EcoSystem Indicator Partnership

Information on change in the Gulf of Maine

Working Together for a Healthy Gulf

What is the EcoSystem Indicator Partnership (ESIP)?

The EcoSystem Indicator Partnership (ESIP), a committee of the Gulf of Maine Council on the Marine Environment (GOMC), was formed to help assess the health of the Gulf of Maine through the use of indicators. ESIP was created out of an identified need to better understand and convey information on the status and trends in the Gulf of Maine ecosystem and the impacts of human use.

Through collaboration with regional experts from local, state, provincial and federal governments, along with academia and members of non-government organizations, ESIP has developed a suite of indicators to scientifically assess changes in the ecosystem. ESIP's initial focus has been on identifying and compiling data for key indicators under seven themes:

- Aquaculture
- Aquatic habitats
- Climate change
- Coastal development
- Contaminants
- Eutrophication
- Fisheries

ESIP also shares information on ecosystem health and monitoring efforts, and raises awareness of indicators. ESIP also provides integrated indicator data via a web-based Indicator Reporting Tool to make the information more easily accessible for practitioners and decision-makers.


Cape Enrage, Bay of Fundy, Nova Scotia

Photo: Rachel Stinson


Harriman Cove, Penobscot River Estuary, Maine

Photo: Sophie Pelletis


Flooding in Saco, Maine

Photo: Stephen N. Dickson, Maine Geological Survey

Generating Knowledge – Ecosystem Indicators

Ecosystem indicators are a mechanism to characterize and convey information on;

- status and trends in the health of the ecosystem;
- cause and effect relationships between uses, practices, and management measures; and,
- effectiveness of management measures.

For ESIP, ecosystem indicators provide a way to understand and assess the general health of the Gulf of Maine ecosystem by looking at key components of the ecosystem rather than by trying to understand and assess every possible component. Using ecosystem indicators also provides a mechanism to convey this information in terms that can be understood and used by scientists, practitioners, or decision-makers.

ESIP 1.0 – Identification and Compilation of Data for Priority Indicators

In 2009, ESIP concluded a thorough investigation and process to select twenty-one priority indicators under its seven indicator themes. The process began with long lists of potential indicators, which were then reviewed and assessed against criteria such as scientific validity, responsiveness to change, cause and effect relationship, regional comparability, and availability of data. These twenty-one priority indicators formed the important first step toward assessing the overall health of the Gulf of Maine ecosystem. The collection and compilation of the indicator data also provided the first attempt to address highly complex interactions among different time scales, geographic scales, data collection methods, and data quality for comparison across the Gulf of Maine.

ESIP itself does not conduct monitoring but relies heavily on data collected from partners and other organizations throughout the Gulf of Maine. Through a concentrated effort on the part of ESIP's members and partners, data collection and initial analysis of the data has been completed for nearly all of the priority indicators. ESIP has also facilitated a number of opportunities for data collection (e.g. impervious surface, lobster settlement, nearshore temperature) that will help to improve regional knowledge of components influencing overall health of the Gulf of Maine ecosystem, as well as address some identified indicator data gaps.

ESIP 2.0 – A Holistic Approach to Assessing Ecological Integrity

As ESIP 1.0 nears completion, efforts now turn to the next phase. ESIP 2.0 will include a review of the previous lists of potential indicators, as well as identification of new indicators that could assess and track emerging issues, to further enhance our understanding of the Gulf of Maine ecosystem. Recognizing that ecosystem function and health is a complex interaction of ecosystem components, ESIP 2.0 will also look at indicators that facilitate a more holistic approach to assessing ecological integrity from a more systems-based approach and cross-indicator synthesis.

Cross-Indicator Synthesis: Estuarine Condition

Estuarine condition is a function of the geophysical nature of the estuary, the larger ocean and atmosphere, and the upstream watershed. To fully understand and predict how an estuary will respond to drivers and pressures, each compartment must be characterized. For example, eutrophication and associated habitat effects are generally well known. What is less understood is how the magnitude and spatial characteristics of watersheds affect estuarine condition.

