

Appendix 1: MWA Programs (2009-2012)

Musconetcong Wild and Scenic River Designation:

On December 22, 2006, President George W. Bush signed into law bill S. 1096, the "Musconetcong Wild and Scenic Rivers Act," which designated portions of the Musconetcong River as a component of the National Wild and Scenic Rivers System. The bill passed the Senate in December of 2005 and passed the House in July of 2006.

The final step, passage of the Senate bill by the House to ensure that identical legislation is recorded in both houses, occurred at 2:00 a.m. on Saturday December 9, just hours before the end of the 109th Congress. Congressman Garrett sponsored the bill in the House with co-sponsors Congressmen Rodney Frelinghuysen and Mike Ferguson. The Senate bill was introduced by then-Senator Jon S. Corzine and co-sponsored by Senator Frank Lautenberg. The signing of S 1096 made two separate segments of the Musconetcong River, a total of 24.2 miles, a part of the National Wild and Scenic River System.

In addition to those listed above, the designation effort, while led by the Musconetcong Watershed Association, could not have occurred without the hard work of citizens, municipal representatives, representatives from Warren, Sussex, Hunterdon and Morris counties, Heritage Conservancy, the National Park Service, the New Jersey Department of Environmental Protection Division of Watershed Management, Division of Fish and Wildlife, Division of Parks and Forestry and other non-governmental organizations that aided the fifteen year-long process.

Musconetcong River Management Council:

With the passage of the Musconetcong Wild and Scenic Rivers Act, the Musconetcong Advisory Committee, which guided the designation process, was replaced by the Musconetcong River Management Council (MRMC) which began meeting in February of 2008. The purpose of the Musconetcong River Management Council is to promote the long-term protection of the Musconetcong River by: (1) bringing municipalities and others involved in river issues together on a regular and ongoing basis, (2) stimulating cooperation and coordination among those organizations and individuals, (3) providing a forum for all river interests to discuss and resolve issues, and (4) coordinating implementation of the River Management Plan (RMP).

The RMP sets forth five major goals and recommends actions to maintain and improve the Musconetcong River corridor, its tributaries and watershed, and surrounding natural, cultural and recreational resources. The development of the RMP was a requirement of the National Wild and Scenic Rivers study and the result of cooperative effort of the Musconetcong Advisory Committee, Musconetcong Watershed Association, Heritage Conservancy, the National Park

Service, and a variety of local, county and state representatives. The RMP can be viewed at [www.musconetcong.org /projects/river_management_plan.pdf](http://www.musconetcong.org/projects/river_management_plan.pdf).

River Watcher Water Monitoring Program

The Musconetcong Watershed Association began training volunteers in 2007 to monitor water quality in the Musconetcong River. Volunteer River Watchers monitor water quality quarterly at four locations on the Musconetcong River. MWA plans to use the data to assure that water quality remains at a level suitable for recreational uses (i.e. fishing and swimming) and for the advocacy of stream protection when proposed projects threaten water quality. Data will be used to observe the impact over time of the implementation of restoration projects such as stream stabilization, riparian restoration and dam removals. The MWA also hopes to measure the impact of preservation of land, improved development controls, and pollution prevention programs. Project data will help the MWA determine if changing land use is affecting water quality.

Musconetcong Watershed Restoration and Protection Plan

Musconetcong Watershed Association has been working with North Jersey RC&D and Rutgers University to develop a Musconetcong Watershed Restoration and Protection Plan. Extensive water quality monitoring data was collected in 2007. By evaluating the results, two subwatersheds were identified as major contributors of bacterial contamination. Additional water quality monitoring is underway to further identify the sources within these subwatersheds. In addition, all original and new sampling locations were analyzed using Microbial Source Tracking techniques. This sampling will help determine if the fecal coliform impairment is from human, bovine or other sources.

Musconetcong River Restoration Project – Gruendyke Dam Removal:

Work on restoring the natural hydrology, vegetation, fish and wildlife of the Musconetcong River began in early March, 2008 when a small notch was cut in the Gruendyke Mill Dam just up river from the Route 46 bridge on the Hackettstown – Mount Olive border near the Pump House. The purpose of the project was to allow fish passage, eliminating a pool of standing water behind the dam that impaired water quality, restoring the riparian corridor along the river, and facilitating the enjoyment of recreational watercraft.

