

**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  
and  
What Lessons It Teaches about Using Ecosystem Services**

by

Albert F. Appleton

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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 buildings in the City, and close to two dozen local water systems in New York's 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 Croton River watershed, which was created in the 1830s and expanded in the 1880s, 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. This area was originally rural, but since World War II it has become (or is now becoming) largely suburban. The Croton supplies 10% of the City's water supply. The City's main watershed is now the Catskill-Delaware watershed system west of the Hudson River. It encompasses most of the Catskill Mountains, a rural area of farms, forests, small towns and a growing number of vacation home developments. The Cat Del system, as it is generally called, extends from 75 to 125 miles (120 to 200 kilometers) north of the City and 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 New York's drinking water system. The Croton watershed was rapidly suburbanizing and under assault from non-point source pollutants such as eroded soils, lawn fertilizers, poorly controlled septic tanks, spilled motor fuels and industrial toxics and solvents, and hydrocarbons leached from roads. By the end of the 1980s, the decision had been reluctantly made that ultimately water from the Croton watershed would have to be filtered to maintain compliance with safe drinking water standards. Filtering the Croton,

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\* For detailed maps of the NYC watershed as well as current information on the status of the City's watershed program, see the New York City Department of Environmental Protection web page at [www.nyc.gov/dep](http://www.nyc.gov/dep)

which is currently scheduled to be completed in 2011, will cost close to \$1 billion to build the necessary filtration works and over \$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, New York City's main source of drinking water. 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, all with low impact on water quality. 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. The traditional economy and the traditional social structure of the Catskills were beginning to unwind, in ways that had ominous implications for the environment.

As farmers in the Catskills fought to stay in business and preserve a rural way of life, they increasingly turned to intensive agricultural practices and concentrated livestock management, producing steadily increasing amounts of polluted runoff and soil erosion. Local forestry was 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 polluted runoff. 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.

By the end of the 1980s, an environmentally destructive pattern of land use was replacing the traditional agricultural and land use patterns that had been compatible with the drinking water needs of the City. What was worse, this environmentally destructive land use pattern was not serving the needs of traditional Catskill residents, whose economic prospects continued to decline. The Catskills were in a lose-lose downward spiral, with the undermining of its traditional agricultural landscape spawning growing environmental pollution which further undermined the landscape which spawned further environmentally destructive practices and on and on.

Moreover, it was clear that existing American environmental regulations were not going to alter this. American water quality regulations have been notably successful in controlling sewage discharges from individual treatment plants or other urban point sources. But the story is starkly different when it comes to controlling the kind of non-point pollution sources that were growing in the Catskills. American non-point source water quality regulations have always failed to articulate a clear, coherent set of

obligations for individual landowners to follow, have never given such landowners any incentive to follow them, and have never been clearly linked to specific water quality improvements. To individual farmers and other rural residents struggling to remain in business on the rural landscape, both in the Catskills and throughout the United States, non-point source water quality regulation has been 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 1.5 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 300 million gallons a day<sup>\*</sup>) 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, and particularly those paid by New York's large low income population 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 changes in land use, or to alter the march of 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.

### The Development of New York 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 for the water from the Cat-Del watershed 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 terms of facility construction solutions to water quality problems, this author's background was in management reform, public finance and environmental

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<sup>\*</sup> See, for example, Scientific American, February 2001, "Leaking Away: More than one billion gallons of water flow through New York City every day, and hardly a drop is wasted," p. 46

policy, particularly land use; and he was experienced in addressing issues from an integrative, multi-partner, problem-solving perspective.

Lacking the institutional biases of the public health expert and the water engineer, the author quickly concluded 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 protect water quality but would also be a black hole for money that would do nothing for the Catskills.. Thus, the City made what was, at the time, a revolutionary decision about protecting the purity of its drinking water. Instead of paying to clean up the results of polluting and degrading the pure water producing Catskill watershed, the City would pay to protect the rural Catskill environment that was providing it with the world's best urban drinking water.

