Current Biological Trends in Jamaica Bay

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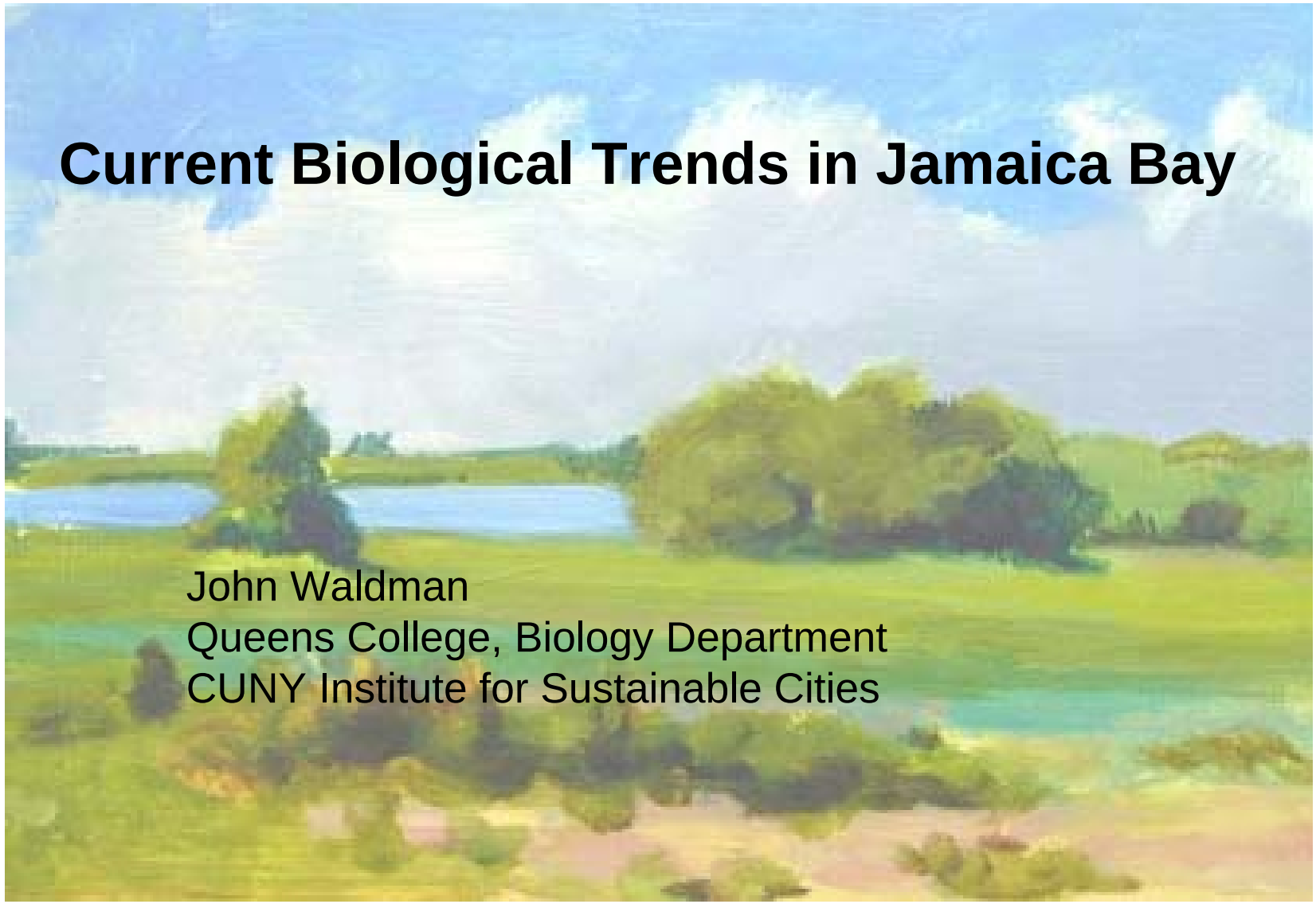


