Urban Waters Initiative

Bronx and Harlem Rivers

U.S. Geological Survey

Shawn Fisher

USGS New York Water Science Center

Coram, N.Y.

In cooperation with:

National Park Service

New York City Environmental Protection

USGS Water Science Centers

- Surface water
- Groundwater
- Water Quality
- Real-time and historical data available online
- Mapper to search by location
- Basic Data
  - Nationwide network of GW water levels, stream flows, SW and tidal info
  - Critical for water-resource management
- Hydrologic Studies
  - Project oriented
  - Unbiased, high-quality data from National laboratories

Urban Waters Initiative

Bronx and Harlem Rivers

- Urban Waters Initiative (UWI) mission
  - Revitalize watershed
  - Improve water quality
  - Connect community with their natural resource
- Local, State, and Federal partnership
  - Community groups; NYC EP
  - NYS DOH, DOT
  - EPA; NPS; NOAA; Army Corp. of Eng.; USGS
- USGS Role
  - Take lead in scientific assessment
  - Provide interpretation to inform decisions
  - Engage community through outreach

Urban Waters Initiative

Bronx and Harlem Rivers

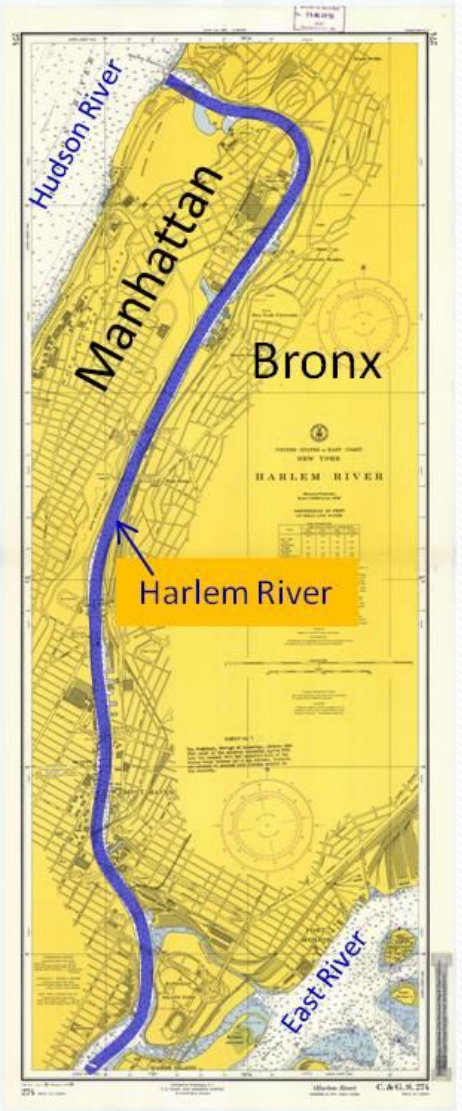
USGS Regional Executive Flexible Spending Grant to support the UWI

- Compile and review existing water-quality and hydrologic data on the Harlem River
- Identify gaps in data and offer suggestions for additional water-quality monitoring as needed
- Identify water-quality problems and likely sources
- Prepare fact-sheet summarizing water-quality data of the Harlem River
- Present findings to residents and partners through coordination with local community groups
- Tabulate compiled data into GIS format for use in mapper programs developed by NYC and the GAIA Institute (pending additional funding)

Harlem River

Harlem River

- 8-mile stretch converted to tidal strait during early urban development
- Limited accessibility to the Harlem River for community enjoyment
  - Under-utilized waterfront with few parks
  - Direct water access hindered by bulkheads and railway infrastructure
- Included in the NY/NJ Harbor Estuary and Hudson River Estuary Programs
- "Watershed" highly urbanized
  - Direct freshwater contributions limited to runoff and Combined Sewer Overflow (CSO); limited GW influx
  - CSOs act as point-sources of pollutants
  - Runoff and adjacent waterways (Hudson River/East River) activities serve as nonpoint-sources of pollutants