The question then became how to translate that strategy into a detailed action plan. Most 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 clean it up. And, in fact, the City's watershed program included an aggressive component of hotspot cleanup, sewage and septic system upgrades, and other engineering and regulatory measures. But the City rejected aiming at individual pollutants as its basic framework for preserving long term water purity. As this author saw it, the fatal flaw of such an approach was that it was reactive. It did not think in ecosystem 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 City 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. Letting the environment do the work, what has now been called ecosystem services, was the most reliable and cost effective way to guarantee clean water. And that made investing in the environment in an area over 100 miles away the smart investment, the profitable investment for New York City. And so New York City set itself on the path towards an ecosystem services strategy itself.

The question then became what environmental investments should the City make. Some, such as buying for public ownership environmentally sensitive lands threatened by development, were obvious. But that did not answer the critical question: how to control non-point source pollution from privately owned farms and other private landholdings. The Catskills were lightly populated. But the population was not going away. The traditional model of pristine, wilderness preservation would not work. The City had to make environmental protection work for and with the residents of the Catskills. And so,

feeling its way, knowing what it had to do strategically, but by no means certain how to do it practically, New York City set out to find ways to reconcile the most ambitious program of non-point source pollution control ever attempted in the United States with the economic needs and social culture of the Catskill mountains.

The City's effort had a bumpy but by no means unexpectedly so start. As the City made clear its intentions to address non-point source pollution seriously, and began a program of serious regulatory enforcement against the worst polluters (initially out of control developers), farmers and other rural landowners reacted angrily and, animated by memories of ham-handed environmental regulation in the past, denounced the City and vowed all out resistance to the urban invaders who intended to undermine their livelihoods and destroy the value of their land. A classic environmental confrontation appeared to be developing.

Though the City was prepared to fight and win such a conflict if necessary, in keeping with his long term strategy, this author insisted on first exploring how to defuse it. The City quietly approached the New York State Department of Agriculture and requested their assistance in creating a constructive dialogue with the farming community. The Agricultural Department Commissioner Dick McGuire, a farmer himself, and his Deputy Commissioner for Policy Dennis Rapp, responded positively to the City's approach. Their insightful suggestions helped set that dialogue on the course that ultimately led to the watershed Whole Farm watershed agreement.

Rapp and McGuire suggested that, instead of immediately proceeding to substantive discussions, the two sides first spend some time in mutual education. First the City and then the farmers accepted this suggestion and each side organized for the other what became a program of four half day information sessions, all of which this author attended personally. Thus the City first provided for the farming community with a soup to nuts primer on the specifics of preserving drinking water purity, the City's regulatory obligations, the contaminant risks it was trying to deal with and eliminate, the economic implications of the filtration issue for New York City residents, and its overall strategy for doing so. The City talked of exurban development, that the farmers saw as a potential source of economic development and explained not only its environmental consequences, but its economic consequences as well in terms of land prices and changing demographics for traditional farm communities. At the end of those presentations, the farmers had begun to replace their stereotypes of the City with a more reasoned understanding of the City's water purity problems needs and were grudgingly acknowledging that the City had raised some real environmental issues that had to be faced

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, their vulnerability to any increases in production costs. They discussed their views of the environmental problems their farms created and their own unhappy experience with the non-point source pollution regulations that addressed them and the top-down environmental solutions that had always been thrust upon them. They explained why such regulations would be

economically fatal to them while, in their opinion, not accomplishing the City's environmental goals. They talked of their own view of themselves as land stewards, the nature of their own expertise as land managers, and their own support networks and community resources, including their social capital and history as farmers in the Catskills.

It was now the City's turn to alter its thinking and to accept the reality that traditional non-point source regulatory approaches, particularly with regards to farm pollution were a dead end. It also meant that the City had to accept the responsibility for reeducating state and EPA environmental regulators, who were institutionally invested in such approaches and whose long history of suspicious interaction with farming communities was a major reason for farmer antagonism to the City's environmental needs.

But the most important conclusion and the building block for the next stage in the urban rural dialogue was the conclusion this author articulated. Speaking for the City, this author stated that he had never accepted the standard folklore of both farmers and environmentalists that they had represented intrinsically opposed interests and that he believed these sessions had shown no such intrinsic opposition existed. 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 sound, vital rural landscape. The alternative, a cross hatch of industrialized agriculture and exurban development was the enemy of both. It was the enemy of the farmer because it would complete the destruction of the economic basis of family farming. It was the enemy of the City because it would produce far more pollution than well managed rural landscapes. The City, the author stated, was prepared to articulate a philosophy that 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 would preserve the full environmental functioning of the watershed..