Painting of the Jamaica Bay Wildlife Refuge by Dave Taft

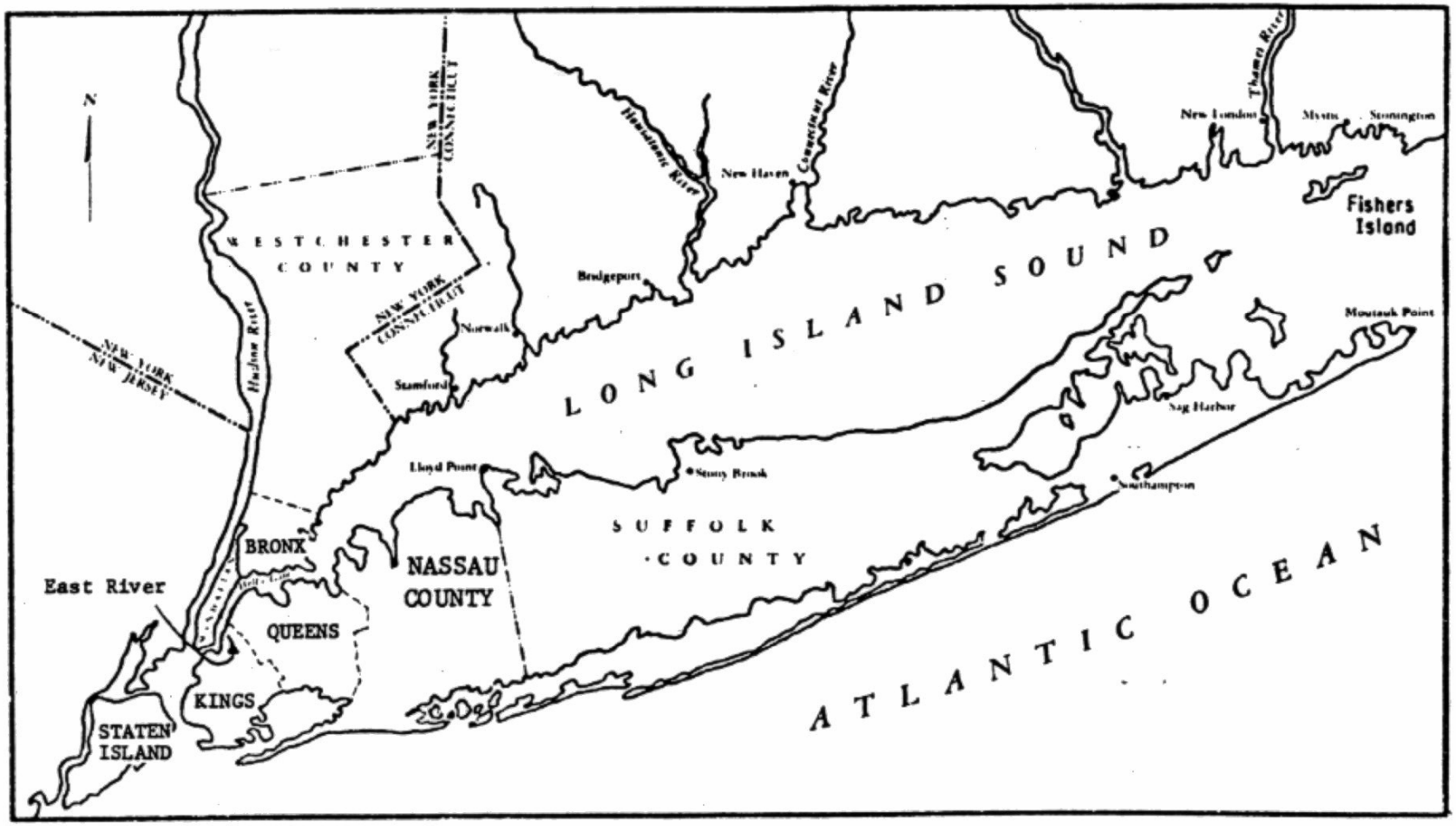
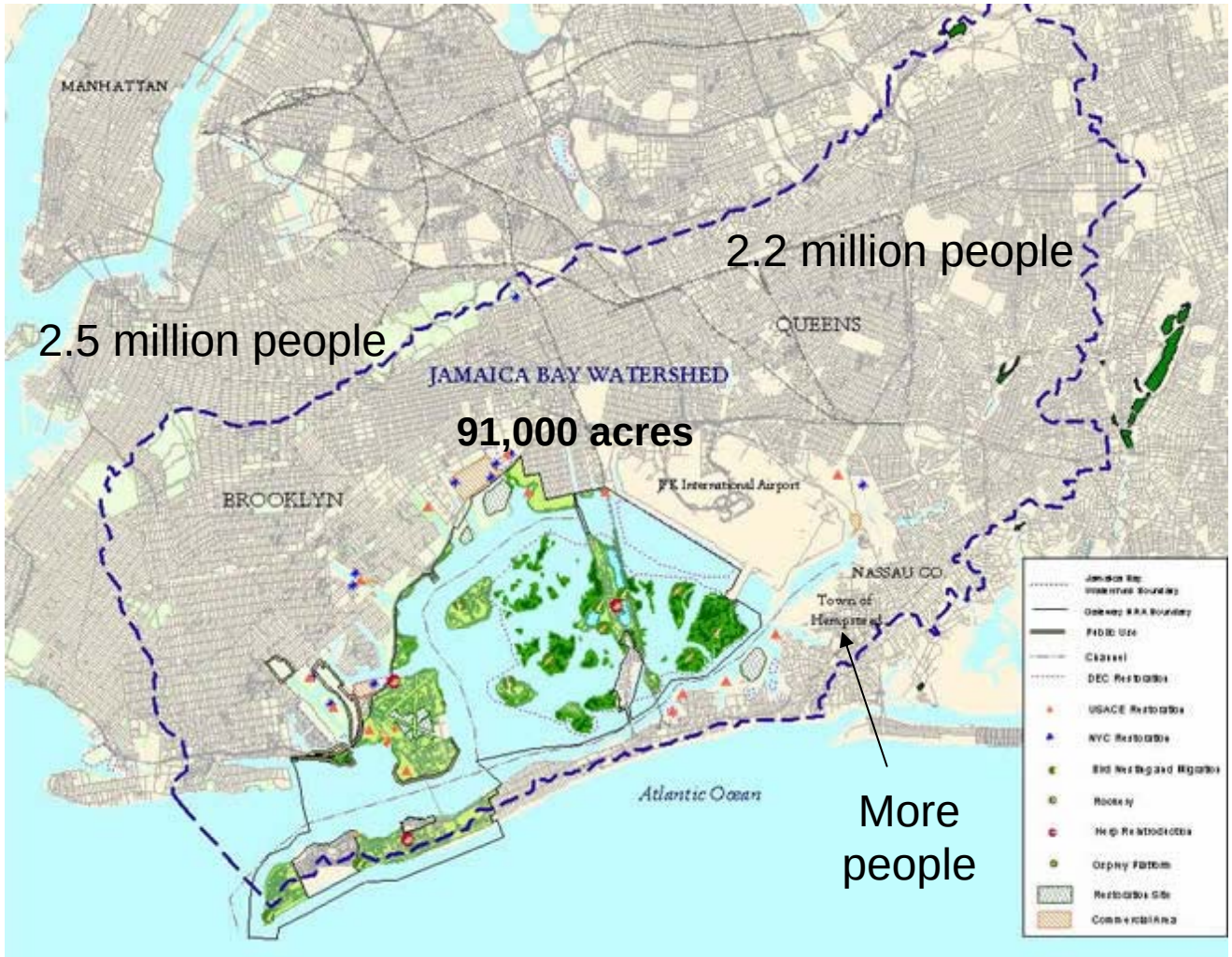


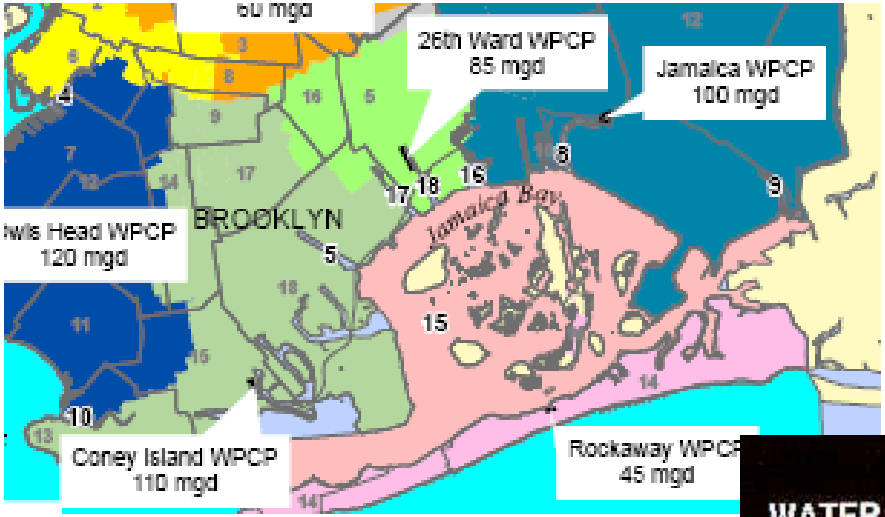
Figure 1. Regional map of Long Island Sound showing its relation to the Piedmont province of Connecticut and Atlantic Coastal Plain province of Long Island.

Trend Analysis

- **The Past**
  - Long-term Data Sketchy, Discontinuous
  - Characterizing the Past
    - Environmental History
    - Analogy from Similar, Neighboring Water Bodies
- **The Present** – Intense Interest
- **The Future** – Ecological Forecasting

What’s Wrong with the Bay?



