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The Stony Brook-Millstone Watershed Association (SBMWA) would like to thank everyone who helped in the development of this Characterization and Assessment of the Rocky Brook Watershed. The funding for this project was made possible by Federal funds from the Clean Water Action Initiative that has been administered by the **New Jersey Department of Environmental Protection** (NJDEP) through Section 319(h) funds.

We would like to thank the members of our **Clean Water Action Advisory Committee** (James Cosgrove, Donna Drewes, Tod Fairbanks, John Gaston, Nancy Grbelja, Marjorie Kaplan, Tom Kellers, Kerry Kirk-Pflugh, Joe Mattle, Gene McColligan, Janice Mironov, Robert Ortego, Paul Pogorzelski, Kent Scully, William Searing, Stephen Souza, Dan Van Abs, and Michael Wright) for their guidance, for sharing their expertise in watershed management, and providing any available data.

SBMWA's **StreamWatch volunteers** (past and present) for donating their time to collect the chemical, biological, and visual assessment data used in this report.

Summer 2001 Watershed Management and Stony Brook-Millstone Watershed Association interns (Meghan Fehlig, Cynthia Lin, Nick Seifert, Lily Stockman, and Alley Welsh) for performing the visual assessments in the Rocky Brook Watershed.

Brian Rappaport, AmeriCorps Watershed Ambassador, for performing the visual assessments and for videotaping the streams in the Rocky Brook Watershed as part of the visual assessment.

The agencies, organizations and companies that shared their data on the environmental resources of Rocky Brook so that a complete picture of the Rocky Brook Watershed's health could be obtained.

ACKNOWLEDGEMENT

Sprawl, according to Webster's New Collegiate Dictionary, is defined as: to creep or clamber awkwardly; to spread or develop irregularly; to cause to spread out carelessly or awkwardly. *Awkward. Irregular. Careless.* These are not words that we want to associate with the planning and development of the towns where we live, work and play. And yet, in Central New Jersey the consequences of this careless development are clear: development is degrading our natural resources, most particularly putting the region's water quality and quantity at risk.

In order to better identify the causes of declining environmental health, we need an understanding of our watershed and the changes that have occurred within the natural boundaries. The water that flows in a stream arrives there in part by flowing over the land or percolating through the soil. Thus, how we develop the land is reflected in the water quality of the streams.

The Stony Brook-Millstone Watershed Association (SBMWA) initiated a project that combined the data analysis necessary to pinpoint problems with projects that can be implemented to restore and enhance the local environment. Research indicates that the most effective management efforts are generally confined to subwatersheds on the order of 20-50 square miles. Such a localized approach allows personal contact with the community and fosters building relationships and trust. The goals of this project include improved water quality, educated local residents, businesses, and municipalities on nonpoint-source pollution reductions, and measurable reductions in this type of pollution in Rocky Brook and its tributaries.

The full *Characterization and Assessment of the Rocky Brook Watershed* provides an overview of the trends seen within this area between 1986 and 1995/97. The report is intended to relay the past and present status of the Rocky Brook Watershed and its environmental resources.

FINDINGS & RECOMMENDATIONS

The results of this characterization and assessment represent an opportunity to properly plan the landscape of the Rocky Brook Watershed in an environmentally responsible way and to work proactively to protect water quality. Overall, waterways are experiencing moderate degradation due to sedimentation in Rocky Brook and stormwater is impacting the health of Etra Lake. Increased sedimentation is due to the makeup of the underlying soils and geology. While this condition is natural, many other factors are amplifying this problem. Increases in populations in the Rocky Brook Watershed, and associated land use changes, are adding to the amount of impervious surfaces, which augment the frequency and intensity of stormwater, flooding and erosion.

Landscape –

Populations in the Rocky Brook Watershed, like the rest of New Jersey, are on the rise. The population went from 55,687 residents in 1990 to 68,037 in 2000, increasing by 22.2%. From 1986 to 1995/97, developed lands increased from 2,248.5 acres to 2,635.3 acres, a gain of 17.2%. The rate of change for developed areas may be slower than the increase in population due to areas such as Hightstown Borough (which was already mostly developed in 1986) and the Twin Rivers development. Hightstown Borough needs to look at redeveloping areas within its town to aid in preventing populations from spreading over the rest of the Rocky Brook Watershed.

