Can We Drink the Water We Live With?

By Paul S. Mankiewicz   Whole Earth Summer 1998

At the time of contact with Europeans in lower Manhattan, the water supply of the local Werpoes peoples came from a fresh-water pond near where the Tombs now stands. The pond and marshes covered about forty-eight acres and were fifty to sixty feet at their deepest. "The Collect" in English (Kalch-Hook in Dutch) was fed by springs, which to this day erupt into cellars. The pond drained down a small channel paralleling Canal Street to the East River.

New York City now supplies about 1.4 billion gallons per day to some nine million users a flow equivalent to a river about fifty feet wide and four feet deep moving at white-water speeds of more than ten feet per second. The Collect became polluted by horse and cow manure and couldn't provide adequate water to fight fires. Pressed by epidemics and costly fires, John Jervis began work in 1836 on a reservoir system in the Croton watershed. Initially delivering ninety million gallons per day from the Croton watershed, the Croton aqueduct was expanded in 1892 to 390 million gallons. After 150 years, the water remains remarkably pure and requires no filtration before supplying New York citizens.

But pure or not, it is the center of a controversy. The EPA has said that the Croton watershed is stressed from development and has sued New York to force them to build a billion-dollar water treatment facility for the Croton supply. A coalition of citizen groups and scientists say it's cheaper and safer to rely on well-stewarded soils and streams within the watershed. At the heart of the disagreement is a choice: an end-of-the-pipe billion-dollar filtration facility in a community of 50,000 residents and 25,000 students, or protection and enhancement of watershed ecostructures and functions. The question is what to trust: nature's diverse and widespread capacities, or one centralized technological filtration facility?

The Bronx Council for Environmental Quality, the Northwest Bronx Community & Clergy Coalition, Bronx and citywide housing groups, block and community associations, the Croton Watershed Clean Water Coalition, local and regional chapters of the Audubon Society, Trout Unlimited, and the Sierra Club, the Friends of Clearwater, land trusts, and trail groups, among others, advocate a watershed maintenance and restoration program to insure that the Croton water quality remains topnotch. Connect street and land surface runoff with the soils and subsoils, wetlands, forests, meadows, and streams and let these ecostructures bio- and geochemically treat, filter, adsorb, and absorb pollutants and pathogens (the disease-causing organisms). Let nature do the purification work.

The Soil/Watershed Alternative

Soil is the key to clean water. Soil works as a physical strainer, a biochemical renovator, and a biological recycler of all wastewater passing through it. The story is as complex as a single cell or the biosphere itself. Besides a mix of grains of sand, silt, clay, and organic matter (humus), each teaspoon of rich soil contains a million to a billion bacteria, hundreds of thousands of protozoa, up to a hundred thousand or more algae, and up to millions of fungal strands (see box). The soil community eliminates pathogens, turbidity, and most color and taste problems in six ways: (1) it harbors creatures who out-compete the pathogens for food, as well as protozoa that prey on pathogens; (2) the soil, bacteria, and fungi produce antibiotics that poison pathogens (penicillin is produced by a soil mold); (3) the clay in the soil adsorbs viruses and other potential pollutants and the hydrophobic (water- repelling) surfaces adsorb uncharged particles that could degrade drinking water supplies; (4) the soil's texture and structure act as a physical strainer; (5) the soil environment is so different from the host which excreted the pathogen that the pathogens simply die from different moisture, temperature, acidity, and nutrient conditions; (6) the pathogens get trapped in the humus (the organic component of soil) where they eventually die from the extremes of wetness and dryness. Keep water in close contact with living soils as it flows from hill slopes to streams, and it is purified. The Croton has some 300 square miles of soil of varying depths and qualities.

All or Nothing Rules

To date, federal regulations only address one question to build or not to build a costly centralized filtration facility. If built, an immense amount of financial capital goes into a single-purpose facility, subject to human error during operation, with inevitable moments of failure. In addition, the costs of capital and operation burden lower- and middle-class urban dwellers, and can even become a driving force in the flight to the suburbs. There is, further, the "out-of-sight, out-of-mind" aspect: With a filtration installation in place, the watershed's citizenry loses its sense of responsibility for water quality. Increased covering of the soils with asphalt, malls, and condominiums on hill slopes further degrades rather than maintains or improves water quality.

The 1989 Surface Water Treatment Rules formalized the EPA's approach to water quality. The rules require that all surface sources of drinking water be filtered unless municipalities establish that they meet all standards for water quality and "show control of the watershed."