Project partners and principal funders include owners Rodger and Eileen Cornell, Princeton Hydro LLC, USDA Natural Resource Conservation Service, Warren County Charitable and Municipal Trust Fund, the Morris County Freeholders, North Jersey Resource Conservation and Development Council, the U.S Fish & Wildlife Service, Corporate Wetlands Restoration Partnership, Trout Unlimited and NJ Federation of Sportsman’s Clubs. Construction work was ably performed by Harrington Construction of Long Valley.

Work commenced in 2008 and continued throughout that summer. After the pond behind the dam was allowed to de-water, Trout Unlimited volunteers, MWA members and others conducted an enormous trash clean up to remove tons of tires and other debris that had accumulated for decades behind the dam.

The demolition and river bank stabilization portions of the job were completed in the fall of 2008. This work has been followed by continuing planting to restore the riparian corridor along the river.

The North Jersey Resource Conservation and Development Council, the FWS and Corporate Wetlands Restoration Partnership funded the riparian restoration effort. About 600 native trees and shrubs such as American sycamore, river birch, silver maple, shrub dogwoods, buttonwood and many other locally sourced plants have been planted by volunteers in the fall 2008. Invasive, exotic plants such as purple loosestrife and phragmites will continue to be removed.

Seber Grove Dam Removal

Early in 2009 after years of engineering and permitting, work was initiated on removing the next dam up river from Gruendyke. Seber Grove Dam was built in the 1940's by the Town of Hackettstown for the purpose of creating a swimming and recreational site for residents. The dam was badly broken and was severely impacting the river bank in the area.

MWA secured permission and extensive cooperation from the dam owner, the Town of Hackettstown, and contracted with Princeton Hydro of Ringoes, NJ for engineering services. The removal was fully funded by USDA Natural Resource Conservation Service. Subsequent riparian restoration and tree and shrub planting was funded by a grant from the Corporate Wetlands Restoration Partnership.

The structure was removed in four days of effort by Harrington Construction of Long Valley. The dam removal and river bank stabilization was completed in March, 2009. An extensive effort to re-plant the river bank that was exposed due to pond removal was led by volunteers from MWA and Trout Unlimited.

Like the Gruendyke Mill Dam removal, this effort was undertaken to permit improved fish passage, to improve water quality by eliminating a pool of standing water behind the dam, to restore the riparian corridor along the river, and to enhance the enjoyment of recreational watercraft.

Annual River Cleanups:

During annual spring and fall cleanups over 300 volunteers help remove tons of litter along the riverbanks, roadsides and parks. The cleanups are conducted in partnership with Hunterdon County Department of Solid Waste, Central Jersey Trout Unlimited, and Warren County Department of Roads and Bridges. Warren County and Raritan Valley Disposal provide trash pickup.

The New Jersey Clean Communities Program has been the primary funding source for MWA's annual cleanups.

Funding Source(s): New Jersey Clean Communities Program, Hunterdon County Department of Solid Waste and Recycling, Townships of Bethlehem, Washington (Morris), Town of Hackettstown.

Education

The Watershed Education Program focuses on teaching watershed residents and local school students about the importance of watershed resources.

MWA staff and volunteers present weeklong comprehensive watershed education program for elementary schools in Franklin, Bloomsbury, Mansfield, and Washington Township. Programs have been presented to middle school students in North Warren Middle School and Holland Township School. Students are presented with specific information about their local watersheds including the Pohatcong Creek and Musconetcong River. The curriculum includes 3 days of classroom lessons and a field trip to the Musconetcong River or other nearby stream. Students are shown how to monitor water quality by measuring chemical, biological and physical characteristics of fresh water streams.

Funding Source(s): MWA (general fund and in-kind volunteer), The Watershed Institute New Jersey Department of Environmental Protection and MWA Special Events

Outreach

Quarterly issues of the *Musconetcong River News* are published and distributed to MWA members, municipal officials, and the general public. A Special Homeowner Edition of the River News was distributed to MWA members and hundreds of property owners within the lower Musconetcong. This edition described basic water pollution problems impacting the Musconetcong watershed, and presented river-friendly landscaping techniques for property owners. Special Editions of the newsletter have also been dedicated to the designation of the Musconetcong River as a part of the Wild and Scenic Rivers System and to Dam Removals on the Musconetcong River.