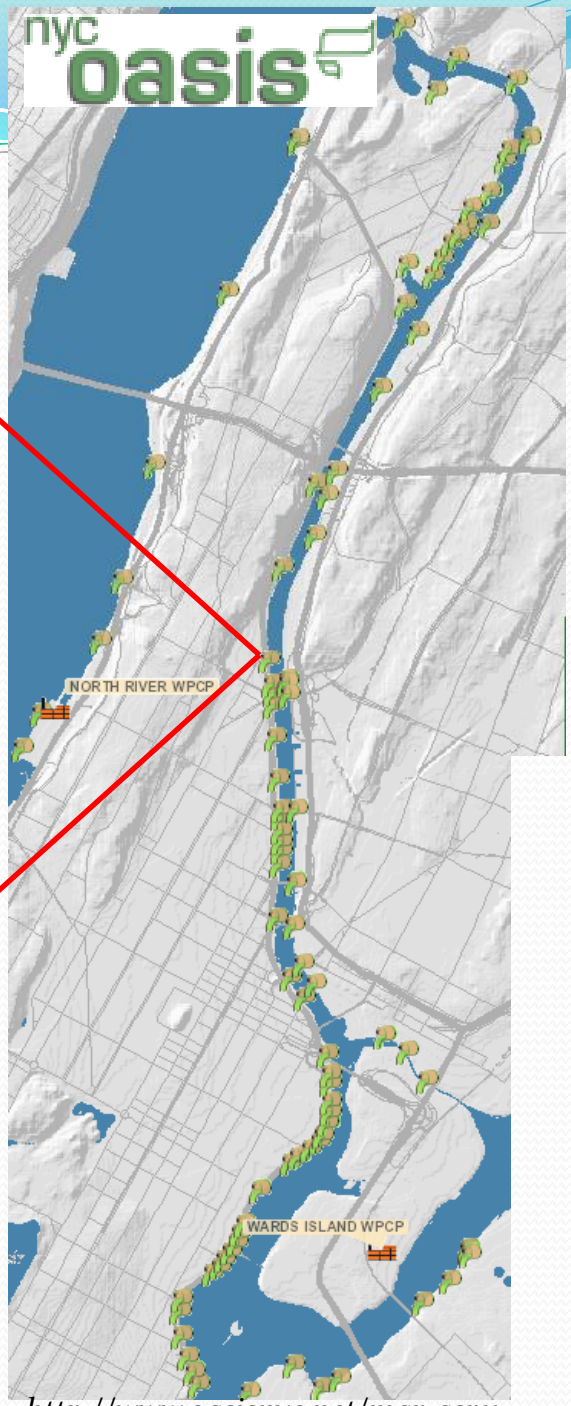


USGS
science for a changing world

Harlem River

Water-quality concerns

- CSO events
  - Precipitation
  - Increased water use
  - WWTP failure
- Untreated sewage contributes to a decrease in water quality and usability
  - Increased Fecal Coliform and Enterococci levels
  - Decreased dissolved oxygen
  - Increased nutrient loading
- Storm water runoff contributes to poor water quality
  - Increase in pollutants from roads and sidewalks
  - Litter washed down drains and into the river (floatables)
- On-going improvements have decreased the number of CSO events and better sustained-water quality



http://www.oasisnyc.net/map.aspx

Harlem River

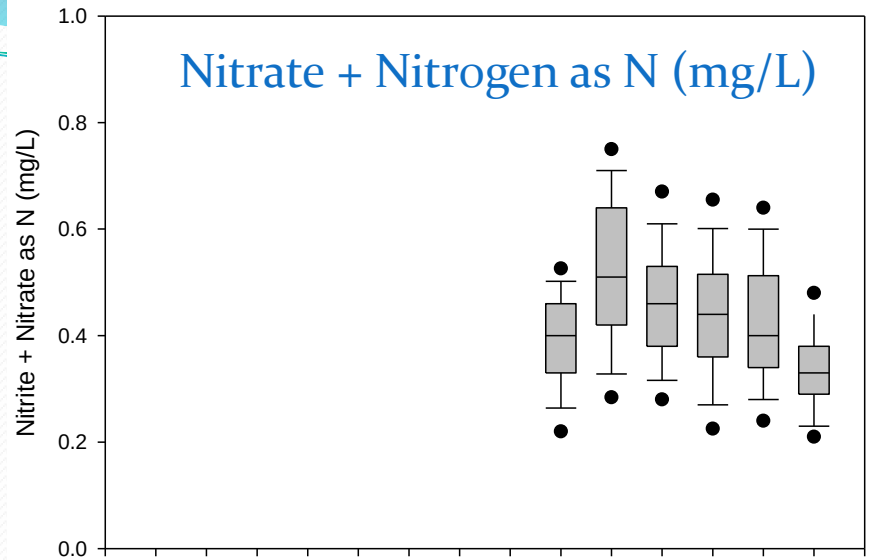
Water-quality data sources

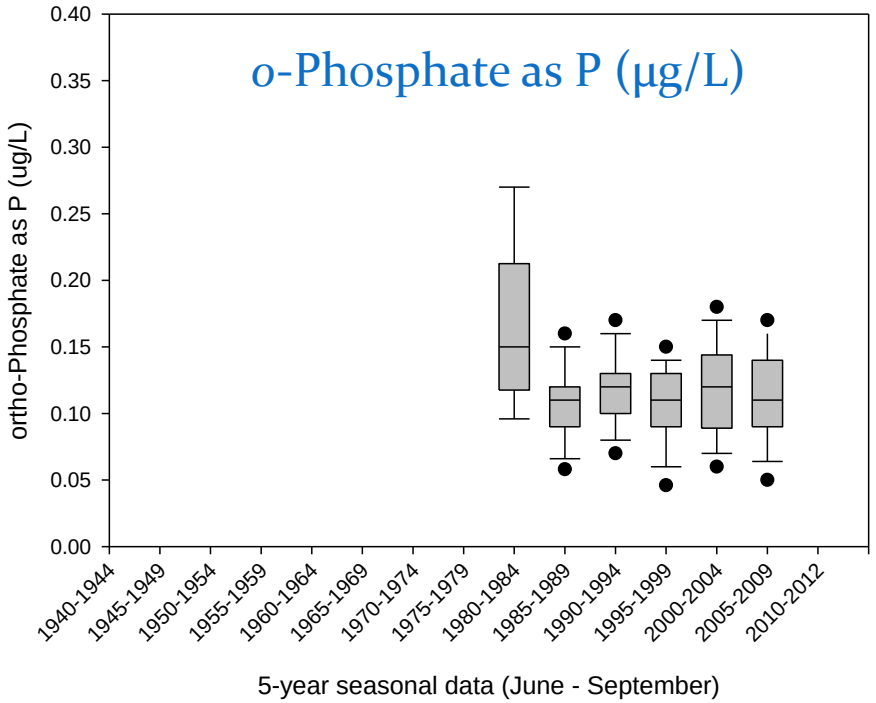
- Data sources
  - NYC Environmental Protection
    - New York Harbor Survey Program – over 100 years of water quality data
    - Annual Reports
  - Riverkeeper, Inc.
    - Basic water-quality parameters and Enterococcus levels
    - Website
  - U.S. Environmental Protection Agency
    - Water- and sediment-quality data from 2000-2002
    - Storage and Retrieval (STORET) data repository
- Relate NWS precipitation records to NYC EP water quality data
  - Better assess the effects of CSO events relative to basic water quality parameters
  - Correlate these with fecal coliform and/or Enterococcus levels that limit contact with water, as well as fin- and shell-fishing
- Studies on water quality, net-flow, and floatables also available