These rules are based on no rational criteria. They contain no measurable nor clearly stated standards for determining when surface water must be filtered. Although the EPA says they are in favor of multiple-use, multiple-barrier watershed protection and enhancement, the rules provide for none. No allowance or recognition is made for biogeochemical purification by the landscape. This is a virtual guarantee of contentiousness, since the rules lead to only one choice: to build or not to build.

The rules only allow filtration by an installation manufactured by the water filtration industry, with concomitant large inputs of energy and chemicals from outside the watershed. No equivalent investment and no stature has been given to natural systems. Besides the purification powers of soils, additional natural services provided by the watershed humidification and scrubbing of the air, recreation, aesthetics, and protection from global warming are also "outside the law" and the calculations of economic benefit.

"Control of the watershed" is not defined ecologically or even in terms of land use. The Croton is nearly twenty-five percent publicly owned, and the watershed is largely managed forest, but no distinction is made between a watershed which is ninety percent paved and one that is ninety percent greenspace. Control is defined only by ownership. The rules thus equate private ownership with water quality degradation. Ownership, however, does not determine water quality. Biogeochemical activity and water-holding capacity do, regardless of ownership. In other words, it's not who owns the land, but how it is managed. The EPA has left in its rules no role for stewardship.

This battle of rules, the watershed commons, and best management practices rages in a number of larger cities, especially Boston and New York. The expense for a filtration facility for the flow from

New York's Croton supply is $1 billion, and $10 billion for the complete system, which includes the Catskills and the Delaware inter-watershed transfers. Boston is looking at a two-hundred-million-dollar bill.

Where is the common ground? The Gaia Institute, the State Department of Health, and the EPA all agree that the health of water drinkers is paramount. Everybody also agrees that the Croton water quality already meets all of EPA's criteria for drinking water. So why build anything? The EPA says the watershed is "stressed" and "shows cracks in the system." But what does stress mean? How and what is stressed? Could the stressed parts of the watershed and infrastructure be dealt with at lower cost with more targeted projects? Could watershed managers practice "preventive medicine" to reduce the risk of drinking water falling below standards at some time in the future? In any case, the narrow focus on one, end-of-pipe techno-fix does not address the critical present and future issue: how to protect and enhance the watershed's biogeochemical filtration effectiveness. Even with a filtration installation, a continually degrading watershed will only make matters worse and force an even more expensive water treatment process in the future.

Unencumbered by information to determine if the big filtration facility is necessary, the EPA has upped the ante by suing New York and filing an intent to sue Massachusetts for not complying with their filtration mandate.

The Bigger Picture

The Surface Water Treatment Rule brings up some larger questions. Can the presence of humans be beneficial? Can sustainable development enhance economic well-being, the environment, and water quality in communities that live within their own or someone else's water supply? Can we drink the water we live with?

To live with the water we drink, two ecological principles must become incorporated in the rules and minds of the planners, designers, and funders of drinking water systems. They are: slow the flow and increase the intimacy between water and the filtration media of the watershed. Technically, this is described as increasing the hydroperiod and filter contact time. To live with and drink the water in the Croton watershed, the amount of runoff that infiltrates the soil and enters the groundwater can be maximized. The Gaia Institute has suggested this as a workable strategy since 1989. Right now it is ignored.

Landscape-based treatment installations which can be replicated throughout the watershed will provide decentralized, redundant, robust, and lower-cost water quality protection and enhancement with increased health protection. They should also yield higher water quality. This tool kit includes: terraces, gabions, coupling wetlands with upland soils, stream bank stabilization, in-stream aeration, and infiltration hollows and basins. Since the first rains after a period of dryness wash over eighty percent of surface pollutants into receiving waters, the new approach would be designed for "first flush" catchment and treatment.

Hot spots along the thousands of miles of roadway and human-built hard surfaces in the Croton watershed must be located and mapped. Sources of runoff carrying the wastes of vehicle exhaust, pets, pigeons, and septage need to be identified. From this map and assessment, the best management of biogeochemical purification by the soil and increased hydroperiod can be determined. Comparative costs of enhancing ecological structures are likely to be a fraction of the annual interest on the billion dollars required for centralized technological filtration.

By monitoring the watershed, it may become possible to continually improve the benefits of wetland, upland soil and in-stream water purification. Predicting precise costs is difficult because each monitoring station would be custom designed to fit landscape and water quality conditions, but information on water quality would make it possible to evaluate the pollution source, its risk to human health and water quality, and potential costs of available management practices to solve the problem, i.e., a risk based, cost-benefit approach to improving water quality.

Sustainable development continues to generate discussions in agencies around the country, but not much has been accomplished on municipal, state and federal levels to achieve sustainable goals. But now, the defining criterion is at hand: development is sustainable when it protects and enhances water quality in the watersheds where we live and work.

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