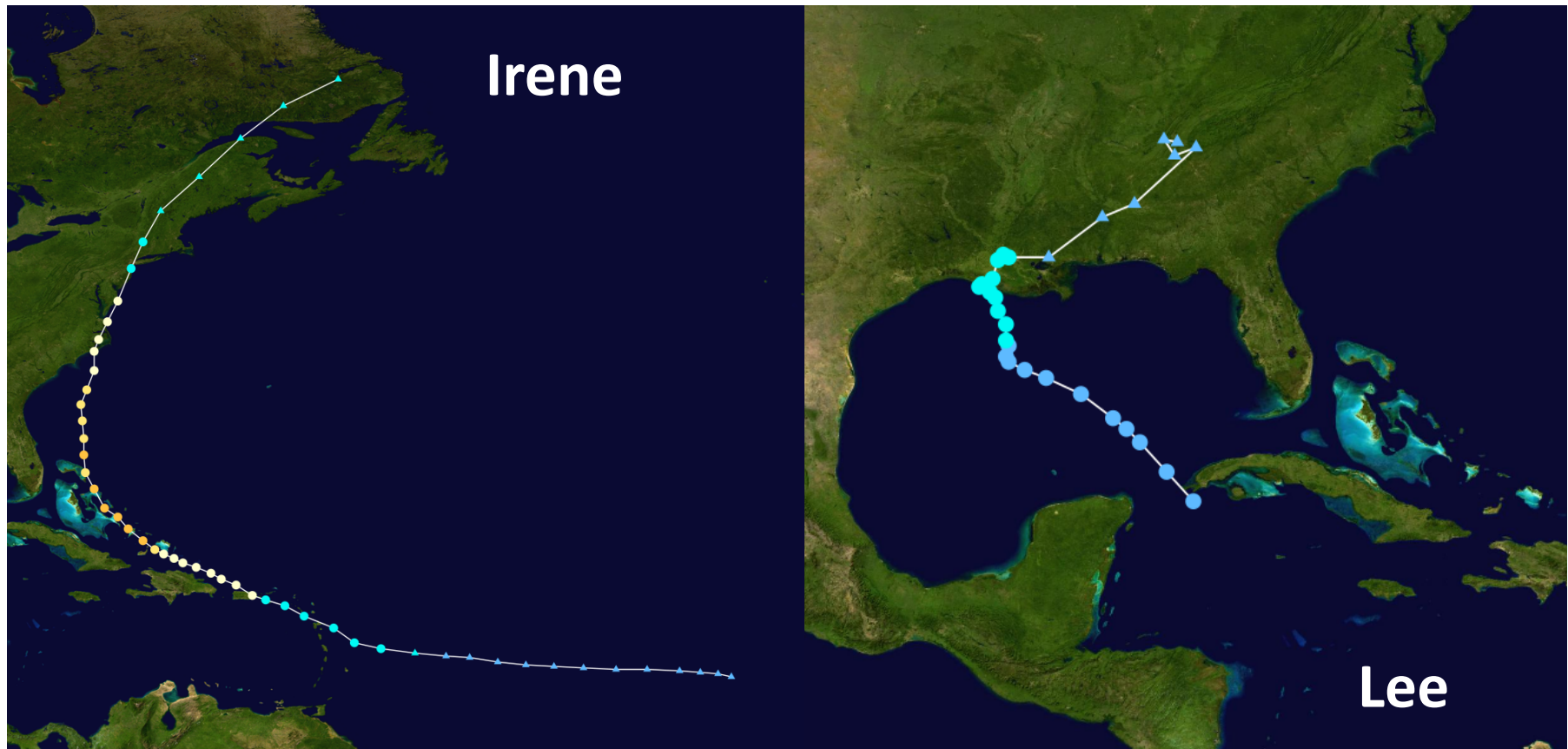


# Hurricane Irene and Tropical Storm Lee Virginia Water Quality Effects

David Jasinski, CEC



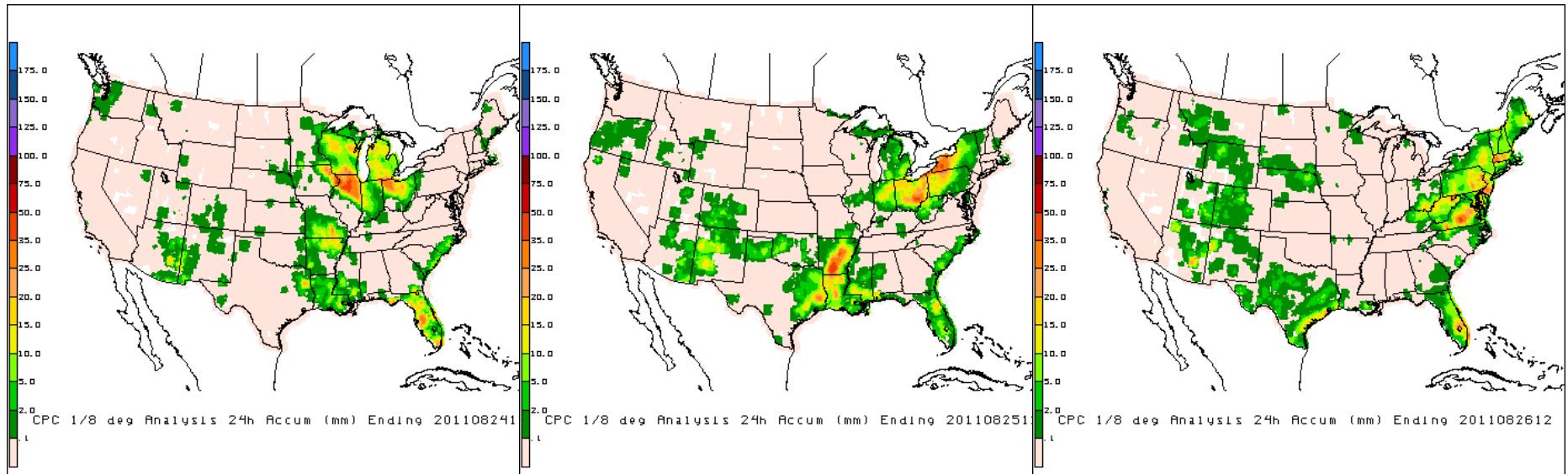
# Storm Tracks



Irene impacts the Chesapeake region as Cat 1 Hurricane  
August 27-28, 2011

Lee degrades to a Tropical Depression September 5, 2011  
and continues to dump rain as it moves up the east coast  
over the next few days.

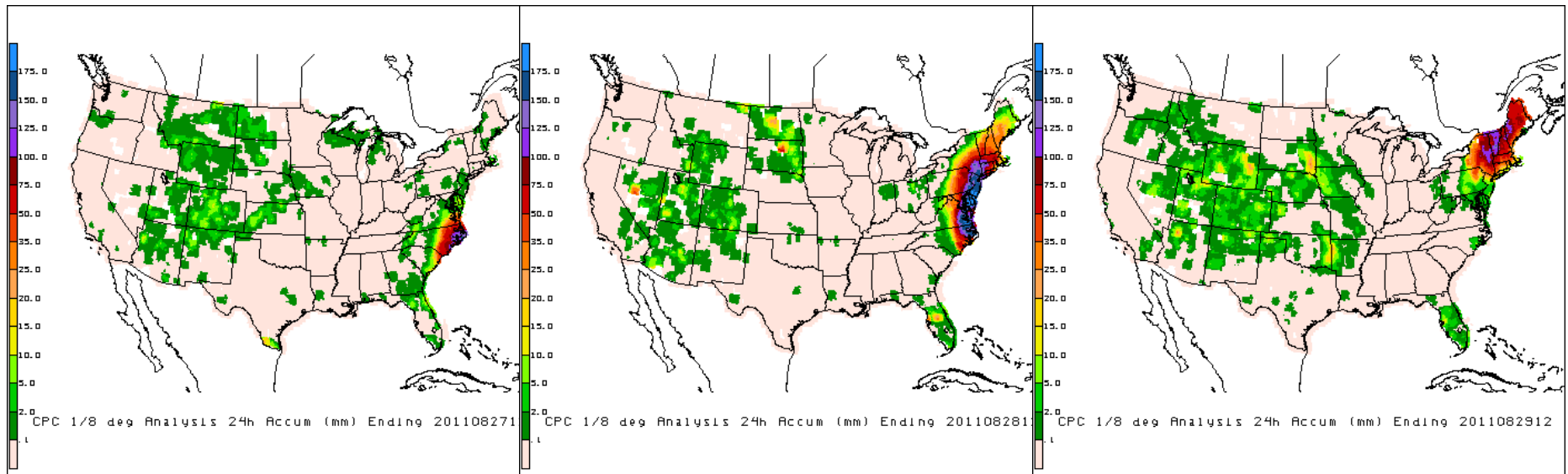
# 24 hour rainfall totals - Irene



**8/24**

**8/25**

**8/26**

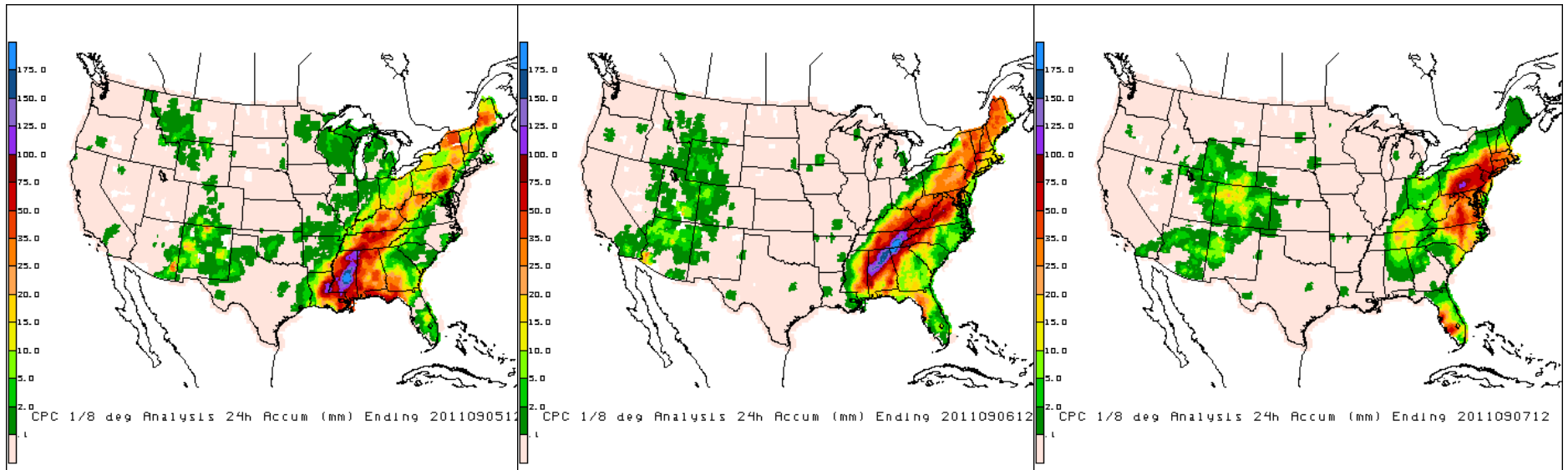


**8/27**

**8/28**

**8/29**

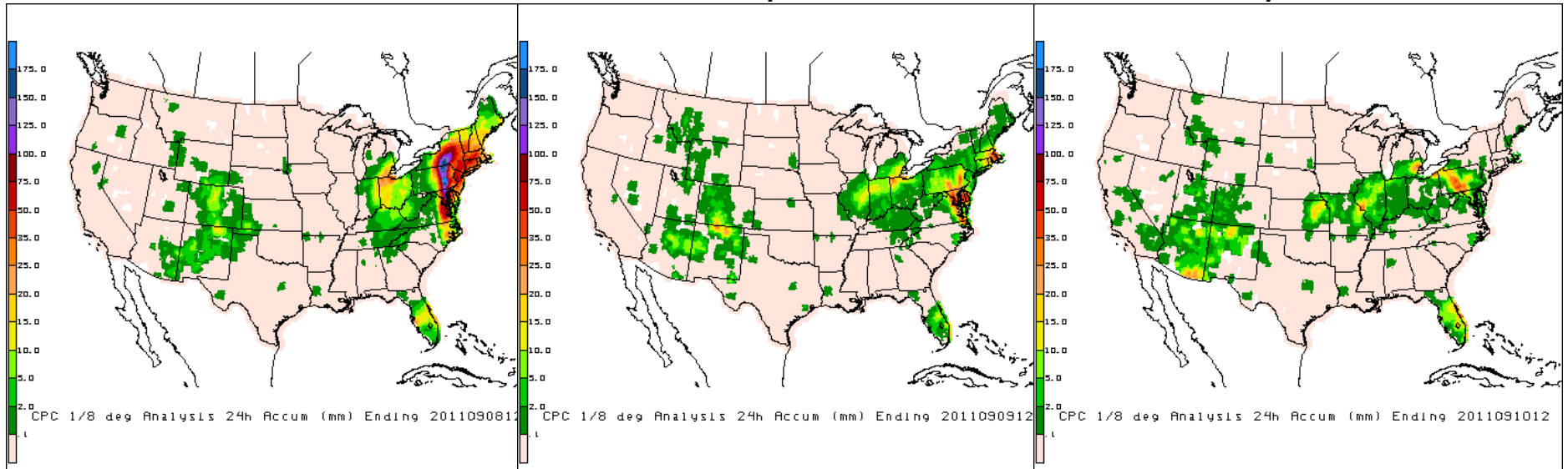
# 24 hour rainfall totals - Lee



**9/05**

**9/06**

**9/07**

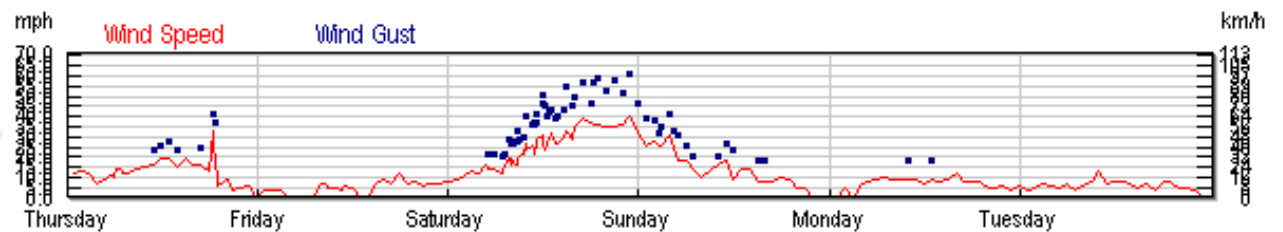
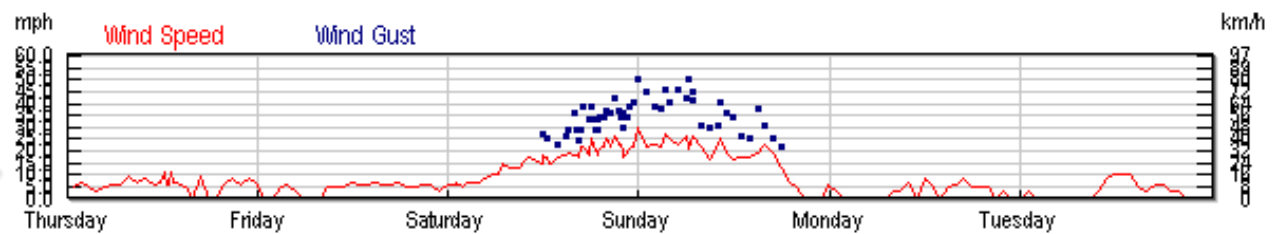
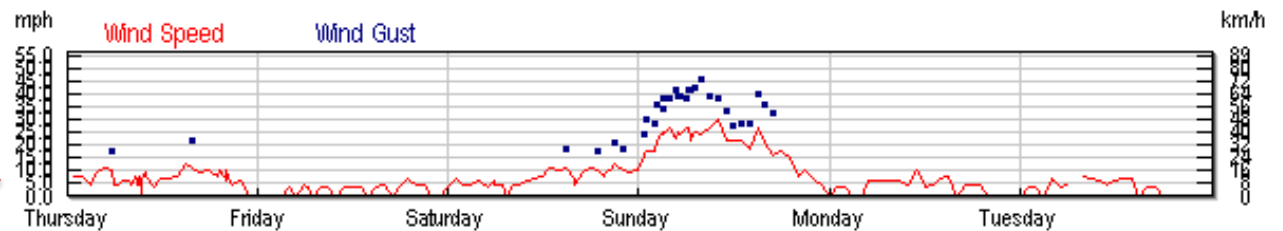
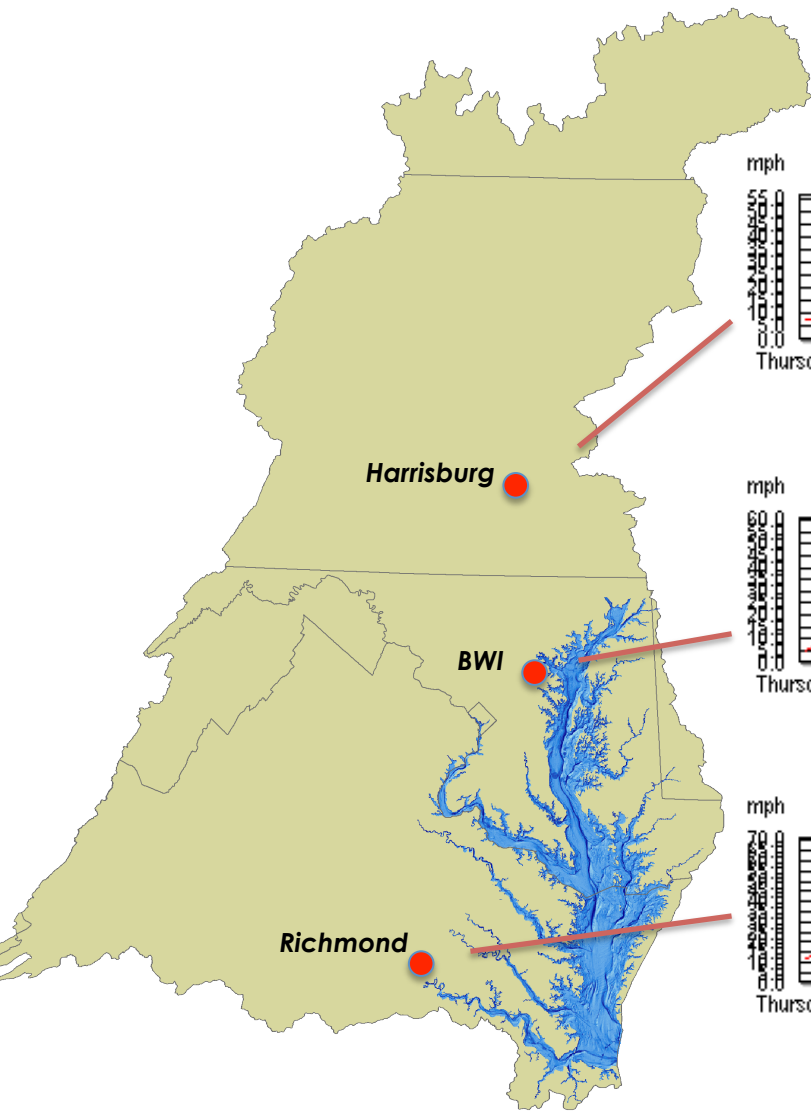


**9/08**

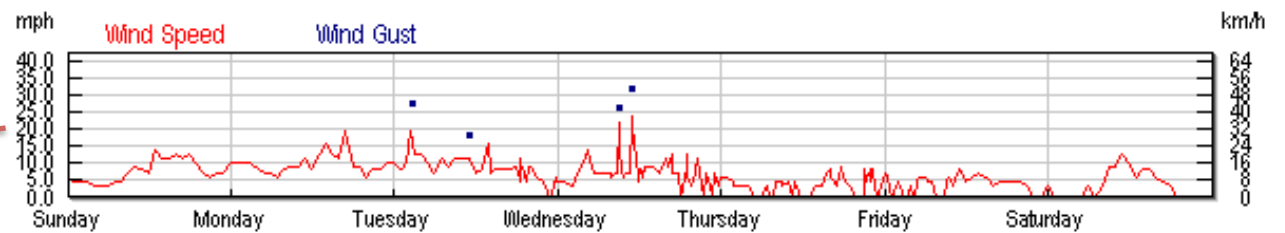
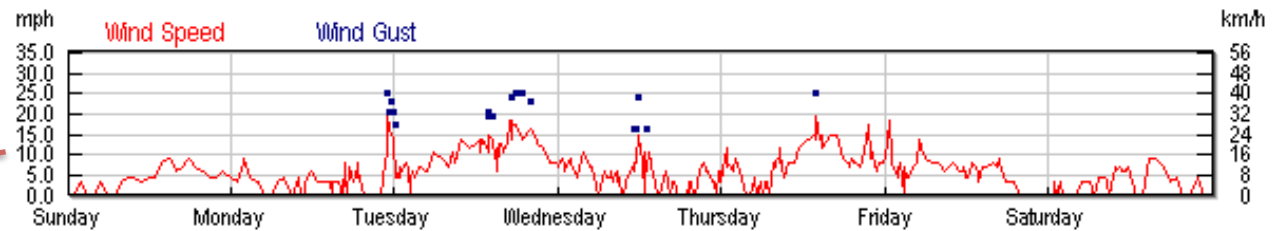
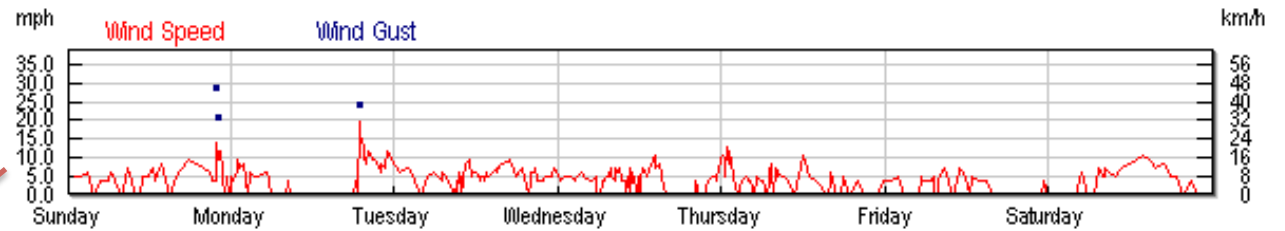
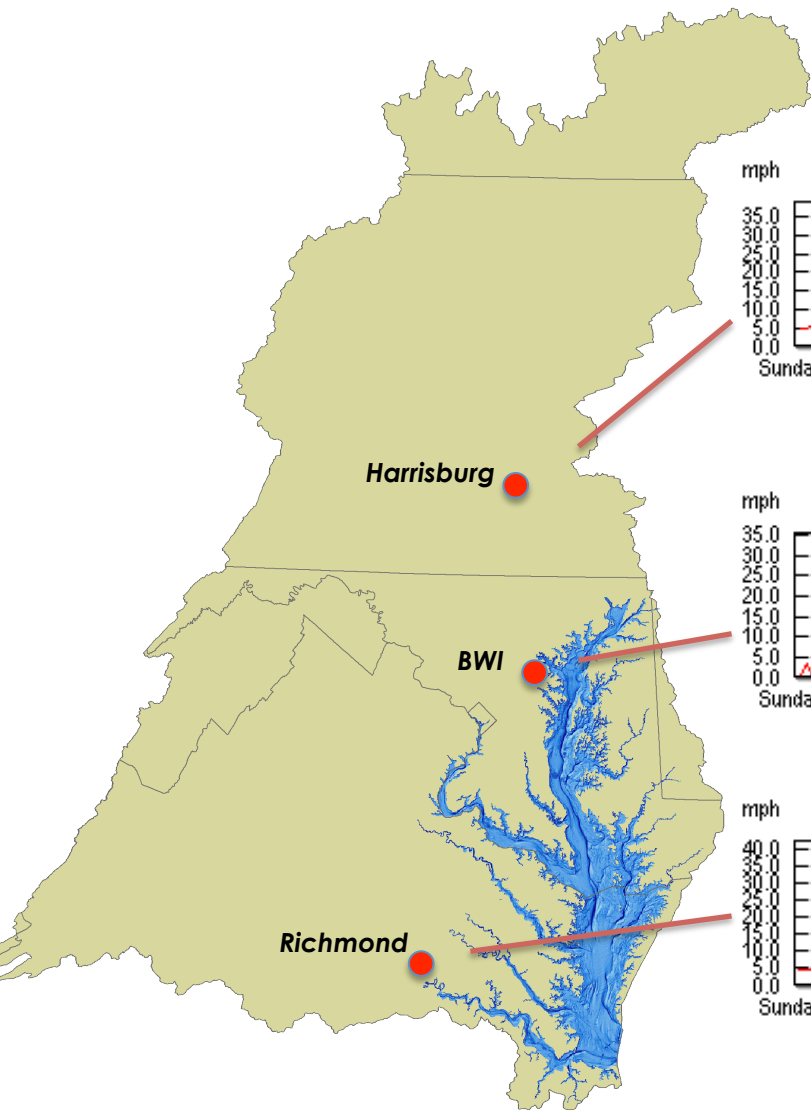
**9/09**

