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The Current Controversy Regarding Tmdls: Contemporary Perspectives "TMDLS And Pollutant Trading"

Professor Ann Powers *

I. INTRODUCTION

Since the 1970s, a wide array of federal programs has been developed to protect human health and the environment. This trend began with the Clean Air Act (CAA) of 1970[1] and was rapidly followed by the Clean Water Act (CWA) of 1972[2] and numerous other statutes, most of which are aimed at specific environmental media, issues, or natural resources.[3] Over time these statutes have led in most cases to substantial improvements in environmental quality and protection. One of the most notable success stories has been the CWA, under which point source[4] discharges of pollutants to the Nation's waters have been sharply curtailed. The story is not so positive, however, for nonpoint source[5] pollution, which is often referred to as polluted runoff. Consequently, far too many of our Nation's waters remain impaired. Current efforts are underway to address these impaired waters through provisions of the CWA that require states to determine maximum pollutant loadings for each impaired waterbody ("total maximum daily loads" or TMDLs), and develop plans to reduce the loadings. This is a time consuming and costly process that states have not readily undertaken.[6] The U.S. Environmental Protection Agency (EPA) proposed guidance for implementation of the Act's TMDL requirements,[7] and is encouraging the states to address TMDLs and other water quality issues on a broad watershed basis.[8] It is also considering the role that the trading of pollutant credits among dischargers can play in attaining water quality standards in impaired waters.[9]

Pollutant trading is a system which allows the discharger of a designated pollutant to reduce its discharge below whatever limits have been imposed upon it, and to sell the surplus thus created to another discharger. The purchaser may then exceed its own discharge limits by the amount purchased. As explained below, typically dischargers with low control costs will choose to overcontrol and sell the excess credits thus created to dischargers with higher control costs. Accordingly, trading should result in attaining the desired level of pollutant reduction at the lowest cost.

Pollutant trading has garnered substantial attention in recent years, generated in large part by the sulfur dioxide (SO₂) control provisions established in Subchapter IV of the Clean Air Act to control acid deposition.[10] Although there is some debate concerning the impact on overall SO₂ levels from actual trades, the program is usually credited with achieving substantial reductions in SO₂ at costs well below those projected for traditional regulatory controls. While the SO₂ trading program was devised to address a single pollutant from Midwest power plants, pollutant trading has been implemented or suggested in an array of other situations, from trading of water pollutants[11] to wetlands mitigation banking.[12] Trading, however, may not be appropriate in many circumstances, and its application should be closely examined in each specific factual situation.

Depending upon the manner in which the program is structured, a trading program may also run afoul of environmental regulatory programs. Since the EPA is encouraging states to explore pollutant trading as a possible mechanism for implementing TMDLs, this article examines some of the issues which may arise in that context. The article first summarizes CWA requirements relevant to TMDLs and outlines elements of an effective trading program. It then examines the program recently established by the State of Connecticut to allow trading of nitrogen credits among sewage treatment plants on Long Island Sound to achieve an established TMDL, and the CWA issues presented. Finally, it gives a brief comparison to the program being designed for the Chesapeake Bay, for which no TMDL has been established. Current brief descriptive summaries of several often cited programs are appended.[13]

II. OVERVIEW OF THE CWA

A. General

The CWA is the principal statute regulating the discharge of pollutants into U.S. waters. The Act's stated objective is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."^[14] Congress also declared it national policy that all waters be made safe for fishing and swimming, and that the discharge of pollutants into U.S. surface waters be eliminated.^[15] To achieve these goals the Act establishes a framework for regulating the discharges of pollutants into U.S. waters. The heart of this framework is the National Pollutant Discharge Elimination System (NPDES) permit program.^[16] An NPDES permit authorizes the permittee to discharge pollutants subject to defined conditions and specific numerical limits. Unless done in compliance with a federal or state permit issued under the NPDES program, the discharge of pollutants from a point source into U.S. waters is prohibited.^[17]

Under the CWA, two types of standards, technology-based and ambient water quality based, are considered when setting discharge limits in an NPDES permit. Technology-based effluent standards form the backbone of the CWA. Under these standards, dischargers are required to meet treatment levels based on an evaluation of the capabilities of treatment technologies that are technologically and economically feasible in the discharger's particular industry.^[18] This technology-based treatment level is considered to be the baseline for dischargers and must be complied with regardless of the quality of the receiving water.^[19]

In contrast to technology-based standards that focus on the type of discharger, water quality standards (WQS) focus on the quality of the receiving water. Established pursuant to Section 303 of the CWA, WQS dictate the quality that the ambient water in a particular lake, stream, or other body of water must achieve.^[20] Section 303 of the Act requires states to designate water quality uses, such as fishing or recreational contact, and to set standards to protect those uses.^[21] Section 303(d) of the CWA requires states to identify those waterbodies that, after implementation of the Act's required technology based standards, still do not meet WQS (impaired waters) and to establish TMDLs for these waters on a prioritized schedule.^[22]

A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. EPA regulations have gone further and define a TMDL as "a written, quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific waterbody and pollutant."^[23] It must include "waste load allocations" (WLA), which are loads allotted to existing or future point sources, "load allocations" (LA), meaning loads allotted to existing and future nonpoint sources including loads from natural background, and a margin of safety to account for uncertainty.^[24]

B. Importance of TMDLs

The Focus on Point Source Pollution. A point source is defined as a "discernible, confined and discrete conveyance . . . from which pollutants are or may be discharged."^[25] Since its enactment, regulation under the CWA has focused, for practical and political considerations, on this type of discharge. As a practical matter, it is simply easier to identify point source pollution and subject it to controls. The application of technological controls to and the monitoring of such a source are relatively easy tasks. In contrast, nonpoint source pollution is composed primarily of runoff and is caused by a wide range of activities occurring over large areas. This diffuse nature of nonpoint source pollution leads to substantial problems in trying to impose regulatory controls. Simply identifying the locus of nonpoint source pollution and quantifying its amount can be a challenge and is complicated by the fact that some polluting runoff occurs naturally. Additionally, the relative percentage of natural (as opposed to manmade) runoff can vary according to season and weather condition, further compounding the problem.

In addition to the practical problems, political opposition to nonpoint source control can also be a severe stumbling block to effective regulation. Nonpoint source controls often involve restrictions on the use of land or methods of operation, and the political will to implement such measures may be lacking.

