

How New York City Used an Ecosystem Services Strategy Carried out
Through an Urban-Rural Partnership to Preserve the Pristine Quality of Its Drinking
Water and Save Billions of Dollars

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Introduction

The New York City Water system serves nine million people, eight million in New York City and one million in the suburbs north of the City. It provides these customers with 1.2 billion gallons of water a day, delivered to 600, 000 residential and 200,000 commercial building in the City, and close to two dozen local water systems in the northern suburbs.

New York City is a surface water system that gathers its water from three watersheds located well north of the City. These watersheds cover an area of 2,000 square miles (830,000 hectares), nearly the size of the state of Delaware. The City's 19th century watershed, the Croton River system, is located 15 to 25 miles (25 to 40 kilometers) north of the City and east of the Hudson River in Westchester and Putnam counties, areas that were once rural but have now become (or are becoming) largely suburban. The Croton supplies 10% of the City's water supply. The City's 20th century watershed, the Catskill-Delaware system west of the Hudson, encompasses most of the Catskill Mountains, a rural area of farms, forests and small towns and a growing number of vacation home developments. It extends 125 miles (200 kilometers) north of the City. The Cat-Del system, as it is generally called, provides 90% of the City's water.

Unlike most other major metropolitan cities with surface water systems, until the last quarter of the 20th century, New York had been able to avoid the enormous expense of building filtration works to treat and purify its drinking water. In a series of farsighted decisions between 1830 and 1905 New York City rejected proposals to use questionable local water sources, which would have been considerably cheaper in the short term, and chose to make the large scale investments necessary to go as far north of the city as necessary to collect abundant, pristine water from unspoiled rural watersheds. These decisions gave New York low cost, abundant water to support the City's growth while the pristine quality of New York City water has become legendary. New York City water regularly beats bottled waters in blind taste and purity tests, is imported to England for tea tasting, to many other American cities for bagel and pizza making, and has been characterized as the "champagne of drinking waters."

But by the early 1980s, the shadow of water quality problems had begun to fall on the City's water system. The Croton watershed was rapidly suburbanizing and under assault from non-point pollution sources. By the end of the 1980s, the decision had been reluctantly made that ultimately the Croton would have to be filtered to maintain compliance with safe drinking water standards. Filtering the Croton, which is currently scheduled to be completed in 2009, will cost well over \$500 million to build the necessary filtration works and \$50 million a year to operate them. It will also have harsh impacts on the Bronx neighborhoods where the plant will be built.

The City's failure to protect the Croton watershed naturally turned attention to the state of the Cat-Del watershed. Though City officials insisted throughout the 1980s that Cat-Del water remained as pristine as ever, their assurances were received with growing skepticism. Only 30% of the total land in the Cat-Del watershed was in public ownership and protected from development. The remaining portion of the Cat-Del watershed had traditionally been devoted to family farm agriculture, woodlot forestry, and outdoor recreation based tourism, with a sprinkling of small local villages. But by the 1980s the viability of those traditional rural activities was steadily declining and local residents were growing increasingly fearful about their economic future. As farmers in the Catskills fought to stay in business, they were turning to increasingly concentrated agricultural practices that produced steadily increasing amounts of polluted runoff and soil erosion. Forestry practices were increasingly characterized by high-grading of premium species, destructive road construction and other non-sustainable land management practices. Land no longer suitable for agriculture or forestry was increasingly being put on the market for vacation home development. Vacation home builders soon found they got the highest prices for houses with sweeping vistas or proximity to streams, both of which produced disproportionately high volumes of pollution. Non-farm rural residents and the residents of the small local villages promoted such developments, including the major increase in road construction and road salting in the winter needed to keep them open, in the hopes of keeping their communities economically viable as farming and forestry declined. All of these together contributed to a major increase in non-point source pollution and a major threat of future sewage contamination from misuse of rural septic systems by developers who had little or no interest in investing in Clean Water facilities.

