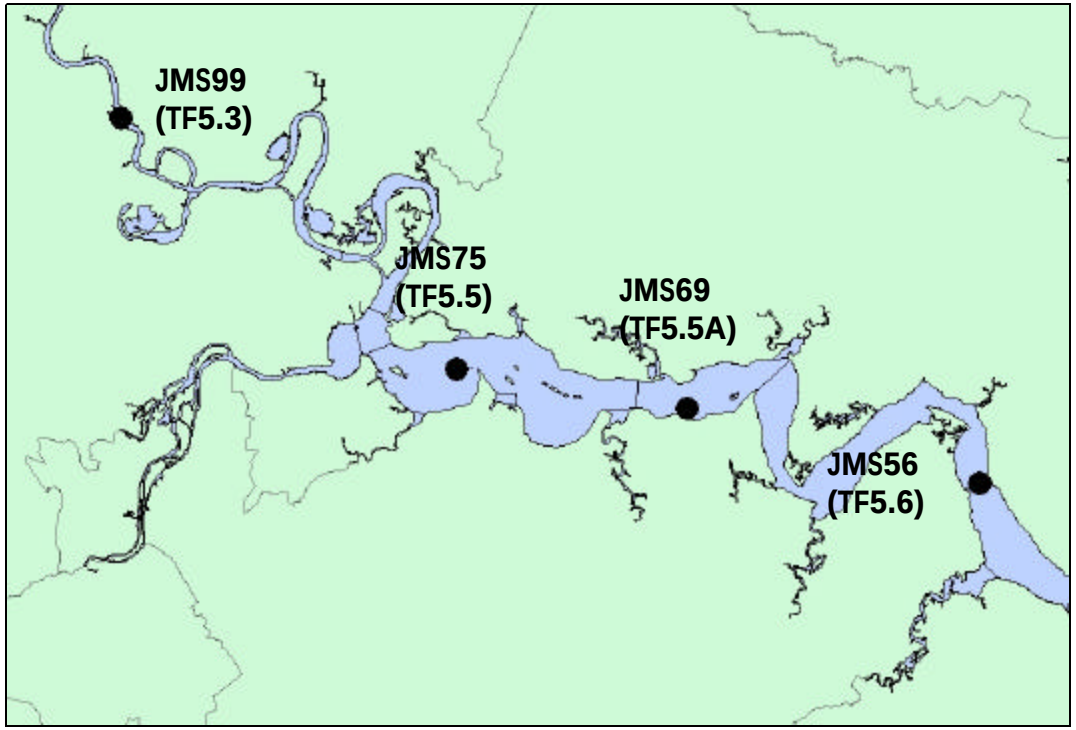
JAMES RIVER CHLOROPHYLL STUDY
PROPOSED WORK FOR 2013

Goals for 2013

- Algal characterization
- Factors promoting algal blooms
- Greater emphasis on potential impact to aquatic life
  - At what concentration of HAB species are negative impacts to aquatic life observed?
  - What does that concentration translate to in terms of CHLa concentrations?

