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Croton Watershed Clean Water Coalition



The Degradation of Our Croton Reservoirs and How We Can Prevent It

By Marian H. Rose, president CWCWC

The Croton Watershed is truly unique for many reasons. Among these is its remarkable capacity, for over 100 years, to supply NYC and parts of Westchester and Putnam Counties with high quality, unfiltered drinking water. In times of drought, when water supplies from the much larger Catskill/Delaware system run low, the 380 square-mile Croton is capable of supplying up to 30% of the City's needs.

The Croton owes its resilience to its unusual abundance of wetlands, the watery remainders of the thick glacier that, over 10 thousand years ago, covered large areas of the US, including ours, and the regrowth of forests as farming was gradually abandoned during the first half of the 20th century. As Mike Dombeck, former chief of the US Forest Service wrote in the NY Times (1/8/2003): "New York City has some of the

best water in the world because it maintains healthy forests in its Catskill, Delaware and Croton watershed system. The EPA recently warned that New York would have to spend more than \$6 billion on a purification plant if it failed to protect those watersheds." The reference is to the \$6 billion potential filtration plant for the Catskill/Delaware (Cat/Del) system. A \$1.5 billion plant for the Croton is in the process of being built in Van Cortlandt Park in the Bronx.

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The Croton Watershed's wetlands and forests, dispersed over a landscape of gentle hills, a few remaining farms and small towns, all this combined with its proximity to New York City, make it one of the most desirable areas in which to live. At the same time, growth within the watershed is destroying those very features that make it so desirable.

Continued on next page



Illustration by Enrique Dura

Even more seriously, the streams, wetlands and reservoirs that have provided high quality water, both for New York City and Westchester and Putnam residents, are being degraded. The problem we face is how to control and direct growth so that it does not ruin those very features that make the watershed so attractive in the first place.

An example of undesirable development (and other similar ones that are far along in the planning stage) is Brewster Highlands where a thickly-forested hilltop was flattened and laid bare and replaced with Home Depot, Kohl's and others. This once beautiful entrance to the Hudson Highlands along Rte.84 is now replaced with a fortress-like wall and large advertisements. Pictures taken during construction show large amounts of sediment being carried off the site due to inadequate erosion and sediment control devices.

According to the US Environmental Protection Agency (EPA): "Sediment runoff rates from construction sites are typically 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction activity can contribute more sediment to streams than can be deposited over several decades, causing physical and biological harm to our Nation's waters." (Storm Water Phase II Final Rule - Small Construction Program Overview, Fact Sheet 3.0, January 2000). Brewster Highlands sits in the Middle Branch Reservoir watershed. The reservoir is listed as phosphorus-impaired.

The time has come, some would say long overdue, when watershed residents and their elected officials must envisage and enforce a new set of priorities, one in which our most vital need, clean, healthy drinking water is at the top of the list, and where the convenience of an extra shopping mall or ensuring that a developer gets maximum return on his investment, is secondary. Fortunately, we now have the unique opportunity to really protect our resources, thanks to the designation of the entire East of Hudson

(EOH) Watershed that includes the Croton watershed and some of the Catskill/Delaware, as a Phase II small regulated Municipal Separate Storm Sewer System (MS4). Very briefly, an MS4 is a conveyance, or system of conveyances...owned by a State, city, town or other public entity that discharges to waters of the U.S. and is designed

or used for collecting or conveying storm water, is not a combined sewer and is not part of a Publicly Owned Treatment Works (POTW). These regulations, if properly enforced and followed at the state level, should go a long way towards reducing the pollution that has been afflicting Croton streams and reservoirs. Furthermore, since the waters we see are connected to those we don't see - our groundwater - these regulations should also help to protect the well water on which so many watershed residents depend.

