James River Chlorophyll Study Update

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VA DEQ – Office of Ecology
2016 HAB Taskforce Meeting
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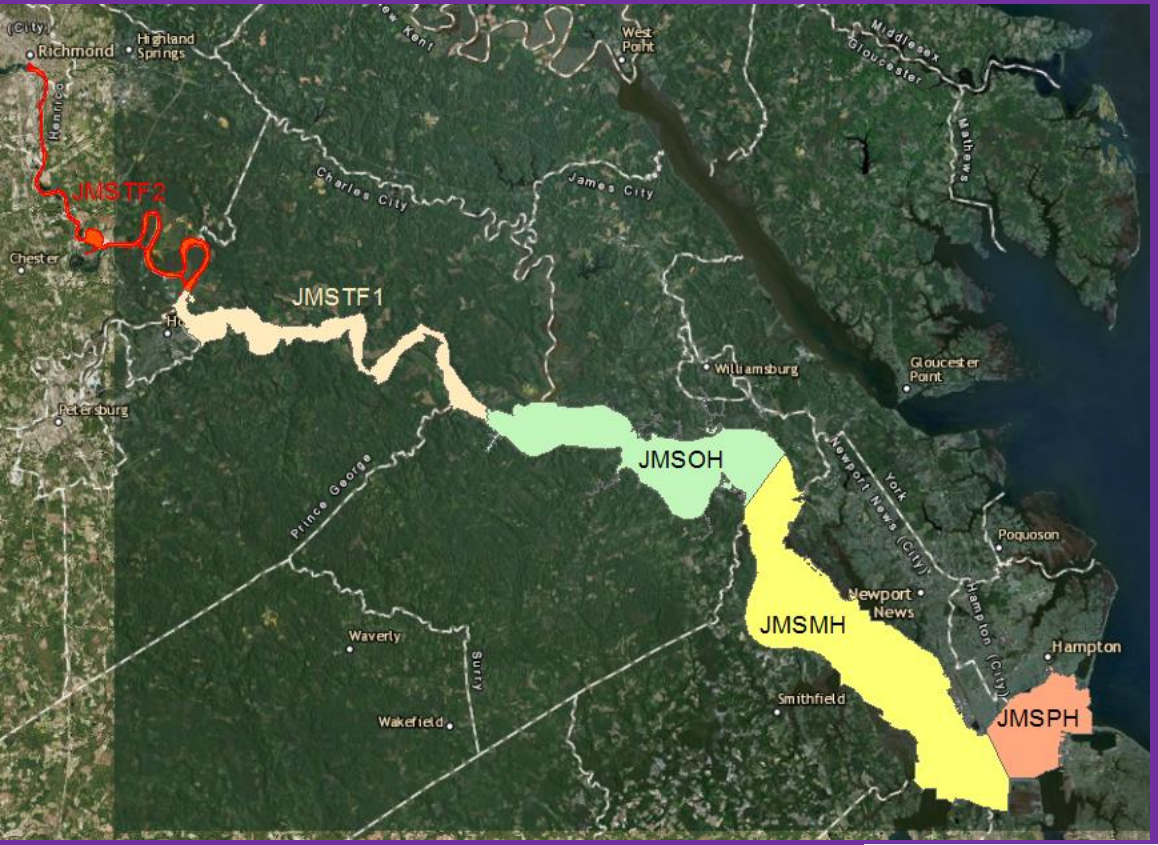
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Why do we have chlorophyll criteria in the James River?

Severe hypoxia is a problem in almost all the Bay waters. The James River is one exception. The James has numeric chlorophyll criteria because such criteria provide the means for protecting aquatic life from algal-related effects unrelated to dissolved oxygen—such as toxic HABs, poor water clarity, and elevated pH.



Virginia's Water Quality Standards

bb. The following site specific numerical chlorophyll a criteria apply March 1 through May 31 and July 1 through September 30 as seasonal means to the tidal James River (excludes tributaries) segments JMSTF2, JMSTF1, JMSOH, JMSMH, JMSPH and are implemented in accordance with subsection D of 9VAC25-260-185.

