


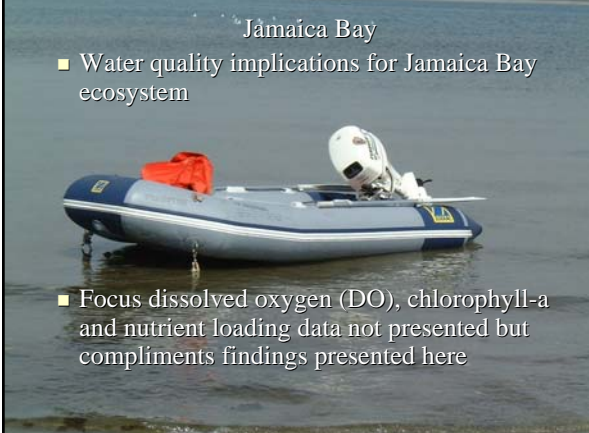
# Water Quality in Jamaica Bay 1966-2005

Mark Ringenary



## Jamaica Bay

- Water quality implications for Jamaica Bay ecosystem
- Focus dissolved oxygen (DO), chlorophyll-a and nutrient loading data not presented but compliments findings presented here



## Historical dataset

- Gateway 1978 to present (USEPA - STORET web site, <http://www.epa.gov/storet/>); sizeable 1988-present
- 1966-1978 IEC & NYC-DEP data set, in addition to overlapping 1978-present



## Jamaica Bay

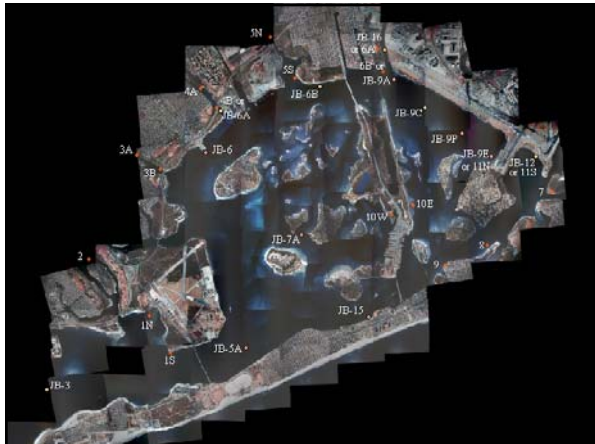
- 6,192 acres of land
- 12,367 acres of water
- Water, land and bay bottom are under jurisdiction of the federal government through the NPS



## Methods and Materials

### Sediment Collection and Lead-Spiking

- Horibia U-10
- Surface water, approximately 1-foot below surface
- Bottom, approximately 3-foot from bottom
- 13 routine up to 30 other locations throughout Jamaica Bay – locations coincide with some NYC-DEP sites
- Primarily end of May through beginning of September on a weekly basis (JABERRT study was weekly for an entire year)



## Experimental Results DO

### Data set characteristics

- Sampling done weekly –during summer
- All location in Jamaica Bay were used in calculation of yearly means; tributaries, head-of-bay and inlets.
- Yearly averages are both top and bottom samples combined
- Occasionally multiple values on the same day were used for individual site results
- 5,210 DO results from 1966-2005 past ~40 years
- Total number of values used ranged between 13 and 356 for any given site (avg 121 per site)

## Experimental Results DO

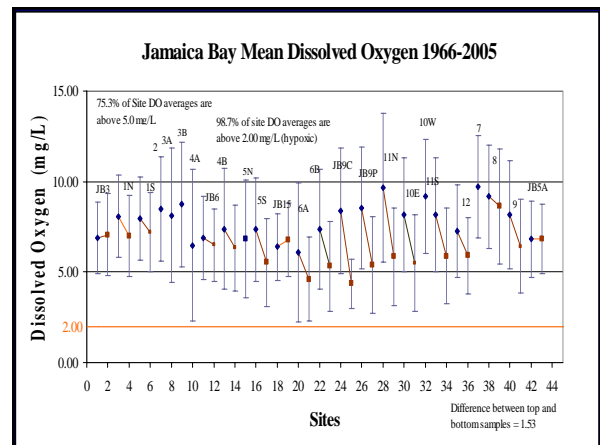
### Water quality thresholds for DO

- Standard optimal conditions exist if DO is greater than 5.0 mg/L
- Hypoxic: 2.0 mg/L
- Anoxic: 0.1 mg/L

## Experimental Results DO

### By Site:

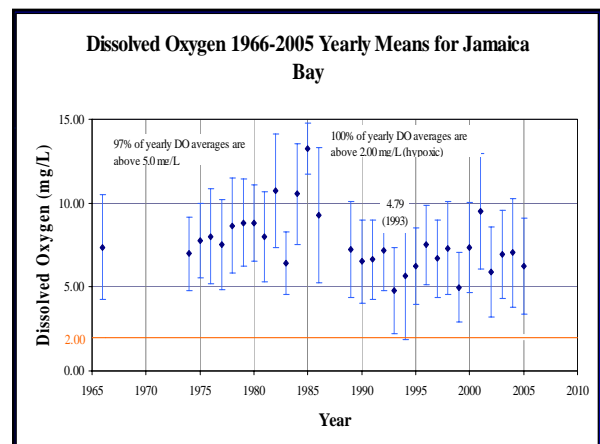
- 75.3% of site DO averages are above 5.0 mg/L;
- 98.7% of site DO averages are above 2.0 mg/L, therefore only rarely hypoxic condition exist.
- 99.9% of DO in Jamaica Bay are above 0.1 mg/L, essentially anoxic condition have not been present in the Jamaica Bay ecosystem for the past 40 years
- Bottom DO are 1.53 mg/L less than surface samples

