

Developing Indicators for the Bay of Fundy to Long Island Sound

1. Regional indicators

Regional indicators are used to summarize complex coastal and marine information into a simplified and useful manner without compromising the integrity of the source data. We envision they will serve as "vital signs" and be used to communicate the status and trends of the region's coastal area.

Our request

Based on your knowledge of the local issues and indicators in your area, we are asking you to comment on (1) the leading management issues and (2) potential indicators that could answer questions from leading management issues. We will use the results of this web survey to develop a set of indicators relevant to the coastal area of the northeastern Atlantic region between the Bay of Fundy and Long Island Sound. The results of this survey will be discussed at a workshop in Durham, New Hampshire on January 6-8, 2004. (You can indicate below if you would like to receive the results of this survey or learn more about the workshop.)

1. Leading management issues

Based on your local knowledge, please indicate how important these issues are to you.

	Very Important	Important	Somewhat Important	Not Important
Health of fisheries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contaminants in the food chain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effects of coastal eutrophication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effects of coastal development and land use change on the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human effects on aquatic habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change on the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. If you checked "Other", please specify the issue here.

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2. Tell Us About Yourself

We would appreciate it if you would complete the following questions so we have an understanding of whom has completed the survey. All personal information will only be used for this effort and related workshops to this effort.

4. Jurisdiction

- Massachusetts
- New Brunswick
- Nova Scotia
- Rhode Island
- Maine
- Connecticut
- New York
- New Hampshire
- Other (please specify)

5. Name

6. E-mail

7. Scale at which you are working

- Harbor
- Estuary
- Embayment
- Open Coastal Waters
- Other (please specify)

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8. Self-description

	Public	Private	Non-governmental	Citizen
Manager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy-maker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scientist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Address (optional) If you would like to receive written materials on upcoming workshops, please complete the following

9. Street Address

10. City

11. Jurisdiction/State

12. Zip Code

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3. Issue Areas

The remaining survey questions are divided into 6 sections, each section corresponding to one of the following issues areas: fisheries, contaminants, eutrophication, land use change, aquatic habitat, and climate change.

Select an issue area for which you are familiar. When you complete a section, you will be returned to this page, where you can select another issue area. When you have completed all issue areas for which you are familiar, select -- Finish Survey --.

After making your selection, click Next.

*** 13. Select an issue area for which you are familiar and then click Next.**

When finished, select --Finish Survey --.

- Fisheries
- Contaminants
- Eutrophication
- Coastal Development
- Marine Aquatic Habitat
- Climate Change
- Finish Survey --

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5. Fisheries

Productive fisheries stocks are of vital ecological and economic importance to the northeast U.S. and eastern Canada. Throughout the last several decades, increased efforts to catch commercially and recreationally important fish have caused several species to be overexploited. Moreover, changes in regional ecosystems have caused changes in the types of species found in several areas. As a result people are concerned about the sustainability of marine fish and shellfish populations.

14. How important are the following fisheries issues are?

	Very Important	Important	Somewhat Important	Not Important
The levels of commercial and recreational fish stocks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in species composition and biomass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fish harvesting practices on non-target species and habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Affect of changing fish stocks on coastal communities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Suggested Additional Fisheries Issues:

- a.
- b.
- c.

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16. How useful are the following themes in communicating the status and trends of the fishery?

	Very Useful	Useful	Somewhat Useful	Not Useful
Populations of harvested species	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Status of commercial finfish stocks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Status of lobster stocks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Status of forage fish species abundance/distribution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Increase/decrease in species diversity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commercial by-catch of non-target fish species and protected resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Value of commercial landings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Days fished by commercial/recreational vessels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catch per unit effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Direct recreational fishing expenditures/multiplier effect in the regional economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gear deployment information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relative fish abundance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bottom type	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shellfish landings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miles of stream open to fish migration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Economic contribution of fisheries and related industries in coastal communities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Suggested Additional Fisheries Themes:

a.

b.

c.

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7. Contaminants

Contamination in the world's oceans, rivers, estuaries, groundwater, soil, sediment, and air threatens plants, animals, and the safety of our food supply and clean water. It also may impact the economy, tourism, aquatic and upland habitat and the biological integrity of many marine species. Contaminants of concern can be biological, such as bacteria, which have been cited as the main cause for beach closures (US EPA, 2001) or chemical, such as metals or organic chemicals (e.g., PCBs, PAHs). Many organic chemicals are readily taken up by animals and concentrate at the top of the food chain. Although metals occur naturally in the environment, high concentrations of some metals (e.g., mercury) in fish have resulted in advisories recommending limited consumption of a number of fish species.

18. How important are the following contaminant issues?

	Very Important	Important	Somewhat Important	Not Important
Extent of contamination in the marine environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lethal and sub-lethal effects of contaminants on fisheries and people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in the sources of contaminants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fate and transport of contaminants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Suggested Additional Contaminant Issues:

- a.
- b.
- c.

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20. How useful are the following themes in communicating the status and trends of contaminants?

	Very Useful	Useful	Somewhat Useful	Not Useful
Sediment and water contamination levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tissue contamination levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• clams & mussels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• marine birds and mammals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shellfish acreage closed to harvesting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bathing beach closures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loading of contaminants to the marine environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• atmospheric	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• land-based	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. Suggested Additional Contaminant Themes:

- a.
- b.
- c.

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6. Eutrophication

Nutrient pollution is an important threat to coastal water quality. Sources of nutrients include atmospheric, groundwater, point and non-point with potential consequences ranging from ecological changes to socio-economic impairments (e.g. fisheries), to serious human health threats. The primary impact of nutrient pollution is eutrophication.

