



A Science-Based Regional Restoration Initiative in the Delaware Estuary

Danielle Kreeger, Jennifer Adkins, Laura Whalen and Priscilla Cole

Partnership for the Delaware Estuary, One Riverwalk Plaza, Suite 202, Wilmington, DE 19801. DKreeger@DelawareEstuary.org

Abstract

A regional approach to identifying and prioritizing protection and enhancement activities and projects in the Delaware Estuary and its watershed was outlined in the 2008 report, "A Blueprint for Regional Restoration in the Delaware Estuary." This blueprint describes a two-track approach for evaluating and forwarding regional priorities – "a science track" that will bolster information on high value restoration needs and projects and a "consensus track" that will set priorities and work to find support for high value activities and projects. A comprehensive project registry will provide a one stop shop for restoration projects (includes enhancement and conservation activities) across the watershed, itemized by sub-watershed area and containing data on expected natural resource benefits.

During report preparation and a workshop convened in late 2007, an important requirement for stakeholder satisfaction was found to be the quick elevation of priorities that can be applied immediately for project selection. Over time, these will be refined or redirected through science and partner input.

Based on our Comprehensive Conservation Management Plan, input from partners in the region, and our knowledge of the Delaware Estuary, we identified four areas to initially focus on: tidal marshes, urban waterfronts, signature species, and forested headwaters. These focus areas have multiple "stacked" resource values and strong partner interests. For each case study, the RRI workgroups will work to develop and elevate conservation, enhancement and restoration priorities rooted in the best available science and cooperative decision-making.



Acknowledgments

We are grateful for the generous financial support provided by the National Estuary Program, DuPont Clear into the Future Program, and the United States Geological Survey. We also thank Simeon Hahn (NOAA), Lance Butler (Philadelphia Water Department), Bill Shadel (American Littoral Society), and Paul Racette (Pennsylvania Environmental Council) for their continued help with the RRI Workgroup.



Partnership for the Delaware Estuary

Since taking on the full responsibilities of the National Estuary Program in 2004, the Partnership has expanded in scope and has been strengthening its science coordination, restoration, and policy activities. Collaborating with diverse partners and our Science and Technical Advisory Committee, the Partnership leads efforts to assess the status, trends and needs regarding the science and management of natural resources across the Delaware Estuary watershed. Of special importance is our role in facilitating the exchange of educational, science and technical information among the many agency, academic, industry, and public groups in the region. Toward this goal, the Delaware Estuary Science and Environmental Summit fills a vital niche.

Need

Regional restoration planning is emerging nationally as a means to promote better coordination among restoration practitioners, planners and project decision-makers on a watershed basis to ensure that the most meaningful ecological outcomes are realized. Restoration, enhancement and conservation projects are often in reaction to particular program interests, issues or incidents, without scientific consideration for how they fit within the broader landscape of ecological needs. This is particularly true in the large and complex landscape of the Delaware Estuary where new challenges threaten the system's functionality and its continued ability to purify our water, provide clean air to breathe, and supply hundreds of other critical goods and services that enable survival for both people and natural communities.

Conservation and restoration of natural habitats is a primary program objective of the Partnership for the Delaware Estuary, as specified in the Comprehensive Conservation Management Plan (CCMP). Regional restoration offers new concepts to ensure that restoration investments are sensible and equitable in protecting core ecosystem structure and functions, tailored to the variable conditions across the watershed.

Blueprint Report

The Partnership solicited input from numerous stakeholders across the region about the need and feasibility for a Regional Restoration Initiative, through meetings, direct outreach, and via a workshop in September 2007 that attracted more than 100 scientists and managers (Fig. 1). Experts with experience devising and implementing regional restoration case studies elsewhere were consulted. Literature was reviewed regarding natural resource assessment methods to find the most useful currency on which to base natural capital for the initiative.

Regional restoration coordinators and practitioners were also engaged to devise a scheme for an integrated project registry as a one-stop shop for all available projects across the watershed. A matrix-based system was developed to ensure that restoration opportunities are sought and included from different sub-watershed units, and which addresses all critical living resources and habitats. These "restoration matrices" are expected to cross-link to the project registry.

To facilitate the flow of science-based recommendations to decision-makers, and restoration priorities and needs from decision-makers to scientists, a policy-oriented group was also envisioned in the blueprint report. This "consensus group" was named the Alliance for Comprehensive Ecosystem Solutions (ACES).

To facilitate the flow of science-based recommendations to decision-makers, and restoration priorities and needs from decision-makers to scientists, a policy-oriented group was also envisioned in the blueprint report. This "consensus group" was named the Alliance for Comprehensive Ecosystem Solutions (ACES).



Figure 1. The Regional Restoration Initiative (RRI) was developed as a habitat strategy for meeting restoration coordination needs articulated in the CCMP and other workshops and reports. The RRI is being launched with two focus tracks, one devoted to science and the other devoted to consensus building.

Development and Structure

Beginning in 2006, we worked with collaborators to outline a Regional Restoration Initiative that consists of three components:

- Science Track** - develops ecological matrices and decision support tools to help elevate needs and opportunities that are expected to yield the greatest ecological goods and services;
- Consensus Track** - synthesizes and coordinates regional program priorities and activities among restoration decision makers, and
- Project Registry** - a clearinghouse for restoration projects across the watershed.

Decision-makers will be engaged in the consensus track through a PDE-led Alliance for Comprehensive Ecosystem Solutions (see Adkins presentation). This poster presentation is focused on expected science track activities. The RRI began in 2008. Contingent on continued support and involvement from key partners, the Partnership is proceeding with implementation of both tracks of this RRI in 2009.