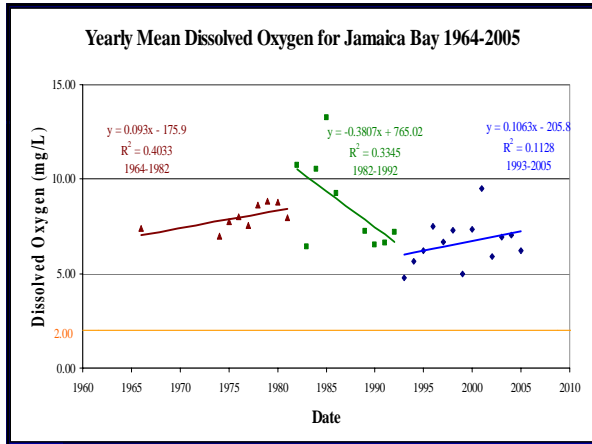


## Experimental Results DO

### By Year:

- 97% of yearly DO averages are above 5.0 mg/L;
- 100% of yearly DO averages are above 2.00 mg/L (not hypoxic)
- As a system Jamaica Bay is not hypoxic,
- However, infrequently hypoxic and rarely anoxic results are reported in Jamaica Bay





## Experimental Results DO (2005)

By Depth August 2005:

- Average DO in Jamaica Bay 13 sites
- Average DO in Grassy Bay 4 sites transect
- One-second intervals in vertical profile averaged over 5 cm increments within water column

## Experimental Results DO (2005)

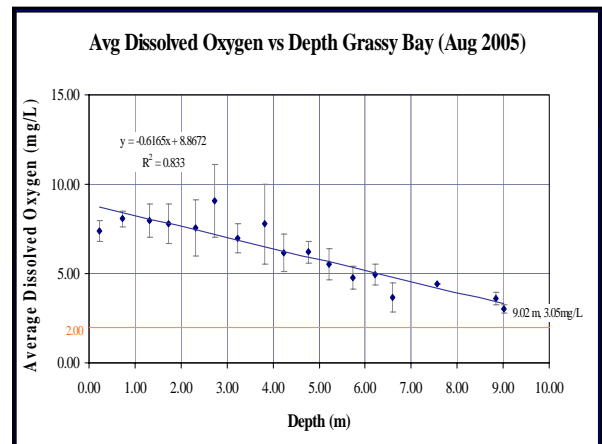
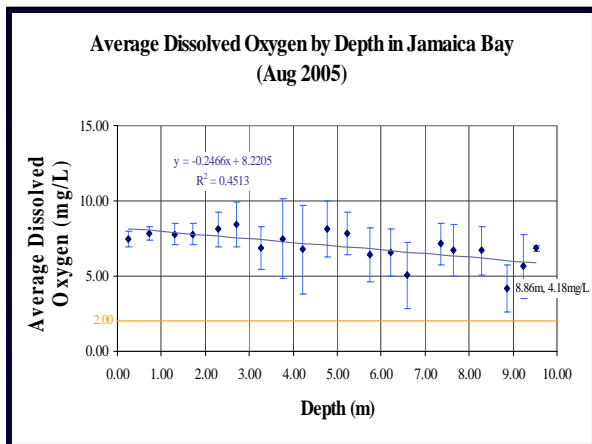
By Depth August 2005:

- Average DO in Jamaica Bay is above 5.0 mg/L from the water surface to 9 meters or further down;
- Average DO in Grassy Bay alone is above 5.0 mg/L from the water surface to 6 meters (+) down;

## Experimental Results DO (2005)

By Depth August 2005:

- In the water column DO values are above the 5.00 mg/L 74% of the time; and
- Intermittent hypoxic conditions can occur at 6-9 meters (20-30 feet) below the water surface where DO values fall below 2.00 mg/L 4% of the time; and
- No anoxic (DO less than 0.1 mg/L) were reported in 2005 (dry season)



## Discussion / Conclusions

- Very infrequently Jamaica Bay DO results in hypoxia, only 2.2% of the time since monitoring began 1966
- Chl-a data from 1974-2005 (31 years)
  - supports 7-day retention time in Bay, only one time was chl-a high in two consecutive weeks.
  - Consistent with increased DO in surface waters.
  - 99% chl-a site averages are below 20 µg/L, no sustainable eutrophication

## Discussion / Conclusions

- Hydrology
  - 7-day retention time in Jamaica Bay (Lamont Doherty) supported by water quality data sets
  - recontouring Jamaica Bay will redistribute water contamination to other locations, currently not impacted or stable.
  - canalization and wastewater discharges have historically occurred and will continue
- Impacts on water quality are directly related to wastewater effluent entering the Jamaica Bay system.

## Discussion / Conclusions

- Habitats and water quality are sustainable only through reduced impacts from wastewater
- Recommendations;
  - Tertiary treatment essential to reduce  $\text{NO}_4$ ,  $\text{PO}_4$  and other loadings
  - Reduce adverse shock loads due to effluent and CSO input into Jamaica Bay

These analyses are a work in progress on water quality parameter in Jamaica Bay.

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