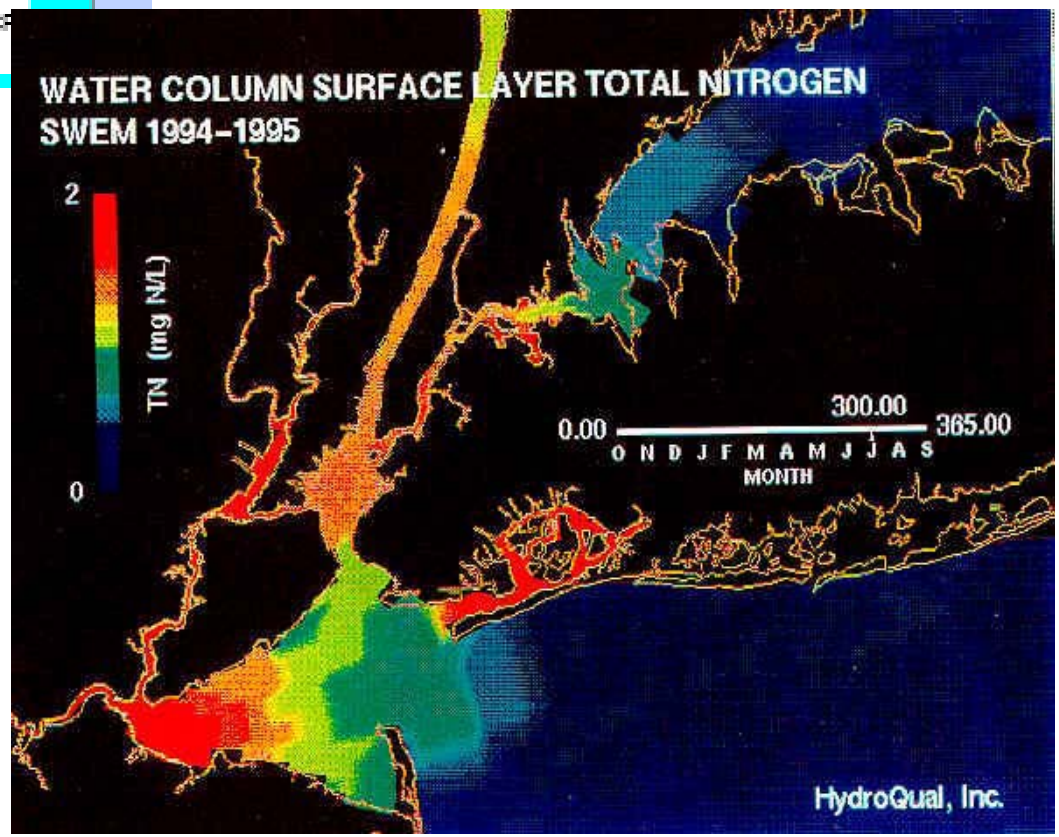


Nutrients

Almost 300 million gallons treated effluent per day

Watershed?

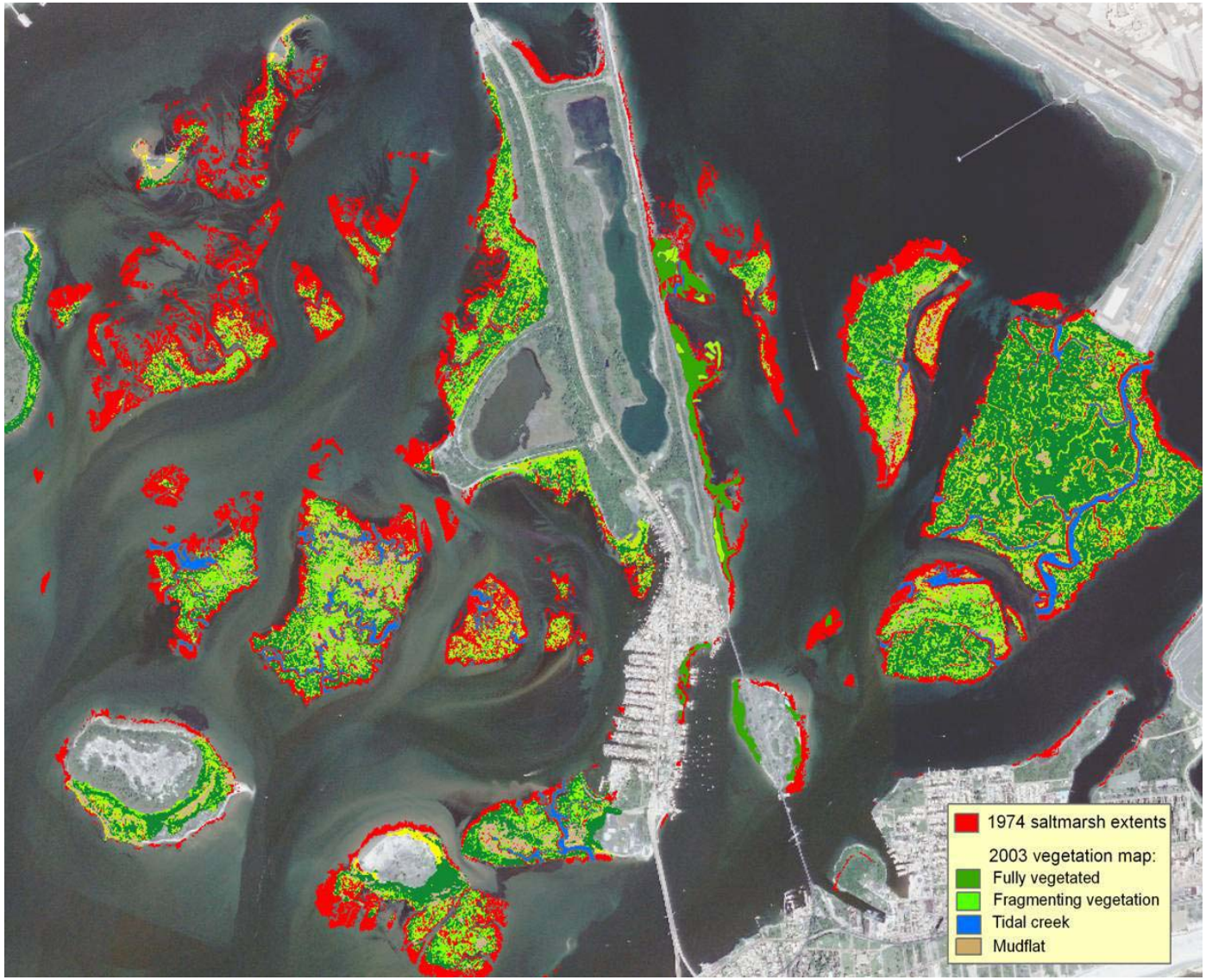
Sewershed!



