Water Information Strategies

- Water Quality Assessment & Statistics
- Data Management and Access
- Program Development and Network Design
- Ad Hoc Projects
Activities

1. NJ Survey of Water Quality Indices
Water Quality Indices Questionnaire

A. Are you currently in the process of developing a composite water quality index or report card to communicate the condition of a water resource? If so, please briefly describe the index and include the water body type.

B. Chemical, Physical, Microbiological Composite Indices
1. Does your organization currently use any composite water quality indices for chemical, physical and/or microbiological water column parameters?
   - If so, what parameters comprise the index (e.g., DO, TN, TP, fecal coliform), and for what water body types? (e.g., estuarine waters, streams, lakes)
2. What were the primary objective(s) in developing this index?
3. How was the index developed and what entities were involved? Was there a public, stakeholder or scientific peer review process used in its development?
4. How is the index calculated, and what, if any, criteria/standards or thresholds are utilized in the index determination? Are these weighting used in the calculation?
5. Describe the monitoring program design and type of data used for the index (e.g., summer sampling probabilistic design, quarterly sampling fixed station network)
6. What are the primary users of the index and who are the primary audiences? Is the index used to evaluate progress toward strategic environmental or sustainability goals for your state/region?
7. How and on what frequency is the index reported?
8. What are the primary strengths and limitations of the index? How successful do you believe the use of such an index has been?
9. Please provide website addresses or other references for the index.

C. Biological or Eutrophic Condition Indices
1. Does your organization use any biological, biological indices? If so, for what trophic levels (e.g., benthic, fish, phytoplankton) and what water body types (e.g., estuarine waters, streams, lakes)
2. If you have more than one trophic level index, does your organization aggregate any of the biological indices (e.g., benthic and fish)? If so, which ones and how?
3. Do you use an index that combines any biological indices with other water quality and/or habitat data for a consolidated indicator? If so, which ones and how?

4. Do you use any indices of eutrophic conditions? If so, what parameters comprise the index and for what water body types?

5. If you answered any of the above questions in Section A. are yes, please provide general information on objectives of the index, its development and use as in Section A above. If information in Section A is applicable to the Biological or Eutrophic Condition indices, please indicate as such.

6. Please provide website addresses or other references for biological or eutrophic indices above.

D. Sediment Quality Indices
1. Does your organization use a sediment quality index? If so, for what parameters (e.g., sediment contaminants, sediment toxicity), water types, and describe the index.
2. If yes, please provide general information on objectives of the index, its development and use as in Section A. If information in Section A is applicable to the Sediment Quality Index, please indicate as such.
3. Please provide website addresses or other references for sediment quality index.

E. Overall Condition Indices
1. Does your organization use an overall composite index, or combine any of the above into an overall condition index? If so, for what parameters (e.g., water quality, biological, sediment, and habitat) water types, and describe the index.
2. If yes, please provide general information on objectives of the index, its development and use as in Section A. If information in Section B is applicable to the Overall Condition Index, please indicate as such.
3. Please provide website addresses or other references for Overall Condition Index.

F. Indices Contacts in Your Organization or Other Organizations
Are you aware of anyone else in your organization we should speak to regarding water quality indices? Are you aware of other organizations, particularly state, interstate, tribal organizations that are using water quality indices? If so, could you provide contact information?

G. Would you like a copy of the Summary information from this water quality index questionnaire? If so, please provide email address.

Leslie J. McGeorge, M.S.P.H
Administrator
NDEP, Freshwater and Biological Monitoring
PO Box 420 (Mail Code 55-51)
Trenton, NJ 08626-0420
Ph: 609-292-0427
Fax: 609-292-0365
locale_mgeorge@dep.state.nj.us

