

Agricultural Nonpoint Source Pollution and Eutrophication: A Survey of Environmental Responsibility in the Federal System and Case Study of the Chautauqua Lake Watershed, New York State

John Haskell Peabody College and the College of Arts and Science, Vanderbilt University

This report is concerned with nutrient pollution in Chautauqua Lake from agricultural nonpoint sources (NPS) and the policies that have formed at all levels of the federal system to address this problem in public water bodies. The analysis will be helpful to a national policy audience concerned with NPS policy efficiency and effectiveness, especially with regards to agricultural sources. It will also be of special use to lake managers and state/local policymakers who want the NPS policy problem demystified so they can make better, clearer decisions for managing their lakes, rivers and streams. For this latter audience, the paper will survey how NPS pollution has been addressed in other watersheds, what policies have been effective or ineffective, and what financial and technical support are available from federal and state administrations for watershed management.

Federal, state and local NPS policy players interact with and influence each other to produce a wide spectrum of policy solutions for impaired watersheds. Ultimately, however, federal and state policies protect only a small percentage of polluted watersheds, and local citizens and authorities are often left unsupported to bear the responsibility of pollution prevention and cleanup without the required technical expertise or financial resources. When federal executives or states fail to protect polluted watersheds, it is implicit and necessary that local authorities coordinate horizontally across municipalities or counties to centralize watershed management debates and decision-making; however, effective watershed management plans also require local authorities to initiate and sustain vertical coordination with state and federal administrations that can help provide the requisite resources.

While some state executives have expanded the coverage of their watershed management programs, this expansion has been far too limited and slow to stem the natural acceleration of NPS pollution damages. Local authorities (within affected watersheds or bordering water bodies) cannot assume, nor wait for, federal or state leadership when the problem worsens beyond a critical level. Watershed management must come from organic leadership, marshaling local, state and federal resources to begin sustainable, comprehensive remediation.

Understanding the Public Problem: Agricultural Nutrient Pollution and Eutrophication

This policy analysis is concerned with agricultural nonpoint-source (NPS) pollution and the resulting eutrophication of waterbodies such as Chautauqua Lake, located in western New York State. The term eutrophication describes a malignant process in standing bodies of water, usually lakes, whereby nitrogen and phosphorous nutrients feed enormous growths of invasive vegetation. This vegetation may be of the macrophyte (seaweed) or algal varieties. Eutrophication hurts the aesthetic appeal, recreational viability and biodiversity of an infested body of water. Macrophyte weeds, reaching three to six

feet in height, grow in dense patches and often touch the water's surface. Depending on the water's clarity, macrophytes can grow in waters up to eight feet deep (Ohio Division of Natural Areas and Preserves, 2001). Lakes with severe eutrophication problems have been described by observers as stagnant or "dead" with more vegetation visible on the surface than water itself.

Recreationally, the quality of fishing declines due to weed growths that upset biodiversity by providing protective habitats to smaller, non-sport fish; this leads to declining populations of bigger game fish, such as the muskellunge and walleye of Chautauqua Lake. Additionally, boat recreation is hampered by weed growths in important navigable regions of the lake. These long, dense weeds clog water intakes and cause boat engines to

overheat. Macrophytes also wrap around propellers and can increase tension on drive shafts—affecting both the performance and structural integrity of the engine unit. Currently, swimming on Chautauqua Lake is near impossible except in deeper portions of the lake (those exceeding 8 feet) if the weed growths are not checked by short-term controls like weed harvesting.

Studies have found agricultural pollution to be a leading cause of eutrophication. During irrigation or inclement weather, agricultural fertilizer or manure nutrients leave the farm system and are carried by water in runoff or leaching to a watershed's water resources. These resources include streams, rivers, or aquifers that feed a larger body of water. This policy study will look at nutrient pollution in Chautauqua Lake—pollution caused primarily by agricultural runoff to streams in the watershed as well as runoff from farms located on the lake's periphery. Agricultural nutrient pollution comes from a nonpoint source; the exact location of nutrient leaching and runoff is impossible to determine. Consequently, the regulation and abatement of agricultural pollution becomes especially difficult as the responsibility for pollution cannot be assigned to a single party, often deterring policymakers.

Since studies in the Netherlands during the mid-1970s identified nitrogen and phosphorous loading as the cause of eutrophication in surface waters, nutrient pollution has gained acceptance as a public problem in Europe and the United States. References to agricultural NPS pollution appeared in U.S. environmental bills and laws as early as 1987 when Congress amended for the third time the Clean Water Act of 1972. On February 19, 1998, the Clinton White House responded to the EPA's concerns and released the Clean Water Action Plan, which states that:

After 25 years of progress, the nation's clean water program is at a crossroads. Implementation of the existing programs will not stop serious new threats to public health, living resources, and the nation's waterways, particularly from polluted runoff. These programs lack the strength, resources, and framework the finish the job of restoring rivers, lakes, and coastal areas. To fulfill the original goal of the Clean Water Act—fishable and swimma-

ble water for every American—the nation must chart a new course to address the pollution problems of the next generation. (EPA, USDA, 1998)

In 1999, the following assessment of water quality issues in the U.S. was presented by the Department of Agriculture's (USDA) Economic Research Service:

Nonpoint-source pollution has been identified as a major reason for remaining U.S. water quality problems. Despite some progress in reducing agricultural production practices believed harmful to water quality, agriculture is generally recognized as the largest contributor of nonpoint-source water pollution in the United States.

More recently, in February of 2001, the Environmental Protection Agency (EPA) identified agricultural NPS pollution as “the largest remaining threat to water quality nationwide,” when the Clean Water Act was in Congress for reauthorization.

However, most agricultural water pollution in the U.S. exists under the federal radar in smaller watersheds across the country, and persists because state, county, and municipal governments lack the coordination or technical expertise to battle an intricate problem in a watershed area that often extends across political divisions and jurisdictions. The purpose of this report is to examine and elucidate these complicated technical and jurisdictional issues using the Chautauqua Lake watershed (CLW) as a case study. Important to this analysis are the environmental policy layers that form at the federal, state, county, and municipal level, and how they ultimately affect nutrient pollution in the CLW. In order to better understand and address NPS pollution, a problem inherently difficult to police, one must understand both the science behind NPS abatement and its policy arena: how policy players interact and influence each other to produce an array of solutions. The discussion will be a lesson in the convolution and inefficiency of federal environmental policy, as well as the problems encountered when assigning jurisdictional responsibility over environmental concerns.

Assigning governing jurisdiction to a naturally delineated area (watershed) that transcends the normal political division of responsibilities between layers of U.S. government presents a formidable challenge for the bureaucratic

federal system, especially when regulatory efficiency is a priority. Ultimately, we shall assess how responsibilities are divided and what level of coordination there is between the federal, state, county, and municipal governments in addressing the problems and causes of eutrophication in the Chautauqua Lake watershed.

Currently, there is no government program or regulatory mechanism to directly address the public problem present in Chautauqua Lake despite community pressures and a legislative attempt to do so. The actions of private citizens' groups prevent Chautauqua Lake from total eutrophication. Government action to ameliorate the local problem has been minimal, and this runs contrary to the Clean Water Act's classification of a polluted, publicly-used waterbody as a public problem. As President Clinton reiterated in 1998, surface waters were to be kept "fishable and swimmable" for the public and government programs should be restructured to address the needs of NPS pollution control in attaining this goal.

Somewhere in the federal system environmental policy has failed—agricultural NPS pollution continues to feed the eutrophication of Chautauqua Lake. This failure renders Chautauqua Lake less fishable and less swimmable, taking it further from the goals of the Clean Water Act and complimentary legislation. Are local geopolitics to blame, or is a particular governing body ultimately responsible for the system's failure? Do the jurisdictional issues in the federal system prevent public action or the creation of a new regulatory mechanism? These questions will guide this policy analysis of agricultural NPS control in the federal system, and the ways in which policies within this system ultimately affect the Chautauqua Lake watershed problem.

A Framework for NPS Pollution Policy Analysis

According to the USDA (1999), the fundamental goal of environmental policy is to "induce polluters to explicitly consider the costs they impose on society through their production-related activities." Ideally, a policy will maximize the expected net benefits to society from pollution control. Designing NPS policies to achieve efficiency, however, is often impossible because the relationship between economic damages and nonpoint pollution is seldom known. Instead, policies can be designed to achieve specific environmental goals (such as reducing "ambient" pollution levels

or reducing fertilizer applications in a region) at least cost, given the policy instruments available to a resource management agency, relevant policy transaction costs, and any other political, legal, or informational constraints that may exist.

