- Summary notes -

Bay of Fundy Ecological Health Index Workshop,

"Finding an Ecological Health Index for the Bay of Fundy"

April 3, 2013
St. Andrews Biological Station Conference Centre

prepared by Scott Kidd

1. BACKGROUND TO WORKSHOP:

The Bay of Fundy Ecosystem Partnership (BoFEP) is a knowledge network that promotes and facilitates the creation, sharing and use of knowledge about the Bay of Fundy. BoFEP is dedicated to: 1) promoting the ecological integrity, vitality, biodiversity and productivity of the Bay of Fundy ecosystem, in support of the social well-being and economic sustainability of its coastal communities, and 2) facilitating and enhancing communication and co-operation among all citizens interested in understanding, sustainably using and conserving the resources, habitats and ecological processes of the Bay of Fundy. It is a "virtual institute" that links people and organizations who work together for the promotion of an ecologically and socially sustainable Bay of Fundy.

BoFEP believes that the development of an environmental health index (EHI) or report card would be an effective way to determine and communicate information about the Bay of Fundy's ecosystem health. With support from Environment Canada, BoFEP has undertaken a project to determine the feasibility of producing this EHI.

The first part of the project focused on researching marine report cards and EHIs used by various organizations around the globe. A summary of seven of these EHIs was then written and shared with invitees to the workshop.

The second part of the project was to conduct the April 3, 2013 workshop to gather input on the development of a Bay of Fundy EHI from individuals knowledgeable about the culture, ecology, and economy of the Bay of Fundy. The workshop was conducted using a "town hall" format. During the workshop, the attendees discussed four main questions:

1. What do attendees believe are the general characteristics of a "good" index?
2. Based on the seven examples of marine report cards and EHIs presented to workshop attendees, is there a preferred index for the Bay? Why? What is appealing about that index? What is not "good" about the other indexes (perceived shortcomings).
3. If there is a preferred index, are there indicators that need to be added or subtracted?
4. If there is not a preferred index, what are the components (anything in addition to the list generated by Question 1) and indicators that are required?

The final part of the project will be the production of a report that outlines how BoFEP can move forward with the development of a Bay of Fundy EHI or report card.

2. WORKSHOP ATTENDEES:

Scott Kidd – BoFEP EHI Project Coordinator
Heather Breeze – DFO, EHI Project Steering Committee
Marianne Janowicz – BoFEP, EHI Project Steering Committee
Christine Tilburg – Ecosystem Indicators Partnership (ESIP), EHI Project Steering Committee
Peter Wells – BoFEP and Dalhousie University, EHI Project Steering Committee
Hugh Akagi – Passamaquoddy First Nation and BoFEP
Maria-Ines Buzeta
Blythe Chang – DFO
Karen Coombs – Govt. of N.B., Dept. of Agriculture, Aquaculture and Fisheries
Andrew Cooper – DFO
Jack Fife – DFO
John Hallen – NATech
Alex Hanke – DFO
Sharon M^{c}Gladdery – DFO
Gerhard Pohle – Huntsman Marine Science Centre
Amanda Smith – Sweeney International Mgmt. Corp.

3. OUTCOME OF THE WORKSHOP:

As will be discussed further below, at the end of the workshop it was proposed that the methodology of the Ocean Health Index (OHI) be tested by trying to develop an OHI score for the Southwest New Brunswick Bay of Fundy Marine Resources Planning Area. The Marine Resources Planning Area extends from the southwestern limits of the Saint John Harbour Authority to the U.S. border and from the high water mark to the mid-bay line between New Brunswick and Nova Scotia (for a map, see: http://www.bofmrp.ca/home/index.php/phase2/planning_area/). The development of an OHI score is data intensive and requires an understanding of community values. This area was chosen as a test case for a Bay of Fundy EHI for several reasons. First, the area was and is ecologically rich, which in turn fueled the founding of the St. Andrews Biological Station (SABS). In turn, because of the SABS, there is much more scientific data available for the Marine Planning Area compared to the rest of the Bay of Fundy. Another reason the Marine Planning Area was chosen as a test case was because the Southwest New Brunswick Marine Advisory Committee has determined, using various public participation methods, what are the community values (e.g., ecological, cultural, social, economic) in the area.

