

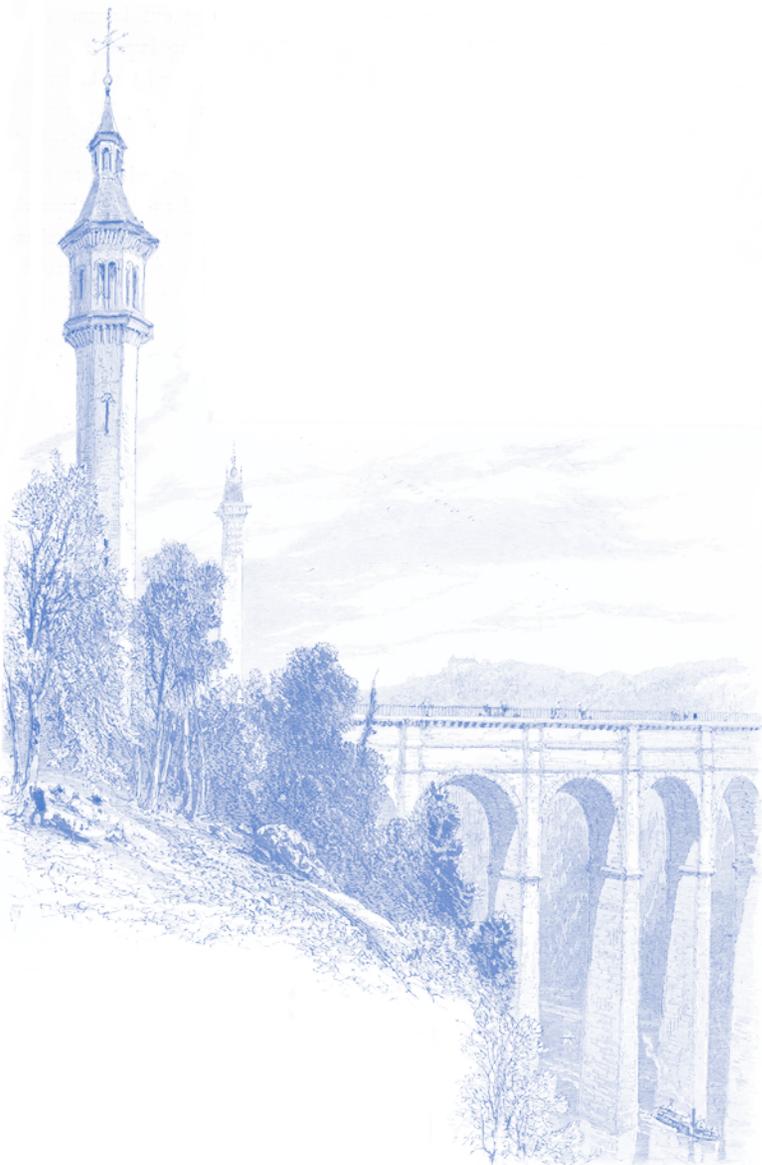
2003

WATERSHED PROTECTION AND PARTNERSHIP COUNCIL

George E. Pataki, Governor

Annual Report

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WATERSHED PROTECTION AND PARTNERSHIP COUNCIL'S MISSION

The Watershed Protection and Partnership Council represents and provides a working forum for the diverse interests that share the common goal of protecting and enhancing the environmental integrity of the Watershed, the social and economic vitality of its communities and the quality and quantity of the water that sustains them.



WATERSHED PROTECTION AND PARTNERSHIP COUNCIL

MESSAGE FROM GOVERNOR GEORGE E. PATAKI



STATE OF NEW YORK

GEORGE E. PATAKI
GOVERNOR

June 15, 2004

Dear Members of the Watershed Protection and Partnership Council:

Allow me to extend my sincere thanks and congratulations to you on all of your accomplishments regarding the New York City Watershed in 2003.

Over the past 160 years, City officials have had to keep pace with a burgeoning population and growing demand for safe drinking water. To do so, the City of New York constructed a highly sophisticated water supply system of extraordinary size and magnitude. This monumental endeavor involved visionary planners, brilliant engineers, sagacious politicians, and the hard work and dedication of so many workers.

Today, the 1997 Watershed Agreement continues to have unprecedented success in instituting a fundamental approach to protecting the New York City drinking water supply that is predicated on forging important partnerships between the City and the upstate watershed communities that are the linchpin to the long-term protection of this irreplaceable natural resource. These key partnerships continue to be successful and effective at protecting and safeguarding New York City's drinking water supply for many future generations to come.

I commend Department of Environmental Conservation Commissioner Erin Crotty for her outstanding leadership as the Council Chair, and to her staff for their dedication and commitment to this endeavor. I would also like to extend my gratitude to Secretary of State Randy Daniels and the Department of State staff, as well as Department of Health Commissioner Dr. Antonia Novello and her staff for all their efforts over the past year.

Protecting the largest, unfiltered drinking water supply serving nearly half of New York State's population is no small endeavor. On behalf of the people of New York, I thank you for your dedication and commitment in protecting this valuable resource and wish you all the best as you continue to aid in the implementation of the historic Watershed Agreement.

Very truly yours,

EXECUTIVE CHAMBER STATE CAPITOL ALBANY 12224
<http://www.state.ny.us>



MESSAGE FROM CHAIR, ERIN M. CROTTY



GEORGE E. PATAKI
GOVERNOR



STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

ERIN M. CROTTY
COMMISSIONER

Watershed Protection and
Partnership Council
2 John Walsh Boulevard
Suite 206
Peekskill, New York 10566

Dear Members of the Watershed Protection and Partnership Council:

I am very pleased to present you with the Watershed Protection and Partnership Council's (WPPC) Annual Report for 2003. Six years have passed since the Parties signed the historic and landmark New York City Watershed Memorandum of Agreement. As I look back over this relatively short time period, I am truly amazed with our accomplishments to date toward achieving the goals of protecting the drinking water supply that serves nine million New Yorkers, while preserving the economic vitality of the upstate Watershed communities.

The WPPC's 2003 report provides an opportunity to highlight all of our accomplishments, and to demonstrate how the WPPC, along with its Watershed partners, are working to protect the largest, unfiltered drinking water supply in the Nation.

I wish to sincerely thank all the Council members, their staffs and our other Watershed partners for their continued dedication and hard work in ensuring the protection and preservation of this irreplaceable natural resource for many future generations of New Yorkers.

Sincerely,

Erin M. Crotty

WATERSHED PROTECTION AND PARTNERSHIP COUNCIL MEMBERS

CHAIR

Erin M. Crotty, *Commissioner, NYS Department of Environmental Conservation*

Randy A. Daniels, *Secretary of State*

James Walsh, *Governor's Office*

Darren Suarez, *NYS Senate*

Julia Mallalieu, *NYS Assembly*

Ronald Tramontano, *NYS Department of Health*

Amy Schoch, *NYS Empire State Development*

Ruth A. Moore, *NYS Agriculture & Markets*

Jeffrey Gratz, *EPA-Region II*

Jeffrey D. Freidlander, *NYC Mayor's Office*

Michael A. Principe, Ph.D.,

NYC Department of Environmental Protection

Wilfredo Lopez, *NYC Department of Health*

James F. Gennaro, *NYC Council*

Andrew M. Alper, *NYC Economic Development Corporation*

Gretchen Dykstra, *Commissioner*

NYC Department of Consumer Affairs

Jonathan A. Ballen, *NYC Business Community*

Ronald L. Wozniak, *Dutchess County*

John Lynch, *Putnam County*

Gerard E. Mulligan, *Westchester County*

Richard Knabel, *Westchester Water Consumer*

Alan Rosa, *Catskill Watershed Corporation*

Ward Todd, *Catskill Watershed Corporation*

Georgianna Lepke, *Catskill Watershed Corporation*

Leonard Govern, *Watershed Business Community*

Fred Huneke, *Watershed Agricultural Council*

Robert F. Kennedy Jr., *Environmental Parties*

Cathleen Breen, *Environmental Parties*

WPPC EXECUTIVE DIRECTOR

William C. Harding



Randy A. Daniels
Secretary of State

With the advent of the 1997 New York City Watershed Agreement, we in New York achieved a landmark in protecting our natural resources. And while this was a great accomplishment, I am pleased to see that this agreement was not the final step - instead, the various partners in the Watershed have continued to work together to enhance these protection efforts and secure a sound future for the next generation of New Yorkers.

In 2002, the State of New York and New York City completed written evaluations of the agreement, and while these reports included recommendations for improvements to some programs, they also showed clearly that the necessary programs were in place and working to protect the City's water while ensuring the economic vitality of the upstate communities.

The federal Environmental Protection Agency has continually approved the ways in which the City is protecting its water. So much so, that EPA allows the water from the City's two largest supply areas - the Catskill and Delaware systems - to remain unfiltered.

But with all of the triumphant technology, science, and skilled stewardship, it is partnership that remains at the core of this resounding success. In fact, I believe that an undertaking as far reaching as protecting New York City's water - and preserving the economic vitality of those communities within its watershed - could not work without such a partnership as ours.

Looking back to 1990, when DEP circulated the first Watershed Protection Plan since 1953 in response to the mandates of the Surface Water Treatment Rule, the limitations of the suggested regulatory structure were immediately apparent. Threats of litigation and defiant resistance by those affected promised protracted conflict. But then in 1995, after a series of fits and starts toward updated protection, Governor Pataki suggested a different approach - Partnership.

At that time, the literature reported some success stories with respect to environmental protection partnerships, ones that were inclusive of all stakeholders, and respectful of the diversity of opinions. The challenge was that never before had an environmental partnership so ambitious been attempted.

The importance of succeeding with this innovative approach cannot be understated. New York City and dozens of downstate communities simply could not exist without a safe drinking water supply, let alone prosper. An inability to avoid

filtration would mean saddling ratepayers with a multi-billion dollar burden from which they would not escape for generations - if ever.

We now find ourselves just past the sixth anniversary of the Watershed Agreement. Is it working? Has the partnership been a success? Unquestionably, the answer is yes.

But just exactly how and why does it work? Numerous case studies on how the preservation of community economic vitality AND the protection this magnificent Watershed have been presented, discussed and examined across the country in recent years, and a few constants have begun to emerge:

- FUNDING

Perhaps the number one success factor is funding. Nationwide, partnerships like ours that have adequate funding tend to accomplish their goals at a far greater rate than those who do not. In the NYC Watershed, the City has already paid or promised to pay hundreds of millions of dollars to preserve water quality and promote sustainable economic development. In addition, the State of New York continues to provide millions of dollars annually for land acquisition and a variety of other programs within the Watershed. The City and the State also work closely with our federal partners to secure funding for additional activities.

- TRUST

With the passage of time, trust among all the stakeholders and the public has been built. The partners have been working together for years now and have learned that for the most part, what is said is what is done.

• **BROAD AND INCLUSIVE PARTICIPATION**

For many watershed stakeholders, the legitimacy of the partnership is measured against the ideal of a participatory democracy. In many respects, we have lived up to this ideal. The Watershed Protection and Partnership Council includes all parties and all points of view. If anyone needs to know what is happening in the NYC Watershed, they can contact the Council or any agency and receive an answer. If they wish to participate, they are encouraged to do so. Meetings remain open and the Council recognizes that effective communication is key.

• **COOPERATIVE AND COMMITTED PARTICIPANTS**

The NYC watershed is full of them and we could not have made the progress we have without their hard work. Also important is continuity. Many of the faces that were there when this endeavor began, are still actively implementing its various programs, and that kind of uninterrupted involvement has been a very positive force.

• **AGENCY SUPPORT AND PARTICIPATION**

From the EPA Watershed Team, to the many State agencies (DEC, DOH, DOS, EFC), and city agencies, to the local county, town and village governments, agency support and participation has remained at consistently high levels. Partnerships often fail if grassroots organizations or municipal entities try to go it alone, or if the responsible regulators assume a hands off approach to the partnership's goals. Not so in the NYC Watershed. The City continues to actively respond to EPA's requirements, and takes proactive measures on its own initiative.

The State of New York remains committed to an extraordinary degree, and constantly offers assistance to local communities, who sometimes grapple with the complex implementation of the Watershed Agreement.

• **TIME**

Simply put, older partnerships have more opportunity for success than those set up to accomplish a few short-term goals. This partnership is NOT an ad hoc blue ribbon committee. It was formed for the long haul and its participants benefit from that longevity and commitment. Promises have time to be kept - and are being kept.

• **CONSENSUS DECISION-MAKING**

The concept of consensus building that began with the Watershed Agreement negotiation process continues today. Agencies rely on open discussion, outreach to stakeholders, and the gathering of input before important decisions are made.

• **ADEQUATE SCIENTIFIC AND TECHNICAL INFORMATION AND RESOURCES**

Many aspects of watershed protection are highly technical, requiring skilled agency resources. EPA, the City, and the State of New York have committed significant scientific and technical resources and personnel to this process. The Watershed Protection and Partnership Council's Technical Advisory Committee works to provide a scientific opinion on those issues requiring additional study where technical matters are in dispute. Towards this end, the first Annual New York City Watershed Science and Technical Conference was held in Kingston this year in

order to bring scientists together to present research findings and data, and to enhance technology transfer and increase coordination among the unprecedented array of entities working with Watershed science. In keeping with our partnership mandate, we will annually sponsor this unique opportunity to pass along new information to the public, interested parties, and other scientists working in similar watershed protection arenas.

