

Watershed – An area of land, a bounded hydrologic system: within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community

– John Wesley Powell

WATERSHED PROTECTION AND PARTNERSHIP COUNCIL

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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.

MESSAGE FROM GOVERNOR GEORGE E. PATAKI



GEORGE E. PATAKI
GOVERNOR



November 28, 2006

Dear Members of the Watershed Protection and Partnership Council:

Please allow me to extend my sincere appreciation to you on all of your accomplishments regarding the New York City Watershed in 2005.

It has been eight years since the landmark New York City Memorandum of Agreement was signed by the Watershed partners, and I am proud of the progress we have made. Working together, we have advanced the protection of the largest unfiltered drinking water supply in the nation, while never losing sight of the economic needs of upstate Watershed communities. Without the unyielding dedication, commitment and hard work of all our Watershed partners, we could not have achieved these successes, and by continuing our work together, we will ensure the protection of this critical resource for future generations.

I would like to take this opportunity to highlight a number of our accomplishments since the historic Watershed Agreement was signed. The State and City of New York have protected over 60,000 acres of high-priority water quality sensitive lands through conservation easements and/or fee acquisition throughout the Watershed. A total of 34 non-City-owned and six City-owned wastewater treatment facilities, representing 83 percent of the wastewater flow in the west of Hudson watershed, were upgraded to the highest level of treatment in the country, while seven other communities have constructed or are in the process of completing construction of state-of-the-art wastewater treatment facilities. Thousands of failing or likely to fail septic systems have been replaced or repaired throughout the Watershed, and hundreds of farms have implemented Whole Farm Plans and best management practices that not only protect water quality, but improve farmer profitability and economic viability. Over 150 miles of stream banks have been protected and many miles of stream reaches restored. Economically, over \$20 million in low interest loans and grants have been awarded to nearly 100 small businesses and numerous civic and cultural organizations throughout the west of Hudson portion of the Watershed, thereby ensuring continued economic vitality into the future. These accomplishments are astounding given the relatively short time period in which they have been made. They are a true testament of what can be achieved when we all work together toward a common goal.

On behalf of all New Yorkers, including the nine million New Yorkers who each day rely on this irreplaceable drinking water supply, I thank you for your continued devotion and commitment in protecting this vital natural resource and wish you all the best as we continue to implement the historic 1997 Watershed Agreement.

Very truly yours,

A handwritten signature in black ink that reads "George E. Pataki". The signature is written in a cursive, slightly slanted style.

WATERSHED PROTECTION AND PARTNERSHIP COUNCIL MEMBERS

CHAIR

Denise Sheehan, *Commissioner, NYS Department of Environmental Conservation*

Christopher L. Jacobs, *Secretary of State*

James Walsh, *Governor's Office*

Darren Suarez, *NYS Senate*

Julia Mallalieu, *NYS Assembly*

Antonia C. Novello, *Commissioner*

NYS Department of Health

Ronald Tramontano, *Designee*

NYS Department of Health

Charles A. Gargano, *Commissioner*

NYS Empire State Development

Amy Schoch, *Designee*

NYS Empire State Development

Patrick H. Brennan, *Commissioner*

NYS Agriculture & Markets

Alan J. Steinberg, *Region II Administrator*

US Environmental Protection Agency

Philip Sweeney, *Designee*

US Environmental Protection Agency

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

Emily Lloyd, *Commissioner*

NYC Department of Environmental Protection

David Warne, *Designee, Acting Deputy Commissioner*

NYC Department of Environmental Protection

Dr. Thomas R. Frieden, *Commissioner*

NYC Department of Health

Wilfredo Lopez, *Designee*

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*

Fred Huneke, *Watershed Agricultural Council*

Robert F. Kennedy Jr., *Environmental Parties*

Cathleen Breen, *Environmental Parties*

Vacant Positions

New York City Water Consumers Representative

Watershed Business Community Representative

WPPC EXECUTIVE DIRECTOR

William C. Harding

MESSAGE FROM CHAIR, DENISE M. SHEEHAN



GEORGE E. PATAKI
GOVERNOR



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

DENISE M. SHEEHAN
COMMISSIONER

Dear Members of the Watershed Protection and Partnership Council:

I am very pleased to present you with the Watershed Protection and Partnership Councils's Annual Report for 2005. As the Council's Chair, I am honored to work with each one of you as we continue to successfully implement this important partnership forged by the 1997 Watershed Agreement. In the eight years since the signing of the Watershed Agreement, we have worked collaboratively to ensure that Governor Pataki's vision and goal of protecting the drinking water supply that serves nine million New Yorkers and preserving the economic vitality of the upstate Watershed communities are achieved.

The Annual Report provides an opportunity to highlight many of our accomplishments during the past year, and continues to document the efforts of New York City and the upstate Watershed communities in furtherance of this historic partnership. As I read the report, I am impressed with how our partners are able to overcome obstacles, rise to any challenge, and continue to advance state-of-the-art science and technology that further protects this invaluable drinking water supply.

I wish to sincerely thank all the Council members, their staff and all of our Watershed partners for their continued commitment, dedication and hard work toward ensuring the success of the Watershed Agreement, and the protection and preservation of this vital natural resource for many future generations of New Yorkers.

Sincerely,

A handwritten signature in black ink that reads "Denise M. Sheehan". The signature is fluid and cursive.

Denise M. Sheehan

MESSAGE FROM THE EXECUTIVE DIRECTOR



William C. Harding
Executive Director, WPPC

More than a decade ago, I was fortunate to be a part of the negotiations that led to the signing of the 1997 New York City Watershed Agreement. During those years, I never strayed from a firm stance on environmental protection issues because, as a biologist and a native of the NYC Watershed, I grew up appreciating its natural beauty and ecological complexity. Later, my years as an elected official and municipal manager imbued me with the importance of assuring a healthy economic future for the scores of communities that call the Watershed home. During those times I carried with me the heartfelt belief that, while sometimes at odds, those two goals of the negotiations were clearly not incompatible and, in fact, were inexorably linked.

Now, almost ten years after the beginnings of this historic endeavor, the promise of a new way to protect the Watershed environment and enhance its communities has been turned into practice. The accomplishments continue to mount because of the willingness of all the partners to listen and appreciate the divergent perspectives of all those who care deeply about this living Watershed.

What was negotiated so long ago, is now well into implementation, but we have much left to do. Thus, the role of the Watershed Protection and Partnership Council continues to evolve and adapt in order to most effectively respond to the divergent perspectives and changing needs that form the partnership. Due in large measure to the cooperation and constant efforts of the parties to the Agreement, I am proud to report that our goals of becoming a central point of communication, providing a problem solving forum, and coordinating Agreement implementation activities have all become day to day realities. I am grateful to all involved for their dedication and honest hard work.

The WPPC Annual Report is the product of the collaborative efforts of our many Watershed partners and agencies, and could not be done without their support. Please allow me to especially thank the Council members and the WPPC staff including Jean Noel, Lisa Melville, and the many others in our Peekskill, Margaretville and Albany offices. I should also note the invaluable expertise of Debbie Ritzko and Jane Hamm from DOS Administrative Rules, for making the report a reality.

Respectfully,

A handwritten signature in black ink that reads "William C. Harding". The signature is stylized and cursive.

William C. Harding
Executive Director, WPPC

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.

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 Denise M. Sheehan provided exemplary leadership as chair of both the full Council and the Executive Committee into 2005. Executive Director William C. Harding and staff from the NYS Department of State (DOS) skillfully manage the day-to-day operations.

HISTORIC NEW YORK CITY WATERSHED AGREEMENT

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

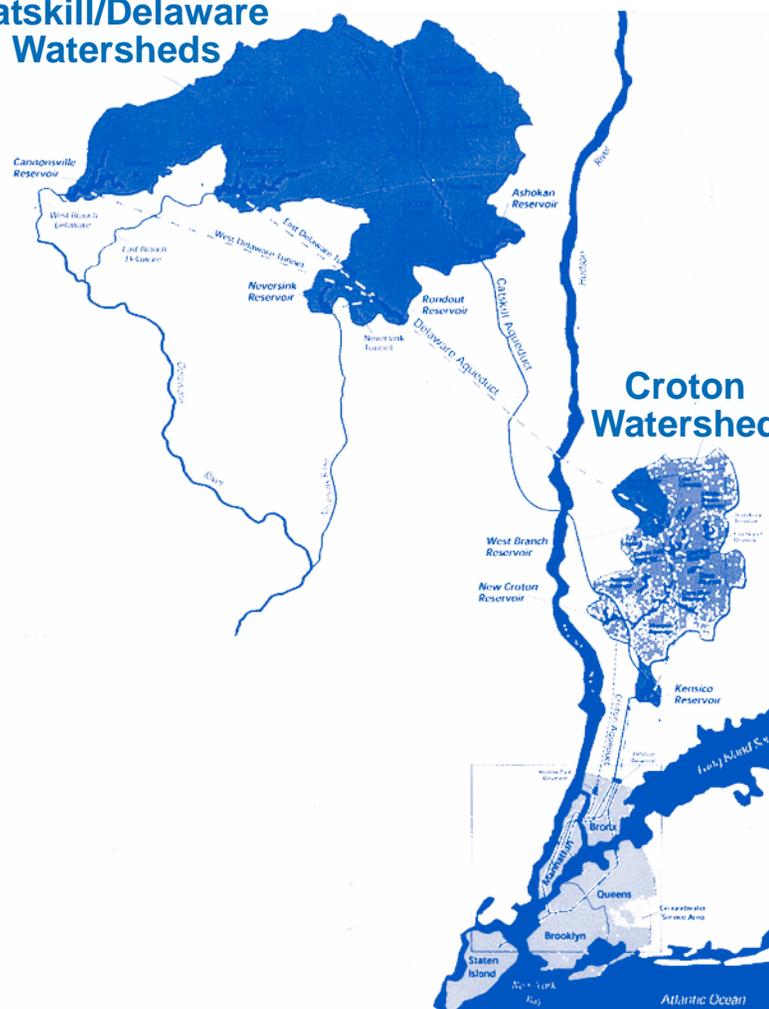
- prohibit or restrict the construction of Wastewater Treatment Plants (WWTPs) in Watershed basins deemed to have excess phosphorus or coliforms;
- prohibit discharges in wetlands;
- require prior approval for all new septic systems and prohibit such systems within certain areas;
- require the study 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 sub-surface 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.

