Building and Sustaining Integrated Monitoring Networks in the Chesapeake Bay and Basin

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CEER, New Orleans, July 30, 2014
Chesapeake Bay Program Long-term Water Quality Monitoring Network

Tidal and Nontidal Monitoring Networks

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<td>Nontidal Network</td>
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Nontidal Network (NTN) Annual U.S. EPA Chesapeake Bay Program Office Cost History

(No data analysis costs shown here)

Investment phase to grow and maintain the expanded nontidal network

<table>
<thead>
<tr>
<th>Year</th>
<th>Sites</th>
<th>RFP 1st Gain</th>
<th>RFP 2nd Gain</th>
<th>Reduced Level NTN</th>
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<tr>
<td>2004</td>
<td>85 sites</td>
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<tr>
<td>2010</td>
<td></td>
<td></td>
<td>88 sites</td>
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<td>2011</td>
<td>126 sites</td>
<td>105 sites</td>
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<tr>
<td>2012</td>
<td></td>
<td></td>
<td>122 sites</td>
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<td>2013</td>
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Total non-CBPO cost of network: $3.2M
CBPO investment: $300K at least in 2008, 2009

2009 Review Results
Tidal and Nontidal Long-term Water Quality Monitoring Budget

- **Tidal Network Budget**
- **Nontidal Network Budget**

2006 to 2014

Budgets:
- $0
- $500,000
- $1,000,000
- $1,500,000
- $2,000,000
- $2,500,000
- $3,000,000

Graph showing the trend of budgets from 2006 to 2014.
Working through Uncertainties: Trying to maintain funding for a long-term monitoring network

**Crude Oil prices react to a variety of geopolitical and economic events**

Crude oil prices are a primary driver of petroleum product prices.

In 2014 it requires about $230 to afford what $100 could purchase in 1984 due to inflation.

Our Goal is to Maintain the Quality of the Network until 2025

We recognize there are uncertainties that impact the maintenance and sustainability of the Networks.
Effective monitoring requires significant resources

- Field work is expensive (people, equipment, vehicles, boats)
- Data analysis is time intensive (database development & maintenance, statistical analyses)
- Recurring costs are subject to inflationary pressures
BASIN: A Three Phase Process

Phase I
• Short-term Review to Sustain the Monitoring Network for FY2013

Phase II
• Investigate alternative operational models
• Explore new Business Models
• Gather Customer Expectations of Monitoring Products

Phase III
• Expanded Monitoring in Support of the New Chesapeake Bay Agreement beyond Water Quality goals

Phase II Activities

Case Studies
STAR Workgroup Discussions
Customer Expectations Surveys and Workshops
LESSONS LEARNED

BASIN Phase II
Phase II: Case Studies
Scale = (1/10 to 20X the Chesapeake)

Puget Sound

Moreton Bay

Wisconsin

Ireland

Great Barrier Reef

Great Lakes

Mid-Atlantic Regional Association Coastal Ocean Observing System
Network objectives were very similar across all Case Studies.

**Monitoring Objectives:**
- Delisting Impaired Waters Clean Water Act 303(d) (All)
- Water quality, habitat, fisheries (All)
- Tracking Progress (All)
- Social impacts (Puget Sound)

**Factors Influencing Network Design:**
- Risk Assessments (Ireland)
- Toxic Substances and Areas of Concern (Great Lakes)
- Sewage plume tracking (Moreton Bay)
- Pressure – State – Response (Great Barrier Reef)
Business Model Options

- Partner organizations provide significant match funds (All)
- Leveraged funds from multiple data & product consumers (MARACOOS)
- Evolution toward ‘user pays’ (Moreton Bay)
Examples of Additional Funds to Sustain Monitoring Programs

The Case Study Monitoring Programs came up with unique ways to fund their programs such as charging municipalities (Moreton Bay), stormwater permitting and NOAA Salmon Recovery Grant (Puget Sound), levies on plastic bags (Ireland), and membership fees (MARACOOS).
Chesapeake Bay Program:
- Long-term Tidal Water Quality Monitoring Network
- DATAFLOW for underway sampling
- Fixed Station Continuous Sensors including Vertical profilers
- Interactive reporting and report cards

Case Studies Examples:
- Vital Signs – Progress of Recovery Efforts (Puget Sound)
- MyMARACOOS Fishing Interactive Map (MARACOOS)
- Divided into three monitoring programs: Surveillance, Operational, and Investigative elements (Ireland)
- Different levels of citizen scientists engaged (All)
Citizen science can augment but **CANNOT** replace institutional monitoring