By the end of the 1980s, an environmentally destructive pattern of land use was becoming the norm in the City's Cat-Del watersheds and was threatening to replace traditional land use patterns that had been compatible with the drinking water needs of the City. Moreover, it was clear that existing American environmental regulations were not going to alter this. American environmental policy in the water area has been notably successful in controlling sewage discharges from individual treatment plants or other urban point sources. But it was then (and has largely remained up to the present) a byword for ineffectual failure when it comes to controlling the kind of non-point pollution sources that were growing in the Catskills. Traditional models of command and control regulation did not work when the economic livelihood of individual farmers and other rural landowners was at stake. Non-point source water quality regulations had and have failed to articulate a clear coherent set of obligations for individual landowners to follow, and have never given such landowners any incentive to follow them. To individual farmers and others, struggling to remain in business on the rural landscape, both in the Catskills and throughout the United States, non-point source water quality regulation is nothing more than unrealistic, arbitrary, top-down thinking by urban interests who do not understand or care about the economic needs of the countryside. The resulting opposition of rural landowners and real estate developers to traditional non-point source pollution control policies has combined with their own structural weaknesses to render them almost completely ineffectual.

As Federal and state public health regulators pondered these realities, a consensus began to grow that the Cat-Del watershed should be filtered as well. By the end of the 1980s, public predictions were rampant that filtration of the City's Cat-Del water was inevitable. This development produced consternation among City officials and the owners of the 807,000 buildings in New York City who paid the City's water and sewer rates. The estimated cost of a filtration facility with enough capacity and backup to process the 1.35 billion gallons a day of water that the Cat-Del then provided the City (a figure that the extremely successful water conservation program carried out by the City in the early nineties has since reduced by about 250 million gallons a day) was \$4 to \$6 billion dollars and the annual operating cost another \$250 million annually. The impact of such costs on the City's water and sewer rates would be disastrous.

Unfortunately for the City, traditional water quality strategies offered no way to avoid this course. Filtration was the tried and true remedy to the non-point source pollution impacts of land development. The unchallenged position of orthodox water quality regulators and water industry planners was that it was impossible to control land development. Moreover, as discussed above it was also indisputable that attempts to address the non-point source pollutions associated with both agriculture and suburban development had been a dismal failure.

Narrative - The Development of the City's Watershed Program

Thus, when this author became Commissioner of the New York City Department of Environmental Protection and Director of the New York City Water and Sewer system in early 1990, making a decision about what to do about preserving the purity of the City's drinking water sources and determining if there was any alternative to filtration was at the top of a very crowded agenda. However, unlike nearly the entire American water industry and its regulators, both of which were dominated by civil and public health engineers who thought almost exclusively in facility construction terms to water quality problems, this author's background was in management reform, public finance and environmental policy, particularly land use; and he was experienced in addressing issues from an integrative, multi-partner, problem-solving perspective, rather than from the menu driven solutions of the traditional, single issue expert that had shaped the filtration debate until that point.

The author and his new management team were quickly convinced that allowing Catskill drinking water purity to deteriorate and then spending massive sums to clean it up was not the ideal option. Initial calculations showed that a comprehensive program of watershed protection would cost far less than filtration, would maintain water quality even more effectively, and would produce numerous other benefits as well, both for New York City and also for the Catskills, whereas a filtration strategy would be nothing more than a money pit. Thus the City made its basic strategy decision. Instead of paying to clean up the results of degrading the water producing environment, the City would invest

in preserving the rural Catskill environment that was providing it with the world's best urban water.

The question then became how to translate that strategy into a detailed action plan. More traditional water engineers, including virtually all of the EPA safe drinking water regulatory bureaucracy, argued for and expected the City to take a pollution source by pollution source approach, go after each identified water quality problem and plug it up. And, in fact, the City's program included an aggressive component of hotspot cleanup, sewage and septic system upgrades, and other engineering and regulatory measures. But the City rejected that as its basic framework for long term water purity protection. The City concluded that the fatal flaw of such an approach was that it was reactive, it did not think in system terms, and it invariably tended to do no more than was necessary to meet whatever the current regulatory goal for water chemistry was. Above all, it was treating symptoms, not causes. It did not provide a basis for creating assurance that long term water purity could be comfortably maintained

Instead, the author and his team chose to place the ultimate focus of their filtration avoidance strategy on the Catskill environment itself. As the author stated numerous times on behalf of the City, a good environment will produce good water. And that made investing in the environment in an area 100 miles and more (160 to 200 kilometers) a smart and profitable investment for New York City.

The question then became what environmental investments should the City make. Some, such as adding to the publicly held land in the watershed, particularly critical lands threatened by development, stream corridor restorations and better stewardship of City owned lands were obvious. But that did not answer the critical question: how to control non-point source pollution on privately held farmlands and other rural landscapes.