Catskill/Delaware Watersheds



BUILDING NEW AND UPDATING EXISTING WATER QUALITY PROTECTION INFRASTRUCTURE

Septic System Rehabilitation and Replacement

Established under paragraph 124 of the Watershed Agreement, the \$13.6 million septic rehabilitation program repairs or replaces failing septic systems serving single 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 2005, the Septic System Rehabilitation and Replacement Program reimbursed 198 owners of one and two family homes for eligible costs associated with repairs to their failed on site systems. The total number of systems repaired or replaced since 1997 rose to 2,128. CWC staff interviewed 447 property owners to determine eligibility and explain the program, which reimburses 100% of repair and replacement costs for permanent residents, and 60% for part-time residents.

The development of a hybrid wastewater handling system in the Gladstone Hollow section of the Town of Andes was also nearly completed in 2005. Funded through the Septic Program, this system retains solids in septic tanks at 15 residential properties while funneling wastewater to a new wastewater treatment plant constructed for the hamlet of Andes under the New Infrastructure Program.

The Septic Maintenance Program, initially restricted to properties which received CWC funded septic systems, was expanded in 2005. It now pays for half the cost of septic system pump-outs and inspections for

any DEP approved system installed anywhere in the West of Hudson Watershed since January 21, 1997 (an estimated 1,000 households). Systems must be at least three years old. As of year end 2005, 84 septic tanks were inspected and pumped, bringing the total since program inception to 148.

Phase 1 of a CWC coordinated research project, the Septic Monitoring Program, was completed in 2005 with the construction of 34 alternative and conventional residential septic systems. Partially funded by a DEC grant from federal Safe Drinking Water Act funds, the project will sample effluent from 20 of those sites to determine which systems offer the most effective treatment for varying soils and terrain. Peat filters, aerobic treatment units, sand filters, raised systems and traditional soil treatment systems were installed. An advisory committee made up of members of the regulatory and scientific community is consulting with CWC staff. A laboratory which will analyze the samples for 12 to 18 months (Phase 2) will be contracted in early 2006.

Stormwater Infrastructure Retrofits

Pursuant to paragraph 125 of the Watershed Agreement, existing stormwater infrastructure problems are addressed through the Stormwater Retrofit Program. Under the MOA, 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 2002 FAD required the City to continue this successful program, and the City committed an additional \$6.3 million to sustain project activity levels. The City also committed \$1.25 million to support a community wide stormwater infrastructure assessment and planning grant initiative as part of the Stormwater Retrofit Program.

Seven projects were completed under the Stormwater Retrofit Program in 2005, and the CWC expended \$2,114,643 on them. They addressed stormwater runoff at three municipal road projects, a corporate campus and a ski center parking lot, and made possible the purchase of a street sweeper to remove debris and contaminants from Watershed roads so that they do not end up in streams and reservoirs.

Several Community Wide Stormwater Infrastructure Planning and Assessment projects were conducted to help municipalities identify infrastructure problems and prioritize improvement and repair needs. Some recipients subsequently applied to CWC for Stormwater Retrofit funds to implement necessary improvements.

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 stormwater controls required for new construction.

Eight projects funded in whole or in part by the CWC were closed out in 2005. CWC reimbursed project owners \$414,037 for expenses associated with these stormwater controls. The projects included residential and commercial enterprises. CWC also reimbursed operation and maintenance expenses for some of its previously funded stormwater control systems in order to maintain their efficiency and extend the useful life of these projects.

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 (SMP) is to increase stream system stability through development and construction of demonstration projects, and to enhance long-term stream stewardship through increased community participation.

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 SMP made substantial progress in 2005 towards accomplishing its extensive set of stream management plans and demonstration restoration projects. Since 2002, the SMP and its partners completed six stream management plans addressing 33% of the NYC West of Hudson Watershed and remain on schedule to complete three additional stream management plans bringing the area addressed to 65% by 2007.

Further, SMP realized its goal of establishing a diverse network of restoration demonstration projects by completing assessment, design and construction for 6 projects as of December 2005. SMP has completed 12 projects since 1996 and expects to complete an additional 5 projects before December 2007.



Healthy stream corridors maintain stable banks, good water quality and important wildlife habitat.

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 Restoration Project	12/31/03	Complete
Stony Clove Creek Stream Management Plan	12/31/03	Complete
• Beecher Smith Property/Lanesville (T) Restoration Project	12/31/04	Complete
Batavia Kill Stream Management Plan	12/31/02	Complete
• Red Falls Restoration Project	12/31/06	In process
• Big Hollow Restoration Project	12/31/03	Complete
• Red Falls Monitoring Report	12/31/10	In process
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)	12/31/06	In process
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	In process
• 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	In process

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 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.

The Regulatory Upgrade Program is designed to assist each WWTP in meeting regulatory requirements and provides for the design and installation of highly advanced state of the art treatment of WWTP effluent. Treatment technologies required by the Regulatory Upgrade Program and funded by DEP include, but are not limited to, phosphorus removal, sand filtration, back up power, back up disinfection, microfiltration (or DEP approved equivalent), flow metering and alarm telemetering.

When complete, WWTP upgrades will provide highly advanced wastewater treatment in the Watershed. The task of coordinating these complex projects with WWTP owners in the Watershed is enormous. Many of the owners are restaurateurs, hoteliers, camp operators, school administrators and managers of recreational facilities, not professional WWTP operators and construction specialists. DEP has proceeded diligently with this vast undertaking and provided step by step guidance on a host of engineering, operating, contracting and regulatory issues.

Over the past 5 years remarkable progress has been made toward achieving the goals of the program. In fact, efforts of the WOH projects

are drawing to a close. By the end of 2005, 24 of the 35 West of Hudson WWTP Upgrade projects were built and began operation, accounting for 96 percent of the SPDES permitted flow. The majority of these projects are in the close out process, pending completion of paperwork and final payments. Another project is nearing completion and four others have been authorized to solicit bids, with construction anticipated to begin in the spring of 2006. Therefore, only 7 projects are still in the design stage. Three of these projects were added late in the program, one as recently as 2005, and are in the early stages of design.

In addition to completing construction on a number of projects, the Regulatory Upgrade Program also paid for the first year of Start Up and Performance Testing for 21 of the projects. The rest of the projects were not eligible for Start Up and Performance Testing payments as they had converted to a subsurface disposal system as their upgrade. Over \$2.3 million was disbursed through the Regulatory Upgrade Program for this first year of start up.

During this time period, a total of 927 disbursements were made to WOH WWTP owners, totaling almost \$64.2 million, approximately

\$60.3 million of which was for the Regulatory Upgrade Program. The remaining \$3.9 million was disbursed for WWTP improvements, primarily construction, paid for through the SPDES Program. Of the Regulatory disbursements, approximately \$46.6 million was disbursed for Regulatory construction costs, with the remainder disbursed for engineering, legal and administrative costs.

The Regulatory Upgrade Program is designed to assist each WWTP in meeting the requirements of the WR&R and provides for the design and installation of highly advanced state of the art treatment of WWTP effluent. Treatment technologies required by the Regulatory Upgrade Program and funded by DEP include, but are not limited to, phosphorus removal, sand filtration, back up power, back up disinfection, microfiltration (or DEP approved equivalent), flow metering and alarm telemetering.

EFC made some 322 disbursements during 2005, amounting to approximately \$27 million paid to WWTP owners for eligible program costs. To date, the Regulatory Upgrade Program has paid over \$114 million to upgrade and improve WWTPs in the NYC Watershed.

Phase II Municipal Separate Storm Sewer System program within the east of Hudson portion of the New York City Watershed

Stormwater runoff is generally viewed as a major source of non-point source pollution in streams, rivers, lakes, and reservoirs throughout the Nation. The New York City Watershed is no exception.

