Summary of NCEE Project on Estimating the Benefits of
Improving Water Quality in the Chesapeake Bay Watershed
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Contact: David Simpson (simpson.david@epa.gov)

On May 12, 2009, the President signed Executive Order 13508 calling for the protection and restoration of the Chesapeake Bay. In response to the Executive Order and other considerations on December 29, 2010, the Environmental Protection Agency announced Total Maximum Daily Loads (TMDLs) for pollutants that could reach the Bay – a "pollution diet" designed to restore the Bay and its watershed to health. The six states in which the Chesapeake Bay watershed lies, as well as the District of Columbia, are now refining the Watershed Implementation Plans (WIPs) that detail specific measures each will take to adhere to the TMDLs.

The Bay has been degraded for decades by a variety of pollutants from a multitude of sources. The most significant pollutants are the nutrients nitrogen and phosphorus, as well as sediment, and the sources include industrial and municipal waste water, private septic systems, airborne deposition from vehicles and generating plants, stormwater runoff, and both animal and crop agriculture. Even if the states design their WIPs to meet their TMDLs cost-effectively, the TMDLs will still place substantial costs on producers, consumers, municipalities, and utility rate payers.

What will these stakeholders get in return? Economists at EPA's National Center for Environmental Economics (NCEE) are asking this question now. Just as the costs of the TMDL will be borne widely, the benefits will also be spread over many communities and constituencies. People who live on or near Chesapeake Bay and its tributaries will benefit from improved water quality. Their homes will be more valuable, and their opportunities for outdoor recreation will be improved. The watermen who work the Chesapeake will be able to draw on more abundant stocks of fish and shellfish, which will both enhance their own livelihoods and benefit consumers of their harvests. Recreational fishermen, bird watchers, hunters, swimmers, sailors, and others will enjoy cleaner, more appealing, and more abundant venues for their activities. Residents who rely on groundwater will have cleaner sources from which to draw. The reduction of sediment flowing into the Bay and its tributaries will reduce the need for dredging to maintain channels for commercial and recreational navigation.

In some instances the benefits of a restored Chesapeake Bay will accrue to closely circumscribed local groups: the improvement in property values experienced when a water body is restored accrue largely to those who reside on or near the waterfront. In other instances benefits will be more broadly dispersed. Recreational users of the Chesapeake and its tributaries may travel from distant locations to enjoy them, including, in many instances, from large cities such as Philadelphia and New York, which lie outside the watershed but are relatively easily accessible to it. Moreover, there are a number of less tangible, but arguably no less important, values that cannot be ignored. The Chesapeake Bay has been described as a national treasure, and citizens' reasons for caring about its preservation transcend concerns with the value of their own homes, their own health, or their own leisure time enjoyment.

People are concerned with the resources and culture they pass along to their children and grandchildren.

NCEE will use a number of methods to estimate the benefits of restoring the Chesapeake Bay and its watershed. Our aim is to measure both the tangible and intangible benefits of restoration. All of these approaches are intended to reduce our estimates to the common metric of dollars and cents, so that benefits can be compared with costs. Such exercises inevitably generate controversy, and even most economists would agree that the consideration of monetary measures alone should not be relied upon as the sole basis for public decision making. Benefit estimation exercises do, however, provide one important source of information for making public choices.

Most o f the methods economists employ to estimate the benefits of environmental improvement are categorized under the rubric of "revealed preference" approaches. We estimate values based on the preferences that producers and consumers reveal in their production and consumption decisions. Consider, for example commercial fisheries. When water quality is improved, many species of fish, shellfish, and other organisms are able to reproduce and grow more quickly. NCEE economists will use biological information about enhanced rates of survival and reproduction to compute the correspondingly higher rates of sustainable harvests that can be realized and the consequent benefits to watermen and consumers. Of course not all fish are caught commercially; recreational fishing also is important. By calculating what people spend to travel to fishing sites and comparing individual's choices among potential sites, we will calculate the extra value of recreational fishing enhancements that arise from water quality improvements. Depending on data availability, similar exercises may be conducted for other categories of recreational use, such as hunting, birdwatching, swimming, and boating.

Property prices also reveal the values consumers place on environmental quality. While great care must be taken to account for all of the other attributes of a property that determines its market price (e.g., proximity to jobs, quality of schools, property tax rates, etc.), economists have developed statistical methods for estimating the contributions of environmental improvements to property values. NCEE economists will employ such "hedonic pricing" models to determine the incremental contribution of improved water quality to property values. In addition, certain measures taken to achieve the TMDLs, such as the establishment of forest buffer zones along rivers and streams, may also enhance the value of adjoining properties. NCEE economists may also include these values in their estimates of benefits.

In addition to affecting water quality in the Bay itself, policy measures undertaken under the state WIPs may also enhance the quality of ground and surface waters in the upstream watersheds. The costs of water treatment vary with the quality of intake water, and economists often estimate the avoided costs of treatment when calculating benefits of water quality improvements. A similar procedure is followed to calculate the avoided costs of dredging to maintain navigational channels that would otherwise be choked with sediment.

Many of the benefits of enhanced water quality, as well as the ancillary benefits of steps that may be taken to achieve enhanced water quality, can be difficult to infer from people's production and consumption patterns. When existing data on market transactions or other observed behaviors are insufficient to infer peoples' values, economist adopt another approach, referred to as "stated preference" studies, which use carefully designed surveys asking people to compare hypothetical scenarios. For example, "Would you prefer Scenario A, with higher food and utility prices as well as higher water quality, or Scenario B, with the food and utility prices you currently enjoy, but further degradation in the Chesapeake?" By constructing different scenarios and asking large numbers of people to rank them, it is possible to estimate values that could not be inferred by other means, or that accrue to people who may not live near or visit the Bay.

NCEE will undertake efforts to estimate benefits in all the categories discussed above. Two final caveats should be mentioned. The first is that some of the methods employed may overlap, and so it is not necessarily appropriate simply to add up estimates derived from different approaches, as doing so may lead to some double-counting. It is impossible to predict at the outset exactly how problematic this will be, but it is a consideration we will bear in mind as we proceed. It may be possible to apply some newly developed methods for combining the results of potentially-overlapping valuation models in such a way that double-counting can be avoided.

Second, virtually any attempt to measure benefits will, in the final analysis, be incomplete. We will aim to identify as many categories of benefits as possible, but some will inevitably slip through the cracks. For this reason we see this as an ongoing activity to be augmented and expanded upon as we learn more over time. That learning will lead both to more accurate estimates of benefits in the Chesapeake and the development of tools and methods that may be applied to the estimation of water quality improvement benefits in other places.