It is becoming increasingly clear that, absent effective control of nonpoint sources of pollution, achievement of CWA goals will not occur. Despite the extensive efforts and measurable gains which have been made in the control of point source pollution, the U. S. General Accounting Office has reported that over one-third of state assessed waters do not meet water quality standards.[26] Nonpoint pollution is cited as the principal reason for these continued water quality problems.[27]

The Watershed Management Approach. In 1999, the EPA and the U.S. Department of Agriculture issued the "Clean Water Action Plan" which identified watershed management as the key to controlling water pollution.[28] Watershed management involves examining all sources of water quality impairment within a defined water basin instead of viewing individual sources in isolation. The TMDL is the basic tool of watershed management and must include loadings from both point and nonpoint sources. However, the decision of how to achieve the reductions is still difficult. The use of pollutant trading programs has been suggested as a potential solution to the practical and political hurdles posed by the allocation requirements and the need to regulate nonpoint sources of pollution.

III. TRADING PROGRAM ESSENTIALS

Pollutant trading is a market-based approach to environmental protection which seeks to attain specific environmental objectives while effectively lowering overall pollution control costs. It is often offered as an alternative to traditional regulatory methods, but in fact usually relies upon them as a foundation. As noted, pollutant trading aims to take advantage of the differences in pollution control costs confronting dischargers of the target pollutant by allowing those dischargers that can achieve pollution reduction most cost effectively to sell their excess pollutant reduction capabilities to other eligible dischargers for whom reducing their own pollutant loads is more expensive.[29] By separating the issue of who will pay for controlling pollution from who will actually implement those controls,[30] trading is deemed to address complaints of rigidity and inefficiency in traditional regulatory programs.[31]

Trading programs must rely on three basic elements found in every market: a commodity to be traded, a demand for the commodity, and a structure in which trading can occur.[32] In a pollutant-trading scheme, the commodities to be traded are pollution discharge units, usually referred to as credits or allowances, that represent a defined amount of a pollutant expressed in terms of kilograms, pounds, or tons.[33] It is essential that the tradable units be quantifiable and that trades be verifiable to assure that actual pollutant reductions are achieved and that the environmental resource is protected.

Once the trading program has been established, demand will be driven by the degree to which dischargers perceive that there will be potential cost savings from purchasing credits rather than installing controls.[34] Generally, there would be an incentive for a discharger to purchase credits if, by doing so, it could achieve the required pollution reduction at a price below its own control costs. In other words, pollution trading becomes a less expensive option when compared to installing technology controls. On the other hand, a discharger would be able to enter the market as a seller if its control costs were low and it could profit by generating excess saleable pollution reduction units.[35] The structure of a trading program will vary from program to program, but as previously noted it is generally grounded in an established regulatory program. While there are "open" market programs which have no cap on the overall amount of pollution discharged or limit on the number of pollution units which may be traded, closed trading programs, generally referred to as "cap and trade," are the most common.[36]

In a closed trading program, the sources that may participate are specified by statute, regulation or other mechanism, and a regulatory agency or other entity sets a cap on the amount of pollutants that a watershed, air shed or ecosystem may absorb. That cap may be either fixed for the life of the program or may become stricter over time. Once the cap is set, it serves as a baseline for the trading program. Dischargers may be given individual limits or may be allocated a specified number of pollution units (allowances). This enables them to produce surplus credits or allowances when they reduce their pollutant loads below the specified limit. These surplus pollution units may be traded with other sources in the program, or may be "banked" for future use, depending on the program. Usually no allocations are made for new sources, which must purchase unused allowances to gain market entry. In this way, new sources will not affect the aggregate limit placed on the pollutant being traded.

IV. THE LEGAL AND POLICY BACKDROP

In 1996, the EPA published a Draft Framework for Watershed-Based Trading.[37] In this document, the EPA maintained its adherence to its enforcement and compliance responsibilities under the CWA[38] and spelled out a number of principles to guide pollutant trading. Most importantly, the agency affirmed that trades must occur within constraints of the CWA. More specifically, point sources must meet technology-based standards established under the Act; the trades must be consistent with attainment of WQS; trades must occur in the context of current regulatory (i.e., permitting) and enforcement mechanisms; and adequate opportunity must be provided for public participation. The EPA also stressed that the boundaries of a trading program should generally coincide with watershed or waterbody segment boundaries. This correlation of boundaries ensures that the environmental consequences of trades between parties occur in the same waterbody or stream/river segment, that boundaries are of manageable size, and are selected to prevent localized problems.[39]

As noted, the CWA essentially prohibits the discharge of pollutants into our Nation's waters unless done in conformance with a federal or state permit. Standards are established to govern the issuance of permits, along with a regulatory scheme for implementing the program. That scheme includes enforcement mechanisms and the opportunity for citizen input. Under the CWA, emission limitations embedded in the NPDES permit can serve as the requisite standards. Additionally, the flexibility inherent in the TMDL process can serve as one method of allocation under the watershed management approach.[40]

V. LONG ISLAND SOUND

A. Status of the Resource

Long Island Sound is an estuary of national significance.[41] It extends 110 miles from New York City eastward to the Atlantic Ocean off the northern tip of Long Island.[42] The Sound's watershed comprises over 16,000 square miles in six states and Canada, including some of the most heavily urbanized areas in the country, with a population of almost eight and a half million people.[43] It is home to a great diversity of flora and fauna, and has an estimated annual value exceeding five billion dollars generated from commercial and recreational fishing, beach swimming, and boating. The ecological integrity of the Sound, however, has been seriously damaged by human activity. Fish catches are down, species diversity continues to decline, and the water quality is often severely impaired. The states advise that swimming be foregone in certain areas after heavy rainfalls and that the consumption of local finfish be restricted. In some areas shellfish beds have been closed since the 1930s.[44]

Of the numerous pollution problems facing the Sound, the most prominent is the lack of dissolved oxygen (DO), a condition known as hypoxia. Hypoxia occurs in parts of the Sound during the summer months as a result of over-enrichment of its waters by excess nitrogen. Hypoxic conditions can have a deleterious impact on aquatic life, stressing organisms and threatening their survival. The excess nitrogen which causes this problem is derived from numerous sources. The primary contribution, however, is from the more than one billion gallons a day of treated effluent discharged by sewage treatment plants located on or close to the Sound.[45] Indeed, more than half of the total load of nitrogen delivered to Long Island Sound as a result of human activities is from these publicly owned treatment works (POTWs).[46] Hypoxic conditions do not occur uniformly throughout the Sound and tend to be most severe in its western end, the area of highest population concentration and sewage treatment plant loadings.[47]

B. Addressing the Hypoxia Problem

Like other point source dischargers, sewage treatment plants are required under the CWA to obtain discharge permits and to employ a specific level of technological controls,[48] and undertake even more stringent controls if necessary to prevent the impairment of local waters.[49] Most plants are not designed to remove significant levels of nitrogen, thus construction of new facilities or upgrades of old ones is often required. The cost of improved sewage treatment can be extremely high, and both the cost

of upgrades and of day-to-day operation and maintenance can vary with the age and condition of the individual treatment plant. Moreover, the benefits to be gained in improved water quality in the Sound, especially the western Sound, from better sewage treatment may change according to the location of the particular plant.

