Early Detection of Coastal Ecosystem Response to Management Actions

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EMECS9
Baltimore, MD
August 28, 2011
Setting: MD Coastal Bays

Sampling site locations:
- Maryland Department of Natural Resources
- National Parks Service (including site number)
- Continuous monitor
Satoumi is defined as marine and coastal landscapes that have been formed and maintained by prolonged interaction between humans and ecosystems.
Many areas have no trend

Linear Trends

Non-Linear Trends

>10 years data
Current Status

Water quality index (chl, DO, TN, TP) show areas with no trends are degraded.

3 yr medians
### Bishopville Management Actions

<table>
<thead>
<tr>
<th>Year</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>removal of Selbyville WWTP, Del</td>
</tr>
<tr>
<td>1992</td>
<td>Little land use change after 92</td>
</tr>
<tr>
<td>1997 - 2002</td>
<td>sewer hookups in Selbyville additional 26,000 gpd (~87 edu @300g per edu)</td>
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Two methods to track ecosystem

• Cumulative sum, Cusum, of nutrients
• Dissolved oxygen criteria assessment
CuSum analyses

A technique for detecting the magnitude and timing of changes in means within an extended time series.

A change in the underlying mean will be reflected as a simultaneous change in the slope of the CuSum graph.
Benefits of the CuSums approach

- Match anthropogenic changes / activities to inflection points or trends
- Match climatological events / trends to inflection points or trends
- Identify potential drivers within watersheds.
Cusums indicate improvement Bishopville Prong

Total Nitrogen: Bishopville

ug/L

14
12
10
8
6
4
2
0
-2
-4
99 00 01 02 03 04 05 06 07 08

CuSum Z-scores

dry dry wet wet dry dry

99 00 01 02 03 04 05 06 07 08

= Hurricane Isabel
• Not all parameters show improvement
Dissolved Oxygen Assessment

- Analysis of high frequency data
  - Every 15 min
  - April to October

- Time below State thresholds
Early sign of improvement

Hours DO < 3.2 mg/L

$R^2 = 0.8555$
Changes not related to flow
Summary

New techniques show potential improvement.
Hours DO below 5 mg/l

- Bishopville
- Newport
- Turville
- Greys Creek
- Chincoteague