

JAMES RIVER CHLOROPHYLL STUDY

2013 MONITORING & RESEARCH



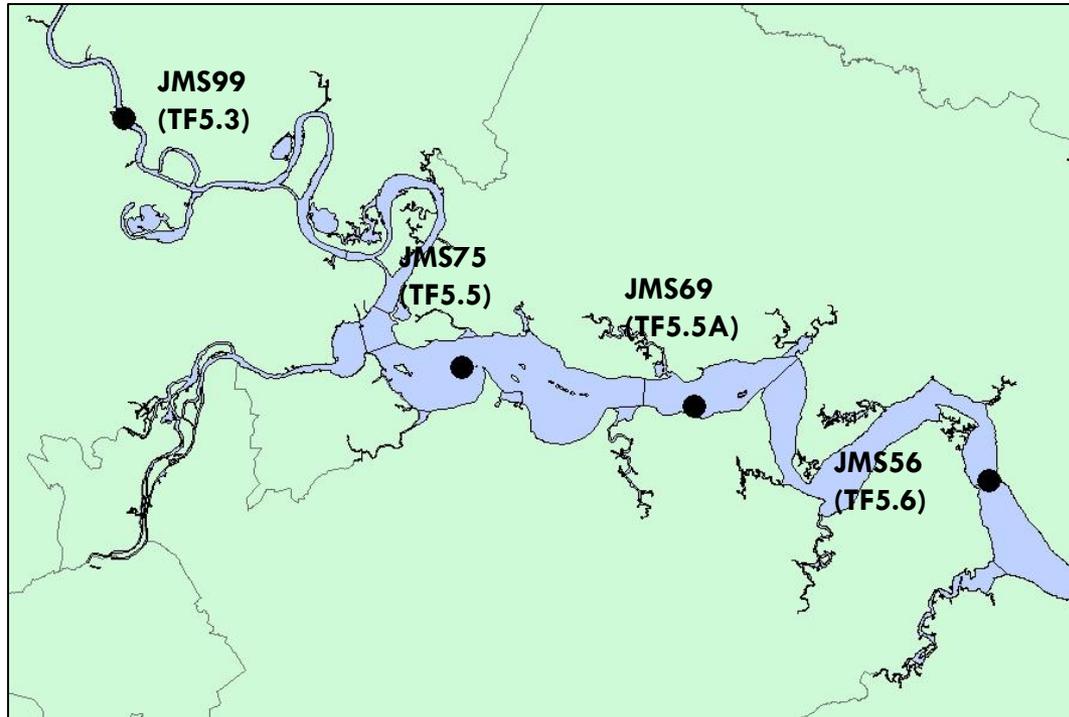
Stakeholder Advisory Group
VCU Rice Center
August 13, 2013

Summary of 2013 Work

- Algal characterization
 - ▣ Fixed Station in TF
 - ▣ DATAFLOW lower estuary
 - ▣ Top-down controls in TF
- Algal Bloom Triggers
 - ▣ Daily and diel monitoring
 - ▣ Storm events
 - ▣ SONE
 - ▣ Nutrients
- Potential Impacts to Aquatic Life
 - ▣ Invertebrates (zooplankton & shellfish including oysters)
 - ▣ Fish