The City realized that its first step had to be to make it clear that it intended to do so, come whatever. It began to organize an unprecedented program of regulatory enforcement against non-point source pollution runoffs in its watersheds. As the scope of the City's intentions became apparent, farmers and other rural landowners reacted angrily, denounced the City and vowed all out resistance to the New York City invaders who intended to undermine their livelihoods and destroy the value of their land.

Though the City could not afford to back away from that conflict, it fortunately realized that it should first seek to defuse it. The City quietly approached the New York State Department of Agriculture and requested their assistance in creating a dialogue with the farming community. New York State Ag. also made a thoughtful suggestion that helped set that dialogue on the course that ultimately led to the watershed agreement. They proposed that, instead of immediately proceeding to substantive discussions, the two sides first spend some time in mutual education. Thus the City first provided for the farming community a soup to nuts primer on the specifics of preserving drinking water, the City's regulatory obligations, the risks it was trying to deal with and its overall strategy for doing so. At the end of that discussion the farmers had begun to replace their

stereotypes of the City with a more reasoned understanding of the City's needs and were grudgingly acknowledging that the City had some real needs that had to be met.

Then it was the farmers' turn. They took the City through the realities of their life as farmers in the Catskills, the economic pressures they faced, how they viewed the environmental problems their farms created, their own unhappy experience with non-point source pollution regulations and the top-down solutions to that had always been thrust upon them, why they regarded the City's needs as unacceptable if approached traditionally, and why those that proposed them were seen as the enemies of farmers.

It was now the City's turn to alter its thinking and recognize that a new approach had to be taken. The City then made another response that set for stage for the development of one. Speaking for the City, this author stated that he did not accept the common conclusion of both farmers and environmentalists that they had diametrically opposed interests. While acknowledging short conflicts on issues such as pesticide management, this author went to state that he regarded farmers and environmentalists as natural allies because they both had a vested interest in a working landscape. For the City, the author stated, farming was a preferred land use in the watershed and that given what both sides had learned, they now faced the mutual challenge of crafting a farmer-friendly program of watershed protection.

That statement provoked both a positive reaction from the farm community but also a bit of a testiness about the mutual challenge language. Instead, the farmers asked, would you be willing to let us design and run the program to control farm pollution? In a response that would be repeated many times, the author replied that the City was up in the Catskill watershed to get clean water, not run a regulatory system. If there was a better way to preserve drinking water quality the City would embrace it.

With that commitment, confrontation (though not considerable residual mutual suspicion) was replaced by innovation and the design of a mutually beneficial upstate-downstate partnership began.

What the farmers developed was a program that came to be called Whole Farm planning. Its basic features were as follows. The City would pay both the operating costs of the program and the capital costs for pollution control investments on each farm as an incentive to farmers to join (Later a stipend for time was also added). Farmers would administer the program through a self-selected Watershed Agricultural Council who would contract with local farm support services and academic resources to provide needed technical assistance, and with independent academic institutions for monitoring and research. Instead of selecting a top down menu of best management practices to be applied to each farm, the program, with the full participation of each farmer, would custom design pollution control measures for each farm, to maximize their effectiveness and minimize their cost. A particularly important feature of this custom design was that the measures would be selected not only for their pollution control benefits, but they would also be designed into and integrated with the farmer's business plan and management practice for his farm. Thus the farmer would not only solve his pollution

problem cost free, but he would also gain significant ancillary benefits as well. Often, these were not cash benefits, but time and ease of labor. Many Catskill farms were cowshed dairy operations with enormous and time-consuming problems of manure disposal that were a major part of the farm pollution problem. Generally the solutions to these problems the program developed were not only more efficient, they saved the farmer a significant amount of precious time and freed him from one of the most onerous aspects of his day, which proved to be a particularly valuable and attractive element of the program for many farmers.

Thus the name Whole Farm planning, designed to capture both the environmental and business aspect of the program. Environmental protection and business improvement were integrated together in the program design and the investment plan. Catskill farmers who had previously thought of the environment as something that forced them to spend their money to help others were now making money by becoming stewards of environmental resources, money that was helping them stay in farming. It was a true mutual success story.

Before the program could be finalized however, two significant hurdles had to be overcome. The farm community insisted that the program be voluntary with respect to any individual farmer. A long and complex history made this issue, as the City realized, a deal breaker for them. On the other hand, voluntary non-point source pollution programs had been, in American experience, a universal failure and to present a voluntary program as a centerpiece of the City's watershed effort would probably doom its credibility among those who would pass final review on whether or not it would provide the long term protection the City's water supply needed.

