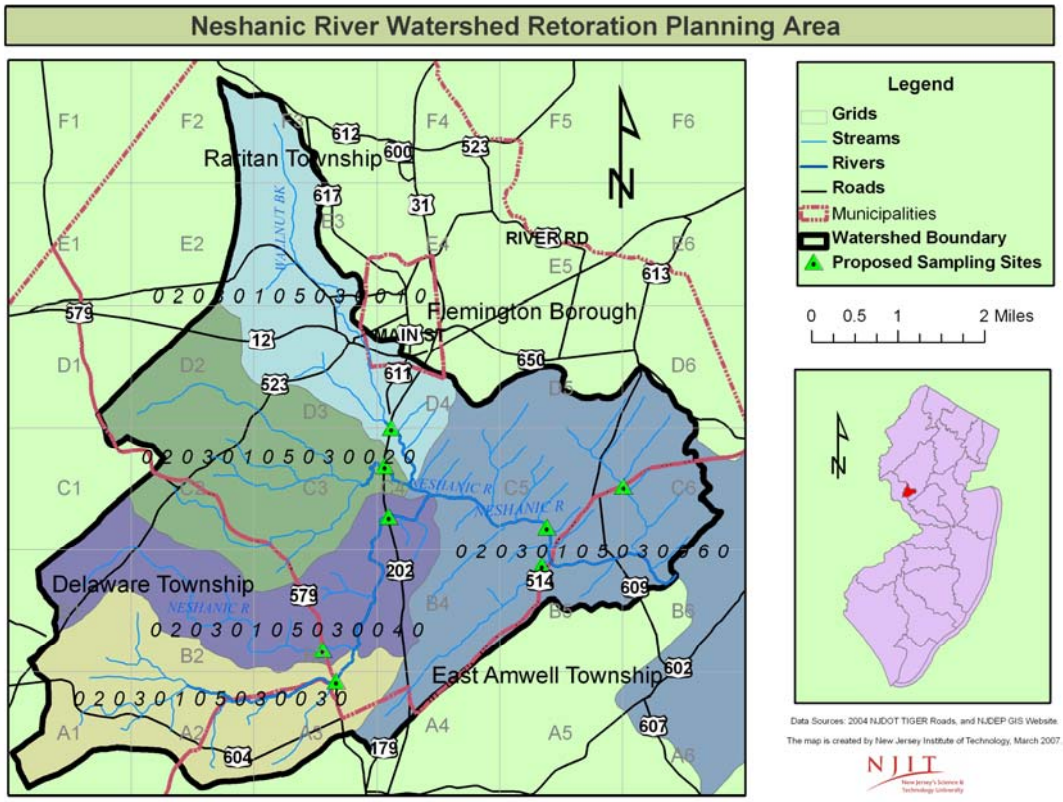
Neshanic River Watershed Restoration Plan Project Description

The project will develop a watershed restoration plan that will detail the management measures needed to achieve the necessary reduction in fecal coliform and attain water quality standards for the total phosphorus, the total suspended solids, reduce the aquatic life impairments to a non-impaired level, and outline the possibility of restoring the base flow of the Neshanic River in the 31 square miles watershed. The watershed restoration planning area is 31 square miles of Neshanic River watershed and includes Walnut Brook, First, Second and Third Neshanic River and the Neshanic River main branch immediately above the Back Brook entrance into the Neshanic River. The watershed is located in Hunterdon County, encompasses Raritan, Delaware, East Amwell and Flemington townships and is part of the Raritan River Basin, in Central New Jersey.



Funding Source

The Federal Clean Water Act Section 319 (h) Program administered and awarded by Division of Watershed Management of New Jersey Department of Environmental Protection.

Project Duration

3 years from October 1, 2006 to September 30, 2009

Project Team

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Project Tasks

TASK 1: ESTABLISH AND OPERATE A NESHANIC RIVER WATERSHED RESTORATION PLANNING COMMITTEE

A watershed restoration planning committee will be formed to guide the watershed restoration planning efforts. The planning committee will include the project partners, representatives of four townships in the watershed, related agency personnel and other stakeholders such as local residents, businesses and farmers.

The planning committee will coordinate at the onset and through the completion of the project with the NJDEP Division of Watershed Management's TMDL Team within the Bureau of Environmental Analysis and Restoration. The committee will meet bimonthly and will play critical roles in the watershed restoration planning process. The methodologies used in this project and the project results will be discussed and reviewed in those bimonthly meetings. The committee will assist in identifying additional partners to participate in the project. This committee will also identify opportunities for implementing the watershed restoration plan.