The process of designing comprehensive policies for controlling NPS pollution therefore consists of defining appropriate policy goals, choosing appropriate instruments, and setting these instruments at levels that will achieve the goals at least cost (USDA, 1999). Society does not benefit from overly stringent or costly water quality goals. There are difficulties associated with each of these aspects due to the complex physical nature of NPS pollution. First, NPS runoff cannot be measured at reasonable cost with current monitoring technologies because nonpoint sources are diffuse and are impacted by random events such as weather. In addition, the process by which runoff is transported to a water body where it creates economic damages is also impacted by random events (Moss, 1997). The random nature of these physical processes creates significant limitations in the types of policy tools that can be used to attain a cost-effective outcome. Finally, runoff depends on many site-specific factors. The better that policies and goals can address these site-specific factors, the more effective NPS policies will be. However, obtaining the appropriate information to adequately design and implement policies that address site-specific factors will be costly. These costs may limit the types of policies (i.e. to those that are more uniformly applied and informationally less intensive) that can be used to control NPS pollution (Moss, 1997; USDA, 1999).

Three classes of environmental policy instruments have either been applied to NPS pollution or are considered the most feasible tools. These classes are economic incentives, standards, and education. In evaluating a policy's potential, a number of important economic, distributional, and political elements should be considered. These include the ability to achieve goals at least cost, administration and enforcement costs, incentives for innovation and political feasibility.

Economic-incentive based policies include performance incentives (taxes on runoff or ambient water quality), design incentives (taxes or subsidies on inputs and technology), and market-based approaches such as discharge allowance trading. Performance incentives are assessed based on real measured levels of the instrument base (i.e. ambient water quality or discharge quantities). Performance incentives are ideal for water quality policy because they are

directed at an aspect of the pollution process, the instrument base, closest to the source of the water quality problem (i.e. a runoff tax to discourage discharging polluted runoff). However, because NPS discharges cannot be observed, performance incentives are infeasible for NPS abatement. Design incentives are assessed based on a firm's expected contribution to NPS pollution using expected runoff models, which use information on input-use and technology choice to estimate runoff with simulation models. Design incentives have some of the desirable qualities of performance-based policies; they also target the instrument base (i.e. expected contribution) and are closest to the *cause* of the water quality problem (USDA, 1999). Market-based approaches rely on trading quantities of the instrument base and are generally infeasible for the same reason as performance incentives; the discharges cannot be measured.

Standards use a regulatory system to mandate that agricultural producers meet a particular environmental goal, or that they adopt more efficient nutrient management practices. In theory, standards can be applied to performance measures, such as runoff or ambient quality, or to design measures like inputs and technology. As with performance-based incentives, performance-based standards (i.e. a runoff cap) are generally infeasible. Design-based standards, which are feasible, include standards based on expected runoff and standards based more directly on input use and technology choices. Examples of design-based standards include the required use of best management practices on cropland, mandatory establishment of "riparian buffer strips," and restrictions on where and at what rates fertilizers can be applied (USDA, 1999).

Education initiatives provide producers with information on how to farm more efficiently with current technologies that minimize the excess use of fertilizers or about new methods that generate less pollution (i.e. conservation tillage). While such solutions to water quality problems are attractive, education alone is not considered a strong tool for water quality protection. "Its successes depends on alternative practices being more profitable than conventional practices, or that producers value cleaner water enough to accept potentially lower profits," the USDA reports. Evidence from USDA education programs suggests that net return is the predominant concern of producers when adopting alternative management practices. In general, producers have not exhibited interest in adopting practices that do not benefit them personally. A more appropriate role for

education is as a support tool for other policies (USDA, 1999). Lijklema (1997) reports that education programs can shorten the time it takes producers to successfully adopt alternative practices promoted or required through other policies.

The nature of NPS pollution currently renders performance-based policies infeasible. Education can be valuable in a support role but cannot stand alone. This leaves design-based policies such as design standards and design incentives as the most viable stand-alone options. In practice, however, more than one policy tool should be used. The USDA (1999) believes that "the characteristics of nonpoint-source pollution and the diversity of resource conditions important to agriculture rule against a single tool being applied to all problems." For example, a serious eutrophication problem might require a combination of fertilizer bans in erosion-prone areas, reduced application rates elsewhere, the use of cover crops to soak up nitrogen remaining in the soil after harvest, and the use of long-term land easements to retire marginal cropland. To complicate policymaking further, such regulation of land-use activities presents constitutional questions in many states.

Setting the Agenda: The Netherlands Precedent

In looking at past NPS pollution policy in the Netherlands the concern is with the identification of agricultural nutrient loading as a public problem and the national government's first attempts at ameliorating the problem. The Netherlands was the first country to nationally regulate and set standards for agricultural nutrient usage. Government-funded studies and legislative examples from the Netherlands provided impetus for U.S. environmental policymakers and groups to formulate a stronger, more potent domestic federal policy on agricultural nonpoint-source pollution.

Lying below sea-level, the Netherlands are rich in lakes and have a sophisticated dyke system to prevent the countryside or "lowlands" from flooding. This system of lakes and dykes is both environmentally and historically valuable. Multiple times throughout history these dykes have been let open to flood invading armies out of the countryside, protecting routes to major cities. The conservation of these lowland lakes became a concern of the national government when surface waters were becoming infested with seaweed and caked with algal blooms. Surrounded by intensive cattle breeding and corn

production, lake after lake became unsuitable for public use and aesthetically repelling. Although the signs of eutrophication were recognized in the 1960s, it was not until the 1970s that measures were gradually introduced to limit the loss of nutrients to the environment (Centre Européen d'Etudes des Polyphosphates [CEEP], 1998).

Passed in 1984, the Interim Law represented the Netherlands' first regulatory move to curb nutrient pollution. The law prohibits new start-up establishments for chickens and pigs, while the expansion of existing establishments is tied to an upper limit (CEEP, 1998). In 1987, after many publicized government studies, the Netherlands set nationwide nonpoint-source nutrient reduction goals; this legislation, the Ten-Year Action Plan, contains some of the most restrictive agricultural regulations in the world (EPA, 1999). The legislation also included reduction quotas for point sources like urban runoff and wastewater. The goal was to reduce the nitrogen and phosphorous load by 80% and 50%, respectively, from all sources within ten years. The initiation of more stringent government standards for point-source nutrient pollution was a success, but reduction quotas for nonpoint sources like farms were not met (Herremoes, 1997).

To reduce agricultural nutrient loads, the Netherlands mandated that all farms maintain government-approved nutrient management plans in the Manure Action Program, a part of the 1987 Action Plan. This policy ensured a limited number of livestock per acre and restricted the application of manure and organic sludge (processed human waste). The program included recordkeeping requirements, taxes on excess manure production, and the institution of manure banks to collect and distribute manure from farms that cannot dispose of the manure they produce (EPA, 1999).

These regulations had several limitations. First, they intended to clamp down on livestock operations but left cropland virtually unaffected because they did not limit synthetic fertilizer usage. Furthermore, the restrictions on manure application were unenforceable because transactions would often go unreported; informal community black-markets facilitated the purchase of manure from nearby farms. Physically observing manure application is prohibitively expensive, taking an inventory on already-spread manure is exhaustive, and measuring nutrient-loss on a farm-by-farm basis is too imprecise to legally justify penalties. Studies in 1994 and 1997 verified that agricultural pollution continued to be a major problem and was unresponsive

to easily-circumvented regulations. The study released in 1997 (ten years after the Netherlands set ten-year reduction goals) identified agriculture as responsible for 81% of nutrients lost to inland waters and lagged behind other nutrient sources by reducing their nitrogen loads by less than 20% since 1987 (Harremoes, 1997).

The Netherlands had a policy failure. Its pollution abatement program was impotent against nonpoint nutrient sources. The Ten Year Action Plan was not a very sophisticated piece of legislation and was more of a blunt instrument that tried to force agricultural nutrient reductions across the board. It failed to capture the intricacies of nonpoint source pollution, and without an effective enforcement mechanism or a system of positive incentives, the new policy was easily circumvented by the creative and enterprising farmers.

The national government found that it was much easier and cheaper to regulate urban rather than agricultural nutrient loads. Not only were some nutrient regulations unenforceable, but farmers overtly resisted by demanding monetary incentives to adopt nutrient management plans. Some farms outright refused because their methods were a continuation of family or community tradition. Eutrophication and agricultural pollution were also not widely understood by the public, adding to the complacency among farmers about circumventing regulations. Harremoes (1997) contends that the policies would have been more effective had there been less public and farmer ignorance about the issue of nonpoint pollution and eutrophication.