Designated Use	Chlorophyll a µ/l	Chesapeake Bay Program Segment	Temporal Application
Open Water	10	JMSTF2	March 1 - May 31
	15	JMSTF1	
	15	JMSOH	
	12	JMSMH	
	12	JMSPH	
	15	JMSTF2	July 1 - September 30
	23	JMSTF1	
	22	JMSOH	
	10	JMSMH	
	10	JMSPH	

DEQ initiated the James River Chlorophyll Study in 2011 to address two objectives:

1. Review the scientific bases of the numeric chlorophyll criteria that were adopted for the tidal James River in 2005, and revise criteria if deemed necessary.

2. Verify the predictions made by EPA's watershed model pertaining to chlorophyll criteria attainment under the Bay TMDL.

DEQ assembled a group of university, state/federal, and industry scientists to serve as the James River Scientific Advisory Panel.

Clifton Bell (B&C)

Brian Benham (VT)

Claire Buchanan (ICPRB)

Paul Bukaveckas (VCU)

Todd Egerton (ODU)

Greg Garman (VCU)

Will Hunley (HRSD)

Rebecca LePrell (VDH)

Kenneth Moore (VIMS)

Margaret Mulholland (ODU)

Kim Reese (VIMS)

Peter Tango (USGS)

Harry Wang (VIMS)

DEQ funded a number of HAB-related projects for the purposes of the study:

- Microcystin in the James R. food web (Bukaveckas et al.)

- HAB and phytoplankton community composition in the James R. (Egerton et al.)

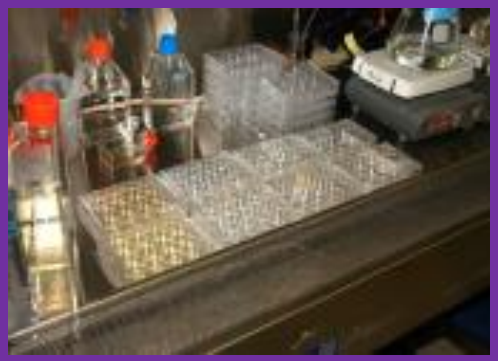
- Molecular genetic analysis of blooms & determination of bloom impacts on aquatic life (Reece et al.)

- Environmental factors favoring algal blooms in the lower James (Mulholland et al.)