4. WORKSHOP MINUTES:

Introduction

- Marianne provided a brief background on BoFEP, the project, and the agenda and format of the workshop.
- Attendees introduced themselves.
- Scott briefly discussed what he believes is the "value of environmental health indexes or report cards". They: 1) Look at the state of a whole ecosystem, 2) Provide a baseline, 3) Synthesize data/information, 4) Set the agenda, 5) Are useful as a communication tool, 6) Poor scores or grades can act as a form of "shock and awe", thereby spurring action to address the poor score, and 7) Provide a target for management.
- Scott provided a brief background on the seven report cards and EHIs chosen as models for a potential Bay of Fundy EHI.
    1. Ocean Health Index (OHI)
    2. EPA National Coastal Condition Report IV (NCCR IV)

3. European Water Framework and Marine Strategy Framework Directives (EWF)
4. South East Queensland (Australia) Environmental Health Monitoring Program (EHMP)
5. Integration and Application Network Chesapeake Bay Report Card (Chesapeake Bay)
6. Australia State of the Environment (2011) – Marine Health: Example of an expert knowledge iterative process (AUS SOE)
7. Eastern Scotian Shelf Integrated Assessment (ESS IA)

- These seven examples were chosen because they provide a range of options. For example, the OHI provides an index score for the entire world's oceans, although it also has been used at a smaller scale to provide OHI scores for individual countries. It is data intensive and requires a lot of complex calculations. The NCCR IV includes coverage of the Northeastern U.S., allowing for comparisons between it and the Bay of Fundy. It does not require as much data as the OHI. The EWF uses more qualitative vs. quantitative descriptions of marine ecosystem health. How the EWF is actually being used is unclear. The EHMP is a long-standing, well respected report card system. One drawback to using the EHMP is that Moreton Bay, Australia is a much different marine system than the Bay of Fundy. The Chesapeake Bay report card uses very few indicators. Scott described this as being both an advantage and disadvantage. The AUS SOE is a qualitative assessment of marine ecosystem condition done through the polling of marine experts. While this process gets around issues of data availability and quality, Scott raised concerns about its repeatability. Finally, the ESS IA does not provide an index score. However, it was presented as an option for a different way to interpret and present data for the Bay of Fundy.
- More complete descriptions of the seven examples can be found in the BoFEP background report for the workshop.

<u>Question 1:</u> What do attendees believe are the general characteristics of a "good" index?

- Initial discussion focussed on whether an index for the Bay of Fundy should be made up of only <u>biological/ecological indicators</u> or should it include indicators that measure other aspects of sustainable development, e.g., <u>social, cultural, economic</u>. (*Supplementary note:* In answering Question 2, there was consensus that a Bay of Fundy EHI should calculate the physical/biological aspects of the score separately from the human/social aspects, and potentially combine them to make one index.)
  Points raised:
  - The Southwest NB Marine Advisory Committee includes social, cultural and economic values, in addition to ecological, when making recommendations regarding development in SW NB Marine Planning Area.
  - We choose indicators that evaluate the ecosystem services delivered by the Bay.
  - A Bay of Fundy Index should focus on ecological indicators. Some of these indicators will capture human use of the Bay, e.g., indicators dealing with fishing.
  - Social indicators are often good and bad at the same time. For example, one OHI indicator is tourism. A high score for tourism (good) often results in a poor score for coastal condition (bad).
  - It needs to be recognized that we are part of the ecology of the Bay.
  - Need a balanced approach with indicators that are relevant to people.
- There was discussion about some "over-arching" details of an index.
  Points raised:
  - In calculating an index score, a lack of monitoring/data should result in a poor score for an indicator.