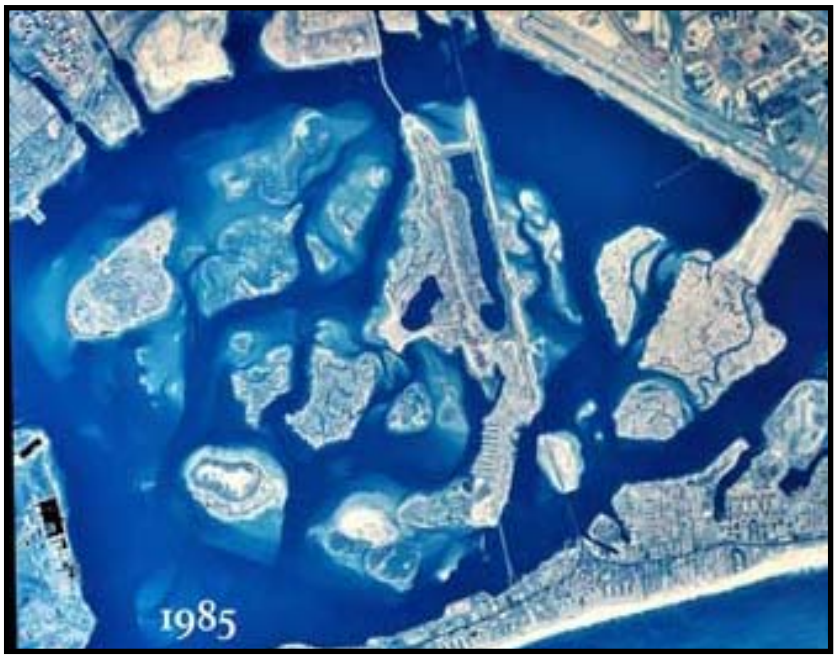
Habitat Change

- Channelization
- “Borrow” pits >50 ft depth
- Avg. low tide depth 3 ft → 16 ft
- 70% increase in bay volume
- “Hardening” of shores
- Freshwater wetlands 1% original area
- Extreme marsh loss (island marshes)

Loss of Island Marshes



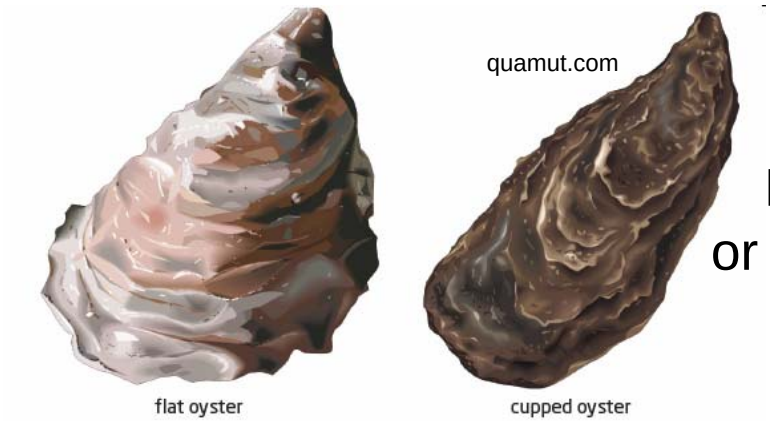
2024? Try 2012



What's Gone?
What's Here that Shouldn't Be?

Gone:

- Oysters
- Eelgrass

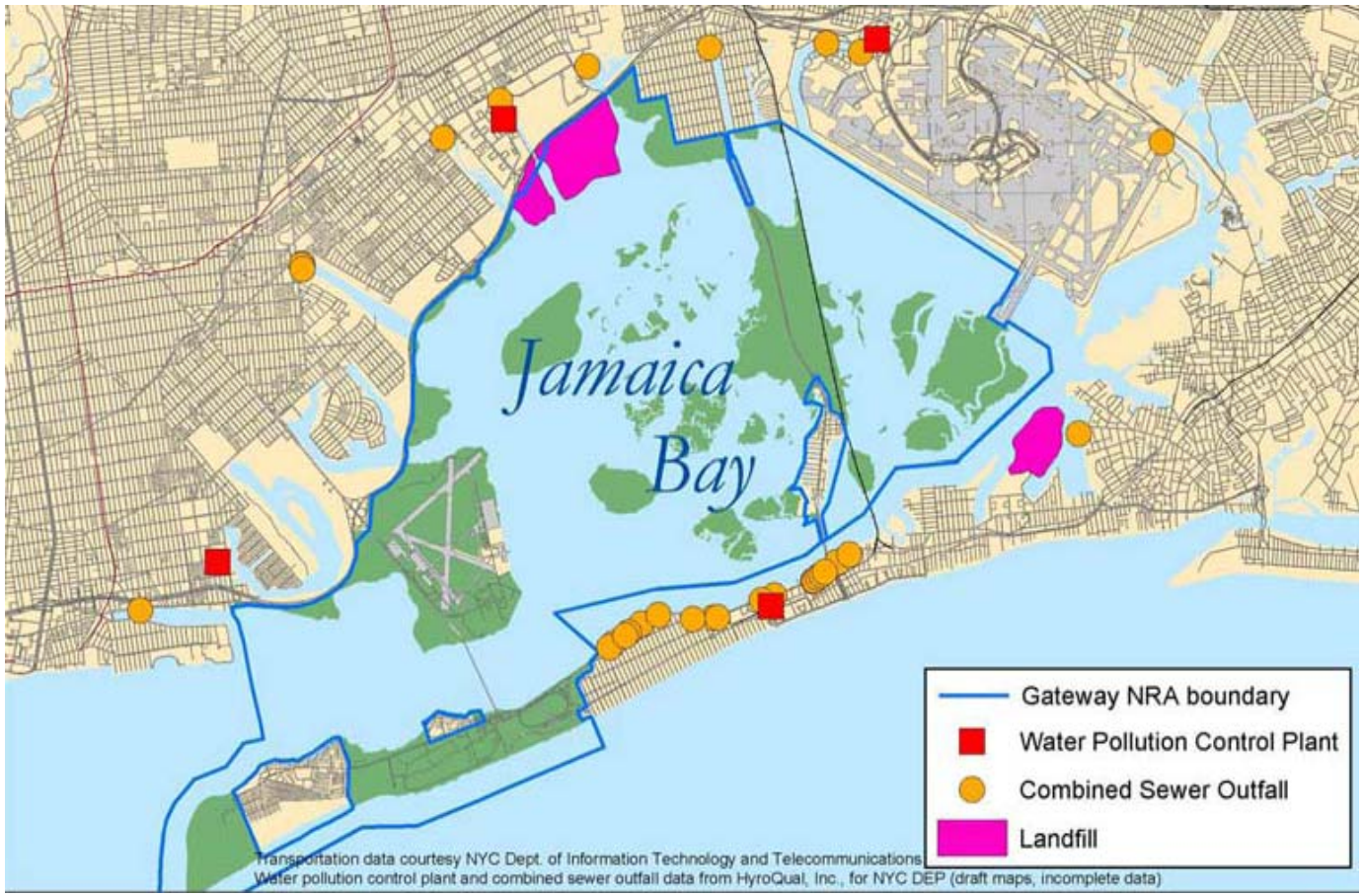


Keystone species?
or Indicators?

Here:

- Myriad non-native species

What's Right about the Bay?



What’s Right about the Bay?