• **DISPUTE RESOLUTION**

Perhaps unique to this partnership is a formal dispute resolution capability. The Watershed Agreement allows for a dispute resolution methodology as an alternative to litigation as a remedy.

Our Watershed Protection efforts are a remarkable and inspiring success - a story of the most productive watershed protection partnership anywhere in America. And there's more to come.

I thank everyone for their commitment and involvement and look forward to continuing success.

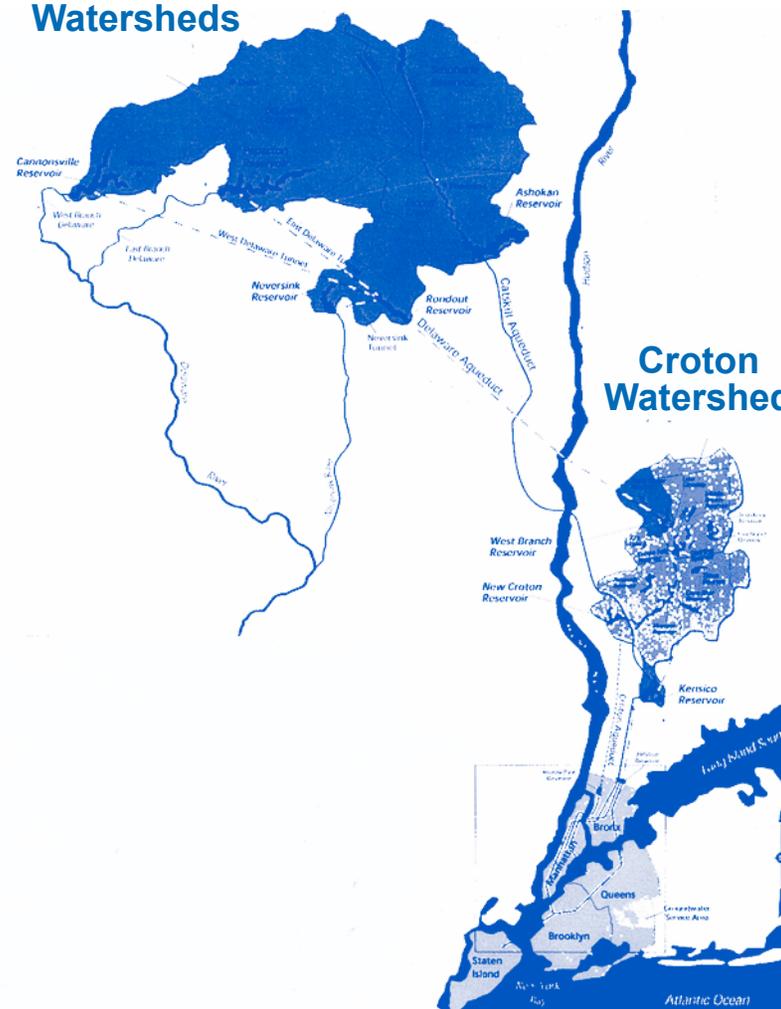
Water for the City that Doesn't Sleep

New York City's water supply system provides 1.4 billion gallons of high quality drinking water to more than 9 million New Yorkers each day. The NYC Watershed covers over 2,000 square miles and extends 125 miles north and west of the City. A total of 19 reservoirs supply drinking water to the City. The Watershed is composed of three systems: the Catskill, the Delaware and the Croton. Together, the Catskill and Delaware systems provide up to 90% of the City's water supply and originate West of the Hudson River (WOH) in portions of Delaware, Greene, Schoharie, Sullivan and Ulster Counties. The older Croton system, which came on line in 1842, is located East of the Hudson River (EOH) in portions of Westchester, Putnam and Dutchess Counties. It typically supplies the remaining 10% of the City's water supply but has provided up to 30% in times of drought.

Ensuring the Health of 9 Million New Yorkers

Responding to public health concerns spawned by outbreaks of water borne illnesses, such as giardia where 5,000 citizens of Luzerne County, Pennsylvania were sickened in 1983, the United States Congress approved the federal Safe Drinking Water Act (SDWA) to mandate that the United States Environmental Protection Agency (EPA) address drinking water quality. In 1989, EPA mandated filtration of all the nation's surface water supplies. An exception was allowed only for those supplies that have a comprehensive watershed management program to ensure that a high quality of drinking water can be maintained. For these systems, EPA can grant a Filtration Avoidance Determination (FAD). City, State and federal entities believed that the high quality of water in the City's Catskill and Delaware systems can achieve the stringent requirements of the SDWA regulations upon the adoption of more comprehensive watershed management measures.

Catskill/Delaware Watersheds



HISTORIC NEW YORK CITY WATERSHED AGREEMENT



“The key to the success of the watershed protection program has been the enormous support and commitment of the City’s watershed partners, including the federal government, the State of New York, eight counties, dozens of towns and villages, organizations, the Catskill Watershed Corporation, the Agricultural Council, the Coalition of Watershed Towns, and the Watershed Protection and Partnership Council.”

Christopher O. Ward, Commissioner NYC DEP

Steps to Partnership

Recognizing the need for a new collaborative approach to make a FAD possible, in 1995, Governor George E. Pataki tasked key State representatives to reach out to Watershed stakeholders. These stakeholders worked tirelessly over the next two years to develop a cooperative framework to address water quality protection. On January 21, 1997, the historic “New York City Watershed Agreement” was signed, which cemented a partnership among New York City, New York State, EPA, environmental representatives and the 80 Watershed host communities. This landmark agreement formed a new partnership to protect New York City’s Watershed, yet ensured the economic vitality of the Watershed communities. This innovative, cooperative Watershed protection program is the first and only of this magnitude in the nation.

The Council - Where the Partners Meet

The Watershed Protection and Partnership Council (WPPC) was created under the Watershed Agreement to provide a regional forum to aid in the long-term protection of the City’s drinking water quality and the economic vitality of the Watershed communities. The 27 members of the Council represent a broad-based, diverse group of interests. Consisting of representatives from the Watershed stakeholders, the Council continues to bring the parties together, as partners, to share information and reports of progress as well as to identify issues of concern. It also provides a resource for dispute resolution. The Council’s 16 member Executive Committee anchors the organization while the Technical Advisory, East of Hudson Advisory and the East of Hudson Sporting Advisory Committees contribute sound technical support. NYS Department of Environmental Conservation (DEC) Commissioner Erin M. Crotty provides exemplary leadership as chair of both the full Council and the Executive Committee. Executive Director William C. Harding and staff from the NYS Department of State (DOS) skillfully manage the day-to-day operations.

New York City Rules and Regulations

The New York City Watershed Rules and Regulations work in concert with existing federal, State and local environmental regulations, providing comprehensive long term protection of the City’s drinking water and minimizing, to the extent feasible, adverse impacts on the Watershed communities.

The Regulations

- prohibit or restrict the construction of Wastewater Treatment Plants (WWTPs) in Watershed basins deemed to have excess phosphorus or coliforms;
- prohibit discharges in wetlands;
- require prior approval for all new septic systems and prohibit such systems within certain areas;
- require the study of appropriate siting distances for septic systems and the use of galley type systems;
- prohibit new impervious surfaces in certain areas;
- require stormwater pollution prevention plans for stormwater discharges;
- prohibit or restrict the location of new hazardous or petroleum subsurface tanks; and
- require existing WWTPs to implement microfiltration and phosphorus removal measures within five years and require any new plants to implement these measures.

The regulations include certain exemptions from these restrictions for activities within existing concentrated communities, such as hamlets and villages, to encourage any new development to be focused in these areas, reducing the likelihood of environmentally unfriendly sprawl. Compliance with environmental regulations in the Watershed is ensured through a rigorous and coordinated program including project design and review, inspection and enforcement.

Project Design and Review

Projects proposed in the Watershed are reviewed by the NYC Department of Environmental Protection (DEP), State and local authorities to ensure conformance with the Watershed Rules and Regulations, as well as State and local laws. The State Environmental Quality Review Act (SEQRA) process also is used to coordinate the interests and comments of various agencies and to maximize the effectiveness of analysis for projects in the Watershed.

BUILDING ON THE SUCCESS OF THE HISTORIC NEW YORK CITY WATERSHED AGREEMENT

Building on the Success of the New York City Watershed Agreement

First steps were taken in 2003 toward implementing the newest FAD for the Catskill and Delaware Watersheds. The 2002 FAD waives the federal requirement for the City of New York to filter drinking water from the Catskill/Delaware Watersheds for another five years, and provides further testament to how successful the Watershed Agreement has been and continues to be at protecting the largest, unfiltered drinking water supply in the nation. The new FAD builds on, enhances and expands many of the watershed protection programs contained in the Watershed Agreement.

Some program elements of the 2002 FAD are highlighted below and are discussed in further detail in the accompanying program sections.

- Making improvements to the City's Watershed Rules and Regulations in the areas of SEQRA involvement, and public education and outreach;
- Continuing an aggressive and improved land acquisition Program;
- Building on the City's comprehensive program to protect and improve water quality in the Kensico basin;
- Improving the Wastewater Treatment Plant Upgrade Program and New Infrastructure Program throughout the Watershed;
- Expanding the Septic Repair and Replacement Program, including a program to address the operation and maintenance of these systems;
- Expanding the Stream Management Program to include Stream Management Plans for all sub-basins within the WOH Watershed, as well as increasing the number of stream restoration/demonstration projects;
- Expanding the Agricultural and Forestry Program to include small farms and areas within the EOH portion of the New York City Watershed;
- Expanding the Nonpoint Source Program in the EOH portion of the New York City Watershed to include wastewater infrastructure mapping and inspection, wastewater infrastructure remediation, remediation of failing septic, stormwater infrastructure mapping and inspection, and stormwater retrofit and remediation;
- Strengthening of those programs that address turbidity problems within the City's reservoirs, particularly Schoharie Reservoir; and
- Enhancing regulatory review and enforcement coordination with DEC.

BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

New Sewage Treatment Infrastructure Program

Paragraph 122 of the Watershed Agreement established a new Sewage Treatment Infrastructure program (NIP) which identifies, in order of priority of greatest water quality benefit, 22 communities in the WOH portion of the Watershed that are eligible to receive funds for the construction of wastewater treatment facilities. New York City provided \$75 million to fund this program.

The 2002 FAD recognized the importance of continuing this program to ensure the long-term protection of the New York City drinking water supply. The City agreed to extend this program beyond the original commitment of \$75 million and will fund wastewater systems in two additional municipalities, Phoenicia and Prattsville. The City also agreed to fund a Community Wastewater Management Program which will address wastewater issues in five other communities. The Community Wastewater Management Program is an outgrowth of the New Infrastructure Program. Under this program, the City will provide sufficient block grant funding to support the implementation of wastewater solutions, which can include septic maintenance districts, community, or cluster septic systems.

Designs for new WWTPs and collection systems were completed for the Village of Hunter and the Towns of Windham and Andes. Bids were received and construction started during 2003. The Town of Roxbury also completed design of its connection with the NYC owned WWTP in Grand Gorge and initiated construction this past year. The Village of Fleischmanns continued work on the design of its WWTP and collection system. Each of these five communities is using the NIP Block Grant funding for these projects, under which NYCDEP provided capped funding amounts to each community. The capped amount represents NYCDEP's maximum program contribution to each community for engineering, construction, legal and other associated project costs. The largest cost item is construction, and if the bids received are higher than anticipated, the community has the option to re-bid the project. This was done for both Hunter and Windham, where the projects were re-

signed to lower the costs following receipt of the initial bids. Each re-bid project was successful in reducing the construction costs.

As part of the 2002 FAD, the City agreed to provide funding for a new program administered through the Catskill Watershed Corporation (CWC) called the "Community Wastewater Management Program." This program is being designed by CWC to address the wastewater issues in five more communities included in the original Watershed Agreement list of twenty-two communities identified under the NIP. The Strategic Wastewater Planning Study prepared by the New York State Environmental Facilities Corporation (EFC) will help form the basis for planning activities that will be undertaken by CWC in the Community Wastewater Management Program. EFC continued to provide CWC with technical assistance in the development of this new program.

Septic System Rehabilitation and Replacement

Established under paragraph 124 of the Watershed Agreement, the \$13.6 million septic rehabilitation program rehabilitates failing septic systems serving single-family or two-family homes in the WOH portion of the Watershed, ensuring that wastes from these systems do not enter the City's water supply. Phase II of this program, funded with an additional \$15 million from the City, was approved as part of the 2002 FAD, which also created a Septic Maintenance Program, funded at \$1.5 million.

During 2003, the Septic System Rehabilitation and Replacement Program was expanded once again, to include approximately 1,700 properties whose center points, or whose septic systems are located within 50 feet of a watercourse or within 500 feet of a reservoir or reservoir stem. A total of 581 inspections were conducted during the year, and 230 septic system repairs and replacements were paid for through the program. The CWC paid for a total of 1,832 repaired or replaced systems between 1997 and 2003.

Rules for a new Septic Maintenance Pilot Program were approved in 2003, as required under the 2002 FAD. The ten-year program to provide pump-outs and inspections of residential

septic systems serving one- and two-family households in the WOH Watershed will be instituted in priority areas during a two-year trial phase before it is launched Watershedwide.



CWC staff member checks soil conditions to determine the location of a septic system.

Sites were selected in 2003 for a new Septic Monitoring Program, funded through a grant from the federal Safe Drinking Water Act. The CWC will coordinate the project, which involves installing and evaluating 40 alternative and conventional septic systems in 18 Watershed towns to determine which systems offer the most effective treatment for varying soils and terrain.

BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

Stormwater Infrastructure Retrofits

Pursuant to paragraph 125 of the Watershed Agreement, existing stormwater infrastructure problems are addressed through the Stormwater Retrofit Program. Under the Watershed Agreement, the City of New York committed \$7.625 million to support this program which funds the design, construction, implementation, and maintenance of stormwater control measures or "best management practices" (BMPs) to address problems from existing stormwater runoff within the WOH Watershed. The new FAD requires the City of New York to continue this successful program. To do so, the City of New York committed an additional \$6.3 million to the CWC to sustain historic project activity levels. The City of New York also agreed to develop and fund a new component of the Stormwater Retrofit Program that will support a community-wide stormwater infrastructure assessment and planning program, and committed \$1.25 million to support this initiative.

Ten grants totaling more than \$667,637 were awarded to municipalities under the Stormwater Retrofit Program in 2003. Funds were given for projects to correct stormwater problems affecting water quality. Recipients included the Towns of Andes, Jewett, Windham and Middletown; the Delaware County Department of Public Works, and the Greene County Soil & Water Conservation District. The 2003 awards brought to 32 the number of retrofit projects funded by the CWC. Three previously funded projects were completed during the year.

Retrofit Program rules were revised in 2003 to accommodate the new Planning and Assessment Grant program. Procedures were developed, and the first grant applications accepted. In January of 2004, ten grants were awarded in the first round of the new assessment initiative program.



Delaware County's vacuum truck, purchased with a Stormwater Retrofit grant, clearing culverts and catch basins.

Future Stormwater Controls

As provided in paragraph 128 of the Watershed Agreement, the City of New York provided \$31.7 million to fund new stormwater measures required by the Watershed Rules and Regulations, but not otherwise required by federal or State law in the WOH Watershed. This program funds the design, construction, implementation, and maintenance of new stormwater measures.

In January 2003, DEC implemented new stormwater regulations under its Phase II Stormwater program. The new State-mandated rules require Stormwater Pollution Prevention Plans (SPPPs) for construction-related projects disturbing one or more acres. This change reduced the number of projects eligible for CWC funding, which only covers work exceeding State mandates in the New York City Watershed. Five projects were assisted by the CWC's Future Stormwater Program in 2003, and \$470,338 in reimbursements for eligible costs were distributed. Work was completed on SPPPs at the Town of Kortright Town Hall, Ultra Dairy Garelick in the Town of Delhi, and Tri-Valley Central School in Grahamsville.



Sand and Salt Storage Facilities

Under paragraph 126 of the Watershed Agreement, the City provided \$10.25 million for a program, administered by CWC, to build new or upgrade municipal road maintenance sand and salt storage facilities in the WOH portion of the Watershed in order to keep these materials from coming in contact with water and entering into streams.

During 2003, the last of 39 sand and salt storage sheds was constructed. The Town of Woodstock facility was in use for the winter of 2003-2004, and the CWC contract with the municipality is expected to be closed in early 2004. The storage buildings were constructed throughout the Watershed between 1999 and 2003 using CWC funds totaling \$9,637,389.

BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

Stream Management

Under paragraph 127 of the Watershed Agreement, the City committed \$3 million for a stream management program to work in partnership with the WOH Soil and Water Conservation Districts (SWCDs) to develop stream management plans and stream restoration demonstration projects in priority streams. In light of the tremendous success of the Stream Management program, the current FAD greatly expands this program. The City of New York committed an additional \$22.8 million for this endeavor.

The objective of the Stream Management program is to increase stream system stability through development and construction of demonstration projects, and to enhance long-term stream stewardship through increased community participation.

The following is a schedule for completing Stream Management Plans and associated Demonstration Projects within the WOH Watershed:

Schedule for Stream Management Plans and Demonstration Restoration Projects in Priority Watersheds		
<i>Requirement</i>	<i>Due Date</i>	<i>Status</i>
Broadstreet Hollow Stream Management Plan	12/31/02	Complete
Chestnut Creek Stream Management Plan	12/31/03	Complete
• Town Hall/Grahamsville	12/31/03	In process
Stony Clove Creek Stream Management Plan	12/31/03	Complete
• Beecher Smith Property/Lanesville (T) Restoration Project	12/31/04	In process
Batavia Kill Stream Management Plan	12/31/02	Complete
• Red Falls Restoration Project	12/31/05	In process
• Big Hollow Restoration Project	12/31/02	In process
• Red Falls Monitoring Report	12/31/07	Complete
West Branch Delaware Stream Management Plan	12/31/04	Complete
• Town Brook/Post Property	12/31/04	Complete
West Kill Stream Management Plan	12/31/05	In process
• Restoration Project (undetermined location)	12/31/05	Complete
Esopus Creek Stream Management Plan	12/31/06	In process
• Woodland Valley	12/31/03	Complete
East Branch Delaware Stream Management Plan	12/31/07	Complete
• Restoration Project (undetermined location)	12/31/07	In process
Schoharie Creek - including East Kill Stream Management Plan	4/30/07	In process
• Restoration Project (undetermined location)	12/31/07	Complete

Stream restoration projects use “bioengineering” and natural channel design to reduce erosion and potentially decrease turbidity, lessen the threat of flood damage from erosion and improve stream ecology. The DEP and SWCDs had completed 7 restoration projects by the close of 2003; two additional projects were initiated, but work was suspended due to unusually high stream flows in the late summer of 2003. Stream

management plans, built on a broad public outreach effort and local input, have been completed for the Batavia Kill, Broadstreet Hollow, Chestnut Creek, and Stony Clove Creek. Plans define the extent of stream instability and stability-related problems and provide recommendations for addressing these problems.



BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

Regulatory Upgrade Program

Under paragraph 141 of the Watershed Agreement, the City pays the costs, including future added Operation and Maintenance (O&M) costs, of upgrades to existing WWTPs in the Watershed that are required by the Watershed Rules and Regulations. For the WOH portion of the Watershed, the City also agreed to provide up to \$5 million to help pay for upgrades required under State Pollutant Discharge Elimination System (SPDES) requirements.

Following the signing of the updated FAD in November 2002, the schedule for the remaining WOH Regulatory Upgrade Program projects was extended to 2007. This will provide additional time for the completion of the approximately 39 remaining upgrades of mostly smaller WWTPs located in the WOH Watersheds. Many of these designs are unique due to the intermittent, small flow or seasonal flows typical of the smaller size facilities. These remaining facilities account for approximately 17% of the permitted flow in the Catskill and Delaware WOH Watersheds.

The focus of EFC's efforts during 2003 was mainly the continuation of project designs for both the WOH and EOH projects, and helping some projects proceed to construction. During 2003 it became apparent that the designs for several projects were either not progressing well with the present engineer or needed an alternate

technology that would better accommodate the expected operating conditions. These issues resulted in additional efforts being aimed at helping owners select a new design engineer or re-designing the upgrade with different technology. As a result, project schedules were impacted. However, both issues were critical program decisions that will help ensure a positive impact on water quality protection.

A group of seven WOH existing WWTP upgrade projects will be connecting to new wastewater collection and treatment systems built under the NIP in the Village of Hunter or Town of Windham. Connections from the existing WWTPs to the new municipal facilities will be made once the new systems are constructed. It is expected that completion of the sewage collection system and wastewater treatment plant will take at least two years. A study was con-

ducted to determine the best interim treatment technology for the existing WWTPs during their continued operation prior to connection. Ultraviolet disinfection was approved as the preferred interim supplemental treatment technology. Installation of UV disinfection was nearly completed on the seven projects during 2003 and, following start-up, will be operated until connection can be made to the NIP municipal systems.

During 2003, EFC began assisting DEP with negotiation of O&M agreements for the publicly-owned WWTPs participating in the Regulatory Upgrade program. Negotiations are started once a facility has completed the design of the wastewater treatment plant improvements required under this program. The City is obligated to pay O&M costs associated with the upgraded components of the WWTP.

Phase II Municipal Separate Storm Sewer System (MS4) program within the EOH portion of the New York City Watershed

Polluted stormwater runoff is often transported to municipal separate storm sewer systems (MS4s) and oftentimes ultimately gets discharged into local rivers, streams, reservoirs, and wetlands with little to no treatment.

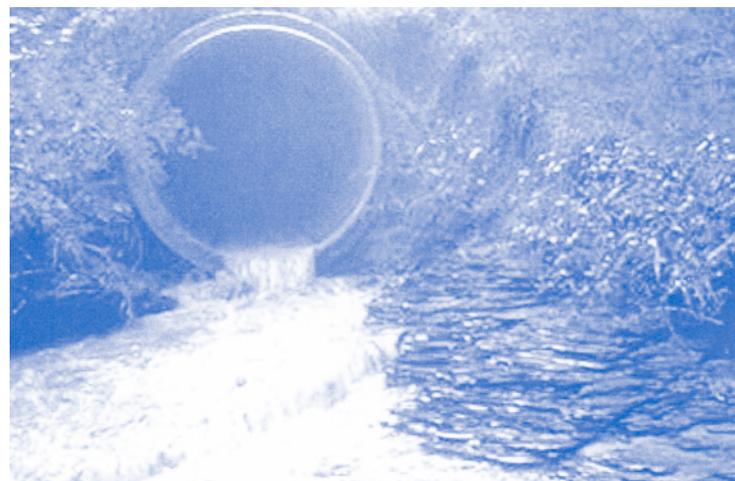
To better address the potential adverse impact stormwater runoff can have on water quality, the United States Environmental Protection Agency's (EPA) Stormwater Phase II Rule requires that areas designated as MS4s develop a stormwater management program to comprehensively address stormwater runoff. The goal of the MS4 stormwater management program is to improve the nation's waterways by reducing the amount of pollutants that stormwater transports into storm sewer systems and into our waterways during storm events. Common pollutants transported by stormwater include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and trash. When these pollutants are deposited into nearby waterways through MS4 discharges, they can severely impact the receiving waterbody and result in contaminated drinking water supplies, degraded aquatic life and wildlife habitat, reduced aesthetic quality and recreational use of the resource.

In 1990, the EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s required "medium" to "large" MS4s, (populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges.

In 2000, the EPA promulgated Phase II. The Phase II Stormwater Rule extends coverage of the NPDES stormwater program to certain "small" MS4s. This includes the entire EOH Watershed. Under the Phase II Stormwater Rule, MS4s are required to develop a stormwater manage-

ment program that is comprised of six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

In addition, under Phase II Stormwater Rule, the threshold for regulating construction site runoff was reduced from five acres of disturbance down to one acre of disturbance. Under this new requirement, development one acre or above is now subject to specific sediment and erosion control requirements. Stormwater runoff also has to be managed during and after construction under the Phase II Stormwater Rule.



Adverse impact of stormwater runoff on water quality

“Far more resources are being deployed to assure compliance with important new rules and practices governing polluted runoff from new construction. Pollutants swept along by storm waters are the largest source of contaminants entering the reservoirs.”

*James Tierney
New York City Watershed
Inspector General*

BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

On January 8, 2003, DEC issued its statewide Construction Activity and MS4 permits as required under the Phase II Stormwater Rule. In conjunction with this initiative, DEC hired nationally-recognized experts in stormwater, from the Center for Watershed Protection (CWP), to assist in developing a strategy for addressing stormwater in the EOH Watershed. The CWP was charged with developing a list of recommendations on how DEC should proceed with the Phase II Stormwater program within this area, given the continued development pressure and the Total Maximum Daily Load exceedance for phosphorus within many of the EOH reservoirs. The CWP was also charged with determining if the Statewide MS4 program was sufficient to address EOH concerns or if additional requirements are necessary.

The CWP prepared a report with detailed recommendations and submitted it to DEC for review and consideration. The DEC then convened a Watershed stakeholder group to review CWP's recommendations, and to assist the DEC in developing a strategy for addressing stormwater in this area. The DEC plans to continue meeting with Watershed stakeholders in 2004 to determine the most effective approach to move this initiative forward.



An example of poorly maintained and ineffective sediment and erosion control measures.



An example of post construction runoff controls as required under the Phase II Stormwater Program - stormwater runoff from impervious surface is collected, filtered through a grass swale and allowed to naturally infiltrate back into the ground.



Demonstration of stormwater runoff from a precipitation event.

Federal Funding

Safe Drinking Water Act (SDWA) — Recognizing the importance of ensuring that all sectors of government (federal, State, and local) effectively commit to the implementation of the Watershed Agreement, paragraph 164 specifically references an enhanced water quality monitoring and surveillance program for the Watershed. Based upon the intent of the Watershed Agreement, Governor George E. Pataki worked with members of the New York Congressional Delegation, particularly Congressmen James T. Walsh and Sherwood L. Boehlert, to fashion appropriation language authorizing funding to undertake a comprehensive water quality monitoring and surveillance program. As a result of their good efforts, the SDWA of 1996 includes language directing the EPA to monitor the effectiveness of the Watershed Agreement by authorizing up to \$15 million annually over seven years to demonstrate compliance with the Watershed Agreement. This authorization expired at the end of 2003, and reauthorization efforts are currently underway. SDWA funding requires a 50 percent non-federal match.