    - Aggregation of individual indicator scores can be a problem—it can hide a really important high or low score for a particular indicator. (*Supplementary note:* The European Water Framework addresses this in part by basing its grade for the overall ecological status of a water body on the lower value of the water body`s biological or physico-chemical monitoring results.)
    - A good index is one that has a definition of "health".
    - Data used must have quality control, cover a time series, and be repeatable.
    - We need to look at the physical parameters of the Bay – they underpin everything else. For example, sea level changes impact other conditions in the Bay.
    - We should think of the index and indicators in terms of, "What do we need to know, what is changing, where is this change occurring, and what does this change mean?"
- Scott asked some specific questions about an index for the Bay of Fundy. There was agreement that the index needed to be:
    - Transparent: The public should be able to understand in general how the score/grade was determined and where the data came from. However, how the index score is calculated, i.e., the math used, or individual indicators are assessed, can be complicated. A good EHI for the Bay of Fundy should not be sacrificed because of a lack of simplicity.
    - Defensible: The elements that go into the calculation of the score should be based on evidence. However, any index needs to make it clear that there is a subjective element to the score. For example, what indicators are measured, what weight you assign to each indicator in calculating the index score, what are the threshold levels, and what makes a score an A vs. B or C, are all subjective decisions (although they are typically based upon expert opinion).
    - One final score for the Bay: The group agreed this was a good idea, but that it should allow for different regions within the Bay to calculate their own score.
    - Practical: There was a general agreement that not all the data/information we might want for the whole Bay or regions of the Bay is available.

Question 2: Based on the seven examples of marine report cards and EHIs presented to workshop attendees, is there a preferred index for the Bay? Why? What is appealing about that index? What is not "good" about the other indexes (perceived shortcomings).

- Scott was asked which example he thought was most amenable to being used in the Bay of Fundy. He answered that it was the method used in the US EPA's National Coastal Condition Reports because of ecological similarity of US Northeast coast to Bay of Fundy, and data used to calculate NCCR scores was available for Bay of Fundy.
    - Subsequent discussion detailed there is significant subjectivity in the NCCR grades (what score = good, fair, poor) and that not all the data needed for an NCCR grade for the Bay of Fundy is available.
    - Concerns were raised about the OHI placing too much weight on human use of a marine ecosystem.
- Any example chosen would likely require some modification to address local conditions and values, and availability of data.
- There is more data for the region near the St. Andrews Biological Station.
- Concern was raised about the "snapshot" aspect of a first report card. How do we make comparisons to past conditions? Has the condition of the Bay improved or worsened?
- At the end of the discussion of question 2, there was consensus that:
    - Because of problems of repeatability, the AUS SOE method not be used as a model.

- The Southwest New Brunswick Marine Resources Planning Area be used as a test case for any model chosen.
- A Bay of Fundy EHI should calculate the physical/biological aspects of the score separately from the human/social aspects, and potentially combine them to make one index.

Question 3: If there is a preferred index, are there indicators that need to be added or subtracted?

- The group discussed indicators not listed in ESIP or the State of the Gulf Reports that they would like considered in future discussions (see BoFEP background report for the workshop for a list of these indicators). (*Supplementary note:* More work needs to be done to review the relevance of these indicators for the Bay of Fundy.)
  - sea turtles
  - sea and shorebirds
  - zooplankton – changes in timing of population events
  - iconic species, e.g., whales
  - herring
  - temperature and salinity
  - contaminants
  - accurately measuring invasive species
  - (*Supplementary note:* UNESCO is developing a list of Essential Ocean Variables (EOVs). See "A Framework for Ocean Observing" at: http://unesdoc.unesco.org/images/0021/002112/211260e.pdf.)
- Be practical, use indicators with data, but should also make it clear what other data are needed to make the EHI more complete.
- Discussion returned to the issue of what are indicators measuring and what is EHI describing.
  - Are we talking about the state of the system vs. health of the system?
- BoFEP should report on overall "health" of the Bay. Governments report on the status of various indicators, which is not the same thing.
- Consensus: Concerns were raised about using the word "health" – what does it mean? It was determined that this is not a good term for BoFEP to use. Should consider using words/terms such as, "Index, Condition, Status, Quality, Ecological Integrity". Whatever word used must be clearly understandable to the public, as one of the purposes of an environmental index/report card is to be a public communications tool.