Working with the Environmental Protection Agency's Office of Research and Development's Safe and Sustainable Water Research Program, data derived from ESIP's indicator program and other sources will be used to develop relationships between;

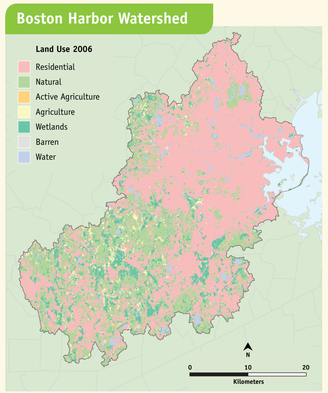
- the magnitude of watershed characteristics (e.g., land use indicators);
- the spatial distribution of watershed characteristics (e.g., location of land use); and,
- the magnitude of estuarine state and/or impact indicators (e.g., chl-*a*, seagrass extent).

This research will utilize a design based on a gradient of watershed drivers and pressures that hypothetically will affect the associated estuaries being studied. A subset of these watershed-estuary systems will be in the category of lesser impact and perhaps reference or normative condition (i.e., healthy in the sense of EPA's Healthy Watersheds Initiative). Thus, it will be possible to develop the levels of various watershed characteristics that comprise those watershed-estuary systems that have the highest integrity.

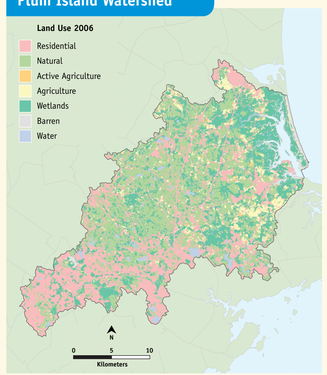
Priority Indicators

Indicator Theme	Priority Indicators	Status of Data
Aquaculture	• The economic value of aquaculture • Acres of permitted aquaculture	Completed
Aquatic Habitats	• Extent of eelgrass • Extent of salt marsh • Locations of tidal restrictions	Completed
Climate Change	• Sea level • Precipitation trends and anomalies • Air temperature trends and anomalies	Completed
Coastal Development	• Point sources • Population density • Employment density • Impervious surface coverage	Completed
Contaminants	• Chemical contaminants in mussels • Shellfish beds approved for harvesting • Sediment contaminants and toxicity	Completed
Eutrophication	• Nitrogen and phosphorus loading • Water clarity • Dissolved oxygen • Chlorophyll *a*	Completed
Fisheries	• Ocean jobs • Dominant species metric	Being analyzed

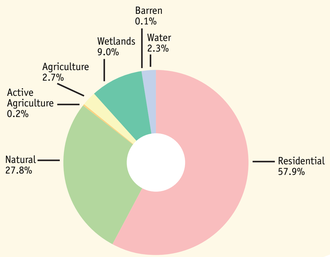
Boston Harbor Watershed



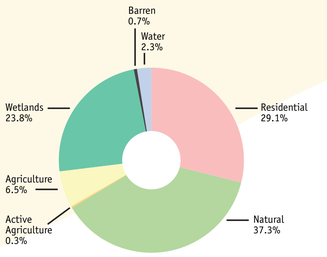
Plum Island Watershed



Boston Harbor Land Magnitude



Plum Island Land Magnitude



Information Use and Accessibility – ESIP's Tool Box

Practitioners and decision-makers receive and use information in different ways. Recognizing these different needs, ESIP employs a number of different techniques, from print to virtual, for conveying information and providing access to indicator data. This approach provides multiple avenues for users to obtain information and data on the status trends of ecosystem conditions in the Gulf of Maine.