- *A Holy Temple of Birding*

>325 species seen in the Refuge alone

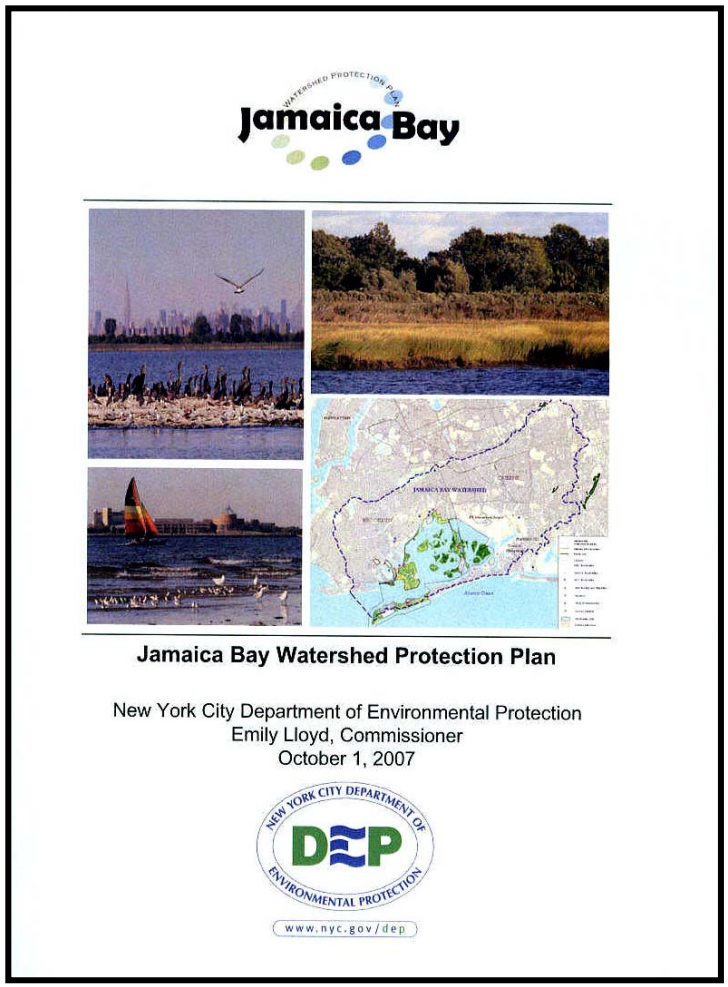
What’s Right about the Bay?

- Largest local remaining diamondback terrapin population
- Important horseshoe crab breeding bay
- Reasonably strong winter flounder population
- Important nursery for estuarine and marine fishes
- Densest ribbed mussel population

Bioblitz, September 2007

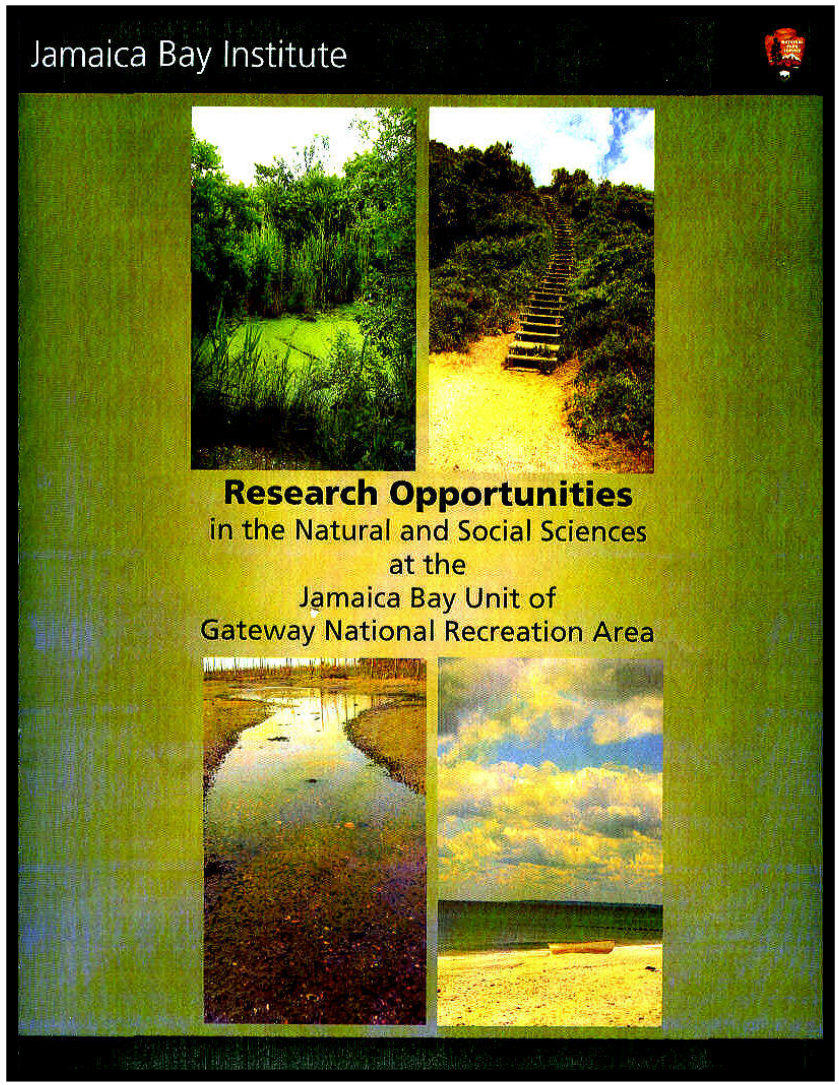
300 participants, > 650 species identified

The Bay is Getting *Serious* Attention



- Federal (8)
- State (5)
- NYC (7)
- Nassau County
- NGOs

Ideas on Going Forward



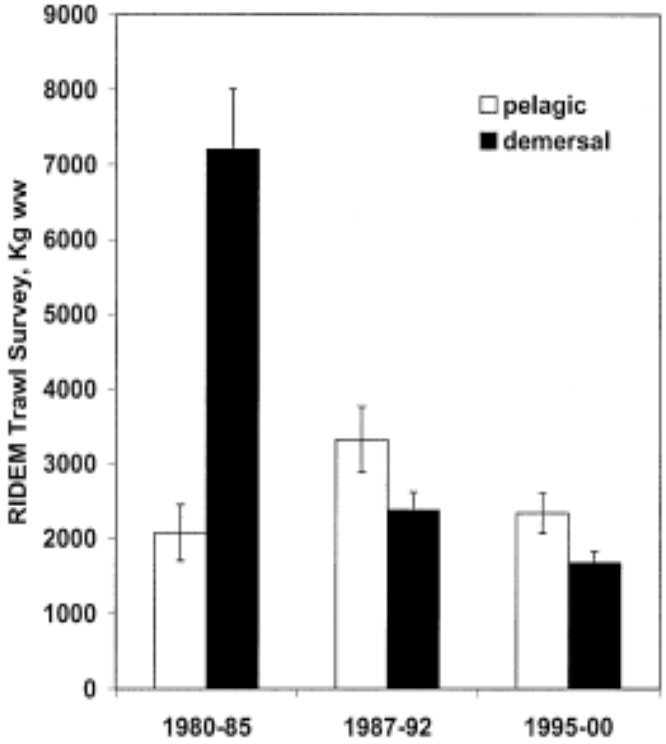
http://www.nps.gov/gate/naturescience/jamaica-bay-institute-research.htm

Restoring the Bay
Some Principles - TEC

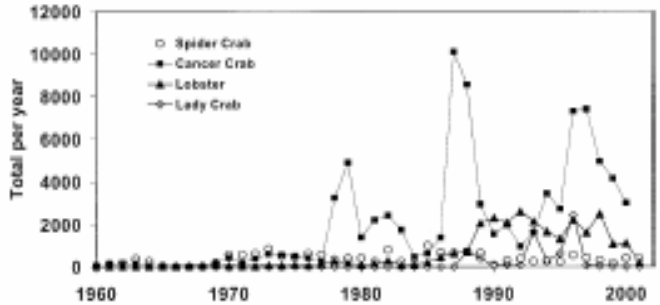
- Ecosystem is human dominated
- ***It has been irreversibly changed***
- ***It is dynamic and will change further***
- Enhancements can be made through application of science and technology

Regime Shift in Narragansett Bay?