- One way to keep the rate of population growth and rate of development comparable is to plan for and build mixed-use developments (projects that integrate different land uses, such as restaurants, residences, offices and parks), such as the Twin Rivers development in East Windsor. This development was completed in 1969 and was the State's first planned unit development. A planned unit development is a zoning designation for property developed at a higher density than conventional development in an area. Much of Twin Rivers design incorporated the needs of the community: schools, library, recreational facilities, retail establishments and light industry. The only question remains after 34 years is whether or not Twin Rivers is efficiently working to reduce sprawl. A more thorough study needs to be conducted to determine Twin Rivers' impact on population growth and what percent of the residents utilize the facilities associated with the development.
- Rocky Brook Watershed contains many critical habitats for a variety of threatened and endangered species. Many of these critical areas are adjacent to increasing development, putting them under pressure to be built upon. The municipalities that make up the Watershed should review their zoning and rezone their municipality to coincide with these environmentally important areas and restrict development and fragmentation of these habitats.

Known Contaminated Sites –

There are 15 known contaminated sites (KCSs) in this 15 square mile watershed. Seven sites are found within the 1.2 square mile boundary of Hightstown Borough alone. This large number of KCSs in the Rocky Brook Watershed warrants that the PRPs clean up any contamination present.

- There is one wellhead protection area (WHPA) in Hightstown Borough that is in close proximity to a public community drinking water well. This WHPA is important as there is the potential for ground water contamination due to their proximity to four KCSs: North American Phillips Lighting, Hightstown Oil Company, Pullen Fuel Company and Citgo Service Station. These sites are located within a half-mile of two public water supply wells in Hightstown Borough. Because of this, these

four KCSs need to be the top priorities for remediation in the Rocky Brook Watershed. Special attention needs to be given to the monitoring of these four sites to ensure that public safety is maintained.

Point Source Dischargers –

The point source discharges in the Rocky Brook Watershed have been compliant with their permits.

- The dischargers need to stay vigilant of their monitoring efforts to maintain the health of local waterways.

Geology –

The nature of Coastal Plain geology has a large influence on the water resources of the Rocky Brook Watershed. The unconsolidated nature of the sediments has two major implications from the standpoint of water resources. First, streams and rivers of the Coastal Plain are typified by large amounts of alluvial sediment (considering their shallow gradients and relatively sluggish flows) because of the erodibility of the underlying deposits. The soils are easily eroded and carried to other areas of the Watershed. Second, the lack of cementation of the buried sediments means that the sandy units retain a high porosity, making them very productive aquifers.

- Increasing urbanization in the Rocky Brook Watershed also increases the amount of impervious cover. This has the effect of decreasing the amount of water flowing into the aquifer by diverting precipitation over the landscape to streams and not downward into the soil. Placement of new development, and therefore impervious cover, out of areas that have high value for recharging the aquifers will help to maintain water levels for drinking, irrigation, and industrial use.

Soils –

Much of the Rocky Brook is classified as hydrologic soil group B, covering 4,498 acres out of a total of 9,604 acres in the entire Watershed. Hydrologic soil group B represents soils with a moderate infiltration rate, and is representative of the moderately coarse soils seen in the Coastal Plain Physiographic Province. Most of this soil underlies the agricultural areas in East Windsor and Millstone Townships. This aids in both creating extensive aquifers in the region and allowing for much ground water to be recharged to the soil.

- In conjunction with the visual assessment data and observations during the biological assessments, the most likely stressor affecting the macroinvertebrate communities in Rocky Brook is heightened sedimentation. The basis for this heightened sedimentation may be due to the soil composition and erodibility of the Rocky Brook Watershed itself. This moderate erodibility combined with the sandy geology seen in much of the southeastern portion of the Millstone Watershed probably

accounts for much of the sedimentation observed. The nature of the Coastal Plain soils in the Rocky Brook Watershed is an important factor impacting water quality of Rocky Brook (especially macroinvertebrate communities).