**9/10**

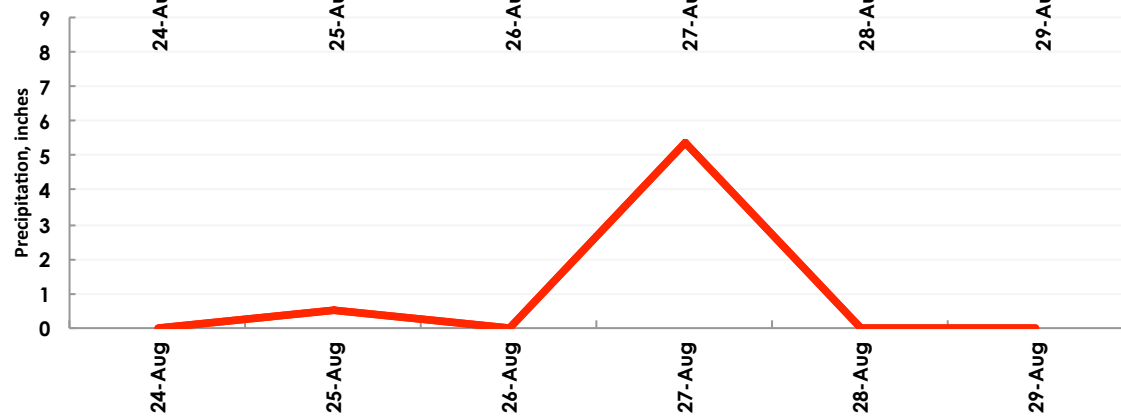
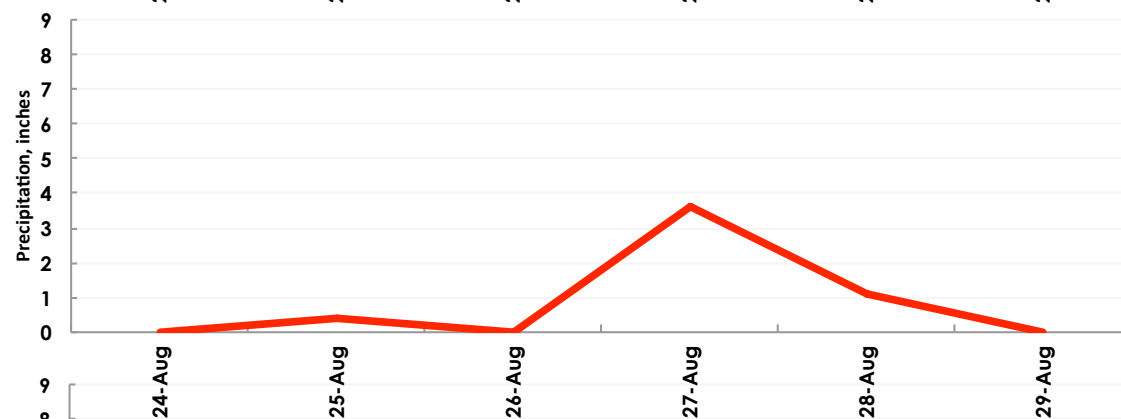
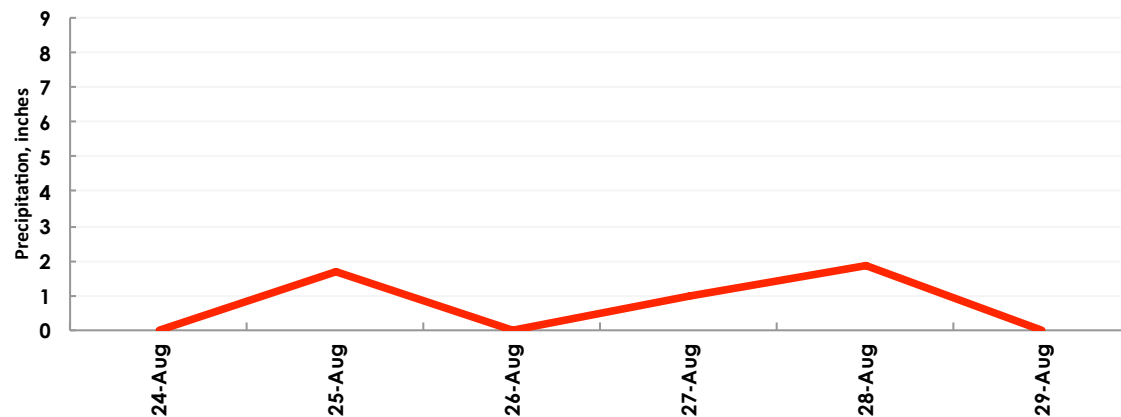
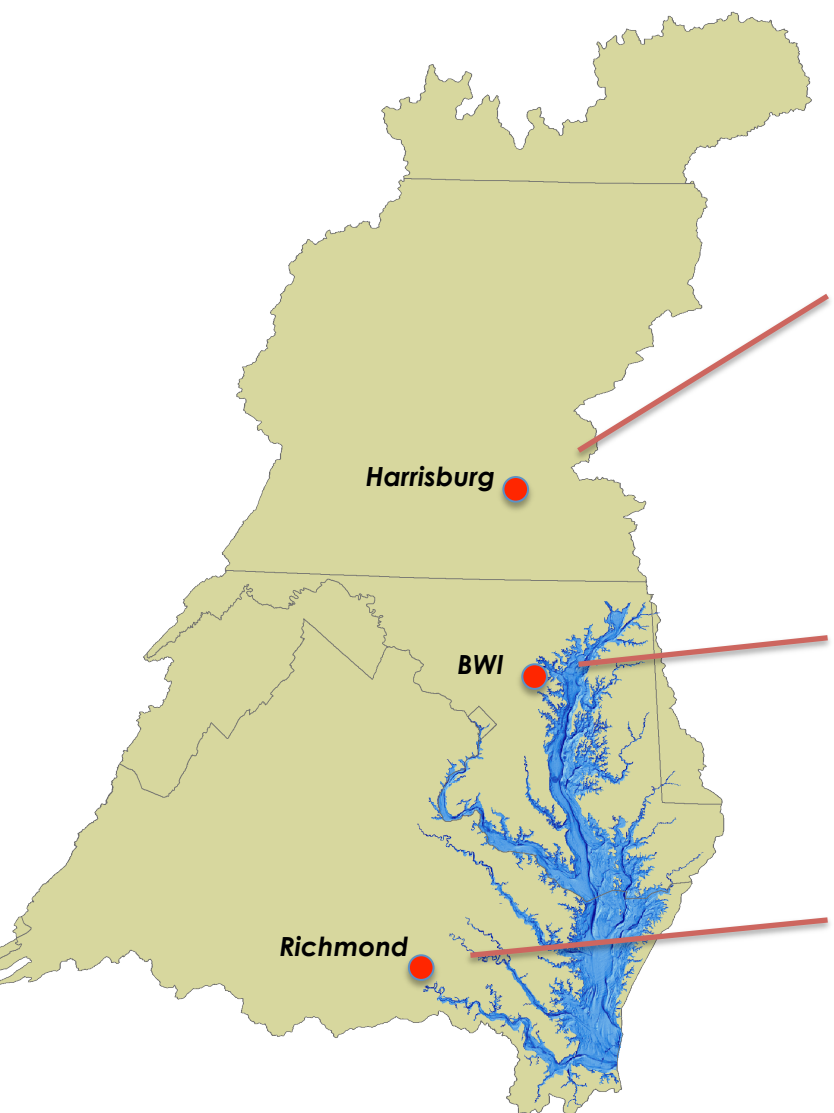
# Wind speeds - Irene



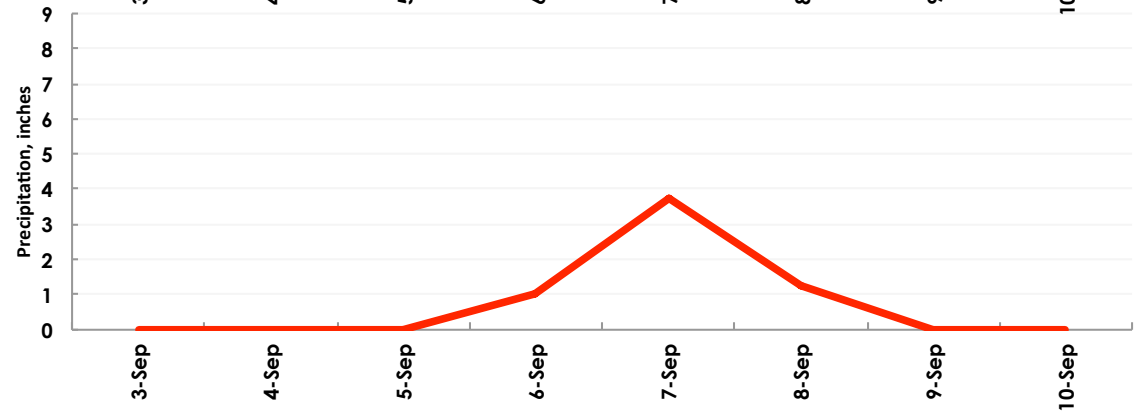
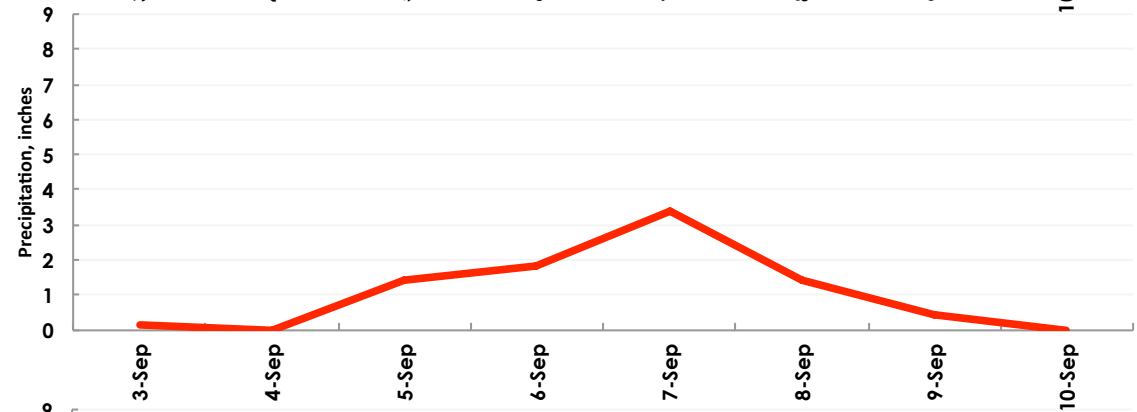
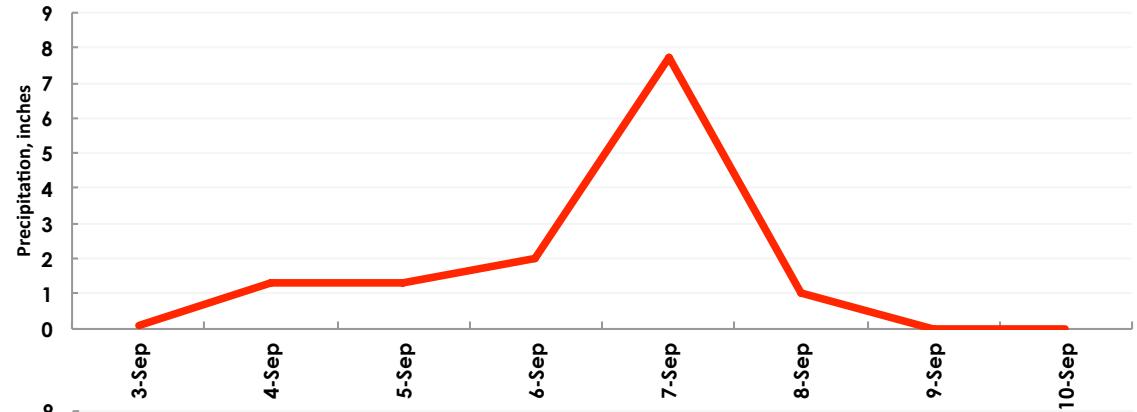
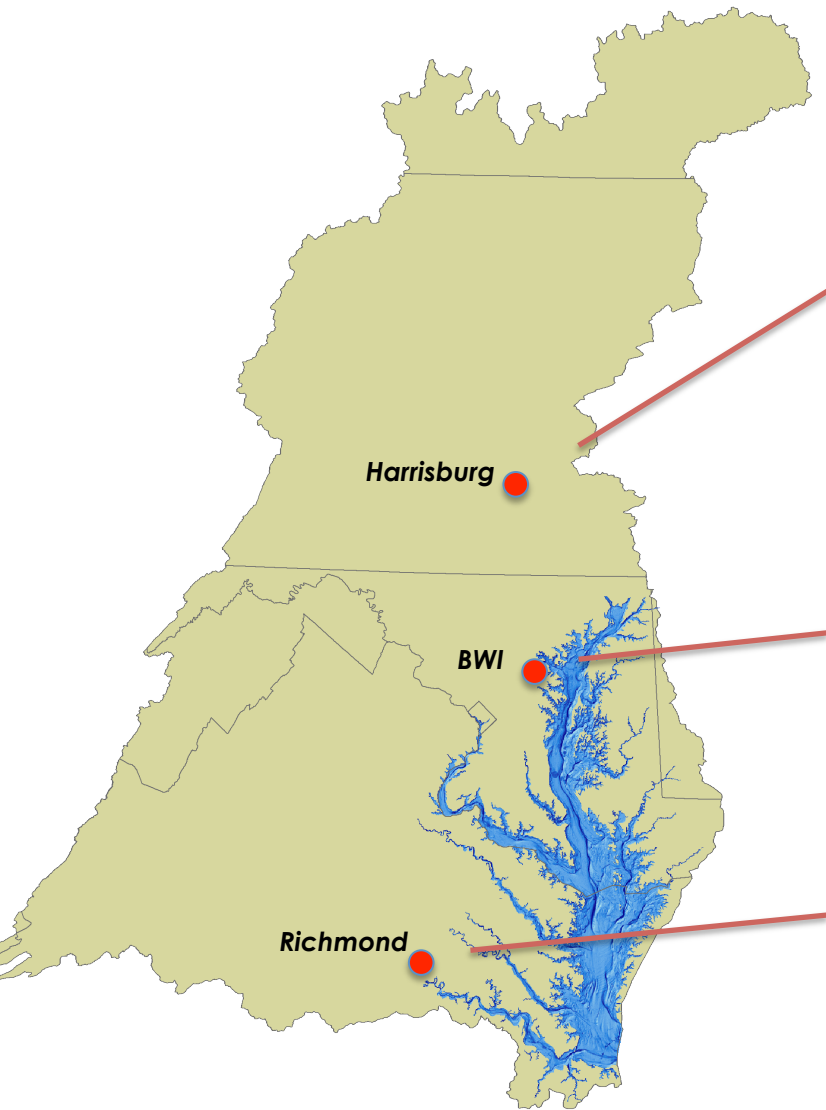
# Wind speeds - Lee



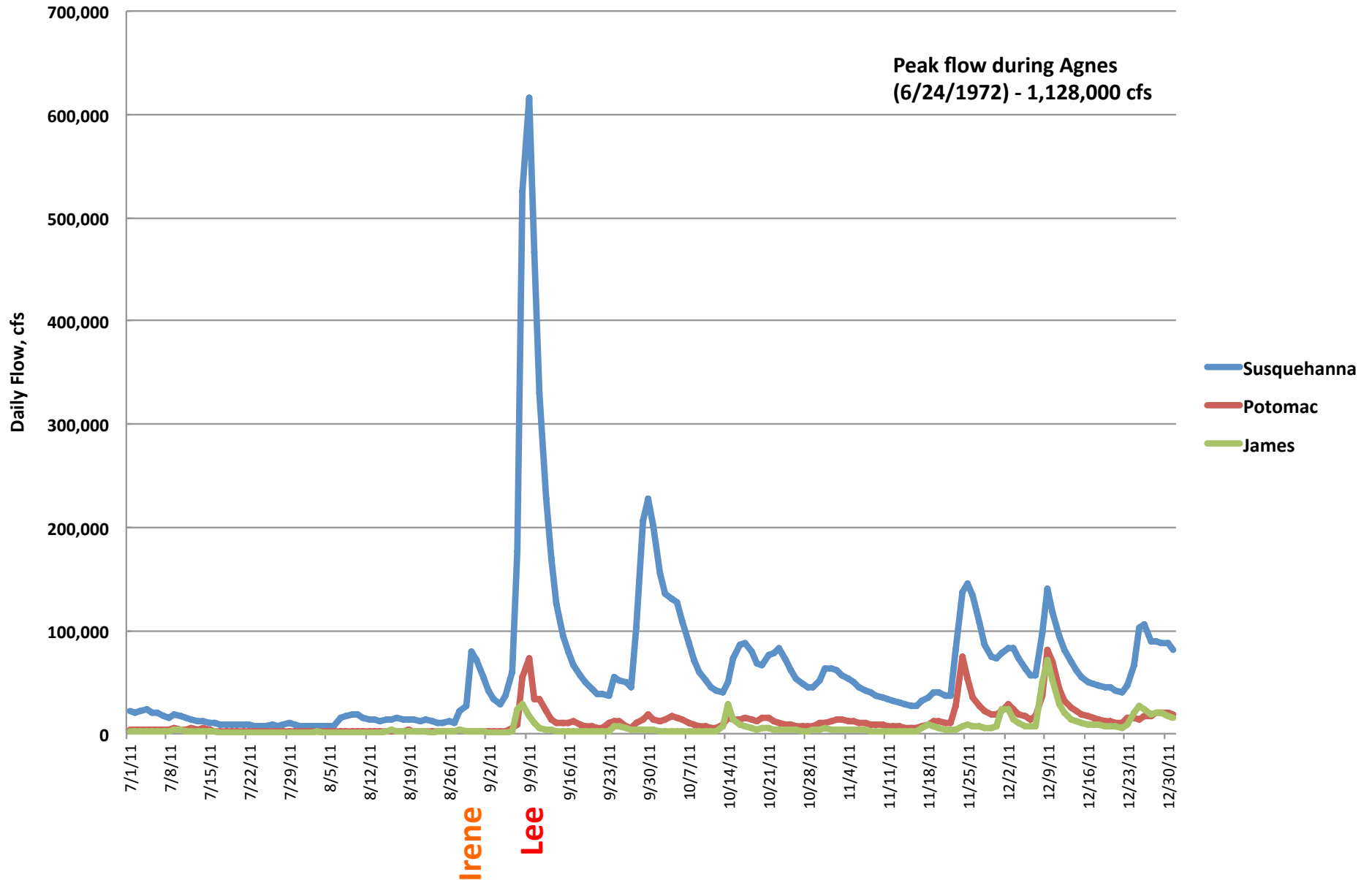
# Precipitation - Irene



# Precipitation - Lee



# River Flow



# Rappahannock River Vertical Profiler (RPP021.36)

**Location:** 37° 43' 12.72 76°W 34' 0.78

**Tributary:** Rappahannock River

**Salinity regime:** Mesohaline (>5-19 ppt)

**Mean water depth:** 13.8 meters

**Mean tidal range:** 1.30 ft

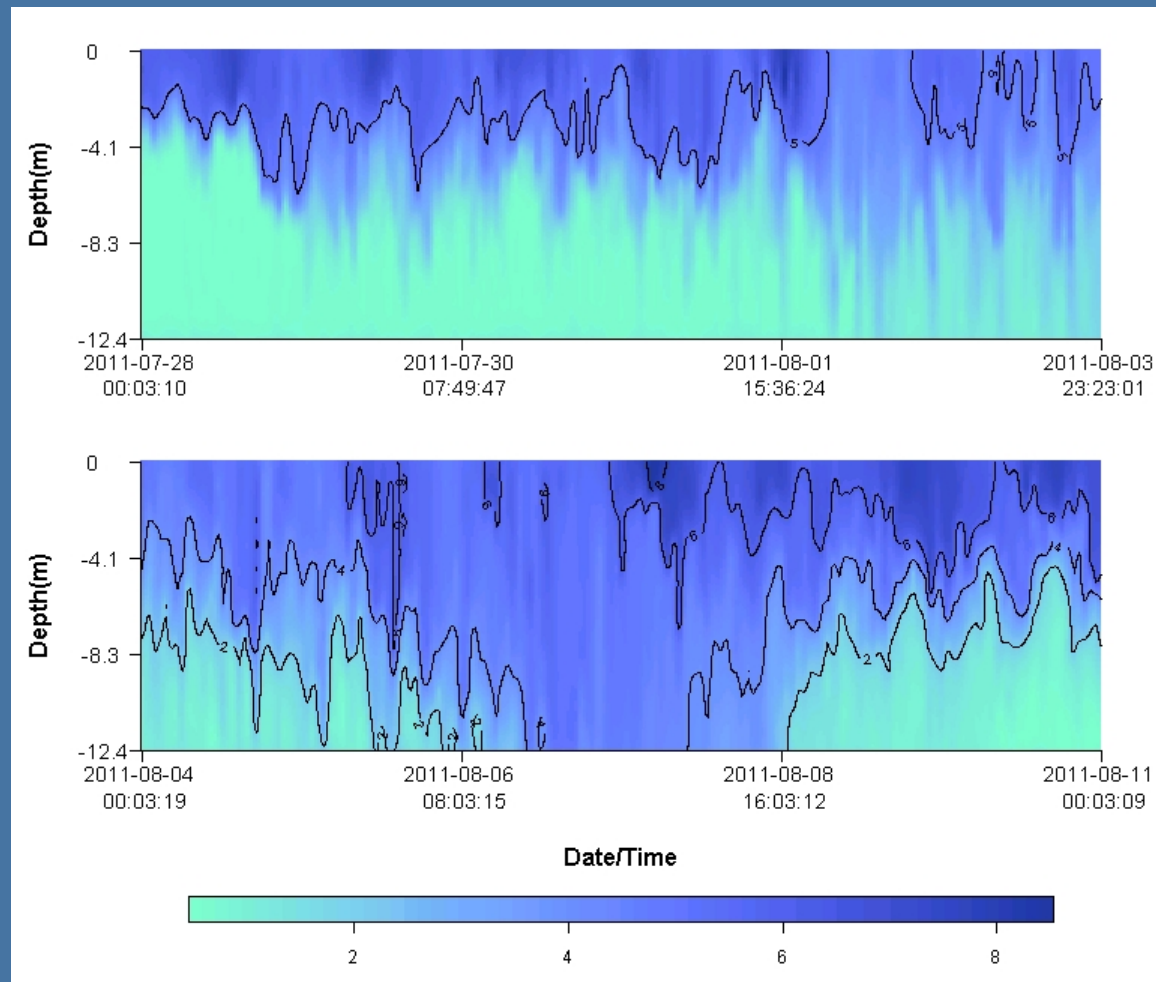
**Adjacent water:** This station is located 21.36 nautical miles from the mouth of the Rappahannock River near the mid channel.

**Landscape:** This station is location downstream of Belle Isle State Park on the Rappahannock River.

**Vertical profile:** 1 meter intervals; Hourly, June - September

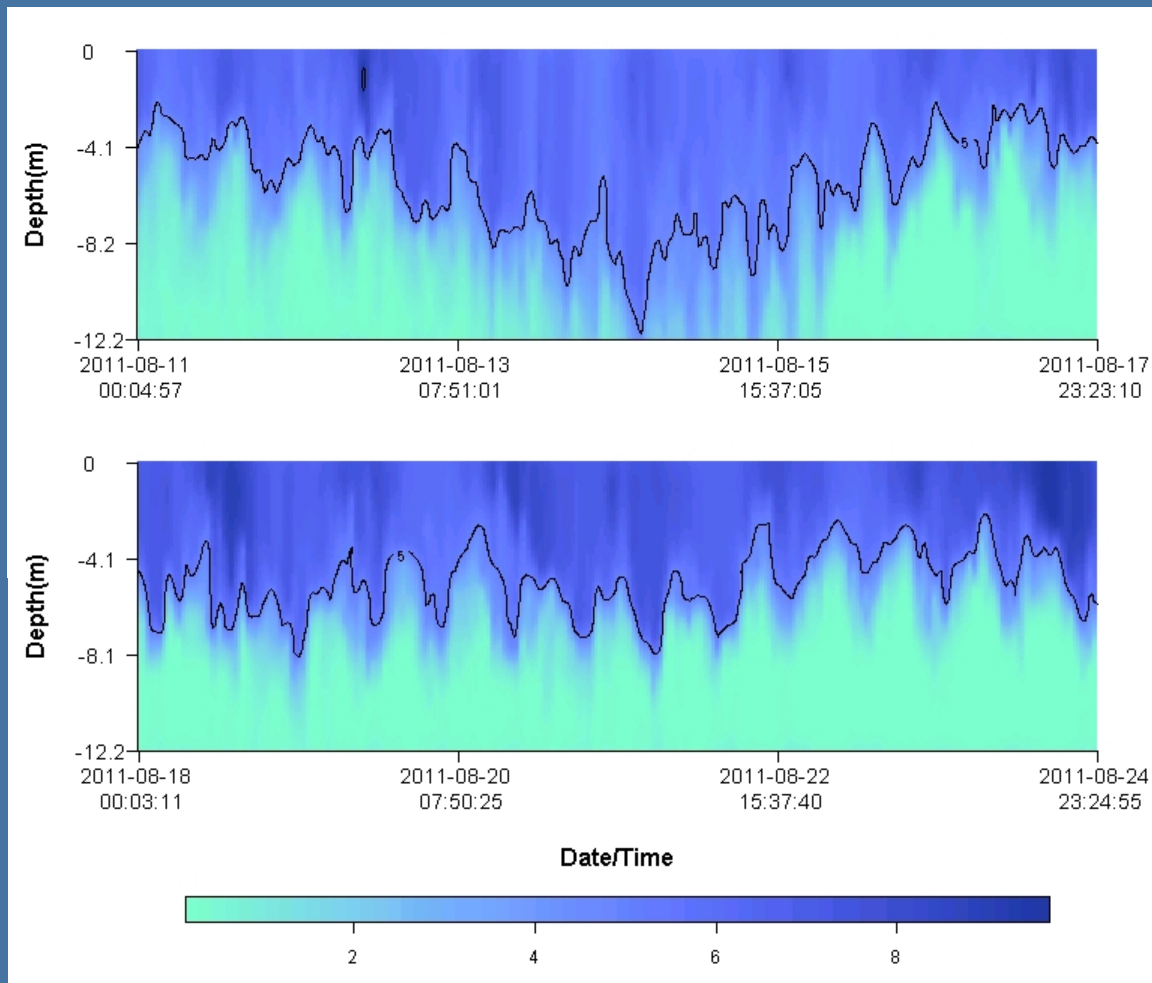


## Rappahannock River Profiler - Jul/28-Aug/11/2011



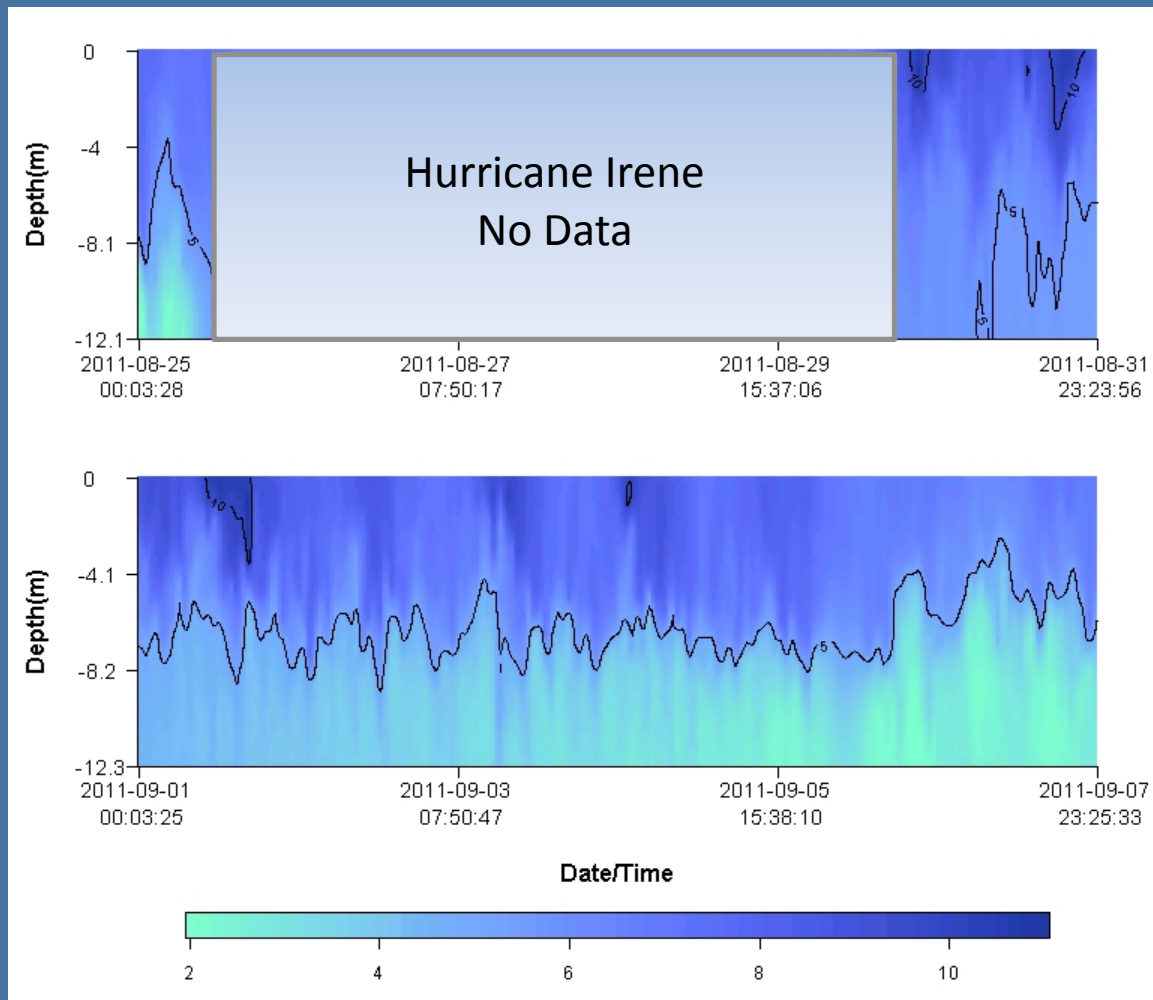
Dissolved Oxygen (mg/l)