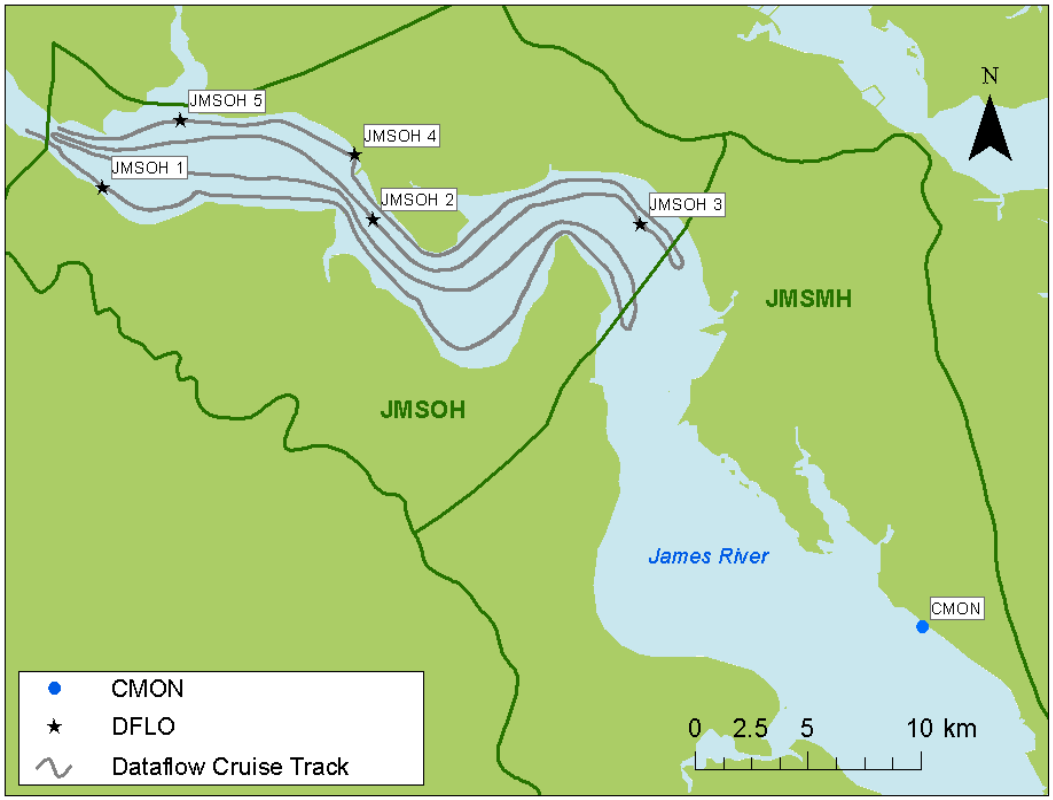
Algal Characterization

Algal Characterization
Tidal Freshwater



- Weekly monitoring from May – October
- Water samples analyzed for CHLa, nutrients, and microcystin
- Samples for phytoplankton enumeration from 2 sites

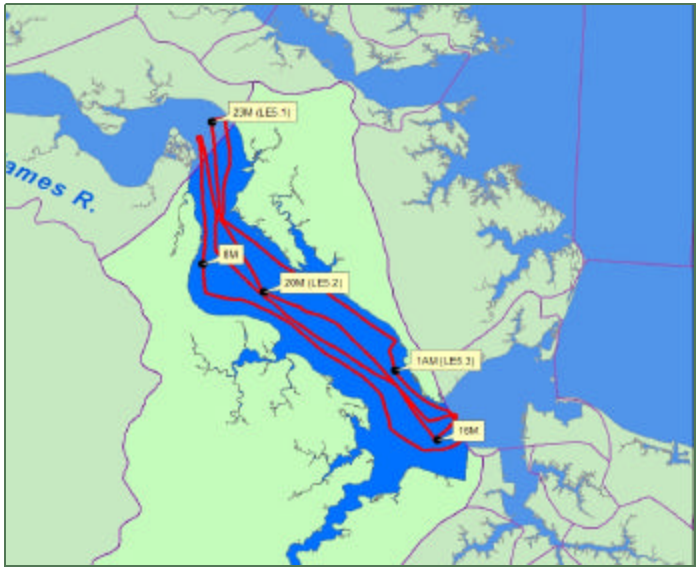
Algal Characterization
Oligohaline

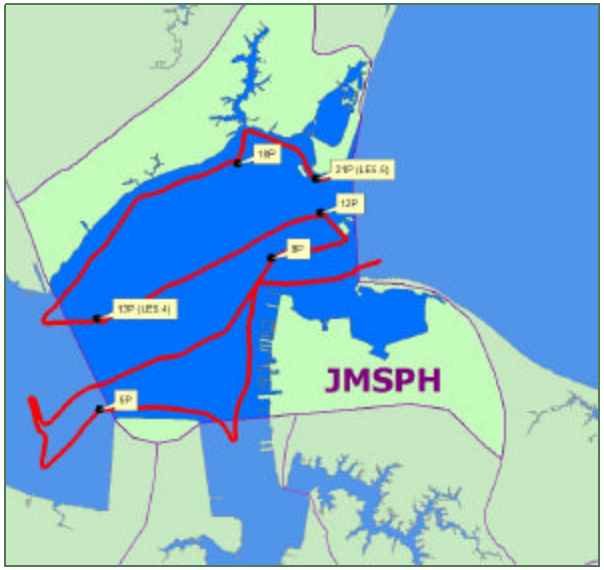


- DATAFLOW - OH
  - Weekly during spring bloom
  - Monthly until October
  - Cruises increased during summer bloom
- ConMon - MH
  - Feb – Oct