Lijklema (1997) expressed concern for the environmental policy situation in his country, saying the time constraints of social and political processes were equally significant in controlling eutrophication as the time constraints of the "inherent physical processes driving environmental change." In other words, the views of a government and its constituents that drive public policy could not keep up with growing environmental needs and challenges such as eutrophication. The success of a nutrient reduction strategy, he says, will be limited by its political and social acceptance. Lijklema believes government personnel, farmers and citizens must be educated on the causes and ill-effects of nutrient loading and eutrophication before compliance can be expected. "It may also be necessary," he says "to support farmers, in the form of economic incentives, to reduce manure and fertilizer application."

Over the years, limiting measures taken by the Netherlands have been steadily tightened up

(in a phased approach) and the amount of research into proposed problem solutions has simultaneously increased (CEEP, 1998). Though the Netherlands represents an international policy case without a direct connection to U.S. public policy, their legislative attempts and government-funded studies influenced U.S. environmental policy on nonpoint-source pollution. The Netherlands-based studies (particularly, Shortle & Abler [1994]) are often the basis of continued research on NPS pollution by the EPA and USDA. Because of this early research and the policy problems unfolding in the Netherlands, environmental policymakers here were in a better position to direct the U.S. toward more efficient and effective agricultural pollution abatement programs.

Federal Initiatives and Guidance to State Programs

The regulatory problems in the Netherlands gave federal legislators and environmental officials in the U.S. some foresight in discussing effective national NPS pollution abatement strategies. There were doubts as to whether regulatory control would be feasible. Though not decided on appropriate long-term regulatory strategies, the EPA and federal legislators took action to bring NPS pollution to the national environmental agenda. In a move to convey concern for NPS pollution to the states, federal legislators and the EPA took a guarded first step and introduced legislation on NPS pollution by amending in 1987 the Federal Water Pollution Control Act of 1972. This piece of legislation is commonly known as the Clean Water Act (CWA).

The 1972 CWA deals mostly with point-source pollution through specific, technology-based controls; NPS pollution was not addressed. In contrast to its stringent policies on point-source pollution, the 1987 CWA NPS pollution strategy is relatively vague and passive. The CWA delegates responsibility for NPS pollution to the states in a regulatory manner. The CWA does not directly address NPS issues; instead, it requires states to develop the plans that directly target NPS pollution. The EPA is there to make sure the states are meeting their planning responsibilities.

When technology-based controls described in the original legislation are inadequate for waters to meet water quality standards, Section 303(d) of the 1987 CWA requires states to identify those waters and to develop total maximum daily loads (TMDL's) for nitrogen and phospho-

rous. A TMDL is the sum of individual waste allocations for point sources, load allocations for nonpoint sources, natural background, and a margin of safety (EPA, 1998a). A TMDL approach forces the accounting of all sources of pollution. This helps identify how additional basin reductions, if needed, might be obtained. The EPA takes responsibility for developing TMDL's if a state fails to act (USDA, 1999; EPA, 1998a).

Once a state identifies the affected surface waters, load reductions are to be pursued through nonpoint source programs authorized under CWA § 319. This section established the EPA's Nonpoint Source Program, which mandates that states develop and promote nonpoint-source management plans and supporting programs (EPA, 1998a). According to the EPA (2004), Congress approved § 319 because "it recognized the need for greater federal leadership to help focus state and local NPS control efforts." The program provides grants, guidance and technical support to help states meet these requirements. States had a deadline of 1995 for developing and implementing nonpoint-source management plans, and by November 1994 all states had met these needs and began applying for federal grants authorized by § 319. EPA regional offices began awarding grants as early as 1990, and had awarded \$470 million by the end of fiscal year 1996.

In 1996, the EPA issued new guidance to EPA Regional and State Water Quality Program Directors concerning the award of grants and implementation of § 319 state programs. While there were a number of success stories about grants that helped to restore rivers, wetlands, and inlets, states had paid little attention to lake protection and restoration. The new EPA (1996) guidance encouraged states to address these lake issues with § 319 grants:

Lake protection and restoration activities are eligible for funding under Section 319(h) to the same extent, and subject to the same criteria, as activities to protect and restore other types of waterbodies from nonpoint source pollution. States are encouraged to use Section 319 funding for eligible activities that might have been funded in previous years under Section 314 [Clean Lakes Program] of the Clean Water Act.

The Clean Lakes Program was established in § 314 by the original 1972 CWA to provide

states grants for various in-lake and bank restoration projects; its operations and funds have since been rolled into the newer Nonpoint Source Program of § 319. In the same 1996 guidance the EPA also remained steadfast to principles of responsible public policy—making sure funds were being allocated to treat the cause (NPS pollution) and not the problem (eutrophication):

However, Section 319 funds should not be used for in-lake work such as aquatic macrophyte harvesting or dredging, unless the sources of pollution have been addressed sufficiently to assure that the pollution being remediated will not recur.

In another round of guidance two years later, the EPA (1998a) introduced a new CWA-related initiative to ensure that priority lake management needs were met. The Clean Water Action Plan was developed jointly in 1998 by the EPA, USDA, and other agencies at the request of the Clinton White House. The Plan was the first national, coordinated assessment of watershed conditions and statement of watershed priorities by states. The Plan called for states to upgrade their NPS programs by submitting “unified” watershed assessments and priorities for federal review by August 1998. While not an official amendment to the CWA, the Plan was able to change the dynamics of state NPS programs because the EPA (with direction from the White House) used additional funding as a lure. The Plan provided that beginning in fiscal year 2000, states that had completed their unified watershed assessments would receive exclusive application rights to an additional \$100 million in § 319 grants after the first \$100 million in grants available to all states had been allocated. The additional incentive, which was made possible by Congress doubling the EPA’s budget for NPS programs to \$200 million in 1999, brought states into compliance without legislative recourse (EPA, 1998b).

Additional guidance encouraged states to make more use of the Clean Water State Revolving Fund (CW-SRF) to address NPS problems. The CW-SRF was created by Congress to ensure that it would be able to fund virtually any type of water quality improvement project. Of importance to lake managers, the CW-SRF can fund NPS controls as long as the problem is identified in the EPA-mandated state NPS management programs. The fund has in excess of \$24 billion and from 1989 to 1998 it funded more than \$650

million in NPS projects. Thus, in addition to the annual grant funds available under § 319, an enormous potential exists for using the CW-SRF in lake restoration and protection projects (EPA, 1998a).

The above EPA guidance from 1996 and 1998 was intended to clarify national NPS policy to include lake management and to marshal EPA, state and local staff working on lake programs, the § 319 program, the TMDL program, and the CW-SRF to address each other’s needs in the management of lakes and their watersheds. For example, EPA Regional staff members were asked to “discuss with their counterparts in the states how the above policy considerations can be applied to meet lake management needs in a particular state,” (EPA, 1998a). The EPA guidance was also intended to provide more transparency and exposure to federal NPS-inclusive programs in easily accessible, clearly-articulated and often repetitive memoranda. This helped state and local watershed managers understand the extent and limits of federal involvement in NPS control and surface-water preservation.

These EPA programs can exercise *indirect* regulatory control over NPS pollution; they are meant to force NPS pollution on the environmental agenda at the state level (by requiring states to consider regulatory and/or non-regulatory NPS pollution abatement), while providing the necessary funding to carry out minimum-standard abatement programs. Shortly after the passage of the 1987 CWA, which identified agricultural NPS pollution as a major obstacle to achieving water quality goals, the U.S. Department of Agriculture (USDA) cooperated with the EPA and became the second major federal NPS policy player. The USDA took a more active role by funding a series of water quality and policy studies that aimed to find practical strategies for dealing *directly* with agricultural NPS. These USDA studies identified feasible regulatory and non-regulatory abatement programs and guided future federal and state NPS policy formulations.

One of the more well-known USDA studies, used previously in this report to help develop the framework for NPS policy analysis, is *Economics of Water Quality Protection* (1999). This policy study favored voluntary, design-based economic incentive conservation programs. The Farm Security and Rural Investment Act of 2002 (commonly known as the Farm Bill) advanced these recommended programs through the USDA in a “significant commitment of resources toward conservation on private [agricultural] lands.” The legislation responded to a broad range of prob-

lems faced by American farmers and ranchers, including natural resource challenges such as nutrient management. Private farms now benefit from an array of cost-effective voluntary assistance, including cost-share, land rental, incentive payment and technical assistance programs to help reduce NPS runoff (USDA, 2002).