## Rappahannock River Profiler - Aug/11-24/2011



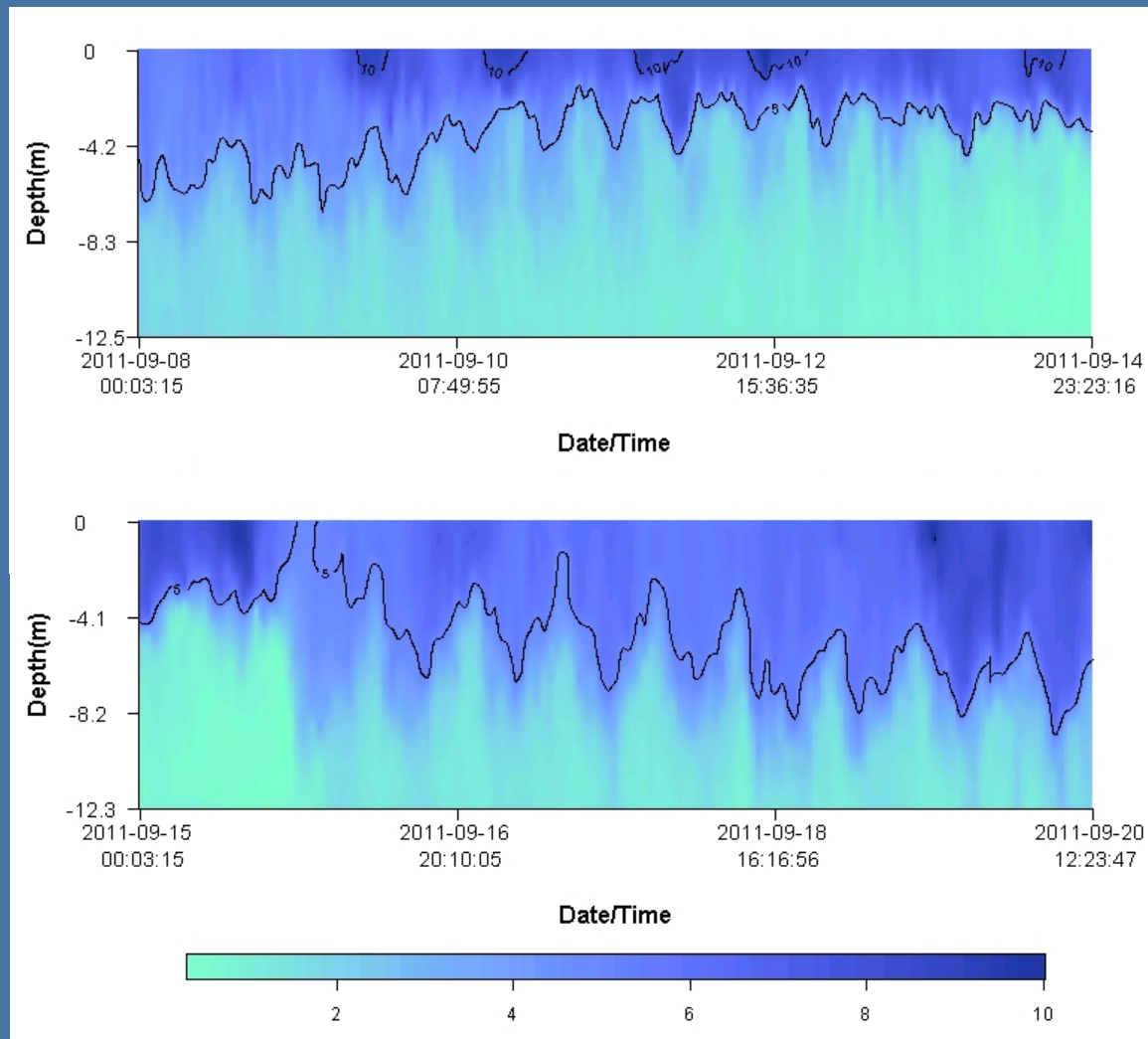
Dissolved Oxygen (mg/l)

## Rappahannock River Profiler - Aug/25-Sep/7/2011



Dissolved Oxygen (mg/l)

## Rappahannock River Profiler - Sep/8-20/2011



Dissolved Oxygen (mg/l)

## York River Vertical Profiler (YRK004.26)

**Location:** N 37° 13' 35.94" W 76° 28' 43.76"

**Tributary:** York River

**Salinity regime:** Polyhaline (>18 ppt)

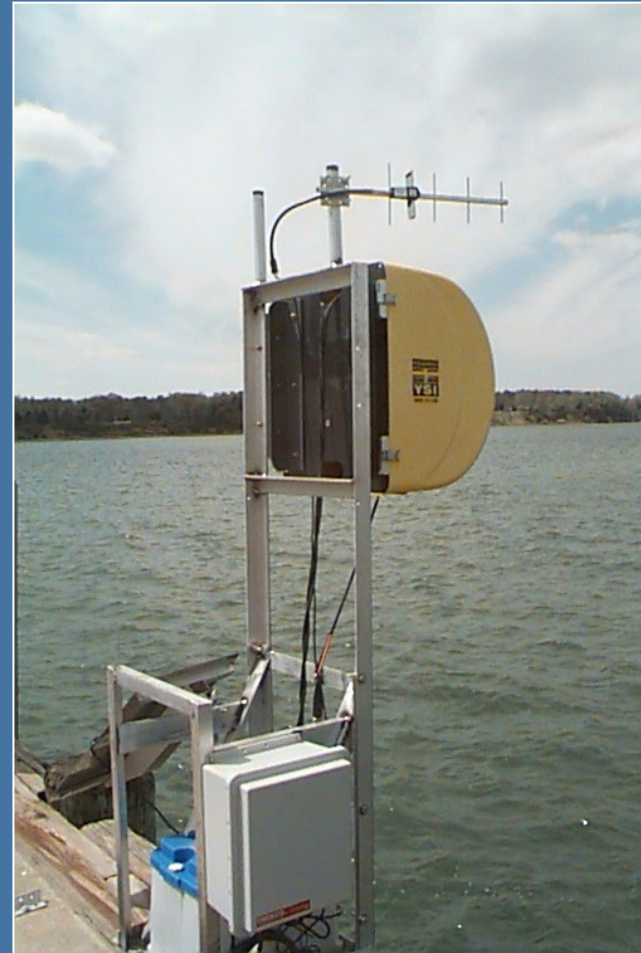
**Mean tidal range:** 2.28 ft

**Mean water depth:** 9.5 m

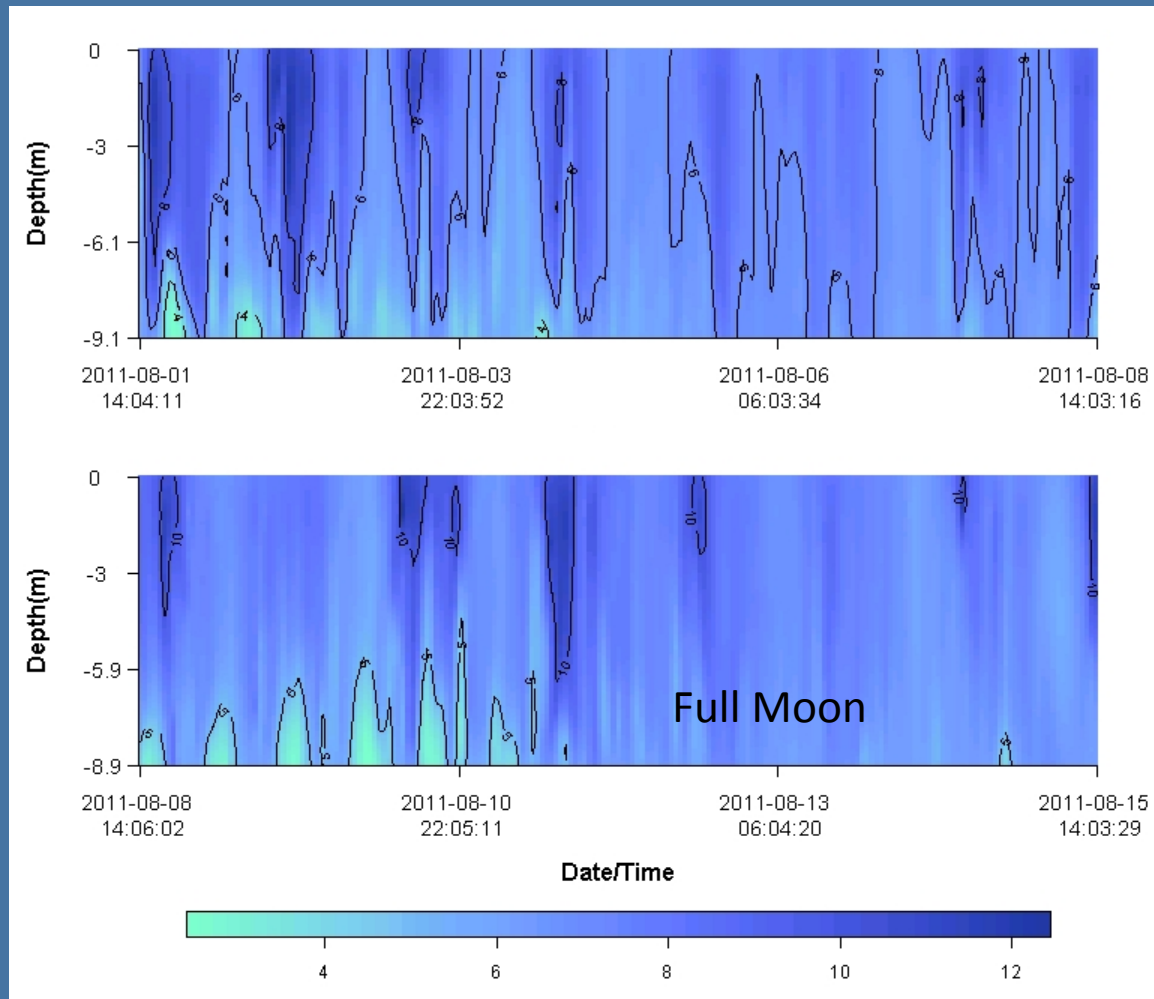
**Adjacent water:** This station is located 4.26 nautical miles from the mouth of the York River near the mid channel.

**Landscape:** This station is located at the end of the U.S. Coast Guard Training Center Pier in the lower York River.

**Vertical profile:** 1 meter intervals; Hourly, June - September

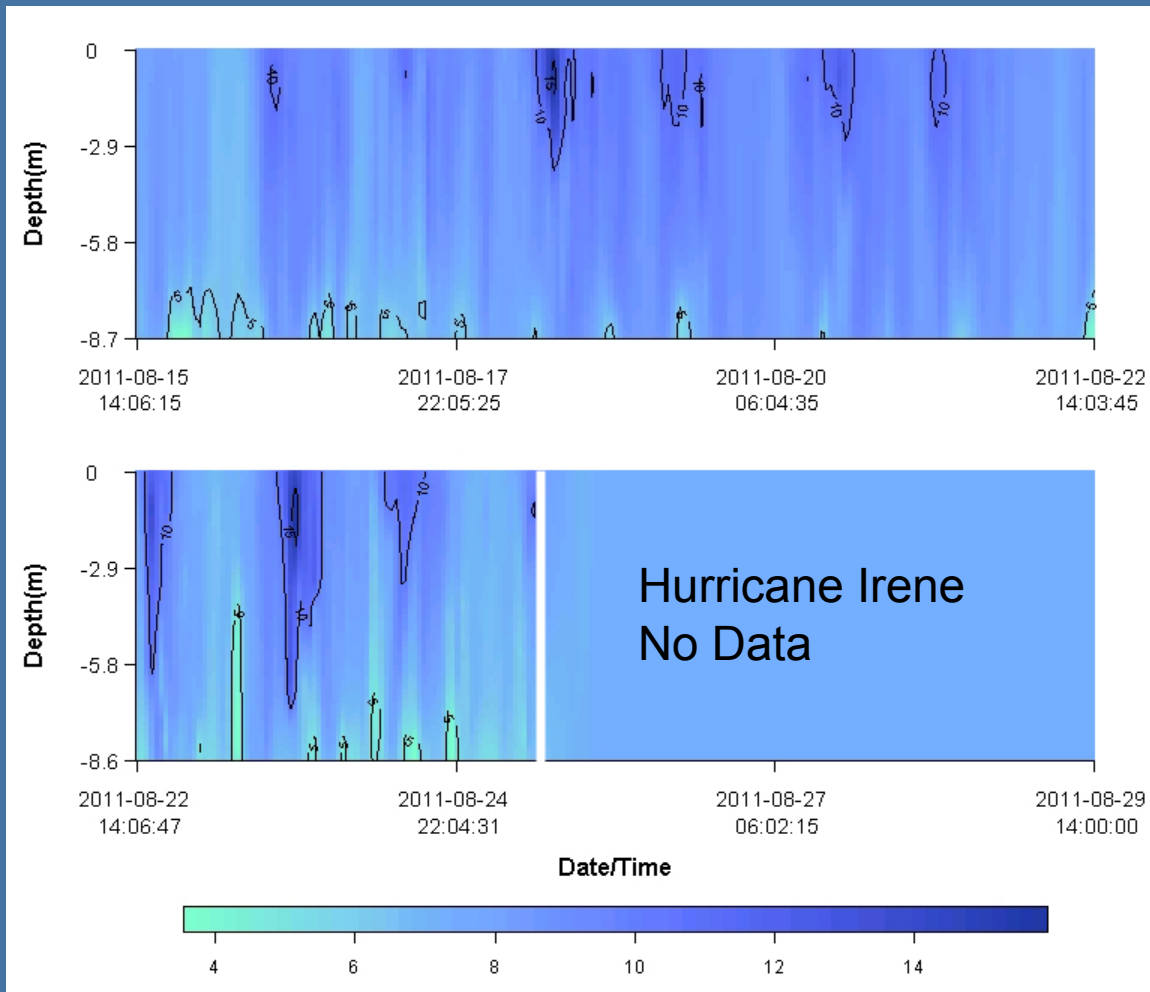


## York River Profiler - Aug/1-15/2011



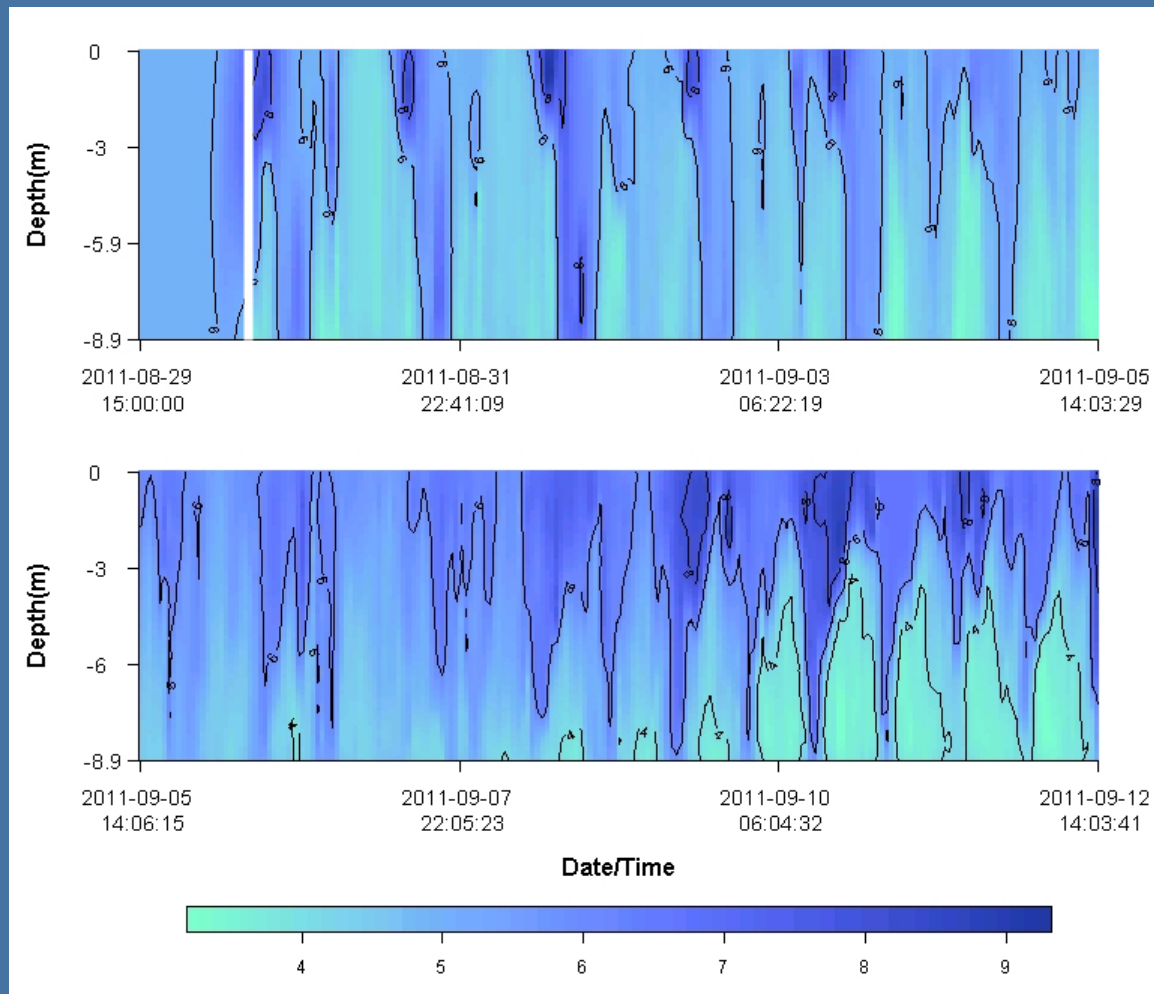
Dissolved Oxygen (mg/l)

## York River Profiler - Aug/15-29/2011



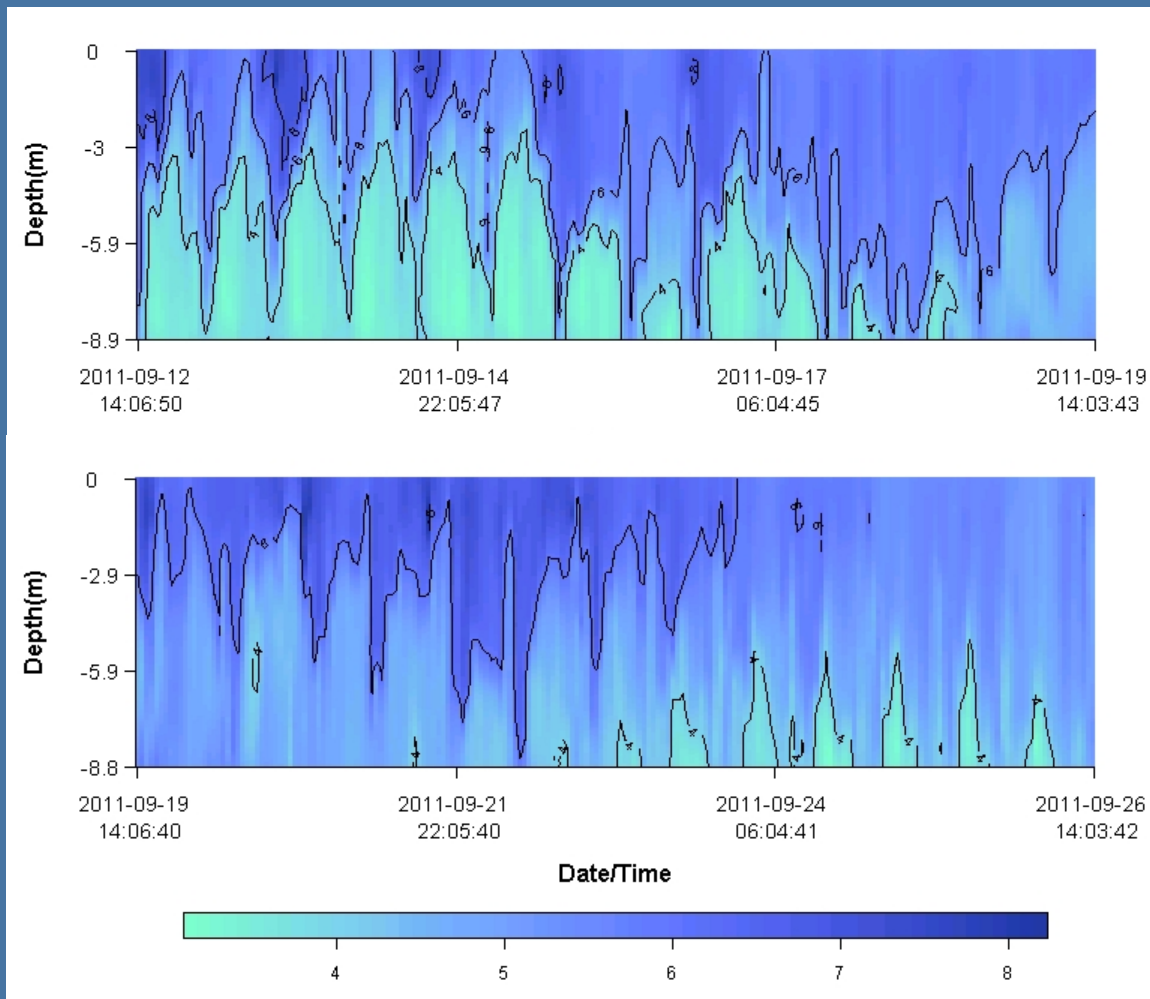
Dissolved Oxygen (mg/l)

## York River Profiler - Aug/29-Sep/12/2011



Dissolved Oxygen (mg/l)

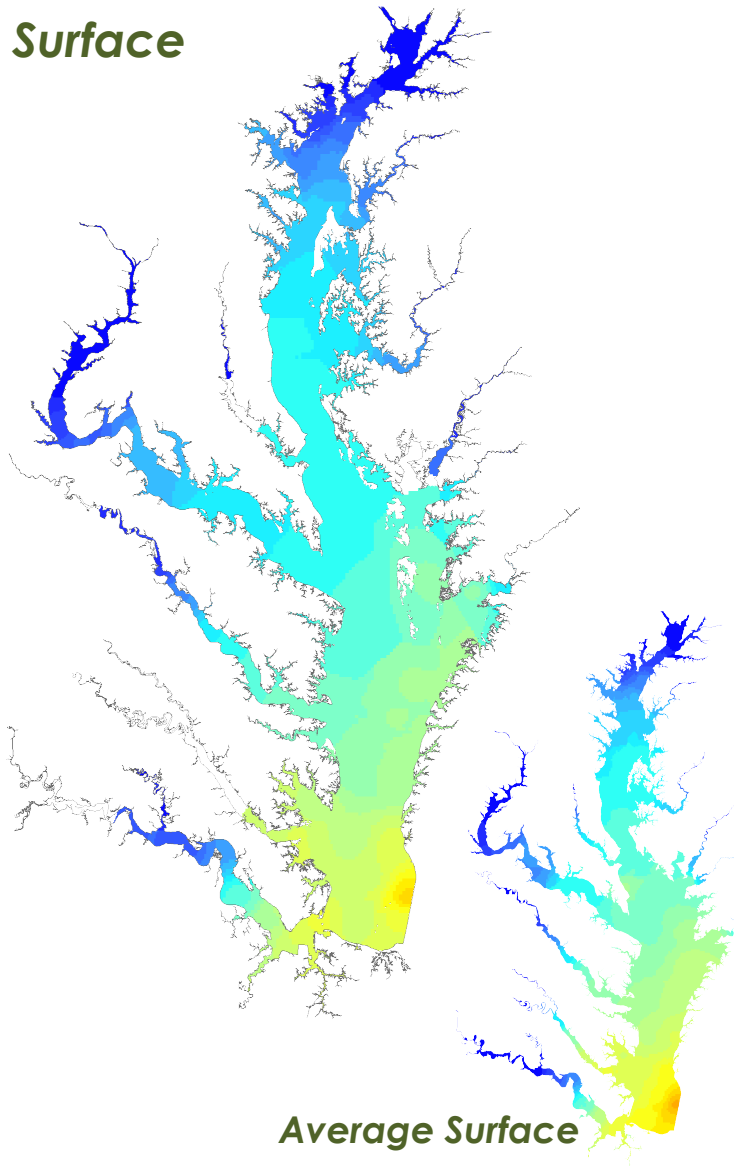
## York River Profiler - Sep/12-26/2011



Dissolved Oxygen (mg/l)