Algal Characterization

Mesohaline, Polyhaline, Elizabeth River, LaFayette River





- DATAFLOW conducted by HRSD
- ODU assisting
- Phytoplankton enumeration
- Feb – Nov

Factors Influencing and Promoting Blooms

Factors that affect magnitude, duration, frequency of algal blooms

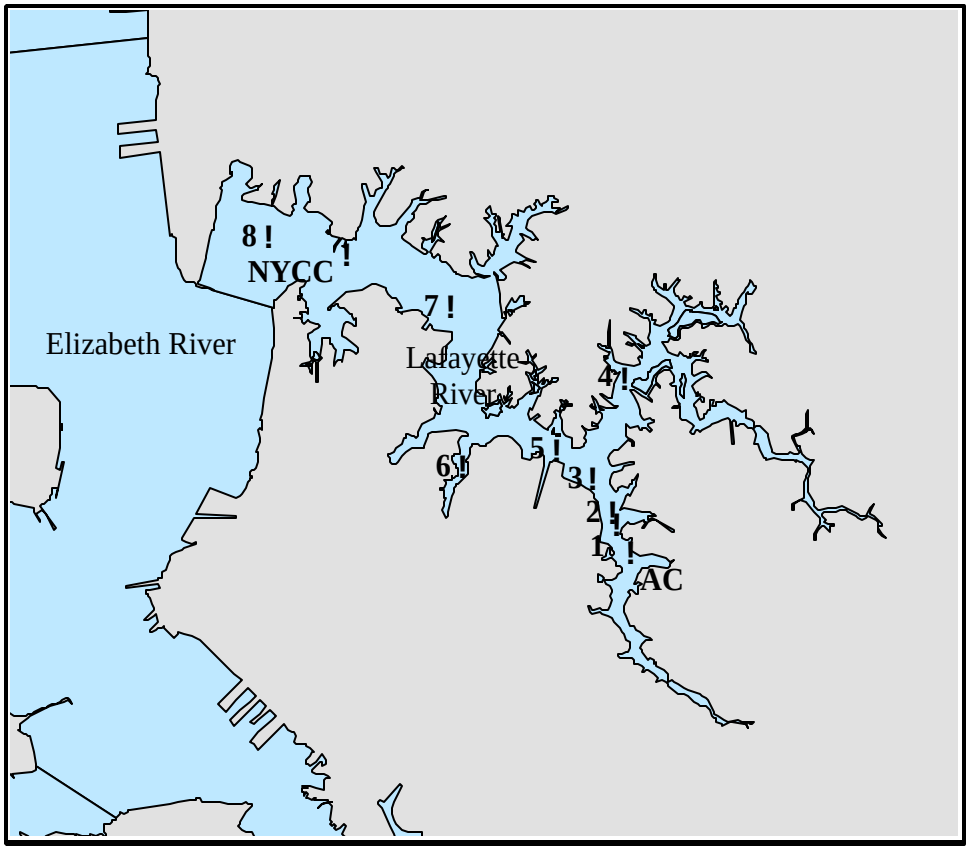
Factors Influencing Blooms

Top-Down Controls in Tidal Fresh James River

- Assess role of consumers in influencing algal blooms
- 2012 work determined per capita CHLa ingestion rates
- 2013 – Grazing Impacts - Density estimates needed to scale per capita ingestion to areal CHLa loss rates
  - 2 surveys: June and August using electrofishing
  - 10 randomly selected transects