Algal Characterization

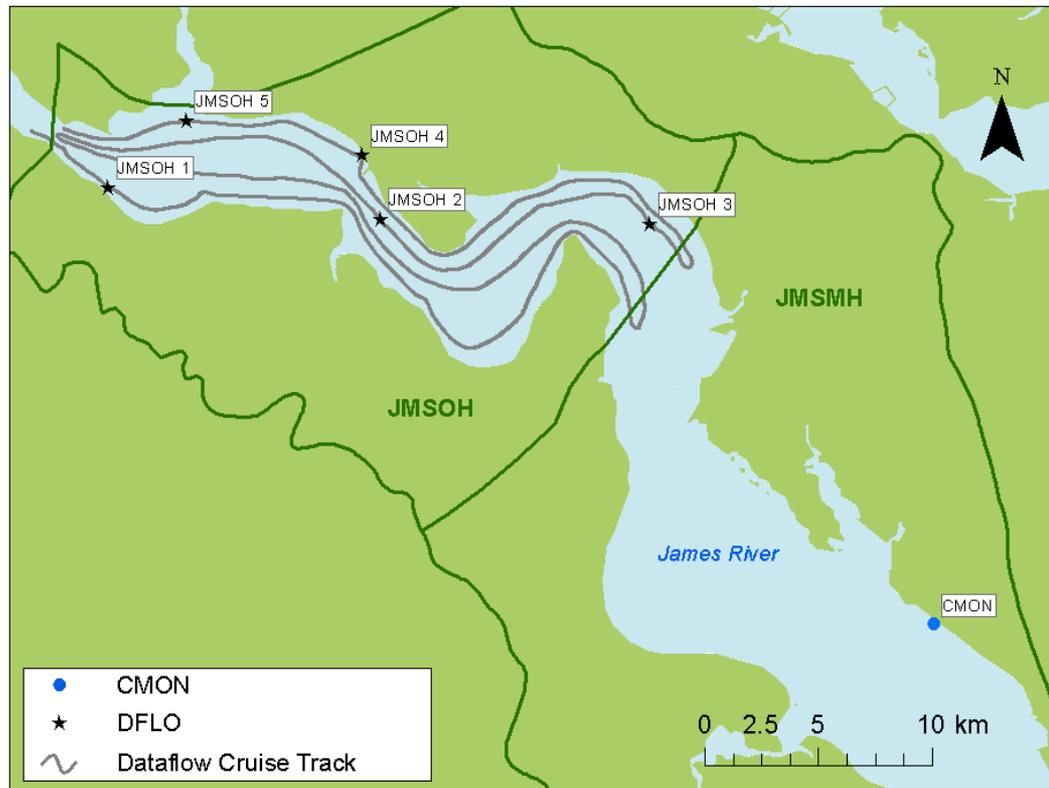
Tidal Freshwater



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

Algal Characterization

Oligohaline

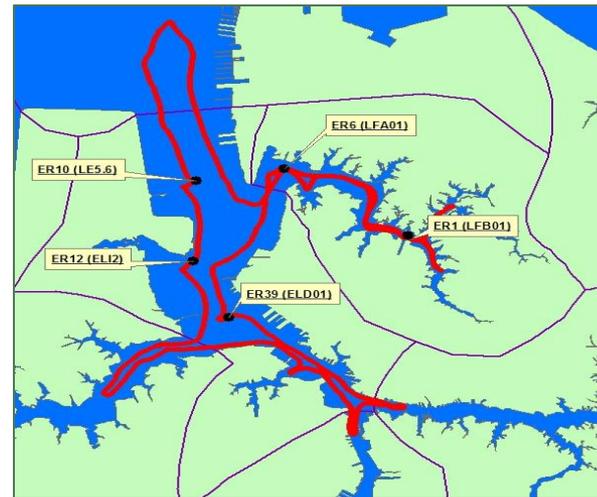
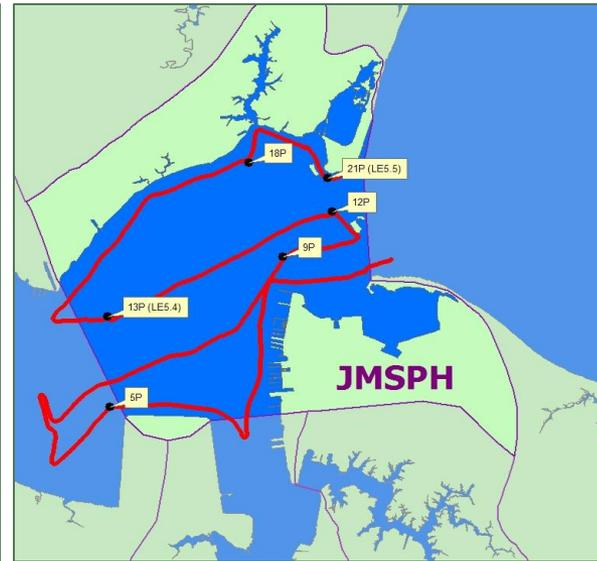
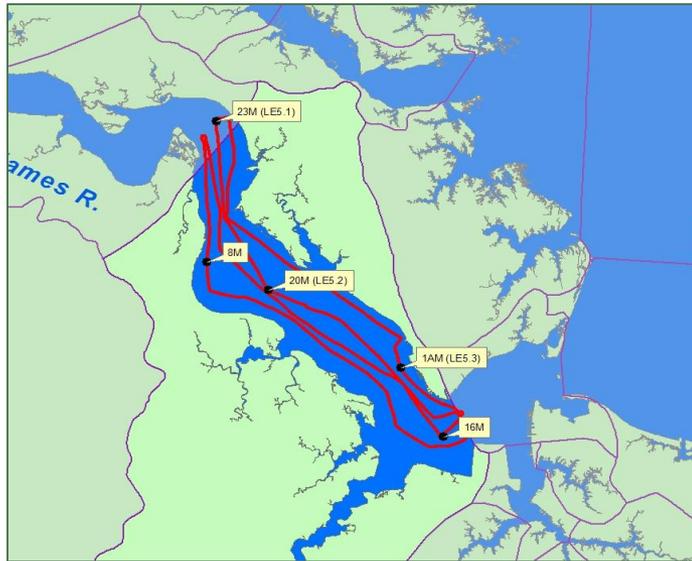