The United States Environmental Protection Agency's (EPA) Stormwater Phase II Rule requires that areas designated as Municipal Separate Storm Sewer Systems (MS4) 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 2000, the EPA promulgated Phase II of its Stormwater Rule. The Phase II Stormwater Rule extends to certain "small" MS4s which includes the entire EOH portion of the New York City Watershed. Under the Phase II Stormwater Rule, MS4s are required to develop a stormwater management 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. The six minimum control measures include the following: Public Education and Outreach; Public Involvement/Participation; Illicit Discharge Detection and Elimination; Construction Site Stormwater Runoff Control; Post Construction Stormwater Manage-

ment; and Pollution Prevention/Goodhousekeeping for Municipal Operations.

During 2003, DEC issued statewide Construction Activity and MS4 permits. In conjunction with this initiative, DEC hired the Center For Watershed Protection (CWP), to assist in developing a strategy for addressing stormwater runoff within the EOH portion of the New York City Watershed. The CWP was charged with identifying additional measures above and beyond the statewide MS4 program requirements that could be implemented in order to address water quality issues within this area.

The CWP prepared a report which contained a number of detailed recommendations on what additional requirements may be necessary to address stormwater runoff and phosphorus concerns within the

EOH Watershed. DEC in turn convened a Watershed stakeholder group to review the CWP's recommendations and requested comments and feedback from the Watershed stakeholder group on how it should proceed.

DEC met with the Watershed stakeholders and municipal officials from Putnam, Westchester and Dutchess Counties throughout 2004 and 2005. Based on these stakeholder meetings, DEC received some very valuable input and feedback. The DEC expects to formally public notice the final draft proposal in 2006. Based on public comments received, the Department intends to finalize the MS4 Heightened Criteria for the EOH Watershed in late 2006.

ADVANCED STUDIES AND ANALYSIS FOR WATER QUALITY

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 references an enhanced water quality monitoring and surveillance program. 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 the water quality monitoring and surveillance program. Resulting from all their efforts, the Safe Drinking Water Act of 1996 includes language directing the Environmental Protection Agency 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 in 2003 and through all the hard work of Governor Pataki and the New York State Congressional Delegation, the Safe Drinking Water Act was re-authorized in 2004 for another seven years at \$15 million annually.

Safe Drinking Water Act funding requires a 50 percent non-federal match.

Water Resources Development Act (WRDA) — In addition to the Safe Drinking Water Act, Governor George E. Pataki also worked with members of the New York Congressional Delegation to include language in the Water Resources Development Act authorizing funding to undertake water quality related construction projects within the Watershed. The Water Resources Development Act of 1996 includes language directing the United States Army Corps of Engineers to work with the State of New York and financially support water quality improvement projects and ongoing watershed protection efforts identified in the Watershed Agreement. Resulting from the Governor's and New York State Delegation's efforts, the Water Resources Development Act of 1999 contained additional language increasing authorization up to \$42.5 million to assist local governments in their implementation of activities to protect the Watershed. Through these funds, upstate communities have been able to construct or improve much needed sewage treatment facilities, address stormwater runoff and support numerous other important water quality improvement initiatives.

Water Resources Development Act funding requires a 25 percent nonfederal match.

The federal appropriations under the Safe Drinking Water Act and the Water Resources Development Act since Federal Fiscal Year 1997 are demarcated below:

Federal Appropriations for the New York City Watershed		
Federal Fiscal year	SDWA	WRDA
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
2004	\$ 5.0 million	\$ 2.0 million
2005	\$ 4.0 million	\$ 9.0 million
Total	\$40.2 million	\$24.0 million

A brief overview of all SDWA and WRDA projects funded to date is included as Appendix A.

Freshwater Wetlands Map Amendments within the New York City Watershed

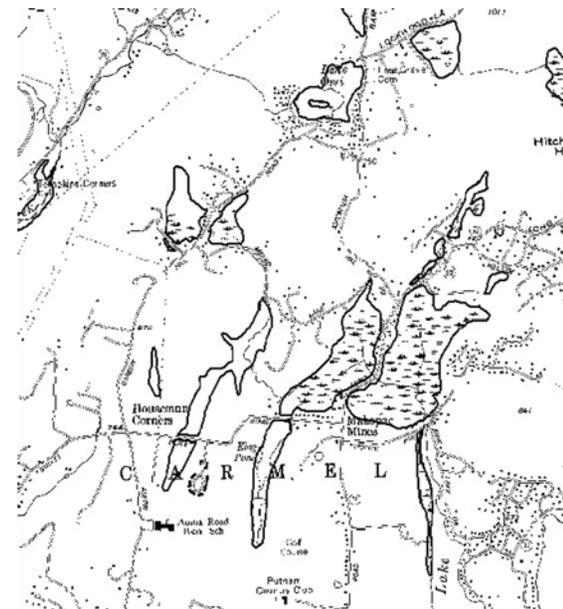
Wetlands play a critical role in maintaining and enhancing water quality. In New York State, not all wetlands are directly regulated under the State's Article 24 Freshwater Wetlands Act. Only those wetlands 12.4 acres or greater and smaller wetlands identified as of "unusual local importance" (ULI) that are specifically identified on the Department'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 that DEC has the most accurate Article 24 Freshwater Wetlands Maps within the New York City Watershed, in 1998, the DEC undertook a comprehensive wetland remapping effort within the entire New York City Watershed. The map amendment process originally began in the WOH Watershed and included the addition of 15 newly identified wetlands encompassing 700 acres.

With the WOH wetlands remapping initiative complete, efforts turned to EOH to identify wetlands that were not included on the Freshwater Wetlands Maps, but met the size criteria. In 2004, the DEC completed its remapping effort in Westchester County, which resulted in the addition of 3,363 acres of wetlands. This in-

cluded 36 new wetlands greater than 12.4 acres, 75 smaller wetlands identified as of unusual local importance (ULI), and amendments to 72 existing State regulated wetlands. With Westchester County complete, in 2005, the DEC continued its Article 24 Freshwater Wetlands Map amendments in Putnam and Dutchess Counties.

DEC completed its field work in 2005 and held two informational meetings and a public hearing in September 2005 to provide the general public with an opportunity to review the draft amendments. This amendment also encompassed the addition of previously unmapped wetland areas, inclusion of smaller wetlands identified as of ULIs, and boundary adjustments to previously mapped wetlands. Although the draft Article 24 Freshwater Wetland Maps were not officially promulgated by the end of 2005, DEC anticipates the maps will be finalized by April 2006. Based on this map amendment, DEC anticipates that an additional 3,546 acres will be included on the State's wetland regulatory maps within that portion of Putnam and Dutchess Counties that falls within the New York City Watershed. This includes 125 new wetlands, 20 ULIs and boundary adjustments to 107 previously mapped wetlands.



An Article 24 Freshwater Wetlands Map identifying regulated wetlands areas - outlined areas are Article 24 wetlands.

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 originally agreed to expend \$10 million for land acquisition, and in 2004 committed an additional \$25 million. The State of New York has committed a total of \$7.5 million to acquire water quality sensitive lands within the Croton Watershed.

With the issuance of the 2002 Filtration Avoidance Determination, the City was requested to set aside an additional \$50 million for land acquisition above and beyond the funds already committed under the Watershed Agreement.

In 2005, the State of New York, through DEC, entered into an innovative and collaborative agreement with New York City, Westchester County and the Town of Somers to protect one of the largest undeveloped tracts remaining in Westchester City. This parcel, known as Eagle River is 654 acres in total. Under this partnership, the State of New York contributed \$3.2 million for the purchase of a conservation easement on 370 acres, while New York City purchased in fee an adjacent 269 acre parcel. The Town of Somers and Westchester County purchased in fee the remaining 15 acres. The conservation easement will restrict development and provide public access for passive recreation.

Moreover, pursuant to paragraph 82 of the Watershed Agreement the City of New York will grant to DEC a conservation easement on all lands it acquires 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. Back in 2004, DEC received a second batch of conservation easements from the City of New York. This submission covered approximately 130+ parcels throughout the Watershed. In 2005, DEC's Real Property Bureau was busy working with the Office of the Attorney General to execute and record these easements. To date, DEC has executed and recorded six easements covering 87 parcels throughout the Watershed.

Under the 2002 FAD, the City was required to satisfy both formal solicitation goals as well as re-solicitation goals. As of December of 2004, the solicitation requirement contacting the owners of 355,505 acres was met. As of December 31, 2005 watershed wide solicitation and resolicitation efforts have resulted in the City securing 57,361 acres in fee simple or conser-

vation easement, with another 12,743 acres of farm easements secured by the Watershed Agricultural Council. This represents a tripling of lands controlled by the City as of 1997.

During the last eight years, the City has increased its land holdings dramatically compared with pre- 1997 ownership patterns. To date DEP has purchased 756 properties totaling over 61,000 acres. Of these 756 properties, approximately 524 properties are located in the west of Hudson watersheds, totaling 42,567 acres and valued at \$58.0 Million. Additionally, DEP has secured 52 farm easements totaling approximately 9,800 acres. Currently, DEP is in contract to acquire an additional 7,277 acres through outright purchase and an additional 4,056 through farm easements.