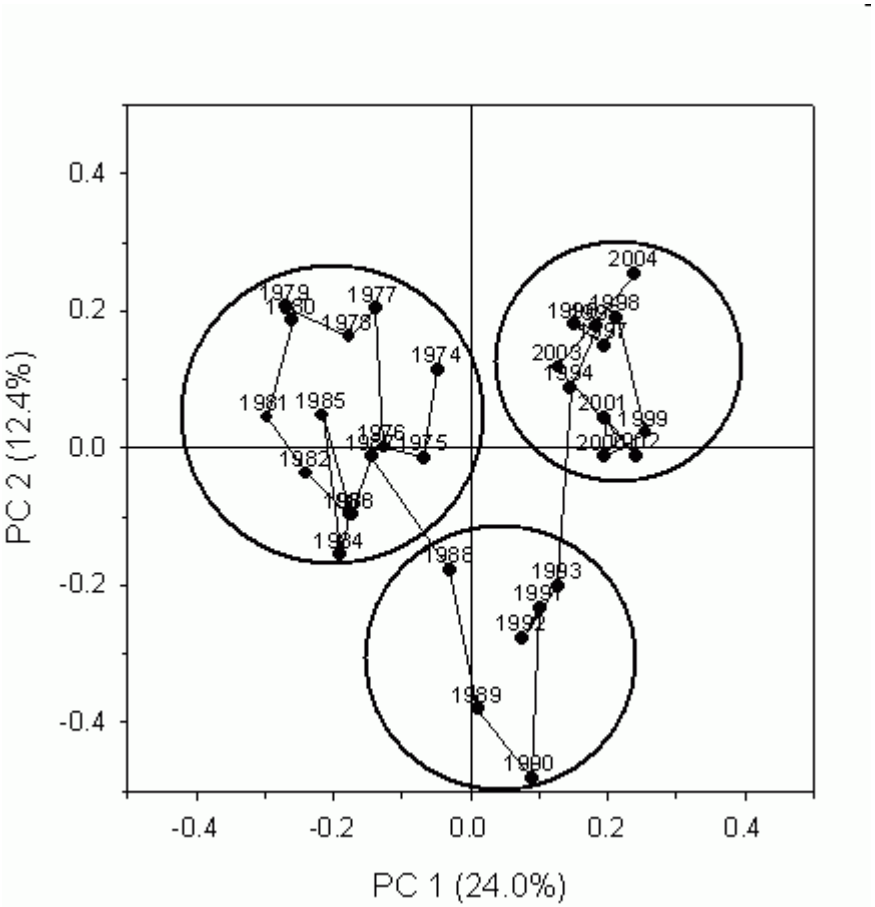
Fishes



Decapods



Another Regime Shift



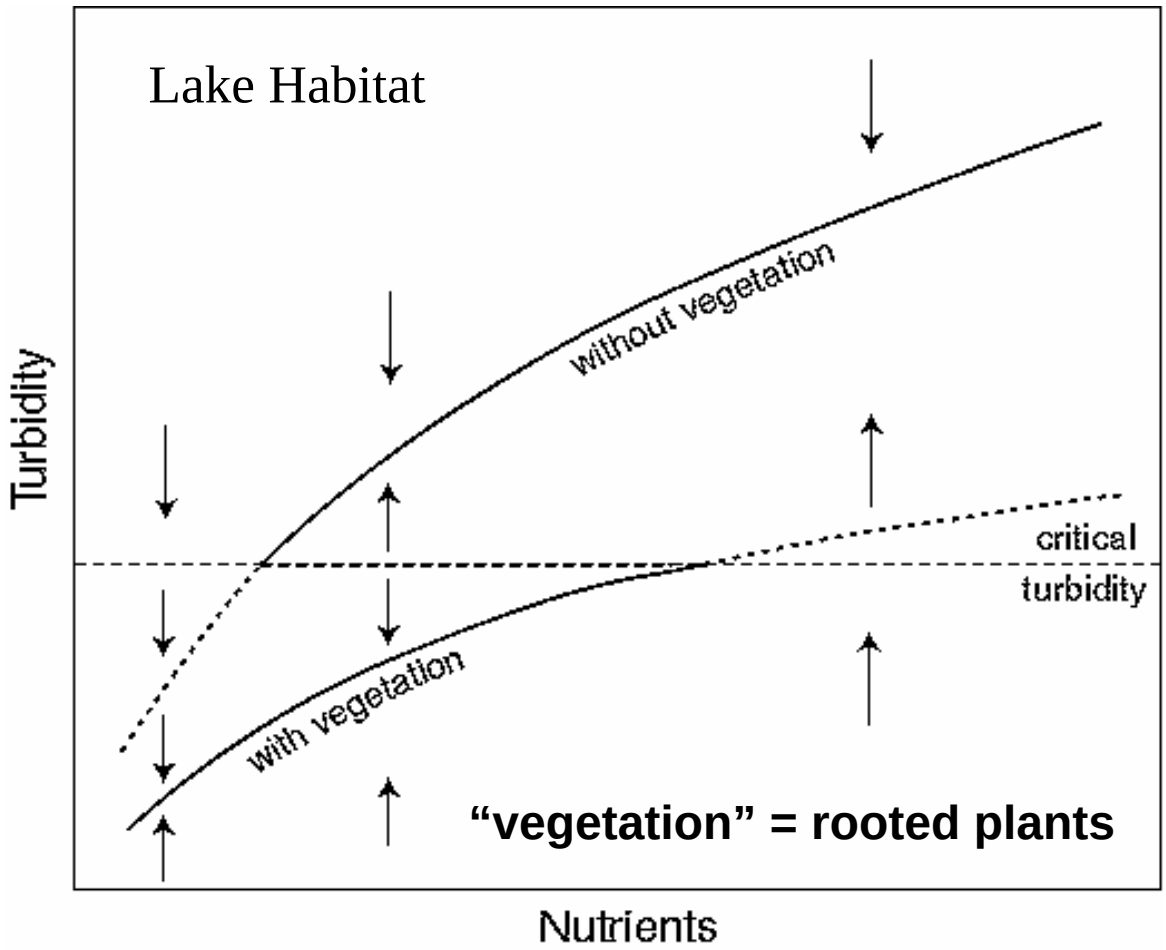
Baltic Sea (Helsinki Commission)

*75 time-series variables

- 1970s – low temp, high salinity
- 1990s – freshening, warming, bottom anoxia
- late 1990s – warm, low saline, stable nutrients