- DATAFLOW - OH
 - ▣ Weekly during spring bloom
 - ▣ Monthly until October
 - ▣ Cruises increased during summer bloom
- ConMon - MH
 - ▣ Feb – Oct

<http://www3.vims.edu/vecos/>

Algal Characterization

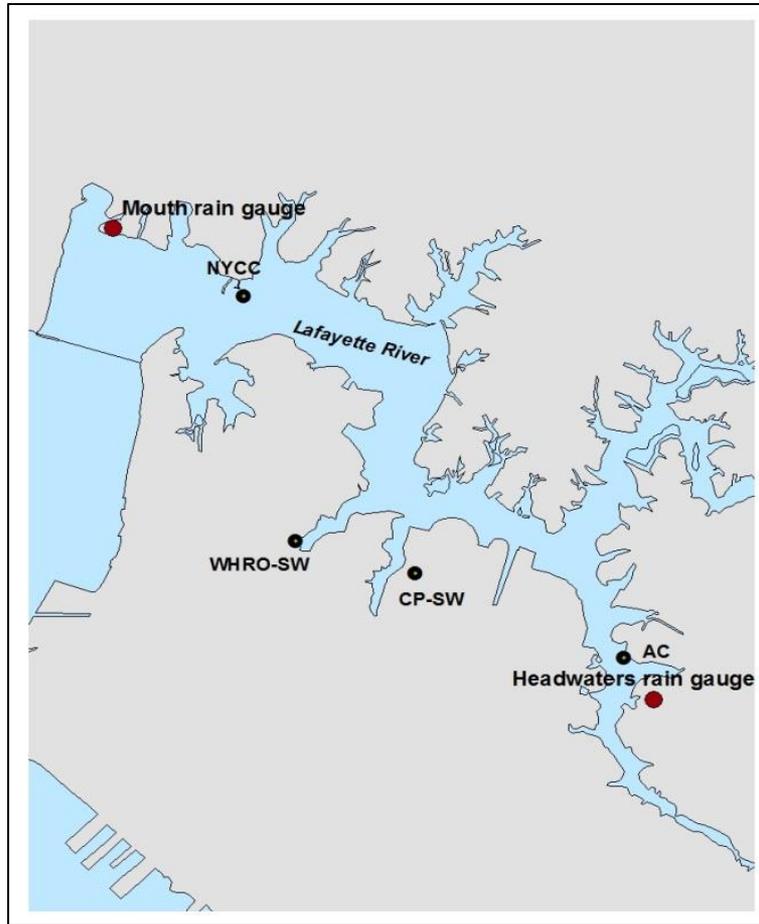
Mesohaline, Polyhaline, Elizabeth River, LaFayette River