The pollutant of most concern is phosphorus; the reasons will be explained in the following section. NYS Department of Environmental Conservation (DEC), NYC Department of Environmental Protection (DEP) have completed useful studies on its origins in the watershed and how to control it. The regulated MS4s

include the Croton Watershed municipalities, the NYS Department of Transportation (DOT) whose roads with their stormwater conveyances criss cross the watershed, among others. They have the opportunity to use these studies in fulfilling the regulations. Unfortunately, with a couple of notable exceptions, municipalities have fulfilled only the very minimum of their obligations, and this will continue unless the public demands more. If the public does not seize this opportunity for enhanced protection of their watershed, unfettered development will continue, and we shall have ourselves to blame for degraded reservoirs, streams and groundwater, and the present trend towards higher school taxes, cluttered roads and poor air quality.

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The Phase II Phosphorus Total Maximum Daily Load (TMDL) Plan for the Croton Watershed

DEP and DEC together have worked out calculations and plans for reducing phosphorus in eight Croton reservoirs (out of ten) whose levels of phosphorus exceed the limits that would allow them to fulfill their designated uses (see,

for example, **Nonpoint Source Implementation of the Phase II TMDLs**, April 2001, and further refinements of the Implementation Plan in 2005). In this case, the designated use is as a source of unfiltered drinking water. The Total

Maximum Daily Load (TMDL) is “the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes that the State has designated. The calculation must also account for seasonal variations in water quality.” (EPA definition)

Phosphorus is the target because, in excessive amounts, it can seriously impair water quality.

Phosphorus stimulates the growth of plant life. It is the so-called “limiting factor” because it controls the amount of plant growth and, in particular, algae growth. A mere

1 pound of phosphorus can trigger the growth of 114 pounds of algae blooms (according to Dr. Jack Smith - **NYC Watershed Phase I Total Maximum Daily Loads/Watershed Allocations/Land Allocations for Phosphorus in the Croton System** - the formula for algae mass is 12C106 1H263 16O110 14N15 31P1).

According to DEC's estimate (**NYC Watershed Croton**

Reservoir System Phase II TMDL Nonpoint Source Implementation Plan,

2005), 24,616 pounds of phosphorus pollute the New Croton Reservoir each year. This translates into 12.3 tons of phosphorus triggering the growth of 1402 tons of algae per year - in the New Croton Reservoir alone. The Muscotee bears a similar burden of algae, clearly visible during the warm months as greenish mats - sometimes blue-green. The blue-green algae produce toxins that can be dangerous to humans and animals. These so-called “algae blooms” die off as soon as the phosphorus supply is consumed.

As the algae die and sink to the bottom of the reservoir, they become a food source for bacteria that consume oxygen as they breathe. As the bacteria multiply, they deplete the

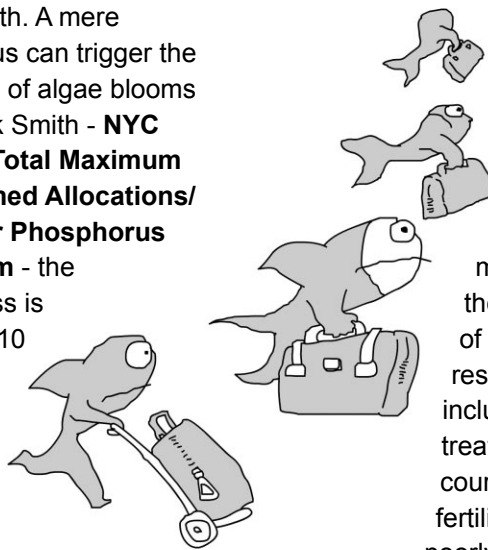
oxygen in the water and create conditions (anaerobic conditions) where fish and other creatures cannot live. They either move elsewhere, or die. In addition, the reservoirs cover areas where soils are rich in oxides of iron and manganese. When these also lose their oxygen, the release of iron and manganese creates color problems.

The excess algal growth results in an excess of Natural Organic Matter (NOM) in the reservoir. The reaction of NOM with chlorine, the disinfectant of choice, is the creation of so-called “disinfection byproducts”

(trihalomethanes and haloacetic acids), some of which are suspected carcinogens and are strictly regulated at both the state and federal levels.