The South Branch Watershed Association will be responsible for Task 1.

TASK 2: CONDUCT BIOLOGICAL AND CHEMICAL WATER QUALITY MONITORING

We plan to conduct additional chemical and biological water quality monitoring in seven monitoring sites in the watershed. The seven sampling sites are evenly distributed across the watershed to capture spatial variability of watershed conditions. Surface water quality sampling will be conducted to assess the loading inputs of nutrients, TSS and bacteria to the Neshanic River, as well as the movement of nutrients, TSS and bacteria from basin to basin to identify and quantify the sources of pollution under dry weather and wet weather conditions. Biological sampling will be conducted so that the benthic macroinvertebrate community can be better characterized, compared, and evaluated for biological integrity.

The US Environmental Protection Agency (USEPA, 2000) Stressor Identification (SI) process will be performed to accurately identify any type of stressor or combination of stressors that might cause biological impairment. We will follow the procedure outlined in the EPA's Stressor Identification Guideline Document (USEPA, 2000). All activities will be coordinated with the appropriate staff at the NJDEP. A stream characterization analysis will also be conducted to determine the stream stability and the stage of the stream as defined by the Channel Evolution Model and/or Rosgen Classification. Although the Rosgen Classification may not be appropriate for all stream segments in the watershed, the parameters developed for the Rosgen analysis (eg., bank full stage, flood plain width, entrenchment ratio, sinuosity, channel bed material, and stream slope) will provide useful information that will help the project partners better identify BMPs that are suited for restoring the watershed.

The Rutgers Cooperative Extension will be responsible for this task.

TASK 3: CONDUCT STREAM VISUAL ASSESSMENT.

We will follow the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Stream Visual Assessment Protocol to assess the health of the stream, identify pollutant sources, and identify potential management measures to control these pollutant sources. All data will be incorporated into an ArcView GIS for the watershed and will be used to evaluate the watershed management and stream restoration needs.

A web-based data entry system will be developed to allow the project team members and volunteers to quickly and efficiently enter their assessment data into a watershed-wide database.

New Jersey Water Supply Authority and other project partners will provide technical training to project partners and volunteers to use the stream visual assessment protocol.

South Branch Watershed Association will be responsible for organizing the volunteers and carrying out this task.

TASK 4: CONDUCT STORMWATER INFRASTRUCTURE INVENTORY.

The stormwater infrastructure includes detention basins, best management practices, catch basins, piped drainage, ditches, outfalls to streams and ditches, culverts, diverters (also known as off-shoots and turn-outs), and others. A field inspection of all roads and streets (including developments) in the watershed and any known or suspected stormwater infrastructure (facility/structure) will be conducted. The location of condition of each facility/structure will be recorded. All information will be compiled into ArcView GIS files. A list of structures/facilities that require maintenance or need some type of retrofit will also be developed. The information from this inventory will be used to quantify the impacts of the stormwater runoff on water quality and develop the management measures to reduce the

pollutant loads from storm runoffs.

The Hunterdon County Soil Conservation District will be responsible for this task.

TASK 5: EVALUATE STORMWATER MANAGEMENT MEASURES.

A database of the existing and potential management measures to reduce pollutant loads from stormwater runoff and other municipal sources will be compiled. Additional potential management practices to reduce the pollutant loads from stormwater runoff and other municipal sources will be reviewed and selected from the NJ Stormwater BMP Manual (NJDEP, 2004). The examples of such measures are constructed wetlands, bio-retention systems and so on. NJ Stormwater BMP Manual documented the potential impacts of some management measures on some pollutants. Literature will be reviewed to evaluate the expected pollutant load reductions of various BMPs. The biophysical modeling will be also used to estimate pollutant load reductions of those management measures in different landscape settings and weather conditions. The implementation costs for these management measures will be estimated from literature. If some data are not available, construction cost will be estimated based upon standard engineering procedures.

The Rutgers Cooperative Extension will be responsible for this task.

TASK 6: EVALUATE AGRICULTURAL BEST MANAGEMENT PRACTICES (BMPS).