That statement provoked both a positive reaction from the farm community but also a bit of farmer 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 also 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 urban rural 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 staff costs of the program and the capital costs for pollution control investments on each farm as an incentive to farmers to join (later a small stipend for farmer time was also added).

Farmers would administer the program through a self-selected Watershed Agricultural Council on which the City and other governmental stakeholders would also sit and vote, but would hold a minority of seats. The Council would contract with local farm support services and academic resources to provide needed technical assistance, and would contract with independent academic institutions for monitoring and research.

But the key to the program was how the pollution control was designed. Instead of selecting a top down menu of best management practices to be applied to each farm, the typical non-point source pollution regulatory approach, the Whole Farm program would provide each farm with a technical team that, 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 practices for his farm. Thus the farmer would not only solve his pollution problem cost free, but he would also gain significant ancillary business benefits as well. Often, these were not cash benefits, but time and ease of labor. Many Catskill farms were large cow barn 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.

The program was given the name Whole Farm planning, which was designed to capture the goal of environmental investments that also served the farmer's business interests. 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 program that was brilliant in its common sense practicality, in its utilization of the best features of the social capital of the Catskill farm community, and its acceptance of the need to genuinely respond to the City's insistence that the only inflexible criteria for whatever program the farmers were going to propose was that it had to produce pure, clean drinking water.

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 local history, as well as deep rooted elements of American farm culture, made this issue, as the City realized, a deal breaker for the farmers. On the other hand, voluntary non-point source pollution programs had been, in American experience, a universal failure. Even had the City been willing to accept one, which it never was, 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 to avoid the need for filtration.



Finally, this author identified a way out of this dilemma. 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, and that means a 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, enforcement based, 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, confident in their own program design, knowing their own community, and by now realizing the City was correct on the need for critical mass, agreed.

The other issue was what should happen to water quality regulations. Many traditional environmentalists conceded that the Whole Farm program was a potentially great innovation, but they argued that 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 willful polluter provision. In an interesting example of preconceived notions controlling thinking, many environmentalists initially opposed the Whole Farm program because it was, in the farmers terms, voluntary, and environmentalists know voluntary point source programs don't work (as noted above) even though the 85% trigger provision gave the Whole Farm Program a critical mass far beyond what any traditional regulatory point source program had ever achieved.

Within five years after the City and the Catskill farmers created the Whole Farm program, 93% of all the farms in the New York City watershed had chosen to participate. Whole Farm planning is arguably the most successful non-point pollution control programs in the United States. Its success played a critical 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 the remaining elements of the City's watershed program, including a Catskill forestry management program, stream corridor management and restoration efforts, sewage treatment and septic remediation and upgrades, and 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. Economic growth strategy in the watershed is now focused on identifying

opportunities for landscape compatible economic development for current residents of the watershed. Each of these programs is built 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, a decade after the 1990 to 1993 period which saw the creation of the Whole Farm program and then the remaining elements of the New York City Catskill urban rural water quality partnership, 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 and 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 was common sense to spend what will be no more than 1/8 of the cost of filtration on preserving water purity nature's way, while using the environment to economically preserve and reinforce the ability of agricultural and rural residents to preserve and reinforce a cherished way of life.

But the City's program has done more than just enormously benefit New York City and the residents of the Catskills. The debate over watershed protection versus construction of filtration works that took place during the City's creation of its 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 program has become one of the catalysts of ecosystem service thinking, and rightfully so, for its ecosystem services strategy intertwined economic and environmental success to the point where each had a vested interest in each other, each was mutually supportive of the other. That model is now sending ripples throughout the United States in a growing number of experiments in upstream downstream ecosystem service partnerships, the best of which draw on and reflect local experience and needs, just as New York City did.