To address the hypoxia problem, the Long Island Sound Management Conference, in which Connecticut participates, initiated a multi-phased approach to nitrogen reduction.[50] Under Phase One, point and nonpoint loadings were frozen at 1990 levels.[51] Phase Two, which took effect in 1994, required that low-cost nitrogen reduction actions be undertaken, consisting primarily of a series of modest sewage treatment plant retrofits using a variety of biological nitrogen removal technologies at selected facilities.[52]

Phase Three, adopted in 1998, required that a TMDL for nitrogen be calculated for the Sound and that loadings in the basin be reduced in accordance with it.[53] The EPA approved the TMDL on April 3, 2001.[54] The TMDL requires that the cumulative point and nonpoint nitrogen load of all in-basin[55] sources be reduced by 58.5% (specifically a 10% reduction in total non-point source load of nitrogen and a 63.5% reduction of point source discharges)[56] over a fifteen-year period with five-year incremental targets.[57] It was recognized, however, that even after these reductions have occurred, the state WQS for dissolved oxygen in the Sound would not be achieved. Therefore, in addition to requiring a 58.5% reduction from in-basin sources, the TMDL also requires reductions in nitrogen from out-of-basin sources in Phase Four, and the implementation of non-treatment alternative technologies in Phase Five.[58]

C. Unique Features of the Long Island Sound TMDL

The Phased Approach. The TMDL for nitrogen in the Sound, like the overall Sound cleanup, adopted a phased approach to the attainment of WQS. This method of TMDL development has been the subject of criticism by some who contend that the CWA's requirement that TMDLs "be established at a level necessary to implement the applicable water quality standards"[59] does not allow for the achievement of WQS on an incremental schedule. The EPA has, however, endorsed the phased approach in cases where a TMDL is developed under conditions of "high uncertainty" where the necessary data and predictive tools are inadequate to characterize and analyze the pollution problem.[60] Indeed, the Agency's guidance document states that a phased approach is "required when the TMDL involves both point and nonpoint sources, and the allocation of waste loads to the point sources assumes implementation of non-point source controls." [61] When a point source is given a less stringent WLA based on the assumption that nonpoint source load reductions will occur, the EPA requires reasonable assurances that the nonpoint source reduction will, in fact, happen.[62] When reasonable assurances are not possible the entire load reduction must be assigned to point sources. In the case of the Long Island Sound TMDL, the phased approach includes monitoring requirements and a schedule for re-assessing TMDL allocations to ensure attainment of WQS.

Requirement of Nitrogen Reduction from Out-of-State Sources. The TMDL approach assumes that Massachusetts, New Hampshire, and Vermont (upstream states that do not border the Sound but nonetheless contribute nitrogen through streams and tributaries) will also reduce both point and non-point source nitrogen.[63] Nothing in the CWA authorizes one state to regulate the discharges of an upstream state, and EPA does not approve out-of-basin nitrogen reductions as formal allocations.[64] Instead, when evaluating a proposed TMDL, EPA allows the state a certain amount of flexibility to make assumptions about improvements which it expects to see in water quality beyond its boundaries.[65] However, it is incumbent upon the state to explain clearly why such assumptions are reasonable when a TMDL relies on them.[66] Regarding Long Island Sound, EPA deemed the assumptions made regarding out-of-basin loadings reasonable. EPA asserted its readiness to use its statutory and regulatory authority when issuing or overseeing NPDES permits to upstream dischargers. This assures that individual facility permits included nitrogen reductions sufficient to achieve the overall 25% reduction level.[67] Furthermore, EPA committed to working with Massachusetts, Vermont and New Hampshire to address non-point source nitrogen loads affecting the Sound.[68]

D. The TMDL's Trading Option

Non-point sources do contribute large amounts of nitrogen to Long Island Sound (LIS), but the most significant loadings come from point source discharges, particularly POTWs.[69] Accordingly, most of the nitrogen control burden falls upon these facilities. As a result of their size, design, and operating costs, some POTWs are more cost-effective at removing nitrogen from their effluent than others. In addition, a POTW's location determines how its nitrogen load affects the hypoxic areas of the Sound, with those sources closest to the areas of hypoxia having the greatest impact. Acknowledging these factors and recognizing that an effective trading program might provide significant cost savings for regulated entities, the LIS TMDL contemplated nitrogen trading among sources as a means for attaining the required nitrogen reduction. In June 2001, the Connecticut legislature enacted Public Act No. 01-180[70] which established the framework for a Nitrogen Credit Exchange Program (NCEP) for Connecticut sources. Based on analysis by Connecticut's Department of Environmental Protection (DEP), it was estimated that the NCEP exchange program would save Connecticut's affected municipalities and its Clean Water Fund, which provides grants and low-cost loans for upgrades and new plant construction, \$200 million in avoided capital construction costs over fifteen years.[71]

Although state officials originally anticipated that participation in the NCEP program would be optional,[72] the legislation is less than clear and seems to require that all POTWs be included in the program.[73] It directs that a statewide general permit for nitrogen be issued for all of the POTWs covered by the nitrogen TMDL, limiting the total amount of nitrogen these facilities are allowed to discharge and assigning each POTW an individual WLA based on the TMDL.[74] Each POTW will continue to have an individual state-issued discharge permit which covers other pollutants and conditions,[75] but will normally not contain a nitrogen limit.[76] The trading program differs from traditional regulatory programs by the manner in which compliance is achieved. Participants in the trading program can meet their discharge limit in one of two ways: (1) by reducing their nitrogen discharges to an amount less than or equal to their allocated wasteload; or (2) by purchasing "nitrogen credits" equal to the amount that the POTW exceeds its allocation.[77] A nitrogen credit is the difference between a POTW's annual WLA, as specified in the general permit, and the amount of nitrogen the POTW actually discharges.[78] Since the location of the plant affects the hypoxic conditions in the Sound, the DEP accounts for the differential impact by setting an "equivalency factor" for each plant.[79] The watershed had been divided into geographic management zones each of which has a different degree of influence on hypoxic conditions. Within these management zones, tiers are established reflecting their distance from the Sound and the amount of attenuation of their pollutant load.[80] DEP uses these divisions in arriving at an equivalency factor reflecting the impact of each discharger on hypoxia in the Sound. Multiplying the nitrogen credit by the equivalency factor for the plant results in an "equivalent nitrogen credit." [81]

The Act assigns to DEP the responsibility for administering the NCEP, and charges the agency with overseeing and executing all nitrogen credit exchanges.[82] Pursuant to the Act, DEP established a Nitrogen Credit Advisory Board, comprised primarily of state and municipal officials, to assist and advise it in carrying of the trading program.[83]

The Connecticut nitrogen trading program is a closed program, and banking of credits is not allowed. The DEP creates the market. It must establish the value of equivalent nitrogen credits annually,[84] and is charged with buying and selling all of the credits. The Act requires the DEP, on an annual schedule, to purchase all available nitrogen credits and sell credits to individual POTWs which need them to meet their nitrogen limits specified in the general permit.[85] Although the initial participants are the 79 POTWs, whenever practicable, the DEP must sell any excess state-owned nitrogen credits to other public or private entities, not just POTWs.[86] Although the program has focused to date on point sources, its future expansion to include nonpoint sources is allowed.