Factors Promoting Blooms

Environmental triggers – storm events

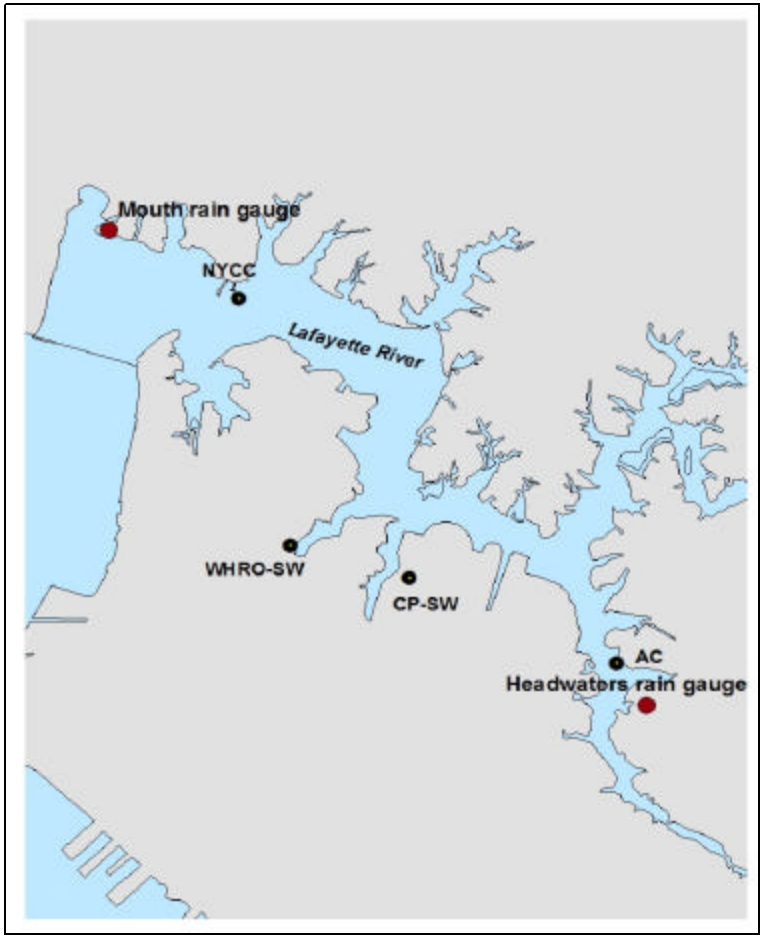


Storm Events

- Goal – examine impacts of storms on water quality
- HRSD has also committed to continued funding
- Collect nutrient and biomass samples and assess stratification

Factors Promoting Blooms

Environmental triggers



Daily Succession

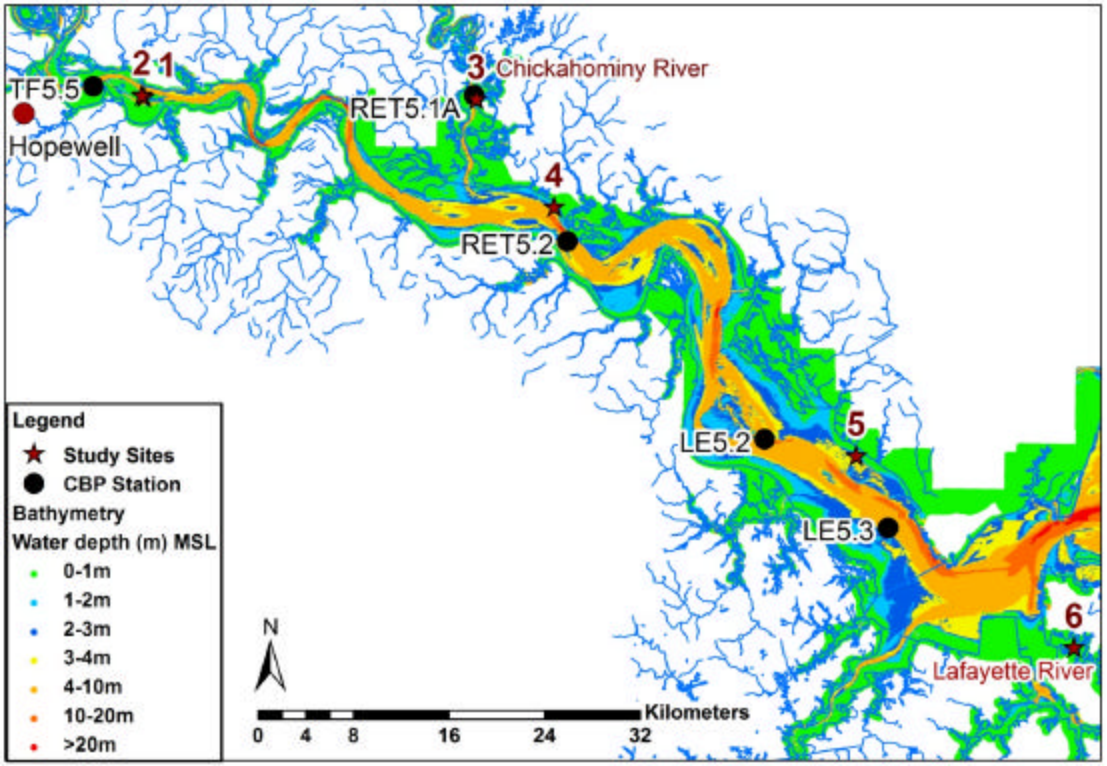
- 30 day period during bloom
- Nutrient concentrations, biomass, primary productivity, and assess stratification