It is important to note that, in those years, New York City did not limit its innovations in ecosystem services to its watersheds. Between 1990 and 1993, New York City also designed and implemented 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 also 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 results for City residents were dramatic, and not only in terms of environmental quality and environmental resources. The New York City water and sewer system is an enormous economic enterprise, whose revenue totals over one billion dollars a year. In 1990, when this author became water and sewer system director, and the system had locked itself into facility construction solutions to environmental problems, the resulting costs had been driving up water and sewer tariffs at an average of 14% a year for close to a decade. When this author resigned, at the end of 1993, the annual rate of tariff increase had been reduced to 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 a wide ranging program of financial and management innovation the author carried out. But the second was major cost savings due to the switch from a clean up facility strategy to an ecosystem services strategies environmental protection and restoration strategy, as described above. Ecosystem services not only produce superior environmental and social results, it produces them far more cheaply than traditional environmental strategies. As the City experience vividly illustrates, ecosystem service approaches change the environment from a cost center to a profit center.

## 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 full justice to the leadership 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 basic instincts of all those people were correct about the two decisive facts. First, 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. Second, properly harnessed, locally based and locally designed programs work best.

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. The City experience suggests three considerations will be especially critical if that interest is to realize its full potential.

First, the ecosystem must be seen as including both their natural and human resources. One cannot be sacrificed to the other. Both need investment, mutually supportive and reinforcing investment. 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, and the potential of both to be mutually supportive. 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 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 acceptance that farmers in the Catskills just might be the best people to design an environmental protection program that would be compatible with their needs as farmers.

Second, what the Catskill experience vindicates is the economic validity of the concept of ecosystem services. From an economist's perspective, what the New York City-Catskill experience represents is entrepreneurial success in exploiting a previously unrecognized economic opportunity that presented itself in environmental guise. Landscapes with potential for ecosystem service strategies present a raft of individual opportunities for entrepreneurial creativity at very high levels of economic return. Every encouragement should be given to seizing those opportunities. Ideally, the next decade will be a decade of ecosystem entrepreneurs, not only in the private sector but, in appropriate situations, for non-profit and 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. This author suggests that puts the matter exactly backward. The financial savings for New York were so great because it was receiving such a high level of ecosystem service, and because it had created water institutions that had the flexibility and financial resources to move quickly to seize the economic and environmental opportunities using ecosystem services offered.

But what of the many other areas that do not have the institutions necessary to seize their opportunities to use ecosystem services. Often, this author has been presented with the lament that we don't have the capability to mount those kinds of programs. Again, that is to approach the matter backwards. If the opportunity exists, then the right response is to create such institutions, just as infrastructure agencies have created systems like authorities to provide the financial resources needed for large scale urban investments. It cannot be stressed often enough that ecosystem services are potential profit centers, not cost centers. If existing institutional structures and existing patterns of environmental regulation and investment do not allow those environmental benefits to be obtained, those economic profits to be realized, then the answer is to create new ones, using the political capital that getting something better for less always creates.

It is important to remember that New York City in many ways actually did this. If it had the institutional resources needed to exploit ecosystem services, prior to 1990 it had never even recognized their potential to do so. It had to reconceptualize its own strategies and structures, take a new approach to the use of environmental regulation, create new ways for a distant urban government to relate to what for it were very strange creatures, rural agricultural counties. Without this institutional creativity and design, without this new understanding of environmental economics, all of New York's resources would have counted for nothing.

In the hundreds if not thousands of other ecosystem service opportunities that exist, both in the United States and worldwide, New York teaches a twofold lesson. . First, identify and target as high a level as practical of ecosystem services, 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, using the energy that opportunity and creativity can generate. 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 resources 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 other course.

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*ALBERT F. APPLETON, the author of this paper, is currently a Senior Fellow with the Regional Plan Association (RPA) of New York City, a Senior Fellow at the City University of New York Institute of Urban Systems (CIUS), and a member of the Katoomba Group. He also consults nationally and internationally on issues of water and the environment, watershed management and working landscape preservation, environmental finance and ecosystem services. Between 1990 and 1993, Mr. Appleton served as New York City Commissioner of Environmental Protection and Director of the New York City Water and Sewer System, in which capacity he designed and directed the implementation of the New York City urban rural watershed protection partnership program, as well as the other ecosystem services initiatives described above.*