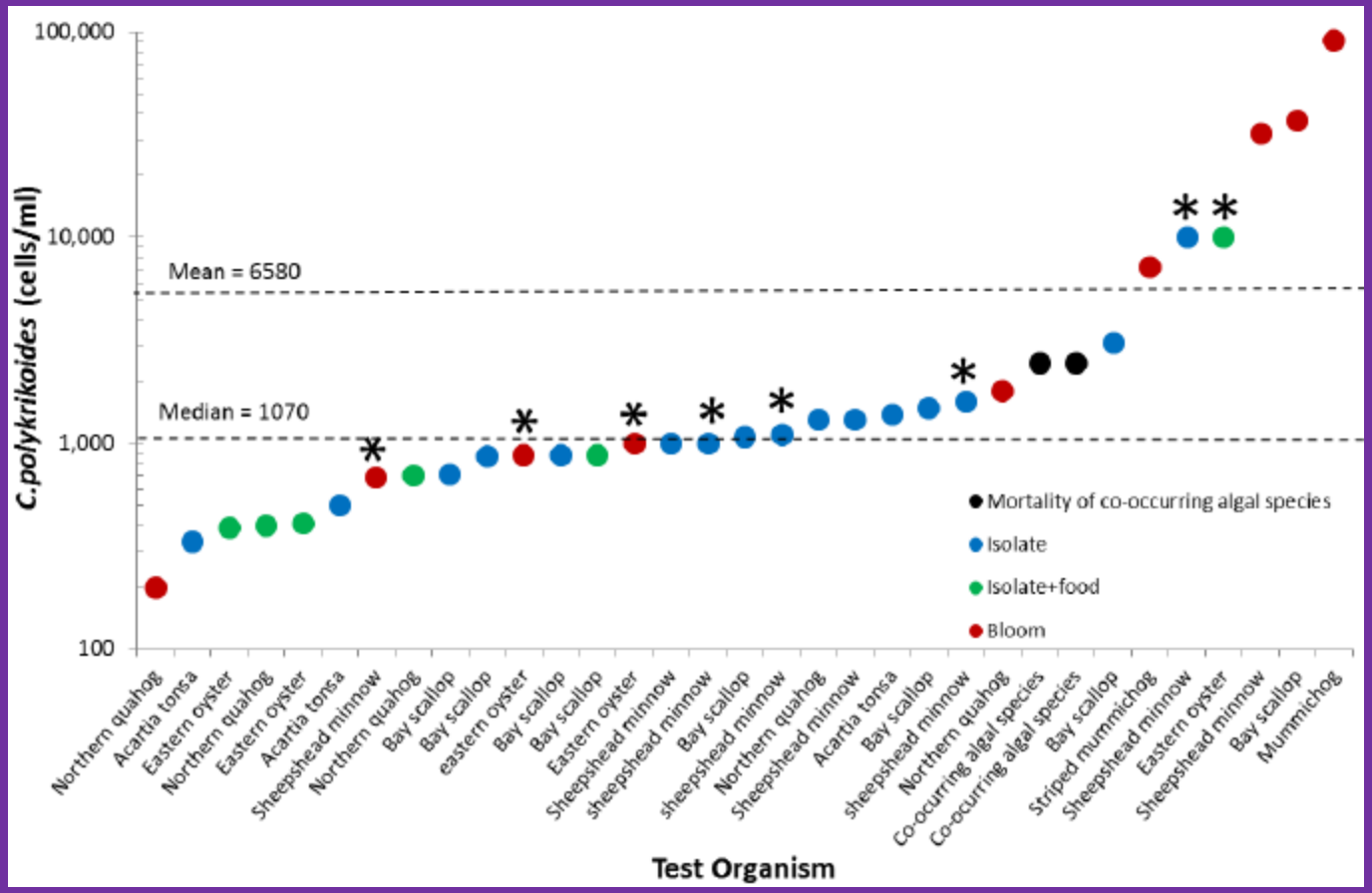
Bioassays were performed to discern effect concentrations of HAB species/toxins. Both lab-cultured and field samples were used in some studies.

Endpoints:

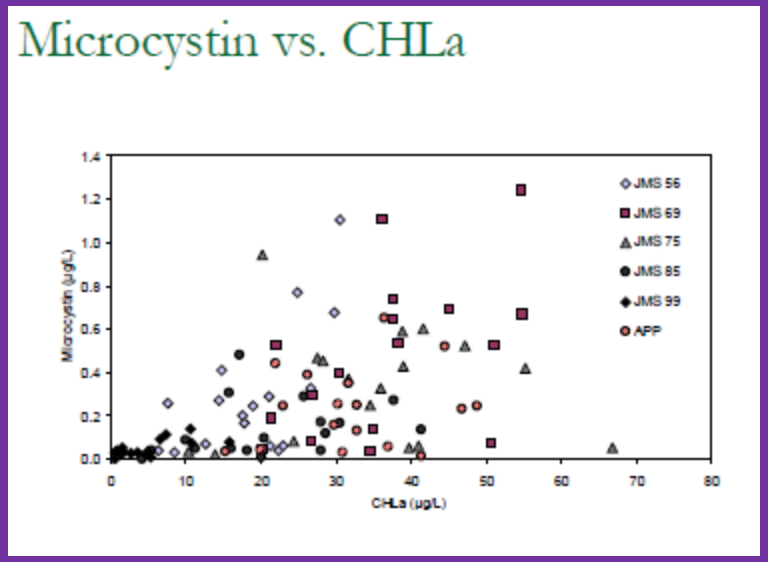
- Grazing rates of the wedge clam (microcystin)
- Fecundity of the zooplankton *Bosmina* (microcystin)
- Survivorship of larval fish, mollusks, and crustaceans (*Cochlodinium, Karlodinium, Heterocapsa, Gymnodinium, Microcystis, Prorocentrum*)