- Coordination needed
- Training needed; personnel turnover issue; QA/QC issues
- Continuity essential
- There are some difficult and dangerous locations where trained personnel are needed
- Tremendous untapped potential
Citizen Monitoring in the Chesapeake Bay

Example: VA DEQ Citizen Monitoring Program:
Three levels of data quality

Level III status (2012: 695 sites):
1. Audit
2. QAPP and/or SOP
3. Calibration & QC

FY13 and FY14
$88,000 state funds

FY12
4,124 stream miles
Roy et al. 2012

- 234 projects evaluated
- 30 selected for case studies

“Citizen science has vital roles in scientific research and engagement/education, but it also has the potential to help meet the demands of environmental/biodiversity monitoring, giving it clear relevance to policy.”

Green et al. 2013

- 103 respondents
- 41 states
- 94 unique programs

“In 2010 alone, these program monitored over 20,000 sites and involved nearly 73,000 individuals. Program volunteers contributed more than 515,500 hours of monitoring. According to the Independent Sector, their effort is valued at $10,834,340.”
Customer Expectations

The purpose of the Customer Expectations portion of BASIN Phase II is to gain feedback on the usefulness of the Chesapeake Bay Program water quality monitoring networks and the products derived from them.
Phase III
Ecosystem Based Monitoring: Expanding Beyond Water Quality

Monitoring support of new goals and outcomes
Take Away Message

- Monitoring programs around the world are continually faced with funding challenges and uncertainties that impact maintenance and sustainability.
- There are many solutions to this problem, no one RIGHT answer.
- BASIN is an ongoing process. We need to continue to learn from each other.
Acknowledgments
For More information

www.chesapeakebay.net/basin

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(410) 267-9872
## Wisconsin Citizen-Based Lake Water Quality Monitoring:

### New Volunteer Costs

<table>
<thead>
<tr>
<th>Type of Monitoring</th>
<th>Startup Cost Per Volunteer</th>
<th>Number of new Volunteers per year</th>
<th>Annual startup costs</th>
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<tbody>
<tr>
<td>Secchi</td>
<td>$50</td>
<td>100*</td>
<td>$5,000</td>
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<tr>
<td>Chemistry</td>
<td>$375</td>
<td>20</td>
<td>$7,500</td>
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<tr>
<td>Native Plant</td>
<td>$100</td>
<td>5</td>
<td>$500</td>
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<tr>
<td>Aquatic Invasive Species</td>
<td>$65</td>
<td>Up to 200</td>
<td>$13,000**</td>
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<tr>
<td>Temp profile</td>
<td>$130</td>
<td>20</td>
<td>$2,600</td>
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<tr>
<td>Dissolved Oxygen</td>
<td>$60</td>
<td>20</td>
<td>$1,200</td>
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### Wisconsin Citizen-Based Lake Water Quality Monitoring:

#### Maintenance Costs for 2013

<table>
<thead>
<tr>
<th>Type of Monitoring</th>
<th>Annual Maintenance Cost per volunteer, site or lake</th>
<th>2013 counts: volunteers, sites or lakes</th>
<th>Approx. annual cost to Maintain Volunteers</th>
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</thead>
<tbody>
<tr>
<td>Secchi</td>
<td>$5 per volunteer</td>
<td>1124 volunteers</td>
<td>$5,620</td>
</tr>
<tr>
<td>Chemistry (lab, postage, replacement equipment, etc.)</td>
<td>$200 per site</td>
<td>549 sites</td>
<td>$110,000</td>
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<tr>
<td>Native Plant</td>
<td>$25 per lake</td>
<td>30 lakes</td>
<td>$750</td>
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<tr>
<td>Aquatic Invasive Species***</td>
<td>$5 per lake</td>
<td>300 lakes</td>
<td>$1,500</td>
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<tr>
<td>Temp profile</td>
<td>$5 per lake</td>
<td>523 lakes</td>
<td>$2,615</td>
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<tr>
<td>Dissolved Oxygen</td>
<td>$30 per lake</td>
<td>361 lakes</td>
<td>$10,830</td>
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</table>
Programs reported a wide range of budget distributions. Not surprisingly, in addition to generally making up the largest percent of budgets (about 38% on average), salaries are the most challenging component of program budgets to fund. Only 13% of programs do not provide staff salaries, while 65% have no budget for office space, which tends to make up the smallest percent of program budgets overall. Nearly one third of programs (28%) have no budget for equipment and half have no budget for printed materials.

![Categorized Program Spending](image)

**Figure 9.**