Harlem River

Water-quality concerns

- Relating and interpreting data
- Parameters for determining eutrophication limited
- 2007 study by NOAA reports for Hudson River/Raritan Bay (which includes Harlem River) as Moderately Eutrophic

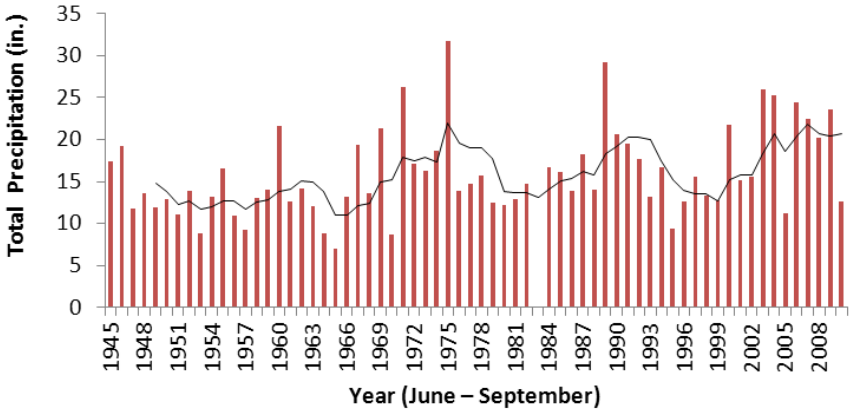




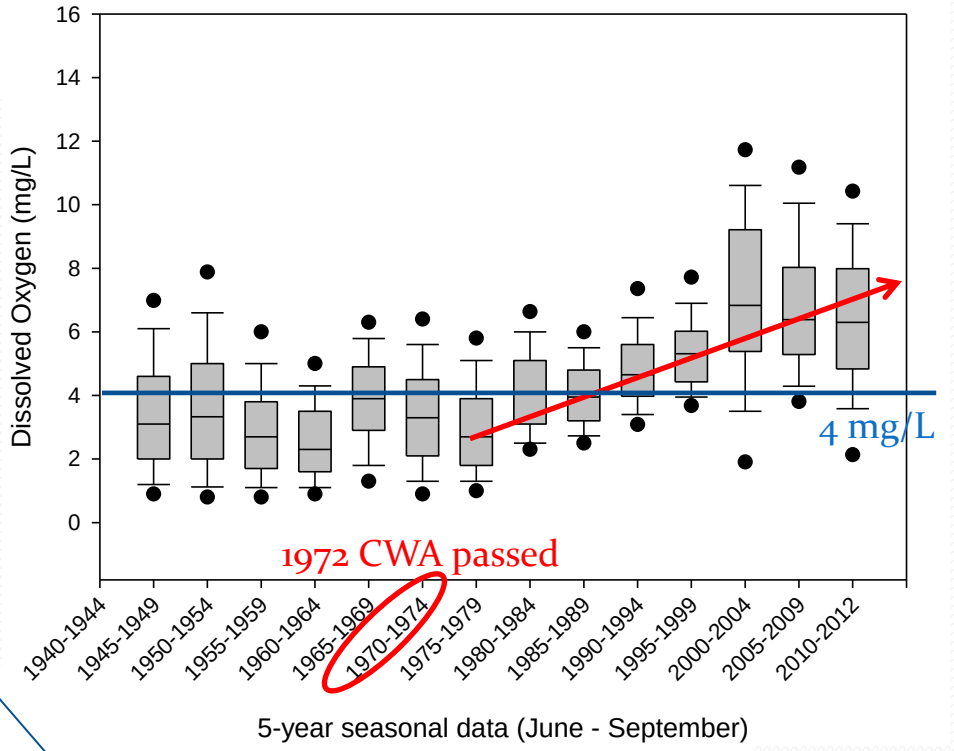
Harlem River – water quality

Dissolved Oxygen

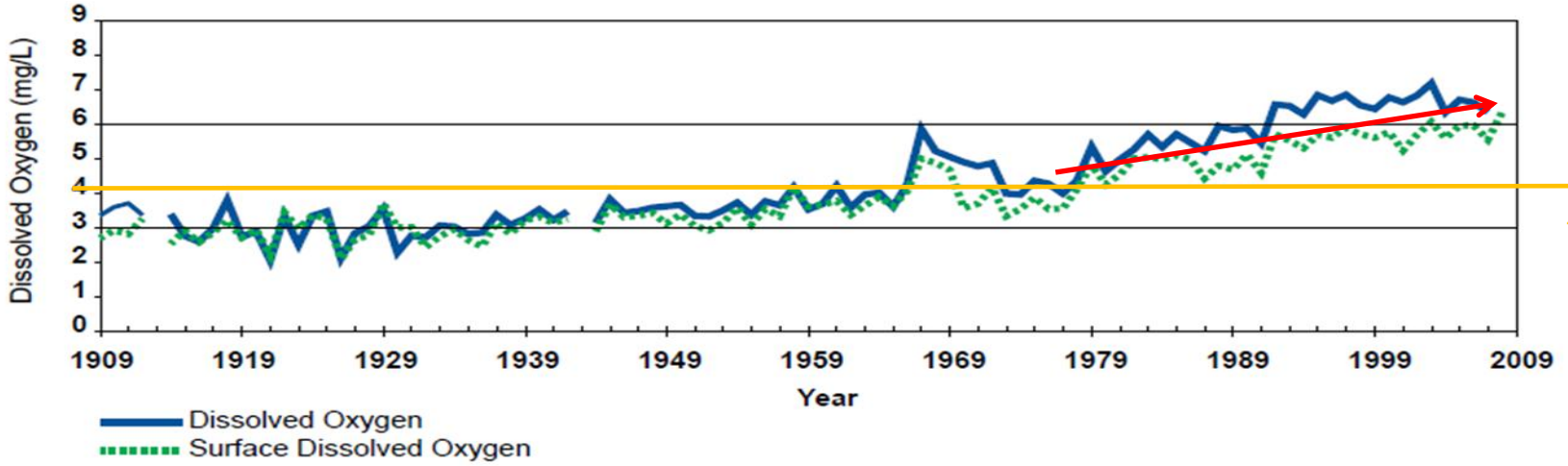
Seasonal Precipitation Totals (June – Sept)