Finally, a way out of this dilemma was identified. In trying to assure the City that a voluntary program would work, the farmers emphasized time and again to the City their willingness to be the City's water stewards if the City would provide the needed financial incentives to be so. Very well, said this author for the City, we agree. And we will provide the incentives and let the program be voluntary for any individual farmer. Which meets your needs. But in return you must meet our need, and our need is for an effective non-point source pollution control program with critical mass. Therefore, you the farmers must commit to obtain participation in the Whole Farm program by 85% of all your fellow watershed farmers within five years. If you meet that commitment well and good. If you fail to meet that commitment the City will have the option of reverting to traditional water quality regulation with the only limitation being it will hold harmless all the farms who have actually participated in good faith in the program.

The farmers agreed, including most importantly that they would truly be on the hook for recruiting program participants.

The other issue was what should happen to the City's proposed new water quality regulations. Many environmentalists argued that the Whole Farm program was potentially great, but the City should keep traditional water quality regulation as well. The farmers argued it was incompatible with an incentive based program. In another

innovation, the City agreed that any farmer who participated in good faith in the program would be exempted from all other water quality regulations save only a rogue polluter provision.

Within five years after this program was established 93% of all farmers in the watershed had chosen to participate. Whole Farm planning is considered to be one of the most successful non-point pollution control programs in the United States, and its results have played a major role in stabilizing and reducing watershed pollution loads and in enabling the City to avoid the multi-billion dollar cost of filtering the Cat-Del water supply. Perhaps the greatest testimony to its success has been the growing number of reports of farmers outside the watershed's boundaries who keep asking how they can become part of the New York City watershed.

The watershed program has also served as a model for a Catskill forestry management program, for stream corridor management efforts in the watershed, and for a Catskill Development Council, which uses City money to strengthen town centers and limit sprawl type exurban and vacation home development in the City's watershed, and to identify opportunities for landscape compatible economic development for current residents of the watershed. Each program of this component is designed around an ecosystem services model, one that seeks to provide economic opportunities to local residents in ways that are compatible with the preservation and enhancement of the ecosystem integrity of the Catskill landscape.

Today, nearly a decade later from the 1990 to 1993 period which put this program together, the City has succeeded in carrying out its good environment equals good water strategy. There is little if any remaining interest in filtering the Cat-Del system. True, like all mature programs, this detail or that detail of the watershed program is regarded as especially successful or needing work, there are parts of it that are ahead of schedule, some parts that are a bit lagging. But overall, the City program has settled into the day to day life of a mature and accepted program, to the point where it what seemed almost revolutionary a decade ago now seems obvious and simple common sense. And it is common sense to spend what will be no more than 1/8 of the cost of filtration on preserving water purity nature's way.

But the City's program has done more than just enormously benefit New York City. The debate over watershed protection versus construction of filtration works that took place during the City's creation of the watershed program gave a major new impetus to watershed protection in the United States, which prior to 1990 was regarded by serious water and public health professionals as a great idea theoretically, but a piece of feel good fluff in practice. The City's ecosystem services strategy has shown how to make watershed protection work economically and practically and is having ripples throughout the United States in a growing number of experiments in upstream downstream ecosystem service partnerships.

And New York City did not limit its innovations in ecosystem services to its watersheds. Between 1990 and 1993, it carried out the largest water conservation

program in American history, permanently reducing its per capita water use by close to 20% and, at the cost of roughly \$500 million dollars saving the \$3 to \$5 billion dollars it would have cost to construct new water supply works on the Hudson River. During the same period, it created a Bluebelt program for Staten Island that preserved and restored natural stream corridors and then integrated them into the City's master sewer plan for storm water management, saving several hundred million dollars in storm sewer construction costs while enhancing the natural character and amenity of Staten Island residential neighborhoods, significantly increasing their property values. And it developed natural restoration programs for Jamaica Bay and a series of closed landfills that also saved major sums of capital.

The City's water and sewer system revenue totals over one billion dollars a year. In 1990, when this author became water and sewer system director, the water and sewer rates had been going up at an average of 14% a year for close to a decade. When this author resigned, at the end of 1993, the annual rate increase was zero for two years, and has not exceeded the inflation rate until this year, 2002-2003. There were two reasons for that financial success. One was innovative management and financial reforms. The second was major cost savings due to the widespread use of ecosystem services strategies. During those years, the City was clearly committed to the environmental results an ecosystem services strategy produced more effectively than any others. But it was equally committed to the bottom line for its building owners. In using ecosystem service strategies, it found a way to be both.