Water Resources Development Act (WRDA) — In addition to the SDWA, Governor George E. Pataki also worked with members of the New York Congressional Delegation to institute appropriation language under the WRDA authorizing funding for water quality related construction projects within the Watershed. The WRDA of 1996 includes language directing the United States Army Corps of Engineers to work with the State of New York to financially support water quality improvement projects and ongoing watershed protection efforts identified in the Watershed Agreement. Resulting from the efforts of the Governor and New York State Delegation, the WRDA of 1996 authorized up to \$42.5 million to assist local governments in the implementation of Watershed protection efforts. Through the use of these funds, upstate communities have been able to construct or improve sewage treatment facilities, control stormwater, study phosphorus reduction measures, restore and stabilize streams, and support many other important water quality initiatives. WRDA funds require a 25 percent non-federal match.

Below is a listing of the federal appropriations under the SDWA and the WRDA since Federal Fiscal Year 1997:

Federal Appropriations for the New York City Watershed		
<i>Federal Fiscal Year</i>	<i>SDWA</i>	<i>WRDA</i>
1997	\$1.0 million	0
1998	\$2.0 million	\$5.0 million
1999	\$2.0 million	\$2.0 million
2000	\$10.0 million	0
2001	\$8.0 million	\$3.0 million
2002	\$3.0 million	\$3.0 million
2003	\$5.2 million	0
Total	\$31.2 million	\$13.0 million

A brief overview of all SDWA and WRDA projects funded through 2003 are included in *Appendix A*.

ADVANCED STUDIES AND ANALYSIS FOR WATER QUALITY

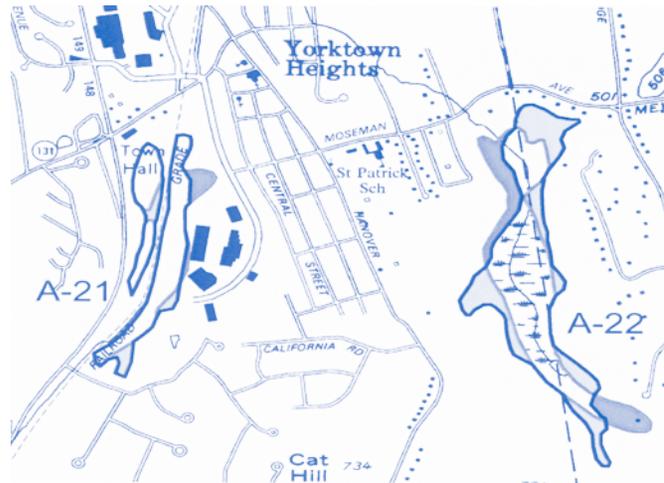
“DEC is conducting an extensive and thorough scientific evaluation of the current extent of wetlands in the Watershed. To date, this has resulted in the State’s formal mapping and protection of an additional five square miles of wetlands that naturally filter pollutants from our drinking water.”

*James Tierney
New York City Watershed
Inspector General*

Freshwater Wetlands Map Amendments within the New York City Watershed

Wetlands play a critical role in maintaining and enhancing water quality. In New York State, not all wetlands are regulated under the Environmental Conservation Law Article 24 Freshwater Wetlands Act. Only those wetlands 12.4 acres or greater and smaller wetlands identified as of “unusual local importance” (ULI) that are specifically identified on DEC’s Article 24 Freshwater Wetlands Maps are regulated by the State of New York. The Act also allows the DEC to regulate activities within 100 feet of the wetland.

To ensure the DEC has the most accurate Article 24 Freshwater Wetlands Maps within the New York City Watershed, DEC undertook a comprehensive wetland remapping effort in the WOH Watershed in 1998. A total of 15 new wetlands, constituting 700 acres WOH are now under State regulatory jurisdiction.



An example of a revision to the Article 24 Freshwater Wetlands Map within the New York City Watershed. Outlined areas are Article 24 wetlands.



Typical wetland area being added to the State’s Article 24 regulatory maps through the map amendment process.

With the WOH wetlands remapping effort complete, efforts turned to EOH to identify wetlands that were not included on the State’s wetland regulatory maps, but met the DEC’s size criteria. As of the end of 2003, the DEC is proposing to add an additional 3,363 acres to the Article 24 Freshwater Wetland Maps within that portion of Westchester County that resides within the New York City Watershed. This includes 36 new wetlands greater than 12.4 acres and 75 smaller wetlands identified as ULIs. Wetland amendments also were included on 72 existing State regulated wetlands. Once the map amendment process is completed within Westchester County, the DEC will continue its efforts over the next two years to revise the maps of portions of Putnam and Dutchess Counties that are within the New York City Watershed. Wetland map amendments in Westchester County should be finalized in 2004.

The WPPC Technical Advisory Committee (TAC) — Total Maximum Daily Loads (TMDL)

Paragraph 105c of the 1997 New York City Watershed Agreement sets forth that on the fifth anniversary of the Agreement, the WPPC Executive Committee may commence a review of:

- The implementation of the Watershed Regulations as set forth in Attachment W of the Agreement;
- The Watershed land acquisition program as set forth in Article II of the Agreement;
- Any comprehensive water quality monitoring programs in the Watershed;
- Any Watershed Protection and Partnership Programs set forth in Article V; and

The WPPC Executive Committee undertook such a review, and received reports from the City of New York and the State of New York regarding their respective activities implementing the Watershed Agreement and other activities relating to the protection of water quality in the New York City Watershed.

Following a series of public comment opportunities on the implementation of the Watershed Agreement and on the City and State reports which were made available to the public, the WPPC Executive Committee convened and adopted a list of 29 “Priority Recommendations for MOA Programs.” One of those recommendations was to convene the TAC to study and make recommendations on Watershed TMDLs for phosphorus.

The TAC began its work in January of 2003 by reviewing an interim report on Nonpoint Source Implementation of the Phase II Phosphorus TMDLs in the New York City Watershed, prepared by DEC in 2002, and is in the process of making recommendations to DEC on how to finalize the interim report.

The objective of the current TAC initiative is to make recommendations to DEC for the development of its Phase II TMDL Implementation Plan which will provide a reasonable assurance that TMDLs for each basin will be met and which will identify how local communities will be involved in developing site specific projects to achieve TMDL goals. The final TAC report will also suggest a mechanism for evaluating the effectiveness of TMDL implementation program over time.

Specifics of the current TAC study include:

- A review of the DEC Interim Report and a determination of specific additional steps or data that are needed to adequately address the implementation plan components identified by EPA. The implementation plan components identified by EPA are:
 1. For each upstream waterbody, quantification of additional load reductions (including reductions from point sources and non-point sources) above those required to meet the TMDL for that waterbody, that will result in achieving standards in downstream reservoirs;
 2. Identification of management practices specific to the land use areas within each basin that may be implemented to meet the more

ADVANCED STUDIES AND ANALYSIS FOR WATER QUALITY

- stringent of either the TMDL for that waterbody or the reduced load necessary to achieve downstream standards;
3. A list of municipalities, and other storm sewer systems, by basin, that should be designated under the Phase II Stormwater Rule;
 4. For each reservoir, management practices that will be implemented to achieve standards in that waterbody and achieve standards in downstream reservoirs;
 5. A description of the implementation mechanism/institutional framework;
 6. The time frame for implementing the actions;
 7. Funding sources for implementation; and
 8. A plan for evaluating/monitoring the effectiveness of the management practices.
- The TAC will recommend how and from whom to obtain this additional information, along with a schedule.
 - The TAC will provide recommendations on the necessary stakeholder input and stakeholder commitments for plan finalization, such that implementation of the Phase II TMDL Implementation Plan will meet the phosphorus goals of the TMDL.
 - The TAC will review the draft and final (if available) Croton Plans for specific commitments.
 - TAC will provide specific recommendations to DEC on finalizing the Phase II TMDL Implementation Plan for achieving nonpoint source reductions in the NYC Watershed.

The final TAC report is expected to be completed by April of 2004.

Land Acquisition

Article III of the Watershed Agreement, the Land Acquisition program, is one of the most effective and crucial tools for permanently protecting the City's drinking water supply. The goal of the Land Acquisition program is to ensure that undeveloped, environmentally sensitive Watershed lands remain protected. The Land Acquisition program allows the City to purchase title to, or conservation easements on, environmentally sensitive undeveloped lands.

The City must pay fair market value for these lands and is responsible for municipal property taxes once they are under City ownership. Most importantly, the City has agreed to only acquire land from willing sellers, and to notify Watershed towns or villages of its intent to purchase properties within their borders. The Watershed Agreement stipulated that the City will seek a 10-year water supply permit from DEC to acquire additional Watershed lands. On a priority basis, over time, the City will solicit owners of 355,050 acres of eligible land for the Catskill and Delaware Watersheds and has committed \$250 million for the purchase of lands within these Watershed areas. In the Croton Watershed, the City has agreed to expend \$10 million for land acquisition, and the State of New York has committed \$7.5 million to acquire water quality sensitive lands within this area.

The EPA also views the City and State land acquisition programs under the Watershed Agreement to be a tremendous success. As a condition of the current FAD, the City agreed to set aside an additional \$50 million for land acquisition above and beyond the \$250 million already committed under the Watershed Agreement. This additional funding will ensure that sufficient financial resources will be available for land acquisition until the next FAD comes up for renewal in 2007.

With Governor Pataki's commitment of an additional \$10 million towards EOH land acquisition, DEC staff have been busy working with interested landowners and land trust organizations to identify lands available for acquisition and/or for the purchase of a conservation easement. DEC staff have identified a number of potential projects that should be finalized in 2004.

Pursuant to paragraph 82 of the Watershed Agreement, the City of New York will "grant to the DEC a conservation easement that shall run with the land on all land acquired in fee under the Land Acquisition program to ensure that such land is held in perpetuity in an undeveloped state in order to protect the Watershed and the New York City drinking water supply." The first batch of conservation easements is being processed by DEC and will be forwarded to the Office of the Attorney General for execution and recording. The DEC expects to receive a significant number of additional easements from the City of New York in 2004.

By the close of 2003, DEP and its partners had more than 53,000 acres either acquired or under purchase contract for acquisition or easement. During 2003, 99 projects comprising 8,536 acres were closed and 76 projects ac-

counting for 6,238 acres were signed to purchase contract.

Of the 4,830 acres eligible in the Rondout 1A priority area, the total number of acres acquired or under contract increased to 2,678 acres (55%).

Of the 12,645 acres eligible in West Branch 1A and 1B priority areas, the total number of acres acquired or under contract increased to 8,010 acres (63%).

In December 2003, Mayor Michael Bloomberg announced that New York City would commit an additional \$25 million for land acquisition in the Croton system. This additional funding exemplifies the City's commitment to watershed protection for the Croton, as well as the Catskill/Delaware system.

Recreational Opportunities

The undeveloped lands that the City owns or is purchasing can provide tremendous recreational opportunities for outdoor enthusiasts. In fact, for many of the Watershed communities, such activities represent a way of life that they would like to see continued. Yet, the City's priority for managing these lands is to ensure that they have adequate security to prevent anything from adversely impacting the City's water supply. Thus, it is compelled to carefully evaluate potential recreational opportunities. The City requires permits, which are available at no cost, for recreational users of its lands.

The City continued to make lands available in 2003 under its access permit system. Currently, there are almost 68,000 valid access permits, with over 6,300 DEP hunting tags issued in 2003. The amount of lands available to the public continued to increase with 58 sites totaling 16,045 acres open for hiking and 70 sites totaling 32,092 acres open for deer hunting.

In 2003, hunting access was made available during the archery season for the first time on all hunting areas, and four new hunting areas (3,078 acres) were created on reservoir lands. The City has also begun cleaning up abandoned boats along the shores of the reservoirs, and is in the process of updating its rules and regulations for recreational use.



Sporting Advisory Committees (SAC)

Paragraph 115 of the Watershed Agreement created an EOH SAC that reports to the Council, and paragraph 118 created a WOH SAC that reports to the CWC. The Committees make recommendations to the City regarding potential recreational use opportunities on newly acquired lands.

In addition to generating recommendations to DEP regarding appropriate recreational uses for properties acquired under the City's Land Acquisition program, SAC meetings provide a valuable opportunity to interface with DEP Land Acquisition and Stewardship staff to discuss concerns and ideas relative to the entire process of recreational use. It also allows SAC members to bring local community concerns and preferences to the attention of DEP staff.

During 2003, DEP began a process of updating its Rules and Regulations for Recreational Use of City Owned Property. SAC members reviewed and commented on final draft Rules and Regs, prior to the start of a public outreach process to be completed by the City in 2004.

The SAC reviewed 19 parcels submitted by DEP totaling almost 861 acres during 2003.

MASTER PLANNING AND ZONING

Master Planning and Zoning Incentive Awards Program

The New York City Watershed Master Planning and Zoning Incentive Awards Program (MP&Z Program) was established pursuant to Paragraph 152 of the Watershed Agreement and is administered by the DOS. This program aids municipalities “in the development of community development tools and any necessary local laws”. Eligible projects include preparation or updating of comprehensive plans; the development of new or amended local land use regulations or other environmental controls for Watershed or water quality protection; the development of strategic capital investment management plans and management plans to address existing non-point sources of water pollution; and preparation of strategic capital investment and management plans for hamlets, villages, village extension areas, and other potentially developable areas in the NYC Watershed that regulate land use for the purposes of protecting water quality and encouraging development consistent with the Watershed Agreement.

Originally established for WOH communities with a funding stream of \$500,000, the MP&Z Program was expanded to the EOH Watershed in 2002 and has now awarded \$1,405,000. The Fifth Round (2003) included 18 projects that totaled \$269,594 in grant funding.