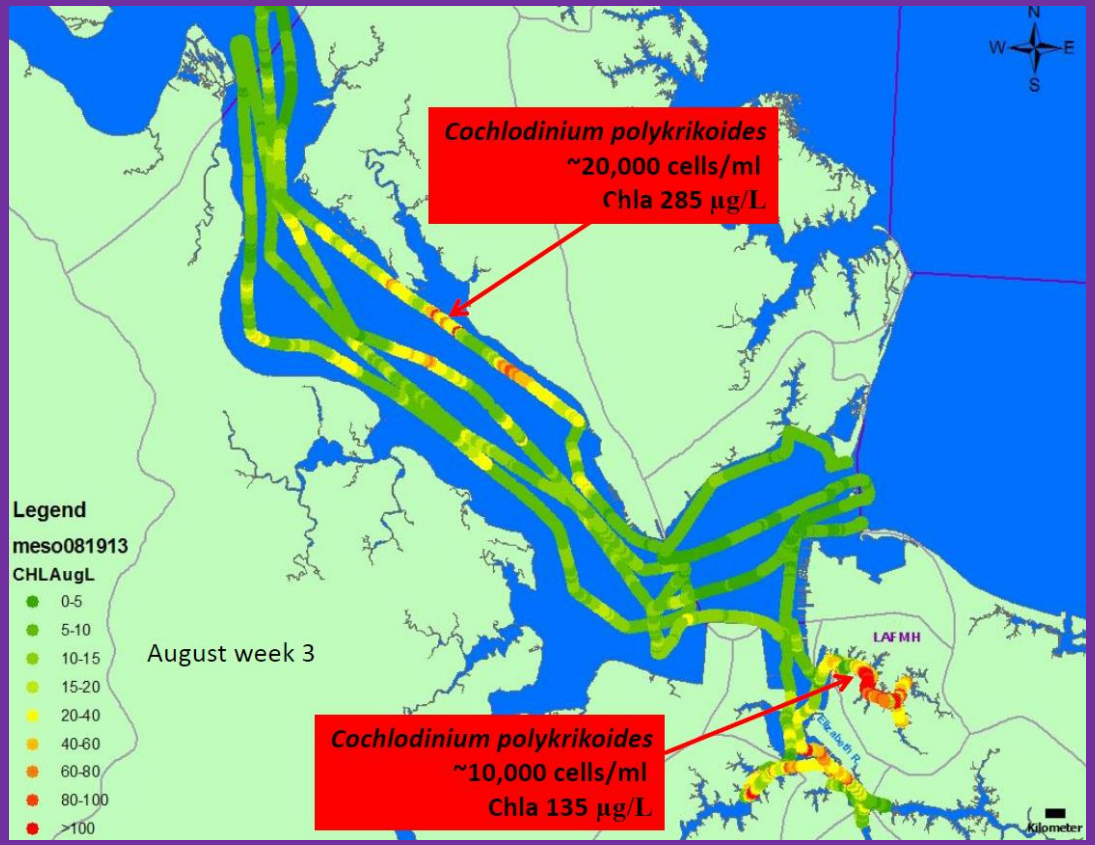


Published LC50s were also consulted



Additionally, field studies were conducted to establish relationships between ambient chlorophyll and HAB toxins/cell densities.





The Scientific Advisory Panel (SAP) gave DEQ its findings in May 2016.

The SAP presented DEQ with “defensible” ranges of chlorophyll for most of the James River segments-seasons. These ranges were based on the absence of observed HAB-related effects, in addition to others (such as elevated pH and water clarity). Almost all of the criteria fall within these ranges.

So where are we now?

- Based on the research conducted for the JR Chl Study, DEQ has determined that there is sufficient cause to revise the chlorophyll criteria and their assessment methodology.
- The James River Chlorophyll Regulatory Advisory Panel is currently reviewing DEQ's proposal documents.
- It is likely that most of the criteria will be adjusted to enhance aquatic life use protection.
- The completed regulatory process is anticipated by late 2017/ early 2018.


Questions?