DATAFLOW by HRSD with ODU
Feb – Nov

Algal Bloom Triggers

Environmental triggers

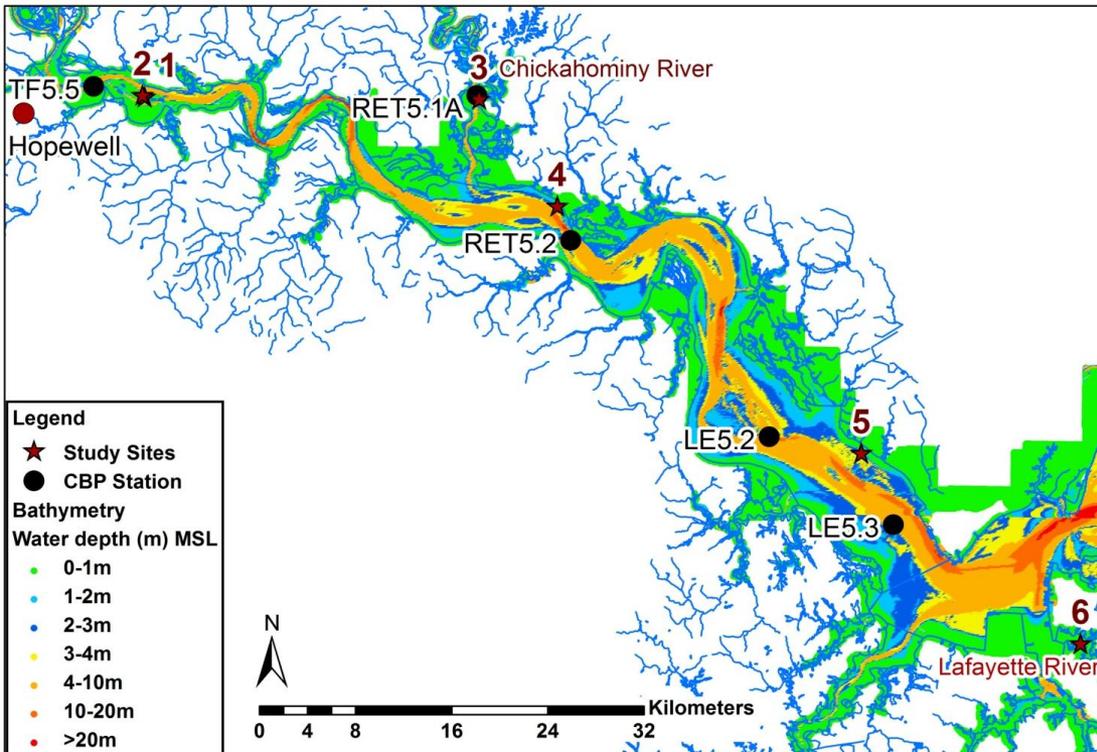


Daily & Diel Sampling

- Identify daily changes relative to precipitation, tides and nutrient loadings
- Determine vertical movement of algae and obtain estimates of community metabolism on daily timescales
- Storm events