Question 4: If there is not a preferred index, what are the components (anything in addition to the list generated by Question 1) and indicators that are required?

- The SW NB Marine Advisory Council has done a lot of work in determining the community's ecological, social, cultural, and economic values for the SW Bay of Fundy Marine Resources Planning Area.
  - See: http://www.bofmrp.ca/home/images/uploads/Community%20Value%20Criteria%20Table.pdf
- Scott raised the point that any index or report card uses threshold values to determine the status of an indicator. (For example, the NCCR IV thresholds for the Northeast Coast indicator "dissolved inorganic nitrogen" were: < 0.1 mg/L (good); 0.1—0.5 mg/L (fair); > 0.5 mg/L (poor).) He asked the group how thresholds should be approached.
  Points raised:

- Thresholds need to be sensitive to broadscale changes.
- They need to represent what is outside natural variability or statistically expected.
- Where possible, they should be based on existing guidelines, such as those of Health Canada or Canadian Council of Ministers of the Environment (CCME), DFO fisheries measurements, and US EPA guidelines, as well as guidelines from peer reviewed literature and those used in other indexes.
- Don't forget about questions of scale – different data are collected for different purposes and areas.

5. CONCLUSION

- Although not a planned outcome of the workshop, the attendees coalesced around the recommendation that as a test case, the methodology of the Ocean Health Index (OHI) be used to develop an OHI score for the Southwest New Brunswick Bay of Fundy Marine Planning Area.
  - The OHI was seen as an attractive example because:
    - It has received the support of big players such as UNEP (UN Environment Programme) and NOAA (National Oceanic and Atmospheric Administration).
    - It has scientific rigour (published in journal Nature).
    - There are ongoing efforts to use the OHI for smaller regions.
    - It uses social and ecological indicators.
    - There is an OHI score for Canada, so data must exist.
    - BoFEP has links to some individuals involved in developing the OHI.
- In using the OHI, some questions to be addressed include:
  - How fully does it touch on the biotic aspect of the Bay of Fundy?
  - What happens when you remove some layers?
  - Can you separate out social indicators?
  - Perhaps only tackle one or two of the OHI goals at this time.

6. NEXT STEPS

- Scott would send out minutes of workshop. Attendees would review and provide clarification where necessary.
- A call for the establishment of a working group to implement the OHI test case. This would be done after attendees and others view some videos that describe the OHI. They can be found at:
  - AAAS 2012 Presentation Ben Halpern: Assessing the Health of the World's Oceans (http://vimeo.com/47266403)
  - OHI Methodology (http://vimeo.com/47257137)
  - AAAS 2012 Presentation Karen McLeod: From Metaphor to Measurement (http://vimeo.com/47266404)
  - AAAS 2012 Presentation Catherine Longo: Flexible Applications of the Ocean Health Index (http://vimeo.com/47266407)
  - AAAS 2012 Presentation Jameal Samhouri: Reference Points for Ocean Health (http://vimeo.com/47266406)
  - AAAS 2012 Presentation Heather Leslie: Applying Knowledge of Human-Ocean Connections at the Local Scale (http://vimeo.com/47266408)
  - The Ocean Health Index website is: http://www.oceanhealthindex.org/
  - OHI method papers can be accessed at: https://www.adrive.com/public/FxScxz/OHI-Paper