The Farm Bill authorized and reauthorized a number of incentive-based conservation programs to directly manage NPS problems from the federal level. The USDA's Environmental Quality Incentives Program (EQIP) provides technical, educational and financial assistance to eligible farmers to address soil and water concerns in an environmentally beneficial and cost-effective manner. Five- to ten-year contracts may include design-based incentive payments as well as cost-sharing of up to 75 percent of the costs of installing approved nutrient management practices and structures (such as manure containment structures). EQIP contracts are managed locally by USDA branch offices. The Water Quality Program (WQP), which was merged into EQIP by the Farm Bill, was established to research the relationship between agricultural activities and water quality.

These EPA and USDA-administered programs are the extent of federal involvement in agricultural NPS pollution abatement. The EPA programs indirectly influence NPS pollution policy by forcing states to consider agricultural NPS pollution a top environmental priority and to develop programs that *directly* address these issues. The USDA programs more directly influence NPS pollution abatement from the federal level by working with individual cases at the local level, operating through their previously established branch offices. However, neither federal agency regulates nutrient use or NPS pollution to the extent seen in the Netherlands. In the United States, even the most egregious agricultural NPS polluters are free from federal involvement in their nutrient management practices. From the farmer's perspective, the federal government has no regulatory role in agricultural nutrient pollution; the USDA programs are voluntary and may or may not provide enough incentives to adopt environmentally sound nutrient management practices. Any regulation on a farmer's application of nutrients or NPS pollution prevention hinges entirely on the state's discretion.

Managing State NPS Programs: New York's Management of NPS Pollution

New York has identified nonpoint sources as the primary cause of water quality problems in 91% of its priority waterbodies (EPA, 2003). A number of locally-administered federal programs and state initiatives manage agricultural NPS pollution in New York State. The USDA operates branches in most agricultural counties in New York, including Chautauqua County, where the USDA's Natural Resource Conservation Service (NRCS) administers EQIP separately in each locale. Local offices for the USDA's Farm Service Agency also provide technical services for NPS abatement.

In 2003, the USDA and New York State launched the Conservation Reserve Enhancement Program (CREP) in a cooperative to enhance the state's portfolio of NPS pollution programs, which are organized under the state's Agricultural Environmental Management (AEM) initiative. The AEM funds watershed rehabilitation projects throughout New York, and it coordinates most federal and state agricultural NPS pollution programs, including the USDA-NRCS and EQIP, CREP, and New York's Agricultural Nonpoint Source Abatement & Control Program (ANSACP). This allows New York State to more efficiently allocate federal and state funds available for NPS abatement to watersheds where they are needed most (New York State Department of Agriculture & Markets [NYSDAM], n.d.). New York first established the AEM and related state programs to meet Clean Water Act mandates.

The management of agricultural NPS pollution in New York began with the requirements of CWA § 303(d) and § 319. Section 303(d) established TMDL's for nutrient-polluted surface waters, while § 319 mandates that state programs be created to restore and protect these waters. Under § 319, the governor of each state (for that state or in combination with adjacent states), must submit to the EPA for approval a management program for controlling the NPS pollution of navigable waters within their boundaries. Specifically, states must: (1) identify agricultural management practices that reduce nutrient loadings; (2) develop regulatory or non-regulatory programs (for enforcement, technical assistance, financial assistance, education, training, etc.) to support NPS management practices; (3) receive certification of the attorney general of that state that the laws of the state provide adequate

authority to implement such management programs; and (4) utilize local public and private agencies and organizations that have expertise in the control of NPS pollution (EPA, 1994). In adhering to CWA § 319 and the elective standards of the *Clean Water Action Plan*, New York has developed such plans on a watershed-by-watershed basis under ANSACP and then under AEM.

New York's ANSACP was established independently of the state legislature by the Governor's Office in 1994 to meet the requirements of § 319. The program provides competitive grants that are awarded through each county's Soil & Water Conservation District, which are administered at the state level by the NYS Soil & Water Conservation Committee (a group of agricultural and environmental experts that is appointed by and reports directly to the Governor's Office). Since the AEM program began in 2000, most ANSACP grants have been added to the pool of federal and state NPS abatement funds managed under AEM, and they are awarded only to farms implementing approved AEM plans (NYSDAM, 2001).

Funds awarded under ANSACP come from both federal and state sources including the EPA under § 319, the New York State Environmental Protection Fund, and the state's 1996 Clean Water/Clean Air Bond Act (EPA, 2002; New York State Soil & Water Conservation Committee [NYSSWCC], 2004). Through fiscal year 1998, a total of \$1.86 million in § 319 funds had been used to develop and promote the program in New York's agricultural community. Before ANSACP funds were absorbed by AEM in 2000, the total allocation of state funding sources stood at \$20.4 million. Clearly, the bulk of ANSACP's financial burden fell on the state. Through not used for New York's ANSACP, other sources of federal funding for state NPS programs include the USDA's NRCS and Small Watershed Program (USDA, 1999).

The total federal share of costs (EPA plus USDA funds) cannot exceed 60% of the costs incurred by the state in implementing NPS programs. However, states can rely on a combination of alternative funding sources to implement NPS controls. In 1994, the EPA published *A State and Local Government Guide to Environmental Program Funding Alternatives*. This brochure gives examples of how states and local governments can use the CW-SRF, leases, grants, taxes, fees, and bonds to craft innovative strategies to generate funds for NPS controls (EPA, 2004).

Before the year 2000, projects selected for ANSACP grants were required to address a significant water quality need, propose a cost-effective

solution to the problem, and the solution must have local landowner support along with "significant" financial support (NYSSWCC, 2004). Between 1994 and 2000, the program provided \$26 million for projects across the state. However, ANSACP provided a mere \$77,100 to a single project in Chautauqua County that cost \$137,450 to build three water retaining structures in the French Creek Watershed (NYSSWCC, 2003). Since ANSACP's inclusion into the AEM program, the Chautauqua County Soil & Water Conservation District has received an additional \$260,000 to build leachate management systems on eight large farms in the Chautauqua and Cattaraugus County portions of the Upper Conewango Creek watershed. The Chautauqua Lake Watershed, adjacent to both the French and Upper Conewango Creek watersheds, has seen no funding from ANSACP or AEM (New York State Office of the Governor, 2004).

A toughening of federal standards for § 319-funded state programs, as expressed by the 1998 *Clean Water Action Plan*, led to a revamping and legislative formalization of ANSACP under the Agricultural Environmental Management Act of 2000. The act, which established the state's AEM program, was signed into NYS law by Governor Pataki after the state legislature's approval. The act ensured that agricultural NPS programs once represented by ANSACP (and now by the AEM program) would continue receiving maximum federal § 319 funding.

The AEM program follows the voluntary, economic incentive-based model to protecting water quality similar to USDA's EQIP. The EPA (2002) is very supportive of New York's AEM program, calling it "an innovative state program that has put New York in the forefront of a national effort to help farmers identify and address agricultural nonpoint source pollution." Through AEM, New York is coordinating more than 50 nonpoint source programs and numerous federal, state and local agencies. AEM operates at both the state and local levels to provide financial, educational, technical, and regulatory compliance assistance to farmers who wish to voluntarily develop and implement AEM plans. While the state provides the administrative, cooperative and fiscal framework through the NYSSWCC, actual watershed conservation and agricultural planning initiatives are led by a variety of local private groups and government agencies. These may include private watershed conservation groups, university cooperatives, county planning departments, local USDA branch offices, and the local Conservation District led by the NYSSWCC (NYSSWCC, 2002).

For example, the AEM-sponsored Skaneateles Lake Watershed Agricultural Program (the first NYS-funded agricultural NPS program started in 1994 via ANSACP) is a cooperative effort of the local Soil & Water Conservation District, Cornell University's Cooperative Extension and the USDA's NRCS offices of Onondaga, Cayuga and Cortland counties. Under the direction of the NYSSWCC, this early and successful partnership grew into the present AEM Steering Committee that guides AEM statewide.

The AEM process is modeled after the Skaneateles program, which utilizes a tiered approach to address agricultural nutrient management and other environmental concerns by developing and implementing "Whole Farm Plans" for individual farms in the watershed. The process begins with an assessment of farm activities to identify good stewardship practices and areas of environmental concern. The farmer and local program managers then develop a conservation plan that addresses the areas of concern and is tailored to the individual goals of the farm. Plans are then implemented by coordinating the use of available federal, state, and local financial, educational and technical assistance (for example, a local AEM initiative may aid farms in obtaining federal grants such as those offered by the USDA's EQIP). Finally, the farmer and local managers will perform occasional evaluations to ensure protection of the environment and viability of the farm (NYSSWCC, 2002).