Conclusion

A paper like this inevitably foreshortens events, gives them more coherence and order than day to day life actually saw, suggests foreknowledge when the reality was more instinct and creative improvisation, and never does justice to the creative contributions and generosity of spirit of the many individuals whose personal decisions to work together and find something smart that would work, even if it challenged their own long-standing beliefs, made the City's watershed program a success in the face of professional and expert opposition, numerous political minefields, agency fears of losing bureaucratic control, and the inertia of many stakeholders, both urban and rural, starting with the City's own budget bureau, whose basic instincts were just to stall and hope the problem would go away.

Ultimately, the watershed program worked because the instincts of all those people were correct. Investing in the City's watershed environment, both its natural and human resources, was the best way to insure the City a long term source of pure drinking water.

Today, this concept of linked investment in natural and human resources, which is being articulated and enriched as the idea of ecosystem services, is attracting widespread attention. If this concept is to succeed, the City experience suggests several elements will be critical. This conclusion will stress three of them.

First, the ecosystem must be seen as including both its natural and human resources. One cannot be sacrificed to the other. The oft-hailed ideal of a win-win solution must not be understood to be just something for both, but to be maximizing the potential of both. Similarly, in terms of the oft-stated model of urban-rural partnership, it is not the question so often posed of regional versus local values. It is a question of reconciling one with the other. That means, and it cannot be stressed enough, the legitimacy of both sets of values has to be recognized, and mutually recognized. One of the most fundamental preconditions of the watershed agreement was the coupling of the recognition of Catskill residents that, like it or not (and most didn't at first) the City had a legitimate interest in seeking to protect the purity of its water, with the City's own humble acceptance that farmers in the Catskills were the best experts about what needed as farmers and on how to adapt essentially uniform water quality techniques to local Catskill conditions.

Second, what the Catskill experience vindicates is the economic validity of the concept of ecosystem services. The Catskill experience does not necessarily represent a story of a market for ecosystem services. Rather, it represents a critical first step on the way towards market development: entrepreneurial success in exploiting a previously unrecognized economic opportunity. Though many of the markets for ecosystem services are still nascent and emergent, ecosystem services present a raft of individual opportunities for entrepreneurial creativity at very high levels of economic return. Every encouragement should be given to exploiting those opportunities, not only for their immediate benefits to both the landscape environment and those who live in it, but because it will be from the successful experience of doing so that the more structured ecosystem markets of the future will take their ultimate shape. Ideally, the next decade will be a building decade of ecosystem entrepreneurs, not only in the private sector but, for the areas in which purely private investment may not yet be appropriate, public sector entrepreneurship as well.

Finally, as the New York City experience has drawn steadily more attention, some have raised the issue of whether or not the financial savings for New York City were so great that the New York City experience is unique and not particularly applicable to other ecosystem service situations. That, this author would suggest, puts the cart before the horse. The financial savings for New York were so great because it was receiving such a high level of ecosystem service, and because it was fortunate to have created water institutions that had the flexibility and financial resources to move quickly to seize those opportunities, once it discarded its own self inflicted blinders on how to use those institutions and deploy those resources.

In the hundreds if not thousands of other ecosystem service opportunities that exist, both in the United States and worldwide, that should be the twofold lesson. First, identify and target as high a level as possible of ecosystem services, either real or potential, for the higher the level of service the higher the level of economic benefit. Second, find ways to monetize the service in a way that the value it creates can be captured, and reconfigure existing institutions and regulations so they can do so. Sometimes, as in New York City, it will only require a crisis and some outside the box

thinking to identify how to proceed. Sometimes it will require more institutional creativity to create a payment stream that provides value for all parties or an institution that can capture and allocate it in an accepted, mutually beneficial way. But whether it is New York or East Asia or Central Europe what will underlie the progress of ecosystem services is a simple truth. The environment is about many things, beauty, biodiversity, sharing the earth's commons, the obligation humanity owes to the biological heritage of the past and the generations who will walk the earth in the future. But the environment is also about economic resources, in this case the critical economic resource of ecosystem services, and the wise use of any economic resources, which is the ultimate goal of market systems, will always make more money than any alternative.

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