Algal Bloom Triggers

SONE Studies

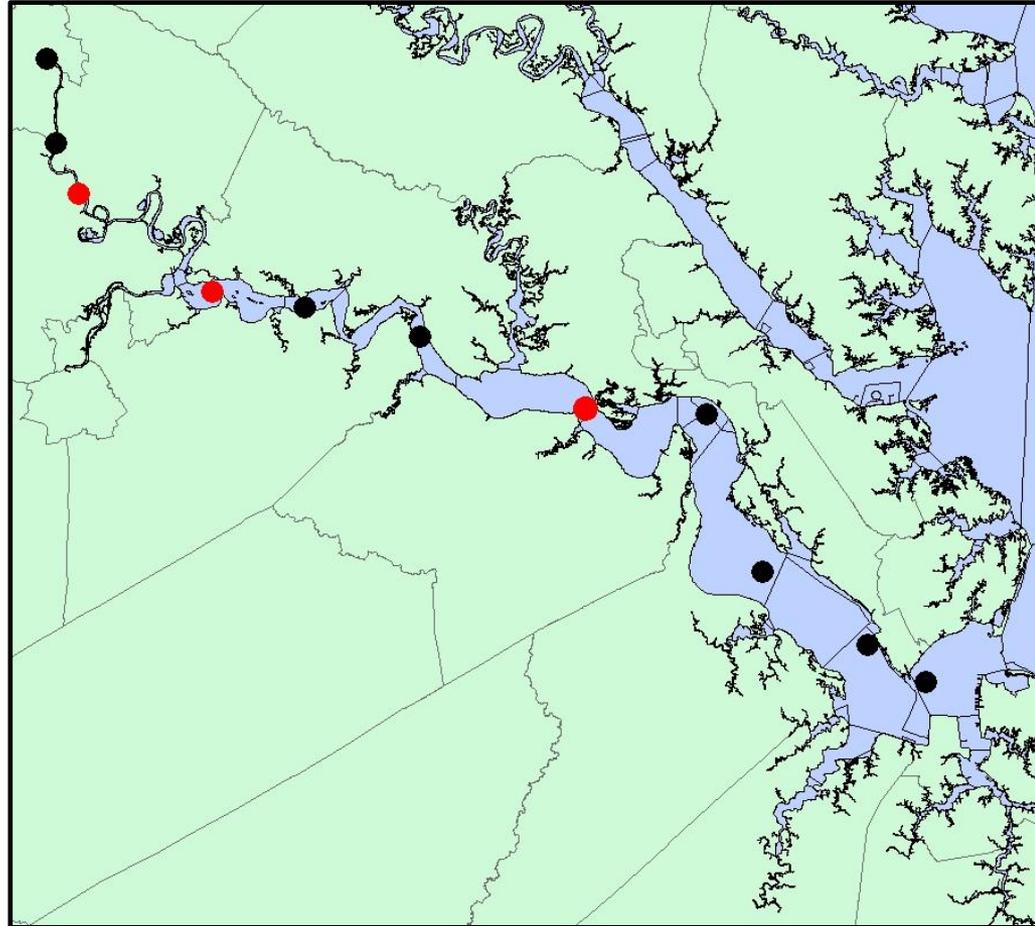


- **Goal:** study the dynamics of nutrients to estuary bottom and impacts to local water quality
- Data collected in August 2012 and April 2013 at 6 sites
- Supports JR modeling and potential triggers

Impacts to Aquatic Life

Spatial extent of microcystin during bloom

- Spatial extent of microcystin
 - Water
- Comparative study of toxin levels in Tidal FW and OH
 - 3 sites (red dots)
 - 4-5 dominant fish species
 - Data from lower site used to gauge toxin export from TF into OH



Impacts to Aquatic Life

Effects of microcystin on invertebrates

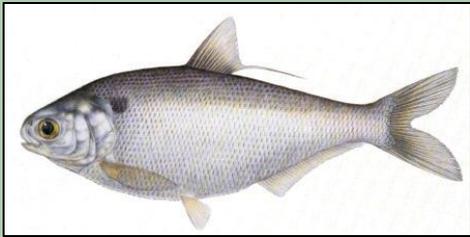


- Dose-response relationships
- Exposure to dissolved microcystin in water
- Microcystin diet



