

Should Nature Go on the Credit Card?

Putting an Economic Value on Natural Resources

Marisa Mazzotta

How much is a healthy Narragansett Bay worth to you? It doesn't take a credit card ad for most people to answer, "Priceless." And, in one sense, this is true. Who could imagine Rhode Island without our 400 miles of shoreline and our waters teeming with boats on a summer day? The Bay and ocean are truly essential to our sense of place in the Ocean State.

Yet, every day, in small and large ways, individually and collectively, we make decisions that affect the health and sustainability of the things we value about our rivers, lakes, bays, coastal ponds, and ocean. These decisions often have financial outcomes that can be easily measured and evaluated. But they also affect the less tangible, yet no less valuable, aspects of our coastline and waters that matter to people, such as clean water, a thriving fishery, healthy biological communities, views, and recreational opportunities. These vital benefits that are freely provided to people by nature are sometimes referred to as "ecosystem services."

We all would like to see the things we value about the Bay sustained into the future. But, at the same time, we want many other things, including jobs, roads and other transportation, electrical power, agriculture, green lawns, and places to live. Sometimes our values and wants come into conflict. Then, whether consciously or not, we and our public officials make tradeoffs.

For example, hardening the shoreline to prevent erosion can disturb nearby habitat or make it impossible for wetlands to migrate inland as sea levels rise; increasing roads, driveways, roofs and other impervious surfaces diminish the land's capacity to absorb stormwater, resulting in greater runoff of nutrients and pollutants to our waterways; commercial and industrial uses provide jobs but can adversely affect water quality and aesthetics; and competing uses of waterways, such as aquaculture, recreational and commercial fishing, boating, marine transportation, or energy generation, can increase some benefits while precluding or diminishing others. On the positive side, restoring habitat, protecting open space, installing wastewater controls or advanced septic systems, using "green infrastructure" to absorb stormwater, and many other actions are improving water quality, wildlife habitat, and aesthetics.

How do we balance these competing interests and benefits to provide the greatest benefit to the most people, while ensuring fairness and equity across groups of people and, at the same time, protecting natural

systems from irreversible harm? One way is to consider the values of the benefits and costs of different options when making decisions. We do this implicitly every time we choose one thing over another.

Economic tools are designed to make the outcomes of such choices more explicit, by putting the financial benefits and costs on equal footing with the less tangible social benefits and costs of decisions that affect nature. Of course, there may be things that are non-negotiable, where we, as a society, impose deliberate constraints that preclude using a strict benefit-cost framework. Laws such as the Endangered Species Act recognize this by removing some choices from the table, making it mandatory to protect threatened and endangered species and their habitats. Issues of social and environmental justice may be similarly addressed. And, extreme uncertainty about future outcomes may also warrant limitations on choices, using safe minimum standards or the precautionary principle. Beyond those constraints, however, we indicate by our everyday actions that we're willing to forego some benefits in exchange for others.

The ecosystem services provided by Narragansett Bay and our coastal waters include some that result in mostly private financial benefits, such as fish and shellfish, aquaculture sites, or channels used for marine transportation; and others



Paddlers prepare to launch their boats in the upper Blackstone River. Recreational uses of the rivers, lakes and bay waters contributes to the local economy. *Photo: Bruce Hooke.*

that provide mostly public and unpriced benefits, such as the water filtration, habitat, and storm protection services of wetlands; aesthetic and cultural services, including views and places of historic or other cultural significance; and many types of recreational services, including swimming and surfing, boating, wildlife viewing, fishing and hunting. All of these rely on the functioning of the underlying ecosystems, which may be compromised or supported by human actions.

While most people understand the importance of Narragansett Bay and Rhode Island's other fresh and coastal waters to our economy, their non-financial benefits are not always explicitly considered, though they may be orders of magnitude greater than the financial benefits. When these benefits aren't included in the deliberations over a decision, we may end up collectively making choices that provide fewer overall benefits than we might otherwise choose.

You may wonder how it is possible to measure the non-financial, public, benefits of nature. Natural resource and environmental economists have developed ways to value in dollars, or using value indicators, the unpriced benefits of nature, so that these benefits can be compared to the values of alternative uses. So-called "non-market valuation" methods have been widely used since the 1960's, although they are not always easy to carry out. They are based on the observation that people value nature's services, even though they do not always directly pay for them. Economic values for nature's services thus attempt to measure ecosystems' contributions to society in terms of their value above and beyond the cost of access or use.

Economic non-market valuation tools include a variety of methods. Some directly ask people about their values for nature's free goods and services or indirectly measure values by asking people about choices they would make among different outcomes; others observe people's behavior, such as how far someone travels to a recreational site or how much more people spend on homes with water access or views, to infer values for recreation, views, and other things. Occasionally, it is appropriate to measure benefits in terms of the costs of technological substitutes, such as using the cost of water purification systems to value the natural purification provided by wetlands. New York City recognized this when it took steps to maintain the high quality of the watershed surrounding the source of the city's drinking water, avoiding billions of dollars in treatment costs.

While Narragansett Bay is one of the most studied estuaries in the country, a limited number of economic valuation studies have been conducted in recent years. I include here some examples of studies of Narragansett Bay values, and values from similar estuaries, which can provide a sense of the economic importance—both financial and non-financial—of the Bay and other coastal waters.