AEM provides successful and efficient NPS programs where it operates because it provides the framework for less state and more local direction. The AEM program finances and supports local conservation partners to tailor a program to best fit the needs of their local environment and individual farm operations in targeted areas throughout the state. This gives New York's AEM certain advantages over other state and federal NPS programs or policies that operate or regulate uniformly over all target watersheds. The localized AEM operations are better able to address the watershed and site-specific factors of NPS pollution, which the USDA's *Economics of Water Quality* (1999) study says leads to more effective and efficient policies (runoff depends on many site-specific factors). Localized initiatives or regulations led by local groups or authorities also tend to have higher participation or compliance rates among farmers because the programs are less questionably aligned with local rather than distant (state or federal) interests. Presently, fifty out of fifty-five farms in the

Skaneateles Lake Watershed have signed up for the program, representing over 95% of the agricultural land in the watershed (NYSSWCC, 2002).

However, as a statewide initiative, AEM's success is limited by its spotty coverage. The program's operations have been highly concentrated in five watersheds: New York City, Skaneateles Lake, Wappinger's Creek, Upper Susquehanna Basin, and Keuka Lake (NYSDAM, n.d.). No AEM initiatives have been established in the Chautauqua Lake watershed. There is no information regarding any estimated completion date of the current "pilot phase," or when AEM programs will be initiated in other watersheds across the state.

Aside from participation in AEM efforts, federal agencies also provide independent agricultural NPS abatement programs in New York State. Though officially federal programs, they deserve attention in this section on state initiatives because they operate at the state level and are managed like state programs. They also warrant attention because their survey helps one to understand the extent to which federal programs reach agricultural NPS programs at the state and local levels.

The most recognized federal agency for agricultural NPS pollution abatement in New York is the USDA-NRCS. The NRCS of New York is managed by the NRCS State Conservationist. The State Conservationist, much like the Governor of New York with his NYSSWCC, appoints the State Technical Committee to assemble ideas and make recommendations for the development and coordination of USDA conservation programs in locales across the state.

The State Technical Committee uses sub-committees to work on the details of NRCS program recommendations for New York. With a focus on EQIP, these sub-committees identify resource concerns and recommend farm management practices, priorities, payment rates and cost-share levels. Additional committees of field office-level personnel guide the creation of ranking criteria for EQIP grant applications that are consistent with State and Federal water quality goals. At the recommendation of the State Technical Committee, the following resource concerns for New York were identified for 2003-04, in order of priority: (1) the reduction of agricultural nonpoint source pollution, (2) the reduction of soil erosion and sedimentation, (3) the reduction of farm emissions, and (4) the promotion of at-risk specie habitats. The Committee also developed a list of eligible practices to address these priorities (USDA-NRCS, 2003a).

The EQIP process begins when a farmer

calls or visits the local USDA branch office, where an NRCS conservationist helps the farmer to develop a plan, including selected conservation practices. Each farm that applies for EQIP cost-sharing is ranked according to criteria consistent with the above priorities and for total environmental benefits gained (USDA-NRCS, 2003b). However, points are awarded only if the farm's target area is within 300 feet of surface water, fields containing "hydrologic-A" soils or fields overlaying a sole-source aquifer. Surface water is defined as a "blue-lined" stream, either solid or dashed, or ponds and lakes appearing on a USGS map (USDA-NRCS, 2003a). The New York implementation of EQIP is competitive; 47 percent of applicants received funding in 2002. EQIP cost-share rates in New York vary from 50-90 percent of the total project cost (USDA-NRCS, 2003b).

Most states have incentive-based programs similar to the USDA's EQIP. States provide incentives to farmers to adopt management practices that reduce NPS pollution. Common strategies include watershed and land-use planning, development of voluntary best-management practices (BMP's), technical assistance programs and cost-sharing for prevention and control measures. Recently, more states have been moving beyond a voluntary approach to address NPS pollution. Mechanisms to enforce certain behavior include regulation and liability provisions. State laws using such provisions for NPS pollution vary widely in definitions, enforcement mechanisms, scope and procedures, largely because of the absence of federal direction in this area. Catalysts moving states toward stronger measures include immediate and urgent problems (i.e. the contamination of ground water in Nebraska), the use of federally-mandated TMDL provisions and the improving technical ability of states to assess their waters.

States are using five mechanisms to make the adoption of BMP's more enforceable. These include making (1) BMP's directly enforceable in connection with required plans and permits; (2) BMP's enforceable if the producer is a "bad actor;" (3) compliance with BMP's a defense to a regulatory violation; (4) BMP's the basis for an exemption from a regulatory program; and (5) compliance with BMP's a defense to liability actions. While many states have regulatory provisions that address water quality as it relates to agricultural NPS pollution, they often target only a subset of water quality problems. Few states deal with agricultural NPS pollution in a comprehensive regulatory manner; most states target either an individual pollutant (i.e. sediments), a region (i.e.

coastal zone), or a type of operation (i.e. swine). According the USDA (1999), New York State has some of the *least* comprehensive regulations in the United States, lacking nutrient plan requirements and pesticide and sediment restrictions. New York does have standards regulating Concentrated Animal Feeding Operations (CAFO's), but this is the extent of their agro-environmental regulation.

However, New York has one of the more successful voluntary NPS control programs in the country. By convincing federal, state and local agencies to shift emphasis and to refocus their efforts, New York has been able to implement an integrated NPS control program, "with a \$ 319-funded staff making coordination a reality" (NYSDAM). Nearly every organization discussed thus far has a role in the AEM program, including the EPA and USDA at the federal level. Unfortunately, none of AEM's great successes have reached the Chautauqua Lake watershed. If NPS controls are to be placed in the CLW, and if eutrophication is to be battled in Chautauqua Lake, governing bodies closer to the environmental interests of the CLW will have to be the responsible parties.

Local Initiatives: Management of the Chautauqua Lake Watershed

The Chautauqua Lake watershed covers 180.5 square miles in Chautauqua County, the second largest agricultural county in New York in terms of acreage and first in terms of number of farms. The entirety of five municipalities and portions of four others fall inside the watershed, which drains into the 20.5 square mile Chautauqua Lake (Wilson, Riforgiat, & Boria, 2000). The lake is 17.3 miles long with an average depth of 19 feet (Chautauqua County Planning Department, 2002). The lake drains southward to its only outlet, the Chadakoin River, a tributary to the Allegheny-Ohio-Mississippi River system.

Because state NPS control programs have overlooked the CLW, one would expect Chautauqua County to lead efforts at pollution abatement and maintenance inside the watershed. This is not the case. The Chautauqua County Planning Department plays minor roles by funding research and water quality testing, but there is no mechanism in the county government to provide further environmental protection. Instead, citizens have taken the initiative to create a variety of private groups to fill preservation and maintenance roles, while the USDA operates EQIP locally with its office in Chautauqua County.

Currently, this assortment of uncoordinated bodies provides the only ammunition to target the growing NPS pollution problem in the CLW.

There are two main private bodies that manage the lake and its watershed. The Chautauqua Watershed Conservancy (CWC) plays an advocacy and prevention role, while the Chautauqua Lake Association (CLA) plays a treatment role. Both organizations are funded primarily by private donations, though the state and county provide some financial assistance. More specific information on the portion of funding by public versus private sources was not available. News releases for two cooperative land-purchases between the state and CWC in 1998 place the state contribution at 45 and 95 percent, respectively. However, these two purchasing projects represent only a small portion of the CWC's activities (New York State Office of the Governor, 1998; New York State Department of Environmental Conservation, 2002).

The CWC is a county-wide organization with "a mission to preserve and enhance the water quality, scenic beauty and ecological health of the lakes, streams and watersheds of the Chautauqua regions." Since its creation in 1990, the CWC has led environmentally sensitive land-purchasing agreements, community-based education initiatives, cooperative research studies and water quality monitoring, and efforts to communicate watershed conservation as a top public priority (CWC, 2003a). The CWC also serves an advocacy role, acting as an intermediary between state and local government officials and watershed environmental interests.