Waterway Trail Guide:

The New Jersey State Trails Plan identifies the Musconetcong as being one of seven rivers in the state deemed eligible for designation as a “Waterway Trail.” MWA received a grant from the NJDEP Office of Natural Lands Management to develop a Waterway Trail Guide for the Musconetcong. The guide, which was developed by MWA staff with assistance from Mohawk Canoe Club volunteers, assisted MWA staff in the development of the guide is the first of its kind for New Jersey rivers.

The Musconetcong Waterway Trail Guide identifies river access points from Byram to Bloomsbury, and emphasizes the importance of boater safety and respect for private property. It is revised on an as-needed basis.

Funding Source: NJDEP Division of Parks and Forestry - Office of Natural Lands Management, Mohawk Canoe Club (in-kind volunteer)

Appendix 2: Geology In Relation to Water Quality/Quantity

Musconetcong River Watershed Geology

The bedrock geology of the Musconetcong watershed is typical of the New Jersey Highlands. The ridges paralleling the river valley consist primarily of Pre-Cambrian metamorphic rocks including crystalline gneiss and granites, schist, quartzite, and occasional igneous intrusions.

Sedimentary carbonate and shale rocks of Cambrian and Ordovician age underlay the river valley floor from the vicinity of Hackettstown down to Rieglesville. Land formed over limestone bedrock formations is known as “karst” topography. Limestone bedrock is highly soluble compared to other types of bedrock. The dissolving or solution of limestone bedrock causes sinkholes, depressions, caves, solution channels, and irregular bedrock surfaces. Sinkholes are of particular concern, especially when formed in densely populated areas.

Fractures and solution channels in karst areas provide a direct connection between land surfaces and groundwater, greatly increasing the potential for groundwater contamination. There is also a dynamic interchange between surface water and groundwater. Some small streams that begin on the ridge tops flow down into the valley and disappear into underground cavern networks that convey water at high velocities. In other areas groundwater flows into the river through springs found in the riverbed.

The gently rolling hills that run through the center of the lower Musconetcong River valley are underlain by Martinsburg Shale (shale, sandstone and siltstone). These rocks are more resistant to erosion than the surrounding, more level limestone formations.

The terminal moraine of the Wisconsin Glacier (which began its retreat northward 20,000 years ago) is a significant feature that crosses the Musconetcong watershed below Netcong and Stanhope. The geological features of the upper river valley include extensive areas of glacial till, moraine and stratified drift deposits. Extensive sand and gravel mining takes place in a complex of quarries along the river in Mt. Olive Township.

South of the terminal moraine, glacial deposits from earlier ice-sheets exist in scattered deposits. Also, gravel outwash from the Wisconsin terminal moraine is found in narrow, intermittent belts the length of the Musconetcong River valley down to the Delaware River confluence.

Surface Water Quality and Quantity – Geological Factors

The geology of a given watershed determines the inherent qualities of its waters. For most of its length the Musconetcong flows through a fertile limestone valley underlain by a productive sole-source aquifer. Limestone rivers like the

Musconetcong are considered by regulatory agencies to be the highest quality waters. They feature colder water temperatures, higher dissolved oxygen levels, diverse populations of pollution sensitive benthic organisms (aquatic insects), and trout. The Musconetcong is classified as a trout maintenance stream and many of its tributaries are classified trout production, the highest water quality classification. Since limestone streams and the organisms that live in them are particularly vulnerable to pollution (especially thermal pollution and sedimentation) federal and state water quality standards and wetlands regulations are set at a higher level compared with warm water, non-trout maintenance or production streams.

Thermal pollution and sedimentation problems have been on the increase with the rapid increase of commercial and residential development in the area. Some dammed areas of the river create thermal pollution, particularly where the dam pool is large and shallow (the areas above Saxton Falls and Waterloo Village are prime examples).

NJDEP's biological monitoring data shows most sections of the river are either unimpaired or moderately impaired. The river has been impacted by a variety of human activities, some going back hundreds of years (Morris Canal, dams).

More research is needed to pinpoint nonpoint pollution "hotspots" via water quality monitoring and visual surveys. Two important activities that can reduce and or prevent nonpoint pollution are planting of stream buffers, and using adequate design and stormwater controls where new development occurs, and retrofitting existing stormwater facilities. Removal or breaching of some dams will reduce thermal impacts and improve water quality.