BUFFER LANDS

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 2005 under its access permit system. Currently, there are almost 100,000 valid access permits, with over 11,100 DEP hunting tags issued in 2005. The amount of lands available to the public continued to increase with a total of over 74,000 acres open for various uses.

In 2005, access for whitetailed deer hunting was made available on 36,538 acres of DEP lands. The City has also continued cleaning up abandoned boats along the shores of the reservoirs, and is in the process of updating its rules and regulations for recreational use and creating an Internet permit issuance system.

lations for recreational use and creating an Internet permit issuance system.

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 the New York City Department of Environmental Protection (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 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.

The SAC met twice in 2005 and reviewed ten parcels submitted by the DEP for acquisition totaling 697 acres. There were also three parcels where conservation easements were obtained on almost 162 acres.

Master Planning and Zoning (MP&Z) Incentive Awards Program

The Master Planning and Zoning Incentive Award Program was established pursuant to Paragraph 152 of the Watershed Agreement and is administered by the Department of State. The program is designed to aid municipalities in the development of community development tools and any necessary local laws to enhance Watershed communities while protecting water quality. Eligible projects include the preparation or updating of a comprehensive plan, establishment or revision of community development tools, local laws, water quality enhancement projects, stormwater designs and plans and the creation of a strategic capital investment management plan for hamlets, villages, and other potentially developable areas in the Watershed.

In 2005, a new project category was added and the amount of the grants was raised from \$15,000 to \$25,000 for all categories except the new one, which was raised to \$50,000. The new category was for the implementation of community development tools in West of Hudson communities only. It was developed in response to the need for implementation of many of the plans, tools or regulations developed through previous rounds of MP & Z programs.

To date, 44 of 55 eligible WOH and 20 of 26 eligible East of Hudson communities have participated, each receiving funding under at least one of the five flexible categories. The MP & Z program has awarded more than 1.9 million dollars to NYC Watershed communities. To be eligible, a municipality need only have a portion of its land area within the Watershed. The MP & Z Program, along with its technical assistance component, has been instrumental in enabling the communities to leverage additional funds, recruit professional services, and develop strategies which strengthen the economy while protecting water quality. Below are four success stories from different Watershed communities.

Town of Southeast, Putnam County (EOH)

The Town of Southeast continues to develop their Strategic Capital Investment and Management Plan. The Town of Southeast received \$25,000 in New York State funding to address the townwide stormwater system.

By capturing all outfall points in the Town and plotting infrastructure information on their Geographic Information System (GIS), the strategic capital investment plan will identify geographic priorities requiring stormwater Best Management Practices with the goal of reducing water quality impairments. During 2005, the Town adopted a new practice of creating drainage districts to fund the ongoing maintenance of stormwater Best Management Practices for new development areas.

Town of Roxbury, Delaware County (WOH)

The Town of Roxbury is a premier Watershed community because it has promoted a sense of place through history, recreation, tourism, culture and the arts and enhanced the region's economic health without compromising water quality protection. Foremost in this effort is the revital-



Pictured in front of the Barn where the DOS funded restrooms will be located, is from left to right, Brian Mulder, project contractor, Peg Ellsworth, Kirkside Park Historian and Roxbury Parks Director, and Tom Hynes, Supervisor of the town of Roxbury.

ization of Kirkside Park, for which the Town received \$10,000 under MP & Z to undertake a feasibility study for the park's reconstruction. Roxbury also received \$10,000 to update its comprehensive plan, \$15,000 for a strategic capital investment plan for two historic barns adjacent to the park, and \$15,000 to develop a wellhead protection plan. In 2005, project funding for the Kirkside Park Barn Restoration Project totaled \$53,000 and included the installation of two handicap accessible public bathrooms.

At the time the feasibility study to reconstruct the park was funded and undertaken, very little of the park's original design remained. Yet, a poll of the Town's residents underscored the widespread support to return the park to its original splendor of 100 years ago. The Town engaged the services of a historic landscape architect to ensure the integrity of restoration was in keeping with original design. Officially titled Kirkside Park: Historic Analysis, Existing Conditions, and Schematic Planning, the study outlines the necessary steps to again afford the public the enjoyment of this historic and centralized civic greenspace. Project components are divided into the path system, the bridges, the gazebo, the retaining walls, the plantings, the soccer field rehabilitation, and the rest rooms. Restoration tasks and associated cost estimates are outlined, providing a sense of which parts of the project could be accomplished by volunteers.

Since completion of the study, the Town has incorporated the goals of the park's revitalization into the comprehensive plan, and has leveraged more than \$600,000 in grant funds and cash contributions into the park's restoration. Accomplishments include the construction of five rustic bridges, 1,000 linear feet of dry laid stream bank walls, 2,500 linear feet of walking paths, a regraded and restored ballfield, and a large portion of the horticultural restoration. The list of individual and business con-

tributors exceeds 600 and the in-kind volunteer time is estimated to be more than 10,000 hours.

Recently, the Kirkside Park historian, Peg Ellsworth was honored in Washington, D.C. by Preserve America for developing local assets and creating synergy through partnerships.

Town of Lewisboro, Westchester County (EOH)

The Town of Lewisboro developed and adopted environmental control ordinances with MP & Z money which have a direct bearing on land conservation, the protection of sensitive natural resources, water quality

protection, and the preservation and protection of wetlands and watercourses, and which are aimed at reducing adverse environmental impacts associated with uncontrolled or poorly planned development. Lewisboro previously used MP & Z funding to update their 1985 Comprehensive Plan by establishing an Open Space Plan component. This provided a basis for the development of specific zoning and environmental regulatory tools related to maintaining and protecting water quality con-

ditions within the Town, the NYC Watershed lands and Westchester County.

In 2005 Lewisboro was awarded a \$25,000 MP & Z grant to initiate an Eastern Westchester Biotic Corridor Land Use Regulations Plan. The project conducted a biodiversity needs analysis and will propose new or amended local land use regulations or other environmental controls for the Eastern Westchester Biotic Corridor. The Town of Lewisboro entered into an inter-municipal agreement with the Towns of Pound Ridge and North Salem to cooperate on this project which will include overlay zoning and uniform provisions in the local laws, policies and practices of each Town. An important aspect of the proposed plan is that it will be developed in accordance with the New York City Watershed Memoran-

"Each community's unique and diverse stories are part of the larger chapter of American heritage, culture and values. It is by visiting and experiencing these special places that we have an opportunity to touch the past, and can best understand how the past touches us." Gale Norton, Secretary of the Interior from the press release designating Roxbury as a Preserve America Community.

MASTER PLANNING AND ZONING

dum of Agreement, which promotes and institutionalizes watershed wide cooperation and planning.

Greene County Soil and Water Conservation District and Town of Windham (WOH)

The Town of Windham on behalf of localities in the NYC Schoharie Reservoir watershed is in the process of developing a multi-objective approach to the source reduction of turbidity in the Schoharie Reservoir basin. The Greene County Soil and Water Conservation District will manage the data collection and is expected to work with local, regional and state representatives to identify specific turbidity reduction projects, assist in the planning of new programs as well as develop infrastructure and equipment resources. In 2005, \$50,000 was awarded to the Town of Windham and Greene County for this project.



Roxbury Parks Director accepted the Preserve America grant in March, flanked by First Lady Laura Bush (left) and Secretary of the Interior Gale Norton. "I suggested that the White House Lawn might be the perfect place for the Roxbury Nine to play vintage baseball," said Ms. Ellsworth, "and Mrs. Bush agreed."

Round VI - 2005 Projects

<i>Municipality</i>	<i>Type of Application</i>	<i>NY State Funding</i>
Conesville (T)	Comprehensive Plan Update	\$25,000
Jefferson (T)	Comprehensive Plan	\$25,000
Fallsburg (T)	Comprehensive Plan Update	\$25,000
Jewett (T)	Comprehensive Plan Update	\$20,350
Roxbury (T)	Kirkside Park Barn Restoration	\$53,000
Windham (T) & Greene County	Turbidity Reduction Strategy	\$50,000
Denning (T)	Master Plan and Zoning Laws Revisions	\$15,000
Marbletown (T)	Open Space and Natural Resource Plan	\$25,000
Conesville, Gilboa & Jefferson (T)	County Planning Technical Assistance	\$75,000
Deposit (T)	Site Plan Review Local Law	\$20,000
Franklin (T)	Comprehensive Plan Update	\$25,000
Walton (T)	Pilot Highway Management Plan	\$25,000
Walton (V)	Wellhead & Source Water Protection Plan	\$25,000
Tannersville (V)	Master Plan Build-out Analysis	\$25,000
Kent (T)	Zoning Law Amendment	\$25,000
Southeast (T)	Stormwater Capital Management Plan	\$25,000
North Salem (T)	Local Law Amendments	\$25,000
Lewisboro (T)	Biotic Corridor Regulation Plan	\$25,000
Brewster (V)	Comprehensive Stormwater Ordinance	\$25,000
New Castle (T)	GIS Stormwater Management Plan	\$25,000

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 2005, twenty loans valued at \$5,464,350 were closed for projects which are expected to create 176 jobs over the next three years. Funds leveraged from other sources by these loans totaled \$11,119,548, bringing the total investment of loans closed in 2005 to \$16,581,898. As of December 31, 2005, 121 loans totaling \$47,924,330 had been approved by the CWC Board of Directors since 1998.

