

Tacking Great Bay's Vital Signs

Each day we interpret bottom-line indicators of status or condition that help us make good decisions and alert us to problems relevant to our lives and society. Outdoor temperature indicates how hot or cold it is, and we respond with our selection of clothing, deciding that maybe it's not the best day for the beach, and perhaps cover up the tomatoes against frost. We also look at indicators for explanations of how things are going – economic (stock market) and health (flu incidence) indicators help steer us toward prosperity and good health.

We effortlessly process these and a myriad of other familiar statistics that represent an enormously complex interplay of technology, society, economy and the ecosystem surrounding us without being specialists. This positions us to reap and sustain the rewards of a healthy lifestyle, vibrant economy and an abundance of natural resources. Much like a report card charting our individual and collective progress towards goals, indicators alert us to looming threats and deficiencies that direct our actions, thus allowing us to improve our condition.

But, how do we know the correct course of action in response to an indicator? Indicators do improve our understanding of condition of human structures (gross domestic product indicates economic health) as well as natural systems (eelgrass acreage indicates Great Bay's health). If our actions are to improve condition, we also need to link cause with condition, and to choose an appropriate remedy. How do we correct the economic decline? What actions do we take to restore eelgrass?

Scientists often simplify environmental problems and solutions using three types of indicators: *pressure*, *state* and *response*. To illustrate, consider: Increased junk food consumption causes weight gain that impacts human

health. This example identifies a health problem using a measurable indicator of State or *condition* – body weight and compromised health. It also identifies one possible cause of the problem, or *pressure* – empty calories consumed from junk food. If the link between junk food calories and poor health is strong amidst multiple possibilities, the action or *response* – eat less junk food. Research and life experiences might suggest other linkages, such as poor overall diet and a sedentary lifestyle. This would lead to a better but more complex *response* – diet and exercise.

Scientists and managers struggle with ways to present indicators that accurately reflect condition in a socio-economic context and effectively guide and motivate the public and policymakers to take appropriate action. Accurate assessments of State are abundant but their link to causative Pressures can be uncertain leading to controversy over Responses with no consensus on the best course of action. Concessions are often made based on conflicting priorities or perceptions among economics, public fears and desires and environmental benefits.

Great Bay's environmental health is not exempt from these imperfections of scientific understanding and human process. Indeed, there are no perfect indicators or benchmarks that effectively and fully capture the interplay of the physical, chemical and biological alterations we unavoidably and pervasively make in Great Bay and its watershed. If ecosystems least impacted by humans are the ideal, then the management benchmarks, goals and criteria we set involve some compromise to accommodate our societal and economic needs.

Researchers, managers and the public enjoined in the Piscataqua Regional Estuaries Partnership (PREP) are updating environmental indicators

Want to know the latest on the condition of Great Bay?

Stay tuned for the Piscataqua Region 2013 *State of Our Estuaries* report. The PREP is part of the EPA's National Estuary Program, established under the Clean Water Act to protect and enhance nationally significant estuarine resources. The Great Bay NERR boundary sits right inside the PREP boundary and, as close partners, we work together to advance our common interest in the health of Great Bay. Every three years PREP publishes a *State of Our Estuaries* report that describes the trends of key environmental indicators in this region based on the latest available science. Keep an eye out for the 2013 *State of Our Estuaries* report in this fall and stay tuned to StateOfOurEstuaries.org for information on the events surrounding the report's release.

for our estuaries and their contributing watersheds. Assurance of “good science” is fundamental to the accuracy and objectivity of State indicators. More difficult are setting benchmarks that define estuarine health and the management actions we must take, especially if constrained by economic and technical capabilities. Everyone's input is needed to ensure an outcome that balances the health of our estuaries with the environmental services we all depend upon and enjoy.

Paul Stacey
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Giving our Rivers a Helping Hand

"The care of rivers is not a question of rivers, but of the human heart."

Here at the Center one of the first things our visitors see is the quote on the wall that defines an estuary. Distilled down to a few words, it is "where fresh water from the rivers meet and mix with salt water from the ocean." It is a concept that is very easy to understand and standing on the floor map, visitors can see the rivers and how they are connected to Great and Little Bay, the Piscataqua and the Gulf of Maine. But what they don't see is how extensive the river system is in the Great Bay Watershed. And what few of them realize is that for each river there is a dedicated group of people, the Department of Environmental Services NH Volunteer River Assessment Program (VRAP) and other organizations, working hard to make sure that each river flowing into the Bay is healthy. Our volunteers here at the Center are, in a way, the beneficiaries of this network of local volunteer groups that are all working for the same thing, the well being of Great Bay.

