State of the Bays 2014
5 year assessment through 2009-2014
Previous Bay assessments

**Boyton et al reports**
- Previous report Boyton and Bohlen data through 90’s-96
- Prior 1993 boyton MDE report Assessment of MD Coastal Bays aquatic ecosystem, nutrient loads and management options.

**2004 Ecosystem health**
- Data through 2003
- First report since CCMP tracking.
- Companion public document

**2009 Shifting Sands**
- Data through 2006
- Went beyond water quality
- Technical/public combined into one book
2014 State of the Bays

• Technical report by DNR focused on aquatic resources
  – actually cover 7 years data 2007-2013
  – Available via the DNR coastal bays page
  – Three year assessments: 07-09 &10-12
  – Release winter 2014

• MCBP will draft technical report for terrestrial monitoring

• $$ UMD to make a public summary?
Chapters similar to 2004 report

• Stream Health
• Water Quality
• Sediment contamination
• Habitat
• Harmful Algae
• Living Resources
• Ecosystem Health Index
Stream Health

• Benthic trends (DNR)
• Stream nitrate (MBSS, MCBP, DNR)
• Benthic IBI (MBSS and Streamwaders)
• Fish IBI (MBSS)
Stream Health

LEAD: DNR Ellen Friedman
Stream Health - MBSS

MBSS - BIBI Scores (2001, 2009)
N = 13 random
(4 in 2009)

MBSS - FIBI Scores (2001, 2009)

LEAD: DNR Dan Boward
Stream Health - Streamwaders

Stream Waders

Mean BIBI Score

Year

1
2
3
4
5

good

fair

poor

Streamwaders 09, 11, 12

N = 52

LEAD: DNR Dan Boward

Stream Waders - Stream Health BIBI scores

N = 158

Previous sites

SW_2012 Events

BIBI_

Fair

Good

Poor
Stream Health – stream nitrate

Stream Nitrate

NO3 (mg/l)

BNT0012
BOB0001
BSH0030
GET0005
KIT0015
TRC0059

LEAD: DNR McCollough
Water Quality

- **Nutrients**
  - DNR, ASIS fixed sites

- **Chlorophyll**
  - DNR, ASIS fixed sites
  - Temporal

- **Dissolved Oxygen**
  - DNR, ASIS fixed sites
  - Temporal

- **Benthic Chlorophyll**
  - National coastal assessment (2010)

- **Water Quality Index**
Water Quality - nutrients

Median total nitrogen, 2010–2012
Annual (Jan–Dec)

- TN
- mg L⁻¹

- < 0.55
- 0.56–0.65
- 0.65–1.00
- 1.00–1.50
- 1.50–2.00
- > 2.00

Median total phosphorus, 2010–2012
Annual (Jan–Dec)

- TP
- mg L⁻¹

- < 0.025
- 0.026–0.037
- 0.037–0.043
- 0.043–0.100
- 0.100–0.150
- > 0.150

LEAD: DNR McCollough/ Wazniak
Water Quality - algae

Median chlorophyll a, 2010–2012
Seagrass growing season (Mar–Nov)

μg L⁻¹

- < 7.5
- 7.5–15
- 15–30
- 30–50
- 50–75
- > 75

LEAD: DNR McCollough/ Wazniak
### Phytoplankton Abundance

**CONMON**

**Frequency of Threshold Failure**

<table>
<thead>
<tr>
<th>Table 4.2.2</th>
<th>March - November</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site</strong></td>
<td><strong>Indicator</strong></td>
</tr>
<tr>
<td>Bishopville Prong</td>
<td>CHLa &gt;50</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;30</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;15</td>
</tr>
<tr>
<td>Public Landing</td>
<td>CHLa &gt;50</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;30</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;15</td>
</tr>
<tr>
<td>Grey's Creek</td>
<td>CHLa &gt;50</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;30</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;15</td>
</tr>
<tr>
<td>Newport Bay</td>
<td>CHLa &gt;50</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;30</td>
</tr>
<tr>
<td></td>
<td>CHLa &gt;15</td>
</tr>
</tbody>
</table>
Water Quality - benthic chl

- Average of 3 reps/site
- High levels of benthic production.
- Is it appropriate to use the water chl thresholds?