In 2005 loans were made to a variety of businesses, including restaurants and produce markets, a communications company, a rigging and industrial supply firm, a producer of athletic stadium equipment and a metal fabricator.

A temporary Tourism and Regional Marketing Committee was established in 2005 to discuss the most effective means of stimulating tour-

ism and enticing business startups and relocations to the Catskill Region. The Catskill Area Mapping Service (CAMS), a portal through which World Wide Web users can find links to travel sites, official government information, maps of the region and more, will be a principal tool of this marketing effort. CAMS is being developed by the CWC with a New York State Archives grant.

The CWC Economic Development Grant Program remained suspended in 2005 because low interest rates reduced interest revenue generated by the CFF, such revenue being used to fund the grant program. Discussions were conducted on possible revisions to the program to enhance the beneficial impact of grants to non-profit and community organizations.

2005 NYC Watershed Science and Technical Conference

The Annual NYC Watershed Science and Technical Conference is a unique opportunity to showcase the wealth of emerging scientific knowledge that is constantly developing in the NYC Watershed. The conference brings scientists together to present research findings and data, to enhance technology transfer, and to increase coordination among the array of public and private entities working with Watershed science across the nation. It is our mission to continue to encourage leading edge technical dialog and to pass along important scientific information to the public, interested parties, and other scientists working in the NYC Watershed and in similar arenas across the nation.

The 2005 edition of the annual NYC Watershed Science and Technical Conference was held on September 21st and 22nd at the Fishkill Holiday Inn and Conference Center, and was a resounding success thanks to our partners and sponsors at DEC, DOH, DEP, CWC, and NYWEA.

Attendance continues to increase with more than 300 registrants for the two day event, including scientists, engineers, State and federal government agencies, local municipal officials and water and wastewater operators.

Participants this year heard a variety of programmatic updates from regulatory agency representatives and watershed partner entities, along with the presentation of dozens of scientific abstracts of new and emerging science developed primarily within the NYC Watershed. A Compendium of Abstracts presented at the conference was designed and published by the Department of State, and distributed to all attendees.

It is our hope that all who attended this year's conference 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 watershed protection.

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

Thirtyfive grants totaling \$145,782 were awarded in 2005 to schools and organizations in the WOH Watershed and in New York City. To date, 191 grants totaling \$1,052,000 have been distributed, reaching thousands of students and teachers who have benefited from Watershed and environmental education programs and projects. These projects have run the gamut from water monitoring to streambank restoration; literary exploration to oral history; teacher training to theatrical performances. A Special Program grant was awarded in 2005 to fund curriculum development for a mobile forestry classroom.

“The Power of Partners,” a WOH teachers conference held in December under CWC auspices, attracted 83 people and disseminated information on the multitude of Watershed Education programs and materials available to educators.

Outreach activities conducted by the CWC in 2005 included the Fifth Annual Catskills Local Government Day, co-sponsored with the NYS Department of State; four septic maintenance classes for homeowners; and presentations to five WOH Town Boards about CWC programs.

During the period 2002-2005, CWC awarded \$516,557 in MOA public education funds to support 117 projects through 4 competitive grant rounds. To date, CWC has provided a total of 188 grants totaling \$942,571 to 102 grant recipients. The primary audience for most of these grants have been K-12 students, with about 28% of CWC’s grant recipients serving New York City audiences and about 53% serving West of Hudson audiences. The remainder of these grants have served combined upstate/downstate audiences through partnerships or collaborations with other organizations.

Over the years, CWC has built education and outreach into many of its program activities. Highlights include: presentations to schools and educators, hosting numerous foreign delegations, promoting economic development and watershed protection programs to the general public, septic system maintenance classes for homeowners and installation training workshops for local contractors, business and entrepreneurial training courses, stream clean up programs, and the periodic sponsorship and ongoing support of many watershed conferences, such as the increasingly popular Local Government Day and the December 2005 Watershed Education Teacher Conference. In addition to these activities, CWC also maintains a website (www.cwconline.org) that was recently redesigned and updated with several new features.

New York City Department of Environmental Protection

Public education and outreach efforts have been a component of the City’s watershed protection strategy since the expansion of the protection program in the early 1990s. DEP’s activities are built on the principle that an informed base of watershed residents and water consumers facilitate development and implementation of protection strategies. An effective outreach program enhances consumer confidence in the safety and quality of the water supply, while teaching watershed residents and consumers alike the importance of watershed protection.

DEP’s efforts have included, and will continue to include, both program specific education efforts and broad based outreach. In many cases, program specific outreach efforts are conducted in coordination with DEP partner agencies and organizations - CWC, WAC, KEEP and the watershed counties, to name a few. It is important to acknowledge the contributions of these locally based groups in spreading the word about the links between land use activities and water quality.

DEP produces two publications aimed at recreational visitors to the City's water supply lands: the biannual *Watershed Recreation* newsletter and the annual *Guide to Hunting on New York City Water Supply Lands*. Published in the fall and spring, *Watershed Recreation* is mailed to more than 96,500 current holders of DEP's Access Permit and is intended to promote their recreational enjoyment and stewardship of water supply lands. The *Guide to Hunting on New York City Water Supply Lands* is mailed to more than 11,000 current holders of DEP Hunting Tags. This guide contains hunting conditions, maps of all hunting areas, and a positive land stewardship message geared towards recreational hunters.

DEP has produced exhibit panels describing land management, forest improvement, agricultural uses, and recreational uses of City water supply lands. These exhibits have been displayed at the various events in the watershed and the region.

Every year, DEP hosts seasonal interpretive hikes on water supply lands, facilitates numerous reservoir clean up events, and participates in "Take a Kid Fishing Day". Since 2003, interpretive hikes have been offered monthly at diverse locations throughout the watershed. These hikes are intended to orient recreational users with water supply lands while providing valuable outreach opportunities for DEP land stewards, foresters and land managers.

In addition, DEP sponsored 21 reservoir clean up events during 2005 with many diverse volunteers such as sportsmen clubs, youth groups, environmental clubs, neighborhood associations, and assorted individuals.

DEP recently drafted a comprehensive recreation outreach plan to improve communications with recreation users, watershed neighbors and other visitors to City owned water supply lands. This outreach plan specifies long term strategies and tools for communicating about watershed recreation and potential land stewardship opportunities.

Through the Watershed Office of Public Affairs (WOPA), DEP takes a comprehensive approach to watershed education. DEP visits schools in New York City and watershed counties and offers students an educa-

tional, action oriented, multi-disciplinary curriculum. DEP programs promote investigation, allowing students to analyze all factors, past and present, human and non-human, which affect the entire watershed. DEP also organizes staff development for teachers, providing them with an opportunity to meet and work with DEP scientists, engineers, and environmental educators.

DEP continues to work with towns that surround the Kensico Reservoir to organize the Kensico Environmental Enhancement Program (KEEP), an outreach effort designed to protect and enhance water quality in the Kensico Reservoir. Joint efforts coordinated by DEP and KEEP promote watershed protection by providing opportunities for watershed residents to learn how they and their communities can prevent non-point pollution. In May, KEEP held the very successful Kensico Reservoir Watershed Water Conservation and Water Quality Preservation Art and Poetry Contest involving schools surrounding the Kensico Reservoir. This Art and Poetry Contest was a culmination of classroom lessons which focused on historical and present day aspects of the New York City water supply system; the role that the Kensico watershed plays in the overall system; water quality issues; and the value of water and water conservation. Through their artwork and poetry the students were able to express their understanding and appreciation of our water supply system as well as the need to protect this vital resource.

DEP's watershed education program includes participation in major events in the region, especially county fairs. DEP's education staff provides visitors of these events with valuable information; offers workshops and demonstrations; and explains the role of DEP as a cooperative partner with its upstate neighbors and environmental groups. A variety of materials are distributed to the public including booklets, pamphlets and fact sheets about the water supply system, drinking water quality, the Whole Farm Program, wetlands, land acquisition and conservation easements, as well as other related materials. During the summer months, thousands of watershed residents visit the DEP education display booth, where they are presented with materials that explain the agency and its programs. In 2005, DEP participated in more than 50 events throughout the watershed.

Watershed Forestry

A Watershed Forestry Program, which promotes sustainable forestry in the WOH Watershed by providing education about BMPs 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.

East of Hudson Program

Putnam County Forestry Plan



Hilltop Hanover Farm strengthens the partnerships of land-based organizations in a new Agricultural/Environmental Resource Center for Westchester residents.

The Watershed Agricultural Council's East of Hudson headquarters are located at Hilltop Hanover Farm in Yorktown Heights. Until the early nineties, this 183-acre farm bred and sold some of the finest Holsteins in the country. WAC recently completed a Whole Farm Plan at Hilltop,

which is now owned by Westchester County and under development as an Environmental Resource Center. The Center also houses Cornell Cooperative Extension, New York City Greenmarket, and Hudson Valley Wool Works.