To date, 39 of 50 eligible WOH and 18 of 23 eligible EOH communities have participated in this voluntary program, each receiving funding under at least one of the four flexible categories. To be eligible, a municipality need only have a portion of its land area within the NYC Watershed. In addition to the 50 eligible towns and villages in the WOH Watershed, there are five eligible counties and two of these have been awarded funding. EOH there are three eligible counties. Upon the yearly announcement of funding for the program, each of the chief elected officials in the eligible municipalities are contacted by mail. Included in the notification are the program rules and an application as well as a contact number for any assistance that may be needed. The MP&Z Program, along with its technical assistance component, has been instru-

mental in enabling the communities to leverage additional funds, recruit professional services, and develop strategies which strengthen the economy while protecting the Watershed.

Round V - 2003 Projects

<i>Municipality</i>	<i>Type of Application</i>	<i>NY State Funding (\$)</i>
Marbletown (T)	Aquifer Protection Regs	\$15,000
Roxbury (T)	Kirkside Park Historic Barns	\$15,000
Tannersville (V)	Comp. Plan Update	\$15,000
Roxbury (T)	Wellhead Protection Plan	\$15,000
Harpersfield (T)	Local Law Amend	\$15,000
Stamford (V)	Implementing Comp Plan	\$15,000
Delaware County	Highway Maintenance Plan	\$15,000
Hurley (T)	Comp. Plan Update	\$15,000
Shandaken (T)	Comp. Plan Update	\$15,000
Deposit (T)	Alternative Access Plan	\$15,000
Andes (T)	Village of Andes Dissolution Plan	\$15,000
Fleischmanns (V)	Dissolution Study	\$14,594
Yorktown (T)	Comp. Plan Update	\$15,000
Brewster (V)	Impervious Surface Reduction	\$15,000
Brewster (V)	Amend Local Laws	\$15,000
Pawling (T)	Comp. Plan Update	\$15,000
Kent (T)	Local Law Amend	\$15,000
New Castle (T)	Zoning Land Use Mapping	\$15,000
Total (\$)		\$269,594

PROMOTION OF ENVIRONMENTALLY SENSITIVE ECONOMIC DEVELOPMENT

The Catskill Fund for the Future (CFF)

The CFF was created in paragraph 135 of the Watershed Agreement and is administered by CWC. Initially capitalized with \$59.7 million from the City, the CFF provides loan and grant support for environmentally sensitive economic development projects in WOH Watershed communities.

The CFF continues to promote environmentally sensitive growth opportunities in WOH Watershed towns. In 2003, loans valued at \$3,662,700 were closed for projects which are expected to create 191 jobs over the next three years. (At year's end, closings were pending on eight additional loans which had been approved by the CWC Board of Directors.) Loans ranged from \$10,000 to \$1 million, and were made to businesses, foundations and hospitals. Funds leveraged from other sources by these loans totaled \$4,628,766, bringing the total investment of 22 loans closed in 2003 to more than \$8.2 million.

As of December 31, 2003, 77 loans totaling \$12,902,410 had been issued by the CFF since 1998.

CFF grant programs also assist businesses, non-profit entities and municipalities planning projects which create or retain jobs, revitalize hamlets and main streets, spur cultural activity or assist natural resource-based industries. A total of 38 Economic Development Grants totaling \$778,019 were awarded in 2003. Funded projects include historic structure restorations, sidewalk repairs, tree replacement, park development, community promotional videos and activities, façade improvements, hospital equipment purchase, and the creation of a business incubator.



Hamden Covered Bridge Park was created with a Main Street Revitalization grant from the Catskill Fund for the Future.

Croton Watershed Strategy

The Croton Watershed Strategy project began in December 2000. The primary goal of this project was to develop an integrated watershed management plan for the Croton System which would allow DEP to optimize management efforts and focus limited resources on critical areas to achieve maximum water quality benefit. This was achieved by:

- Conducting a subbasin Watershed assessment for four critical indicator variables: total phosphorus, total suspended solids, pathogens, and toxic chemicals;
- Implementing the methodology in a Decision Support Tool; and
- Recommending Watershed management alternatives for DEP's consideration.

The Watershed assessment examined both existing and full build-out conditions in the Watershed for 74 subbasins. The methodology focuses on impairment from point and nonpoint watershed sources to identify each subbasins' relative potential to impair water quality. The results were compiled in a series of documents and released in March 2003:

Basin Reports:

Individual reports were developed for each of the reservoir basins which provide: potential

point and nonpoint water quality impairment sources for each variable ("Areas of Concern"); subbasin scores that indicate the relative potential for water quality impairment from each source and each subbasin; and basin-specific management recommendations. Background information on the physical, environmental, and demographic characteristics of each basin are also included in the reports.

Watershed Report:

A Watershed-wide analysis of the individual basin results was also conducted as part of the project. The analysis compares subbasins and Areas of Concern across the Watershed objectively, prioritizing the recommendations based on several factors including: reservoir operations, 60-day travel time, phosphorus restricted basins, trout streams, and wetlands/sensitive environments. Management recommendations were grouped into five general areas: wastewater, stormwater, open space preservation, road drainage improvement and agricultural.

During the remainder of 2003, the project continued with development of a Project Tracking Tool, an additional management tool linked with the Decision Support System. This tool will track implementation of projects by basin (remedial, protective and new development), estimate reductions of phosphorus based on

existing or proposed implementation projects, estimate increases of phosphorus based on new development, and generate basin status reports. The Project Tracking Tool will primarily be utilized to track implementation of the phosphorus TMDLs.

In addition to the Project Tracking Tool, several other tasks were initiated in 2003:

- Stakeholder reports, summarizing the watershed assessment results, are being developed for the counties and municipalities;
- Impervious surface analysis, comparing the mapped impervious data to literature values and examine the results by land use category and by subbasin; and
- Water quality analysis, comparing the watershed assessment results to monitoring data at select sites.

These supplemental reports are expected to be finalized during 2004.

A similar project, the Croton Planning initiative, continued its development during 2003.

Watershed Science and Technical Conference

The historic 1997 New York City Watershed Agreement put in motion unparalleled efforts and resources devoted to understanding the science of the New York City Watershed. Central to these efforts by New York State, New York City, the EPA, Watershed municipalities and partnership agencies, has been an unprecedented array of technical Watershed protection and water quality monitoring measures.

One of the recommendations resulting from the WPPC Executive Committee's Five Year Review of the Watershed Agreement was to hold an annual conference to showcase the unprecedented amount of constantly developing science and technology in the New York City Watershed. The Committee said that the conference should bring scientists together to present research findings and data, enhance technology transfer and increase coordination among the public and private entities working with Watershed science. The forum should also provide a unique opportunity to pass along this information to the public, interested parties, and other scientists working in similar arenas across the nation.

Thus, the First Annual New York City Watershed Science and Technical Conference was created in 2003 to achieve these important objectives. The Conference was held on September 11th and 12th at the Kingston Holiday Inn. WPPC's partnership with DEC, DOS, the New York Water

Environment Association, and the American Water Works Association proved successful, as conference attendance and interest was high. During the two day proceedings, all of the major Watershed agencies gave presentations and updates on their current activities and objectives, while scientists from throughout the Watershed provided details on their cutting edge scientific abstracts. A compendium of abstracts presented at the conference was published by DOS and widely distributed at, and following, the conference.

In addition to all who submitted their scientific endeavors, we wish to thank all of the sponsors, speakers and participants who contributed to the success of the conference. A special thanks also goes to the DEP, not only for its high participation level at the conference, but for providing the dinner program that took the conference attendees along on the fantastic voyage of "ULIISYS", the autonomous underwater vehicle built in cooperation with Woods Hole Oceanographic and launched to inspect a portion of the Delaware Aqueduct.

It is our hope that all who attended were edified by the scientific data presented, and inspired by the dedication and hard work of those who, each day, advance our insight into the science of protecting the drinking water for 9 million New Yorkers.

"This great collaboration works because the signatories to the Watershed Agreement believe in the value of partnership. The WPPC continues to celebrate the diversity of all those with an interest in protecting and enhancing the City's Watershed and the communities living within it."

*William C. Harding, Executive Director
Watershed Protection and Partnership Council*

Catskill Watershed Corporation (CWC)

Pursuant to paragraph 131 of the Watershed Agreement, the City provided \$2 million, administered by CWC, for a public education program.

Public Information and Education Program

Twenty-five grants totaling just under \$100,000 were awarded in 2003 to schools and organizations in the WOH Watershed and in New York City. Funds were earmarked for raising Trout in the Classroom; sending students on environmental study visits to Watershed outdoor education centers; doing stream restoration projects; formulating curricula relating to water study in New York City; doing oral history and folklife projects and learning art through summer nature exploration.

With architectural drawings, models and an exhibit conceptual plan funded by the CWC Education Program, the Catskill Watershed Partnership Museum Board of Directors decided in 2003 to forgo further exhibit design and fabrication money through the fund. It will instead seek outside funding for both capital construction and interior exhibits.



DeWitt Clinton High School student learns how to make a fascine (willow bundle) for riverbank planting from an Americorps member at the Little Delaware River.

The Museum did, however, obtain support through the CWC's Catskill Fund for the Future for a strategic capital fundraising plan to guide development of the facility in the Town of Middletown.

New York City Department of Environmental Protection

In June 2003, DEP launched a comprehensive new website devoted to the Watershed pro-

tection efforts undertaken by the City and its partners. The site includes detailed descriptions and updates on all the major components of the Watershed Protection program. It also includes up to date water quality information, provides access to recent reports on the Watershed programs, and supplies details on how to secure a recreational use permit for City-owned Watershed lands. DEP invites you to visit the web site at www.nyc.gov/watershed.

Watershed Forestry Bus Tours

Through the Watershed Forestry Bus Tour Program, seven school groups from New York City received grants through Watershed Agricultural Council (WAC) to bring downstate students and teachers upstate to explore their water supply at its source. The Program is underwritten by a grant from the United States Department of Agriculture Forest Service.



Eighth graders from Manhattan's School of the Future helped inaugurate the Frost Valley Model Forest with a tour on its opening day in October.

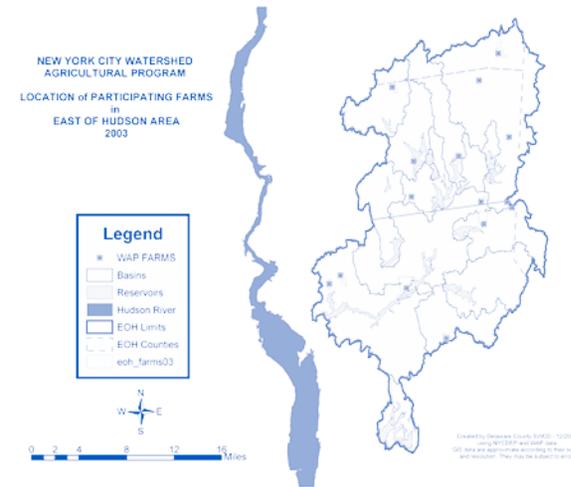
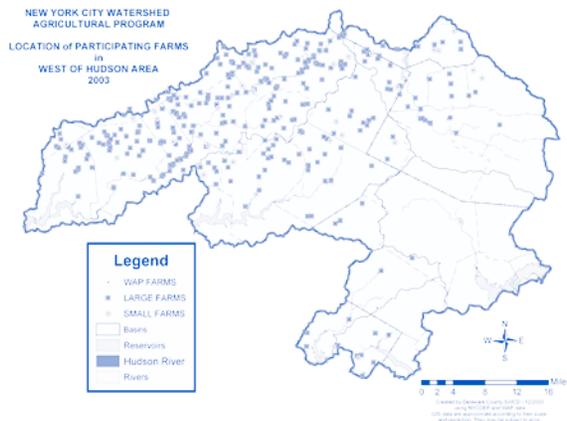
Watershed Agricultural Program (WAP)

The goal of the WAP farmer education program is to support the whole farm planning process by empowering WAP participants with the latest knowledge and management strategies needed to make, and sustain, best management practices designed to protect the water supply of the City of New York. During the workshops, farmers use their own data to find answers to their specific concerns. The programs encourage farmer-to-farmer learning at locations in their own community, or on their farm.

Precision Forage and Feeding Systems Management (PFFSM)

The PFFSM I course was developed with the end goal of helping farmers attain better forage quality so that they could pursue a high forage ration. A follow-up tour was held where farmers were able to see precision forage management applied in the field. The second year of PFFSM (2004) will focus on precision feeding. The end goal of these courses is to:

- Have farmers develop tactical plans to enhance forage quality.
- Have farmers feeding a ration with more forage and less grain.
- Reduce farmers' feed cost per pound of milk sold.
- Reduce nutrient imports into the watershed.
- Increase farm income and quality of life.



NYC Watershed Agricultural Council Links with New York State Cattle Health Assurance Program (NYSCHAP)

The NYSCHAP and the NYC WAP promote progressive herd management through the use of established best management practices. Managing cattle in a manner that promotes their productive potential by keeping them and their environment 'healthy,' go hand in hand. Such an approach has the potential to be beneficial to farmers while helping to maintain environmental quality in the Watershed. The end goal of the NYSCHAP program is to:

- Minimize the incidence of bringing disease into a herd.
- Help to control diseases that exist on the farm.
- Reduce farm animal shedding of disease-causing organisms, like cryptosporidia and giardia, into the environment.
- Increase farm income and quality of life.