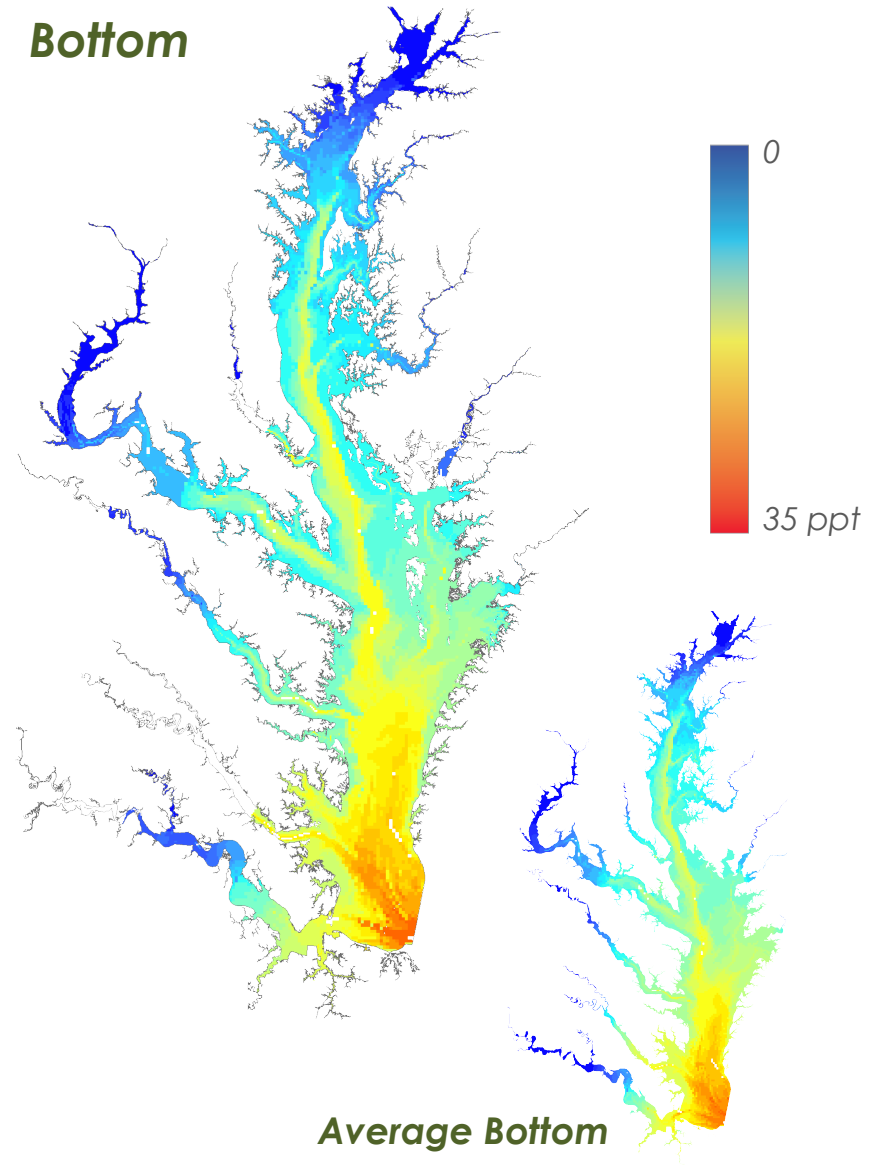
# Salinity – Early August

*Surface*



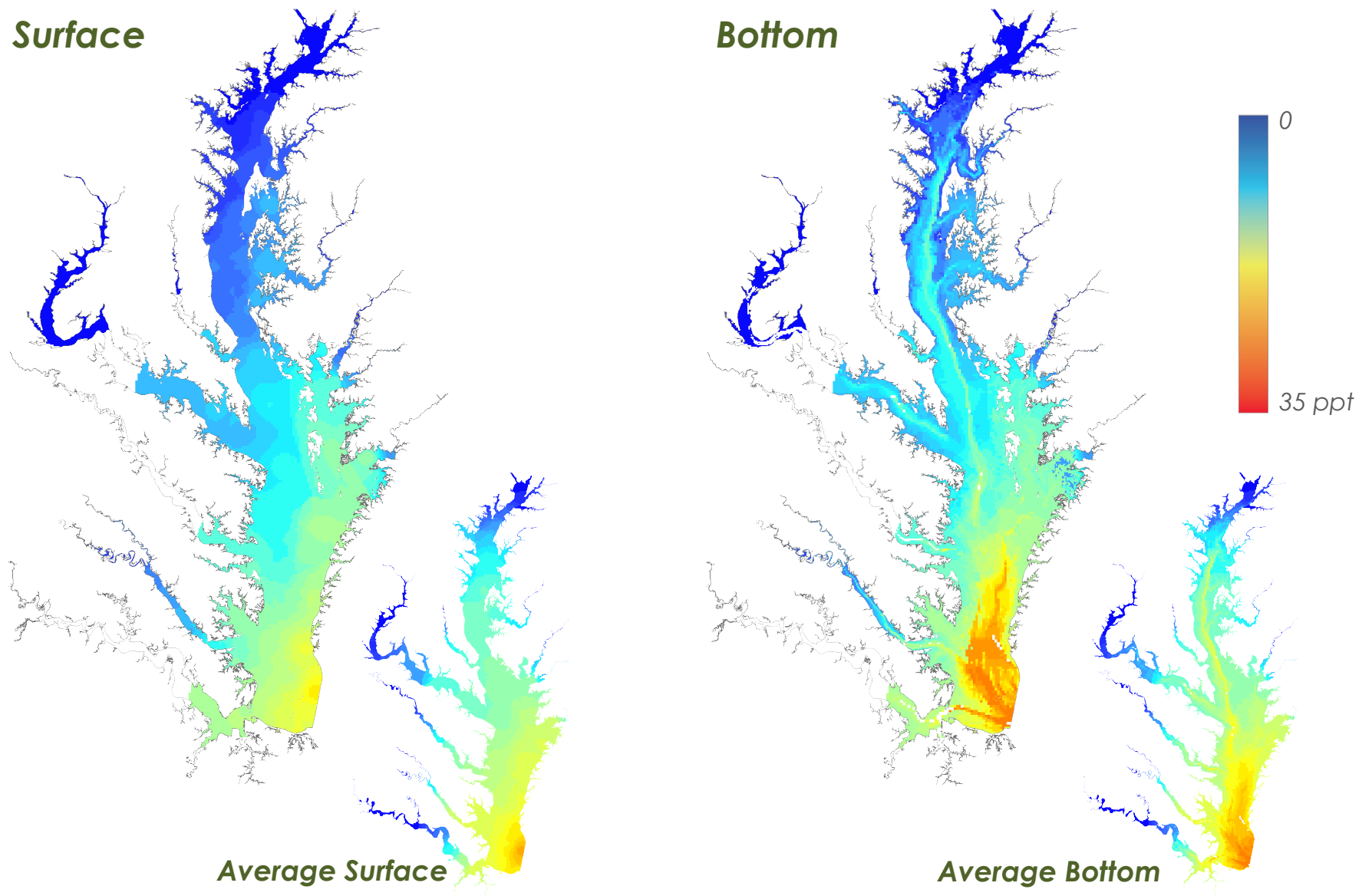
*Average Surface*

*Bottom*

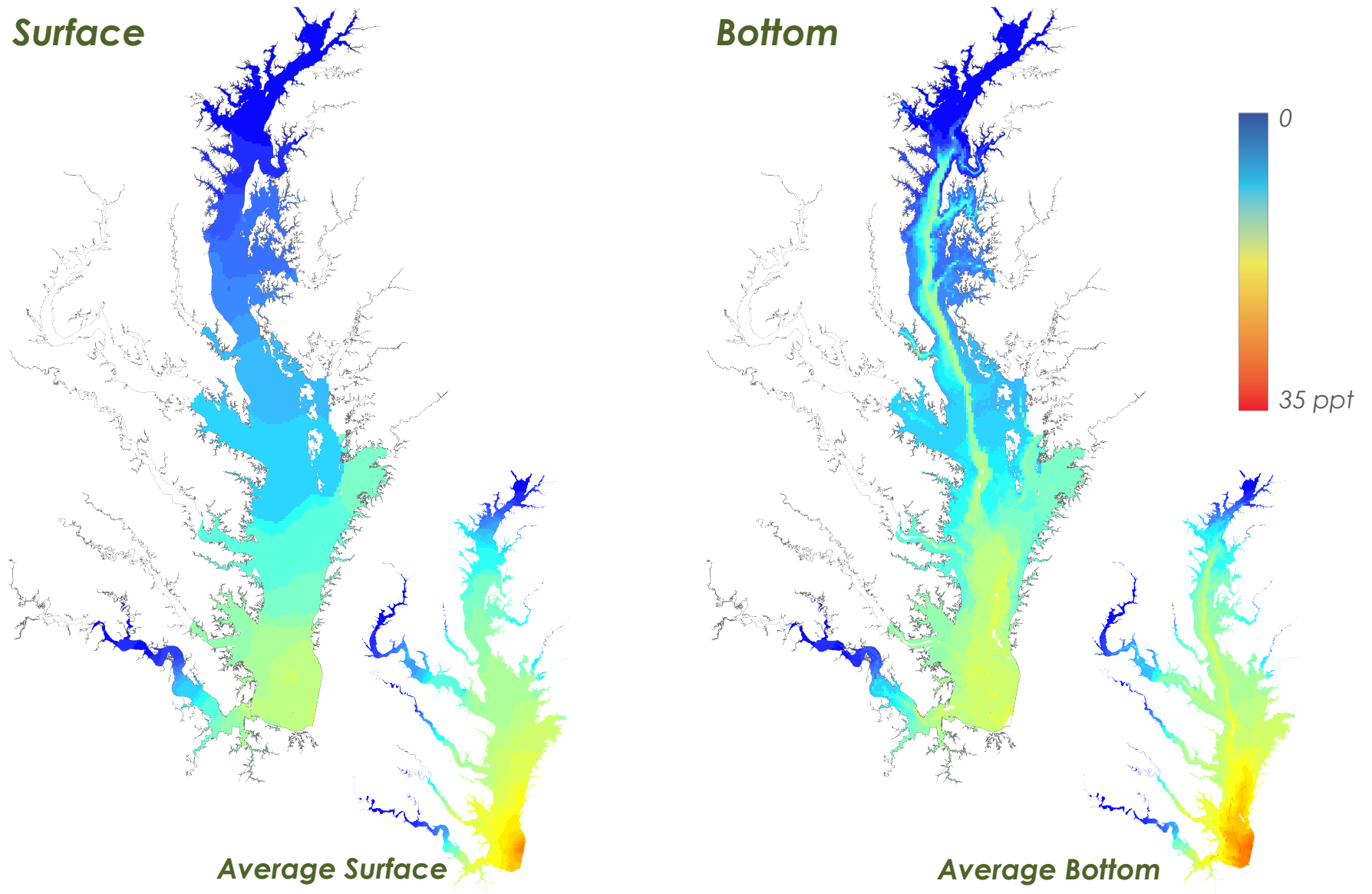


*Average Bottom*

# Salinity – Late September

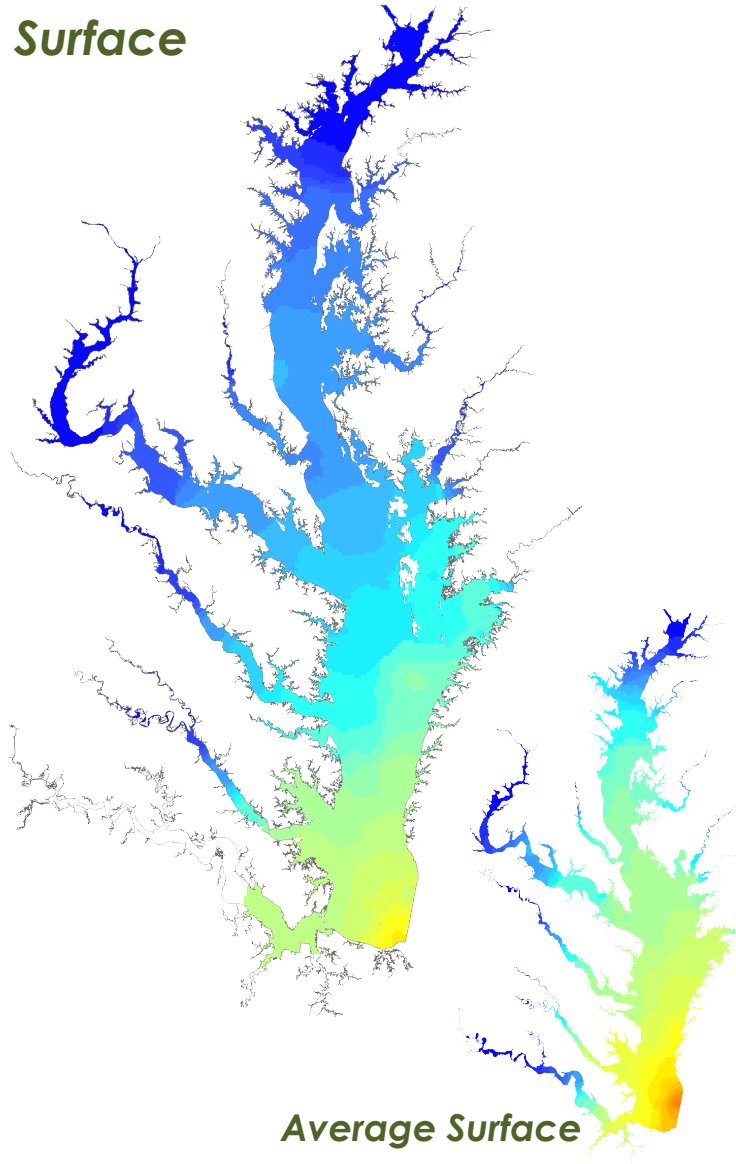


# Salinity – Early October

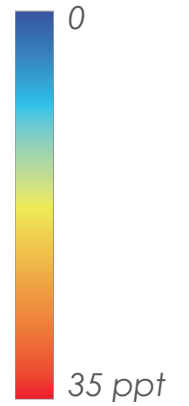
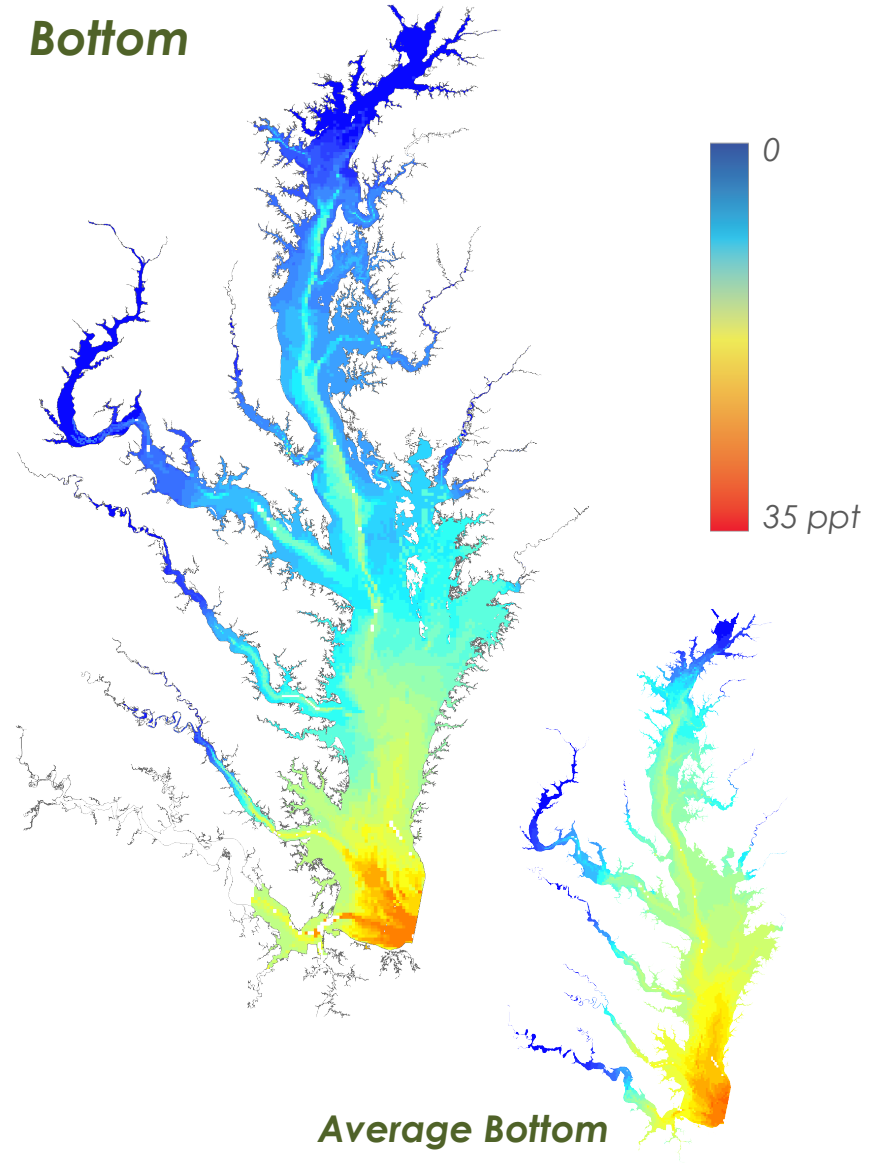