Diel Movements

- Every 4 hours during bloom
- Nutrients, water quality impacts (primarily chlorophyll *a*, particulate C, and DO), community metabolism, primary productivity

Factors Promoting Blooms

SONE Studies



- Data collected in August 2012 and April 2013 at 6 sites
- Sediment : water fluxes: DIN, DIC, DIP, DON, DOC, SiO_2.
- Metabolic rates: gross primary production, respiration, net community production, sediment oxygen demand.
- Sediment characteristics: grain size, bulk density, OM, chl *a*, extractable DIN, DIP, org C, TN, TP

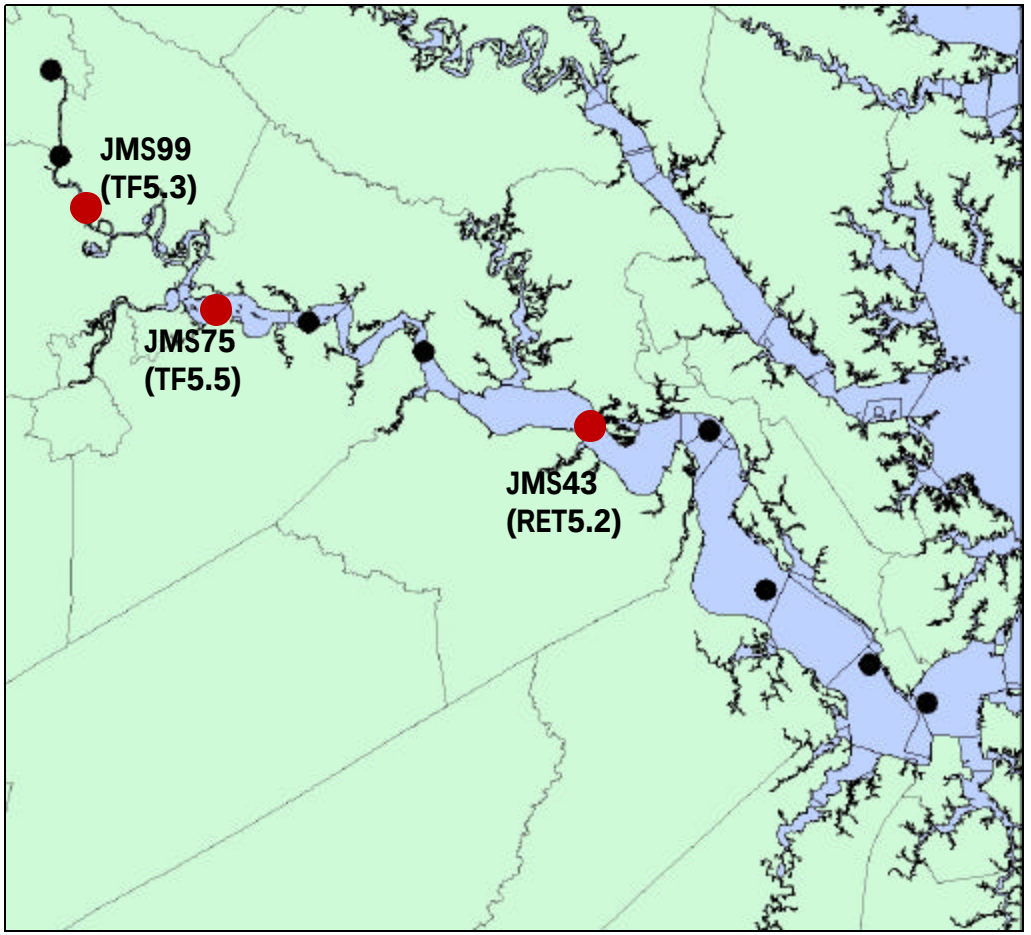
Impacts to Aquatic Life

Zooplankton, fish, and shellfish

Impacts to Aquatic Life

Spatial extent of microcystin

- Spatial extent of microcystin
- Comparative study of toxin levels in fish (FW and OH)
  - Aug – Sep
  - Liver and muscle tissue analyzed for toxin
  - Data from lower site used to gauge toxin export from TF into OH
  - Data from JMS75 will be used to assess inter-annual variation



Impacts to Aquatic Life

Effects of microcystin on zooplankton

- Bosmina and Eurytemora
- May and August
- Exposure to dissolved microcystin in water
- Microcystin diet
  - Microcapsules
- Egg production rates, growth, survival
- Dose-response relationships

Impacts to Aquatic Life

Effects of microcystin on Fish

- Chronic effects
  - Blueback herring juveniles
    - 2 sites (May, July, September)
    - Daily growth rates
- Acute effects
  - Blueback herring eggs and larvae
    - Survivorship
  - Atlantic sturgeon juveniles (from Canadian sources)
    - USFWS concerns
    - Survivorship, histopathology