Dissolved oxygen (Surface) in 5-year increments



Summer average dissolved oxygen from 1909 to 2009
Harbor-wide, seasonal geometric average



NYC EP, 2009, NY Harbor Survey Program – Celebrating 100 years 1909-2009, 32 p.

Harlem River – water quality

Fecal Coliform

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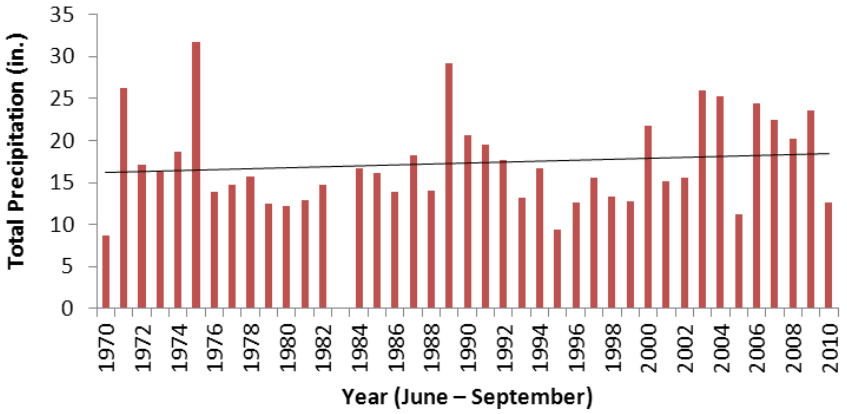

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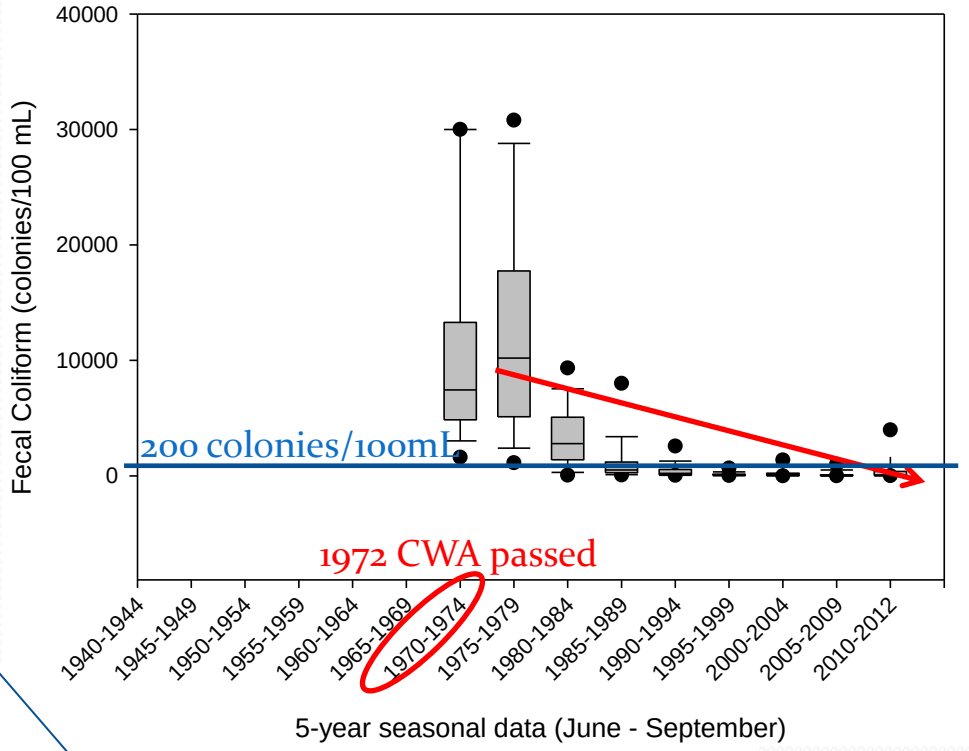

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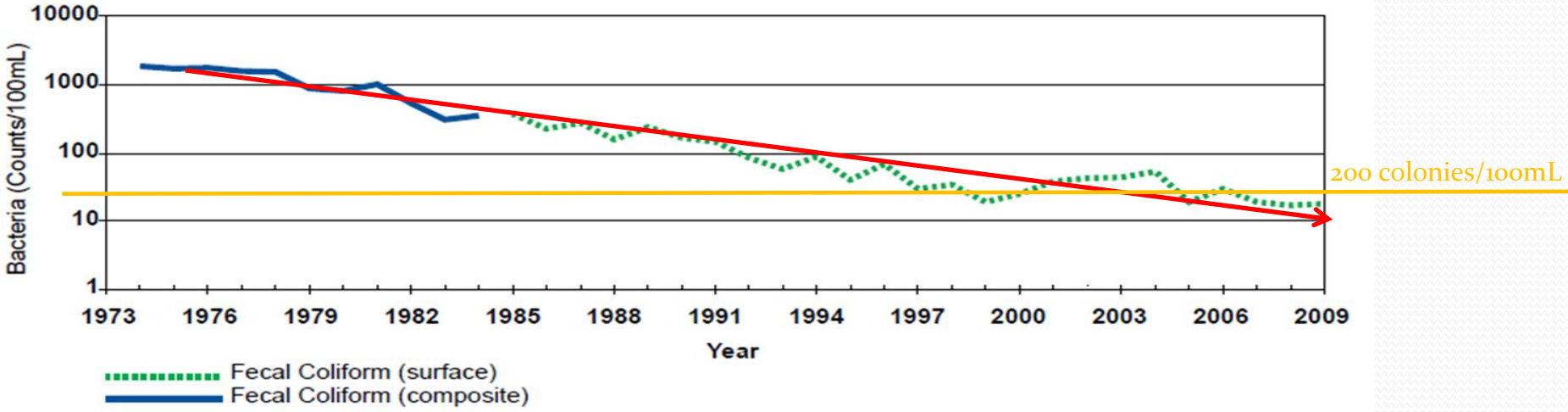

