Redesigning CBP indicator structure and communication

March 3, 2005

Ben Longstaff
NOAA-UMCES Partnership

On behalf of the

Indicator Redesign Taskforce
The Indicators Redesign Taskforce?

• A temporary group formed to recommend solutions for the current deficiencies in the CBP indicators and the way they are communicated.

• Members experienced in environmental data analysis, science communication, and web design.

• Group is compromise between efficiency (small size) and links to every interest group (large size).

• Members:
  – Carlton Haywood (Chair), ICPRB
  – Mike Burke, EPA/CBPO
  – Peter Claggett, USGS/CBPO
  – Bill Dennison, UMCES
  – Mike Land, NPS/CBPO
  – Bruce Michael, MD DNR
  – Nita Sylvester, EPA/CBPO
  – Gary Shenk, EPA/CBPO
  – Rich Batiuk, EPA/CBPO
  – Bob Campbell, NPS/CBPO
  – Chris Conner, ACB/CBPO
  – Rick Hoffman, VA DEQ
  – Ben Longstaff, NOAA / UMCES
  – Steve Preston, USGS/CBPO
  – Ken Moore, VIMS
What are the current deficiencies...

Current communication has led to:

- Sometimes incorrect / confusing messages being received

- Chesapeake Bay Program may not be the primary source of information

- Information generally relates to the ‘whole bay’. Not enough information about local waterways

- Information not always presented in a timely fashion
What are the current deficiencies...

Current Indicators:

- There are many indicators (100+)
- Mix ‘state of the Bay’ and ‘state of the Bay restoration’ messages
- No hierarchy of importance
- Few overarching indices
- Presented stand alone style - don’t tell a complete story
- Long lag time between monitoring and indicator availability
- Often have poor spatial representation
What we need

A communication strategy that:

• Communicates the most important information first

• Provides a constant flow of products

• Provides storylines and links information

• Occurs in a timeframe that is appropriate to the messages being conveyed

• Underpinned by a range of robust and defendable data synthesis and analysis methods

• Provides information in maps, conceptual diagrams and other easy to interpret approaches
What we need...

An indicator framework that:

1. Provides a hierarchy based on the level of detail required, from broad overall levels/conditions to geographically specific details;

2. Minimizes potential for confusing indicator function. That is, whether they relate to State of the Bay, the State of the Bay restoration and those factors that affect Bay health;

3. Facilitates the interpretation and communication of indicator interconnectivity through the development and presentation of storylines;

4. Is closely aligning with the Bay Program’s overall communication strategy; and

5. Is relatively simple, avoiding numerous categories or complex relationships.
Indicator Framework:
Three functional groups

- Chesapeake Bay & watershed restoration
- Chesapeake Bay & watershed stressors
- Chesapeake Bay ecosystem health

Feedback (e.g. improved restoration efforts)

- e.g. Riparian buffer restoration (miles restored)
- e.g. Nontidal sediment loads and river flow (m lbs/year)
- e.g. State of submerged aquatic vegetation (distribution - ha)
## Indicator Hierarchy

<table>
<thead>
<tr>
<th>Role</th>
<th>Chesapeake Bay &amp; watershed restoration</th>
<th>Chesapeake Bay &amp; watershed stressors</th>
<th>Chesapeake Bay ecosystem health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overarching Indices</td>
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<td></td>
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<tr>
<td>Top level indices</td>
<td></td>
<td></td>
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<tr>
<td>Reporting Indicators &amp; Indices</td>
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<td></td>
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<tr>
<td>Diagnostic-detailed Indicators</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Separate into three categories

<table>
<thead>
<tr>
<th>Reporting Indicators &amp; Indices</th>
<th>Chesapeake Bay &amp; watershed restoration</th>
<th>Chesapeake Bay &amp; watershed stressors</th>
<th>Chesapeake Bay ecosystem health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land &amp; loads</td>
<td>Load</td>
<td>Land use</td>
<td>Water quality</td>
</tr>
<tr>
<td>Habitat</td>
<td></td>
<td>Land use</td>
<td>Habitat &amp; Lower trophic</td>
</tr>
<tr>
<td>Harvest</td>
<td></td>
<td>Harvest</td>
<td>Living Resources</td>
</tr>
</tbody>
</table>

Why?