Clearly, reducing the level of phosphorus at the source is the most direct way of reducing its level in the reservoirs. This is a principal aim of the MS4 program for the EOH reservoirs. Sources of phosphorus include nonpoint sources, wastewater treatment plants, animal waste, golf course turf treatment, lawn and plant fertilizers, dishwasher detergent, and poorly functioning septic systems. The last three sources can easily be decreased on an individual basis.

The DEP and DEC studies plainly show that well over 85% of phosphorus loading originates with nonpoint sources such as roads, lawns, urban areas (i.e., developed areas), agricultural areas and forests. Only a fraction, slightly over 200 kg/year, originates in Wastewater Treatment Plants (WWTP). This is consistent with a load of 220 kg/year calculated as the annual load of the Hallock's Mill plant based on a phosphorus concentration of 0.1 milligrams/liter (mg/l) and a SPDES permit of 1.5 million gallons per day (mgd) (see report by Blasland, Bouck & Lee, Inc. **New York City Watershed WWTP Upgrade Program - Conceptual Upgrade Plan Yorktown Heights Sewer District WWTP, May 2000**)

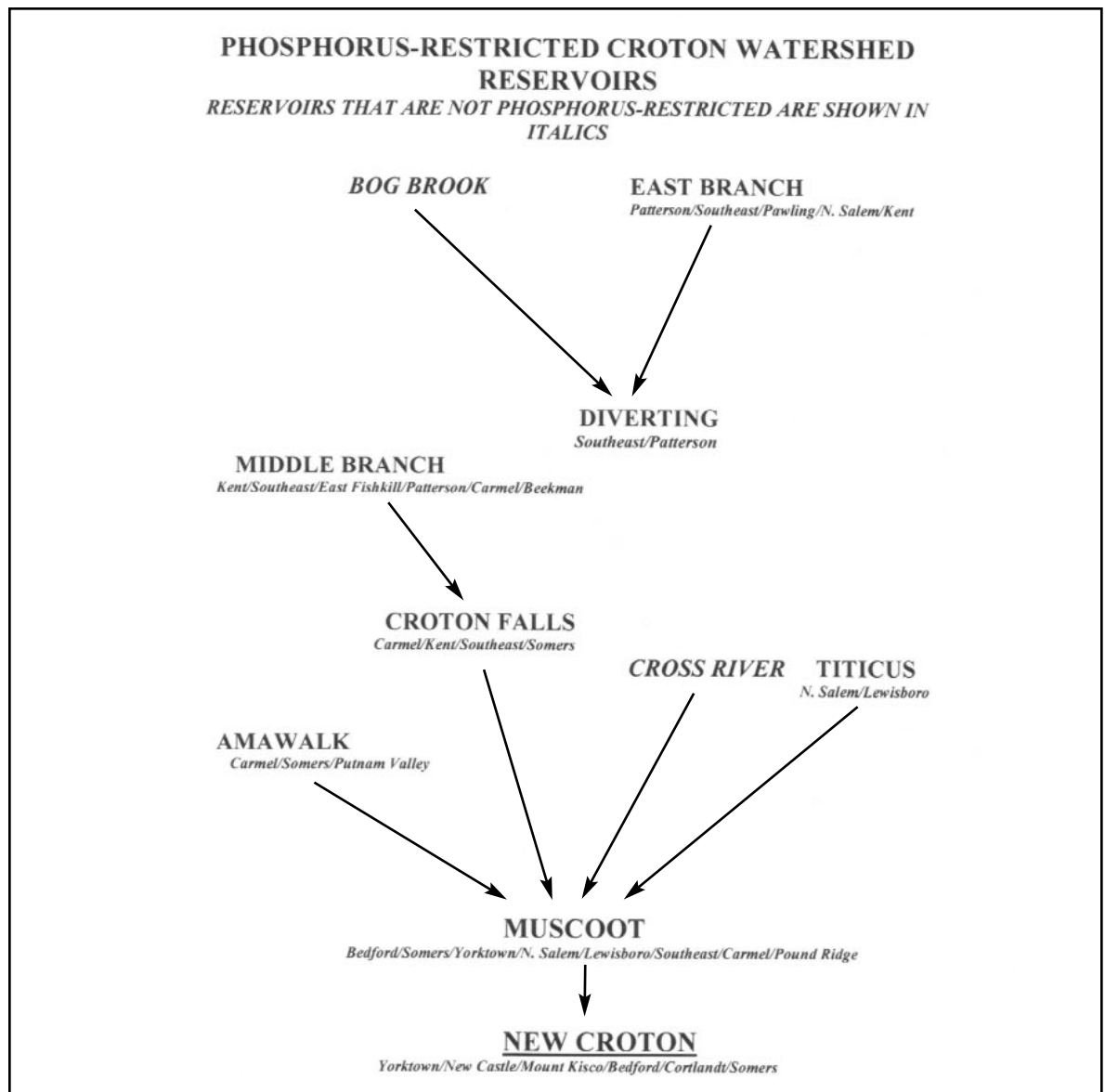


The 2005 Implementation Plan concludes that:

1. Urban areas are the main contributors to the non-point source phosphorus load - 60% and more.
2. Forested areas that constitute three quarters of the watershed coverage are responsible for 20% of the load.
3. Septic systems appear to be relatively small contributors to the phosphorus load.
4. Imperviousness is revealed as an important contributing factor to the load. For example, Table 4.1 in the 2001 study shows that even though Mount Kisco represents only 5% of the New Croton Reservoir Basin area, it contributes 15% to the load - proportionately more than any municipality in the watershed. Since there is a general consensus among storm water experts that the effects of imperviousness (such as streambank erosion) start to manifest themselves at as low as 10% imperviousness, it is reasonable to assume that Mount Kisco's high degree of imperviousness is an important contributing factor.

The study further shows that each of the eight impaired reservoirs is impacted by more than one municipality. As one example, the accompanying figure outlining the interconnections of the Croton reservoirs, shows that the New Croton Reservoir receives phosphorus loads from six towns. These are shown in descending order of loading.