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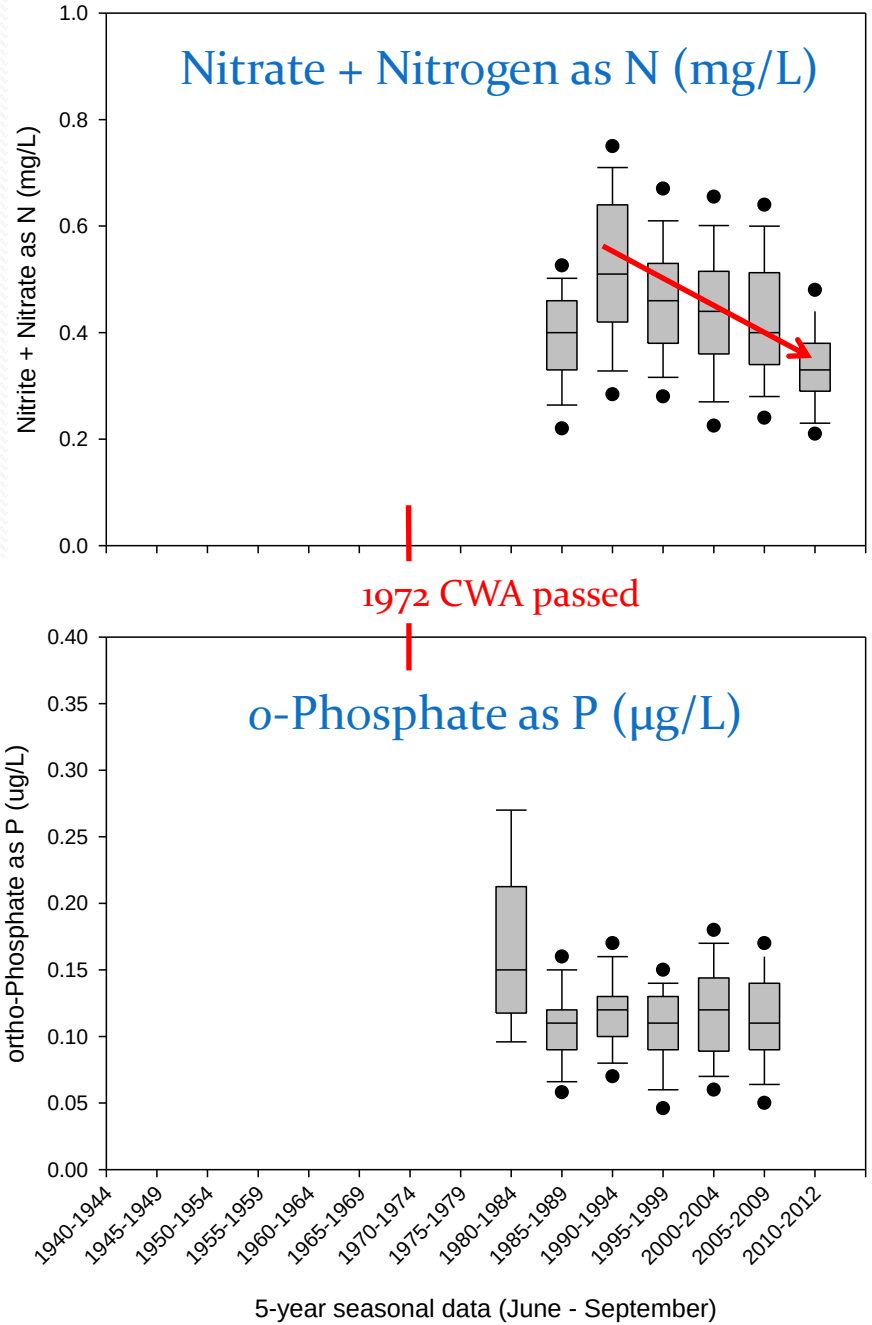