All trades are settled each calendar year. The Act establishes time limits for the annual auditing of participating POTWs and for the completion of purchases and sales.[87] To ensure compliance, the Act subjects dischargers to the state's general water pollution compliance and enforcement provisions.[88]

E. Unique Aspects of the Trading Program

The General Permit. A key component of the NCEP is an unusual state General Permit (GP) for Nitrogen

Discharges, issued on January 2, 2002. This establishes annual discharge limits, monitoring requirements, and reporting protocols for each of the 79 participating POTWs.[89] It allows, however, nitrogen trading between facilities in the program without the need for permit modifications. These facilities, in aggregate, must reduce their annual loading of total nitrogen to Long Island Sound by approximately 63.5% by 2014 in order to achieve the final wasteload allocation established in the TMDL.[90] The permit contains increasingly stringent discharge levels over time, which anticipates that essentially all plants will eventually have to upgrade in order to meet those limits. Those upgrades would depend, of course, upon the continuing availability of funds, something not necessarily reliable in today's economic climate.

Trading and the Need for Revised WLAs. It is evident that the Long Island Sound TMDL and its associated allocations of the nitrogen pollutant load provide opportunity for trading programs. To assure that attainment of the TMDL is not threatened by shifts in allocations, the state is required to notify the EPA annually of any changes which have occurred in the WLAs as a result of reallocations or trading. However, EPA does not intend to require that the TMDL be resubmitted to reflect revised allocations, as long as the changes result in equal or greater water quality improvements, taking into account the equivalency factors.[91] Furthermore, EPA specified certain types of reallocation that will not require the state to resubmit the TMDL. They include trades between plants in the same tier in a management zone, or between plants in different tiers or management zones, as long as the appropriate equivalency factor is applied. But reallocations between point and nonpoint sources, or between nonpoint sources in different tiers or management zones, will require the TMDL to be resubmitted. In addition, a WLA may not be revised so as to cause localized adverse water quality impacts, such as low levels of dissolved oxygen.[92]

F. Program Status

The Connecticut program began formal operation in January 2002. For the first year of operation, the DEP, on the advice of its Nitrogen Credit Advisory Board, set the price of an equivalent nitrogen credit at \$1.65. This price reflects the composite cost of capital construction and operation and maintenance for nitrogen removal at twenty-three projects funded from Connecticut's Clean Water Fund.[93] In early 2003, the NCEB reviewed the 2002 nitrogen discharge levels of all seventy-nine participating plants compared to their permitted levels. It then performed its clearinghouse function, reporting whether each plant would have to buy or sell credits depending on how well the facility did in relation to its permit. An invoice was provided to each POTW, and those purchasing credits are to do so by the end of July 2003. In August, the state will purchase credits from those designated as sellers.

The 79 plants were almost equally balanced between sellers and buyers; however, the amount of credits created versus the number needed was fairly lopsided. Almost \$2.8 million in nitrogen credits were generated by plants, which reduced their discharges below permit levels. However, plants that did not meet their discharge levels need only purchase a little over \$1.3 million to be in compliance. Since banking of credits is not allowed, the state is responsible for the balance of roughly \$1.4 million. At the time of this publication, the state is considering its options for funding this amount.[94] In spite of this problem, Connecticut officials are pleased that the program achieved significant reductions in nitrogen loadings to the Sound, and that they are ahead of the goals set in the TMDL.[95]

Not surprisingly, the plants which were able to sell credits were mainly the twenty-three plants which had undertaken Clean Water Fund nitrogen removal projects.[96] The apparent reason for the relative imbalance between the number of credits created and those purchased is that many plants were able to implement some small capital improvements and/or reduce their discharges by better operation and maintenance. If this is the case then there may be more demand for credits in subsequent years as the discharge limits are tightened.

It is too early to determine whether the program will achieve its goal over the long term of economically reducing nitrogen loadings to Long Island Sound from Connecticut's sewage treatment plants. As a model, the program has a number of points to recommend it: it addresses a single pollutant; from a single type of discharger; within a single jurisdiction; and it is implemented on a watershed basis within the confines of the Clean Water Act's regulatory program, including the requirement that a TMDL be

established and pollutant loads allocated. However, it is somewhat complicated because of the exchange ratios which are employed due to the unequal impact of various plants on hypoxia in the Sound. It also requires the state to administer the program, acting as the broker in all purchases, thus increasing transaction costs, especially if the state must buy a substantial number of unused credits each year. Finally, although there has been public participation in the formulation of the program, and public comment was taken on the nitrogen general permit, it is not clear that citizens have any formal mechanism for challenging individual trades which they think endanger local water quality or otherwise are illegal.

In the final analysis, even if the program may work in the specific factual context in which it has been established, it is unclear what the lessons may be for other jurisdictions. Certainly, it is fairly far from a classic free market, since the participants are all public agencies, the funding for capital construction of new projects comes in large part from state grants or loans for which the state sets the priorities, and the price at which pollution units are traded is fixed by the state.

VI. CHESAPEAKE BAY

The Chesapeake Bay, America's largest and most biologically diverse estuary, measures approximately 195 miles in length and 35 miles at its widest point.[97] It boasts a watershed of 64,000 square miles, several times that of Long Island Sound and considerably more complicated both geographically and politically. Like the Sound, the Bay's drainage basin lies in a number of jurisdictions. While only Maryland and Virginia actually border the Bay, Pennsylvania contributes substantial pollution through the Susquehanna River, the Bay's largest freshwater source. In addition, portions of Delaware, New York, West Virginia, and the District of Columbia lie within the watershed.[98] The Bay, which supports thousands of species of plants, fish and animals,[99] is a major breeding ground for some of the nation's most valuable fisheries and produces 500 million pounds of seafood per year. It is also a major resting ground along the Atlantic Migratory Bird Flyway, with a million waterfowl wintering in the Bay's basin each year.[100] An important recreational resource, the Bay is also a major economic resource. Commercial fishing, tourism, and recreation-related industries provide jobs and contribute tax revenues to local economies.[101]

The Bay has 5,600 miles of shoreline, and its tidal tributaries have an estimated 11,684 miles of shoreline, more than the entire West Coast.[102] Over 100,000 streams and rivers wind their way through the Bay's vast watershed creating a spider's web of interconnected waterways,[103] with 15 million inhabitants living near them.[104] As a consequence of this geography, each river and stream acts as a conduit as they transfer the impact of activities in the surrounding communities to the Bay.