Groundwater – Geological Factors

The State Geological Survey identifies the glacial outwash deposits found throughout the valley (found primarily in the upper valley) as being an important medium for storing and recharging water to the underlying bedrock aquifers. The glacial outwash deposits consist of course sand and gravel that have been sorted and deposited by glacial meltwater.

Other important groundwater recharge areas are the alluvial fan deposits and crystalline colluvium. Alluvial deposits are found along streams and are important groundwater recharge areas. Streams draining across these highly permeable, sandy deposits often lose water to the groundwater system. An example of this phenomenon is found in Point Mountain Park, where crystalline colluvium sand can be seen in the bed of a Musconetcong tributary that is often dry at the point where it meets the river. Further up the slope the stream is flowing, as are the contributing springs that flow into it. Even as a "losing stream" this seemingly insignificant tributary is important to the groundwater recharge system, and helps maintain the river's base-flow.

The lower Musconetcong valley is underlain by a prolific sole source aquifer associated with the limestone rock formations found throughout the valley and surrounding region. Sole-source aquifers are those aquifers that contribute more than 50% of the drinking water to a specific area and the water would be impossible to replace if the aquifer were contaminated.

According to the New Jersey Geological Survey there is an “intimate hydraulic interaction between the river and its important carbonate bedrock aquifers.” This essentially means that the river is fed by groundwater (springs in or near the riverbed), and that in some areas the river feeds the aquifer. The soluble nature of the underlying limestone formations and pervious nature of the limestone-based soils present significant hazards for groundwater and surface water contamination. These characteristics create a high potential for groundwater contamination.

The shale ridges and crystalline rock mountains found within the Musconetcong watershed generally do not store or yield reliable groundwater supplies. As a result groundwater deficits have occurred in areas that have experienced more development pressure. Parts of Mansfield Township have experienced well failure. Groundwater withdrawals and de-watering activities associated with sand and gravel quarrying in Mt. Olive Township are suspected to be the cause of the depletion groundwater supplies. Residents across the river from the quarries in Allamuchy Township have experienced well failures in recent years.

Appendix 3: Municipalities in the Musconetcong Watershed

The Musconetcong River watershed is the 157.6 square mile area of land that drains to the Musconetcong River. The 44-mile long Musconetcong River begins at Lake Hopatcong and joins the Delaware River in Rieglesville.

Listed below are the 26 municipalities that fall either partially or entirely within the natural boundaries of the Musconetcong River watershed.

Note: An asterisk (*) designates those communities that are adjacent to the Musconetcong River.

Hunterdon County

Alexandria Township
Bethlehem Township *
Bloomsbury Borough *
Hampton Borough *
Holland Township *
Lebanon Township *

Morris County

Jefferson Township
Mount Arlington Borough
Mount Olive Borough *
Netcong Borough *
Roxbury Township
Washington Township *

Sussex County

Byram Township *
Green Township
Hopatcong Borough
Sparta Township
Stanhope Borough *

Warren County

Allamuchy Township *
Franklin Township *
Greenwich Township *
Hackettstown Township *
Independence Township
Mansfield Township *
Pohatcong Township *
Washington Borough
Washington Township *

Appendix 4: Current Project Partners (2008- 2011)

American Rivers
Delaware Riverkeeper Network
Heritage Conservancy
Hunterdon County Department of Solid Waste and Recycling
Hunterdon County Freeholders
Hunterdon County Parks Commission
Lake Musconetcong Regional Planning Board
Morris County Soil Conservation District
Morris County Freeholders
Musconetcong River Management Council
National Oceanic Atmospheric Administration
National Park Service
New Jersey Highlands Coalition
New Jersey Resource Conservation & Development
New Jersey Trout Unlimited
NJDEP Division of Fish and Wildlife
NJDEP Division of Watershed Management
NJDEP Green Acres Program
NJDEP Office of Natural Lands Management
Princeton Hydro LLC, Inc.
Rutgers Cooperative Extension Service
USDA Natural Resource Conservation Services
U.S. Fish and Wildlife Service
Warren County Board of Chosen Freeholders
Warren County Board of Recreation
Warren County Department of Land Preservation
Warren County Planning Department
Warren County Soil Conservation District
Watershed Institute
Wild and Scenic Memorandum of Understanding- Signatories