Neshanic River watershed has the highest percentage of agricultural lands in Raritan River Basin (Reiser, 2004). Built upon the Raritan Watershed Agricultural Committee, a Neshanic Farmer Group will be established to evaluate current farming practices and BMPs. The information regarding farming practices includes the crop or grass types, crop rotation, tillage, fertilizer and pesticide application, and harvest methods in the watershed. Examples of BMPs are changes in the usage of fertilizers and pesticides, riparian buffers and vegetative filter strips. NRCS will provide the information regarding the implemented agricultural BMPs at the watershed level. We will collect additional information regarding the implemented BMPs in the watershed through aerial photo interpretation and field visits and from the farmers on a voluntary basis through formal or informal meetings of the Neshanic Farmer Group. The information will be used to build input files for biophysical modeling and evaluate the potential of achieving pollutant load reduction from agricultural sources in the watershed restoration plan. The information on the implemented BMPs collected through various ways may be not detailed enough to reveal any site-specific information of land and farmers, but be sufficient at the subwatershed level for biophysical modeling and watershed management planning. The costs of farming practices and BMP implementation will be estimated through NRCS and the Neshanic Farmer Group.

There are numerous horse farms in the watershed, which historically have not taken advantage

of the NRCS technical and financial assistances, but generate substantial pollutants that go to streams. We evaluate the various BMPs for controlling horse farm runoff.

North Jersey RC&D and NJIT will be responsible for this task and operation of the farmer group.

TASK 7: CALIBRATE AND APPLY THE SOIL AND WATER ASSESSMENT TOOL (SWAT).

SWAT is a process model that integrates field-scale BMPs within a watershed and evaluates the water quality benefits that can be expected from their implementation at sub-watershed- and watershed-scale over a long period of time. It is a continuous, daily time-step model that realistically simulates the water, nutrient, chemical and sediment movement in a watershed resulting from the interaction of weather, soil properties, stream channel characteristics, land management practice and crop growth. We will build the SWAT model using the local soil, water, topographic and weather conditions in the watershed and calibrate the model with the information of stormwater management measures and agricultural BMPs collected in earlier tasks and the long-term monitoring data on stream flow and water quality collected . By using the database of conservation practices collected in Tasks 5 and 6, we will work with an established watershed restoration planning committee to define the baseline condition and expected changes in land use in the watershed for SWAT modeling. The model calibration will be based on the existing stream flow data, water quality monitoring data and county crop yields and follow the calibration procedure recommended by the SWAT developer. SWAT measures both water quality and quantity impacts of different management measures. A well-calibrated SWAT model will then be used to identify the causes and sources of the pollutants and to assess the effectiveness of the implemented and proposed stormwater management measures and agricultural BMPs evaluated in reducing fecal coliform, total phosphorus, and TSS in the watershed. The model will also be used to evaluate the causes of low/no base flow and assess the possibility of increasing the base flow in the Neshanic River through different management strategies.

NJIT will be responsible for this task. New Jersey Water Supply Authority will validate the modeling results.

TASK 8: DETERMINE OPTIMAL SPATIAL PATTERNS OF STORMWATER MANAGEMENT MEASURES AND AGRICULTURAL BMPS.

Based on the estimated implementation costs and effectiveness of the evaluated stormwater management measures and agricultural BMPs, a multi-objective and multi-level mathematical programming model will be developed to determine the optimal allocation of load reductions in fecal coliform, total phosphorus, and TSS among the different pollution sources at subwatershed and watershed levels and the optimal spatial patterns of management measures and BMPs for achieving locally defined load reductions in those pollutants in the watershed.

An optimal spatial pattern of BMPs and management measures geographically presents where and what those practices should take places to achieve the desired water quality changes in the watershed in the minimal implementation costs. The model can be expanded in many different ways to account for the complexity of the decision of BMP adoption in landscape, complexity of hydrological processes and uncertainty of climate change and weather conditions by changing the objective function , adding and/or redefining additional constraints.

NJIT will be responsible for this task.

TASK 9: PREPARE A WATERSHED RESTORATION PLAN.

The plan would include the nine minimum requirements as specified in the NJDEP "Request for Proposals for the SFY 2006 319(h) Grants for Nonpoint Source Pollution Control." These requirements are listed below.

a. An identification of the causes and sources or groups of similar sources. This will be completed in Tasks 2, 3, 4 and 7, described above.

b. An estimate of the load reductions expected for the management measures. This will be completed in Tasks 5, 6 and 7, described above. The expected pollutant load reductions will be evaluated from the best available literature values and/or simulated by biophysical models.