A. The Nutrient Problem

Even though nutrients are essential for the health of the Bay and its many aquatic species, as in Long Island Sound, nutrient over-enrichment degrades Bay water quality. Again the primary culprit is nitrogen, although phosphorous also plays a substantial role in some areas. Excess nitrogen and phosphorous rob essential oxygen from the water column, resulting in seriously hypoxic conditions.[105]

Before European settlement, Chesapeake Bay's watershed was heavily forested. These forests and other undisturbed lands and wetlands absorbed and filtered the relatively small loading of nutrients.[106] Farms, factories, cities, and suburbs have replaced much of these natural filters. As land use patterns change and the watershed's human population grows, the amount of nutrients entering the Bay's waters has increased alarmingly, with roughly 331 million pounds of nitrogen and 20 million pounds of phosphorus reaching the Bay each year.[107] The majority of nutrients are the result of human activities, from such obvious sources as sewage treatment plants, septic systems, commercial lawn fertilizers and runoff from farms and fields. Less obvious is the nitrogen pollution from vehicle exhaust and the chimneys and smokestacks of our homes, factories and power plants.[108] While Long Island Sound certainly suffers from similar pollution loadings, its hypoxia problem can be traced primarily to nitrogen from sewage treatment plants. The primary sources of nutrient pollution to the Bay are more diverse, and may vary substantially from tributary to tributary. Overall, however, agricultural runoff is

the largest source of nutrient pollution in the Bay watershed contributing forty percent of the nitrogen and fifty percent of the phosphorus entering the Chesapeake Bay.[109]

B. Addressing the Problem

The role of nutrients as a primary cause of poor water quality in the Bay was definitively established in 1983, as the result of a multi-year research study aimed at identifying the major environmental threats to the Bay.[110] With the estuary's health in danger, the jurisdictions surrounding the Bay decided it was time to take seriously the Bay's condition and they formally agreed to work together on Bay restoration efforts. Maryland, Virginia, and Pennsylvania, along with the District of Columbia, the EPA and the interstate Chesapeake Bay Commission signed the first Chesapeake Bay Agreement[111] and established a Chesapeake Bay Watershed Partnership to restore the Bay.[112] The goal of the Agreement was to improve and protect the water quality and living resources of the Chesapeake Bay;[113] it was amended in 1987 to include a specific commitment to attain a forty percent reduction in both nitrogen and phosphorous by the year 2000, to thereafter maintain that level,[114] and to manage the Bay as an integrated ecosystem.[115] The focus of the effort became the development of region specific nutrient reduction plans called "tributary strategies." [116] Tributary strategies are comprehensive plans designed to reduce nutrient pollution entering the Chesapeake Bay. Developed by state agencies, local governments, and the citizens living and working in their respective watersheds, the plans delineate how the forty percent reduction goal will be met, including actions taken by both point and non-point sources.[117]

Even though some significant improvements in water quality were achieved, as the 2000 deadline approached it became apparent that the goal of a forty percent reduction would not be met by existing tributary strategies. And even if it could be met, the strategies did not address how the goal would be maintained in the face of increased sewage flows from future urban expansion and increased nutrient run-off from agricultural and from expanded livestock operations.[118] As a consequence, nutrient trading was seriously discussed as a means of achieving and maintaining the nutrient reduction goals, and a Nutrient Trading Negotiation Team reflecting the various Bay stakeholders was organized to explore the feasibility of establishing a trading program in the Chesapeake Bay watershed.[119] The team developed a set of fundamental principles which are generally consonant with EPA's Draft Framework for Watershed-Based Trading, but contain at least three significant modifications. First, sources should begin implementation of measures to achieve the 40 percent reduction goal before considering nutrient trading; and second, trading will only be allowed within each major Bay tributary.[120] In addition, all trades must be subject to a permit or regulation or to an agreement that incorporates the equivalent protections and enforcement provisions of a permit or regulation.[121] The team also prepared guidelines that could be used by the Bay states to develop their own voluntary nutrient trading programs.

With guidelines in place the next step was implementation, and the key states (Maryland, Virginia, and Pennsylvania) began some movement toward developing plans for nutrient trading. In Virginia, the legislature had already enacted a Water Quality Improvement Act that includes a clause requiring investigation of trading as a means to meet its goals.[122] The state turned to developing guidelines for market-based incentives, possibly to include trading, as part of its point source nutrient reduction effort, but has done little more.[123] Maryland unveiled a state nutrient trading proposal in September 2000, which provides for trading between point sources and between point and non-point sources. The state, however, is not currently devoting resources to trading efforts,[124] and has recently required increased technological controls for POTWs.[125] In Pennsylvania, the EPA sponsored a project that simulated the effect of trading programs for several of its Bay tributary basins for which TMDLs have been developed, and the Pennsylvania legislature endorsed a resolution expressing interest in pursuing trading options.[126] In fact, the only serious nutrient trading effort under development in the Chesapeake watershed is in Pennsylvania[127] where EPA had funded a pilot trading project on the Conestoga River and demonstration trades are planned.[128]

Although the Bay Program's fundamental trading principles provide a comprehensive programmatic framework for trading, no real trading programs exist in any of the states or at the Bay level, and none is being actively developed. However, it is conceivable that this situation may change in the foreseeable

future since the Chesapeake Bay program has set new nutrient levels for the tributaries, which may make the development of trading programs more attractive.[129]

C. Unique Aspects of the Chesapeake Bay Agreement

Voluntary/No TMDL. In its efforts to address nitrogen pollution on Long Island Sound, Connecticut followed the traditional CWA regulatory approach by promulgating a TMDL and enacting legislation compelling compliance.[130] It then based its trading program on that regulatory framework. In contrast, Chesapeake Bay officials chose to rely on negotiations among the different stakeholders outside of the regulatory framework, who voluntarily agreed to meet stated goals.[131] The difference in approaches can be traced in part to the nature of the watersheds and the pollution problems. Hypoxia in the Long Island Sound results primarily from excess nitrogen discharged from sewage treatment plants, many of them located in Connecticut. The obvious solution to the problem is to reduce the POTWs discharges. Yet, effectively addressing hypoxia in the Bay necessarily entails the participation of not only multiple states, but also requires reductions from both point and non-point sources within those states. Unfortunately, non-point sources are not regulated under the CWA, leaving Bay officials with little leverage.