Impacts to Aquatic Life

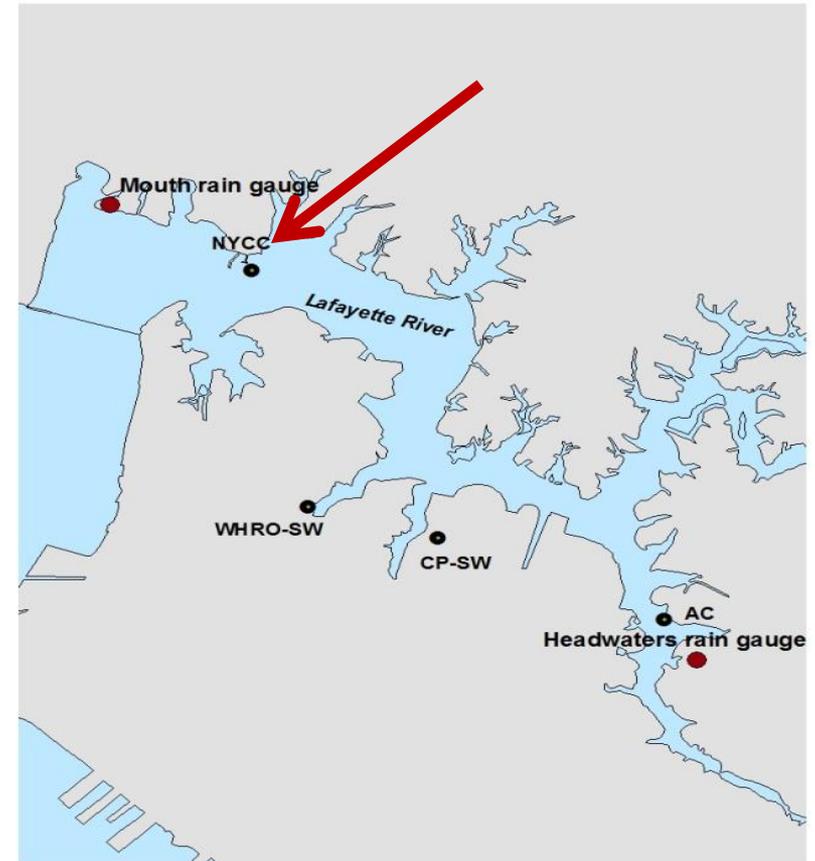
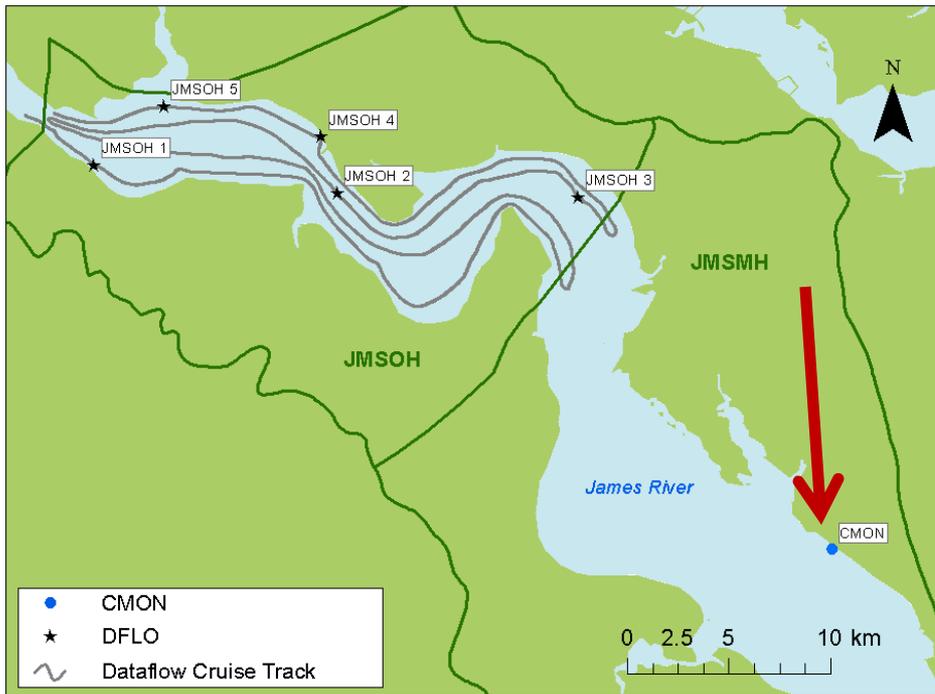
Effects of microcystin on Fish



- Chronic effects
 - Gizzard shad juveniles
 - Daily growth rates
- Acute effects
 - Gizzard shad
 - Survivorship
 - Atlantic sturgeon juveniles (from Canadian sources)
 - Survivorship, histopathology