Brian Homming
Research Scientist
NDEP, Freshwater and Biological Monitoring
PO Box 420 (Mail Code 55-51)
Trenton, NJ 08626-0420
Ph: 609-292-0427
Fax: 609-363-1095
brian_homming@dep.state.nj.us
<table>
<thead>
<tr>
<th>Organization</th>
<th>Applied Composite Water Quality Index or Report Card</th>
<th>Assessment Tool</th>
<th>Area</th>
<th>Waterbody type</th>
<th>Contact</th>
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<tbody>
<tr>
<td>University of Maryland Center for Environmental Sciences-Integration and Application Network</td>
<td>YES</td>
<td>Water Quality Index</td>
<td>Chesapeake Bay, MD coastal bays, Great Barrier Reef, Gulf of Mexico, Baltimore Harbor</td>
<td>Coastal bays and estuaries, rivers, lakes</td>
<td>Heath Kelsey</td>
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<td>South Carolina Dept. Health &amp; Environmental Control</td>
<td>YES</td>
<td>Water Quality Index</td>
<td>South Carolina Estuary and Coastal Habitats</td>
<td>Coastal tidal rivers and bays</td>
<td>David Chesnut</td>
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<td>Massachusetts Department of Environmental Protection</td>
<td>YES</td>
<td>Report Card</td>
<td>Massachusetts</td>
<td>Freshwater streams</td>
<td>Warren Kimball</td>
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<td>McMaster University</td>
<td>YES</td>
<td>Water Quality Index</td>
<td>Laurentian Great Lakes</td>
<td>Great Lakes wetlands</td>
<td>Patricia - Chow Frasier</td>
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<td>Oregon Department of Environmental Quality</td>
<td>YES</td>
<td>Water Quality Index</td>
<td>Oregon</td>
<td>Freshwater streams (4th and 5th order)</td>
<td>Lesley Merrick</td>
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<td>Iowa Department of Natural Resources NR</td>
<td>YES</td>
<td>Water Quality Index</td>
<td>Iowa</td>
<td>Iowa rivers and streams</td>
<td>Mary Skopek</td>
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<td>California State Water Resources Control Board</td>
<td>YES</td>
<td>Report Card</td>
<td>San Diego River Watershed</td>
<td>Freshwater streams</td>
<td>Lilian Busse</td>
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<td>Vermont DEC</td>
<td>YES</td>
<td>Vermont Lake Scorecard</td>
<td>Vermont</td>
<td>Lakes</td>
<td>Neil Kamman</td>
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<td>USEPA (National Coastal Condition Assessment)</td>
<td>YES</td>
<td>Water Quality Index (National Aquatic Resource Surveys)</td>
<td>Nationwide</td>
<td>National Coastal Condition Assessment</td>
<td>Sarah Lehmann</td>
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<tr>
<td>USGS (NAWQA Program)</td>
<td>NO</td>
<td>Pesticide Toxicity Index</td>
<td>National Water-Quality Assessment (NAWQA Program)</td>
<td>Rivers and streams</td>
<td>Karen Beaulieu</td>
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<td>Wisconsin Department of Natural Resources</td>
<td>NO</td>
<td>Water Action Volunteers Stream Monitoring Program- Biotic Index</td>
<td>Wisconsin statewide</td>
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<td>Kris Stepenuck</td>
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<td>New Jersey Pinelands Commission</td>
<td>NO</td>
<td>Multiple-indicator ecological-integrity scores</td>
<td>NJ Pinelands</td>
<td>Pinelands streams and impoundments</td>
<td>Sarah Smith</td>
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<td>Ohio River Valley Sanitation Commission (ORSANCO)</td>
<td>NO</td>
<td>Ohio River Fish Index, Ohio River Macroinvertebrate Index, Ohio River Diatom Index</td>
<td>Ohio River Basin (IL, IN, KY, OH, WV, VA, PA, NY)</td>
<td>Freshwater rivers and streams</td>
<td>Jeff Thomas</td>
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<td>Florida Department of Environmental Protection</td>
<td>NO</td>
<td>Multiple biological Indices</td>
<td>Florida statewide</td>
<td>Florida streams, rivers, macrophytes, lakes, wetlands</td>
<td>Joy Jackson</td>
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<tr>
<td>Indiana Department of Environmental Management</td>
<td>NO</td>
<td>Monitoring program</td>
<td>Indiana statewide</td>
<td>Freshwater streams</td>
<td>Stacey Sobat</td>
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<td>Kentucky Department of Environmental Protection</td>
<td>YES</td>
<td>Watershed Health Reports</td>
<td>Kentucky</td>
<td>Rivers and streams</td>
<td>Katie McKone</td>
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<td>Virginia Department of Environmental Quality</td>
<td>NO</td>
<td>Water Quality Trend Analysis</td>
<td>Virginia</td>
<td>Rivers and streams</td>
<td>Roger Stewart</td>
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</tbody>
</table>
Approaches for Disseminating Water Quality Information: Development and Use of Applied Water Quality Indices and Report Cards

Brian Hermin and Eileen McGehee
New Jersey Department of Environmental Protection
Division of Water Monitoring and Standards
Bureau of Freshwater and Biological Monitoring
Trenton, NJ 08625

Abstract - A questionnaire was developed by the New Jersey Department of Environmental Protection in cooperation with input from the New Jersey Water Monitoring Council to gather available information on composite water quality indices and report cards by governmental agencies and other water quality practitioners to disseminate results to various audiences. We received 17 completed questionnaires from state and federal agencies and academia from across North America. The goal of our survey was to better understand the uses, strengths and limitations, development process, and the applicability of each method to convey water monitoring information in an integrated manner. Several participants in the survey utilized Water Quality Indices (WQI) in freshwater rivers, and streams, estuaries, coastal environments, and offshore shellfish habitats. Notably, popular parameters used in a WQI are dissolved oxygen, pH, chlorophyll-a, total nitrogen and total phosphorus. Contrary to WQI, Water Quality Report Cards were also utilized by participants as an approach to assess the condition of freshwater streams, rivers, and lakes. The Water Quality Report Card (WQRC) concept was originally developed by Warren Kimball, formerly of the Massachusetts DEP, and is becoming a popular model used by a number of water resource agencies. The WQRC uses 10 indicators pertaining to aquatic life, recreation, and fish suitability that are color coded to provide an assessment of a waterbody based on standardized 30(b) reporting procedures. Regardless of the approach, both Water Quality Indices and Water Quality Report Cards appear to be useful tools to provide an overall condition assessment of a water resource and present the data in a manner that is easily and easily understood by multiple audiences.