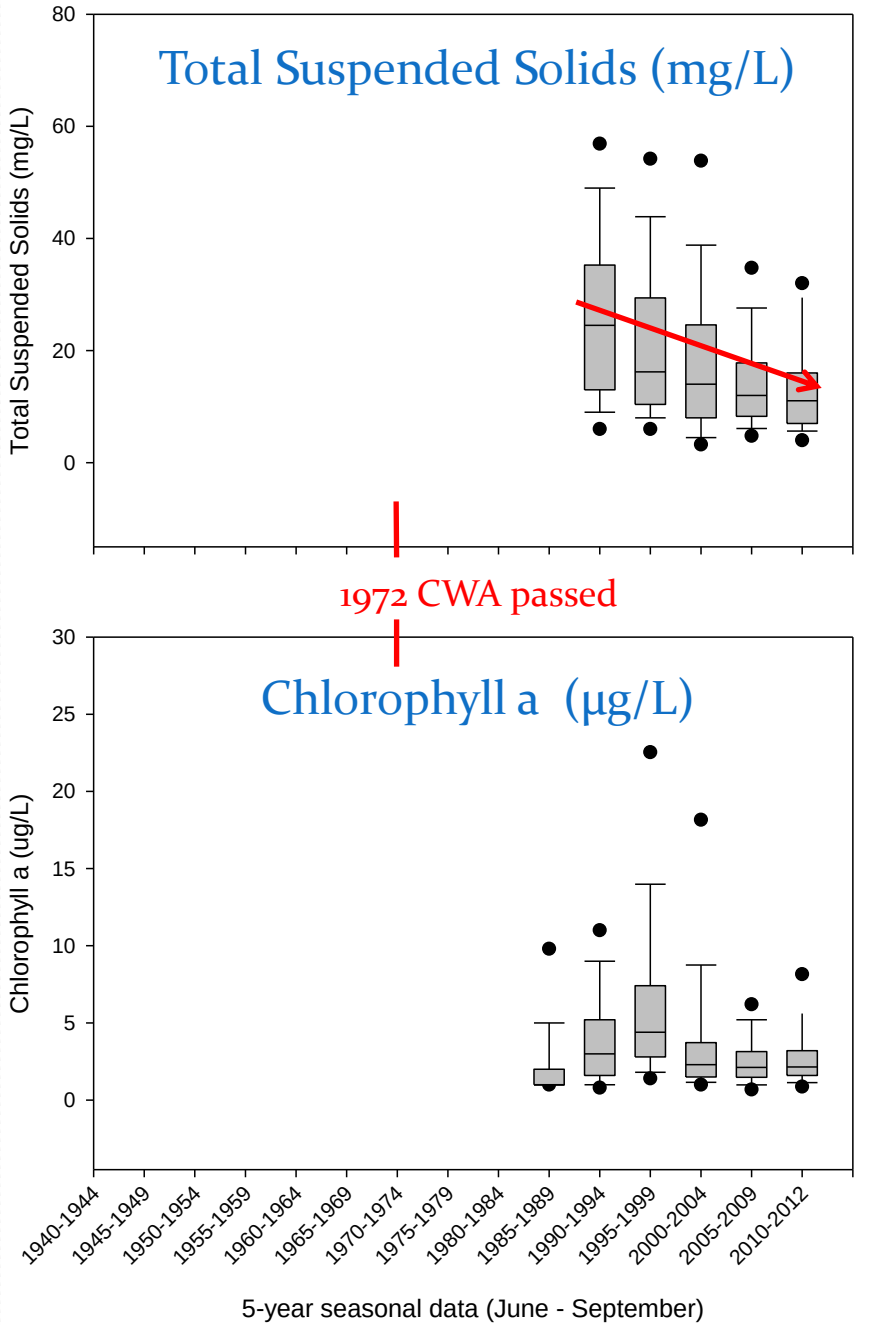
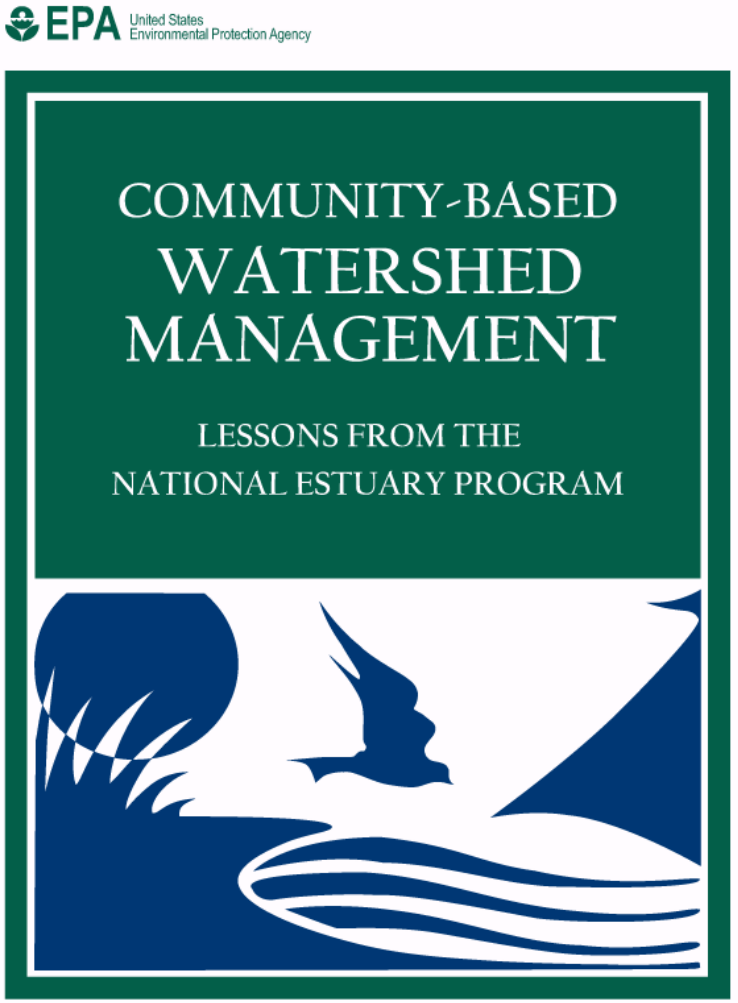

