Early Detection of Coastal Ecosystem Response to Management Actions

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EMECS9
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Setting: MD Coastal Bays

Sampling site locations:
- Maryland Department of Natural Resources
- National Parks Service (including site number)
- Continuous monitor
Satoumi

Ocean City

Assateague
Many areas have no trend

Linear Trends

Non-linear trend analysis
Previously
- Decreasing
- Not significant
- Increasing

Currently
- Increasing
- Not significant
- Decreasing

Data from 1993–2009
Data from 1999–2009

>10 years data
Water quality index (chl, DO, TN, TP) show areas with no trends are degraded.
## Bishopville Management Actions

<table>
<thead>
<tr>
<th>Year</th>
<th>Action Description</th>
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<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
• 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.