- Recognition of diversity within each functional group
- Facilitate development of top level indices
- Facilitate interconnectivity of indicators - storylines
Proposed reporting indicators

<table>
<thead>
<tr>
<th>Reporting Indicators &amp; Indices</th>
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<th>Chesapeake Bay &amp; watershed stressors</th>
<th>Chesapeake Bay ecosystem health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land &amp; loads</td>
<td>- Agricultural BMPs</td>
<td>Loads</td>
<td>Water quality</td>
</tr>
<tr>
<td></td>
<td>- Urban BMPs</td>
<td>- Nitrogen</td>
<td>- Dissolved Oxygen</td>
</tr>
<tr>
<td></td>
<td>- WWTP upgrades</td>
<td>- Phosphorus</td>
<td>- Oxygen</td>
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<td></td>
<td>- Air quality controls</td>
<td>- Sediment</td>
<td>- Chl-a</td>
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<td></td>
<td>- Preserved lands</td>
<td>- Flow</td>
<td>- Clarity</td>
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<tr>
<td></td>
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<td>- Fish passage</td>
<td>- Chemical contaminants</td>
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<td></td>
<td></td>
<td>- Oysters</td>
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<td></td>
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<td>- Fisheries</td>
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<td>- Management</td>
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<td>- Plan</td>
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<td>- Impervious/</td>
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<td>- Pervious</td>
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<td></td>
<td></td>
<td>- Land uses</td>
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<tr>
<td>Habitat</td>
<td>- SAV</td>
<td>- Crab</td>
<td>- SAV</td>
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<tr>
<td></td>
<td>- Wetlands</td>
<td>- Oyster</td>
<td>- Wetlands</td>
</tr>
<tr>
<td></td>
<td>- Rivers</td>
<td>- Fish</td>
<td>- Phytoplankton</td>
</tr>
<tr>
<td></td>
<td>- Salmon</td>
<td></td>
<td>- Zooplankton</td>
</tr>
<tr>
<td></td>
<td>- Turtles</td>
<td></td>
<td>- Benthic community</td>
</tr>
<tr>
<td></td>
<td>- Fishes</td>
<td></td>
<td>- Forage fish</td>
</tr>
<tr>
<td></td>
<td>- Shrimp</td>
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<td></td>
<td>- Crayfish</td>
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<td></td>
<td>- Eels</td>
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<td>- Carp</td>
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- Approximately 35 reporting indicators
- 3 to 6 indicators / category
- The indicator measure/metric still has to be determined by the appropriate Subcommittee, workgroup and/or team of experts
Top level index values should be based on attainment/non-attainment of established criteria/goals.

Incorporate factors such as the:

1. Volume or surface area of the waterway in attainment;
2. Frequency that attainment is reached; and
3. Degree or amplitude of attainment/non-attainment.
### Diagnostic Indicators

#### Chesapeake Bay & watershed restoration
- **Overarching Indices**: Restoration Progress Index
- **Top level indices**:
  - Land & loads
  - Habitat
  - Harvest
- **Reporting Indicators & Indices**:
  - Agricultural BMPs
  - Urban BMPs
  - WWTP upgrades
  - Air quality controls
  - Preserved lands
  - SAV
  - Wetlands
  - Fish passage
  - Oysters
  - Fisheries Management Plan
- **Diagnostic-detailed Indicators**: Remainder of indicators

#### Chesapeake Bay & watershed stressors
- **Overarching Indices**: Ecological Footprint Index
- **Top level indices**:
  - Loads
  - Land use
  - Harvest
- **Reporting Indicators & Indices**:
  - Nitrogen
  - Phosphorus
  - Sediment
  - Flow
  - impervious/ pervious
  - Land uses
- **Diagnostic-detailed Indicators**: Remainder of indicators

#### Chesapeake Bay ecosystem health
- **Overarching Indices**: Bay Ecosystem Health Index
- **Top level indices**:
  - Water quality
  - Habitat & Lower trophic
  - Living Resources
- **Reporting Indicators & Indices**:
  - Dissolved Oxygen
  - Chlorophyll-a
  - Clarity
  - Chemical contaminants
  - SAV
  - Wetlands
  - Phytoplankton
  - Zooplankton
  - Benthic community
  - Forage fish
  - Crab
  - Oysters
  - Rockfish
  - Water bird
  - Migratory fish
- **Diagnostic-detailed Indicators**: Remainder of indicators

- Facilitate interpretation of the reporting indicators; and/or
- Address topics of special interest
- Not used in the generation of top level or overarching indices
Communication Strategy

• **Target Audience**
  – Interested public, agency managers, policy/decision makers

• **Website is the primary communication tool**
  – Redesign website to reflect indicator structure
    • Separate indicators into functional groups
    • Place reporting indices, top level and overarching indices most upfront/accessible

• **Develop/improve website products**
  – *Improve indicators*: Spatial detail, presentation and timeliness of reporting indicators
  – *FAQs / Storylines*: Provide answers to target audience questions
How indicator structure facilitates storylines / FAQ

What is the Chesapeake Bay Program doing to restore SAV?

