

# Data Sharing and Management

## A convergence of science, technology and policy promises a new view of the Gulf

By Peter H. Taylor

I live along the Maine coast in a house overlooking a tidal inlet that connects circuitously to the Gulf of Maine. At the edge of my property, a roadside drainage swale collects runoff and carries the water from the surrounding lawns and wooded areas into the inlet. Although some of the homes in my neighborhood have stood here for a century or more, people are building new houses and our small town is pressured by suburbanization. It makes me wonder about the potential effects on our coastal and marine habitats.

My neighborhood (like many neighborhoods) can be seen as a microcosm of the Gulf of Maine region in terms of the challenges of environmental management. The watershed drained by our humble swale covers only four or five acres. Even so, if one wanted to determine the amounts and sources of pollutants—such as fertilizers, sediments and pesticides—entering the swale and tidal inlet, a sizable investment in data collection and analysis would be required. To assess the effects of land use on wildlife and ecosystem processes, additional research would be needed. Addressing environmental problems would require the participation of several landowners, each with their own priorities and needs.

Now scale up to 350,000 square kilometers—the approximate area of the Gulf of Maine and its watershed—spanning federal, state and provincial jurisdictions. The hurdles in studying and managing such a large ecosystem are obvious, but in some ways the issues and challenges are the same as those in my neighborhood's little watershed and inlet. How can we determine the environmental problems and priorities? How can the needs, interests and priorities of diverse landholders or jurisdictions come together to make environmental progress? How do we know if we're making progress over time? In the past, management efforts have tended to focus on parts of the Gulf of Maine region, rather than the entire ecosystem. Now, however, effective management of large marine ecosystems is emerging as an attainable goal, made possible by an unprecedented confluence of policy initiatives and scientific advances.

Last year, the independent, non-partisan Pew Oceans Commission issued a report calling for a new, coherent U.S. ocean policy that would encompass sustainable ecosystem management, more funding for management and research

and a reorganized governance structure for the nation's ocean waters. Notably, the Commission recommended watersheds and large marine ecosystems, not politically defined jurisdictions, as fundamental units for management. Likewise, the U.S. Commission on Ocean Policy has been working since 2001 to develop recommendations to the President and Congress for a comprehensive national ocean policy. Across the border, the Canadian government in 2002 released its Oceans Strategy, a national framework for protection and sustainable use of the marine environment. These major initiatives indicate a general shift in thinking about our relationship with the ocean and a trend to revamp marine management.

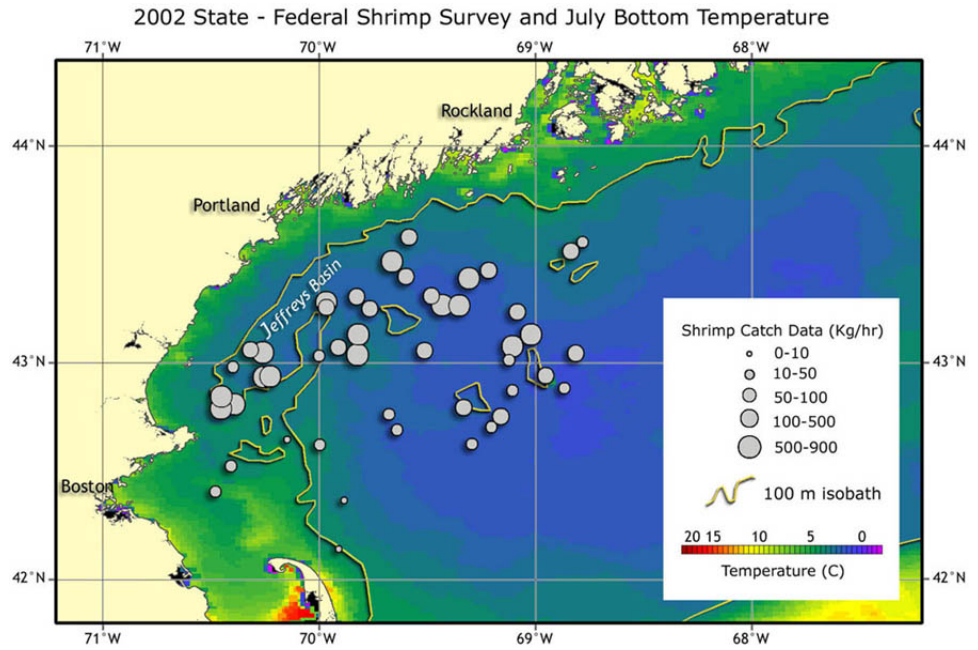
A core constraint for understanding and managing the oceans on a regional scale has been information: collection of data for research and monitoring; data sharing, integration and analysis; and regional exchange of findings and management solutions. These challenges are magnified by the geographic size and ecological complexity of a system like the Gulf of Maine. A glance around my neighborhood can indicate something about its land use patterns (loss of woodlands to residential development) and ecosystem health (lobsters, snails, fish, seals, ducks and occasionally bald eagles live and feed here, suggesting a reasonably healthy ecosystem). It is much harder to obtain such a perspective on the entire Gulf of Maine region that is comprehensive and accurate enough to guide management actions.