c. A description of the NPS management measures that will need to be implemented to achieve the estimated load reductions and an identification (using a map and description) of the critical areas in which those measures will be needed to implement this plan. This will be completed in Tasks 5, 6, 7 and 8 described above. The watershed will be delineated into limited numbers of politically manageable and hydrologically consistent subwatersheds for modeling, selecting management measures, identifying critical areas and allocating load reduction to achieve the overall goal and objectives of this project. Maps and Tables will show the management measures will be implemented in each subwatershed for achieving specific load reductions for certain pollutants as identified in the project objectives. Visual assessment of the watershed will be used to determine potential sites for some of the site-specific management measures such as stream bank stabilization, construction of detention basin or wetlands.

d. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan. This project will also benefit greatly from vast experiences of the project partners in building, designing, and implementing management measures and BMPs. Estimations of needed technical assistance to implement this Plan will be developed by the partners and the planning committee members. Financial needs of implementation will be estimated. These values will include any necessary permits, materials, engineering costs, educational material expenses, and other factors. The estimation will be based on the results from Tasks 5, 6, 7 and 8 described

above.

e. An information/education component. The project partners will develop detailed fact sheets, newsletters, and informational bulletins and distribute them to the stakeholders such as township, residents and farmers through their existing avenues. It will also outline educational programs for twilight meetings and educational workshops that would be hosted by North Jersey RC&D, South Branch Watershed Association and Rutgers Cooperative Research & Extension. These educational materials, meetings, and workshops will be targeted to further provide stakeholders information on nonpoint source pollution and assist them in implementing the identified management measures. An interactive project website will also be developed and hosted at NJIT to distribute the project information to the stakeholders and anyone who is interested in the project.

f. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious. The planning committee and farmer group meetings will develop a set of political, economic, social and environmental criteria to rank management measures and BMPs. The ranking criteria will be integrated into the SWAT and mathematical programming models to spatially allocate management measures and BMPs, which will be prioritized by iteratively incorporating different criteria in Tasks 7 and 8. The schedule of implementation can be developed based on the results of modeling and planning committee meetings. The project partners have developed a high level of trust among the local stakeholders. All municipalities also support this project. Between these partners, a schedule of implementation will be designed to be both realistic and reasonably expeditious.

g. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented. The established watershed restoration planning committee in Task 1 will develop interim, measurable milestones to determine if measures or control actions are being implemented. The project partners have a vested interest in the success of this project and will continue to monitor the implementation of the recommended management strategies. It will be recommended that all applications for additional funding of projects recommended in this Plan cite the relevancy of this Plan. It will also be recommended by project partners that a letter to the NJDEP Nonpoint Source Program be used to communicate the implementation of the project as per the Plan's recommendations. Finally, incorporation of recommendations developed in this Plan by municipal governments will also be important milestones in judging the success of this project.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards. Criteria will be developed to link measurable load reductions to effectiveness of management measures. Existing data will provide a solid baseline of watershed conditions prior to implementation of management strategies.

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time. A monitoring plan will be provided as part of the Restoration Plan. This monitoring plan will make use of the locations used in the watershed assessment to gain a "before" and "after" perspective. This sampling plan will also make use of lessons learned during the field

reconnaissance of the watershed; this includes accessibility, property ownership, and changes in land use, for instance.

The project team will present the relevant elements to NJIT, who will prepare a preliminary draft of the Watershed Restoration Plan and present it to the project partners and the watershed restoration planning committee for review and comment. As appropriate, their comments will be incorporated into the final draft, which be presented for public comments. After incorporating the public comments, the final plan will be submitted to NJDEP along with collected data.

TASK 10: DEVELOP AN INTERACTIVE PROJECT WEBSITE.

We will develop an interactive project website hosted at NJIT. The website will provide the information about the watershed and this project. The project activities, reports and final watershed restoration plan will be posted in the website. The website will also make links to related websites in NJDEP, EPA and many other institutes and agencies. We will also develop interactive tools for visualization, watershed assessment data entry and public opinion survey. The websites will be integral part of the project to facilitate the communications among the project partners, the general public and the administrative agencies.

NJIT will be responsible for this task.

Get Involved

- ✓ Being a regular member in the Restoration Planning Committee
- ✓ Attending the Restoration Planning Committee Meetings
- ✓ Signing up as a volunteer
    - Stream Visual Assessment
    - Water quality monitoring
    - Neshanic farm group
    - Various project and outreach activities

To learn more about the opportunities, please contact Dr. Zeyuan Qiu or Tina Bologna at New Jersey Institute of Technology, or Ellen Cronan at South Branch Watershed Association.

More Information

Please visit the project website after April 1, 2007 at http://ims.njit.edu/neshanic.php.