Journal

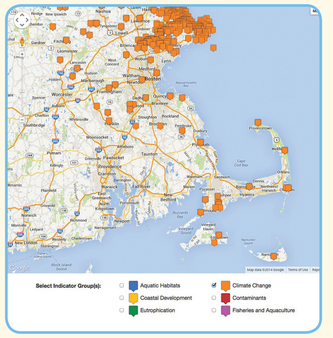
Published regularly on ESIP's website, the journal highlights current activities in the Gulf of Maine. The articles, submitted by scientists, practitioners, and decision-makers working in the region, feature information on current research, programs, project results, and events that help to better understand and address ecosystem health in the Gulf of Maine.

Fact Sheets

Published once data compilation and analysis for an indicator theme is complete, the fact sheets provide an introduction to each of the indicators selected by ESIP along with a snap shot of the current indicator data. Currently fact sheets have been produced for: aquaculture, aquatic habitats, climate change, contaminants (this one will be ready in June), and eutrophication.

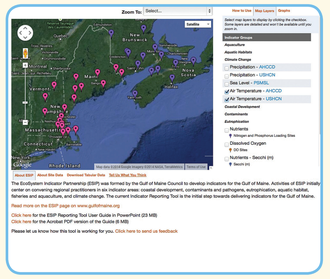
Monitoring Map

Available online, the Monitoring Map uses Google Earth to display information on the location and effort for known monitoring locations in the Gulf of Maine related to ESIP's current indicators. The map also provides information on where the user can locate the actual data. Other features include allowing users to locate monitoring sites in close proximity to areas of their own interest.



ESIP's Indicator Reporting Tool

This innovative on line tool allows a user to easily locate and graph datasets from multiple organizations enabling the users to compare indicators across the Gulf of Maine. Data can be displayed on a map and a graphic function enables the status and trends of indicator data to be displayed spatially or temporally. Other features include datasets and layers that can be downloaded.



For more information, or to download these ESIP products, please visit **www.gulfofmaine.org/esip**.

ESIP always welcomes new members to our work. If you would like to participate or contribute to ESIP you can;

- join a subcommittee;
- provide information on your monitoring activities;
- provide data for ESIP indicators;
- submit a journal article; and,
- direct your colleagues to ESIP.

Gulf of Maine

The Gulf of Maine is a world-class natural wonder shared by Nova Scotia, New Brunswick, Maine, New Hampshire, and Massachusetts. It encompasses a marine area of 93,000 km² (36,000 sq. mi.) and the adjoining watershed draining into the Gulf covers approximately 179,000 km² (69,000 sq. mi.). Over 10 million people live within the Gulf of Maine region, with over two-thirds along the coastline. Ocean sector activities, such as extraction of living resources, marine construction, marine transportation, offshore mineral resources, ship building, and tourism and recreation, provide an estimated $15 billion to provincial and state economies in the Gulf of Maine. The Gulf of Maine is one of the world's most biologically productive ecosystems. Land and ocean processes interact to regulate temperatures and create a marine region rich with nutrients whose waters and shoreline habitats host some 2,000 species of plants and animals.

The Gulf of Maine Council on the Marine Environment

The Gulf of Maine Council on the Marine Environment (GOMC) was established in 1989 by the governments of Nova Scotia, New Brunswick, Maine, New Hampshire, and Massachusetts to foster cooperative planning and actions within the Gulf of Maine watershed. It is a cooperative effort of the Canadian and US federal governments, two provincial and three state governments, academic institutions, non-government organization, and private sector organizations. For nearly 25 years, the GOMC has been working collectively to maintain and enhance environmental quality in the Gulf of Maine to allow for sustainable resource use by existing and future generations.

Every five years, the Gulf of Maine Council on the Marine Environment renews its commitment to working together and develops an action plan to help address the Gulf's most pressing issues that require a unified, regional response.

The current 2012–2017 Action Plan identifies three broad goals:

1. Restore and conserve habitat
2. Environmental and human health
3. Sustainable communities

ESIP is a cross-cutting committee of the Gulf of Maine Council on the Marine Environment, and as such, supports objectives and activities under all three goals. ESIP also works closely with other GOMC committees, including Gulfwatch, the Climate Network and the State of the Gulf of Maine Report, to share and convey information.

For more information on the GOMC please visit **www.gulfofmaine.org**.

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