Nitrate + Nitrogen as N (mg/L)
Nitrite + Nitrate as N (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
1972 CWA passed
ortho-Phosphate as P (µg/L)
ortho-Phosphate as P (ug/L)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1940-1944
1945-1949
1950-1954
1955-1959
1960-1964
1965-1969
1970-1974
1975-1979
1980-1984
1985-1989
1990-1994
1995-1999
2000-2004
2005-2009
2010-2012
5-year seasonal data (June - September)


Total Suspended Solids (mg/L)
Total Suspended Solids (mg/L)
80
60
40
20
0
1972 CWA passed
Chlorophyll a (µg/L)
Chlorophyll a (ug/L)
30
25
20
15
10
5
0
1940-1944
1945-1949
1950-1954
1955-1959
1960-1964
1965-1969
1970-1974
1975-1979
1980-1984
1985-1989
1990-1994
1995-1999
2000-2004
2005-2009
2010-2012
5-year seasonal data (June - September)

Harlem River

- Need for a Total Maximum Daily Loads (TMDL)
  - Nitrogen
  - Pathogens
- Need continuous monitoring along the Harlem River (preferably at a location where weekly samples are collected)



Harlem River

- Improvements to WWTP have improved the water quality significantly over the past 40 years

- Changing in NYS DEC classification from I to C or B would likely require diverting, retaining, preventing CSO input

From EPA's Urban Waters website

Harlem River

- Summary of current objectives and sources of information related to the Harlem River available on the USGS UWI – Bronx & Harlem Rivers webpage

- Information also available through the NYC EP website

http://ny.cf.er.usgs.gov/nyprojectsearch/projects/LK00-DU700.html

Bronx River

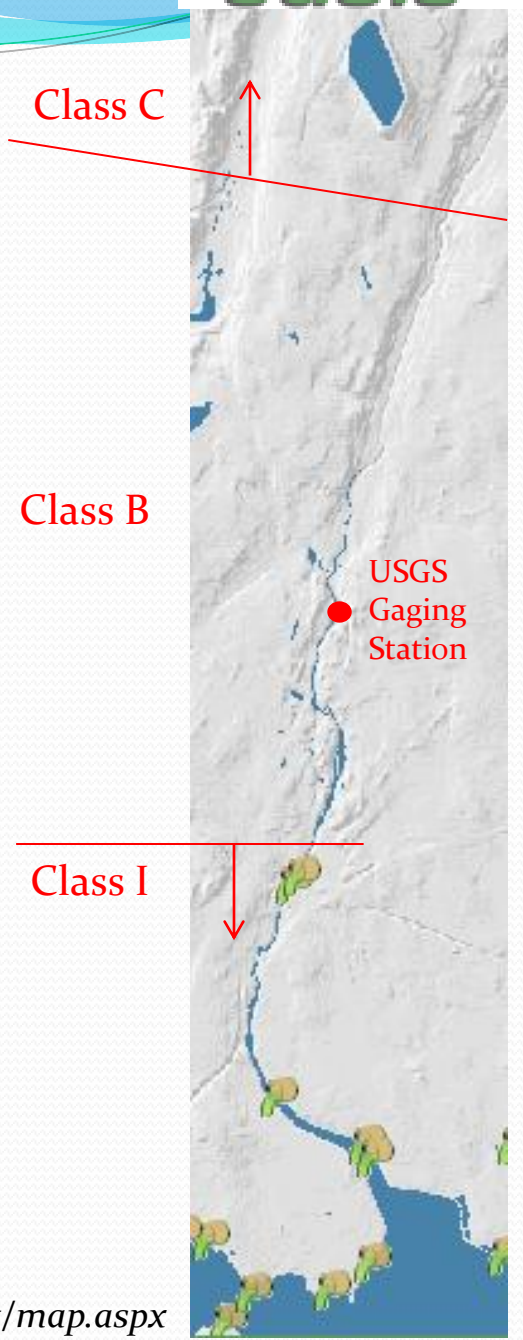
Bronx River

- 20 miles long, with a total drainage area of 60 square miles
- Less impacted by CSO events, but still some upstream effects
- Floatables observed but not documented
- Part of USGS Basic Data network in cooperation with NYC EP
- Stream flow data collection since 1944, continuous, real-time monitoring since 2006
- Emergency managers use data to minimize loss of life and damage to infrastructure
- A "100-year flood" (4/15-16/2007) was recorded following over 8 inches of rain over two days
- Bronx Zoo kiosk
  - Presentation loop describes USGS streamgaging and the benefits of data collection
  - Will be displaying real-time data soon

Bronx River

- Segments of the Bronx River NYS DEC designation
  - Class I – secondary contact only; fishing
  - Class C – primary and secondary contact with stipulations; fishing
  - Class B – primary and secondary contact; fishing

ER-3 portion	Mouth to East Tremont Avenue bridge.	R-24se R-24sw	I	I
ER-3 portion	From East Tremont Avenue bridge to Bronx-Westchester county line.	R-24sw R-24se R-24ne	B	B
ER-3 portion	From Bronx-Westchester county line to trib. 33.	R-24se Q-24se	C	C
ER-3 portion	From trib. 33 to trib. 38.	Q-24se	C	C(T)
ER-3 portion	From trib. 38 to Kensico Dam.	Q-24se	C	C



http://www.oasisnyc.net/map.aspx

Bronx River

Real-time Discharge and Water Level

Normal conditions
(base flow)