Though the CWC has made efforts to purchase agricultural shore lands to remove their nutrient-polluting and erosive capacity, agricultural NPS pollution is not their focus. Most of the CWC's efforts are community-focused, such as educational initiatives discouraging homeowners from over-fertilizing their lawns or educating developers and shore-line owners on the connection between erosion and eutrophication. As a part of their community education efforts, the CWC releases a quarterly newsletter that highlights anything from erosion control to recent conferences on lake management involving cooperating private groups. Eutrophication prevention is one of their main focuses, but the CWC does not place emphasis on what many experts point to as its primary cause—agricultural NPS pollution.

More important than the CWC's explicit environmental activities, however, is what it represents. They are a collection of voices from

an environmentally-concerned local citizenry. The CWC has built cooperatives between the county and state, and representatives from both governments have made the concerns of their environmentally-concerned constituents a higher priority. While not lobbyists in the traditional sense, the CWC has performed many of their mediating and representative functions, bringing their agenda to the public forum.

The Chautauqua Lake Association (CLA), the second private group, manages the results of the eutrophication rather than its causes. The CLA is not a conservation group, and it performs tasks that are commonly mistaken as government services. The majority of CLA funding comes from private donors. To supplement its private funding, the CLA applies for and receives capital from states, county and municipal governments and from local foundations. The CLA requires an annual budget of nearly \$300,000 to operate. In addition to its summertime operations (when weed growth is at its peak) the CLA must maintain a \$250,000 housing facility and \$750,000 in equipment that includes five seaweed harvesters, two powered work barges, two mobile conveyor belts, an outboard motor boat, four trucks and a forklift (CLA, 2002).

The CLA uses this equipment each summer to make the shorelines of Chautauqua Lake swimmable and navigable. While many locals and vacationers mistake the seaweed harvesting operations as a public service like waste management, the CLA is a private organization of citizens. The county does not feel responsible for weed management, and municipalities adjacent to the lake have not coordinated to create a government body to replace the CLA or to formalize annual funding allocations for CLA operations.

Calls for greater government financial assistance in the preservation and maintenance roles filled by the CWC and CLA led to a county-funded study to find a public policy solution. These two private groups, after all, are preserving a public body of water for public use and are maintaining a public problem as defined by the Clean Water Act of 1972 and the Clinton White House. While the county refuses to accept an administrative role in the problem, it seems to accept the shortcomings of municipal cooperative attempts and the economic value of the lake to the county and its tourism industry. The county led a significant research agenda to find a solution and took the initiative to assign public responsibility.

A study funded by the Chautauqua County Planning Department (2002) sought to assess the

environmental damage to Chautauqua Lake from eutrophication and to make recommendations for NPS controls to be implemented by municipalities in the watershed. Strategies recommended include in-lake management (seaweed harvesting and herbicide treatments) and watershed-wide initiatives. The most pressing need identified by the study is the creation of a government entity that can implement the recommendations of the study and execute a watershed management strategy. This includes the identification and establishment of an administrative body with necessary taxation authority to implement lake management initiatives. However, such an authority must receive a charter from the state:

In order to establish such a body, which is capable of promulgating and enforcing regulations, and possibly levying taxes to support its efforts, action by the State legislature is... necessary. (Chautauqua County Planning Department, 2000)

Other than this legal hurdle, there are social and political obstacles as well. The study stressed that any action to create a lake management district would require the full support of local communities around the lake and inside of the watershed. Gaining this support would require an educational effort that reaches both local officials and their constituents. Educational programs would need to focus on the general quality of the lake, the role that vegetation plays in that quality and the development of realistic expectations regarding aquatic vegetation (Chautauqua County Planning Department, 2000). As previously reported, a study in the Netherlands by Lijklema (1997) found that this educational process was crucial to the success of any nutrient reduction strategy. Government personnel, farmers and citizens must be educated on the causes and ill-effects of nutrient loading and eutrophication before compliance can be expected; the Planning Department's suggestions reflect this conclusion.

To begin the formulation and acceptance process, the study suggests creating an advisory board comprised of existing Citizen Advisory Council members (who advise the Planning Department) and representatives of local communities. In working through the County's Local Waterfront Revitalization Program (within the Chautauqua County Planning Department) and other avenues, the advisory board is to encourage local communities, County govern-

ment, and other entities to enact as many recommendations in the study as possible. The advisory board would also prepare for the creation of an administrative body capable of enacting a management plan independently (Chautauqua County Planning Department, 2000).

Both preventive measures (managed by the CWC) and symptom control (managed by the CLA) were included in the lake management practices suggested by the study. On the preventive side, however, the study was limited in its analysis of agricultural pollution and was cautious in suggesting controls on agricultural nutrients. Most BMP's were low-cost in nature, such as those launched through community education programs to encourage such practices as car-washing on grass instead of driveways and lawn care that avoids the unnecessary use of fertilizers. Agricultural BMP's were approached with caution:

More costly BMP's, such as requiring farms to implement whole farm management planning, may not be cost-effective but should be encouraged, especially when State or federal funding can be used to help implement the process. Care should be exercised in implementing expensive BMP's, especially when these put pressure on dairy farming the watershed. The loss of dairy farming in the watershed could mean the loss of valuable open space. (Chautauqua County Planning Department, 2000)

Other preventive measures include more extensive community education programs and further research into the lake's vegetation and organisms, including the routine monitoring of the abundance, location and composition of the lake's rooted and algal vegetation. Continuing work towards understanding nutrient loading in Chautauqua Lake is also suggested.

In dealing with the symptoms of eutrophication, the study concentrated on in-lake management. In the two summers before the study was published (1999 and 2000) there were "bumper crops" of aquatic vegetation; damage control became a higher immediate priority than prevention, though evidence is building that removing in-lake vegetation serves a preventive role by removing nutrients from the lake that would otherwise be recycled in the next year's weed growth. The strategies for seaweed control include harvesting and herbicide use, as outlined by the NYS Aquatic

Vegetation Control Program. Research on alternative methods for vegetation control, such as using weevils and water moths, was also suggested.

Shortly after the publication of the Planning Department's study, county and municipal officials organized a proposal to carry out its recommendations. The proposal would create a district to coordinate and implement lake and watershed protection and improvement efforts. Such protection and improvement efforts would include direct or contracted seaweed harvesting, water quality monitoring, research on alternative methods of vegetation control and agricultural NPS pollution regulation via municipal zoning restrictions. County and municipal officials believe the lake needs to be managed by one entity to prevent contradictory management decisions from "nullifying one another or freezing the entire management process," (*Legislative*, 2004).

The district's members originally included the nine municipalities with all or portions of their land in the watershed, but it was later cut down to the five municipalities adjacent to the lake. Representatives from these five municipalities would make up the district's board. Like a municipal government, the district's board would be able to hire employees, enter into contracts with municipalities, hold permissive referendums and hold hearings and forums. After holding public meetings and allowing time for petitions and referendums, the district would also have the power to override municipal zoning restrictions to launch district-wide land-use regulations. Funding for the district would come from a property tax allotment from each member municipality, essentially giving the district the power to levy taxes. The tax would have a maximum of \$1.00 per \$1,000 of assessed value on a property, though initially it "probably would not exceed ten cents," according to an involved municipal supervisor (Roselle, 2003). Such regulatory and taxing power requires authorization from the state legislature.

On its way onto the state legislative agenda, the district was sponsored by state senator Patricia K. McGee, who wrote and presented the bill for passage in the State Finance Committee and then the state legislature. In its introduction, Bill#1335 proposed "an act to create the Chautauqua Lake Protection and Improvement District." The bill laid out the powers, responsibilities and administrative structure of the district. Also in the bill is an explanation of local legal processes that must take place before the district takes effect. This includes written municipal agreements, advertised public hearings on the purpose and powers

of the district and the chance for affected property owners to vote on the district through a petition-induced referendum. When a town passes a resolution for the creation of the lake district, § 4 of the drafted bill provides residents opposed to the district 30 days to submit a petition signed by five percent of the proposed district's eligible voters to force a permissive referendum. Residents in the towns will be able to express their concerns, ask questions and make suggestions about the document during a series of public information meetings to be held in the towns.

During these meetings it was recorded that many people were opposed to another tax and another layer of government being formed to undertake these activities. Some were concerned that this body would have enforcement powers that would impact their property rights. It was suggested that other funding sources be explored. Over and over, it was stated that the county should be responsible for lake management programs due to the county-wide economic impact of this resource, and because its watershed covers nine municipalities, not just the five towns included in the district. Many citizens also stated their support for creating a body to address the lake and watershed management needs that are not being sufficiently addressed by existing government programs and private organizations like the CWC and CLA. A more effective plant management program was cited as an example (CWC, 2003b).