The Legality of the Voluntary Approach. Although the CWA required the establishment of water quality standards and TMDLs within a relatively short period,[132] the EPA and the states essentially ignored this deadline for many years.[133] As noted earlier, TMDLs have been developed slowly, if at all, resulting in much litigation.[134] Environmental groups typically challenge the EPA or the states over the lack of TMDLs, arguing that the EPA has neglected its duty to promulgate TMDLs where the states have failed to do so.[135] Where TMDLs have been developed, environmentalists sometimes challenge their adequacy,[136] and dischargers may contest the conditions in their NPDES permits based on TMDLs.[137] By and large, the courts have accepted the environmentalists' challenges and have ruled that the statute mandates the development of TMDLs.[138] While this would seem to require that a TMDL, or TMDLs, be established for the Bay and its tributaries, the EPA has not demanded their immediate development, and environmental groups have not pushed the issue.[139] Instead, the EPA is allowing the Bay states an opportunity to redefine and modify the standards by which the water quality impairment is determined before ordering a TMDL. This is a crucial element of the Bay Program's initiative, as some impaired waters will be removed because of new, less stringent standards. If the Chesapeake Bay's water quality is not restored by 2010, then a TMDL covering the entire 64,000 square mile Bay watershed is to be effective by 2011.[140]

Long Island Sound and Chesapeake Bay are estuaries which share many common features and which are both plagued by a similar problem, excess nutrients which lead to reduced oxygen levels, and often, severe hypoxic conditions. The approaches officials have selected to rectify this problem for each estuary differ substantially, based in part on technical as well as political differences. Hypoxia in the Sound results largely from a readily identifiable and traditionally controllable point sources, sewage treatment plants. With a smaller watershed and only two key states involved, officials have been able to establish a TMDL for the primary pollutant, nitrogen. Because of strong interest on the part of Connecticut officials, a trading program has been developed and is underway. The Chesapeake, by contrast, drains a much larger watershed, in a number of political jurisdictions, and has more complicated nutrient problems. A large component of the excess nutrients comes from nonpoint sources, which are not easily controllable and traditionally have not been regulated. These, among other factors, have impeded development of a TMDL for the Bay as a whole, and have led Bay officials to espouse a more voluntary approach to nutrient controls. But without a TMDL to act as a market driver, trading seems to hold little attraction. In both watersheds, the TMDL requirements have presented challenges and have affected the development of pollutant trading programs.

VII. TMDLS AND TRADING – CONCLUDING THOUGHTS

Considering the EPA's strong support and encouragement for pollutant trading programs in our quest to achieve water quality standards, it is likely that such programs will continue to proliferate. But as demonstrated on the Sound and the Bay, the Clean Water Act's TMDL requirement can present challenges when devising and implementing pollutant trading programs. Nonetheless, TMDLs are not

only legally required, but are critical for establishing a foundation upon which a trading program can be built. Thus, it is necessary to understand the TMDL requirements, as well as how they may impact essential elements of a trading program. The EPA asserts that any program must fit within the regulatory structure of the Clean Water Act; however, the agency at times liberally interprets provisions of the Act and its own regulations. On Long Island Sound, the Agency allowed a TMDL to be phased in over time, and it blessed an unusual general permit. On the Chesapeake Bay, it has given the states time to achieve water quality standards and to use trading to do so without imposing TMDLs until far in the future.

In the long run, the success of a trading program will depend largely on whether the essential elements of a market are present and on the details of individual program implementation. Of major concern for TMDL development and for trading programs, are the time and costs associated with researching and establishing TMDLs since this process may take a number of years and require millions of dollars. Not only is the ability to develop an effective TMDL subject to the availability of funds, but it may also be influenced by the interests of the groups involved in its creation. Both factors will affect how quickly trading programs can be put into place, and their effectiveness both in terms of encouraging potential participants as well as actually improving the water quality. Two further project examples make the point. First, in Wisconsin, a non-profit group is researching and developing TMDLs for major rivers and watersheds in the area. The group estimates the task will take at least seven years and it is funded through grants and donations.[141] The research can only proceed according to the funds available. Second, in Colorado, the fifteen year-old TMDL for the Cherry Creek Basin is in need of updating, particularly since the original water quality standards were never achieved, and the Cherry Creek Basin Authority was charged with financing and researching the new TMDL.[142] The Authority's board, however, consisted solely of local municipalities and water treatment plant representatives, who did not push for revision.[143] Eventually, the state legislature was compelled to step in to reassign board seats to ensure a broader group of interests were represented.[144] Both of these situations illustrate complications that may arise when TMDLs and trading efforts intersect. Other points are raised in the programs included in the appendix.

Appendix: Status of Several Well-Known Water Quality Trading Programs[145]

As noted in this article, the EPA has marketed trading as an environmentally and economically advantageous means to combat water pollution. Premised on the air emissions trading program of the Clean Air Act, water effluent trading aims to provide incentives for polluters to take action by buying and selling in a free market. In 1996, the EPA published a framework to facilitate the application of effluent trading for impaired water bodies and watersheds,[146] and has recently developed an effluent trading policy.[147] However, very few trades have taken place in all of the programs, even though some had been in place for many years.[148] Below is a brief update on the status of several of the most frequently cited trading schemes related to water pollution.

Lake Dillon, Colorado[149]

Lake Dillon, a drinking water source for Denver and a recreational lake, was threatened with phosphorous pollution from many sources, especially related to increasing development. The Lake Dillon effluent trading program for phosphorous is one of the oldest in the United States, established in 1984, and was the first to allow trading between point and nonpoint sources.[150] Prior to 1999, there were only two trades under the program, which involved granting additional credits to a sewage treatment plant which replaced septic systems with sewers.[151] A more traditional trading scheme was not implemented until 1999, when a developer sought to expand a ski resort which would have increased loadings to the Lake. In order to offset the increased loadings, the developer paid for a number of homes using septic systems to be connected to sewers.[152] Overall, the load allocation for the Lake has never been exceeded, in large part because there was a lower than expected growth rate in the surrounding communities, and the point source dischargers invested in state of the art technology designed to reduce the level of pollution.[153] The relative wealth of the area, supported by the resort economy, provides funding for the new technology.[154] Consequently, there has been little need for trading. However, increased growth may change the demand for credits and the recent trade may indicate that a market will become active.

Cherry Creek Basin, Colorado[155]

Trades to offset discharges have been allowed in this program since 1985, and a basin-wide trading program was implemented in 1997 which allows trading within the framework of a TMDL.[156] However, only ninety pounds of phosphorous have been traded and the load allocation has not changed since it was established fifteen years ago. The TMDL established at the time was generous in order to accommodate future development, but the waters of Cherry Creek Basin have never attained water quality standards. The original Cherry Creek Basin Authority was only comprised of local governments and municipal dischargers; it was recently reconfigured by the state legislature to reflect a wider array of interest groups. A new TMDL is now being researched for the basin, but it will not be completed for several years. Furthermore, there is concern over how to promote participation among non-point sources since participation remains voluntary.