Goals

The objective of the new Regional Restoration Initiative is to provide a science-based decision-support system that proactively guides restoration activities to ensure that:

- Restoration, enhancement and conservation activities are prioritized based on needs and projected natural capital outcomes most suitable for different sub-watersheds;
- Projects are chosen that minimize short-term loss of opportunity and maximize long-term "bang-for-the-buck" by considering ecological compounding relative to economic investments (a.k.a. "Restoration Up-front"); and
- Project selection is efficient, relying on a project registry to provide fast access to project lists and new decision tools that capture the best science at any point in time.

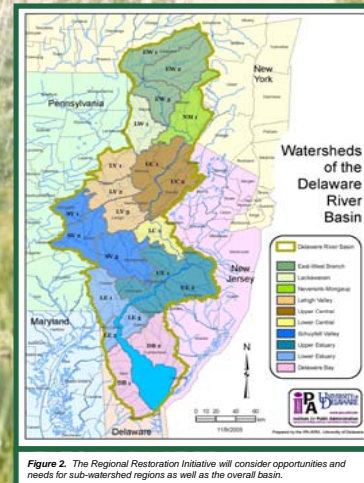


Figure 2. The Regional Restoration Initiative will consider opportunities and needs for sub-watershed regions as well as the overall basin.

Science Basis

The RRI science track will contrast restoration activities that most appreciably enhance the natural capital of ecologically significant living resources and habitats within each of eight sub-watershed regions (**Basic Restoration Matrices**, Figure 3).

The relative importance of different resources in different regions will be characterized according to a natural capital credit system that considers many traits, such as their provisioning, regulating, supporting and cultural services (**Value-Added Restoration Matrices**, Fig. 4). Habitat equivalency analysis (HEA) is an example tool that we will use.

Restoration matrices and decision support tools will be linked to projects in the **Project Registry**, and vice versa, so that 1) projects can be easily prioritized based on projected ecosystem goods and services outcomes, and 2) projects can be cultivated to fill gaps where high value outcomes are not being addressed.

Rapid decision tools remain the focus so that project selection can occur at any time using best scientific judgment, but over time the new Regional Restoration Work Group will strengthen these tools.



Figure 3. Example of a Basic Restoration Matrix for one sub-watershed region. Shaded cells denote lack of relevance, open cells relevance, and checked cells show where projects exist.

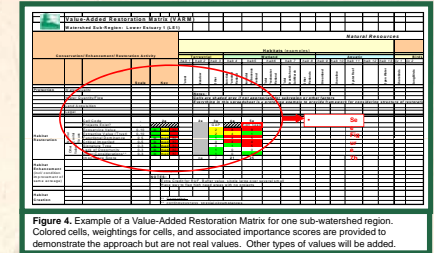


Figure 4. Example of a Value-Added Restoration Matrix for one sub-watershed region. Colored cells, weightings for cells, and associated importance scores are provided to demonstrate the approach but are not real values. Other types of values will be added.

Case Studies

Initially, the RRI science track is focusing on:

- Urban Waterfronts (see Hahn poster)
- Tidal Wetlands
- Bivalve Shellfish
- Headwater Streams

These have multiple "stacked" resource values and strong partner interests. As an example, Table 1 summarizes various natural capital values associated with one of these case study resources, bivalve shellfish.

Example – Bivalve Shellfish

Why Shellfish? Oysters are a prominent natural resource in the Delaware Estuary because they sustain a shellfish industry. Ribbed mussels live in dense clusters along marsh shorelines and provide protection against shoreline erosion. Freshwater mussels are the subject of intense conservation interest because of declining diversity and population abundance. All of these bivalves furnish critically important ecosystem services associated with water quality and habitat improvement (see Table 1 and posters by Gray, Moody and Padeletti).

For each case study resource, the RRI will:

- Describe and begin to quantify different resource values;
- Weigh projected outcomes from various types of restoration, enhancement and conservation activities in terms of natural capital improvements per level of investment;
- Examine where restoration, enhancement and conservation opportunities exist across different sub-watershed regions, highlighting areas of greatest opportunity, areas of project need, and connections among regions (river continuum concept);
- Inventory restoration projects aimed at boosting the natural capital of bivalve shellfish across the Delaware Estuary watershed (the RRI Registry);
- Provide science-based recommendations regarding project prioritization, upon request and tailored for specific purposes.

The same approach will be applied to other case studies of the RRI (see Hahn poster). Contingent upon funding, the RRI may be expanded to include additional natural resources across the Delaware Estuary watershed.

Table 1. Natural capital values associated with bivalve shellfish of the Delaware Estuary watershed, including oysters, marsh mussels, and a freshwater mussel species. Check marks signify an approximation of known importance, as compared among species and value types.

Importance of Shellfish to the Delaware Estuary Watershed		Oysters	Marsh Mussels	FW Mussels
		Common	Rare	Very Rare
Ecosystem Services	Commercial	✓	✓	✓
	Structural Habitat	✓	✓	✓
	Proy	✓	✓	✓
	Bioindication	✓	✓	✓
	Biogeochemistry	✓	✓	✓
Natural Capital Value	Shoreline Protection - nearshore reefs	✓	✓	✓
	Shoreline Stabilization - living edges	✓	✓	✓
	Waterman Lifestyle, Ecotourism	✓	✓	✓
	Native American - jewelry, dietary staple	✓	✓	✓
Biodiversity	Watershed Indicator	✓	✓	✓
	Site-specific Bioassessment	✓	✓	✓
Conservation	Biodiversity	✓	✓	✓