Opposition to the lake management district goes beyond that which was voiced locally in the town meetings. The Chautauqua County Farm Bureau, a local chapter of the New York Farm Bureau (a lobbying group that represents agricultural interests in New York State), finds the zoning and regulatory provisions of the district to be "invasive." Further, it complained that the land included in the district changed from the five townships bordering the lake to the portions of those five townships within the watershed (despite the fact that portions of four other townships are in the watershed but not adjacent to the lake). The Farm Bureau questions why this smaller body of landowners should be responsible for the pollution of all landowners in the watershed, which includes nine towns (New York Farm Bureau, 2003a). The Chautauqua County Farm Bureau attended an informational meeting held concurrently with the public hearing process, and the Bureau brought in officials from other states that battled similar lake districts. The Bureau said it would fight the district unless agricultural interests were taken into account as other lake districts had done:

In one of those districts, farmers were exempted from taxation, and the overall objective of the district was to help landowners prevent pollution while providing lake management resources. Our members who attended meetings indicated a willingness to support a district if it were constructed similar to the district cited at this meeting. (New York Farm Bureau, 2003b)

The New York Farm Bureau reports that it sent staff members to Albany to represent Chautauqua County agricultural interests at the state level and has been discussing issues of concern with state lawmakers (New York Farm Bureau, 2003b).

Currently, the bill has been approved by each municipal government involved and has been referred to the NYS Senate Finance Committee for approval. A referral, however, does not mean the bill will come before the committee for a vote. If it is approved, it is taken out of committee and placed on the Senate calendar. Being on the Senate calendar allows a bill to be taken to the Senate floor for a vote (Roselle, 2003). If approved, Bill #1335 would allow for the creation of a new government entity empowered to levy taxes in managing the lake.

Conclusions

Because the exact source of NPS pollution cannot be determined, the regulation and abatement of agricultural nutrient pollution is especially difficult because responsibility cannot be assigned to a single party. This presents an unusual environmental policy dilemma that the federal government is struggling to sort out; liability for pollution from point sources is easily assessed at the point of discharge (i.e. drainage pipe or smokestack). The national, centralized policies on point-source pollution are uniform, efficient and more easily regulated by the EPA. However, the nature of NPS pollution prevents efficient policy outcomes from the national level, as was observed in the Netherlands where non-compliance issues reigned. Further, because watersheds and agricultural land have unique geological and hydrological features, the USDA suggests the more efficient NPS policies operate at the most local levels.

The United States perceived agricultural NPS pollution as a national issue but, for reasons of efficiency and effectiveness, did not feel it should be uniformly regulated or controlled from

the national level. Instead, the federal government opted for more decentralized policies with less sweeping and stringent standards via the 1987 CWA and subsequent actions by the EPA and Clinton administration. This forced NPS pollution on to each state governor's agenda, preserving it as a national issue despite the lack of federal regulation. The EPA would not interfere with the farmer on the local level, but it would induce states to consider regulating NPS sources or to provide incentives to farmers to adopt BMP's or nutrient management plans.

The USDA addressed the issue more directly from the national level by integrating design-based economic incentive programs (i.e. EQIP) into its Natural Resource Conservation Service. This represented a centralized policy that bypassed state, county and local governments. EQIP provides uniform services across the country through its local bureau offices. While their operations are successful and efficient at the local level, the USDA programs are not expansive enough to battle the nationwide NPS problem. Their services are limited to USDA-member farms and require a great deal of farmer initiative. Enrollment is also limited by USDA resources. This limits EQIP's effectiveness as a national abatement policy with uniform national goals, but this was not the intended role for the USDA program. It is successful and efficient when viewed as a collection of local programs with unique goals for each locale, each managed with a different knowledge of area farming and local hydrological characteristics.

The management of agricultural NPS pollution by New York State began with the requirements of CWA § 303(d) and § 319. New York developed their ANSACP and AEM programs to be eligible for full § 319 funding, but the utility of meeting these requirements is questionable. Before ANSACP was absorbed by AEM in 2000, the state's contribution to the program stood at \$20.4 million, while the federal share was a mere \$1.86 million through 1998. Clearly, the state foots most of the bill for these programs required by the EPA. AEM might be a more successful state-wide program if the EPA more equitably matched the state's contribution. A federal matching program might also encourage states to allocate more funds to their § 319 programs.

The AEM program follows the voluntary, design-based economic incentive model similar to the USDA's EQIP. The AEM is a successful program where it operates locally. It finances and supports local conservation partners to customize a program to best fit the needs of their

local, individual farm operations in target areas throughout the state. AEM is administered similarly to EQIP, where a higher level of government operates programs at the local level through already established channels. The USDA operates EQIP through its NRCS branch offices, while New York operates AEM through its Soil & Water Conservation Districts. Like EQIP, locally-led AEM projects work efficiently and successfully where they operate because they are able to address the watershed- and site-specific factors.

However, also similar to EQIP, AEM is not successful when viewed as a state-wide initiative. The program has concentrated its resources on only five watersheds. Therefore, a few watersheds in New York receive the full battery of treatment to control NPS pollution, while the remaining majority of watersheds receive little or no resources at all. The Chautauqua Lake watershed falls into this under-funded majority. If the environmental health of the CLW is to be improved, either AEM needs increased funding to stretch its arms into more watersheds, or lower levels of government must take up the responsibility locally. With New York's budget already stretched and an increase in the pace of § 319 funds to New York unlikely, the responsibility falls to levels of government inside Chautauqua County.

While the Chautauqua County government seems like the most rational unit from which to organize local NPS and lake management programs, the county refuses to take any active role. County officials believe the health of Chautauqua Lake is only in the interest of a small portion of county residents, and the appropriation of county resources for such narrow purposes cannot be justified. This is likely a huge understatement of the lake's importance to the regional economy. An economic impact study of the lake should be undertaken if other avenues to induce County participation are unsuccessful.

If a federal or state agency were to administer a program in the CLW, constituents within the county would have less influence. The CLW would be viewed not only as an asset to the county but also as an asset of the nation or state, worth preserving with tax revenue even if local constituents do not agree. A program administered by the county will raise questions about equal benefits and liability because local interests involved in a local government have much more sway. According to the USDA (1999), more local, decentralized policies give local special interests more influence because they are proportionally larger and face less competition in local politics than in, say,

state politics. Thus far, Chautauqua County has not found the support to administer a comprehensive management program on Chautauqua Lake.

Chautauqua County officials have not completely abandoned the issue, however. As seaweed in the lake became more of a problem in the mid-nineties, the county played a larger role in the lake's health by sponsoring a number of studies. The county realizes at least part of the lake's economic value: Chautauqua Lake is the largest mainland lake in western New York, and its designation as a summer vacation destination by wealthy families from Cleveland, Pittsburgh and beyond provides tourism dollars to businesses and governments within the county. These studies ignited the most promising policy formulations for NPS control in the CLW, those dealing with the creation of a lake management district via the state legislature and watershed municipalities.

Whether or not the bill creating the lake management district will eventually pass is unknown. The district would fill considerable gaps in public responsibility to pollution in the CLW, but the proposal is very unpopular among county farmers and is being heavily lobbied against in Albany by agricultural interest groups. It also covers only five of the nine towns with portions of land in the watershed, leaving farmers in the remaining four towns protected from district interference. Regardless of the future of the lake management district, NPS policies administered by the EPA and New York State have failed the Chautauqua Lake watershed. According to the CWA, NPS controls are the responsibility of the states, not grassroots efforts coming up through county and municipal governments. Municipalities in the CLW have been pushed to legislative recourse in order to create a new political unit to manage and protect a body of water from agricultural NPS pollution. Programs to accomplish such goals should already be provided by New York, as required by the 1987 CWA.

The AEM program is a success where it exists, but it does not exist in many places. If it is assumed that the lake management district never receives approval, then New York State must expand AEM if NPS control needs are to be met in the CLW. The most efficient policy would require AEM to administer a Skaneateles-like program in the CLW, though this would need additional funding from state-issued bonds or other federal sources. Some state officials may call on the EPA to contribute a larger portion in the way of grants, considering they have already passed administrative responsibilities and bear, in New York's

case, only a small slice of the financial burden. However, as EPA memoranda have stated, there are other funding alternatives that most states, including New York, have yet to consider. This includes the Clean Water State Revolving Fund (CW-SRF). The governor's office should consider tapping into this resource for AEM. If additional funding cannot be acquired by the state, then the CLW would benefit most if AEM resources were thinned-out equally among all watersheds in the state. This would less efficiently address local NPS issues across the state, but from the view of environmental interests in the CLW, the inefficient allocation of some funding is desired over the efficient allocation of none. New York has yet to tap alternative funding sources other than their Clean Water/Clean Air Bonds, and the most rational move would lead them to do so before choosing less efficient policy solutions.