# Salinity – Late October

*Surface*



*Bottom*

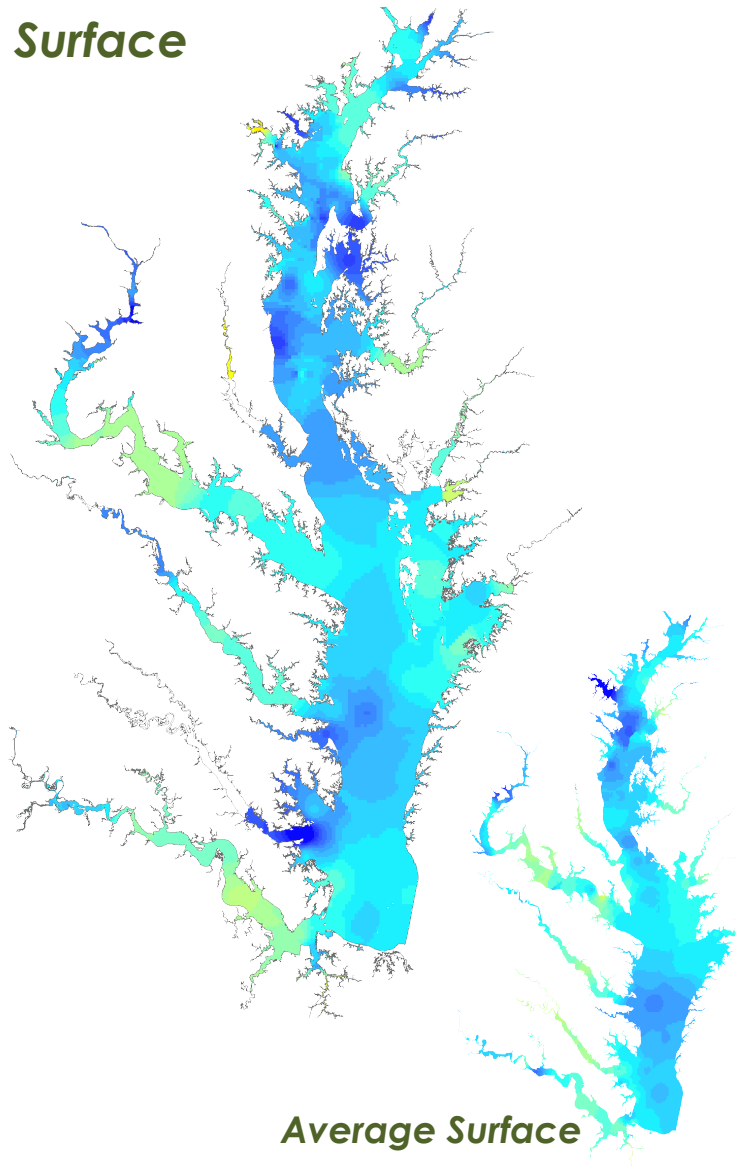


*Average Surface*

*Average Bottom*

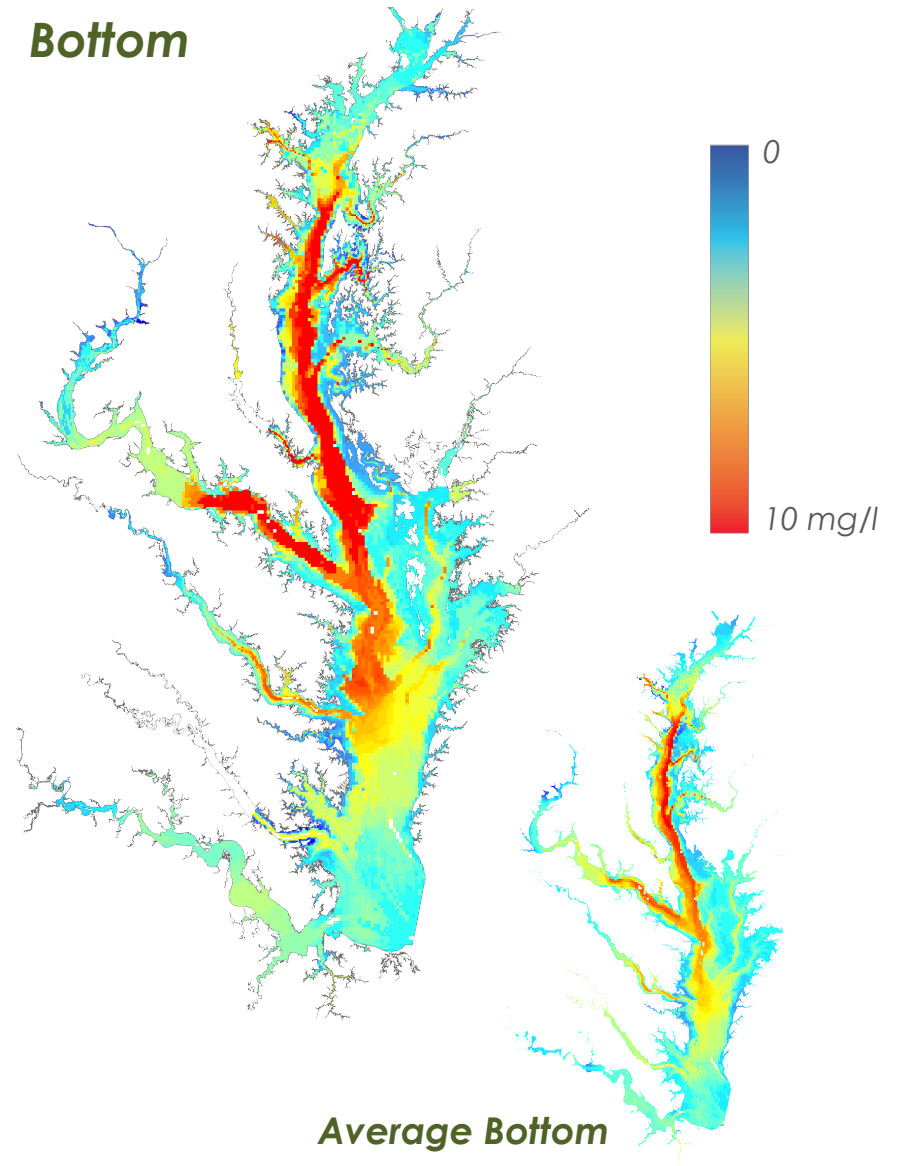
# DO – Early August

*Surface*



*Average Surface*

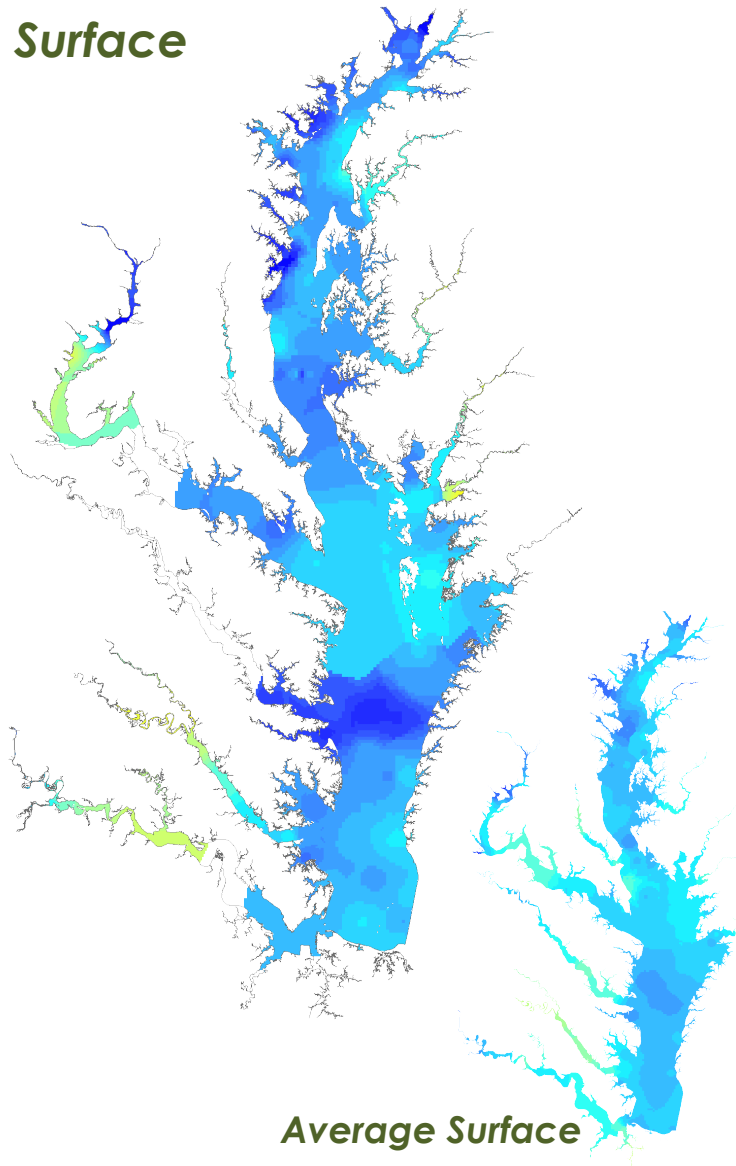
*Bottom*



*Average Bottom*

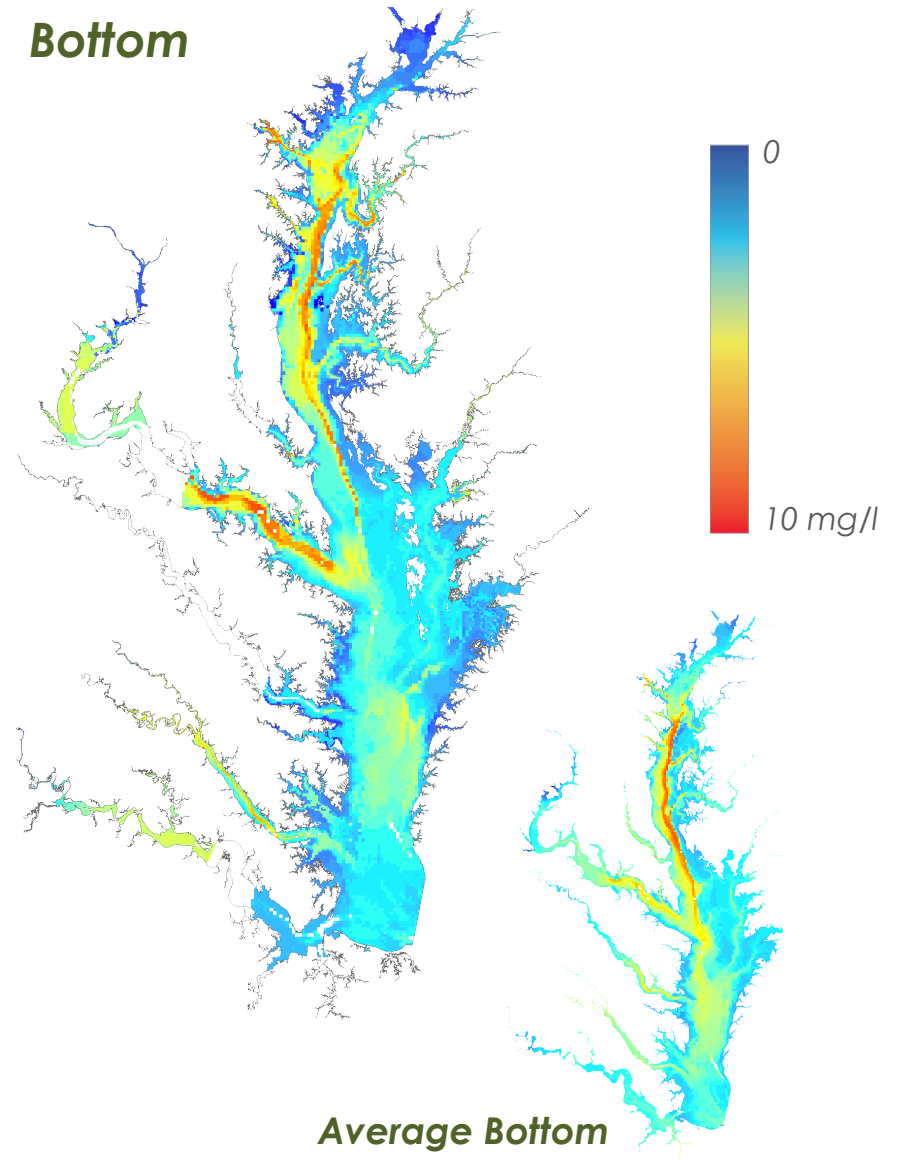
# DO – Late September

*Surface*



*Average Surface*

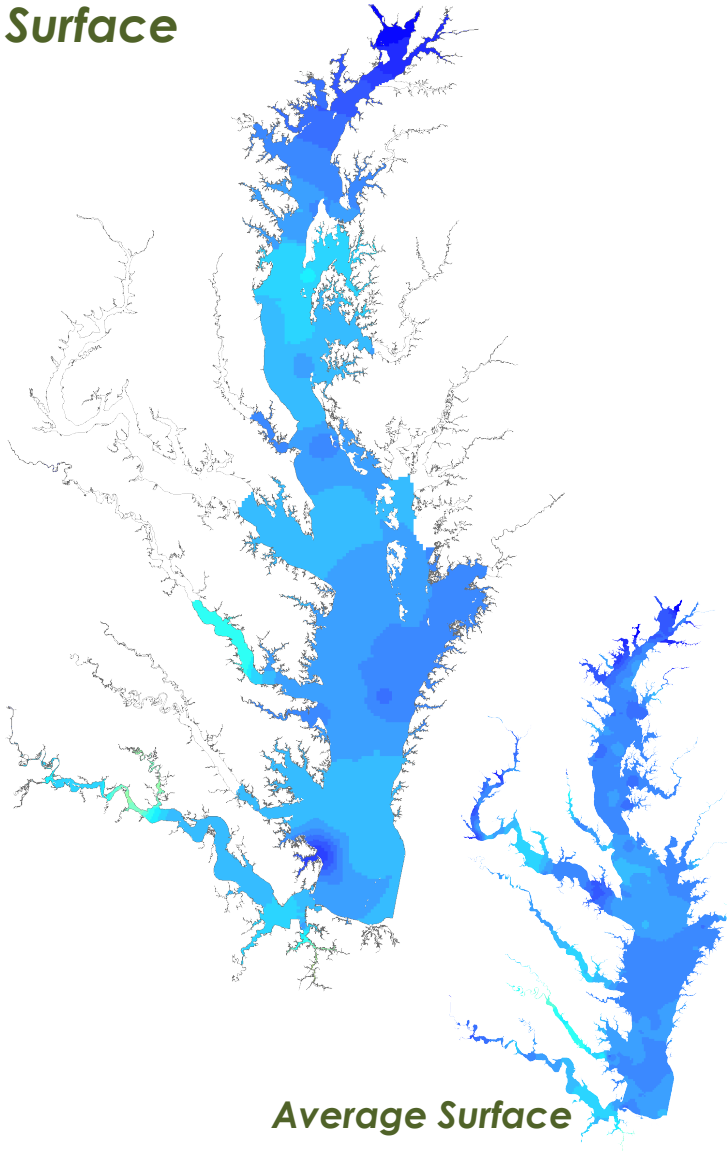
*Bottom*



*Average Bottom*

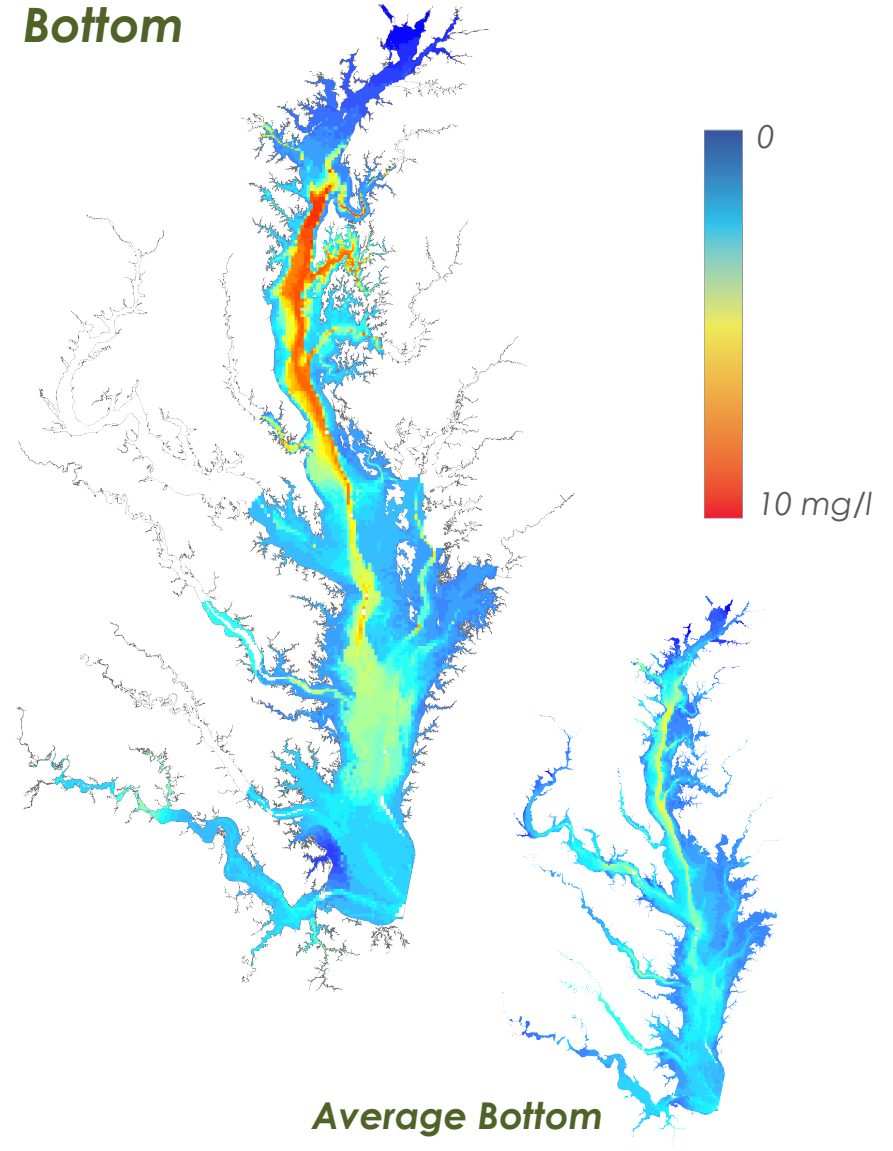
# DO – Early October

*Surface*



*Average Surface*

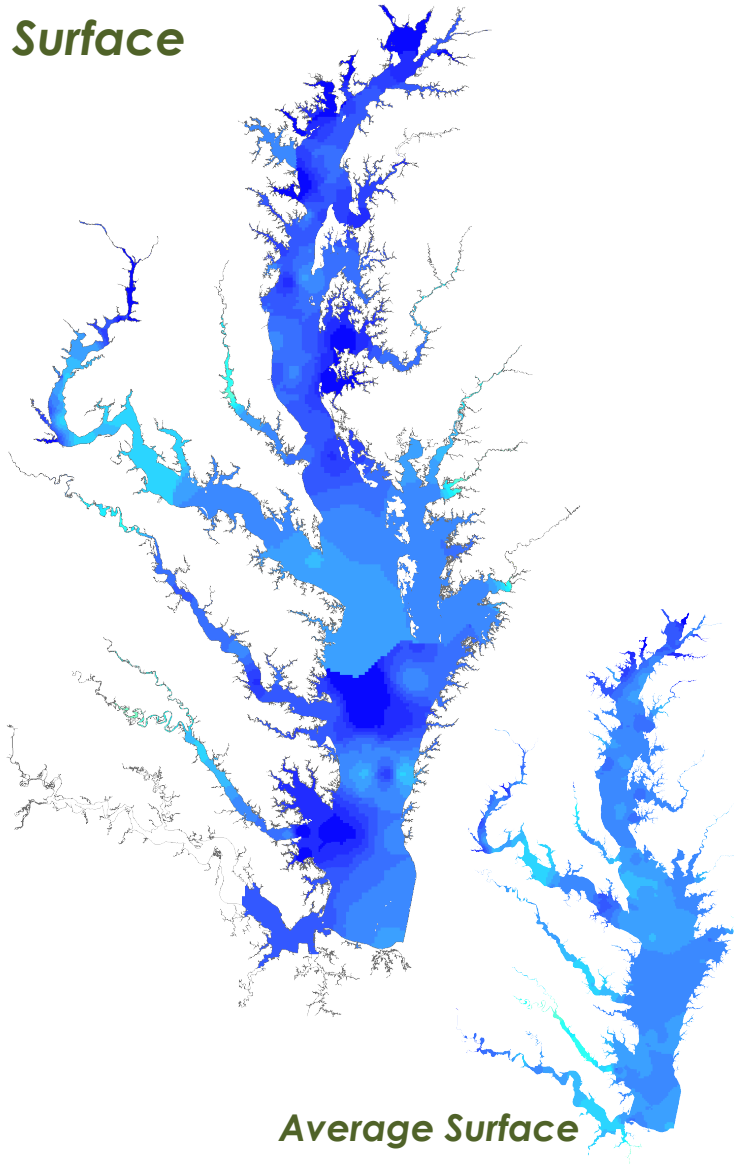
*Bottom*



*Average Bottom*

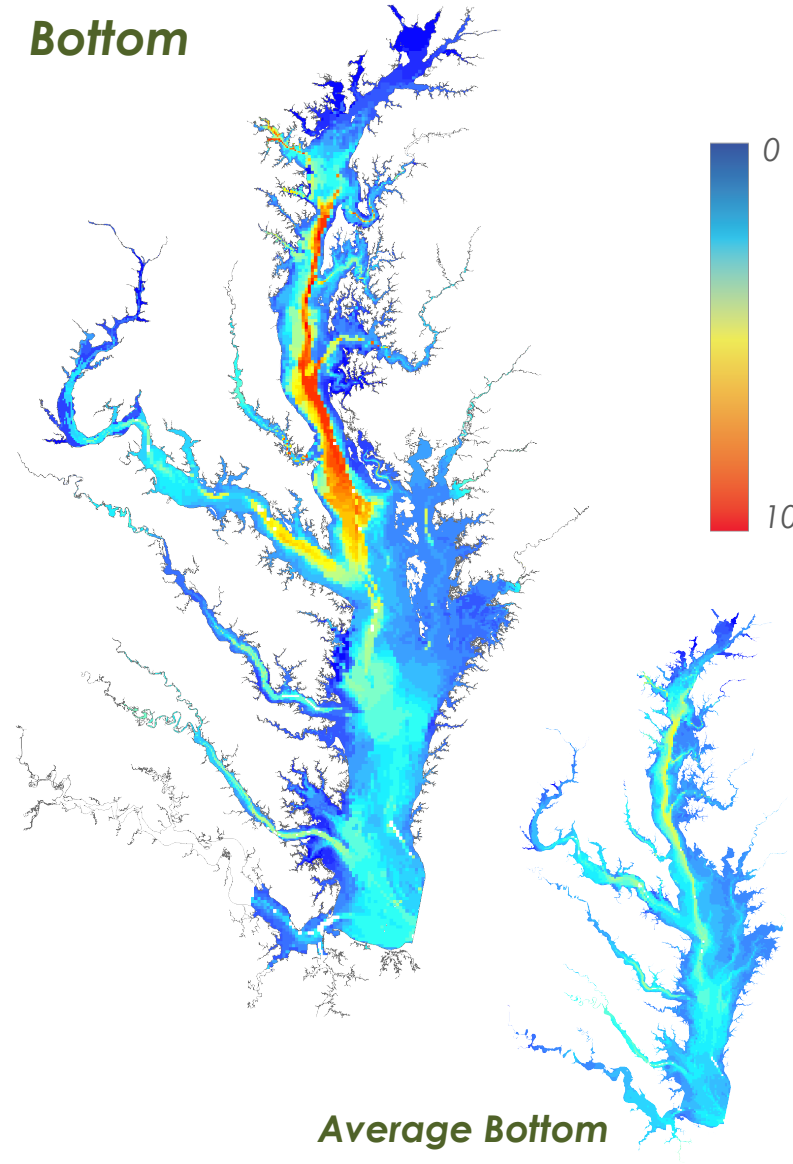
# DO – Late October

*Surface*

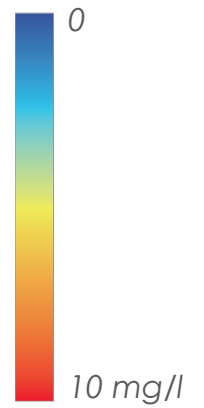


*Average Surface*

*Bottom*

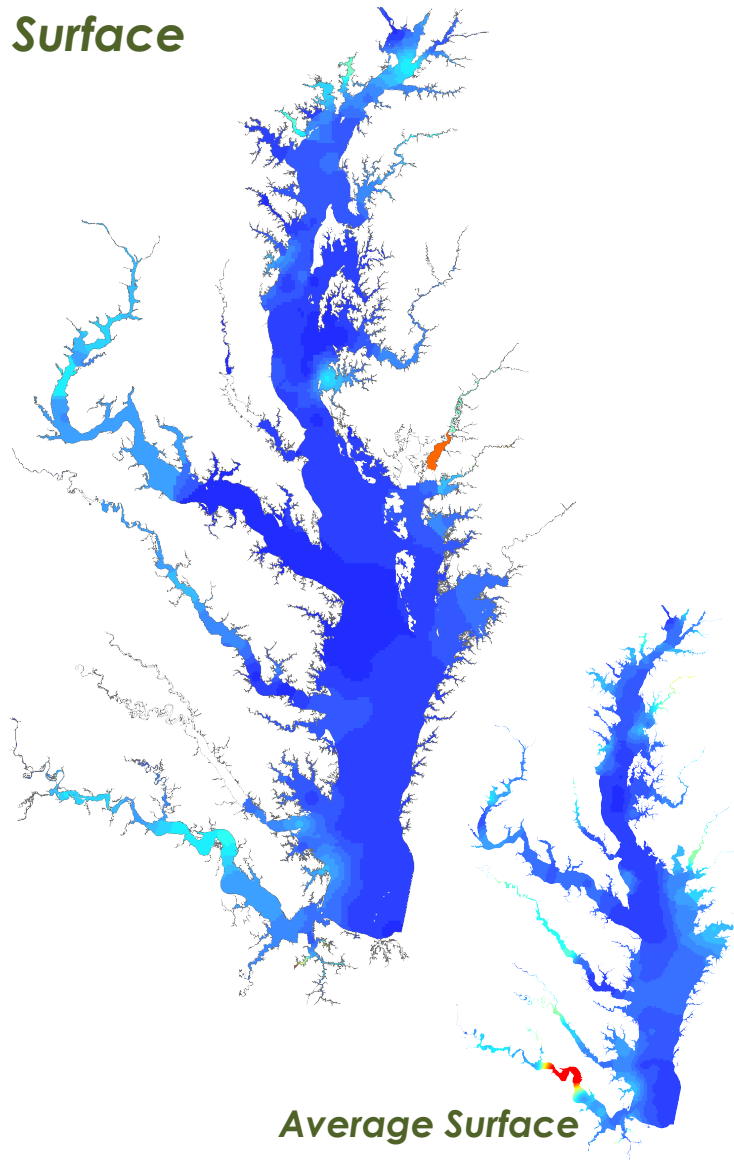


*Average Bottom*



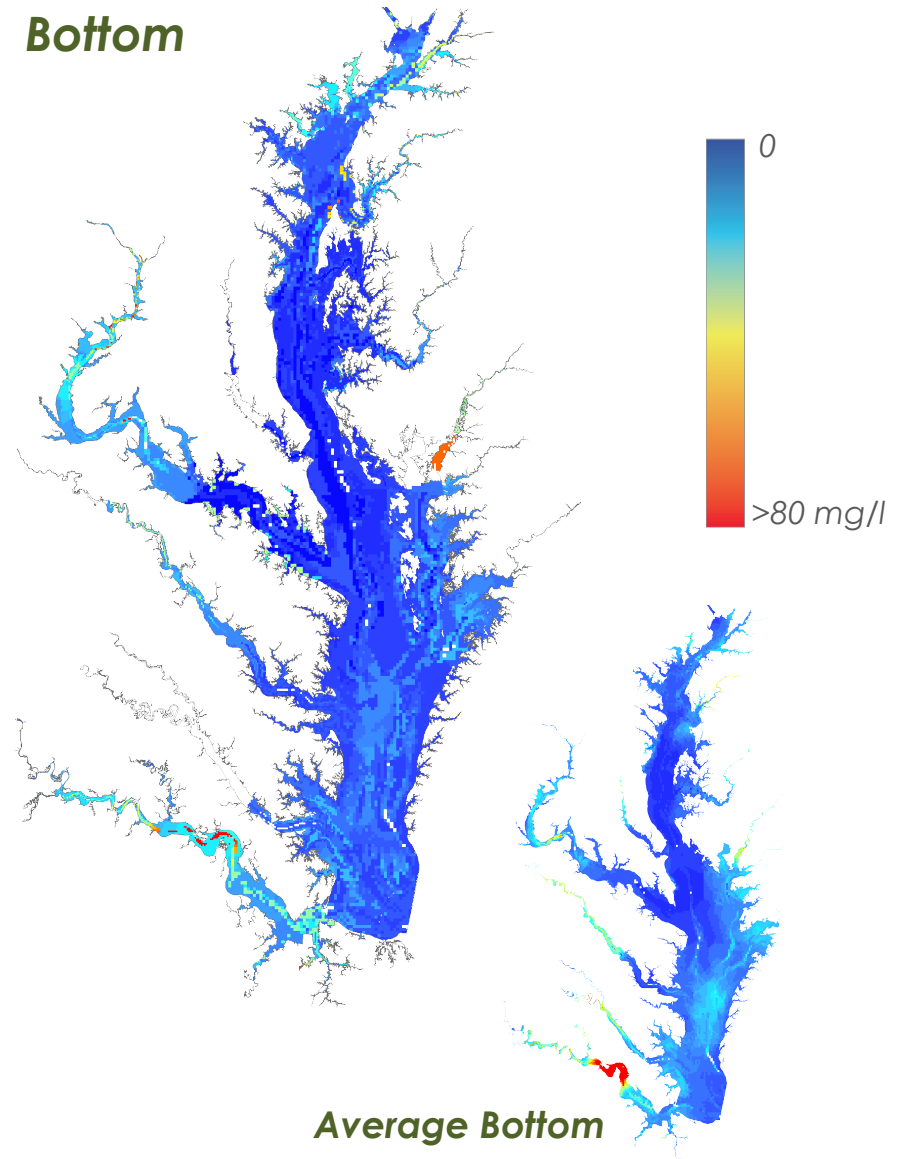
# TSS – Early August

*Surface*

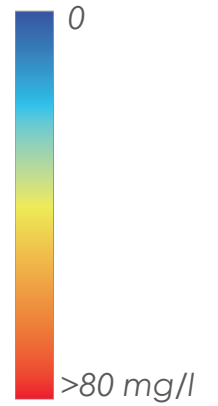


*Average Surface*