AGRICULTURE AND FORESTRY

“Farming has been a way of life for many residents of the upstate communities since before the development of the City’s water supply. Today we are proactively demonstrating that agriculture can be a successful and vital part of the twenty-first century in the New York City Watershed, with an environmentally responsible approach.”

*Nathan Rudgers, Commissioner
New York State Department of Agriculture and Markets*

Thirty-one farms enrolled in the past year and 15 farms are looking to sign on in the next few months (23% of Delaware County WAP participants). The success of NYSCHAP in the Watershed is a result of a collaborative effort between the Watershed Agricultural Council; Dr. Dwight Bruno, D.V.M of NYS Department of Agriculture and Markets; Kathy Kaufman, Extension Associate of Cornell University; local veterinarians and WAP participants.

Nutrient Management Workshops

The nutrient management course was designed to provide WAP participants with a better understanding of nutrient management planning (NMP) and implementation with the end goal of:

- Having farmers understand the concept of mass nutrient balance and estimating the nutrient accumulation on their farm.
- Having farmers learn the basic concepts of hydrology affecting nutrient movement to streams.
- Reducing nutrient and pathogen run-off into streams by enhancing farmers’ understanding of the effects of manure spreading and fertilizer application.
- Having farmers understand how their NMP are developed and how manure is allocated to fields.
- Increase farm income and quality of life.

Program Participation

	Participating Farmers	
	2003 Goal	2003 Actual
Pathogen Management NYSCHAPS, <i>Including Nine Prior Farms</i>	24	31
Precision Forage Management Workshop	30	23
Summer Tour	0	9
Nutrient Management	80 ¹	93
Manure Storage Safety	0	12 ²
Total Farm Management	5	7

¹Combined 2002 and 2003 goal

²WAP agency and agri-service professionals



East of Hudson Program

As an expansion of the WOH program, the EOH Program has approved Whole Farm Plans on 15 operations, with 22 BMPs installed this year. It is estimated that over 200 potential farms are eligible for watershed implementation in the EOH region.

While much of Westchester County continues to suburbanize, Colley's Windswept Farm in North Salem remains relatively rural, in an area where existing farms board horses and produce orchard crops and hay. The Colleys carry out custom haying on 200 additional acres in the



The East of Hudson Program has approved Whole Farm Plans on 15 operations, with 22 Best Management Practices installed this year. It is estimated that over 200 potential farms are eligible for watershed implementation in the East of Hudson region.

town, maintaining open space and providing food for horses and cattle on the remaining farms in the area.

As a pilot farm in the EOH Watershed, the Colley's Whole Farm Plan is one of the first in the area to be on its way to full implementation. With the Titicus Reservoir visible from the upper pastures of the farm, BMPs were targeted to the cow/calf beef operation. The centerpiece of this plan is a riparian buffer which serves as effective protection for hydrologically sensitive areas.

Last fall, animal fencing was installed to exclude livestock from stream areas. In addition, WAC designed new watering facilities to eliminate the need for the herd to travel long distances to the same single watering location each day. Not only is this rotational grazing system more sustainable, it encourages good grazing practices. Since calving is carried out in the open fields, pathogen risks are reduced by limiting direct access to hydrologically sensitive areas. Runoff from pastures and access roads are also controlled through a series of diversions, lined waterways and



Thousands of customers visit Wilkens Fruit & Fir Farm in Yorktown Heights at holiday time for fresh-cut holiday trees and wreaths.

plantings that will help to reduce sediment and potential erosion concerns in the future.

As Whole Farm Planning takes off in the EOH region, WAC is reaching new participants and the water consumers their farm businesses serve.

Most equestrians in the EOH Watershed board their animals at farm operations like River Run in the Town of Southeast in Putnam County.

Watershed Forestry

A Watershed Forestry Program, which promotes sustainable forestry in the WOH Watershed by providing education about BMP for forestry to prevent water pollution, was established in paragraph 130 of the Watershed Agreement. This program also encourages private landowners to be good stewards of forest resources and educates the public about the role well-managed forests can play in protecting water quality.

The opening of the 30-acre Frost Valley Model Forest was a highlight of 2003. The goal of the Model Forest is to introduce visitors to a combination of scientific forestry research and education to promote understanding of the relationship between the environmental and human activity, and to provide a public forum for dialogue about the ecological, social and economic processes that shape forested watersheds. Watershed landowners, foresters, timber harvesters, students and New York City water consumers can visit the forest to see examples of forestry that balance forest production, wildlife management, recreational use, and water quality protection. Funding for the project is provided by the NYC DEP, US Army Corps of Engineers and the USDA Forest Service.

Located in the Catskill high peaks, Frost Valley Model Forest is ideally suited as an eco-tourism site that takes advantage of a steady audience of student, teachers and families who visit the camp year round. A 2.5-mile interpretive forest road takes hikers through a number of water quality BMPs, including portable bridges for crossing streams safely, culverts and other erosion control technology. Throughout the forest, signs educate visitors about invasive plants like the Japanese barberry and pests like Hemlock Wood Adelgid.

Scientists are conducting silvicultural research at the Frost Valley Model Forest in accordance with a forest management plan that guides the YMCA's objectives – education, recreation, forest harvesting, and wildlife management – while minimizing the impact of land use activities on water quality. In an effort to gather baseline data for a variety of water quality monitoring projects, permanent forest inventory plots have been installed, according to the USDA Forest Health Monitoring (FHM) system. These plots will be compared with other sites throughout the Northeast. Long-term investigations are also underway by the United States Geological Survey, USDA Forest Service and SUNY-Environmental Science & Forestry are exploring the forest's role in water quality protection.

In a Watershed that is 85% privately owned, educating landowners about the resources they own is an important part of maintaining a healthy forested landscape. WAC offers a professionally prepared forest management plan to Watershed landowners with ten or more acres, a tool that has the potential to reach thousands of future forest stewards.

AGRICULTURE AND FORESTRY



The Frost Valley Model Forest is one in a network of four Model Forests located in the Catskill/Delaware watershed. Other sites open or in development are in Delhi, Woodstock and EOH in the Town of Kent.

The forest management plan allows landowners to create a unique “blueprint” for their forested property. For example, Charles Bove, a program participant, purchased his Delaware County land for hunting and family use about twenty years ago. His 60 acres were being managed with a professional forest management plan under New York State’s 480-A program, which helped him save on taxes as well as required regular timber harvesting.

His first encounter with the Watershed Forestry Program came through participation in WAC’s Pilot Road Remediation Program. This provided Charles with recommendations and cost-share funding for the installation of culverts, water bars and other erosion control measures to address water quality risks on the network of roads used during his timber harvests. When Charles purchased a second parcel, 383 acres adjacent to working farmland in South Kortright, the Forestry Program provided

a professional update to that property’s existing Watershed Forest Management Plan. With the update, he can meet this specific goals for the new land – hunting, recreation and wildlife management – while maintaining the timber harvesting objectives outlined for his original parcel.

As Charles nears retirement, he has more time to actively carrying out his forest management goals - from timber stand improvement to controlling the deer population in an effort to encourage better forest regeneration. His goals for the new parcel are to maintain roads for recreation and consider riparian area management. He’s also begun attending workshops about forestry techniques and issues offered by the Watershed Forestry Program. As he put it, “I’ve become more and more attuned to the idea that the timber harvest can be done properly, and I recognize how important that is. I grew up in Queens and we were proud of the water we had there.”



WAC staff and its Watershed Qualified Foresters have developed forest management plans for over 450 landowners on more than 50,000 forested acres and 1,500 riparian acres.

SUMMARY OF SAFE DRINKING WATER ACT PROJECTS

WASTEWATER RELATED PROJECTS

Project: Septic System Study

The Catskill Watershed Corporation (CWC) is conducting a project to study the effectiveness of alternative remediation technologies for existing malfunctioning or failing septic systems within the West-of-Hudson (WOH) portion of the New York City Watershed. Enhanced monitoring of rehabilitated septic systems is being conducted to evaluate best available technologies for the long-term control of wastewater from on-site septic systems. This project is focusing on research needs to improve septic system repair and replacement policies within the New York City Watershed.

Project: Septic System Monitoring

This project, conducted by the New York State Department of Health (DOH), will provide subsurface pathogen loading data to the CWC's Septic System Study. The project is focusing on the microbiological components of septic system effluent, including viruses and bacteria, to determine which systems represent the best available technology for use as on-site septic systems.

Project: Ribotyping of Sewers and Septic Systems

This project, implemented by the New York City Department of Environmental Protection (DEP), is a study on ribotyping of wastewater in sewers and septic systems. The project goal is to try to link septic and sewer wastewater to receiving waters and be able to better discriminate human fecal contamination from other sources of contamination. The project is using an automated system which evaluates DNA and RNA in *E.coli* to link septic systems and sewer sources to receiving waters to better discern between human fecal contamination from other sources of contamination. This process will allow DEP to identify water basins with possible human contamination.

NONPOINT SOURCE PROJECTS

Project: Town Brook Project Research Study

The New York State Department of Environmental Conservation (DEC's) Town Brook Project Research Study is a multi-year project to evaluate

landscape-level effects of land use on downstream water quality. Town Brook is located on the West Branch of the Delaware River Basin which terminates in the Cannonsville Reservoir. The DEC initiated its portion of this multi-agency, cooperative research study effort in 1998 by establishing a sampling site on the Town Brook to study base flow and event-oriented instream water quality. This included installation of telemetry, power lines and automatic instream samplers. The DEC continues to operate the monitoring station on this stream to sample for instream nutrient and sediment loads.

Project: Town Brook Best Management Practices (BMPs) Study

This study is being conducted by the Watershed Agricultural Council (WAC) to determine the effectiveness of several existing and proposed Best Management Practices for minimizing phosphorus losses to the Cannonsville Reservoir. The project is analyzing BMPs targeted for high phosphorus soils, stream bank fencing and riparian buffers, barnyard improvements, and the potential for subsurface transport of phosphorus below cropped and pasture land.

Project: Trout Creek Monitoring Station

DEC is collecting data from monitoring station to be used to determine load estimates for three forms of phosphorus, two forms of nitrogen, and sediment for this tributary site in the Cannonsville Basin. The Trout Creek monitoring station, near the inlet of the Cannonsville Reservoir, accounts for 20% of the flow into this reservoir. This data will be provided to the DEP for use in refining their Generalized Watershed Loading Function model to predict material loading in the Cannonsville Reservoir Basin.

Project: Delaware County Phosphorus Study

Delaware County is collecting and assessing phosphorus data throughout the Cannonsville Basin, including septic system, groundwater, stormwater and farm contributions. The study includes: modeling/mapping of critical source areas; soil phosphorus monitoring at the field scale; phosphorus monitoring in runoff at the field scale; assessment of phosphorus contributions from forests; farm point source monitoring;

and improved climate data. One particular focus is an evaluation of measures for phosphorus control on farms through forage and feed management. The study involves integrated monitoring, modeling and assessment at the sub-field, field, and farm scale and at control sites.

Project: R. Farm Study

DEC and Cornell University are continuing research at the R. Farm site to investigate key phenomena that have been discovered as a result of recent work and to incorporate the early effects of the newest management changes into a simulation model. Sampling is being conducted to trace dissolved phosphorus in stream baseflow back to sources on land, using stream sediment and shallow groundwater sampling near the farm. A new weather station is being operated for another year and data being integrated into the simulation model. Sampling of concentrated phosphorus sources within the farm is also being conducted.

Project: Stormwater Best Management Practices Monitoring Demonstration

DEP is conducting a stormwater management practices monitoring demonstration project to gather pre- and post-construction monitoring data at two wetland extended detention basin sites. The project includes reviewing existing water quality data and conducting site evaluations to determine current water quality conditions, identifying additional data needs and water quality trends, including sources of contamination and characterization of pollutant loads. DEP will use this information to evaluate the effectiveness of the stormwater management practices installed and to develop methods that reduce non-point sources of pollution in these water supply watersheds being studied.

Project: Ambient Surface Water Monitoring - High Runoff Monitoring

The objective of this DEP study is to monitor two small catchments, approximately 100 - 200 acres in area, and evaluate the impacts on water quality from land use changes on the catchments. High runoff monitoring is to occur for approximately ten years, allowing for pre-construction, during-construction and post-construction monitoring. This evaluation involves monitoring on two streams that drain catchments where developments (one multi-use complex and one to be determined) are proposed to occur in the next few years, as well as on a reference

catchment where no development is expected to occur. The water quality analysis performed includes total phosphorus, total dissolved phosphorus, nitrite-nitrate, dissolved organic carbon, and total suspended solids.

STREAM MANAGEMENT PROJECTS

Project: Greene County Turbidity Reduction

The Greene County Soil & Water Conservation District is conducting a multi-year project to reduce turbidity in the Schoharie Reservoir Basin. The Safe Drinking Water Act (SDWA) provides partial funding for the project which includes: formation of a stakeholder group; development of a conservation plant management program; development of a comprehensive manual on assessment and restoration for use by local municipalities, planning boards, and conservation groups; conducting three training sessions on turbidity reduction BMP and erosion control plans; and development of procedures for addressing turbidity. This project also continues work on a restoration demonstration project along the Westkill stream.

Project: Calibrating Bankfull Discharge at United States Geological Survey Gages

DEP is identifying and calibrating bankfull discharge at 11 active United State Geological Survey (USGS) gages. The project also includes the reactivation of five to ten inactive USGS gages for bankfull calibration. Additional discharge measurements are being conducted at each site to develop a more accurate stage-discharge rating than would be possible using step-backwater surveys and related analyses.