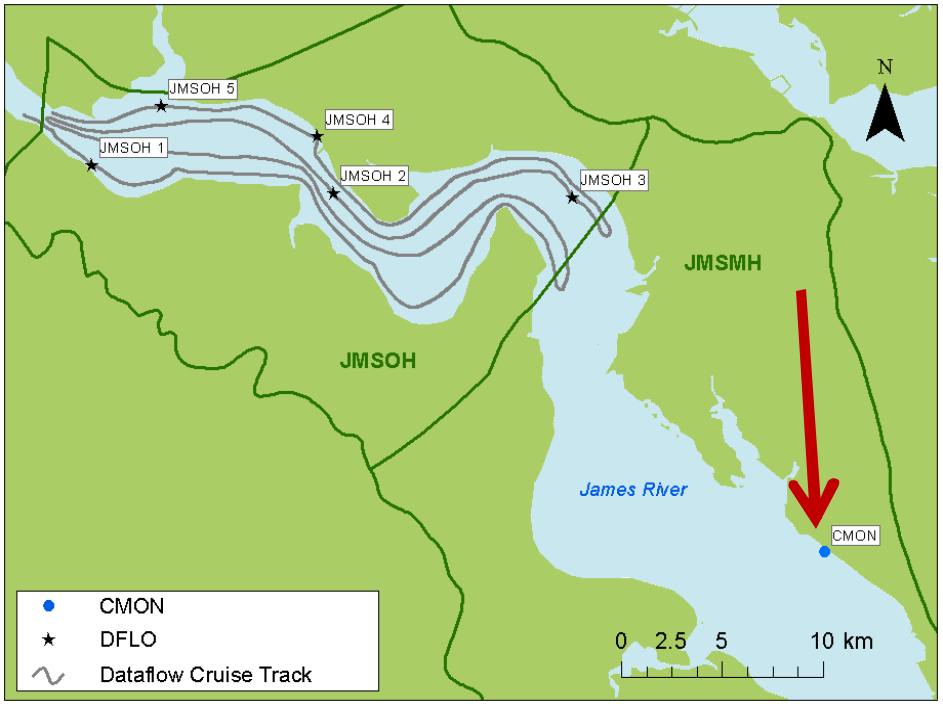
Impacts to Aquatic Life

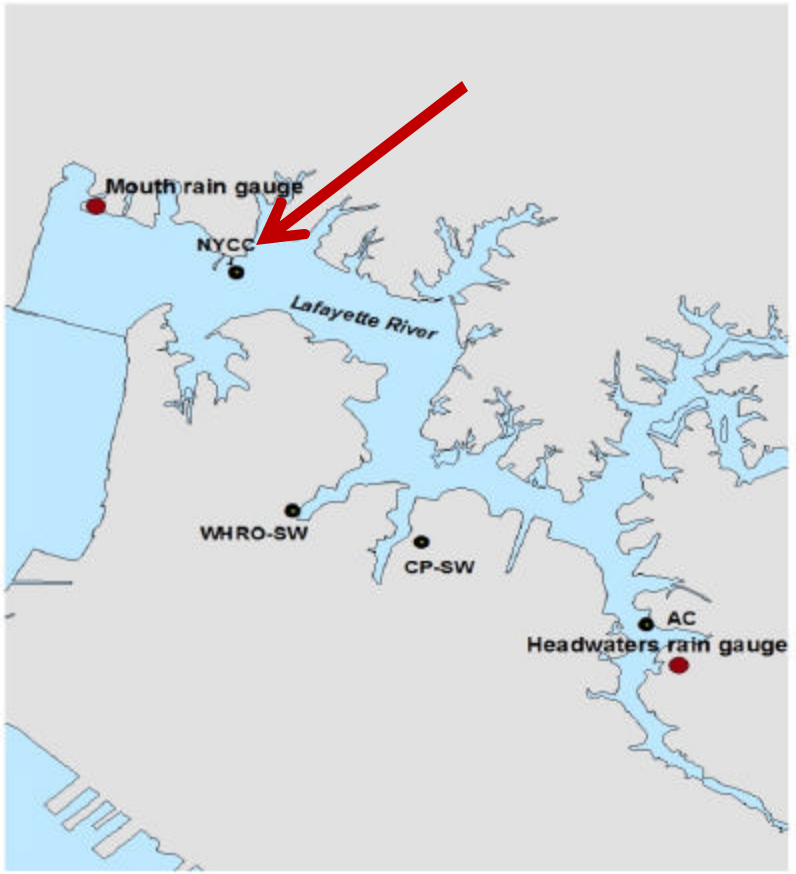
Effects of microcystin on Rangia

- Experiments measuring clearance rates in response to…
  - Dissolved Microcystin
    - Microcystin dissolved in water
      - May and August
    - Algal lysates
      - August
  - Microcystin in diet
    - Compare grazing rates on seston from 3 sources
      - James at JMS75, York (TF4.2), a defined algal media
    - May and August

Impacts to Aquatic Life

Oyster Deployments





- Deployed in April
- During blooms 5-10 oysters collected for histological analysis

Impacts to Aquatic Life

Toxicity Assays

Dose Response Assay	Salinity range	Test Organism		
		Bosmina longirostris (Cladoceran)	*Crassostrea virginica* (larval oysters)	*Cyprinidon Variegatus* (larval sheepshead minnow)
Microcystis aeroginosa	< 2 ppt	TBD	NA	X (more TBD)
Microcystis aeroginosa lysate		TBD	NA	TBD
Gyrodinium instriatum	>5 ppt	NA	TBD	TBD
Gyrodinium instriatum lysate		NA	TBD	TBD
Prorocentrum minimum	>15 ppt	NA	TBD	TBD
Prorocentrum minimum lysate		NA	TBD	TBD
Cochlodinium. polykrikoides	>20 ppt	NA	X	TBD
Cochlodinium. polykrikoides lysate		NA	X	TBD
Karlodinium veneficum	6 – 30 ppt	NA	X	TBD
Karlodinium veneficum lysate		NA	X	TBD

Proposed Work for 2013

- Algal characterization
  - Fixed Station in TF
  - DATAFLOW in OH, MH, PH, ER, LAF
  - ConMon stations
- Factors Promoting Blooms
  - Top-down controls in TF
  - Daily and diel monitoring
  - Storm events
  - SONE
  - Nutrients
- Potential Impacts to Aquatic Life
  - Shellfish
  - Zooplankton
  - Fish
  - Oysters

Allocation of Funds

Year	Monitoring and Algal Characterization	Algal Bloom Triggers	Potential Impacts to Aquatic Life
2012	53%	26%	21%
2013	38%	14%	48%


Questions?