*Bottom*

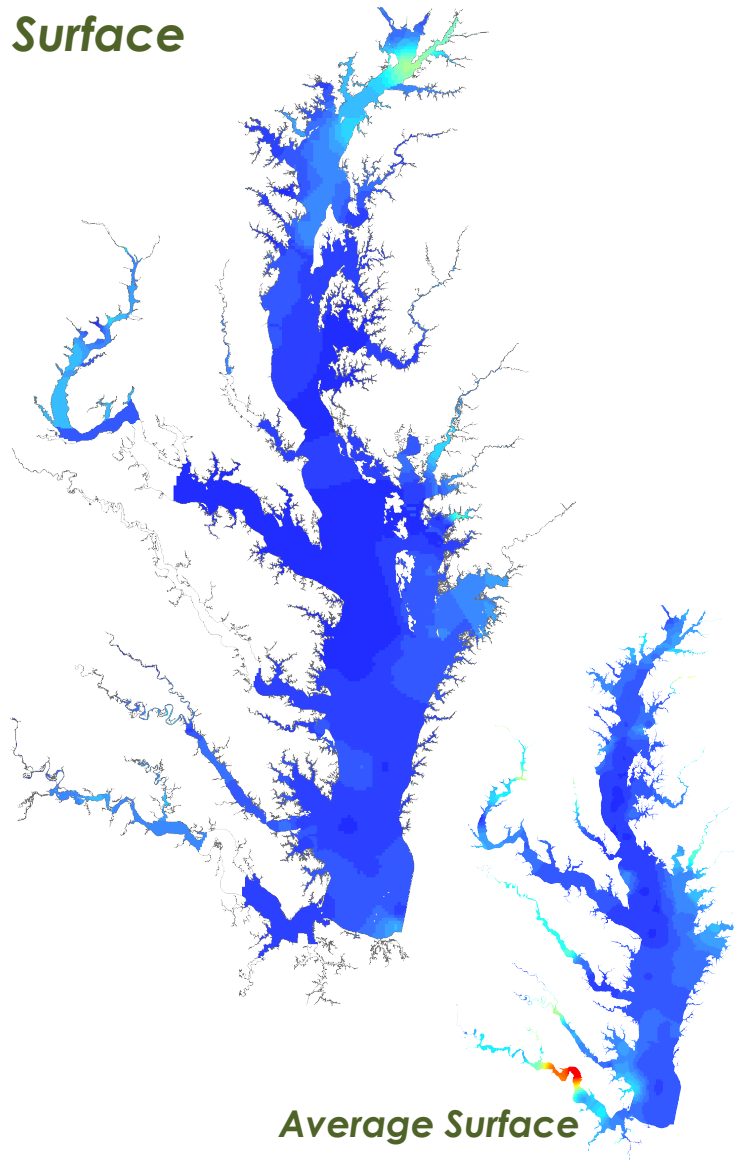


*Average Bottom*



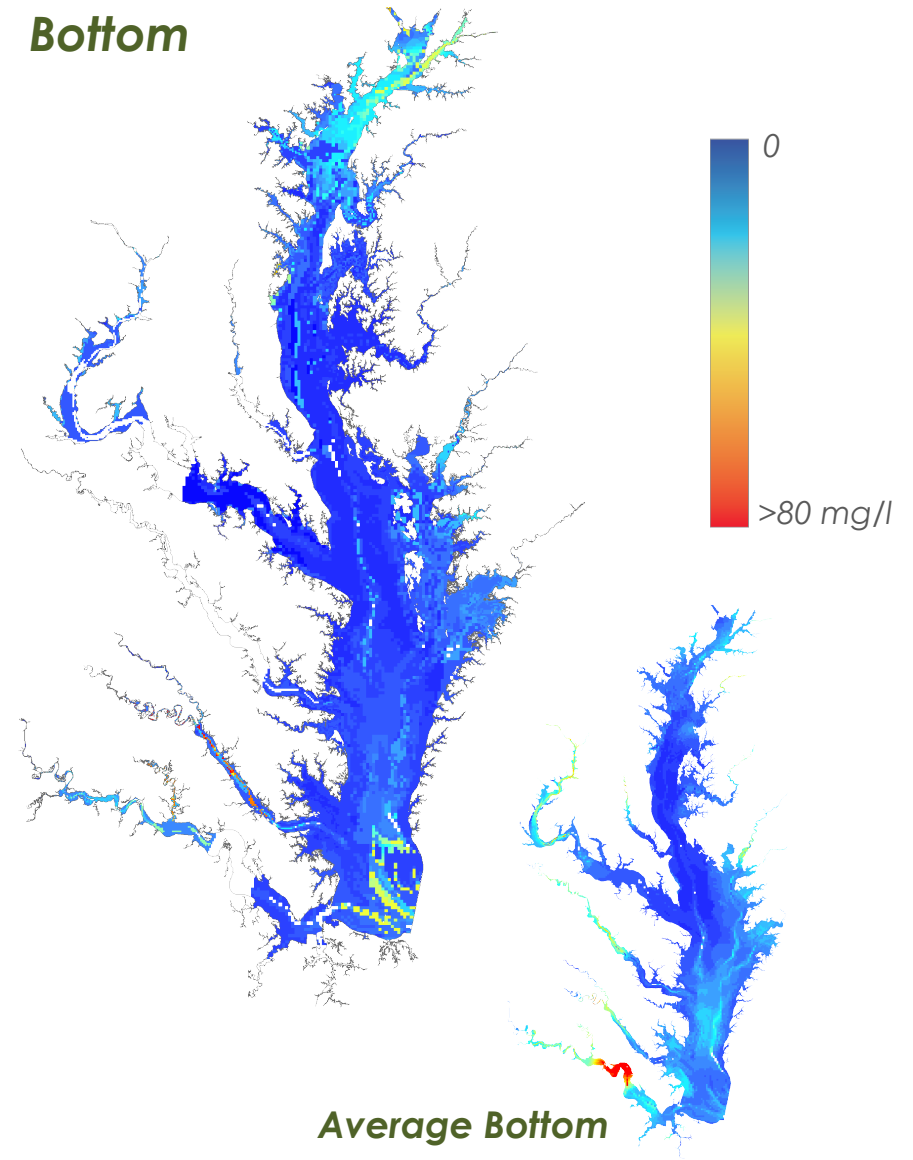
# TSS – Late September

*Surface*

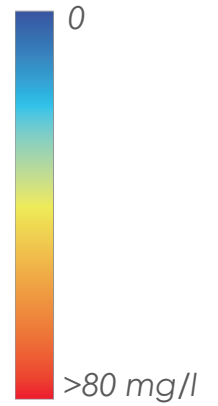


*Average Surface*

*Bottom*

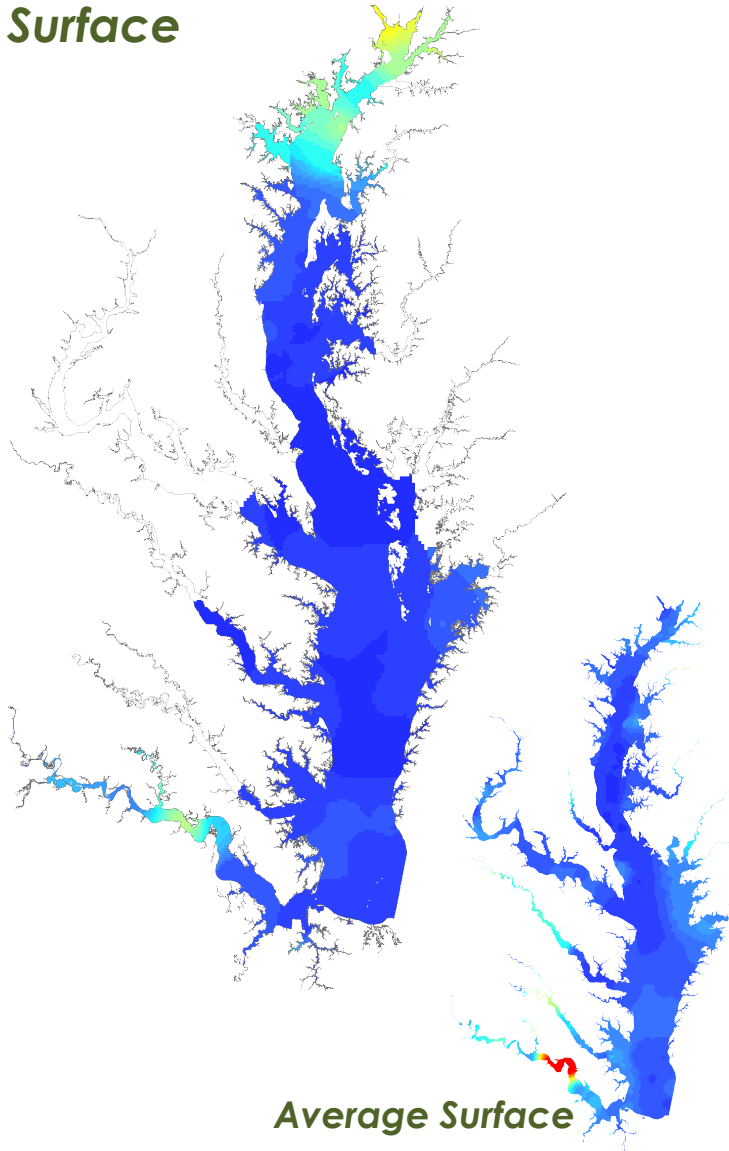


*Average Bottom*



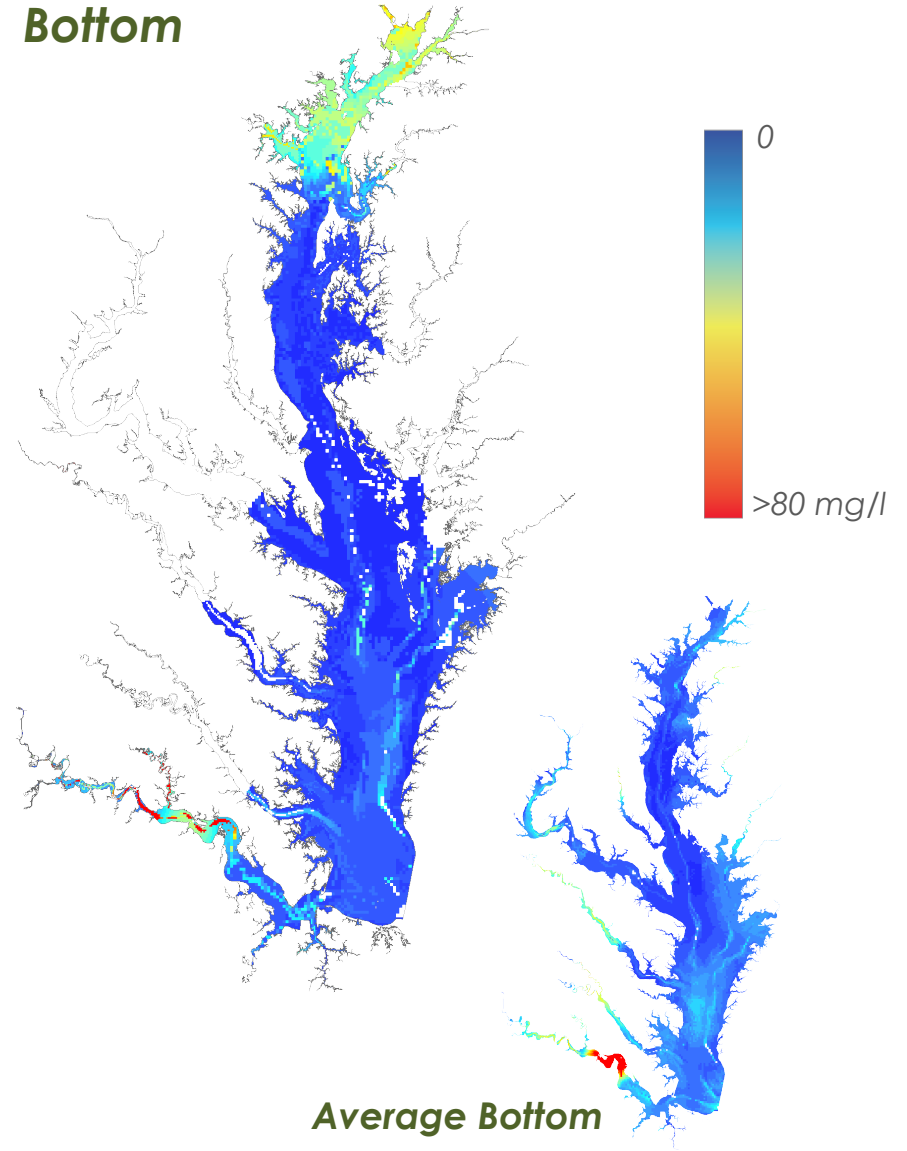
# TSS – Early October

*Surface*



*Average Surface*

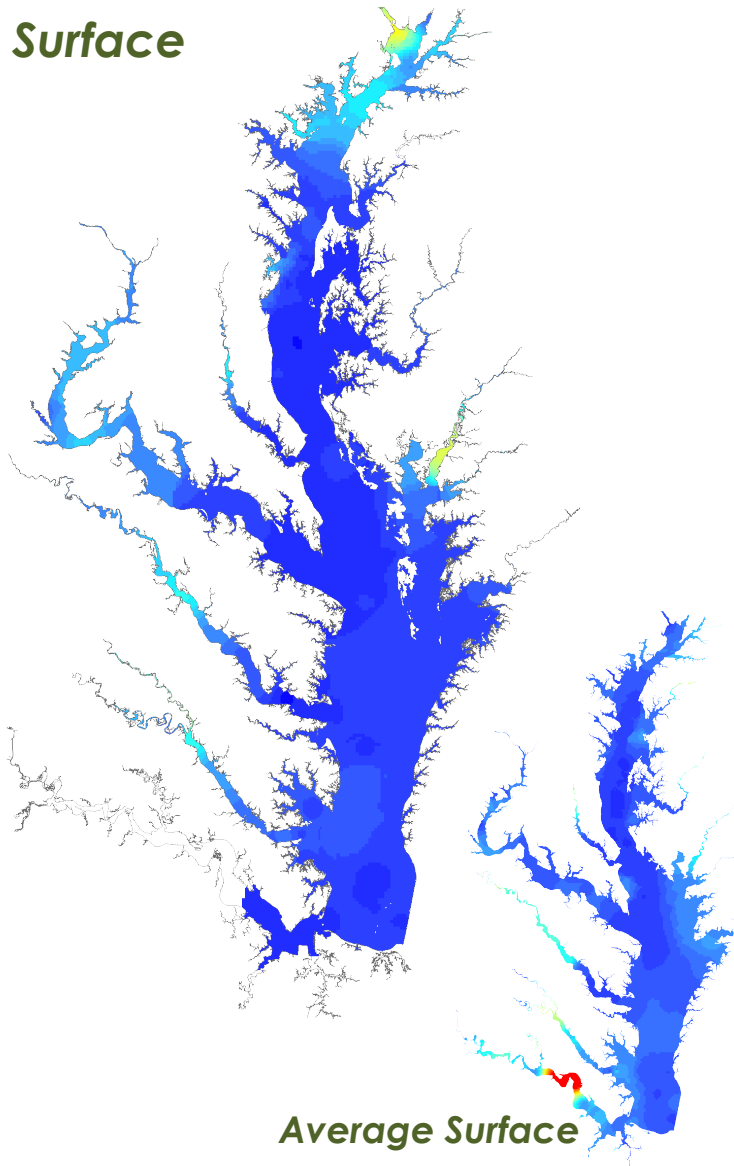
*Bottom*



*Average Bottom*

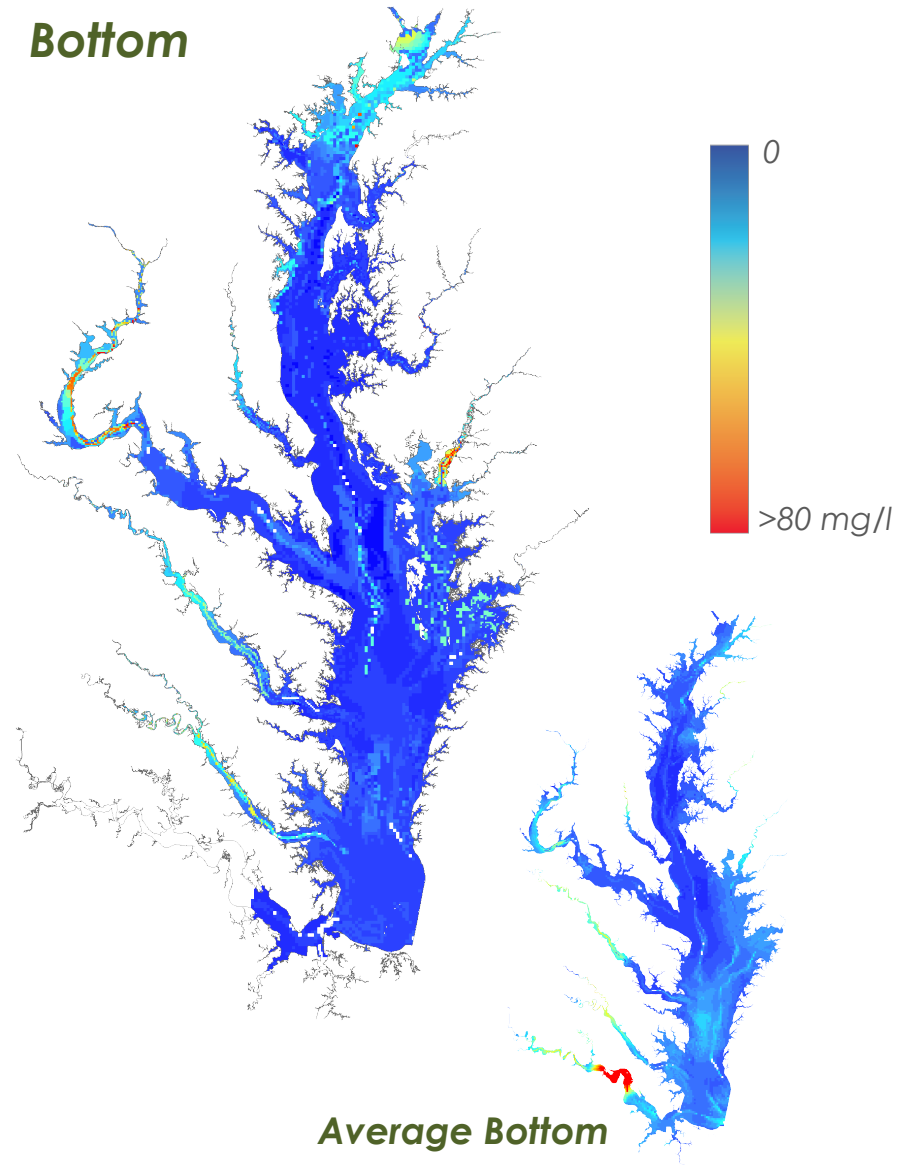
# TSS – Late October

*Surface*

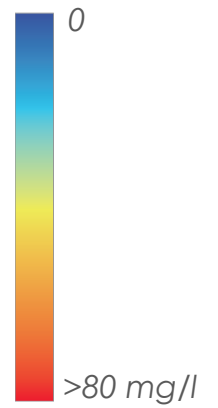


*Average Surface*

*Bottom*

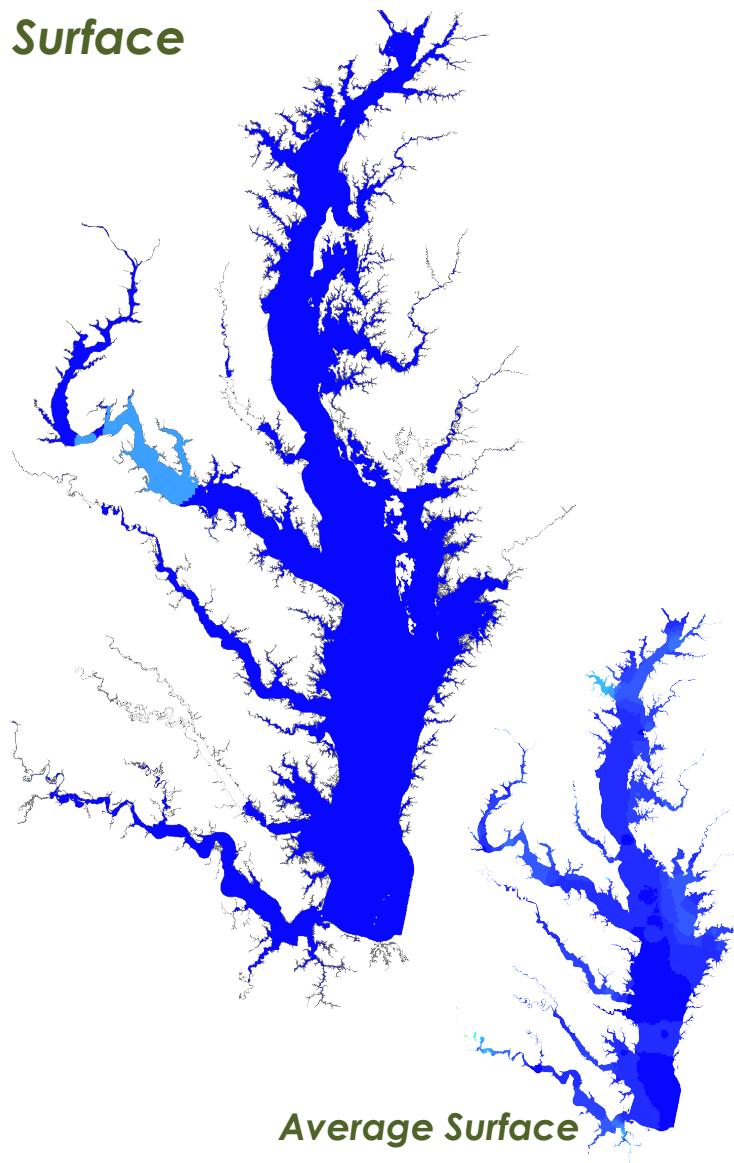


*Average Bottom*



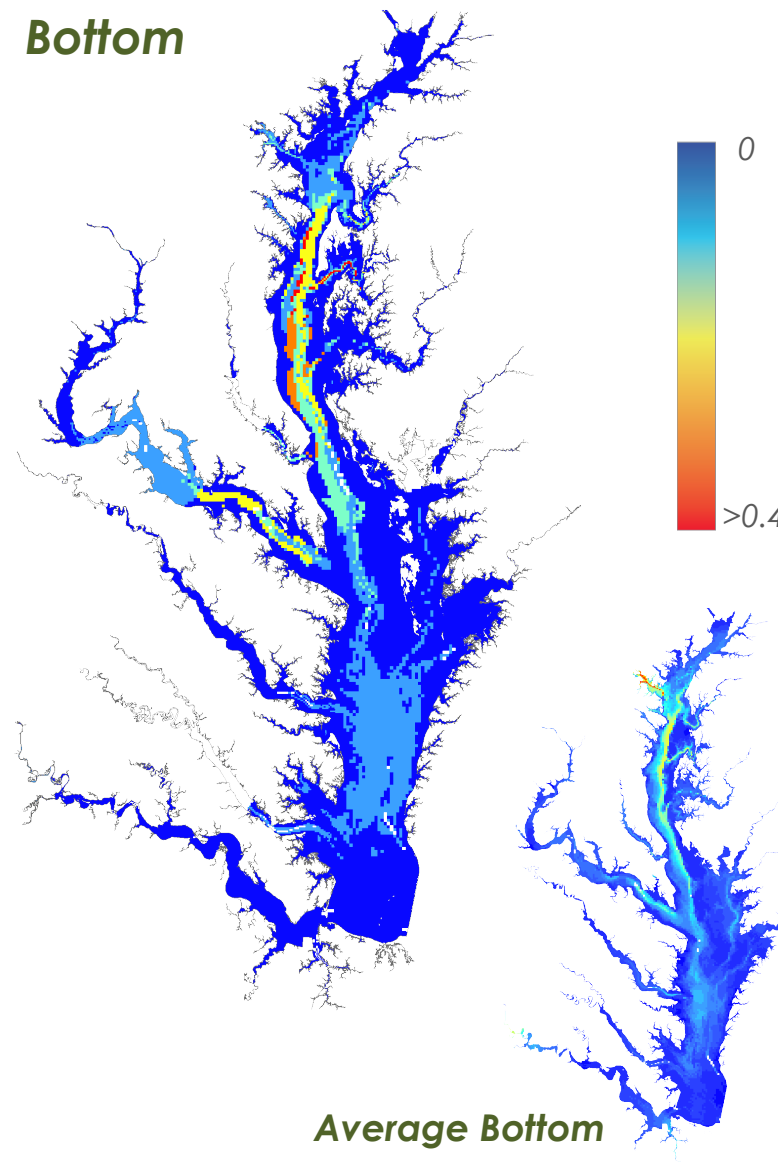
# NH<sub>4</sub> – Early August

*Surface*

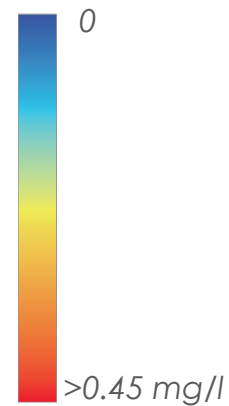


*Average Surface*

*Bottom*

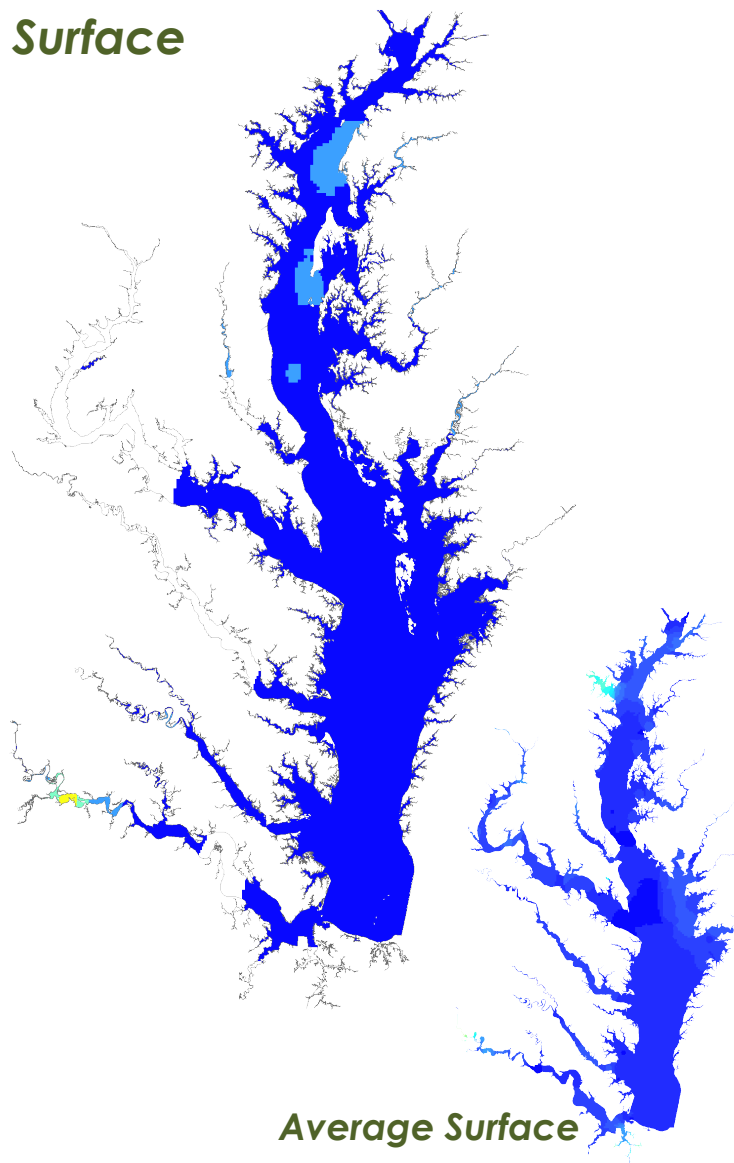


*Average Bottom*

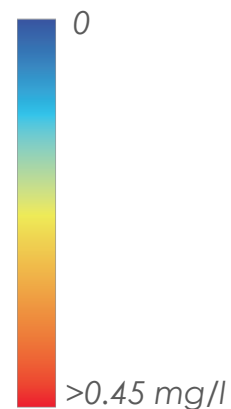
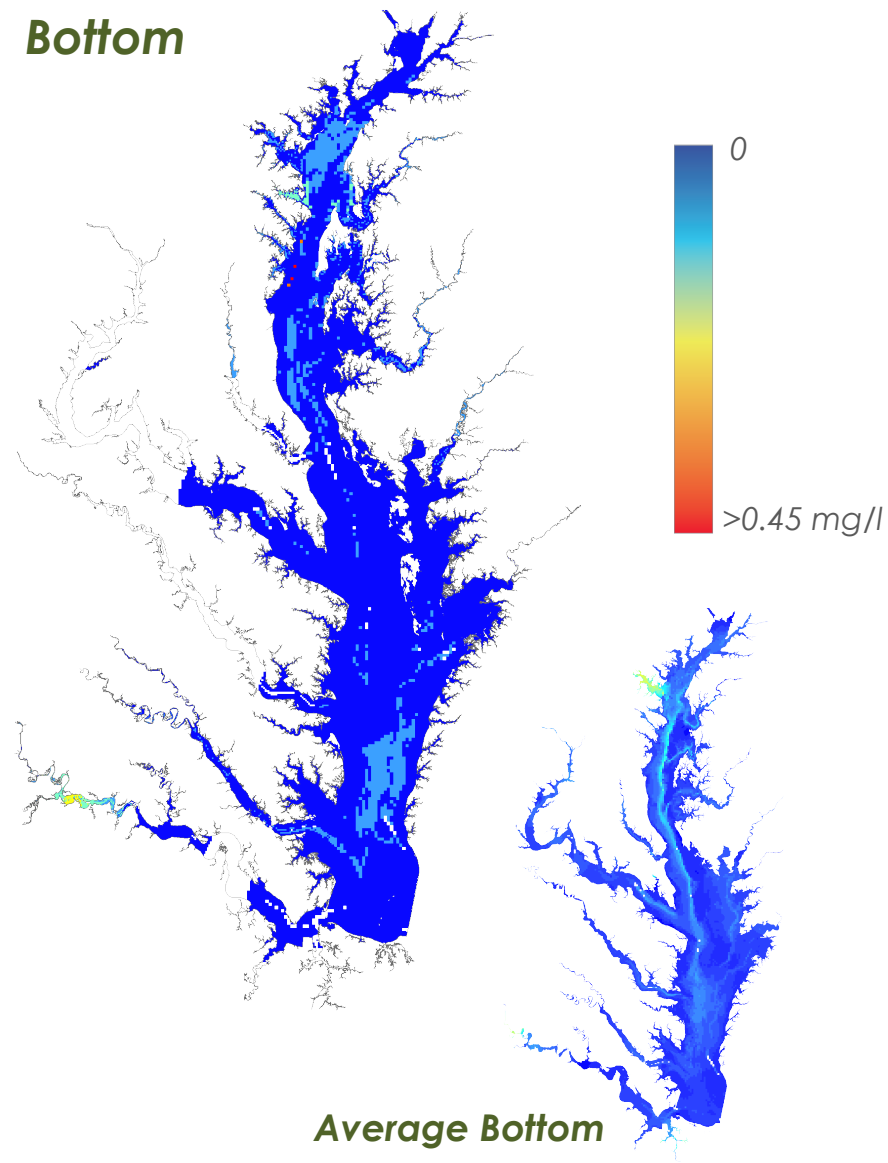