Rather than have each town work separately at reducing its phosphorus load, it would be more effective for such towns to form Intermunicipal Agreements and share manpower, costs and expertise.



How the Phase II Storm Water Regulations For Small MS4s Can Help Croton Watershed Towns Achieve Their TMDLs

On October 29, 1999, EPA issued its Phase II Storm Water Regulations that apply to Small Municipal Separate Storm Sewer Systems (MS4s). MS4s are sewer systems in which the sanitary sewers are separate from the storm sewers. The Phase II small MS4s include any MS4s not already covered by the Phase I program that serves populations of 100,000 or greater. In the EPA universe of small MS4s, those that are regulated lie within so-called "Urbanized Areas" (jurisdictions with a population of 10,000 or more and a population density of 1,000 people per square mile).

At the State level, DEC has devised criteria for including additional MS4 areas, beyond the Urbanized Areas. For example, an area may be designated a regulated MS4 if:

- 1. It discharges to waters for which an EPA-approved TMDL requires reduction of a pollutant associated with storm water beyond what can be achieved with existing programs, and*
- 2. MS4s contiguous to automatically designated urbanized (town lines) that discharge to sensitive waters classified AA-Special (fresh surface waters), AA (fresh surface waters with filtration avoidance determination, or SA (saline).*
(See NYS DEC Final Designation Criteria for Identifying Regulated MS4s, January, 2003)

As of January 2003, under Criterion 1, the entire EOH Watershed has been designated a regulated small MS4. To repeat - this designation does not apply only to municipalities. It may apply to storm water conveyances owned or operated by a State, city, town, county parish, district, association, prison university or other public body (created by or pursuant to state law), including special districts under State law such as a sewer district, flood control district, or drainage district, or similar entity. Among these, the DOT can be a particularly critical MS4 since storm water runoff from roads is a major source of pollution.