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Restoration Progress Index</td>
<td>Ecological Footprint Index</td>
<td>Bay and tidal tributary Ecosystem Health Index</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Top level indices</th>
<th>Land &amp; loads</th>
<th>Habitat</th>
<th>Harvest</th>
<th>Loads</th>
<th>Land use</th>
<th>Harvest</th>
<th>Water quality</th>
<th>Habitat &amp; Lower trophic</th>
<th>Living Resources</th>
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<td>Reporting Indicators &amp; Indices</td>
<td>Agricultural BMPs</td>
<td>Urban BMPs</td>
<td>WWTP upgrades</td>
<td>Nitrogen</td>
<td>Phosphorus</td>
<td>Sediment</td>
<td>Flow</td>
<td>Chi-a</td>
<td>Clarity</td>
</tr>
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| Diagnostic-detailed Indicators | |
|--------------------------------|
Communication Strategy

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  – *FAQs / Storylines*: Provide answers to target audience questions
    – *Annual communication cycle*: Restoration effort, Bay stressor and Bay ecosystem health

• Use e-newsletter to drive audience to website & engage a larger audience
E-Newsletter

- A proactive way to disseminate our information and drive users to the site for additional information.
- Monthly, starting in May 2005
- Each issue will contain:
  - Bay Health, Bay Restoration Bay, Stressor articles (detailed spreadsheet available).
  - Need to be related/linked - provide cohesive overall story
  - Need to target the questions most frequently asked by the target audience
  - Reliant upon up-to-date, timely, well synthesized and presented content
  - Other content: Critter of the month, Bay Journal Tease, Gateway site, What you can do
Annual communication cycle
Goals

1. Forecast summer conditions for a variety of key indicators using:
   - Established relationships with Bay stressors (e.g. flow)
   - Prior year’s living resource population and distribution

2. Improve forecast capacity:
   - Incrementally adding predictions of different indicators
   - Reducing uncertainties of current indicators

3. Effectively communicate the predictions and associated uncertainties to the Chesapeake Bay community.
What we are aiming for in 2005

Forecast to be released in the first week of May 2005.

- Forecast **dissolved oxygen** conditions, particularly the magnitude and extent of hypoxia/anoxia in bottom waters.
- Forecast Potomac River **harmful algal bloom** onset and duration.
- Forecast **submerged aquatic vegetation** distributions (gain, loss no change), particularly the freshwater, mesohaline (*Ruppia*) and polyhaline (*Zostera*) communities.

Next year: Menhaden? Others…
Annual Summer Highlights

Goals

• Review the previous summer environmental conditions and highlight the most significant developments
  • Include meteorological and unusual biotic events.
  • Provide a short explanation for the events highlighted
• Compare the summer predictions with the actual conditions obtained, providing explanations for discrepancies.
• Effectively communicate summer highlights in a timely manner to the Chesapeake Bay community.
Annual Integrated Assessment

Goals

• Conduct an annual assessment of key indicators.
  • Assess key water quality, living resources and habitat parameters.
  • Develop an integrated ecosystem health assessment for the bay and its tributaries using the various key parameters.
  • Create a ranking valuation scheme to compare assessments both geographically and over time (annual assessments).

• Develop an improved assessment capacity:
  • improving the timeliness of various data processing steps
  • developing additional key indicators.

• Effectively communicate the integrated assessments with spatially explicit maps and rigorous scientific assessments to the Chesapeake Bay community.
Annual Integrated Assessment

- Report Card Grade
  - Overarching Indices
    - Top eval indices
      - Reporting indices & indices
        - Chesapeake Bay & watershed restoration
          - Urban BMP
          - Nutrient BMP
          - Agricultural BMP
          - Air quality BMP
          - Preserved land
        - SAV
        - Wetlands
        - Fish passage
        - Management Plan
  - Restoration Progress Index
    - Land & Loads
    - Habitat
    - Harvest
  - Grade A - F

- Grade A - F
  - Ecological Footprint Index
    - Loads
    - Land use
    - Harvest
      - Chesapeake Bay & watershed stressors
        - Nitrogen
        - Phosphorus
        - Sediment
        - Flow
        - Impervious/
          pervious land use types
        - Crab
        - Oyster
        - Fish
      - Chesapeake Bay ecosystem health
        - eutrophication
        - Dissolved oxygen
        - Chemical constituents
        - Habitat
        - Living Resources
          - Water quality
          - Habitat
          - Living Resources
            - Chesapeake Bay
              - Oysters
              - Redfish
              - Water bird
              - Migratory fish
              - Crabs

Ecosystem health report cards...