Impacts to Aquatic Life

Oyster Deployments



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

Dose Response Bioassays

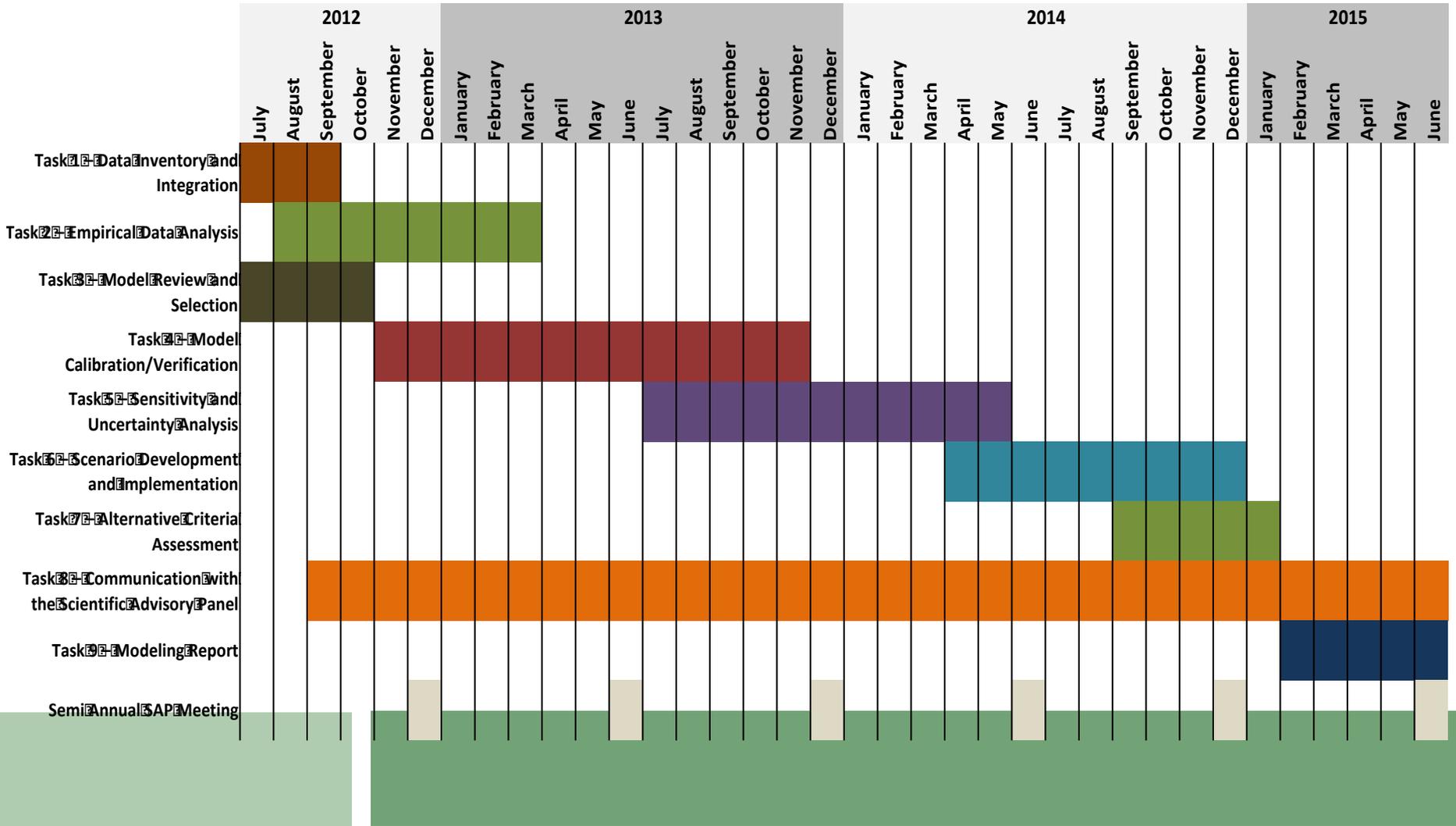
- Toxicity species
 - *Cochlodinium polykrikoides*
 - *Prorocentrum minimum*
 - *Gymnodinium* spp.
 - *Karlodinium veneficum*
 - *Microcystis aeruginosa*
- Test organisms
 - *Crassostrea virginica*
 - *Bosmina*
 - *Cyprinodon variegates*



JR Chl-a Study Schedule

2011	- - - - -	Workplan Developed Notice of Intended Regulatory Action (NOIRA)
2012	- - - - -	Workplan Implementation
2012-14	- - - -	Monitoring and Modeling
2015	- - - - -	Assessment Review and Science Panel Recommendations
2016	- - - - -	Develop Regulatory Proposal (if appropriate)
2017	- - - - -	Complete Regulatory Review & WIP III

CEC Model Timeline





Questions?