By March 10, 2003, all regulated small MS4s had to obtain coverage under a SPDES General permit

Under GP-02-02, a small regulated MS4 has to comply with six Minimum Control Measures. These are:


1. Public Education & Outreach
2. Public Involvement/Participation
3. Illicit Discharge Detection & Elimination
4. Construction Site Storm Water Runoff Control
5. Post-construction Storm Water Management Including Redevelopment
6. Pollution prevention/Good Housekeeping for Municipal Operators

Detailed information on these six measures is at the DEC website, www.dec.state.ny.us/website/dow/spdesdef.htm

for Storm Water Discharges from MS4s, GP-02-02, and a SPDES permit, GP-02-01, for discharges from construction activities. Furthermore, each MS4 is expected to have its program fully implemented by March 10, 2008.

Although it is impossible to quantify the reduction in phosphorus that each of these measures entails, it is not unreasonable to assume that, if carried out conscientiously, each will bring some noticeable measure of reduction. In particular, since sediments washed off a construction site during a heavy storm can have a devastating effect on water quality, the new regulations encompassed in Control Measure #4 are particularly appropriate. For example, Measure #4 requires that all operators of construction sites obtain permits for land disturbances greater than 1 acre and less than 5 acres. Land disturbances less than 1 acre may also require a permit if they have the potential to contribute significantly to the pollution of waters of the U.S. or are part of a larger common plan that





disturbs between 1 and 5 acres (more stringent regulations that are now being proposed would require permits for land disturbances as little as 5,000 square feet). Measure #4 also requires the development and implementation of a stormwater pollution prevention plan (SPPP), a step forward over previous procedures where, often, the SPPP would be added after the site plan had been approved. Integrating the SPPP at the early stages of site planning allows the reviewing agencies to maximize the efficacy of the SPPP. Developers have to install erosion and sediment control devices in compliance with "New York Standards and Specifications for Erosion and Sediment Control". For post-construction stormwater control, developers must use the latest version of "New York State Stormwater Management Design Manual". A supplement to this Design Manual is expected to be completed by March, 2006.

As added insurance that the SPPP will be effective, we recommend that developers use the Source Loading and Management Model (SLAMM) or EPA's Storm Water Management Model (SWMM) to analyze which configurations would be most effective at reducing runoff from the site. In addition, we recommend that no sub-basin carrying stormwater within the site should be covered with more than 10% imperviousness.

Although not mandatory in the regulations, these developments would present excellent opportunities to study the efficiency of various stormwater management practices (SMPs) such as retention and detention ponds, vegetated swales, filter strips and others. Average phosphorus removal rates for various SMPs have been derived from studies made at locations throughout the US and assembled in the National Urban Runoff Program (NURP) data base. These average values that are used in local stormwater calculations may or may not accurately reflect on-site conditions. Since no increase in

phosphorus to impaired reservoirs is allowed under the MS4 regulations, such studies would be extremely useful in ensuring that no increases occur.

Runoff from roads is a major contributor to pollution in our reservoirs. As a small regulated MS4 in the EOH watershed, DOT should take serious action to remedy the over 200 sites listed in the masterful study conducted by John Keane, Clifford Ginn & Vincent Keane: **A Study of Storm Water Conveyances as Point Sources of Pollution in the East of Hudson Watershed, New York City Drinking Water Supply**. DOT has remedied some of those sites but much remains to be done. A convenient time to do so would be during road maintenance work.

Minimum Control Measure #6 deserves further elaboration because of its importance. An MS4 must prevent the discharge of pollutants from municipal activities to the maximum extent practicable. This can include but is not limited to maintenance of roadways and right-of-way, stormwater systems, parks and open space, new construction and land disturbance, fleets and buildings. This also includes the training of personnel.