Legend:
- Sed chl (mg/m²)
  - 0.00 - 7.50
  - 7.51 - 15.00
  - 15.01 - 25.00
  - 25.01 - 50.00
  - 50.01 - 92.24

LEAD: DNR Wazniak
Sediment Contamination

National Coastal Assessment Data only
2006, 2010- limited sites in coastal bays
• Total organic carbon
• chemical contaminant
  – ERLs/ERM
• ambient toxicity
### Habitat – SAV WQI

#### Variable | Threshold value | Reference
--- | --- | ---
Chl a | \(< 15 \mu g L^{-1}\) | 1, 2
Dissolved inorganic nitrogen | \(< 0.15 \text{ mg L}^{-1} (11 \mu M)\) | 1, 2
Dissolved inorganic phosphorus | \(< 0.02 \text{ mg L}^{-1} (0.64 \mu M)\) | 1, 2
Total suspended solids | \(< 15 \text{ mg L}^{-1}\) | 1, 2
Secchi depth | \(> 0.96 \text{M} >40\% \text{ of the time}\) | 1, ??

Also working on an analysis of light attenuation Kd from PAR vs secchi.

<table>
<thead>
<tr>
<th>Region</th>
<th>n (sites)</th>
<th>SAVI 01-03</th>
<th>SAVi 10-12</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assawoman</td>
<td>6</td>
<td>0.63(_{(0.06)})</td>
<td>.87</td>
<td>Good</td>
</tr>
<tr>
<td>St Martin</td>
<td>11</td>
<td>0.41(_{(0.05)})</td>
<td>.60</td>
<td>Poor</td>
</tr>
<tr>
<td>Isle of Wight</td>
<td>9</td>
<td>0.77(_{(0.06)})</td>
<td>.88</td>
<td>Good</td>
</tr>
<tr>
<td>Sinepuxent</td>
<td>5</td>
<td>1.00(_{(0.00)})</td>
<td>.70</td>
<td>Excellent</td>
</tr>
<tr>
<td>Newport</td>
<td>12</td>
<td>0.48(_{(0.05)})</td>
<td>.62</td>
<td>Poor</td>
</tr>
<tr>
<td>N Chincoteague</td>
<td>6</td>
<td>0.77(_{(0.06)})</td>
<td>.78</td>
<td>Good</td>
</tr>
<tr>
<td>S Chincoteague</td>
<td>11</td>
<td>0.80(_{(0.05)})</td>
<td>.65</td>
<td>Good</td>
</tr>
</tbody>
</table>
Figure 30. Percent of total volume of each dominant genus (*Gracilaria, Agardhiella, Polysiphonia, Cladophora, Ulva and Enteromorpha*) by region from 2006 – 2012 in the Coastal Bays Fisheries Investigation Trawl Survey. Macroalgae was present in all regions; no graphical representation indicates total volume from that region is less than 0.1%.
Figure 31. Percent of total volume of each dominant genus (Agardhiella, Polysiphonia, Codium, Ulva and Vaucheria) by region from 2006 – 2012 in the Coastal Bays Fisheries Investigation Beach Seine Survey. Macroalgae was not present or less than 1% at sites represented with no bar.
Figure 36. Total volume of (red and green) macroalgae by year and region for Coastal Bays Fisheries Investigation Trawl Survey. The number in parenthesis after the region name is the number of trawl sites in that region.
Habitat - wetlands