Stable State Hypothesis - Regimes

Forward and backward differences



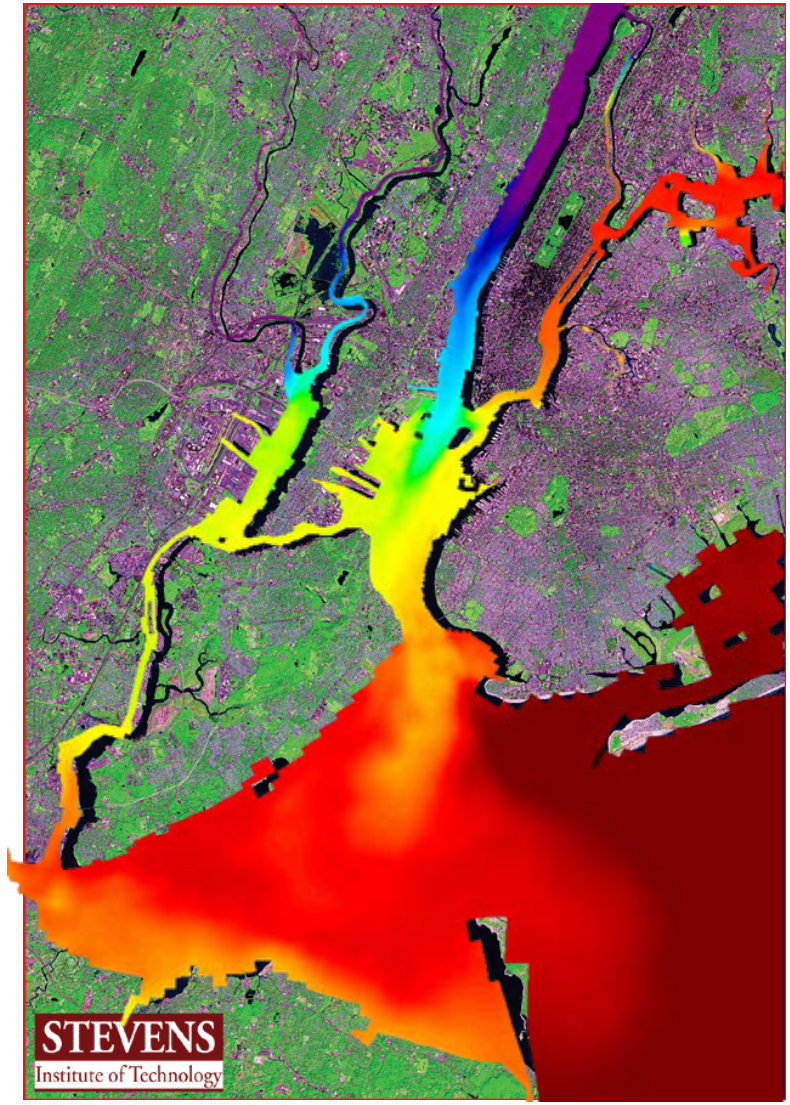
Regime Shift in Jamaica Bay?

- *Possible Drivers*:
  - Cooler → Warmer
  - Shallow depths → Deeper, Varied
  - Island Marshes → Mudflats
  - Moderate nutrient → High Nutrient Levels
  - Salinity gradients → Isohaline
- *Possible Responses*:
  - Oysters → Ribbed Mussels
  - Eelgrass → Sea Lettuce (*Ulva*)

Salinity Gradients

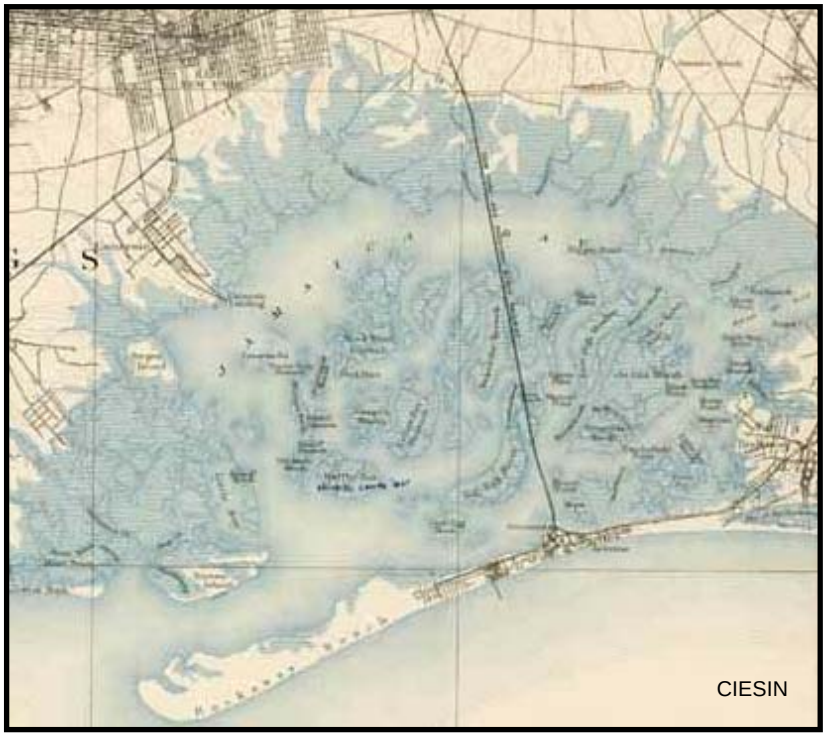
NY/NJ Harbor Estuary
Surface Salinity (psu)
Oct 23, 2008 13:00 - 14:00

http://hudson.dl.stevens-tech.edu/maritimeforecast

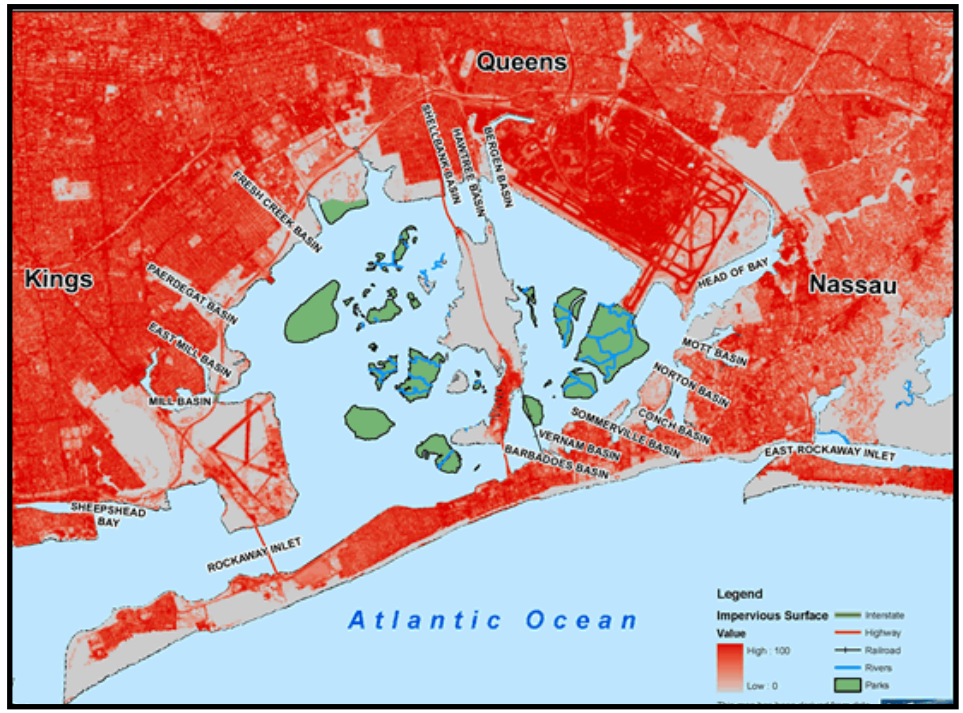


What Happened to Salinity Gradients?