Tar-Pamlico Basin, North Carolina[157]

This program was initiated in 1990, and its rules for trading were established in 1992. The point sources, primarily sewage treatment plants, are grouped together in an association which is subject to a cap set by the state. The point source dischargers may trade among themselves, but if they exceed the collective nutrient loading cap the association must offset those discharges by payments to the state's agricultural cost share program. The payments are to be used to secure nutrient reductions from nonpoint sources in the Tar-Pamlico Basin through the use of best management practices. Since the program's inception, no true trades have taken place in the basin because the point source load caps have not been exceeded, point sources having improved their efficiencies either through capital improvements or operational changes. Nevertheless, the association purchased credits to bank for future needs, using for the most part an EPA grant. The purchases funded a substantial amount of agricultural best management practices.[159] However, some of the funds were used to pay for administrative costs, and not for actual pollution reduction practices. When the second phase of the program was established, environmental groups which had been involved in its original development objected that the nutrient reduction goals being set were too generous. For that and other reasons, they withdrew from the program.[160] New rules for non-point sources, including farms and municipal storm water, went into effect in September 2001, after intervention by the legislature at the behest of farm interests.[161] Although agriculture is subject to an overall reduction goal, and farmers must register with local advisory committees formed to facilitate the process, it is not clear how the installation of necessary nutrient reduction practices will be financed.[162] The farm community is supportive of trading when it provides money for agricultural best management practices, but is concerned about additional regulation of agricultural activities.[163] The loading caps will be reevaluated in Phase III of the Basin program, which begins in 2005.

Fox River-Wolf River Basins, Wisconsin[164]

The Fox River was the first waterbody for which pollutant trading was proposed, in 1981. It was not until 1995 that a trade occurred.[165] Trading pilot programs were established in 1997 for the entire Fox River-Wolf River basin, but no trades were conducted during the pilot because all but two point source dischargers were able to achieve their required goals through technology controls. The two non-compliant dischargers were allowed exceptions to their limits due to economic hardship. Sixty to eighty percent of the loads come from non-point sources, but there are no regulations requiring farmers to abide by the load limits and farmers have been reluctant to discuss trading options. Fox-Wolf Basin 2000, a nonprofit organization, is currently writing a TMDL that will be completed in five years.[166] The Wisconsin Department of Natural Resources concluded that the economy and the lack of a regulatory driver were the main factors in the lack of trading activity.[167]

What Happened to Trading?

Many existing water pollutant trading programs do not appear to be particularly effective, and often do not operate within the context of a TMDL. Indeed, some cannot be called true market trading programs, since they rely heavily on state intervention and funding. The Long Island Sound and Tar-Pamlico programs would seem to be good examples. However, several other trading programs are being developed which show promise, and which address the TMDL requirements. For example, in Idaho the

Lower Boise Effluent Trading Program is tackling the reluctance to develop TMDLs by designing a flexible permitting process where a permit does not have to be rewritten with every trade.^[168] Michigan has made substantial progress in devising a statewide voluntary program. The Department of Environmental Quality issued rules in 2002 which allow trading in any watershed in the state, as long as certain requirements are met, including compliance with the federal Clean Water Act.^[169]

In some cases, technology investments by point source dischargers have resulted in substantial reductions in pollutant loadings and, as a result, have eliminated a demand for trades. Even though existing programs are wrestling with developing new TMDLs that deal more aggressively with the nutrient loadings in their waters, nonpoint sources, which account for the majority of the loads in most areas, create significant problems. Some problems frequently cited by current program administrators are that limited incentives may exist for nonpoint sources to participate; cultural barriers and mistrust can undercut voluntary participation among interest groups such as agriculture; the TMDL process is lengthy and expensive; and it is often time consuming and difficult to gain political acceptance for trading. Finally, the Clean Water Act does not provide a legal framework to deal with nonpoint source pollution, so there is no market driver for those sources.

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[1] Clean Air Act, 42 U.S.C. §§ 7401-7671(q) (2002).

[2] Clean Water Act, 33 U.S.C. §§ 1251-1387 (2002).

[3] *See, e.g.*, Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (2002); Resource Conservation and Recovery Act 42 U.S.C. §§ 6901-6992k (2002); Toxic Substances Control Act, 53 U.S.C. §§ 2601-2692 (2002).

[4] 33 U.S.C. § 1362(14). A point source is defined generally as “a discernible, confined, and discrete conveyance.” Most agricultural discharges are, however, excepted from the definition, and thus from regulation under the Act.

[5] While not defined in the Act, nonpoint source pollution has been determined by EPA to be “pollution . . . from many diffuse sources.” EPA, Office of Water, *What is Nonpoint Source (NPS) Pollution? Questions and Answers*, available at <http://www.epa.gov/owow/nps/qa.html> (last visited on Apr. 19, 2003).

[6] The failure of the states and EPA to develop TMDLs has resulted in substantial litigation brought primarily by citizens groups. A summary of that litigation can be found online. *See* EPA, *TMDL Litigation by State*, at <http://www.epa.gov/owow/tmd/lawsuit1.html> (last visited Apr. 19, 2003). EPA is under a court order, or has agreed in a consent decree, to establish TMDLs if a state does not do so in over twenty cases. *Id.*

[7] The regulations have been controversial, and subsequent to the Symposium, EPA chose to withdraw them, creating additional controversy. *See generally* EPA, *Withdrawal of Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and Management Regulation*, 67 Fed. Reg. 79,020 (Dec. 27, 2002) (to be codified at 40 C.F.R. parts 9, 122, 123, 124, and 130).

[8] *Id.* EPA has been developing a “watershed rule,” but many environmental activists fear that it will be used to undercut the TMDL requirements and will reduce the listing of impaired waters. *States, Industry Optimistic EPA Will Propose Watershed Rule*, Inside EPA (Mar. 28, 2003), available at <http://www.OutsideEPA.com>

[9] See 67 Fed. Reg. 36172 (May 23, 2002); EPA, Office of Water, Watershed Initiative, *available at*: <http://www.epa.gov/owow/watershed/initiative/factsheet.html>; 68 Fed. Reg. 1608 (Jan. 13, 2003); EPA, 2003 Water Quality Trading Policy, *available at* <http://www.epa.gov/owow/watershed/trading/tradingpolicy.html> [hereinafter 2003 EPA Water Quality Trading Policy].

[10] See 42 USC § 7651 b (a).