Voluntary Wetlands Gains in Coastal Bays
2,916 acres total

LEAD: MDE Denise Clearwater
Habitat - shoreline
Harmful Algae - 2012 brown tides

2012 Aureococcus counts (NY flow cytometry)

Location

Ocean City Inlet

MKL0010 TUV0011 XDN3445 XDN5737 XDN7261 XDN7545

Ferry Landing

Green Point

Newport Bay

Public Landing

Sinnickson

Taylors Landing

Tingles Island

Trappe Creek

cells/ml

early april

late April

early May

mid-late May

early June

mid-June

LEAD: DNR Wazniak
2011 Brown Tide

2011 Aureococcus counts (NY flow cytometry)

Ocean City Inlet

N       S

Location

MKL0010  TUV0011  XDN3445  XDN5737  XDN7261  XDN7545  Ferry Landing  Green Point  New port Bay  Public Landing  Sinnickson  Taylors Landing  Tingles Island  Trappe Creek

0 20,000 40,000 60,000 80,000 100,000 120,000 140,000

April
early May
late May
early June
mid June
late June - early July
mid July
late July
mid Sept
late Sept

Ocean City Inlet
N       S
2010 Brown Tide

2010 Aureococcus counts (NY flow cytometry)

Ocean City Inlet

N       S

4/21/2010
5/6/2010
5/24/2010
6/2/2010
6/16/2010
6/29/2010
7/12/2010

Ocean City Inlet

N       S
2008 Brown Tide

2008 Aureococcus counts (immunoflorescence - flowcytometer)

Ocean City Inlet

N       S

2008 Aureococcus counts (immunoflorescence - flowcytometer)
2007 Brown Tide

2007 Brown Tide (immunofluorescence)

Ocean City Inlet

A. anophagefferens (cells ml-1)

- 5/15/2007
- 6/10/2007
- 6/24/2007
- 07/16/07

Locations:
- Ferry Landing
- Green Point
- Newport Bay
- Public Landing
- Sinnickson
- Taylor’s Landing
- Tingles Island
- Trappe Creek
- Ocean City Inlet
Harmful Algae Blooms

- **Dinophysis (OA=DSP)**

- **Raphidophytes** *(Chattonella, Heterosigma, Fibrocapsa, chloromororum toxicum)*
  - Hetero>1,000 2013=5 ; 2012=1; 2011=1; 2010=5; 2009=3
  - chatt>10,000 2013=0 ; 2012=0; 2011=3: 2010=9; 2009=5

- **Karlodinium (karlotoxin)>10K**
  - 2013=0 ; 2012=0; 2011=8; 2010=2; 2009=3

- **Psuedo-nitzschia (DA)**
  - 2013=1; 2012=5; 2011=1; 2010=2; 2009=0

- **Bluegreens** *(microcystis, synechococcus)>10,000*

- **Prorocentrum>10,000**
  - 2013=16; 2012=1; 2011=10; 2010=7; 2009=5

- **Pfiesteria = 0**

- **Amphididinium = 0**

**LEAD: DNR Wazniak**
Living resources - phytoplankton

XBM1301 2010

NPC0012-2010

LEAD: DNR Wazniak
Living resources - finfish

Weakfish - combined trawl/seine

Summer Flounder - Trawl

LEAD: DNR Doctor
Living resources - fishkills
Historical Perspective of Hard Clam Densities in Maryland’s Coastal Bays

Hard Clam Densities

- Assa
- IoW
- Sin
- New
- Chin

Clams per sq m

1952/53 2013

LEAD: DNR Tarnowski
Hard Clam Density Trends in Two Coastal Bays

Isle of Wight Bay
Hard Clam Densities

Chincoteague Bay
Hard Clam Densities

LEAD: DNR Tarnowski
• Most areas meet benthic goals.
• Only 1 year with data out of 7
• Will be doing NCA in 2015
Living resources – blue crabs?
Living resources – horseshoe crabs

- No indicator
- Stable to increasing spawning population
Living resources – piping plover
Living resources – invasive species

- Asian shore crabs
- Green crabs
Climate change

• New section
• Incorporate in other sections
• Sea level rise, temp changes, storm frequency/intensity; habitat changes; introduced species, etc