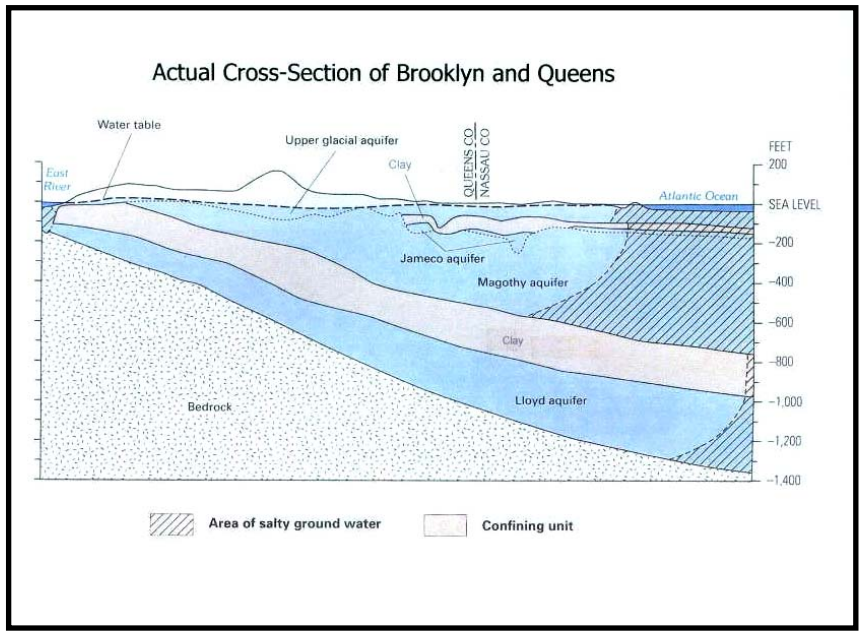
1881



Today



Can Salinity Gradients be Restored?



Well #	Town	Aquifer	Depth (ft.)	Status
W5	Hollis	Magothy or Cretaceous	275	In operation January through December 2006
W1	Kew Gardens	Glacial or Post Jameco	94	Inactive
W11	Jamaica	Jameco	260	
W19	Jamaica	Glacial or Post Jameco	144	
W29	Queens Village	Glacial or Post Jameco	98	
W31	Richmond Hill	Glacial or Post Jameco	144	
W37	Jamaica	Glacial or Post Jameco	207	
W39	Queens Village	Glacial or Post Jameco	96	
W41	Jamaica	Glacial or Post Jameco	116	
W42	St. Albans	Glacial or Post Jameco	84	
W46	St. Albans	Glacial or Post Jameco	132	
W6	Jamaica	Glacial or Post Jameco	67	
W14	Jamaica	Jameco	300	Not operated in 2006
W17	Richmond Hill	Lloyd	550	
W17A	Richmond Hill	Magothy or Cretaceous	281	
W18	Jamaica	Magothy or Cretaceous	250	
W18A	Jamaica	Lloyd	618	
W23	Cambria Heights	Glacial or Post Jameco	97	
W26	St. Albans	Glacial or Post Jameco	115	
W29A	Queens Village	Magothy or Cretaceous	276	
W3	South Ozone Park	Glacial or Post Jameco	98	
W32	South Ozone Park	Glacial or Post Jameco	105	
W33	Jamaica	Glacial or Post Jameco	85	
W38	Hollis	Glacial or Post Jameco	108	
W38A	Hollis	Magothy or Cretaceous	275	
W3A	South Ozone Park	Glacial or Post Jameco	155	
W42A	St. Albans	Magothy or Cretaceous	285	
W43	Richmond Hill	Glacial or Post Jameco	123	
W45	Richmond Hill	Glacial or Post Jameco	158	
W47	Queens Village	Glacial or Post Jameco	105	
W47A	Queens Village	Magothy or Cretaceous	345	
W48	Hollis	Glacial or Post Jameco	120	
W48A	Hollis	Magothy or Cretaceous	280	
W49	Queens Village	Glacial or Post Jameco	130	
W49A	Queens Village	Magothy or Cretaceous	230	
W50	Fresh Meadows	Glacial or Post Jameco	158	
W53	Fresh Meadows	Glacial or Post Jameco	146	
W54	Cambria Heights	Glacial or Post Jameco	103	
W54A	Cambria Heights	Magothy or Cretaceous	360	
W58	Jamaica	Magothy or Cretaceous	320	
W60	Springfield Gardens	Magothy or Cretaceous	353	
W6A	Jamaica	Glacial or Post Jameco	73	
W6B	Jamaica	Glacial or Post Jameco	85	
W6C	Jamaica	Lloyd	602	
W6D	Jamaica	Glacial or Post Jameco	85	
W8A	Richmond Hill	Lloyd	550	
W10	Cambria Heights	Glacial or Post Jameco	105	Emergency use only - Not operated in 2006
W10A	Cambria Heights	Magothy or Cretaceous	432	
W13	Queens Village	Magothy or Cretaceous	291	
W13A	Queens Village	Magothy or Cretaceous	290	
W21	Queens Village	Magothy or Cretaceous	335	
W21A	Queens Village	Magothy or Cretaceous	346	
W22	Kew Gardens	Glacial or Post Jameco	125	
W23A	Cambria Heights	Magothy or Cretaceous	362	
W26A	St. Albans	Magothy or Cretaceous	280	
W27	Jamaica Estates	Glacial or Post Jameco	257	
W36	Rosedale	Magothy or Cretaceous	431	
W39A	Queens Village	Magothy or Cretaceous	255	
W43A	Richmond Hill	Magothy or Cretaceous	242	
W50A	Fresh Meadows	Magothy or Cretaceous	254	
W51	Jamaica	Magothy or Cretaceous	287	
W52	Fresh Meadows	Glacial or Post Jameco	130	
W53A	Fresh Meadows	Magothy or Cretaceous	256	
W55	Hollis	Magothy or Cretaceous	280	
W56	Springfield Gardens	Magothy or Cretaceous	445	
W59	Springfield Gardens	Magothy or Cretaceous	417	
W5A	Hollis	Magothy or Cretaceous	285	
W7	Queens Village	Magothy or Cretaceous	301	
W7B	Queens Village	Magothy or Cretaceous	290	

The New Bay

- May have serious “resilience” in present state
- The success of particular restoration projects may be dependent on broader bay-wide changes
- We don’t know enough to predict success of projects “on paper”

Adaptive/Experimentative Management is Necessary

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