Land Use –

Newly developed lands are being placed in headwaters of Rocky Brook in Millstone Township. Much of the conversion was from separate pieces of forested area to urban land uses. Forests improve water quality by filtering pollutants and reduce flooding by slowing stormwater. Forests also provide habitat to a variety of plant and animal species, and many of the forests in Millstone Township are critical habitat for State Threatened species. It has been shown that the best indicator of the presence of an unimpaired benthic macroinvertebrate community is the total area of forested land located upstream of a sampling site (USGS 1998).

- Millstone Township should review their zoning to determine if more suitable areas away from headwater streams are available for new development or redevelopment in their town and to keep forested areas intact.
- Riparian corridors are being increasingly encroached upon for developed areas in the Rocky Brook Watershed. These areas are particularly sensitive to land use changes, as they are the natural buffers that protect the stream itself from a variety of pollution sources. Placing of new construction in the Rocky Brook Watershed needs to be sensitive to or avoid altogether the riparian corridors in order to maintain ecological integrity.
- East Windsor Township has had an ordinance to protect stream corridors since 2000. Millstone Township proposed a stream corridor protection ordinance in early 2003. Stream corridor ordinances will preserve the riparian corridor and prevent further development to these critical areas. The other municipalities that do not have such protection for area streams should develop and implement such a strategy, if feasible. For example, Hightstown Borough is nearly built out, so a stream corridor ordinance may not be the best solution to protecting the portion of Rocky Brook that flows through its borders.

Impervious cover prevents the movement of water into the soil. The Rocky Brook Watershed is only covered by 13.9% impervious cover. While this is below the 25% impervious cover limit, where there is a shift to poor stream conditions that include diminished aquatic diversity, water quality, and habitat functioning, it is above the 10% impervious cover limit, where sensitive elements are lost from the stream system. The municipalities need to be aware that much of the underlying soils in the Rocky Brook Watershed

are moderately erodible. Water quality impacts have been noted due to the erodible nature of the soils in this region.

- Increasing impervious cover will only exacerbate the problem by increasing the frequency and intensity of storm flows and flooding. Municipalities need to incorporate innovative ways to plan developments including re-zoning (changing zoning classifications to permit development that is less dense or restrictive), mixed-use development (projects that integrate different land uses, such as restaurants, residences, offices and parks), conservation design and town-center designation (centralized growth areas through incentives and allows for developing at higher densities).

Water Supply –

There are many portions of the Rocky Brook Watershed that contain areas with high ground water recharge. These areas need to be protected by ordinances by their respective townships (East Windsor and Millstone, in particular) to restrict development. Reduced development in the high ground water recharge areas will ensure that there are plentiful supplies of water for many years to come.

- Since the majority of high ground water recharge areas are located in East Windsor and Millstone Townships, these municipalities need to develop and enforce regulations on the use of chemicals in the agricultural areas above ground water recharge zones to prevent potential contamination of drinking water.

Water Quality –

The chemical data available shows that upstream and downstream of Etra Lake there is very little impacting water quality. Etra Lake itself is listed by the NJDEP as impaired due to stormwater runoff. Increasing the sampling effort in tributaries draining into Etra Lake or in stations closer to the Lake will help to clarify the impacts affecting its water quality. By increasing the number and frequency that samples are taken, the actual nature of the chemical constituents in the stream can be reliably assessed.

- In order to accurately assess the environmental health of Rocky Brook, long-term trends in water quality need to be determined. Currently, there is a lack of reliable monitoring data on the water resources in this region, especially basic water quality information for many of the area's tributaries, which also have an impact on Rocky Brook. Intensive monitoring needs to occur to determine the health of Rocky Brook and its tributaries.
- Since stormwater runoff has been targeted as the pollution source for Etra Lake, BMPs should be enacted around Etra Lake in order to control the stormwater runoff and preserve this piece of open space. NJDEP

needs to make Etra Lake a priority for restoration efforts. BMPs ranging from simple vegetated filters and extended forest buffers, to bioretention systems or wet ponds are examples of what can be implemented to improve stormwater quality.

- To help alleviate the runoff entering the tributaries of Etra Lake and the Lake itself, local residents and businesses need to incorporate environmentally sensitive landscaping practices into their properties. Programs such as the SBMWA's River-Friendly Resident and Business Programs can offer guidance and expertise to properly implement everyday strategies to protect water quality.

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