Project: Reference Reach Design Geometry and Fluvial Processes

DEP is conducting a reference reach design project for development of design geometry and fluvial processes data for 15 reference stream reaches. As part of the study, crest stage gages are being installed, design parameter surveys are being conducted, geomorphic assessments of Level II, III and IV are being conducted, biological and aquatic habitat monitoring is being conducted, particle tracer analysis is being performed, implementation and monitoring of scour chains is being conducted, and sediment sieve sampling is being performed. Documenting the form and function of stable stream reaches, which effectively pass

both flood flows and sediment will provide a valuable set of templates for stream stability restoration design BMPs.

Project: Stream Restoration Monitoring

DEP is conducting monitoring of the effectiveness of stream restoration demonstration projects at nine sites. The project includes monitoring of control sites and the nine reaches before and after the installation of BMPs. Crest stage gages are being installed and flow measurements taken. The monitoring includes geomorphic assessment, bed mobility dynamics, biological assessment, riparian characterization and aquatic habitat characterization.

EDUCATIONAL PROJECTS

Project: Westchester County Volunteer Monitoring

Westchester County is conducting a volunteer water quality monitoring program to track the physical, biological and chemical characteristics of the major Watershed and sub-Watershed areas throughout the County. The program is expanding monitoring efforts, and creating a Westchester County Lake Group and a Watershed Website.

Project: Streamkeeper Project

The Riverkeeper, in conjunction with Stroud Water Research Center and Hudson Basin River Watch, is conducting an ongoing school education program to promote an awareness of stream biodiversity and its connection with the landscape, as well as an understanding of local stream health and how it relates to local land use practices. This school based project provides students and teachers with insight on the environmental data they gather about their local streams using a curriculum kit called "The Leaf Pack Experiment," a non-invasive aquatic macroinvertebrate sampling kit and the "Hudson Basin Guidance Document" monitoring protocols.

WATER QUALITY STUDIES

Project: Key Point Sampling

Pesticide monitoring in selected reservoirs was initiated by the USGS in 2000 and has been continued to date. Water samples are being collected from 10 key points, which include all the reservoir outflows as

well as inflows to the Kensico reservoir from the Delaware and Catskill aqueducts. These samples are being analyzed for a broad range of pesticides and establish long-term trends for changes in pesticides within the reservoir system over time.

Project: Pesticide Monitoring at Groundwater Baseflow for the Pepacton Watershed

The objective of this USGS project is to supplement water quality sampling for the Pepacton Watershed baseflow network in order to gain further understanding of sources of pesticides in the New York City reservoir system. Sampling is being coordinated with the groundwater (baseflow) monitoring network for the Pepacton Watershed. Samples are being collected from upland sites and valley-segment sites on two occasions - Summer and Fall.

Project: Croton Macroinvertebrate Monitoring

DEC is conducting a five-year in-depth research at 28 stream sites in the Croton basin to determine the source and impact of pesticides on the resident populations of algae and macroinvertebrates. This project is being coordinated with concurrent pesticide research by the USGS. The project is focused on five streams with the highest pesticide levels, determined by sampling in 2000.

Project: Croton Pesticide Monitoring

The USGS is conducting a study of pesticides in the Croton basin to relate the occurrence and concentrations of pesticides to a concurrent DEC study on macroinvertebrates in the Croton Watershed. These samples are being analyzed for a broad range of pesticides.

Project: New York State Department of Health Pharmaceutical Study

The DOH is undertaking a survey to determine the presence of selected pharmaceuticals in the source waters of the New York City water supply, including locations near the intakes to the City's distribution system. This survey is designed to develop initial information to address concerns raised in recent scientific and popular literature regarding the potential for contamination of potable water sources with pharmaceuticals.

Project: United States Geological Survey Pharmaceutical Study

The USGS is conducting a project to study pharmaceutical and other organic wastewater compounds at five wastewater treatment plants and six keypoints in the New York City Watershed. The study is assessing the occurrence and concentrations of these compounds in the New York City Watershed through two focused efforts: sampling keypoints of the New York City reservoir system, and sampling sewage effluent at select wastewater treatment sites and the receiving streams above and below the plant's outfall. The samples collected from the keypoint sites will allow for an assessment of these pharmaceutical and other organic wastewater compounds in the New York City water supply, and the samples collected from the sewage effluent sites will allow for the assessment of wastewater treatment plants as well as the effect of the wastewater treatment plants on the receiving stream water quality.

Project: Stroud Water Quality Monitoring

The Stroud Water Research Center is conducting a multi-year, integrated Watershed-wide monitoring program to address source and ecosystem impairment contaminant dynamics. The monitoring program is designed to compliment existing DEC and DEP monitoring programs which focus primarily on transport and symptom contaminant dynamics. The overall goal of the program is to establish a monitoring system that uses specific physical, chemical, and biological measures to measure, quantify and determine the amounts of specific contaminants and their sources in the Watersheds, and the current structure and function of key ecosystem parameters for the major streams and reservoirs in the study Watersheds.

Project: Algal Communities As Indicators of Stream Bed Instability and Restoration

The goal of this project is to establish a program for biological assessment of streambed instability, using periphytic algal communities. The project includes development of relevant sampling strategies, laboratory analyses and statistical evaluation. Algal communities from nine streams in the Delaware and Catskills systems of the New York City Watershed with stable, unstable and restored banks are being monitored. Samples are being collected before, immediately after major storm events and after a recovery period. Algal community composition and biomass

are being correlated with stream channel conditions and magnitude of storm events. The effect of storms on algal succession is also being evaluated.

Project: Toxicity Identification Evaluation

The Toxicity Identification Evaluation project is being conducted by the DEC at wastewater treatment facilities that have previously exhibited a high toxicity concern but which do not have an obvious cause of toxicity. This is a follow-up to toxicity testing previously conducted in which quarterly chronic toxicity tests were performed at 39 wastewater treatment facilities and 31% of the facilities tested failed all toxicity tests. The total number of facilities to have their toxicity characterized, will be dependent on the extent of characterization required and chemical analyses performed.

SPECIAL STUDIES**Project: Pesticide Manual Update**

The modification of existing Pesticide Applicator Certification Manuals that are particularly relevant to the New York City Watershed and incorporation of these changes into the DEC Pesticide Applicator Certification exams is being conducted. Three different manuals are in the process of being updated by Cornell University. The updated manuals will be made available to pesticide applicators and public libraries located in the New York City Watershed. The updated Pesticide Applicator Certification manuals will also be available through Cornell University's Training Manual Distribution Center.

Project: Tracking Phosphorus Impacts from Lawn Fertilizers

DEP is contracting with local organizations to survey all homeowners within a reservoir basin regarding their typical lawn care practices, and offer free soil tests and lawn care literature. The information obtained will be used to assess: percent of homeowners who fertilize, percent of homeowners who use landscaper services, phosphorus content of the fertilizer used, and the relationship between fertilizer application and soil phosphorus concentrations. This type of Watershed-specific data is necessary to further management plans for phosphorus reduction in the Croton Watershed.

Project: Croton System Reservoir Model Development and Testing

This project continues development and testing of reservoir hydrothermal models for the EOH portion of the New York City drinking water supply. These models serve as in-house management tools for DEP, and will contribute to the effective management of this reservoir system. Model development and testing is being conducted for one-dimensional, hydrothermal models in the EOH system, resulting in a group of seven models which are fully calibrated and verified. Also, a two-dimensional model is being fully developed for the New Croton reservoir to predict vertical and longitudinal variations in thermal structure in order to support water quality management and engineering decisions.

Project: New Croton Reservoir Sediment-Nutrient Submodel

DEP is developing a mechanistic sediment submodel for the New Croton Reservoir that predicts sediment-water exchange in response to redox (predicted) conditions and deposition inputs of decomposable organic material (e.g., phytoplankton). The model will have the capability of predicting changes in sediment feedback from changes in the productivity of the overlying water column, and other ambient conditions. Other constituents released by the sediments, particularly Mn, Fe and color, which are of concern because of potential implications for color in downstream portions of the distribution system are being addressed. The model will be a valuable tool to guide effective management of the reservoir.

Project: Wetlands Remapping Initiative

To ensure that DEC has the most accurate Article 24 Freshwater Wetlands Maps within the New York City Watershed, a comprehensive wetland remapping effort within the EOH portion of the New York City Watershed is currently underway. This effort includes identification of wetlands that were not included on the State's wetland regulatory maps, but which met DEC's size criteria. As of 2003, the DEC is in the process of completing map amendments in Westchester County and proposes to add an additional 3,280 acres. This includes 25 new wetlands greater than 12.4 acres and 75 smaller wetlands identified as of "unusual local importance." Efforts will continue over the next two to three years to revise Article 24 Freshwater Wetlands Maps within those portions of Putnam and Dutchess Counties that are within the New York City Watershed.

Project: Wetland Water Quality Functional Assessment

DEP, in conjunction with State University of New York College of Environmental Science and Forestry (SUNY-ESF), is conducting a two-year study to characterize and assess the functions of wetlands located throughout the Catskill and Delaware Watersheds through a reference wetland-monitoring program. A total of 22 reference wetlands occupying terrene and lotic landscape positions throughout the Catskill and Delaware Watersheds are being studied. Base-flow monitoring is being initiated at each of the 22 sites, and a subset of the sites is being selected for storm flow monitoring. Vegetation, soil, and water table monitoring methodology is being developed and implemented to support biological and functional assessment of the 22 wetlands. Results of this monitoring program will enable DEP to determine baseline conditions and water quality functions of a number of wetland types. Information gained from this study will benefit the development of both regulatory and non-regulatory wetland protection and non-point source programs.

Project: Master Planning and Zoning Enhancement

The New York State Department of State's (DOS) Master Planning and Zoning Enhancement Program (MP&Z) is being used to provide financial assistance to municipalities for updating existing comprehensive plans to reflect land use goals consistent with the Watershed Agreement and to amend or adopt local land use regulations and environmental controls for Watershed and water quality protection. Strategic capital investment programs to address existing non-point sources of water pollution are being prepared, as are strategic capital investment and management plans for hamlets, villages, village extension areas, and other potentially development areas within the WOH Watershed and for designated Main Street areas within the EOH Watershed.

Project: Disinfection By-Products Study

DOH is conducting an evaluation of disinfection by-products formation to develop a comprehensive database in relation to standard and alternative disinfection technologies, source water parameters, operational modes and land management. The results of the study will assist water quality regulators, environmental groups and the general public to find a balance between contemporary disinfection technologies and their associated health risk to provide safe and reliable drinking water.

Project: Pathogen Study

This study is being conducted by DOH to improve the methodology for oocyst concentration, recovery and detection. Using drinking water source samples from New York City's terminal reservoirs, DOH is working on a project to improve the methodology for detecting oocyst concentrations in ambient settings under low-flow and storm flow conditions. The ultimate objective of the study is to improve the methods for oocyst concentration, recovery and detection in storm water samples collected in an agricultural Watershed.

Project: Putnam County Groundwater Study

Putnam County is preparing a Groundwater Protection and Utilization Plan to provide a scientific basis for identifying the most appropriate lands for sustainable development within the County. The assessment provides municipalities with both bedrock and overburden aquifer maps and reports describing aquifer characteristics, including estimated sustainable groundwater utilization levels.

Project: Forest Health and Nutrient Controls Study

This project is part of an on-going assessment by USGS and other research organizations to study forest health, the role of soil nutrients, and the effects logging practices has on water quality within the WOH Watersheds. The study is continuing to monitor the effects of forest re-growth on water quality following clear-cutting in 1997. This study is also determining the effects of varying harvesting intensities on water quality, conducting a nutrient manipulation experiment to identify measurable indices of forest condition and integrating results of the three components with survey measurements to produce Geographic Information Systems (GIS) coverages of the Catskill and Delaware Watersheds. This information will provide spatial patterns of forest condition and the sensitivity of Watersheds to various levels of harvesting.

Project: The Collection and Analysis of Fecal and Sediment Samples for the Determination of *Cryptosporidium* genotypes and *Escherichia coli* Ribotypes in the New York City Watershed

DEP project will use genotyping techniques to subspeciate *Cryptosporidium* oocysts and *E. coli* from potential sources in the New York City Watershed. The target matrices for this study are mainly fecal samples and sediment samples with the addition of some storm wa-

ter samples. Fecal samples are being collected primarily from targeted wildlife species. Sediment samples are being collected mainly at sites where stream beds meet reservoirs - with transect samples out into the reservoirs. Water samples are being collected during storms at sites where historical data suggests a presence of *Cryptosporidium* oocysts. Detection of heterogeneous genotypes of *Cryptosporidium* oocysts and *E. coli* are being identified, and the genetic relationship among genotypes are being identified. All results are being compared to historical DEP data, as well as the library of data available at the Center for Disease Control and Prevention.

Project: Identification of Watershed Sources of *E. coli*

DEP project objective is to link *E. coli* isolates from New York City's Water Supply to potential sources of contamination within the Watershed. In order to accomplish this, DEP's collection of *E. coli* at Penn State University is being ribotyped. The DEP has been collecting *E. coli* from elevated keypoints, reservoirs, streams, geese and gull feces, human feces, wild and domestic animals feces and other potential sources of pollution since 1991. Since waterfowl have an increasingly important role as a contributing contaminant in the City's reservoirs, their addition to the RiboGroup libraries will increase confidence in making decisions on biological source tracking. The use of *E. coli* as an indicator organism may also allow the DEP to monitor other potential pathogens in the Watershed.