The regulated watershed municipalities, with a couple of notable exceptions, are dragging their heels at complying with the regulations. They are barely doing what is required to comply with the six minimum measures. In their defense, it must be said that some measures, #4 for example, require a level of engineering expertise that small towns rarely have. DEC could be helpful but, unfortunately, they are severely understaffed with several hundred positions having been eliminated over the last ten years. For example, Region 3 that includes Ulster, Sullivan, Orange, Rockland, Westchester, Putnam and Dutchess Counties has only one engineer to carry out enforcement. At least, four more

engineers would be needed if the MS4 designation for the Croton Watershed is to have teeth.

As previously mentioned, the towns could form IMAs to share costs and expertise. DEP has the means to provide help from its extensive legal and engineering staffs. The IMAs might serve as the catalysts for further cooperation between the towns that could result in a Storm Water Utility District for the entire EOH Watershed. Although the municipalities would have to forego some of their Home Rule privileges, the

advantages in terms of lower costs and the sharing of top experts who could help attain the desired outcome of lowering pollution, should outweigh the drawbacks.

Unfortunately, the trend, over the last ten years, has been for phosphorus levels to rise in the impaired reservoirs. This increase is coincidental with the building boom, most noticeably in Putnam County, and the inevitable increase in impervious surface. The following chart shows the increases, and that not one of the reservoirs is even close to its phosphorus target.

RESERVOIR PHOSPHORUS CONCENTRATIONS IN MICROGRAMS PER LITER (µg/l)
DATA IS FROM THE DEP

| Reservoir Name | Phosphorus Target | 1997-2001 | 1998-2002 | 1999-2003 | 2000-2004 |
|----------------|-------------------|-----------|-----------|-----------|-----------|
| Amawalk | 20 µg/l | 28.5 µg/l | 28.7 µg/l | 28.1 µg/l | 28.9 µg/l |
| Croton Falls | 15 | 22.5 | 23.4 | 23.5 | 23.6 |
| Diverting | 20 | 30.5 | 35.0 | 34.1 | 34.6 |
| East Branch | 20 | 33.1 | 34.9 | 33.8 | 39.6 |
| Middle Branch | 20 | 27.9 | 29.8 | 29.5 | 30.7 |
| Muscoot | 20 | 30.7 | 32.5 | 32.5 | 32.5 |
| New Croton | 15 | 19.9 | 21.8 | 22.2 | 22.8 |
| Titicus | 20 | 26.6 | 35.2 | 32.8 | 29.8 |

The new regulations give us the tools to reverse this frightening trend that is ruining our drinking water. Watershed residents must demand that all responsible officials do their jobs that are paid for by our tax dollars. Town supervisors, DEC, DEP, DOT and EPA must protect and enhance our most vital resource, our drinking water, for us and for generations to come.

Visit our website

www.cwcwc.org

See our archived newsletters section

(www.cwcwc.org/newsletterGuide.cfm)

covering all Croton Watershed Issues.

JANUARY FEBRUARY 2006

PLEASE JOIN US

Through regional action, CWCWC is dedicated to providing alternatives to chemical treatment/filtration, and to protecting and improving the naturally-filtered, high-quality waters of the Croton Watershed for today and for generations to come.

Send in your membership and receive membership mailings, a subscription to CWCWC's newsletter, "Our Water, Our Future" and (at your request) a free copy of the multi-award-winning video, "The Fight for the Croton Watershed."

Most importantly, your membership will help you get involved with the preservation of one of our most precious resources, our water.

Croton Watershed Clean Water Coalition Membership Application

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Email: _____

- Group/Coalition Membership (Voting) \$25/year [For Groups/Assoc. only]
- Individual Membership (Non-Voting) \$10/year [For Individuals only]

Is this a Renewal or a New Membership? (Circle one)

Make checks payable to Croton Watershed Clean Water Coalition and mail, along with your membership form, to:

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