The Gulf of Maine lends itself to regional scale, ecosystem management because it is clearly defined geographically, oceanographically and ecologically. Recently, a surge of technological initiatives and regional cooperative efforts seems likely to make ecosystem-level management of the Gulf more feasible. While each has its own merit, the fact that all of these efforts are developing at the same time offers the potential for an integrated understanding of the Gulf of Maine ecosystem from seafloor habitats to oceanography to freshwater streams. The following are examples of programs that could weave together to facilitate this larger understanding.

- Oceanographic data—Since 2001, the Gulf of Maine Ocean Observing System has collected hourly oceano-



This map brings together shrimp survey data from NOAA's Northeast Fisheries Science Center with computer-model simulated water temperatures provided by Huijie Xue of GoMOOS and the University of Maine School of Marine Sciences. The map suggests the relationship of summertime shrimp abundance and distribution to bottom temperature and seafloor topography. This example indicates the potential for integration and sharing of environmental and ecological data to facilitate better understanding of the Gulf of Maine ecosystem. Map by Chris Brehme, Island Institute



graphic data from buoys around the Gulf and provided the data on its Web site.

- Seafloor mapping—The Gulf of Maine Mapping Initiative has begun to image the topography and habitats of the Gulf's seafloor, using high-resolution multibeam sonar and other methods.
- Biology—The Census of Marine Life Gulf of Maine Area Program is advancing knowledge of biodiversity and ecological processes from microbes to top predators to facilitate ecosystem-based management.
- Coastal monitoring—The Northeast Coastal Indicators Workshop in January signaled the latest step in multi-agency efforts to establish a coastal environmental monitoring network from Long Island Sound to the Gulf of Maine. In a related project, the Gulf of Maine Council's Environmental Quality Monitoring Committee is compiling an inventory of monitoring programs in the region that will facilitate networking. The Council's Gulfwatch monitoring program provides data on contaminants along the entire coastline of the Gulf.
- Watershed monitoring—The Gulf of Maine Watershed Information and Characterization System offers online data and tools for characterizing freshwater systems in the region.
- Data sharing—The Gulf of Maine Data Framework will provide a common system for sharing spatial data among organizations across the U.S.-Canadian border. The Gulf of Maine Biogeographic Information System is a collaborative project to provide biological and biogeographical data for research, management and education.
- State of the Gulf—The Gulf of Maine Summit in October will use a broad-based process to assess the

health of the Gulf of Maine ecosystem and produce a State of the Gulf report.

- Training—The new Coastal Training Program of the National Estuarine Research Reserve System provides skill-building opportunities to municipal officials and other people who make decisions affecting coastal resources.
- Information synthesis—The Gulf of Maine Council's Science Translation Project provides up-to-date scientific information on key issues for coastal decision-makers at the state, provincial and federal levels.

Over time, these complementary Gulf-wide programs could lead to an unprecedented base of information on the biology, ecology, oceanography, geology and pollution of the Gulf of Maine and its watershed. Like never before, the information—coupled with numerous other efforts such as local water-quality monitoring groups, Sea Grant, National Estuary Program, and the U.S. GLOBEC Georges Bank Program—will enable us to understand and manage the Gulf of Maine as an ecosystem. One significant challenge will be to develop effective ways of integrating and communicating findings as useful information for regional management responses. It is fascinating to think how this convergence of science, technology, policy and communications could fuel the evolution of marine ecosystem management over the coming decades. Perhaps someday, the task of analyzing the Gulf of Maine ecosystem will seem almost as easy as glancing around my neighborhood.

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