The R.I. Economic Policy Council Report, in 2007, estimated the financial benefits of Rhode Island's water cluster (water dependent and water related businesses). They found that these businesses provided around 37,000 jobs and \$1.8 billion in wages. But jobs tell only one part of the story. Other important benefits include recreation, property values, and the value of intact habitats. Researchers at NOAA estimated that, in 2001, over 2.6 million people participated in coastal

recreation in Rhode Island, leading R.I. to be ranked 15th in the U.S. for number of coastal recreation participants. Dr. Linwood Pendleton, in 2005, estimated the following coastal recreational values for Rhode Island: beach-going was valued at \$94 to \$379 million per year; recreational fishing was valued at \$76 to \$511 million per year; and marine-related wildlife viewing was valued at \$202 million to \$2 billion per year (converted to 2007 dollars for comparison to wage figures). Dr. Joan Poor and colleagues, in 2007, found that, in the St. Mary's River watershed in Maryland, a one-unit (mg/L) increase in dissolved inorganic nitrogen, a contributor to eutrophication, decreased the price of the average home in the watershed by close to 9 percent, or \$17,642.

In Long Island's Peconic Estuary, in a survey I conducted with colleagues from URI in 1995, residents of the East End indicated that they were willing to pay \$95,000 to \$136,000 per acre to restore eelgrass; \$78,000 to \$116,000 per acre to restore wetlands; and \$44,000 to \$64,000 per acre to restore safe shellfishing areas (in values converted to 2007 dollars). A related study found that homes in Southold Long Island adjacent to open space were worth almost 13% more than comparable homes not adjacent to open space.

In the Narragansett Bay region, researchers have estimated values for fish saved from impingement and entrainment by construction of two cooling towers to replace the once-through cooling water system at the Brayton Point power



For hundreds of years, shellfish harvesting has been part of the New England economy. Areas closed due to pollution detract value. *Photo: Meg Kerr.*

plant. Scientists estimated that, prior to installing cooling towers, trillions of organisms (fish eggs, larvae, juveniles and adults) were killed each year in Mount Hope Bay by impingement and entrainment at Brayton Point. Economists estimated the value of these organisms to range from approximately \$276,000 per year, for commercial and recreational species only, to \$43.7 million or more per year, for all affected species and organisms (in 2007 dollars). These estimates do not include values for fish, particularly winter flounder, affected by higher water temperatures in Mount Hope Bay caused by discharge of heated water, or other benefits of a healthier ecosystem. The cooling towers will reduce water intake by 96 percent, which will save 96 percent of affected organisms.

Evaluating benefits in dollars allows comparison of both financial and non-financial outcomes of choices in a common metric. But, often it is difficult or infeasible to measure dollar values to support a decision. In such cases, the economic framework of tradeoff analysis can be used with value indicators that include all of the important factors related to non-financial benefits, and ensure that all aspects and outcomes of a choice are considered in deliberations. In general, economic valuation of nature's benefits is an attempt to balance public and private interests. It brings to the table a set of tools that, at a minimum, can inform discussion and debate over how best to manage people's interactions with nature.

Economic valuation of ecosystem services cannot be carried out without first evaluating how human actions affect the things people care about in the ecosystem. Social and natural scientists need to collaborate to understand and evaluate the ecological outcomes that are important to people, and how changes in human behavior will change those outcomes. We're fortunate to have some of the best marine and estuarine scientists in the world studying and recommending actions to protect Narragansett Bay and our other coastal waters. This scientific knowledge is essential to understanding what it takes to sustain the things we value. But understanding ecological relationships is not enough. Natural scientists must be able to predict how human actions will affect the outcomes that people value, using metrics that people can understand and relate to, before economists can estimate how values change as a result of choices.

The multi-disciplinary work required to support the best possible decisions is increasingly being conducted in government agencies, NGOs (non-government organizations such as Save the Bay), and universities. This work is receiving attention at the national and international levels, including a recent article in the New York Times – "An Economist for Nature Calculates the Need for More Protection" (August 8, 2011) – that describes ongoing work to quantify the value of ecosystem services and apply those values to policies and decisions

worldwide. The U.S. Environmental Protection Agency's Office of Research and Development is currently conducting such research throughout the U.S., including the Narragansett Lab, under its Ecosystem Services Research Program. In the coming years, this research will be conducted within the context of the new "Sustainable and Healthy Communities" and "Safe and Sustainable Waters" initiatives. Examples of ongoing projects that I'm involved with, along with EPA ecologists, include a study that relates nitrogen loading to eelgrass extent in RI, MA, and CT, and eelgrass extent to recreational fishing success and values; and a project to develop a value indicator approach that can help funding agencies and advocates demonstrate the benefits of, and compare, wetland restoration projects.

Over time, we are likely to face increasing challenges in making decisions to sustain and restore our waters and coasts, as pressures increase due to sea level rise and an increasing population, among other changes. Every action costs money, and most choices require giving up something that people value. Over time, personal and public values can change, and scientific knowledge grows, so the process of managing people's interactions with nature is an ongoing and evolutionary endeavor.

~Marisa J. Mazzotta is an environmental & natural resource economist with EcoBenefits Research.



Providence's Water Fire celebrations bring thousands of tourists to the city and contributes to the local economy. This Water Fire celebrated the return of migrating herring to the Woonasquatucket River. Photo: Thomas Payne.