Project: Pathogen Occurrence and Transport Within the New York City Watershed

The objective of this DEP study is to provide a broad-based evaluation of the spatial variations in *Cryptosporidium* spp. and *Giardia* spp. (oo) cyst concentrations throughout the New York City Watershed. This is being facilitated through synoptic sampling of a wide range of localized catchments, integrated with the current monitoring programs of DEP. Based upon collected data, an attempt to identify point and non-point sources of (oo) cysts is being conducted in reservoir tributaries with elevated (oo) cyst concentrations. Targeted, pair-wise, sampling of integrator/indicator sites is being conducted when elevated concentrations are found. This sampling approach will provide an overall view of (oo) cyst transport within the Watershed, while identifying possible sources of contamination.

Project: Water Quality Data Analysis and Communication

This DEP project is being conducted to improve data analysis and information communication. The objective of the project is to automate the production of information for a broad audience and streamline access to it as much as possible for the 300,000 analyses representing more than 500 locations throughout the City's drinking water supply. The products of this project include: programming for Annual Reports, a condensed summary report of the scientific volumes devoted to the Evaluation of the Effectiveness of the Watershed Agreement programs, development of a Water Quality Information System and enhancement of the DEP's Intra/Internet. Improvements in the processing of data and availability of information will lead to more informed decision making for DEP managers and broader use of the information by other agencies and the public.

Project: Geographic Information Systems Infrastructure Upgrade and Geodatabase Development

One objective of this project is to provide technical support for the DEP's database development and System Administration and upgrading the DEP's GIS at their Kingston and Valhalla offices. The upgrade includes new server technology, workstations, and implementation of the ESRI geodatabase model. Also, this project is developing an improved Information Technology framework to better assess both the EOH and WOH regions of the New York City Watershed and display available Watershed hydrogeologic and water quality data. This project includes development of an enhanced three-dimensional (3-D) landscape GIS database, in order to assess variability of watershed structure and function at the landscape level. This database consists of digital elevations/slopes, land use drainage, cultural features, soil and vegetation, and other related environmental data. The system also incorporates easy-to-use GIS graphical user interface, and allows for distributed data capture and analysis at stakeholder agencies.

Project: Development and Implementation of a Groundwater Baseflow Monitoring Network for the Pepacton Watershed

This project is being conducted by USGS to define the hydrogeology of the valley-fill aquifer systems in the East Branch Delaware River valley, upstream of the Pepacton Reservoir. The distribution of the valley-

fill aquifers is being mapped and data for these aquifers is being compiled. The groundwater quality is being characterized and an estimate of average annual recharge to the stratified drift is being made. A source water assessment delineation for select municipal wells in this basin is being prepared, including identification of potential threats to groundwater quality.

Project: Toxic and Bioaccumulative Substances in Fish Monitoring

The objective of this DEC project is to assess concentrations of Mercury, PCB, organochlorine pesticides, dioxins and furans in representative fish species taken from the water supply reservoirs within the New York City Watershed. Samples are being collected to examine chemical contaminant concentrations for six species of fish from the 16 reservoirs for which there is very limited data. The results of the analyses are being used to determine if additional health advisories should be considered for any of the reservoirs.

Project: Assessment of Factors Influencing Methylmercury Transformation and Uptake in Aquatic Biota in the Neversink Reservoir Watershed

The DEC is conducting a study to document mercury and methylmercury levels in water, sediments, macroinvertebrates and fish throughout the Neversink Watershed and determine the methylation efficiency (estimated as methylmercury/total mercury) of each site. The study is also measuring mercury and methylmercury levels in indicator macroinvertebrates and fish to determine extent and biomagnification of mercury in biota, and compare these results with other pertinent mercury and methylmercury uptake studies. Twelve sites within the upper Neversink Watershed are being assessed, of which two are headwater streams, two are headwater riparian wetlands, two are man-made ponds, two sites are on the upper main branch of the Neversink River, and four sites are Neversink reservoir sites.

Project: Golf Course Best Management Practices Study

This project is conducted by Cornell University to determine to what extent golf course superintendents and facility managers employ BMP to ultimately protect water quality and minimize off site impacts. The study is assessing the level of conformity to BMPs and potential influ-

ences on environmental quality by identifying golf courses with various management expertise and environmental management philosophy; conducting an exhaustive assessment of cultural, pest, and environmental management practices for conformity to BMPs; and, validating the impacts of completing Audubon International's Cooperative Sanctuary

Certification program requirements. Additionally, the project is seeking to identify trends in current course management and identifying areas that need additional educational efforts to examine chemical contaminant concentrations.

SUMMARY OF WATER RESOURCES DEVELOPMENT ACT FUNDED PROJECTS IN PROGRESS

WASTEWATER RELATED PROJECTS

Project: Town of Patterson / Municipal Sewer System

The Town of Patterson has begun a project to design and construct a municipal wastewater collection and treatment system for the Hamlet of Patterson. The new system will incorporate two existing wastewater treatment systems, several subsurface sewage treatment systems and a new sewer district into one state of the art wastewater treatment plant. The design of the system has been completed, with construction scheduled for 2005.

Project: Town of Bovina / Municipal Sewer System

CWC, in cooperation with Delaware County and the Town of Bovina, is designing and constructing a community septic collection and treatment system to replace septic systems within the Hamlet of Bovina Center. Some of the household septic systems are failing, and repair or replacement is sometimes impracticable. The new treatment system will have a sub-surface discharge. The design has been completed, and construction is scheduled for Fall 2004. The construction for the collection system is to be coordinated with the construction of a stormwater runoff collection system, thereby eliminating the need to excavate the roadways twice.

Project: Village of Stamford / Inflow and Infiltration Reduction

The Village of Stamford is undertaking a project to repair and/or replace sections of the sewer collection system within the Village. During periods of snowmelt and excessive rainfall, the wastewater treatment plant is unable to treat the excessive flow, and has to divert the flow to holding lagoons. This project will replace sewage collections lines in a section of the Village with high groundwater levels. Another part of the

project is to eliminate one of the lagoons which receives a large amount of infiltration, thereby reducing the storage capacity during storm events. Construction of a new lagoon is underway, with completion of the project expected by Summer 2005.

Project: Village of Walton / Inflow and Infiltration Reduction

The Village of Walton is planning a project to repair and/or replace sewage collection pipes in selected areas of the Village. The Village has previously studied the collection system, and repaired certain areas. This project will repair additional areas of the collection system, and reduce the volume of wastewater flow to the Village's wastewater treatment facility. Construction is planned for the 2005 construction season.

STORMWATER CONTROL PROJECTS

Project: Greene County / Schoharie and Stony Clove Watershed Planning

The Greene County Soil and Water Conservation District, in cooperation with DEC, is developing stream classification plans and digital flood plain maps. The project is using digital and LIDAR overflights incorporated into a GIS based computer system to inventory and classify streams. Along with the new flood plain maps, the end results of the project should reduce the amount of traditional ground surveying needed to develop stream management plans. Project is in progress, with completion expected in Summer 2004.

Project: Town of Carmel / Stormwater Management Best Management Practices

DEP is planning to test the effectiveness of stormwater BMPs at two sites. Presently, DEP is sampling runoff before construction of new or

enhanced BMPs. After construction, scheduled for Summer of 2005, sampling will continue to determine the pollutant removal effectiveness of the two different BMPs.

Project: Westchester County / Stormwater Management Study

The County of Westchester has agreed to study stormwater conveyance in a pilot watershed area. The result of the study will lead to implementation of BMPs to reduce the impact of impervious surfaces and incorporate stormwater conveyance to reduce the quantity and quality of pollutants in the stormwater runoff.

Project: Westchester County / Stormwater Education & Training

The Westchester County Soil and Water Conservation District is planning to develop stewardship and training for natural resources management in the areas of erosion and sediment control in the urban Croton Watershed. A series of technical workshops will be held at various locations throughout the Croton and Kensico Watersheds. Much of the information presented will be a result of the stormwater management study conducted by Westchester County.

PHOSPHORUS REDUCTION PROJECTS

Project: Delaware County / Phosphorus Reduction Study

Delaware County is in the midst of a project to determine sources of phosphorus within the Cannonsville Reservoir drainage basin. At the beginning of this project, the Cannonsville Reservoir basin was phosphorus restricted, thereby impairing initiatives that would promote economic growth within the sub-basin. A project goal was to determine the sources of phosphorus, and to develop management practices to reduce the amount of phosphorus entering the Cannonsville Reservoir so the basin would no longer be phosphorus restricted. The areas studied were agricultural, septic systems and highway systems. A GIS database was developed to support data collection. The project is almost completed, with the last of the studies to be completed by December 2004.

Project: Delaware County / Phosphorus Reduction Implementation

Delaware County has undertaken projects to reduce phosphorus runoff from sources determined in the phosphorus reduction study. A stormwater collection and treatment system (as determined in the highway system study) was designed and constructed in the Village of Walton during

2003. Additional collection and treatment systems are planned for Delhi and Bovina (the Bovina system is to be constructed in conjunction with the community septic collection and treatment system project).

Project: Delaware County / Farm Phosphorus Management

WAC plans to construct a manure collection and storage system on a larger farm within the Cannonsville Reservoir basin. This is a project designed to reduce phosphorus runoff from a farm as determined in the phosphorus reduction study. Construction is planned for Fall of 2005.

Project: Delaware County / Farm Precision Feeding

Delaware County, in cooperation with Cornell University, is working on a project to reduce phosphorus runoff from farms by adjusting the feed of cattle. This is a project designed to reduce phosphorus runoff from a farm as determined in the phosphorus reduction study. The reduction study determined up to 40% of phosphorus occurring in manure could be reduced by adjusting feeding patterns on an individual farm, without decreasing milk output or health of dairy cattle. The project is underway with completion expected in 2006. The outcome of this project could lead to additional test projects elsewhere in New York State.

STREAM RESTORATION AND STABILIZATION PROJECTS

Project: Town of Prattsville / Schoharie Creek Stream Channel Improvement

The Greene County Soil and Water Conservation District, in cooperation with the Town of Prattsville, is undertaking a project to reduce flooding caused by ice jamming in the Schoharie Creek. The flooding also contributes to streambank erosion. The project will remove a berm and convert part of a forested flood plain into a wetland meadow. Design of the project has been completed, with construction planned for Fall 2005.

Project: Greene County / Batavia Kill - Red Falls Stream Restoration

The Greene County Soil and Water Conservation District has plans to restore the streambed of a section of the Batavia Kill in the Red Falls area. The final design of the stream restoration project has yet to be completed. At present, DEP has a turbidity monitoring project underway at Red Falls, which will be part of studying the effectiveness of the

stream restoration project. The stream reach to be restored could be contributing as much as 50% of the turbidity in the Batavia Kill sub basin. Construction is planned for 2005.

Project: Town of Neversink / Chestnut Creek Stream Management Planning

DEP has undertaken a project to develop a stream management plan for the Chestnut Creek. The development of a stream management plan will provide integrated assessment and planning for water quality protection, flood hazard mitigation, stormwater management and habitat enhancement. The stream management plan was submitted in February 2004. Part of the plan development was a stream restoration project, which was completed in October 2003.

Project: Town of Hunter / Stony Clove Stream Management Planning

DEP has embarked on a project to develop a stream management plan for the Stony Clove Creek. The stream management plan was submitted in February 2004. Part of the plan development was a stream restoration project, which was started in July of 2003, and should be completed in 2004.

Project: Delaware County / West Branch Delaware Stream Management Planning

DEP, in cooperation with the Delaware County Soil and Water Conservation District, has undertaken a project to develop a stream management plan for the West Branch Delaware River. The stream management plan is still being developed. Part of the plan development will be a stream restoration project on Town Brook, which was started in July of 2003, and should be completed in 2004.

Project: Greene County / West Kill Stream Restoration

The Greene County Soil and Water Conservation District is planning to repair some degraded stream reaches on the West Kill stream. This project is in cooperation with a New York City DEP project to develop a stream management plan for the basin. Repairs to the degraded areas of the stream will serve as a demonstration project of the stream management plan. Construction is planned for the 2005 construction season.

OTHER WATER QUALITY IMPROVEMENT PROJECTS

Project: East of Hudson / Farm Best Management Practices Implementation

WAC is undertaking a project to implement whole farming practices (WFP) on a smaller farm located in the east of Hudson portion of the New York City Watershed. The primary focus of whole farm planning had been on farms located in the WOH portion of the New York City Watershed, typically on dairy farms. This project will study and implement a WFP on a horse farm. Construction is expected during June, 2004.

Project: Ulster & Putnam County / Forestry Best Management Practices

WAC is in the process of planning and implementing model forests to demonstrate a selection of forestry BMPs, and to monitor the effectiveness of sustainable forest management. A model forest has been implemented in Frost Valley, and two others are in the planning stages at Nimham Mountain and Mink Hollow.

Project: Westchester County / Pathogen Monitoring Study

DEP will expand upon an existing monitoring program to gain additional information on the distribution, concentration, transport and fate of *Giardia spp.* cysts and *Cryptosporidium spp.* oocysts in streams during storm events and other periods of high runoff. Expansion of the monitoring program should allow for: year round sampling, sampling in additional sub-basins, determination of which type of watershed land use generates greater loading of pathogens during storm events, and integration of data collected into a transport and fate model.

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