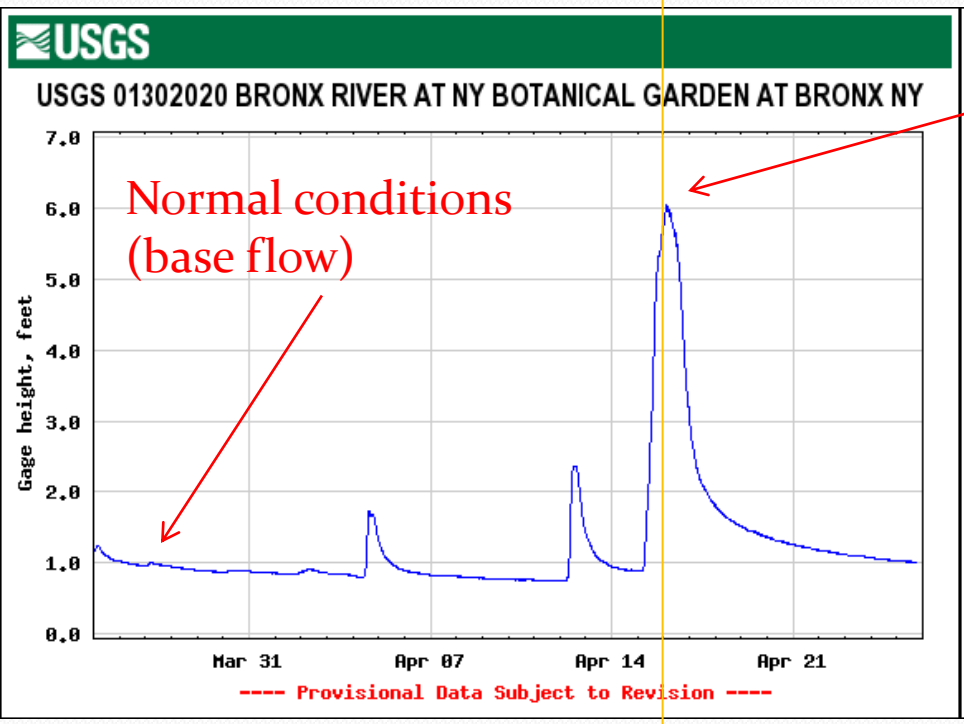
Flooding conditions
(~8” of rain in two days)

Bronx River

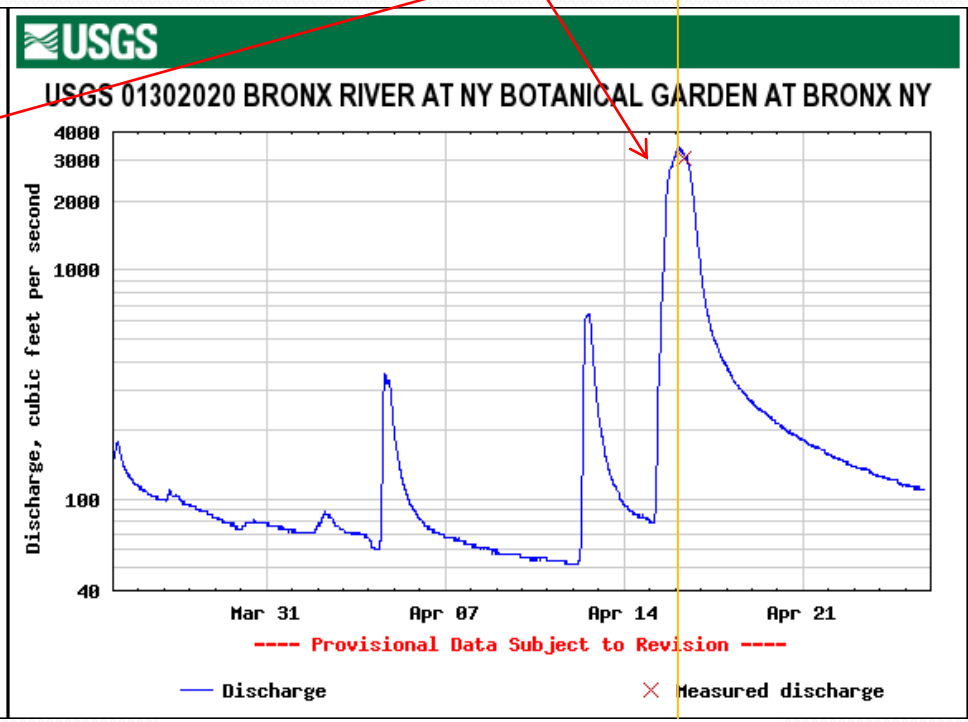
Real-time Discharge and Water Level

April 16, 2007

Flooding conditions
(~8" of rain in two days)



Stream stage (feet)



Flow (cubic feet per second)

Bronx River

Old Snuff Mill on the Bronx River (flooding conditions)

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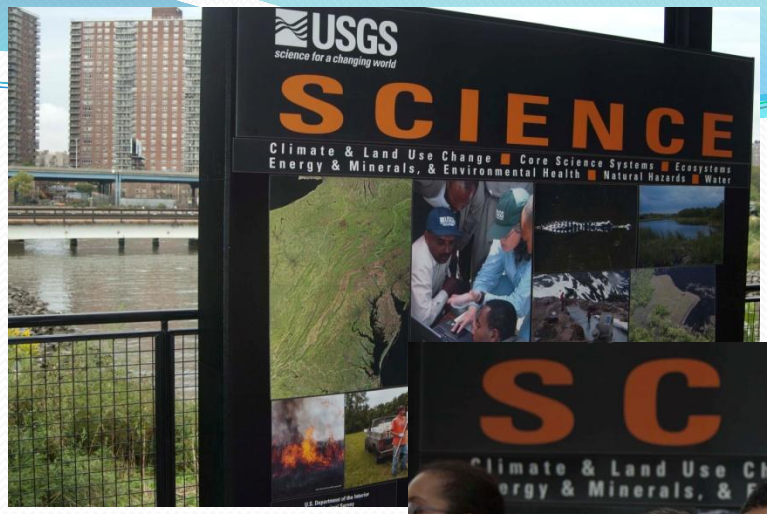
science for a changing world

Bronx River

Bronx River in the Botanical Gardens (flooding conditions)

Thank you!



Shawn Fisher
2045 Route 112, Bldg. 4
Coram, NY 11727

scfisher@usgs.gov

631-736-0783 x 133

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