The Environmental Resource Center will focus on educating professionals, landowners and the general public, and includes demonstrations of BMPs for agriculture and land use. The site offers a prime opportunity for WAC and its partners to showcase agricultural and forestry pro-



Healthy horses need healthy grass. Farm managers are learning new skills that meet these goals and benefit water quality.

AGRICULTURE AND FORESTRY



WAC's Watershed Forestry Program reached out to arborists with a workshop on watershed protection and invasive species.

grams in a working landscape setting. As a first step, WAC installed interpretive signs explaining how BMPs help reduce pollution risks to the water supply. The farm also includes 20 acres of forestland, for which WAC foresters will prepare a forest management plan.

Most agriculture in this region today revolves around the equine industry, including horse boarding, breeding, training and riding instruction. A Paddock Demonstration Project was initiated to address the specific needs of these equine operations, whose goal is to establish and maintain more productive, well managed paddock areas. This permanent grasscover will reduce pollution risks from sediment, nutrients and pathogens. A USDA Natural Resource Conservation soil scientist performed soil quality test in study and control areas on three participant farms to

quantify the impact of horses on soil compaction and infiltration rates. These soil tests will be repeated in 2006 to measure changes, and other farms in the Croton Watershed will be encouraged to implement the practices that prove beneficial to water quality.

On the forestry front, the first Field Day for Arborists and Foresters, brought together professionals who manage and care for trees and woodlands in Westchester County and the lower Hudson Valley. Attendees learned about the health and well being of rural and community forests, including updates on Sudden Oak Death, research findings on the Hemlock Woolly Adelgid and other invasive insects. Outdoor field sessions demonstrated techniques for improving forest stands and Hemlock and American Chestnut trial plots.

West of Hudson Program

The Watershed Agricultural Program continues to implement and maintain Whole Farm Plans on 357 watershed farms through partnership with County Soil and Water Conservation Districts, USDA Natural Resources Conservation Service and Cornell Cooperative Extension. The Conservation Reserve Enhancement Program (CREP), administered by USDA Farm Service Agency, has protected over 1,600 acres of riparian buffers. One of this year's highlights was the introduction of the portable calf kennel on dairies seeking to find a cost effective alternative for pathogen management. The kennel offers well ventilated accommodations for healthier calves on a cleanable surface, with key features including separation between animals to prevent the spread of disease, and to enable the farmer to spread or compost this manure separately on the farm.

Nutrient Management Plans (NMP) continue to be a vital tool to manage both pathogens and phosphorus in livestock manure. In 2005, 91% of all commercial farms had current NMPs, with 68 participating in a popular incentive credit pro-



Over 200 potential small farm participant have been surveyed; 140 have been assessed; and 42 are currently managed with Whole Farm Plans.



Dairy producers exchange information on intensive grazing, which reduces the amount of feed imported into the watershed.



Stream crossings like this one are an integral part of establishing a riparian buffer.

gram that helps them acquire the equipment required to meet their manure spreading schedules. WAC staff traveled to Vermont to explore a promising conservation practice called "bedded pack," which combines manure storage, barnyard and a feeding area in to one management practice on the farm, which will be tested with producers in 2006.

As the implementation phase of the Program evolves toward operation and maintenance, or *stewardship*, of existing practices, farmer education has become increasingly important. Educators took the classroom to the farm this year in order to give producers a closer look at how they can increase profits and protect water quality through new practices. Working in partnership with Cornell Cooperative Extension, training in cow/calf health and safety was conducted in small groups of neighboring farmers and, for the first time, included a bilingual component. Pasture walks were hosted by three farmers who shared how their grazing practices for dairy, sheep and beef can improve profitability through savings on labor, energy and crop expenses.



The portable calf kennel is a new practice to improve calf health which reduces pathogen risk.

2005 WAC Highlights



A New York City buyer instructs farmers about standards in packaging and marketing for distribution, which is key information for producers to succeed in selling wholesale.

www.buypurecatskills.com to create a companion web version of the *Pure Catskills* member Guide, as well as to provide a regional presentation of Catskills products to prospective downstate and wholesale buyers.

Higher milk premiums allied farmers with environmentalists at an Organic Dairy Conference sponsored by WAC at SUNY Delhi during May, at which over forty farmers and professional staff discovered more about

WAC's Farm to Market Program kicked off in May with the printing of 30,000 copies of the 2005 *Pure Catskills* Guide to Fresh Farm Products, in partnership with the Catskill Mountain Foundation. The Guide is a key component to the Catskills regional "buy local" and branding campaign as consumers can find it at stores, markets and events throughout the market season. While local radio and newspapers gave excellent coverage of the campaign, a regular bulletin called the *Farm To Market Update* was mailed to farmers during the season to keep them abreast of the campaign's events and training opportunities. Work began at



Downstate consumers help protect their own drinking water by buying Pure Catskills farm products. A reusable "ecobag" markets the brand at a New Amsterdam Market in New York City last October.

the higher profits and water quality benefits for farmers switching from conventional to organic dairy farming. Later in the year when fields lay dormant, a bus load of vegetable farmers joined us for an Insiders' Market Tour for Farmers designed to provide them with first hand information about how agricultural products are selected, marketed and packaged on the wholesale and retail levels. The tour included a trip through the warehouse of a large produce distributor, a visit to a specialty market and dinner with a chef whose menu features local produce. Dairy farmers and others looking for a new business opportunity or avocation attended a day long cheesemaking workshop, during which Linda Smith of Sherman Hill taught the basics about fresh cheeses such as mozzarella, feta and ricotta.

AGRICULTURE AND FORESTRY



A retail display of specialty cheeses has Aissa O'Neil, a Catskill farmer, considering the potential of cheese for making more for her milk on a tour of urban markets this year.

Over one hundred supporters took part in tasting Catskills chefs' seasonal interpretations of local food at three *Pure Catskills* dinners hosted by local chefs in three regional restaurants from June through September. Participating establishments worked with Pure Catskills farmers to provide three themed dinners, titled "Summer's First Harvest" at The Peekamoose Restaurant (Ulster County), "County Fare" Quarter Moon Café (Delaware County) and "Certified Humane" at Resort (Sullivan County). WAC coordinated farmers to exhibit and highlight Pure Catskills farm products at numerous seasonal outreach events, including the Delaware County Fair, Pakatakan Market, Margaretville's Cauliflower Festival and Slow Food's New Amsterdam Market in New York City.

SUMMARY OF SAFE DRINKING WATER ACT PROJECTS**WASTE WATER RELATED PROJECTS****Enhanced Monitoring and Evaluation of Septic Systems in the Watershed (Catskill Watershed Corporation)**

Phase II of this project will monitor alternative technologies to remediate/repair existing septic systems in difficult areas. Enhanced monitoring of these septic systems is needed to promote use of the best available technology for long term control of sewage from on site systems and research the impact and long term best control practices of existing septic systems on substandard lots. CWC will focus key areas of research needed to improve policies regarding septic repair and replacement in the NYC watershed. CWC has worked with many septic systems for which alternative technologies may be more appropriate than typical soil treatment systems, described within the NYS standards in Title 10 NYCRR Appendix 75-A, due to poor soils, small lot sizes, inadequate set-backs, high groundwater or steep slopes. In order to improve the water quality impact of the septic program, CWC will research the impact of alternative technologies under such conditions. CWC will maintain strong communications with local towns, the Delaware County Soil and Water Conservation District and other county agencies as well as NYSDOH, NYS DEC, NYC DEP, USEPA and other interests to develop workplans and methodologies for monitoring and evaluation. CWC will consult broadly with NEIWPC, Small Flows Clearinghouse and other relevant organizations to ensure the views and concerns of experts in the field underpin effective research development.

NONPOINT SOURCE PROJECTS**DEC Non-Point Source Monitoring at Trout Creek and Lowland Farm (DEC)**

DEC will continue research and monitoring work to determine annual nutrient and sediment losses in the Cannonsville Watershed through event-based monitoring. This cooperative work is being conducted to study phosphorus losses primarily from agricultural lands and to study methods of reducing these losses through alternative agricultural man-

agement techniques. A Trout Creek monitoring station was established under the FFY 2000 SDWA Grant near the inlet to the Cannonsville Reservoir and monitoring initiated. The Trout Creek sub-basin accounts for approximately 20% of the flow into the Cannonsville Reservoir. This monitoring station and DEC's Beerston monitoring station will collect data that accounts for nearly the entire tributary load to the Cannonsville Reservoir.

DEC will also continue sampling at the Lowland Farm site which was established in partnership with Delaware County. In stream nutrient loads will be measured on a monthly basis and during storm events.

This project will complement the ongoing monitoring effort by DEC and Delaware County on the Lowland Farm by detailing the subsurface/surface controls on runoff generation and associated phosphorous (P) loss. This study will address P losses from those farms bordering large streams in the alluvial valleys within the Cannonsville Reservoir Basin.