# NH<sub>4</sub> – Late September

*Surface*



*Bottom*

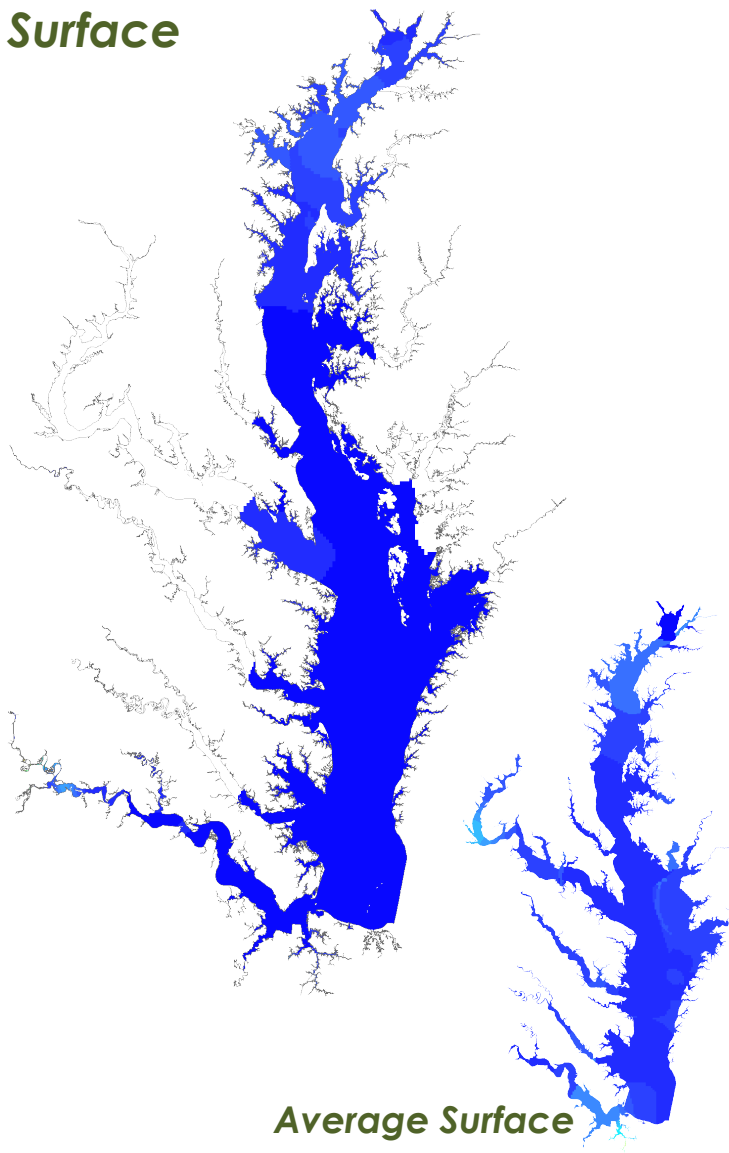


*Average Surface*

*Average Bottom*

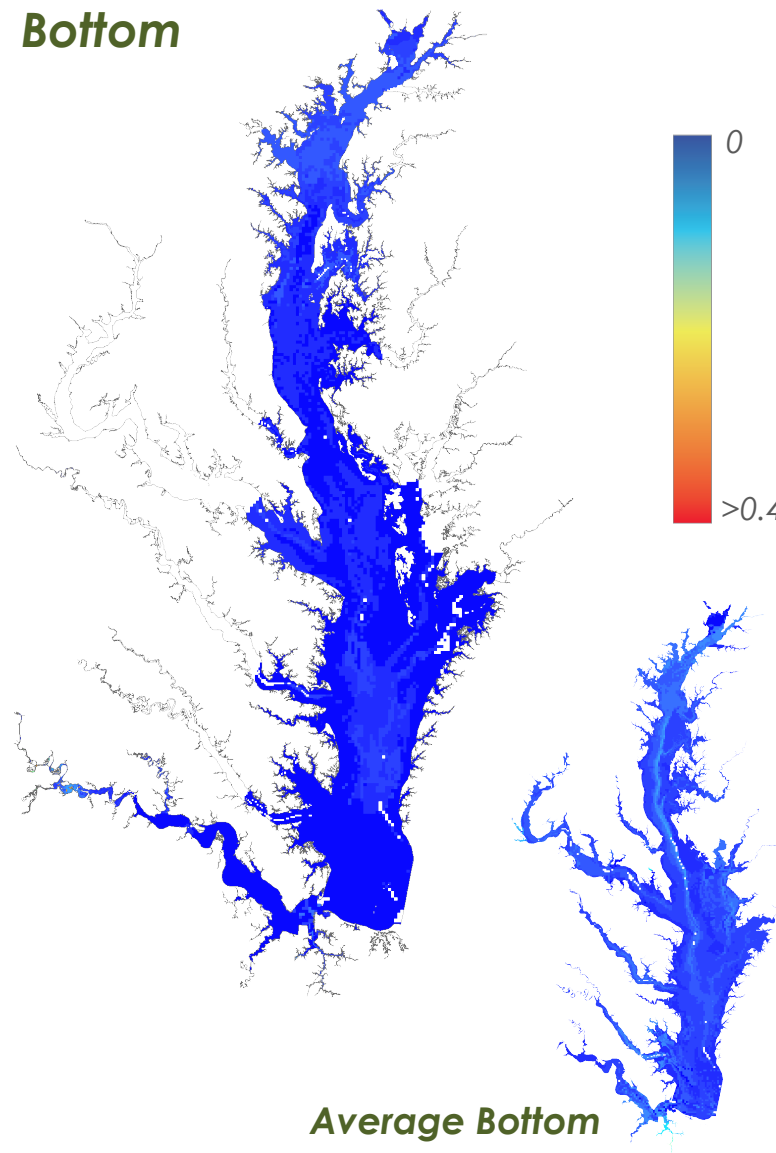
# NH<sub>4</sub> – Early October

*Surface*

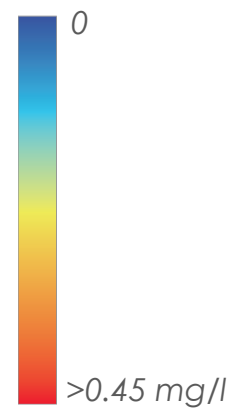


*Average Surface*

*Bottom*

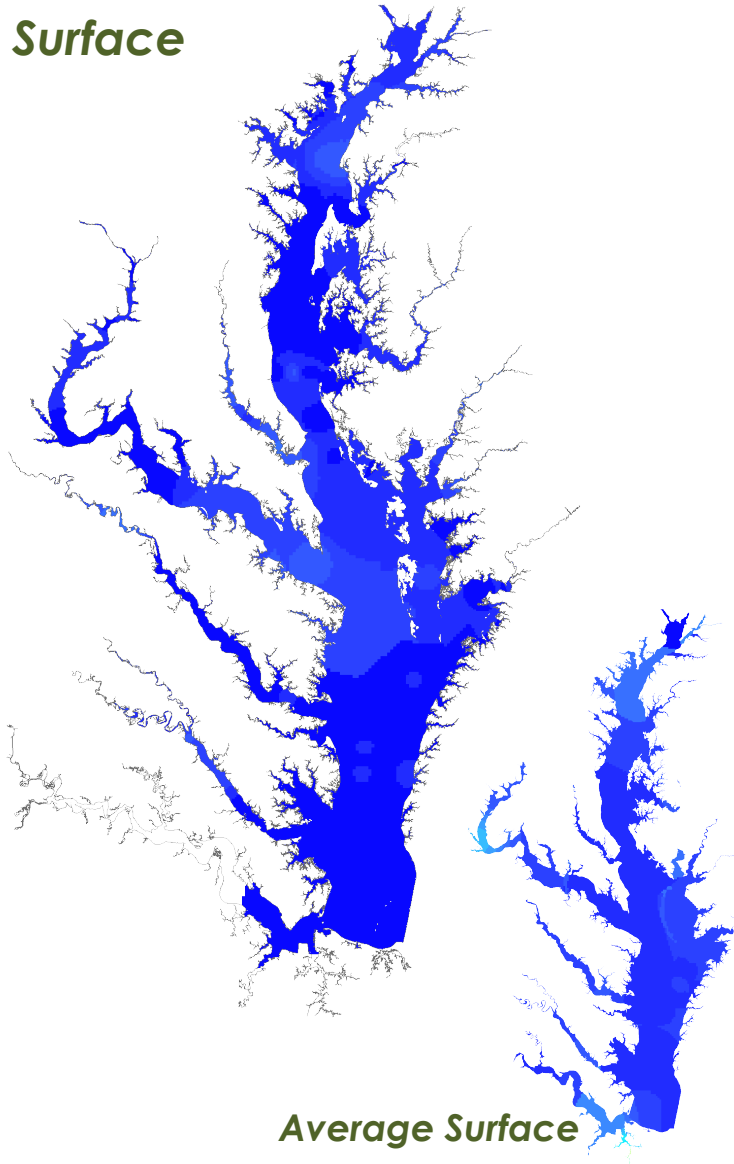


*Average Bottom*



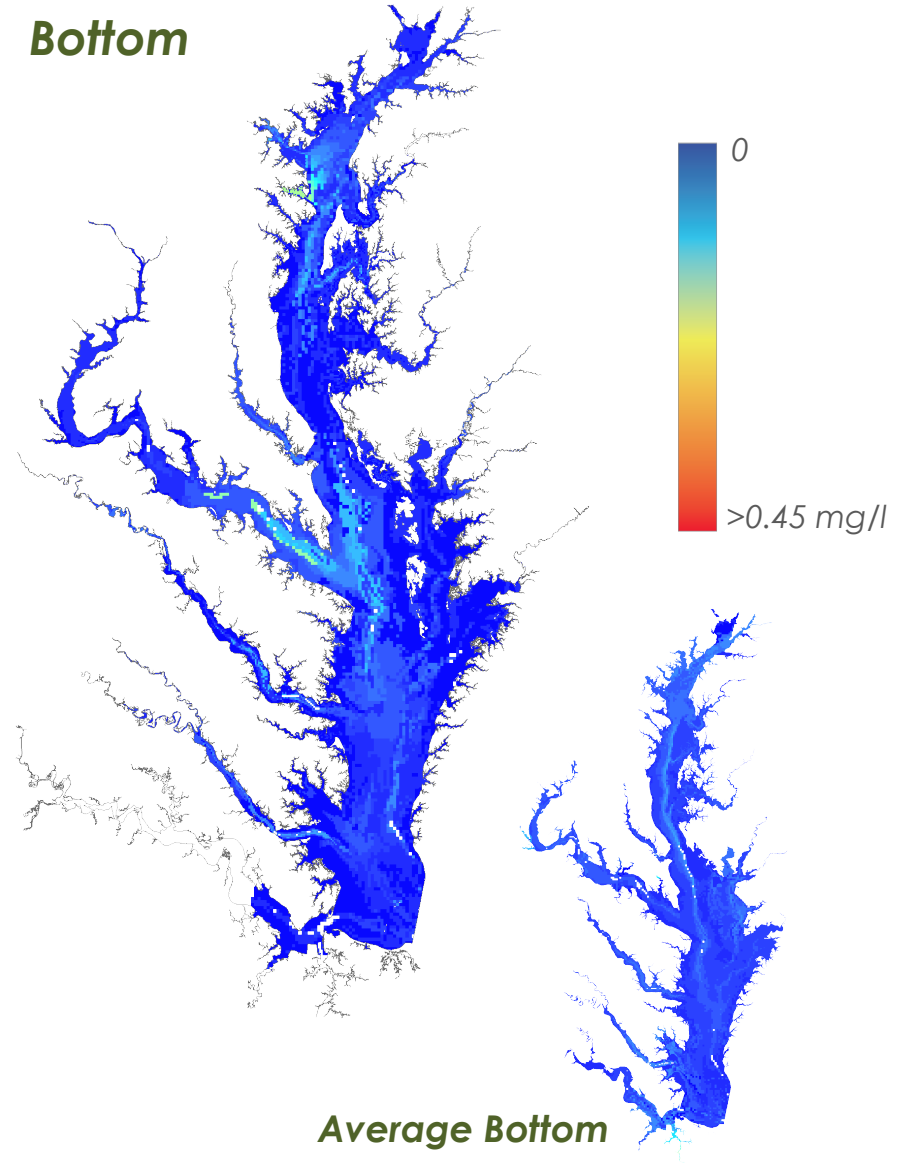
# NH<sub>4</sub> – Late October

*Surface*



*Average Surface*

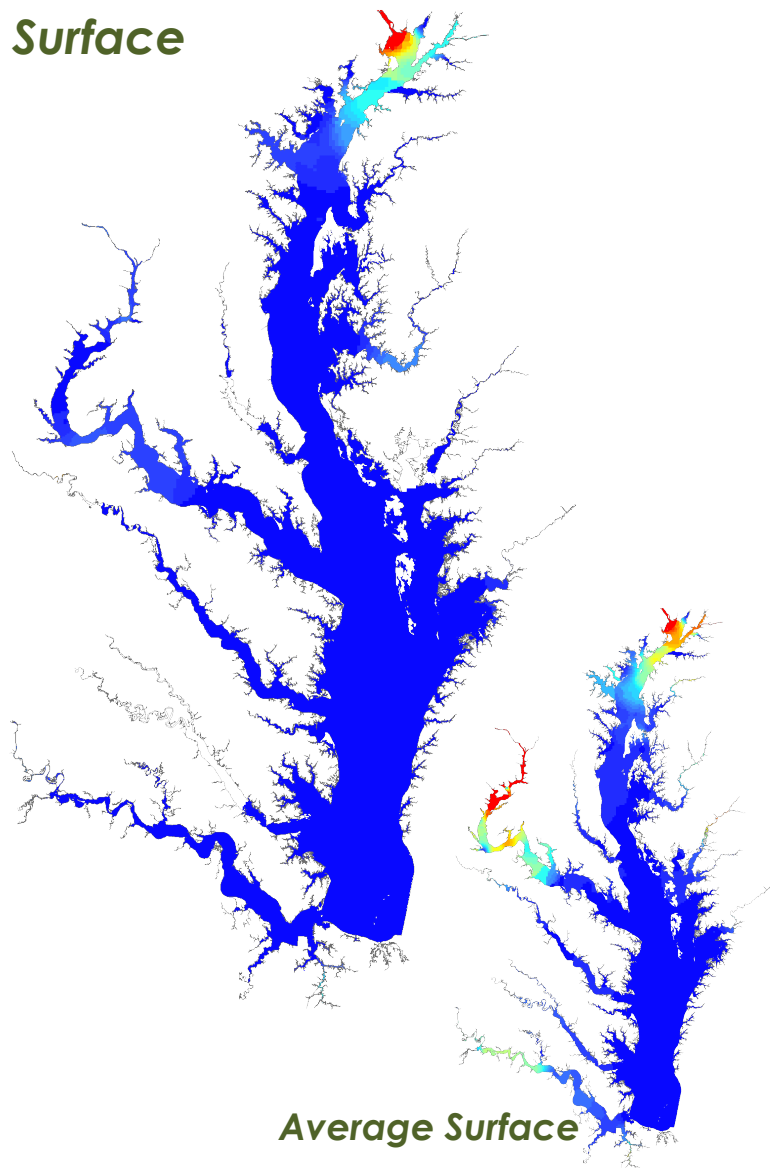
*Bottom*



*Average Bottom*

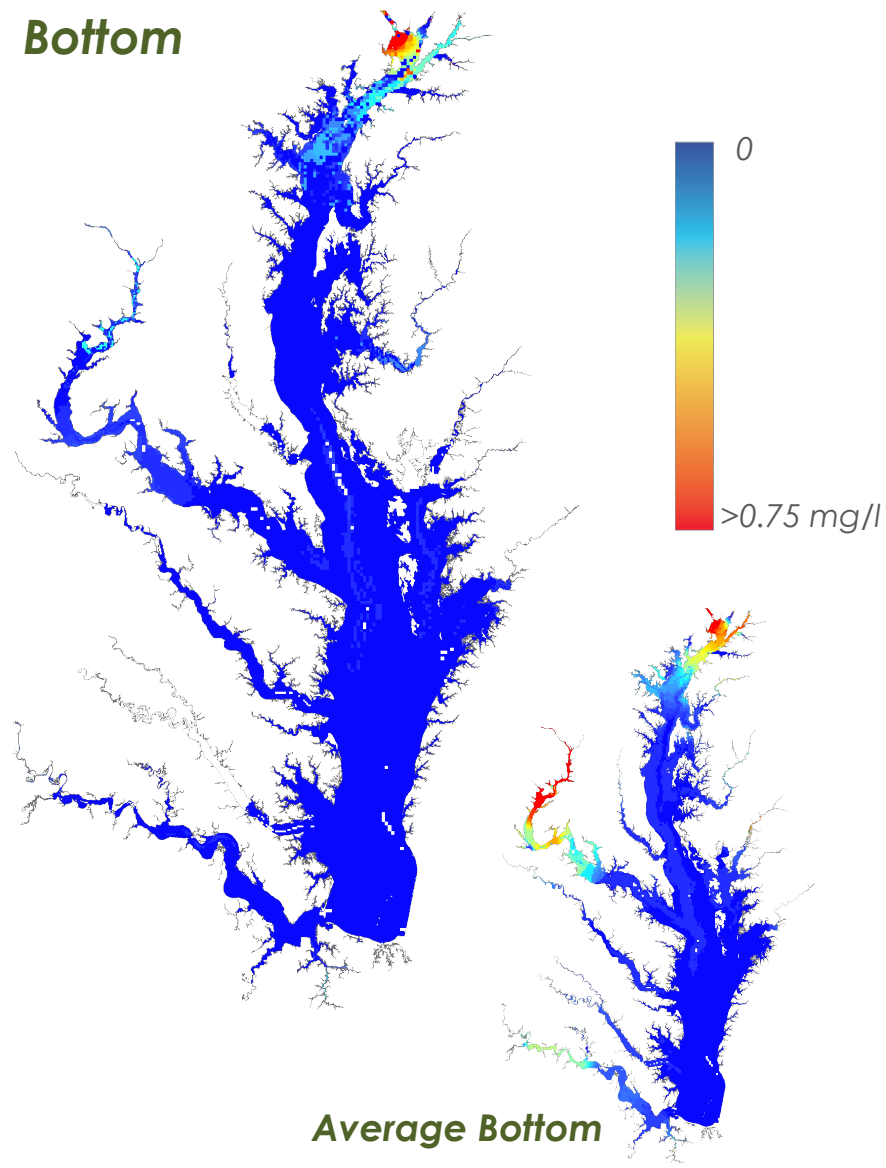
# $\text{NO}_{2+3}$ – Early August

*Surface*



*Average Surface*

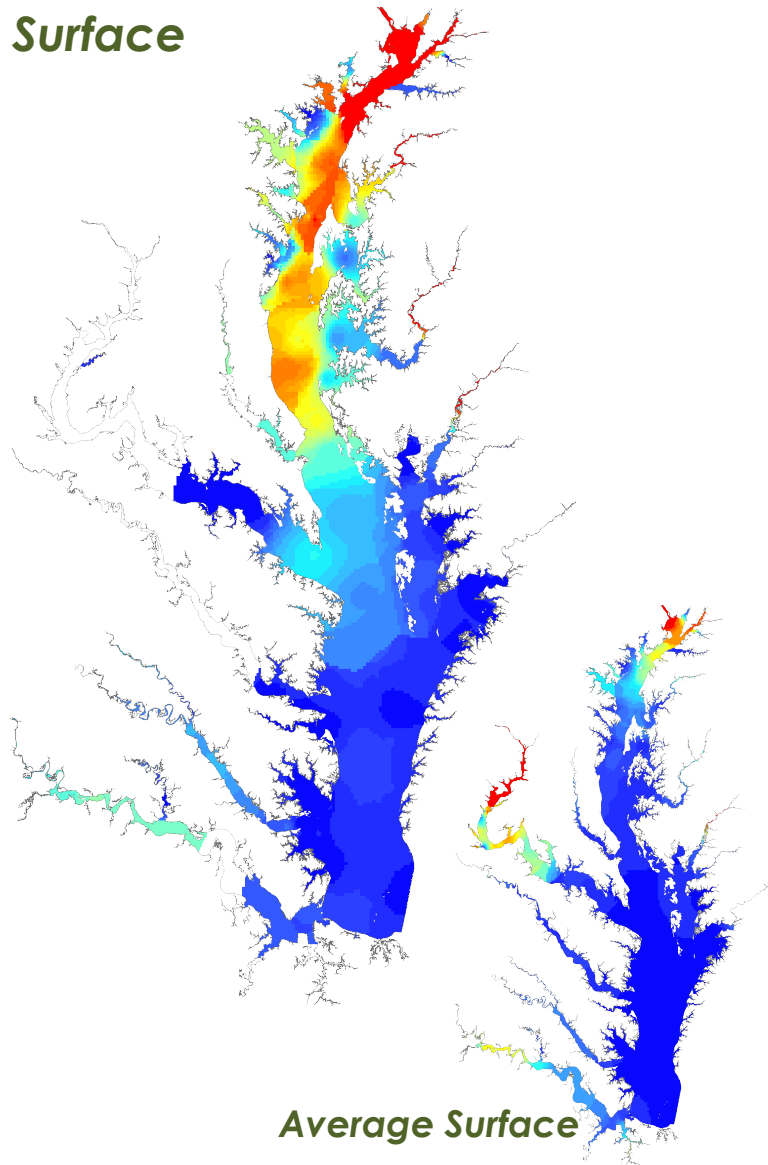
*Bottom*



*Average Bottom*

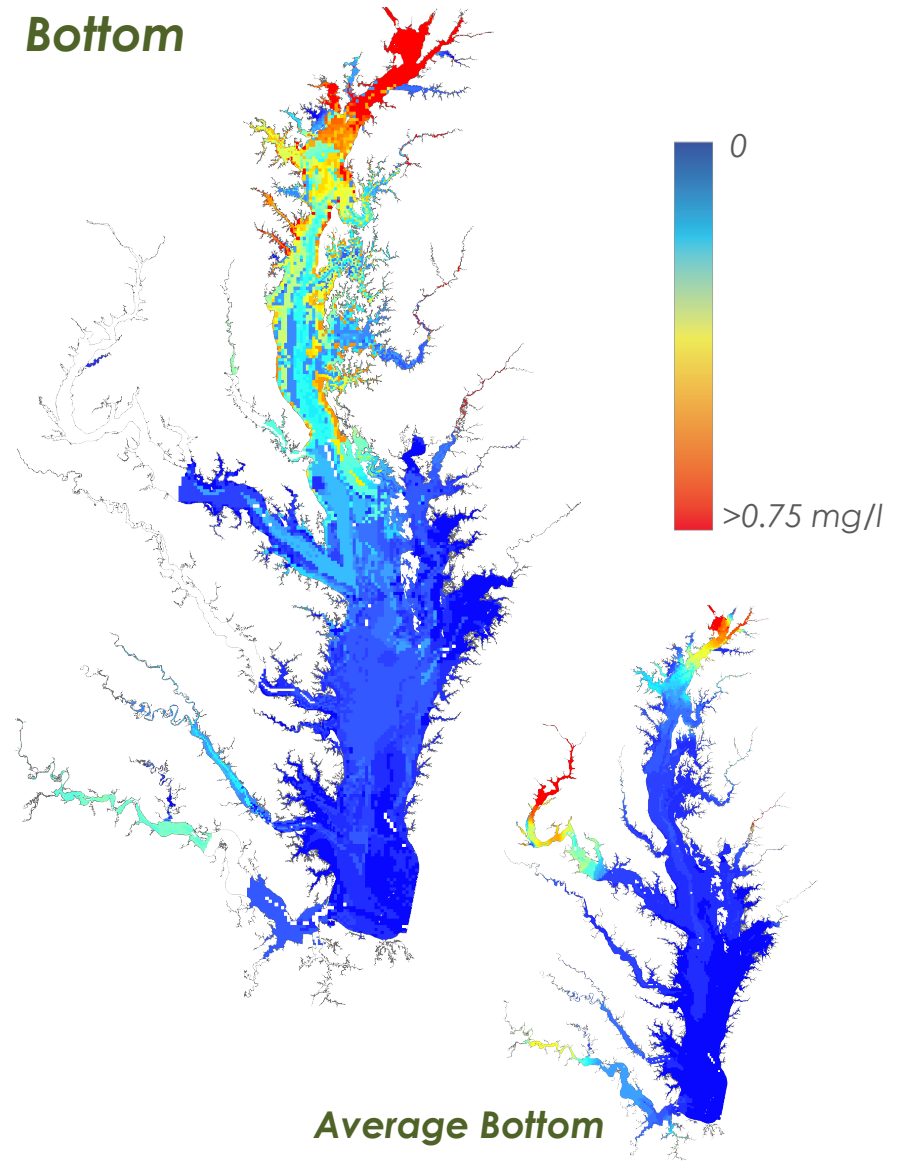
# $\text{NO}_{2+3}$ – Late September

*Surface*



*Average Surface*

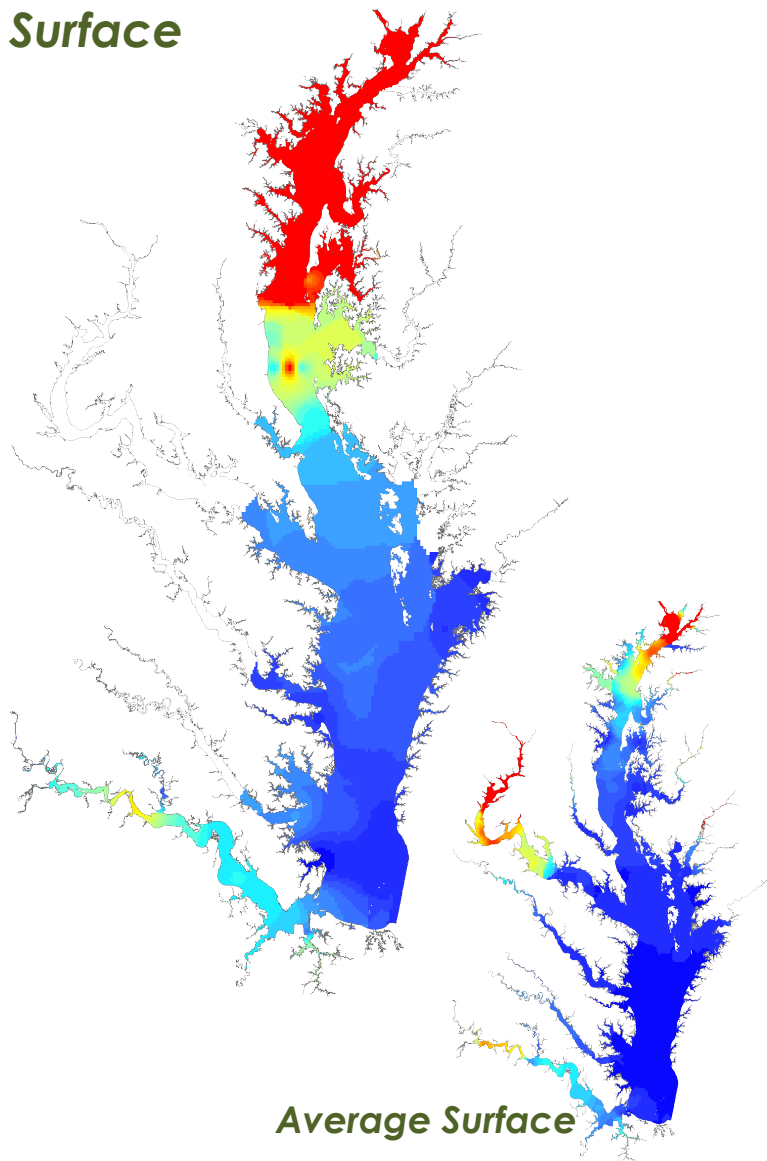
*Bottom*



*Average Bottom*