Symptoms of eutrophication include low dissolved oxygen, excessive and unsightly algal blooms, and losses of submerged aquatic plants that serve as habitat for coastal fisheries. These impacts cause economic losses to tourism, and to commercial and recreational fisheries. Additionally, weakening or destroying native flora and fauna provides the opportunity for colonization by invasive species.

22. How important are the following eutrophication issues?

	Very Important	Important	Somewhat Important	Not Important
Extent of eutrophication in the region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rate of eutrophication in the region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect of eutrophication on human use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect of eutrophication on the marine ecosystem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Major sources of nutrients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concern for potential eutrophication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23. Suggested Additional Eutrophication Issues:

- a.
- b.
- c.

24. How useful are the following themes in communicating the status and trends of eutrophication?

	Very Useful	Useful	Somewhat Useful	Not Useful
Macroalgal abundance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Epiphyte abundance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Presence of harmful algae	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dissolved oxygen levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Chlorophyll A concentrations



Nutrient concentrations



Nutrient loading



Change in SAV abundance



25. Suggested Additional Eutrophication Themes:

a.

b.

c.

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7. Coastal Development

Coastal development and the affects of land use change on coastal and marine ecosystems are having long-term effects. Issues of primary concern include increasing impervious surfaces (leading to increased runoff of chemicals and other materials); alterations to hydrology; habitat fragmentation; loss of coastal wetlands, salt marsh, and riparian buffers; sedimentation/siltation; habitat loss (rate and location); and urbanization/human population shifts.

26. How important are the following coastal development issues?

	Very Important	Important	Somewhat Important	Not Important
Changes in land cover	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect of land use change on terrestrial habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect of fragmentation on priority species	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in water quality and hydrology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

27. Suggested Additional Coastal Development Issues:

-
-
-

28. How useful are the following themes in communicating the status and trends of coastal development?

	Very Useful	Useful	Somewhat Useful	Not Useful
Aerial extent of priority terrestrial habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Status of wildlife species	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Status of threatened or endangered plant and animal species	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land Conversion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Acreage of large undeveloped blocks remaining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Acreage of farmland conversion to urban uses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• Acreage of undeveloped land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Vehicle miles traveled

Acreage of land protected/conserved

Trends in impervious surfaces coverage

Demographics (by watershed): changes in population density

Housing starts

29. Suggested Additional Coastal Development Themes:

a.

b.

c.

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8. Marine Aquatic Habitat

Along our shorelines is a variety of aquatic habitats including intertidal zones (salt marshes, seagrass and seaweed beds, rocky shores) and subtidal zones (deep ocean benthic habitat, reefs, oyster beds, hard bottoms) (US EPA, 2001). These areas are some of the most ecologically dynamic and productive zones of the region. For example, salt marshes, submerged seaweed and seagrass beds, and rocky barrier islands enhance the productivity of nearshore and estuarine waters. Many fish and shellfish species rely on a variety of nearshore aquatic habitats including salt marsh plants, seagrasses, and seaweeds for spawning and shelter for juveniles. A diverse and healthy marine aquatic habitat that includes riverine pathways, nurseries, and breeding grounds is important in the survival of aquatic populations and is a distinct and essential component of the overall ecology.

30. How important are the following marine aquatic habitat issues?

	Very Important	Important	Somewhat Important	Not Important
Changes in the extent and quality of submerged aquatic vegetation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in the extent and quality of coastal and tidal wetlands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coastal armoring and sediment management practices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Type, location and effects of restoration activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in sediment character and quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health and diversity of aquatic habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. Suggested Additional Marine Aquatic Habitat Issues:

- a.
- b.
- c.

32. How useful are the following themes in communicating the status and trends of marine aquatic habitats?

	Very Useful	Useful	Somewhat Useful	Not Useful
Water quality (temperature, salinity, dissolved oxygen, light transmissivity,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

turbidity)

Extent and distribution of various benthic habitats (e.g., eel grass, wetlands)



Extent and location of non-native species



Shoreline armoring and sediment movement



Biodiversity index



33. Suggested Additional Marine Aquatic Habitat Themes:

a.

b.

c.

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9. Climate Change

Many human activities including deforestation and the burning of coal, oil, and natural gas have contributed to an increased accumulation of greenhouse gases such as carbon dioxide and methane. This results in an overall warming of the Earth or portions of it. The potential consequences of this warming (e.g., melting of the polar icecaps and resulting sea level rise, increased water and air temperatures) affect the overall ecosystem of our region. Concerns have been raised regarding the effects of temperature on biodiversity, extreme climactic events, sea level rise; changes in weather patterns affecting hydrology and freshwater inputs; and impacts on coastal wetlands and infrastructure.

34. How important are the following climate change issues?

	Very Important	Important	Somewhat Important	Not Important
Effect of climate change and changing weather patterns on hydrology and fresh water inputs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect on biodiversity related to water temperatures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate-related regime shifts in biota	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effect of sea level rise and changing weather patterns on coastal infrastructure & erosion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

35. Suggested Additional Climate Change Issues:

-
-
-

36. How useful are the following themes in communicating the status and trends of climate change?

	Very Useful	Useful	Somewhat Useful	Not Useful
Rate of sea level rise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Species at risk with changes in climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of extreme storm events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Biodiversity index	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Days with unhealthy levels of ozone pollution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appearance of sentinel species tied to seasonal climate changes

37. Suggested Additional Climate Change Themes:

- a.
- b.
- c.

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10. End of Survey

Thank you for completing this survey. We will analyze the responses in January and notify you of the results via e-mail if you would like. These results will also be discussed at the January indicators workshop in Durham, NH.

Yes, please send me the results of this survey via e-mail.