Monitoring Station Operation and Maintenance (WRI)

DEC has worked collaboratively with WRI/Cornell University on monitoring and research projects in the Cannonsville Basin to create a comprehensive field based water quality monitoring and modeling program. A total of six event based, automated monitoring stations, Beerston, Trout Creek, Shaw Road, R Farm and the Lowland farm, are now operated and represent several watershed scales from farm level to sub-watershed to nearly full reservoir basin. All stations contain sophisticated electronic equipment that collects flow and weather data, and controls sampling of stream water at varying frequencies depending on event characteristics. Data are shared with researchers from NYCDEP, Cornell University, WAC, USGS, USDA ARS, Delaware County and UFI for the purposes of program evaluation, tracking water quality trends, model development, quantifying effects of management practices, and decision making. Funds will be used to ensure continued staff support from WRI. DEC will continue to oversee and supervise WRI staff in project activities.

Highway Management Plans for the Towns of Delaware County (Delaware County)

This project will combine efforts by staff from Delaware County Department of Public Works (DPW) and the Delaware County Planning Department, in conducting an inventory and assessment of the roads and storm water infrastructure of the Towns of Delaware County in the NYC Watershed. The objective of this collaborative assessment is to minimize pollutant delivery to the Cannonsville and Pepacton Reservoirs through initiation of appropriate Best Management Practices (BMP) for town roads and stormwater infrastructure. The Departments, along with the collaborative cooperation and input of the Towns, will create individualized Highway Management Plans (HMP's) using these data and assessments.

Assessing Off-Farm Environmental Impacts of Comprehensive Forage Management Systems (Delaware County)

A modeling system combining the Integrated Farming System Model (IFSM) and the Soil and Water Assessment Tool (SWAT) will be developed to evaluate Phosphorous related environmental impacts of comprehensive forage management at both farm and watershed scales. Incorporation of results of this modeling system in the whole farm planning process will provide a tool for assessing potential for long term, cost effective, and permanent reduction of phosphorous loss from dairy agriculture to the Cannonsville Basin.

Land Acquisition Program (LAP)

This Program is a key component of the collaborative effort between New York City and the New York State Department of Environmental Conservation (DEC) to protect and enhance the quality of New York City water supply through purchase of undeveloped land and/or attachment of conservation easements.

The watershed has, in accordance with New York State Department of Environmental Conservation's Land Acquisition Program, been divided into priority areas based on proximity to reservoirs, reservoir intakes, and the City's distribution system. DEC is currently focusing its land acquisition efforts within Priority Area A of the Croton Watershed, which includes New Croton, Croton Falls and Cross River Reservoir basins.

Priority Area B includes the Muscoot and portions of the Amawalk and Titicus Reservoirs with a 60 day travel time to distribution, while Priority Area C are the remaining reservoir basins and sub-basins beyond a 60 day travel time to distribution.

DEC will conduct an Impact Assessment at the completion of each acquisition to determine the effectiveness of this specific type of land acquisition for the protection of water quality in the source waters of the NYC water supply. The Assessment will qualitatively evaluate the potential impact, had the acquired parcel been developed. Items that will be considered will be location, demographics, and type of parcel as to the potential development.

This comprehensive initiative, which involves both acquisition and stewardship of sensitive areas, protects natural resources and enables responsible recreational activities. The Program will be implemented and assessed within the objective of protection and enhancement of the quality of source waters of the New York City water supply system.

STREAM MANAGEMENT PROJECTS

EDUCATIONAL PROJECTS

Westchester County Citizens' Volunteer Monitoring Program (Westchester County)

This project continues a program to coordinate, train and support volunteers to monitor local water body conditions. The project consists of four components: Stream Monitoring, Lake Monitoring, Online Database and Data Entry Partnerships, and University Partnerships. This will assure the continued coordination of an educational volunteer water quality monitoring program which tracks and posts the physical, biological and chemical characteristics of local streams and lakes in Westchester County.

Riverkeeper Educational Program - Streamkeeper Project

The Streamkeeper project will continue the educational initiative that provides students and teachers with insight on the environmental data they gather about their local streams. The project's goals are to promote:

an awareness of stream health, and biodiversity; an understanding of how stream health relates to local land use practices; and an improvement of local science education through experiential learning that relates what the student learns in the classroom to the local environment. The program uses a curriculum kit called “The Leaf Pack Experiment,” a non-invasive aquatic macroinvertebrate sampling kit and the “Hudson Basin Guidance Document” monitoring protocols. The Leaf Pack Experiment allows students to conduct their own experiments, investigate food webs, learn classification skills and use technology to share their data with a network of schools across the region.

WATER QUALITY STUDIES

Pharmaceutical and Other Organics in Wastewater Sampling (USGS)

This project will continue the existing study of pharmaceutical and other organic wastewater compounds at wastewater treatment plants (WWTPs) and keypoints in the NYC Watershed. New analytical methods will include analysis of hormones and an estrogen assay technique. The study will continue to assess the occurrence and concentrations of pharmaceutical and other organic wastewater compounds in the New York City Watershed through two focused efforts: sampling keypoints of the New York City reservoir system, and sampling wastewater effluent at select WWTP sites and the receiving streams above and below the plant’s outfall.

Key Point Sampling (USGS)

This project is a continuation of the long term effort of pesticide monitoring at key points within the New York City reservoir system by the USGS in order to establish a trends network for pesticides in the reservoir system using trace-level methods. Since 1999, the New York State Pesticide monitoring program has collected pesticide samples from the ten New York City reservoir key points (which represent outflows from all of the reservoirs plus inflows to the Kensico reservoir from the Delaware and Catskill Aqueducts). These data are crucial for forming the basis of a trace-level monitoring program for pesticides in parts of the New York City Reservoir system.

Stroud Water Quality Monitoring Program

This program completes the final, third of three year, Phase 2, study of an integrated watershed wide monitoring program to address source and ecosystem impairment contaminant dynamics. The monitoring program is designed to complement existing DEC and NYC 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. The program will culminate with the completion of data compilation and submission of a final report.

A Baseline Assessment of the Biota of Birch Creek

Belleayre Resort at Catskill Park is a proposed 600 acre development in the upper Esopus Creek watershed. In addition to several large facilities that will include hotels, timeshare units, maintenance buildings, and wastewater treatment plants, the proposal also calls for the development of two 18 hole golf courses. Birch Creek, which is a small headwater stream of Esopus Creek, lies adjacent to the proposed resort. Esopus Creek is a major tributary of Ashokan Reservoir, which is part of the New York City water supply system. The mouth of Birch Creek is already showing signs of nutrient enrichment.

This project will continue to sample the macroinvertebrate and fish communities of Birch Creek to provide a baseline measure that can be used for comparison with post development conditions. This project will be coordinated with the DEC’s Division of Water (DOW) stream biomonitoring of macroinvertebrates on Birch Creek. Sampling will be conducted on the macroinvertebrate and fish communities of Birch Creek for baseline metals, pesticides and polycyclic aromatic hydrocarbons (PAHs) screening. Without pre-development contaminant screening, it may be impossible to determine the effects this proposed development may have on the existing biota. Also, measurement of these contaminants in the biota of three additional streams that already have adjacent

golf courses will be conducted in order to determine the potential effects of the proposed development.

Four sites on Birch Creek will coincide with DOW biomonitoring sites and two sites on Esopus Creek (one upstream and one downstream of the mouth of Birch Creek) will be selected for assessment. Two sites will also be selected at each of the comparison sites, one upstream and one downstream of the golf courses. Three macroinvertebrate and six fish samples will be analyzed from each site. Where present, three crayfish, three forage fish, and three predatory fish will be collected from each site. If crayfish are not present, other macroinvertebrates will be used as substitutes. One water sample will be collected from each location for standard water chemistry analysis. A Final Report will be prepared.

Toxicity Identification Evaluation

The Toxicity Identification Evaluation (TIE) project will be conducted at WWTP facilities exhibiting a high toxicity concern but which do not have an obvious cause of toxicity. This is a follow up to toxicity testing being performed under the 1997 SDWA Grant in which quarterly chronic toxicity tests are being performed at 39 WWTP facilities in the New York City Watershed. Chronic toxicity testing has been performed for SPDES dischargers in the New York City Watershed. Seventeen Facilities which have demonstrated chronic toxicity are going to be evaluated with Toxicity Identification Evaluation (TIE) techniques to identify the cause of chronic toxicity. Scope will be limited by availability of funds for testing. Consequently, facilities will be ranked according to their toxic potential in the receiving water by calculating TUC in receiving water after dilution at 7Q10, and then ranking which facilities should be subjected to TIE work first based on potential for toxicity and receiving water. A final report of findings will be prepared.

Development of Endocrine Disruptor Study

This cooperative effort between USGS and DEC will evaluate the potential for endocrine disruption in fish from streams that supply drink-

ing water reservoirs and also receive effluents from private or publically owned WWTPs throughout New York State. The study will use available municipal, state and federal databases to identify number and type of WWTPs and their relationship to downstream drinking water in regard to identification of potential endocrine disrupting contaminants. This one year study will develop a proposal for a comprehensive New York City watershed study to be completed in subsequent years.

SPECIAL STUDIES

Predicting Future Water Quality from Land Use Change Projections in the Catskill-Delaware Watersheds (SUNY/Yale)

This project completes a study which was initially funded under the FFY 2003 SDWA Grant. A team of research scientists from the State University of New York College of Environmental Science and Forestry and the Yale School of Forestry are combining efforts to examine the historic development of the Catskill-Delaware Watersheds landscape in order to identify when and where changes in land cover/land use have caused significant changes in contaminants of concern to drinking water quality. They will predict, using the spatially explicit land use change model GEOMOD, when drinking water will be compromised given the projected business as usual land use changes derived from analysis of past rates and patterns projected into the future.