While there are success stories in other watersheds, environmental policy on agricultural NPS pollution has failed the CLW. Blame cannot be placed on any single governing body. As it is elsewhere in politics, government agencies will evade responsibility where they legally can or pass it on to lower levels of the governing bureaucracy. The federal government passed the responsibility for NPS control to the states, where programs like New York's AEM meet EPA standards that are vague and lack direction. Local geopolitical friction in Chautauqua County is seen in varying degrees of support and cooperation from watershed municipalities, making a comprehensive, watershed-wide policy solution unlikely. The jurisdictional gray areas in our federal system allow NPS to go unabated in the CLW. No governing body, from the federal to the municipal, is legally responsible for NPS pollution in the Chautauqua Lake watershed. As a result of this gap in public policy, a grassroots effort was necessary to assign public responsibility via the New York legislature. If such efforts are needed for every lake in our country threatened by NPS pollution, or for the 91% of water bodies in New York polluted by agricultural nutrients, this represents an inefficient national policy on NPS pollution. Even if AEM eventually reaches Chautauqua Lake, the federal government will need to provide more direction in NPS legislation to improve national agricultural NPS pollution policy efficiency.

References

- Centre Europeen d'Etudes des Polyphosphates. (1998, January 30). Phosphate Recovery from *Animal Manure: The Possibilities in the Netherlands*. Retrieved February 12, 2004, from <http://www.nhm.ac.uk/minerology/phos/vanruiten.pdf>
- Chautauqua County Planning Department (2000). *Executive Summary: The Management of Chautauqua Lake and its Watershed*. Retrieved February 13, 2004, from <http://www.chautauqua-watershed.org/pubs/2000executivesumm.htm>
- Chautauqua County Planning Department (2002). *Chautauqua Lake Watershed Information Sheet*. Retrieved February 13, 2004, from <http://bfn.org/~chautgov/plan/lakefact.txt>
- Chautauqua Lake Association (2002). *Chautauqua Lake Association*. Retrieved April 7, 2004, from <http://www.nysola.org/cla/cla6.html>
- Chautauqua Watershed Conservancy (2003a). *Chautauqua Watershed Conservancy*. Retrieved April 7, 2004, from <http://www.nfwhc.org/groups/chautauqua.html>
- Chautauqua Watershed Conservancy (2003b, Summer). A Flurry of Lake-Related Meetings Held. *The 'Shed Sheet*, 3.
- Chautauqua Watershed Conservancy (2004, Winter). Simple Solutions May Help Reduce Lake Weeds. *The 'Shed Sheet*, 4. Harremoes, P. (1997).
- The Challenges of Managing Water and Material Balances in Relation to Eutrophication. *Journal of Water Science and Technology*, 37(3), 9-17.
- Legislative Session Information for 2004: Bill Text, Status, Summaries, Sponsor Memos, Floor Votes: Bill #1335* (2004, March) [Data File]. Albany, NY: New York State Senate.
- Lijklema, L. (1997). Dimensions and Scales. *Journal of Water Science and Technology*, 37(3), 1-7.
- Moss, B. (1997). The E Numbers of Eutrophication—Errors, Ecosystem Effects, Economics, Eventualities, Environment and Education. *Journal of Water Science and Technology*, 37(3), 9-17.

New York Farm Bureau. (2003a, May). NY Farm Bureau Regional Reports – May 2003. Retrieved April 7, 2004, from <http://www.nyfb.org/grass-roots/grass0503/regions.htm>

New York Farm Bureau. (2003b, August). *NY Farm Bureau Regional Reports – August 2003*. Retrieved April 7, 2004, from <http://www.nyfb.org/grassroots/grass0803/regions.htm>

New York State Department of Agriculture & Markets. (n.d.) *Agricultural Environmental Management: Farming with the Environment*. Retrieved February 16, 2004, from <http://www.agmkt.state.ny.us/SoilWater/AEMPresentation/sld001.htm>

New York State Department of Agriculture & Markets. (2001, April). *Governor: \$500,000 for Yates County Farmers to Protect Water*. Retrieved February 16, 2004, from <http://www.agmkt.state.ny.us/AD/release.asp?ReleaseID=1199>

New York State Department of Environmental Conservation. (2002, October). *State to Acquire Stow Farm Property on Chautauqua Lake*. Retrieved April 7, 2004, from <http://www.dec.state.ny.us/website/press/pressrel/2002x198.html>

New York State Office of the Governor. (1998, April). *Governor Announces Acquisition of Chautauqua Lake Property*. Retrieved April 7, 2004, from http://www.state.ny.us/governor/press/april3_3_98.html

New York State Office of the Governor. (2004, March). *Governor Announces \$6 Million to Protect New York's Waterways*. Retrieved April 8, 2004, from http://www.state.ny.us/governor/press/year04/march22_04.htm

New York State Soil & Water Conservation Committee. (2002). *Agricultural Environmental Management: Annual Report 2002*. Albany, NY: Author.

New York State Soil & Water Conservation Committee. (2004). *Agricultural Nonpoint Source Abatement & Control Program*. Retrieved February 16, 2004, from <http://www.agmkt.state.ny.us/SoilWater/Projects.html>

New York State Soil & Water Conservation Committee. (2003). *Agricultural Nonpoint Source Abatement & Control Program* (Round 1-8). Retrieved February 16, 2004, from <http://www.agmkt.state.ny.us/SoilWater/ANSACPStatus.pdf>

Roselle, Jody (2003). Bill Drawn to Create Lake Management District [Electronic version]. *James-town Post-Journal*. Retrieved April 7, 2004, from <http://www.bigspat.net/organization/sole/lakeman.html>

Shortle, J.S. and Abler, D.G. (1994). Incentives for Agricultural Nonpoint Pollution Control. In T. Graham-Tomasi & C Dosi (Eds.), *The Economics of Nonpoint Pollution Control: Theory and Issues*. Dordrecht, The Netherlands: Kluwer Academic Press.

United States Department of Agriculture. (1999). *Economics of Water Quality Protection*. (USDA Publication No. AER-782). Washington, DC: Author.

United States Department of Agriculture. (2002, May). *Farm Bill 2002: Conservation Provisions Overview*. Retrieved February 12, 2004, from <http://www.nrcs.usda.gov/programs/farm-bill/2002/pdf/ConsProv.pdf>

United State Department of Agriculture – Natural Resources Conservation Service. (2003a). *Contract Ranking Worksheet Guidance for NY NRCS*. Retrieved February 11, 2004, from <http://www.ny.nrcs.usda.gov/programs/equip/rankguidance.html>

United State Department of Agriculture – Natural Resources Conservation Service. (2003b). *NY EQIP Program Overview*. Retrieved February 12, 2004, from <http://www.ny.nrcs.usda.gov/programs/equip/NYequip.html>

United States Environmental Protection Agency. (1994, January). *Text of CWA Sec. 319 Law*. Retrieved February 14, 2004, from <http://www.epa.gov/owow/nps/sec319cwa.html>

United States Environmental Protection Agency. (1996). Questions and Answers on the Relationship Between the Sec. 319 Nonpoint Source Program and the Sec. 314 Clean Lakes Program. Retrieved February, 11, 2004, from <http://www.epa.gov/cgi-bin/epaprintonly.cgi>

United States Environmental Protection Agency. (1998a, July). *Memorandum: Guidance on Use of Clean Water Act and Safe Drinking Water Act Authorities to Address Management Needs for Lakes and Reservoirs*. Retrieved February 11, 2004, from <http://www.epa.gov/owow/lakes/policy.html>

United States Environmental Protection Agency. (1999, January). *Preliminary Data Summary: Feedlots Point Source Category Study* (EPA Publication No. 821-R-99-002). Washington, DC: Author.

United States Environmental Protection Agency. (2002, April). *Section 319 Success Stories, Vol. III: New York's Agricultural Environmental Management Program*. Retrieved February 16, 2004, from http://www.epa.gov/owow/nps/Section_319III/innov_ny.htm

United States Environmental Protection Agency. (2003, August). *Section 319 Success Stories: New York*. Retrieved February 16, 2004, from <http://www.epa.gov/owow/nps/success319/ny.html>

Wilson, M., Riforgiat, K., & Boria, W. (2000). *Chautauqua Lake Entering the 21st Century: State of the Lake Report*. Mayville, NY: Chautauqua County Department of Planning and Development.