Moreton Bay (Australia):

- Annual release since 1999
- The most important tool for evaluating and communicating health of the regions waterways
- Significantly raised awareness of waterways health
- Often directed / focused management action
- Impetus for some costly (but environmentally important) intervention

High profile media release:
Media Interest → Public Awareness → Political Interest → Action

→ Report Card needs to be **robust and defendable**
We need another report card for Chesapeake Bay

It needs to be:
- spatially explicit - grades for different Bay regions
- robust and defendable
- underpinned by quality data for the reporting year only

Types of products needed for Chesapeake Bay

<table>
<thead>
<tr>
<th>Bay Reporting Zone</th>
<th>Ecosystem Health Index</th>
<th>Compliant area % of waterway that complies with water quality objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bramble Bay</td>
<td>0.64</td>
<td>TN 75 Chl a 59 Secchi 75 Lyngbya 55 N/A</td>
</tr>
<tr>
<td>Central Bay</td>
<td>0.93</td>
<td>100 100 75 97 94</td>
</tr>
<tr>
<td>Deception Bay</td>
<td>0.81</td>
<td>92 99 77 61 70</td>
</tr>
<tr>
<td>Eastern Banks</td>
<td>0.93</td>
<td>100 100 77 100 72</td>
</tr>
<tr>
<td>Eastern Bay</td>
<td>0.95</td>
<td>100 100 87 96 100</td>
</tr>
<tr>
<td>Waterlooe Bay</td>
<td>0.90</td>
<td>94 100 99 71 100</td>
</tr>
<tr>
<td>Broadwater</td>
<td>0.84</td>
<td>100 N/A 74 60 100</td>
</tr>
<tr>
<td>Pumicestone Passage (north of Hills Creek)</td>
<td>0.49</td>
<td>62 0 68 66 N/A</td>
</tr>
<tr>
<td>Pumicestone Passage (south of Glasshouse Mountain Creek)</td>
<td>0.78</td>
<td>100 100 52 59 N/A</td>
</tr>
<tr>
<td>Southern Bay</td>
<td>0.84</td>
<td>100 100 100 42 100</td>
</tr>
<tr>
<td>Southern Bay</td>
<td>0.61</td>
<td>100 50 92 0 100</td>
</tr>
</tbody>
</table>

- Report Card grades must not stand alone
- They must be based upon, and be accompanied by, the supporting data and process
- The process of distilling, analyzing and presenting the supporting data is as useful and necessary as the report card grades themselves
Annual communication cycle

Rationale

• Provide context for understanding the environmental conditions in Chesapeake Bay and restoration progress
  • Importance of intra- & inter-annual variability
  • Educate - anthropogenic and natural factors affecting Chesapeake Bay
• Provide an explicit linkage between management objectives and actual progress in Chesapeake Bay restoration
  • Focus future research priorities, monitoring needs and management actions
  • Establish the importance of targeting restoration efforts in locations/times that environmental conditions will favor restoration success
• Establish a proactive communication and education program
  • Highlight the importance of collecting and analyzing good data
  • Educate the public about the role of assessment and feedback to management and research activities
  • Develop credible and robust assessments that are based on the best scientific information and synthesis available
  • Create public anticipation for annual products
How will this happen?

Only with the commitment of the CBP community - committees/workgroups/individuals
How can LRSC/LivRaw help

1) Feedback on proposed indicator structure and communication strategy

2) Take on all components related to Living Resources
   - Improve indicators: Spatial detail, presentation and timeliness of reporting indicators / selecting reporting indicators
   - FAQs / Storylines: Provide answers to target audience questions / e-newsletter articles
   - Annual communication cycle: Forecast, highlights and annual assessment
## Non-tidal health

### Chesapeake Bay & watershed restoration
- Land & loads
  - Agricultural BMPs
  - Urban BMPs
  - WWTP upgrades
  - Air quality
- Habitat
  - Waterfowl
  - Beaches
- Harvest
  - Fish passage
  - Mussel management plan

### Chesapeake Bay & watershed stressors
- Ecological Footprint Index
  - Loads
    - Nitrogen
    - Phosphorus
- Land use
  - Impervious
  - Land use
- Harvest
  - Crab
  - Oyster
  - Fish

### Chesapeake Bay and non-tidal waterways ecosystem health
- Bay Ecosystem Health Index
  - Water quality
    - Dissolved Oxygen
    - Chl-a
  - Habitat & lower trophic
    - Phytoplankton
  - Living resources
    - Crab
    - Oysters
  - To be added at a later date
    - when monitoring and data reporting networks are established

### Overarching indices
- Restoration Progress Index
- Ecological Footprint Index
- Bay Ecosystem Health Index

### Top level indices
- Land & loads
- Habitat
- Harvest

### Reporting indicators & indices
- Agricultural BMPs
- Urban BMPs
- WWTP upgrades
- Air quality
- Waterfowl
- Beaches
- Fish passage
- Mussel management plan
- Nitrogen
- Phosphorus
- Impervious
- Land use
- Crab
- Oyster
- Fish
- Dissolved Oxygen
- Chl-a
- Phytoplankton
- Zooplankton
- Community
- Forage
- Crab
- Oysters
- Rockfish
- Waterbird
- Migratory fish

### Diagnostic-detailed indicators
- Remainder of indicators
- Remainder of indicators
- Remainder of indicators

↑ = direct numerical relationship