NYC Watershed GIS Program Enhancements

Enhancements to NYC DEP's watershed protection program will be implemented through improving capability to monitor and assess current and proposed watershed activities. These enhancements build on existing work completed in the NYC Watershed Data Management and Software Tool Development project. This project would address enhancements to the Watershed Land Information System (WaLIS). Such enhancements include: Expanded Water Quality/Geodatabase Implementation; Watershed Modeling Meteorological and Hydrologic enhancements and Support; Water Quality Information System Development; Engineering and Operation Data Management Enhancements, and transfer of systems, models and processes from NYCDEP to the Department.

Pesticide Applicator Certification Manual Development

The purpose of the Pesticide Applicator Certification Manual Development program is to continue support for an existing program that will result in significant improvements to the education of commercial and residential applicators of pesticides and fertilizers. This project will support and accelerate certification manual production consistent with the need to minimize off site migration of applied pesticides and minimize water quality impacts within the New York City Watershed. The manual to be developed under this project will be the Commercial subcategory 7D - Wood treatment. This manual will address the use of pesticides by commercial applicators for the preservation and treatment of lumber and wood products. In addition, the manual will explain NY City's drinking water supply system, inform applicators of the potential for contamination from improper application, and recommend appropriate buffers or water restrictions.

Forest Health/Nutrient Controls (USGS)

This project is part of an on going assessment of Forest Health and Soil Nutrient Status to determine the effects of logging practices on water quality in the West of Hudson watersheds. Because forests are the dominant land cover in New York City's West of Hudson water supply watersheds, the long term health of this forested land has important implications for long term protection of water quality. This project will provide comprehensive information on relationships among forest and soil condition, forest harvesting, and water quality that can be used to develop a long term strategy for protecting water quality through appropriate forest management. Information will become available through the course of the project that will provide resource managers with useful preliminary information for decision making. The project will continue installation, recovery and analysis of soil solution resin rings; sampling of first order streams and soil chemistry; and monitoring of the regrowth response in the watersheds previously conducted through a USGS and NYC DEP partnership. Additionally, preliminary testing of carbon nitrogen utilization model, completion of educational signs, and planned partial harvests will take place.

Cross Farm, Time Series Assessment Database for Phosphorus Evaluation (Delaware County)

This project will complete the 3rd and final phase in assessing the progress made in reducing the accumulation rate of soil phosphorus across farms in the Watershed Agriculture Program in Delaware County. The project will develop databases and interpretive software that will be used to make regular interpretations to adjust watershed wide and farm specific priorities in management programs including precision feeding, manure composting services, on farm manure management, and technical support from the Watershed Agriculture Program to farms.

Scientifically Based Management Guidance Controlling Pathogens through Animal Health (Delaware County)

This project will estimate the rate of occurrence of zoonotic genotypes of *Cryptosporidium* and *Giardia* in animals and the environment on dairy farms in the Cannonsville basin, and the practices that are associated with their perpetuation on these farms. This understanding will allow the identification of management practices and measures that will limit the occurrence of Pathogens in animal populations and the water borne transfer of pathogens to watercourses and reservoirs.

Development of a Microscopic Assay to Detect Toxic Cyanobacteria in Routine Reservoir Monitoring Samples (DOH)

This project will monitor two eutrophic reservoirs in the NYC Watershed that have recurrent cyanobacterial blooms for the presence of the potent hepatotoxin, microcystin. The concomitant development of a microscopic assay for the identification of toxin producing algae in routine monitoring samples will provide water supply managers with an important screening tool for detecting cyanobacteria in reservoirs.

Mycobacterium avium complex in the NYC Watershed (DOH)

This project will involve monitoring for Mycobacterium avium complex (MAC) bacteria in the Kensico Reservoir. It is important to determine if the open reservoir is a major source of these waterborne organisms because Westchester County health facilities report a higher inci-

dence of MAC recovery from patients than do facilities elsewhere in the State.

Detection and Identification of Enteric Viruses (DOH)

This project, under the direction of the Department of Health, will complete phase two, and finalize the development of methodologies to be used for the detection and subsequent identification of culturable human enteric viruses in source water samples collected at key sites within the NYC Watershed.

The methods proposed are intended to exploit host cell ranges of specificity (virus infection) in conjunction with molecular detection techniques (RT-PCR; PCR) to provide a reasonably broad range of virus detection capability and subsequent virus identification. Together, the human (Caco-2 and RD) and primate (BGMK) cell lines provide suitable host cell systems for enteroviruses, echoviruses, astroviruses, and adenoviruses (types 40 and 41). Detection of specific viral targets (noroviruses, hepatitis A and E, or others) by RT-PCR affords a direct method for monitoring viruses which do not propagate in cell culture and also provides a tool for identification of cell culture amplified (infectious) viruses.

Sampling strategies will incorporate both seasonal and site specific concerns relating to potential contamination from waterborne enteric viruses. Additional microbial (bacteriophage, enterococci, fecal coliforms, etc.) and chemical (nitrates, ammonia, TKN, TOC, etc.) water quality indicators could also be monitored in order to provide a more complete water quality profile.

The project has three principal objectives:

1. Increase the range of detection for culturable and potentially infectious enteric viruses by incorporating additional host cell lines with differential virus sensitivities.
2. Identification of culturable enteric viruses by RT-PCR using a panel of virus specific primers.

3. Correlate the presence and types of viruses with sites of occurrence in order to identify point sources for viral contamination of the watershed.

Sampling sites include: E-9 discharge to Rye Lake, Malcolm Brook, Bear Gutter Creek discharge, and possibly two locations along the western edge of the Kensico (storm sites). The quantal method for assaying culturable human enteric viruses will be used to analyze concentrated samples (USEPA Manual of Methods for Virology, Ch. 15; EPA 600/4-84/013-N15). In order to expand the detection range of culturable viruses, several host cell lines will be inoculated with equivalent portions of the final concentrated samples. Positive cultures will be amplified by additional passages as required to obtain a high titer cell lysate. RNA will be extracted and purified from positive cell lysates and then subjected to RT-PCR analysis using a panel of virus specific primer sets. In addition, positive cell lysates will be submitted for typing by the LMB microneutralization procedure.

Phase one of the project involved analysis of archived samples on one or two additional host cell lines in order to expand the range of virus detection over that of the standard BGM cell line. A limiting factor of this project is that the residual filtered volumes (100-150 L) would restrict the number of cell lines that could be inoculated with a 100 liter filtered volume equivalent. All positive cultures would be subjected to RT-PCR for identification (and LBM serotyping).

Phase two will involve expanded virus analysis of four new key sampling sites within the NYC watershed. Samples will be analyzed on three host cell lines and all positive cultures will be subjected to RT-PCR and LBM serotyping for virus identification. At the end of the study, a comprehensive final report will be generated. This report will include monthly sampling summaries, experimental results, field results and bacteriological data as well as conclusions and recommendations as needed.

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 commenced in the Fall of 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 create a wetland to collect stormwater runoff in an area that will not affect sewer lines, and a second project to replace a box culvert to prevent flooding which also affects sewer lines. The third project is to replace one of the holding lagoons which receives a large amount of infiltration, thereby reducing

the storage capacity during storm events. Construction plans and contracts are in progress, 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.

Project: Village of Brewster / Municipal Sewer System

The Village of Brewster is planning to install a new sewage collection in the Western Portion of the Village. This project will be the third phase of an overall project to provide sewage collection and treatment to areas of the village served by individual on site septic systems. The design of the collection system was funded through a previous WRDA grant. Construction is scheduled to begin in the Fall of 2005.

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 2005.

Project: Town of Carmel / Stormwater Management Best Management Practices

DEP is planning to test the effectiveness of stormwater BMPs at two sites. DEP has sampled runoff before construction of the new or enhanced BMPs. After construction sampling will continue to determine the pollutant removal effectiveness of the two different BMPs. Construction on one site commenced in the Fall of 2004.

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 2005.

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 started in the Fall of 2004.

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 is near completion. 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 protec-

tion, flood hazard mitigation, stormwater management and habitat enhancement. The draft stream management plan was submitted in February 2004, and should be finalized by Summer of 2005. Part of the plan development was a stream restoration project funded by DEP, 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 draft stream management plan was submitted in February 2004, and should be finalized by Summer of 2005. Part of the plan development was a stream restoration project funded by DEP, which was started in July of 2003, and should be completed in 2005.

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 draft stream management plan was submitted in December 2004, and should be finalized by Summer of 2005. Part of the plan development was a stream restoration project on Town Brook, which was completed in late Summer of 2004.

Project: Delaware County / Terrace Avenue and South Street Restoration Sites

The Delaware County Soil and Water Conservation District will undertake the restoration of severely eroded stream banks located in the Village of Walton. The two sites were identified in the draft stream management plan for the West Branch of the Delaware River. Construction is planned for the Summer of 2005.

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: 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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