Water Quality Indices

Generally, a single value (score) is used to summarize water quality and resource condition for a particular time and location. Indices are typically composed of several parameters (4-12) of importance to water quality and are then aggregated and calculated into an overall score. Indices reported include measures of water column chemistry, sediment, biology, and habitat.

Example of a composite water quality index for Oregon rivers

Applications and objectives of WQIs

Commonly used to communicate water quality conditions to the public, stakeholders, local officials, water resource managers, and also for trend analysis of management practices and strategic goals. Most WQIs are not used for an aquatic resource in part because many parameters often have no water quality standards.

Water Quality Report Cards

The WQRC's described here, use ten indicators pertaining to aquatic life, recreation, and fish suitability that are color coded to provide an assessment of a waterbody based on the standard 30(b) reporting procedures. The ten indicators are biology, chemistry, nutrients, toxins, sediments, fish, flood, bacteria, aesthetics, and fish access.

Applications and Objectives of WQRC

These are used to communicate water quality conditions to public stakeholders, officials, and water resource managers. The WQRC condenses the 30(b) assessment into a one-page summary of a waterbody. It can be used to assess the effectiveness of management practices, guide decision makers, identify monitoring needs and coordinate monitoring programs.

Development

The WQRC concept was first developed by Warren Kimball of the Massachusetts DEP. It uses ten indicators pertaining to aquatic life, recreation, and fish suitability that are color coded to provide an assessment of a waterbody based on the standard 30(b) reporting procedures. Each index has a separate standard water quality index and criteria are used to determine condition rating.

Organizations

<table>
<thead>
<tr>
<th>Organization</th>
<th>Water Resource</th>
<th>Media</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
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<td>California State Water Resources Control Board</td>
<td>Water column, sediment, biology, bacteria</td>
<td>Website</td>
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<tr>
<td>Massachusetts Department of Environmental Protection</td>
<td>Water column, sediment, biology, bacteria</td>
<td>Website</td>
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</table>

Conclusions and Next Steps

Both WQI and WQRC approaches seek to provide a comprehensive evaluation of the condition of the waters resources they are assessing. Many participants felt that the water quality indices were more likely to get incorporated into an overall water quality index if satisfactory water quality conditions are met and need to be available through WQI's. Participants suggested that these approaches can be used to gain trust and build support and are used to assess the condition of water bodies. A report will be prepared summarizing all questionnaires received and will be made available on the National Water Quality Monitoring Council's website.

Limitations

- May not align with state's 30(b)(1)(g) reporting requirements
- Limited use for regulatory purposes
- May not include toxic, habitat, fish tissue or biological indices

Strengths

- Summarized large amounts of data for a variety of audiences
- May include information for parameters for which there are no regulatory standards
- Enables spatial display of ratings
- Provides trends analysis of WQI score
- Generally understood by public, however calculation of index may be confusing

If you have any questions or need further assistance, please don't hesitate to contact us. Thank you to all of the participants who completed the questionnaire.
Fact Sheet on WQI’s
Draft has been prepared and will be distributed to the Council in a few weeks for review and comment.
2. What My Manager Needs to Know Fact Sheet Series

#1 Purposes of Fixed Site, Trend Monitoring Network

**Purposes of a Fixed-site, Trend Monitoring Network**

A fixed-site, trend monitoring network is a water monitoring approach that uses a set of monitoring sites that remain in place and are monitored over the course of many years. Such a network is important for describing long-term water quality conditions. Depending on frequency of water chemistry monitoring and environmental conditions, statistical trends in water quality can begin to be seen after about a decade of monitoring. Even before statistical trends can be determined, fixed station monitoring yields useful information on ongoing water quality conditions. Biological monitoring can also be performed repeatedly at fixed sites to compare changes in biological health over time. Seeing changes in water quality over time through fixed site monitoring can give an indication of positive or negative changes in water quality resulting from land use changes, best management practices implementation, regulations, extreme weather events, or other influences. Quantifying success of implementation efforts can be a major benefit of this type of monitoring. Data from fixed station monitoring, while specific to the site(s) where the data are collected, can be used to create and improve water quality models that can predict water quality conditions in other non-monitored locations.

*Minnesota’s Watershed Pollutant Load Monitoring Network - each site is permanent, has water samples taken regularly, and includes a flow gage to record water quantity measurements:*
Other WYMNTK Fact Sheets to Date

• Overview Fact Sheet
• Probabilistic – Randomized Monitoring
• Water Quality Portal
• Load template on to the web for use….

On Deck…

• Targeted Monitoring
• Program Effectiveness (i.e. 319)
• Other Ideas?
4. Monitoring Extreme Events

- Lessons Learned & Tips and Tricks
- Session at Cincinnati Conference (Monty Porter organized).