RUTGERS
New Jersey Agricultural Experiment Station

Developing Watershed Restoration and Protection Plans

Integrating Research, Education, and Extension

ABSTRACT

The United States Environmental Protection Agency (US EPA) has encouraged states to develop watershed restoration plans for their impaired waterways. Many states are creating these plans to be a detailed roadmap for achieving the pollutant load reductions that have been identified in the Total Maximum Daily Load (TMDL) Reports. Restoration plans identify sources, quantify these sources, and recommend best management practices (BMPs) for reducing source impact. These plans also identify education and outreach programs that need to be put in place to promote behavior change among the stakeholders in the watershed to further reduce pollutant loading to the impaired waterways. For these plans to be completed in accordance with US EPA's recommendations, research, education and extension activities must be integrated. The Rutgers Cooperative Extension (RCE) Water Resources Program has provided leadership in New Jersey in developing these plans.

US EPA NINE ELEMENTS OF A WATERSHED PLAN

1. *Identify causes and sources of pollution that need to be controlled within the watershed*
   Research: Surface water sampling, biological monitoring, site surveying, and stream visual assessments to identity causes and sources of pollution
   Education: University students trained in field work techniques and equipment use

2. *Estimate the load reduction that should be achieved by management measures in order to meet water quality standards within the watershed*
   Research: The Water Resources staff analyzes sampling data to estimate loading rates of pollutants to the watershed.

3. *Development of non-point source management measures to be implemented in order to achieve load reductions*
   Education: Designs of Best Management Practices, or BMPs, are often completed by engineering or science students for senior design classes. Student designs have been incorporated into plans for Beden Brook and Robinson's Branch Watershed.

4. *Estimate of the amounts of technical and financial assistance needed and identification of the authorities to be relied upon to implement the plan*
   Extension: The RCE Water Resources Program forms local action committees to provide input to the plan and help guide BMP recommendations. Land Grant Institutions are provided the resources they need to become more actively involved in watershed management and plan implementation

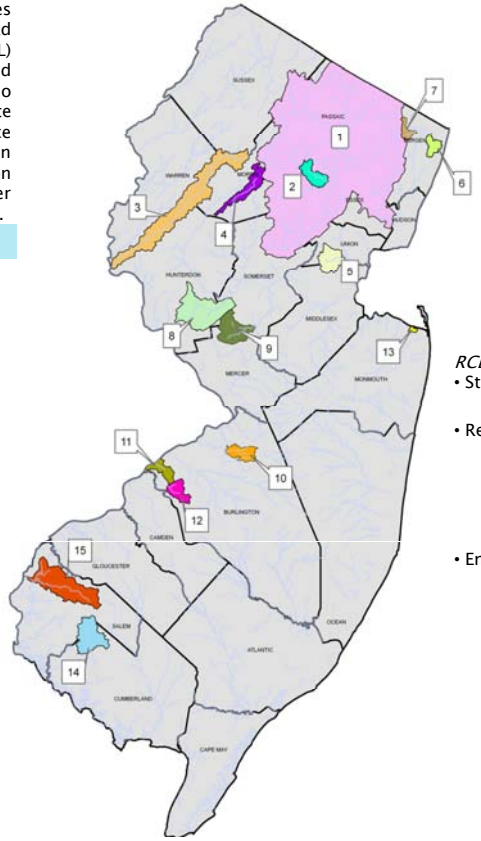
5. *An information or education component used to enhance public understanding of the project is provided*
   Extension: Extension and outreach programs offered by the Water Resources Program include *Stormwater Management in Your Backyard* and *Water Resources for Sustainable Communities.*
   Education: Community Project-Based Learning programs

6. *Schedules for implementing the nonpoint source management measures*
   Extension: Efforts are coordinated between local stakeholders, institutions, and the Water Resources Program to ensure management measures are implemented in a timely manner.

7. *Descriptions of interim measurable milestones for monitoring the implementation of the proposed management measures*
   Extension: Local action committees and stakeholders are educated and then relied upon to meet milestones set in the restoration plan

8. *Development of a set of criteria to determine the efficiency of the management measures and whether load reductions are achieved*
   Research: Management measures are monitored and analyzed by the Water Resources staff to ensure water quality goals are met
   Education: Students are involved in both the monitoring and analysis components of this element

9. *Description of a monitoring component to evaluate the effectiveness of implementation efforts over time*
   Research: Further research and data analysis is conducted by students and staff of the Water Resources Program on the both the implemented BMPs and the watershed to ensure the desired water quality is achieved.



Water Resources Program Restoration Watersheds

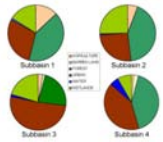
1. Upper Passaic River Watershed
2. Troy Brook Watershed
3. Musconetcong Watershed
4. Black River Watershed
5. Robinson's Branch Watershed
6. Tenakill Watershed
7. Musquapsink Watershed
8. Neshanic Watershed
9. Beden Brook Watershed
10. Assiscunk Watershed
11. Pompeston Creek Watershed
12. Strawbridge Lake Watershed
13. Many Mind Watershed
14. Upper Cohansey Watershed
15. Salem Watershed

BLACK RIVER WATERSHED RESTORATION PLAN: An Example in the Success of Integration

Research

Identifying Causes and Sources of Pollutants

- Aerial Loading Analysis
- Surface Water Quality Sampling
  - Phosphorus
  - Fecal Coliform
  - E-Coli
  - Total Suspended Solids
- Benthic Macroinvertebrate Study
- Stream Visual Assessments



	TN	NH3-N	NO2+NO3	TSS	TP
Subbasin 1	16659.3	429	1468.5	318287.2	678.8
Subbasin 2	22698.3	586.8	2241.5	363630.2	800.5
Subbasin 3	20483.1	974.3	2585.6	264094.8	825.3
Subbasin 4	24917.7	1378.5	3437.9	281689.0	942.3

Loading Analysis Results for Black River Watershed

Extension

RCE Extension Programs

- Stormwater Management in Your Backyard
  - Provides information on BMP implementation, including rain gardens, swales, and wet ponds
- Restore-A-Waterway Program
  - funded jointly by the United States Department of Agriculture Cooperative State Research, Education, and Extension Service (USDA CSREES), New Jersey Sea Grant, and the New Jersey Agricultural Experiment Station (NJAES).
  - provide technical assistance to citizen groups that want to take action in restoring the condition of a waterway
- Environmental Stewardship Program
  - Participants learn land and water stewardship, best management practices, environmental public advocacy, and leadership

Black River Watershed
Non-Point Source Management Measures

- Septic Management Program
- Dumpster Leachate Management Program
- Equine Operations Technical Assistance Program
- Goose Management Program
- Stormwater Disconnection

Education

Community Project-Based Learning

- Incorporates the authentic practice of real scientists into the regular classroom setting
- Identifies a real environmental problem in the community and works with the students to develop solutions
- Work with their teachers, parents, local scientists, and other knowledgeable members of the community

Black River Educational Programs

- Conducted by Raritan Highlands Compact, Association of New Jersey Environmental Commissions (ANJEC) and RCE Water Resources Program
- Rain Garden programs for homeowners
- Stormwater Management programs for municipal officials

Students planting a rain garden at their school

Chris Obropta and a student intern for the RCE Water Resources Program installing a rain garden at a local park in Black River Watershed

Volunteer help and University students working together

Completed rain garden at Leonard Park

New York - New Jersey Puerto Rico - Virgin Islands Regional Water Coordination Program

Water Resources Program

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For more information visit water.rutgers.edu