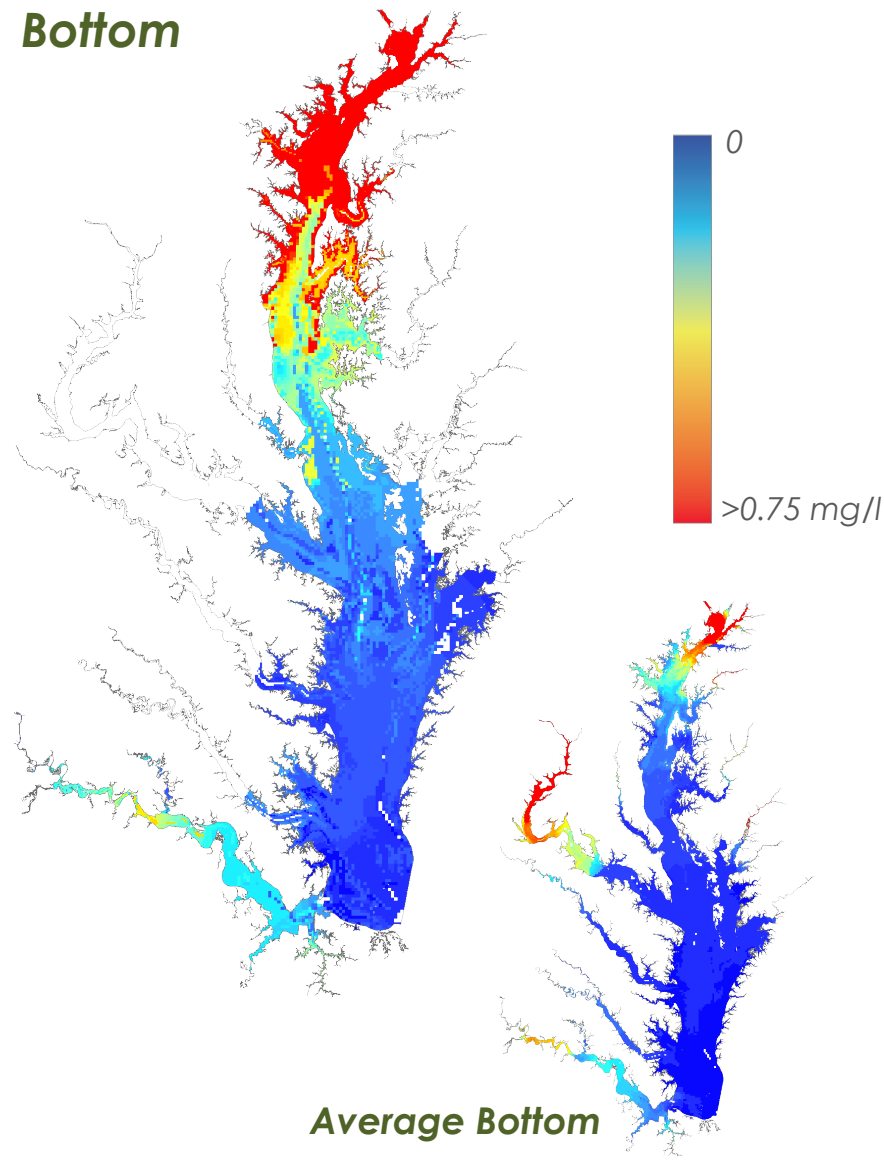
# $\text{NO}_{2+3}$ – Early October

*Surface*



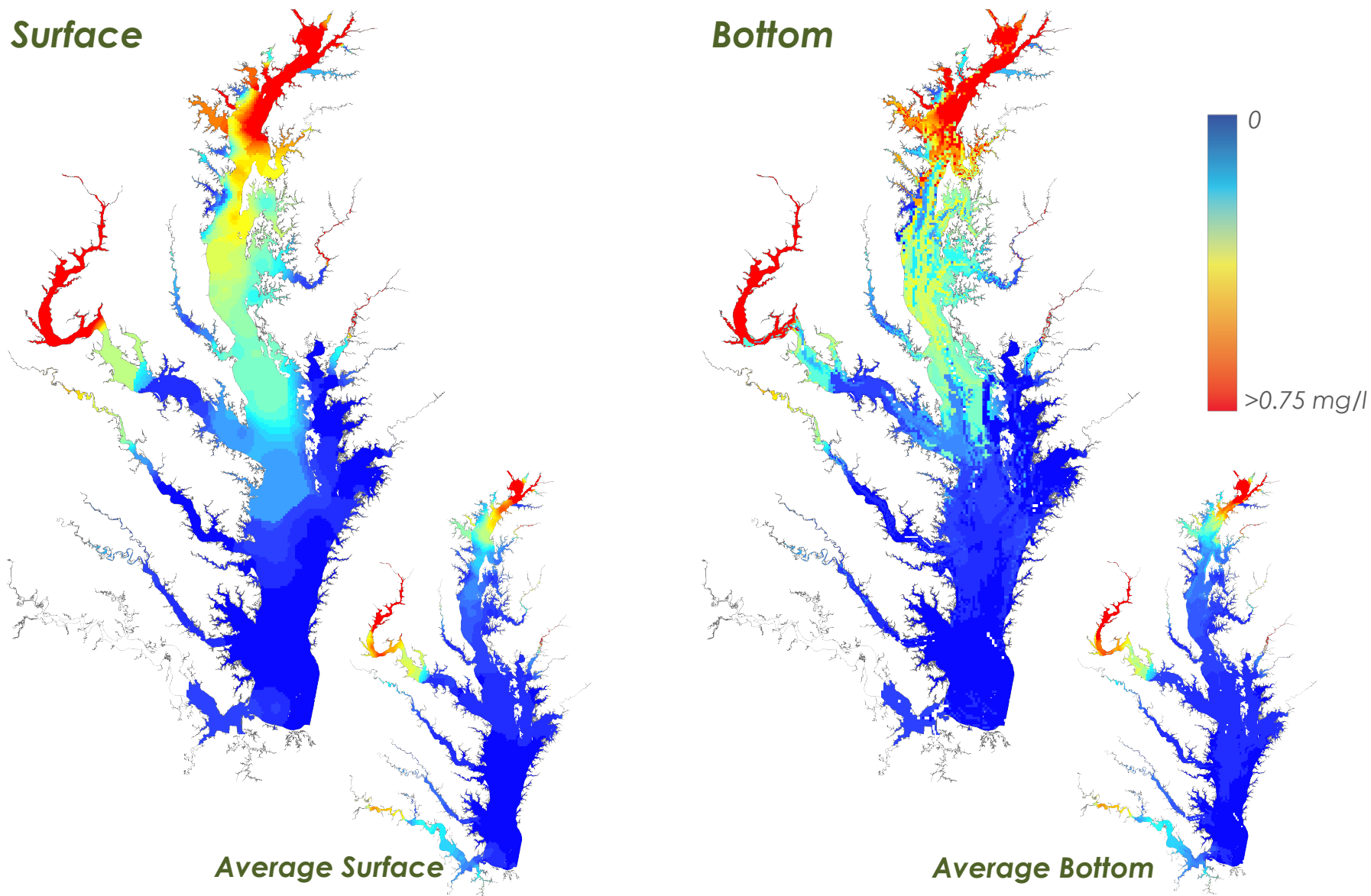
*Average Surface*

*Bottom*



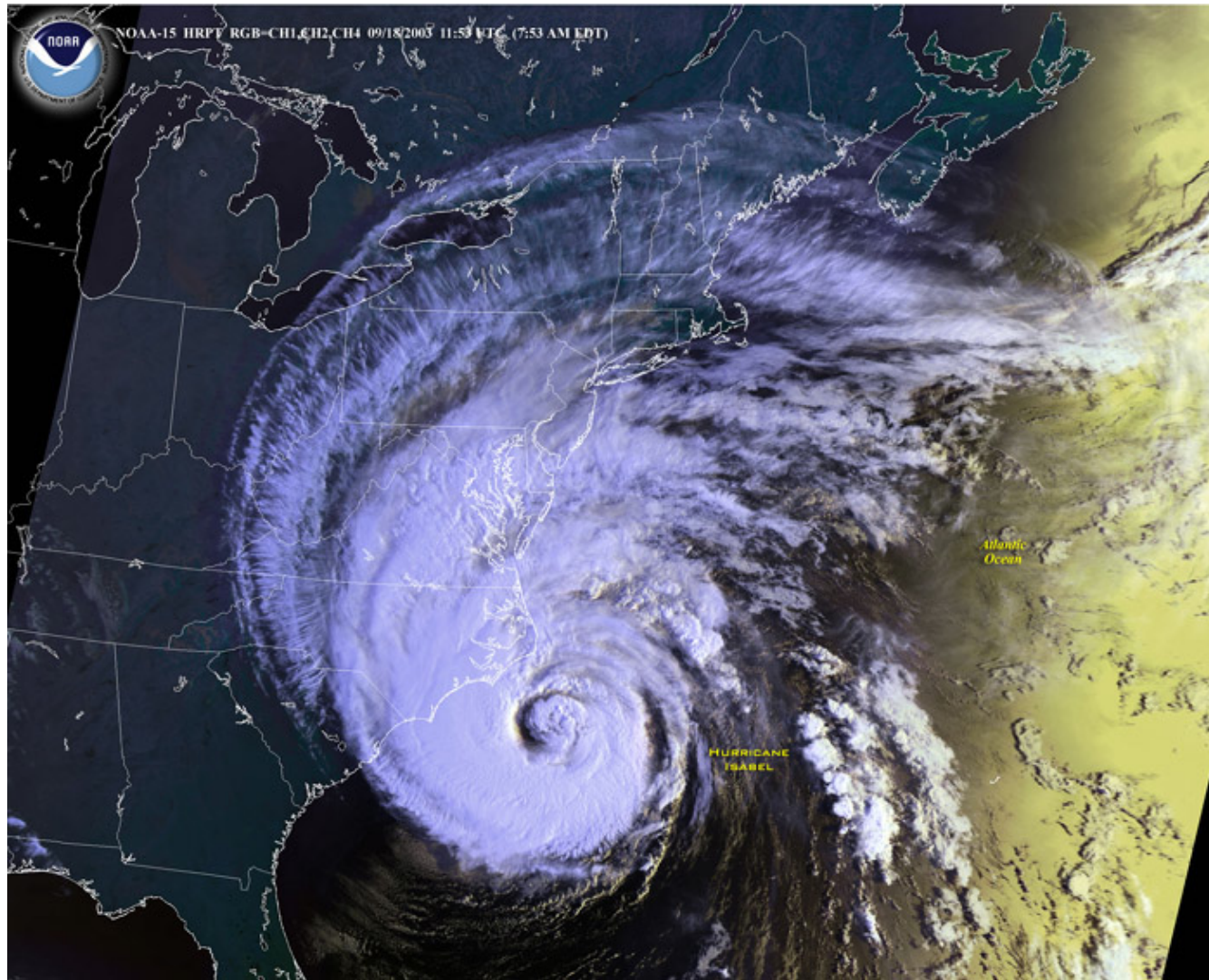
*Average Bottom*

# NO<sub>2+3</sub> – Late October

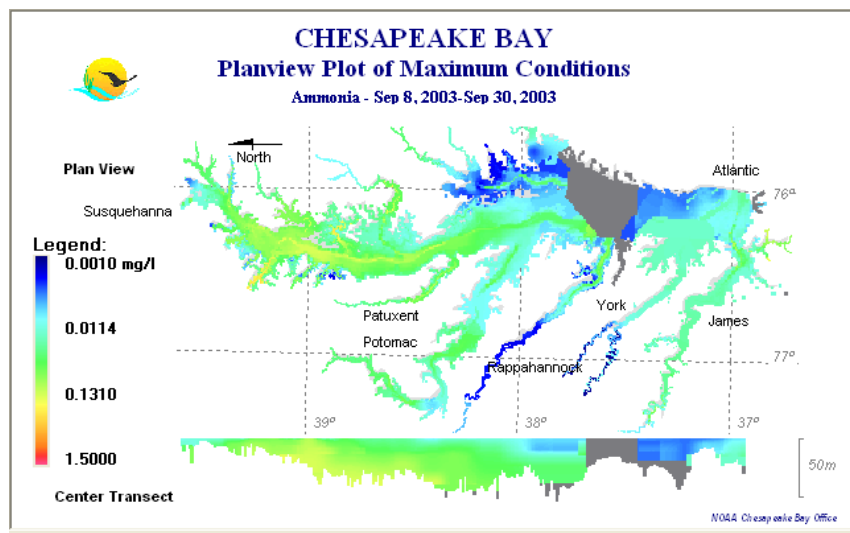




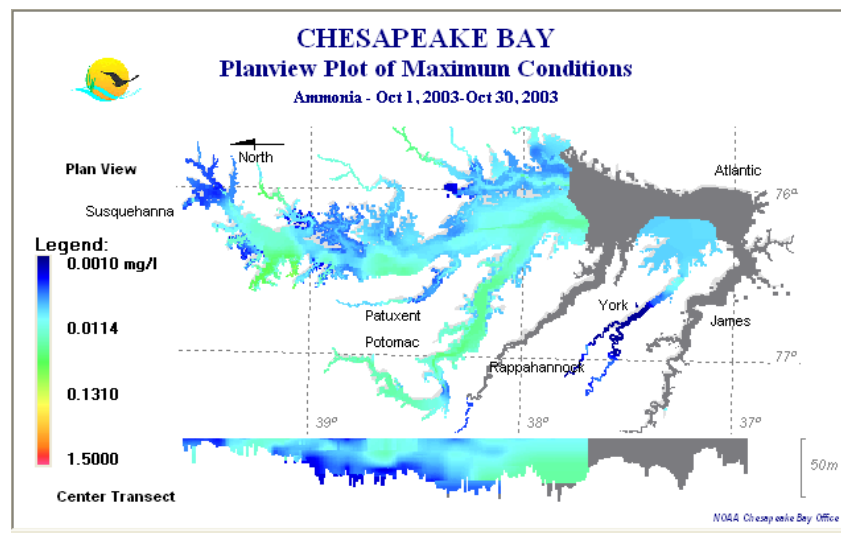
# Hurricane Isabelle – 9/18/2003



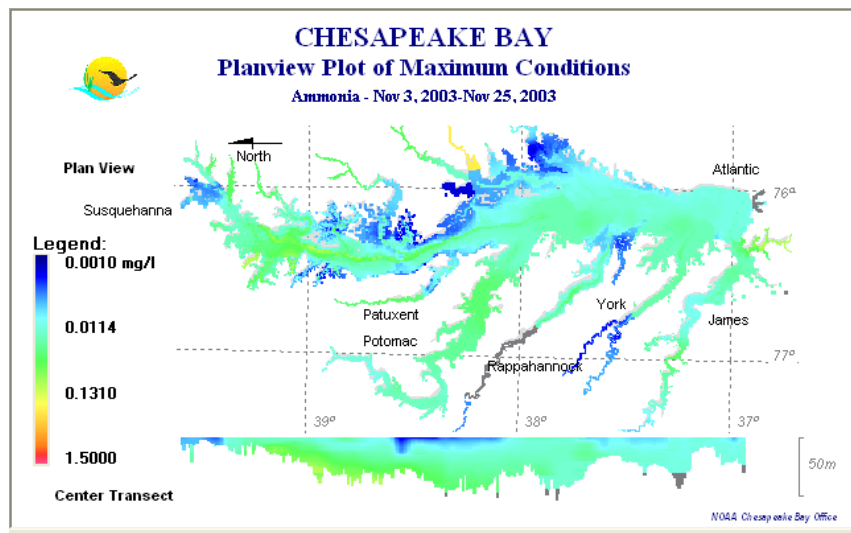
# NH4



September

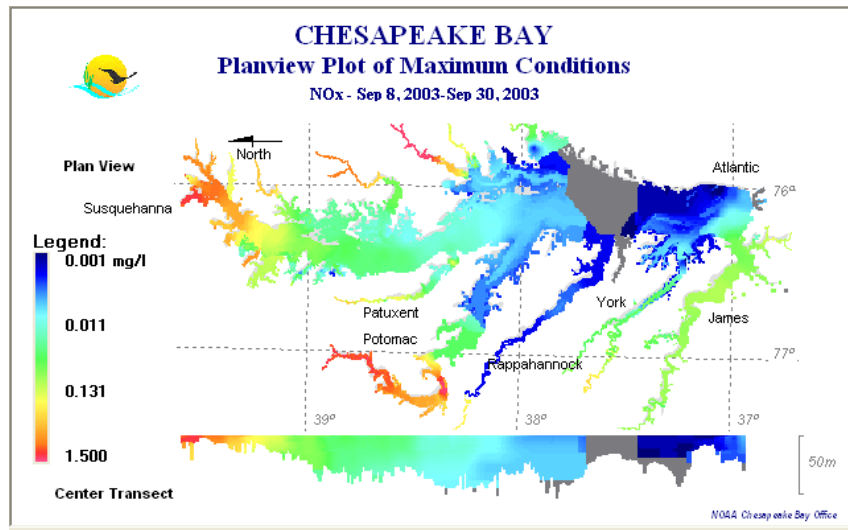


October

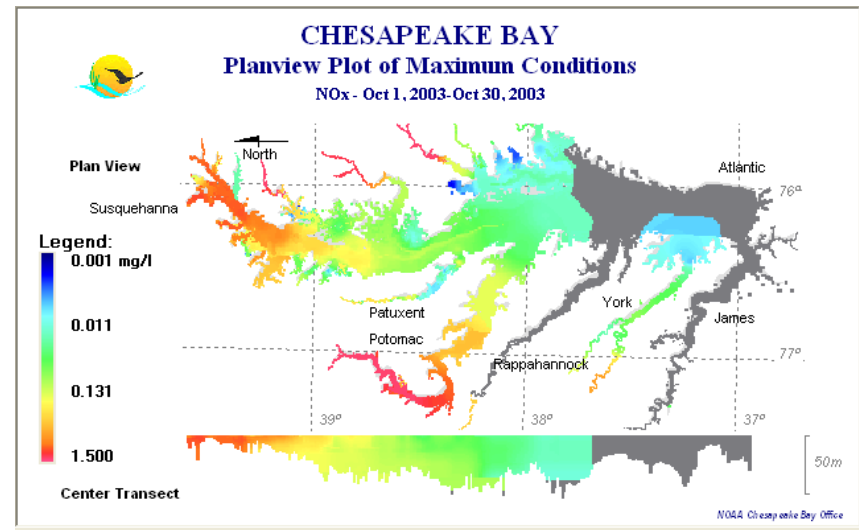


November

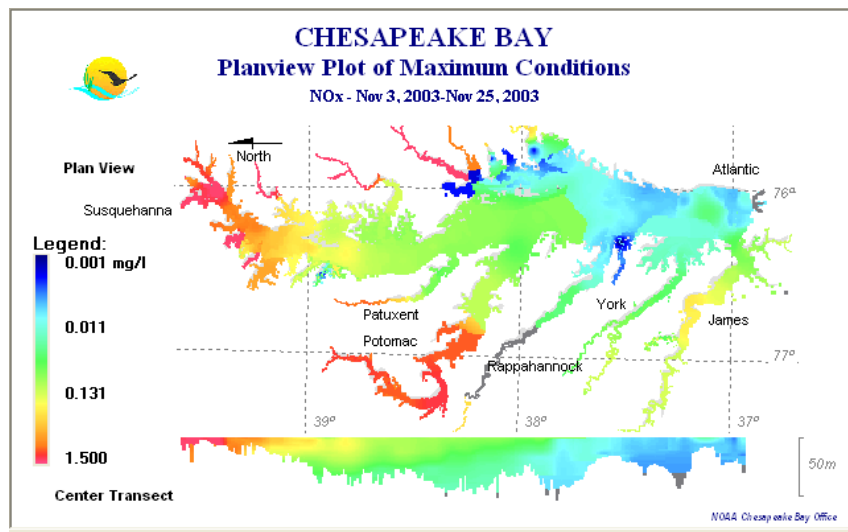
# NO<sub>x</sub>



September

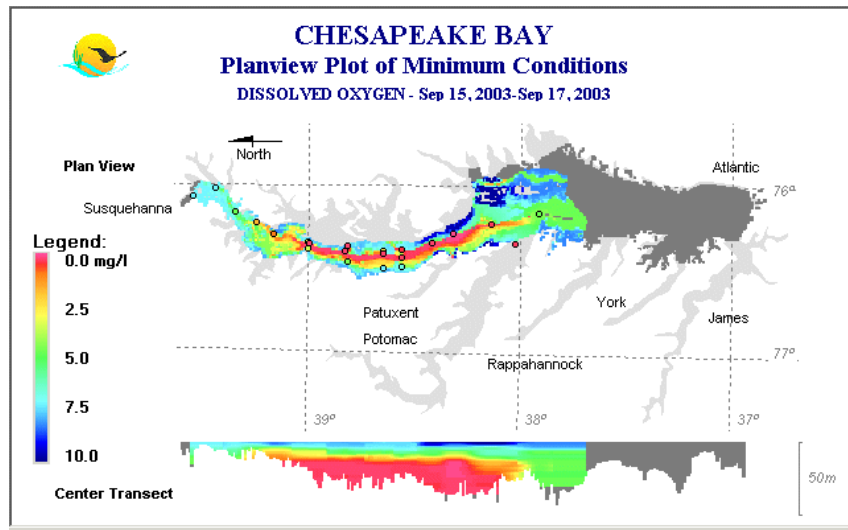


October

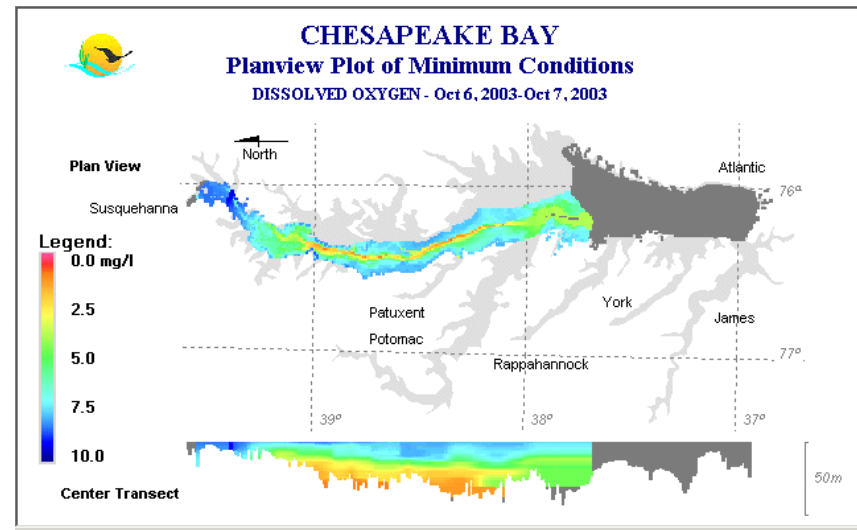


November

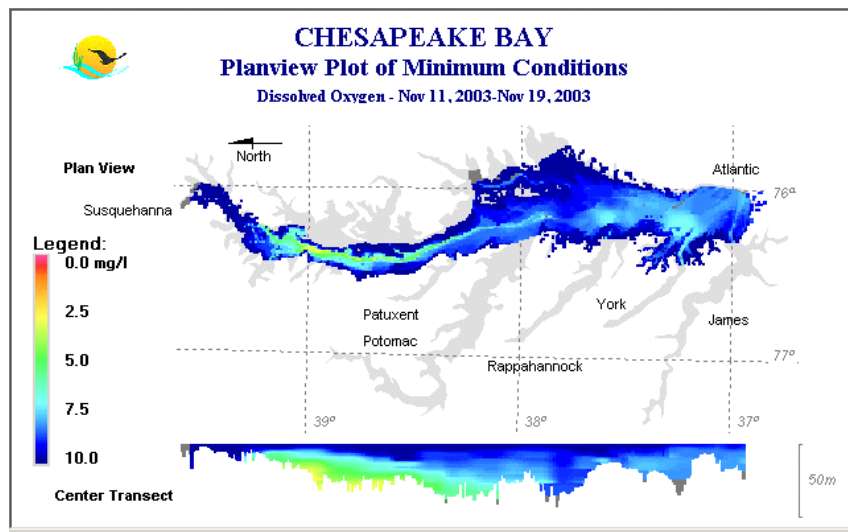
# DO – will we see low DO this January?



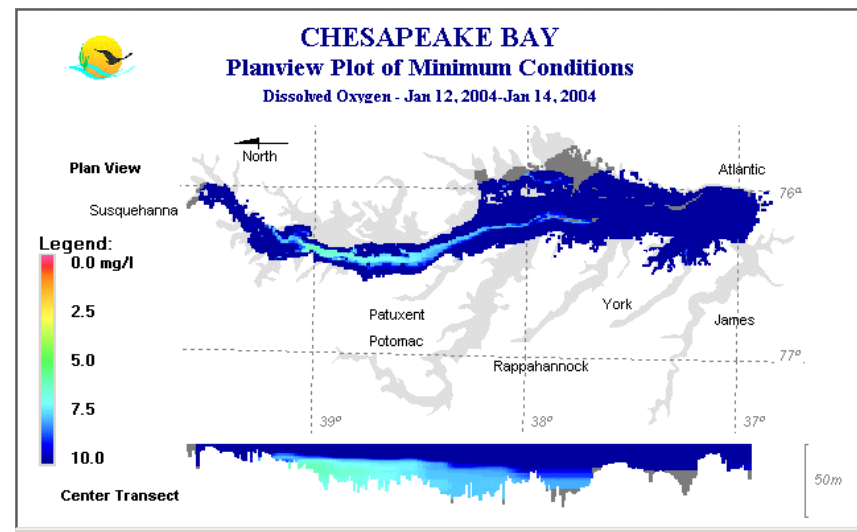
September 2003



October 2003



November 2003



January 2004