The rivers surround Great Bay like the fingers of a hand with the Winnicut forming the thumb, the Exeter/Squamscott the index finger, the Lamprey the middle finger, the Oyster River the ring finger and the Bellamy the "pinkie" finger.

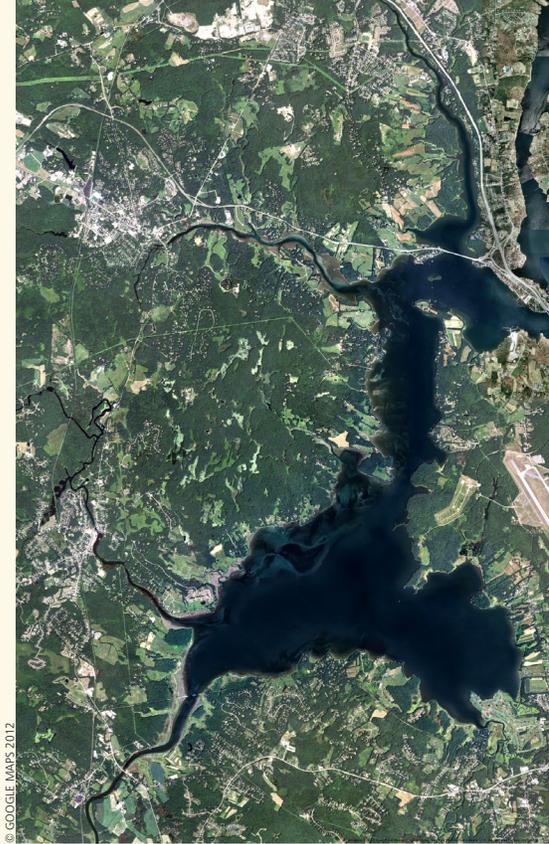
The Winnicut, located in Hampton, Greenland and Stratham is only 9 miles long but has 45 miles of streams. The Winnicut River Watershed Coalition is a group of volunteers who have taken on water quality projects, water sampling, and last year completed an aquatic insect survey. In 2012 they worked with Dr. Steve Jones of Jackson Estuarine Lab on a study to assess citizen involvement in storm water monitoring. The river is the only one in the estuary without a dam and is working toward meeting the qualifications to be

enrolled in the NH Rivers Management Protection Program. The group has a great web site, winnicutcoalition.org with wonderful photos showing the river, volunteers and information about how you can get involved.

The Exeter/Squamscott River Local Advisory Committee (exetterriver.org) was founded in 1996 and has volunteers from the 10 communities that the 33 mile river runs through. They have done stenciling of storm water drains, designed public education and outreach programs and work to increase awareness of the natural resources of the river's watershed. They have been involved in the public information meetings for the potential dam removal. The river is one of 17 protected rivers under the NH Rivers Management Plan.

The Lamprey River covers 47 miles before it becomes tidal in the center of Newmarket. This river is the largest tributary to the Great Bay Estuary. The lower portion of the river is one of only two rivers in NH designated by the National Park Service as Wild and Scenic. Two times a month from June to September volunteers from the Lamprey River Watershed Association monitor the quality of the water at specific "stations." In 2008 and 2009 volunteers inventoried the entire 47 miles of the main river. They have also developed a curriculum for use in 4th grades in all the watershed schools. On their web site lrwa.org various volunteer opportunities are described.

The Oyster River Local Advisory Committee was created when the river met the qualifications to be enrolled in the NH Rivers Management and Protection Program in 2008. Although only 17 miles long, its history, extensive floodplains, and oyster restoration project make the Oyster River an important tributary. As a significant source of drinking water for the town of Durham



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Great Bay

and UNH, the water quality monitoring is vital. For more information, go to oysterriverlac.org.

The last river, the Bellamy River, is part of the Bellamy and Oyster River Watershed Protection Partnership (borwpp.org). Two major conservation areas, the Bellamy River Wildlife Management Area and NH Audubon's Bellamy River Wildlife Sanctuary, cover over 600 acres along the shore between Dover and Newington. A Wildlife Habitat Important Project is currently underway to re-establish native grasses for bird habitat and the area is home to the New England Cottontail Rabbit, a state endangered species. The river is also the site of oyster restoration and other shellfish projects.

The volunteer groups, state agencies, and organizations that partner with the Reserve all keep the "heart" of Great Bay healthy. For more information about the rivers and how to get involved visit their websites or go to greatbay.org.

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