[11] Subsequent to the Symposium, EPA issued a proposed *Water Quality Trading Policy Statement* on May 9, 2002. See 68 Fed. Reg. 1608 (2002), *available at* <http://www.epa.gov/fedrgstr/EPA-WATER/2002/May/Day-15/w12148.htm> (last visited June 30, 2003); 2003 EPA Water Quality Trading Policy, *supra* note 9. EPA stated its intention that the policy be interpreted in conjunction with previously issued guidelines for watershed based pollutant trading, and asserted that it strengthened and expanded the Agency's support for watershed-based trading. The policy did not meet with approval by the environmental public interest community. *Lack of Activist Support May Threaten EPA Water Trading Plan*, Inside EPA (Apr. 12, 2002), *at* <http://www.insideepa.com>. With some changes, it was issued in final form on January 13, 2003. 68 Fed. Reg. 1608 (Jan. 13, 2003), *available at* <http://www.epa.gov/owow/watershed/trading/finalpolicy2003.html> [hereinafter Final Water Quality Trading Policy Statement]. Several national environmental groups then wrote to all the heads of state environmental agencies alerting them that the groups viewed certain provisions in the policy as illegal and suggesting what steps states might take to avoid legal difficulties. Letter from Am. Rivers, Nat'l Wildlife Fed'n, Natural Res. Def. Council & Sierra Club, Re: New EPA Guidance on Water Quality Trading (Mar. 14, 2003) (on file with author). Among other points, the groups argued that state programs which allowed trading to meet water quality standards outside of the context of a TMDL would be illegal. *Id.* at 2-3.

[12] See Federal Guidance for the Establishment, Use & Operation of Mitigation Banks, 60 Fed. Reg. 58605 (Nov. 28, 1995).

[13] For additional information on pollutant trading and pollutant trading programs, see Ann Powers, *Reducing Nitrogen Pollution on Long Island Sound: Is There a Place for Pollutant Trading?*, Colum. J. Envtl. L. 137 (1998) (from which portions of this article are adapted) and articles cited therein. See also Tom Tietenberg, *Tradable Permits Bibliography*, *at* <http://www.colby.edu/personal/t/thtieten/trade.html> (last visited Mar. 23, 2003); Paul Faeth, World Res. Inst., *Fertile Ground: Nutrient Trading's Potential to Cost Effectively Improve Water Quality* (2000), *available at* <http://www.wri.org/water/nutrient.html> (last visited Apr. 19, 2003); Nat'l Wildlife Fed'n, *A New Tool for Water Quality: Making Watershed-Based Trading Work for You* 33-35 (June 1999), *available at* http://www.nwf.org/watersheds/pdf_documents/newtool.pdf (last visited Apr. 19, 2003).

[14] Clean Water Act, 33 U.S.C. § 1251(a) (2002).

[15] See *id.* § 1251(a)(1), (2).

[16] States may be delegated responsibilities under the Clean Water Act and may issue their own permits in lieu of federal permits. *Id.* § 1342.

[17] *Id.* § 1311.

[18] *Id.* § 1314(b).

¹⁹ *Id.* § 1311(b)(1)(C). If, after the imposition of technology standards, the receiving waters do not meet established water quality standards, additional controls on the discharge may be necessary. See *id.* § 1311(a)(1)(c).

[20] *Id.* §§ 1313, 1314.

[21] *Id.* § 1313(a)(3).

[22] *Id.* § 1313(d). If water quality standards are attained in a waterbody, the statute limits degradation

of those waters. *Id.* § 1313(d)(4)(B); 40 C.F.R. § 131.12 (2002).

[23] 40 C.F.R. § 130.2(h) (2002).

[24] *Id.* § 130.2(h)(6)-(8) (2002).

[25] Clean Water Act, 33 U.S.C. § 1362(14) (2002).

[26] U.S. Gen. Accounting Office., Pub. No. GAO/RCED 99-45, Water Quality: Federal Role in Addressing-and Contributing to-Nonpoint Source Pollution 4 (1999).

[27] *Id.*

[28] EPA & U.S. Dep't of Agric., Pub. No. EPA 840-R-98-001, Clean Water Action Plan: Restoring and Protecting America's Waters, available at <http://www.cleanwater.gov/action/toc.html> (last visited on Apr. 19, 2003).

[29] See generally Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era From an Old Idea*, 18 Ecology L. Q. 1, 8-9 (1991); Tom Tietenberg, Emissions Trading: An Exercise in Reforming Pollution Policy 16 (1985) [hereinafter Emissions Trading].

[30] See Tom Tietenberg, Environmental and Natural Resource Economics 410 (1992).

[31] See generally Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 Colum. J. Envtl. L. 171 (1988). The term "command-and-control" is often used, sometimes pejoratively, to describe traditional pollution control regulations which give specific directives to dischargers concerning the level of control to be achieved or the types of technology to be installed. See Hahn & Stavins, *Incentive-Based Environmental Regulation*, *supra* note 29, at 5-6. That term may be inaccurate when it is used to refer to regulatory measures which specify emission levels, and not just precise compliance methods. See David Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 Wash. & Lee L. Rev. 289 (1998). For recent critiques of market based incentives, see Rena I. Steinzor, *Toward Better Bubbles and Future Lives: A Progressive Response to the Conservative Agenda for Reforming Environmental Law*, 32 Envtl. L. Rep. 11421 (2002); L. N. Chinn, *Can the Market be Fair and Efficient? An Environmental Justice Critique of Emissions Trading*, 26 Ecology L. Q. 80 (1999); Richard T. Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 Duke Envtl. L. & Pol'y F. 231 (1999); Lisa Heinzerling, *Selling Pollution, Forcing Democracy*, 14 Stan. Envtl. L. J. 300 (1995); J. R. Nash, *Too Much Market? Conflict Between Tradable Pollution Allowances and the "Polluter Pays" Principle*, 24 Harv. Envtl. L. Rev. 465 (2000). Comments directed at water pollutant trading in particular can be found in congressional testimony given by Professor Steinzor. See *Water Quality Trading – An Innovative Approach to Achieving Water Quality Goals on a Watershed Basis: Hearing Before the House Comm. On Transp. & Infrastructure, Subcomm. on Water Res. and Env't*, 107th Cong., 2d Sess. (2002) (testimony of Professor Rena Steinzor, Center for Progressive Regulation), available at <http://www.house.gov/transportation/water/06-13-02/steinzor.html> (last visited Apr. 19, 2003).

Whatever its flaws, even those who criticize it as inefficient concede that a traditional regulatory approach may be preferable in certain situations, such as when pollutants have local impacts, or where the sources are too few to provide a competitive market. Hahn & Stavins, *supra* note 29, at 14-15. In Hahn's and Stavins' view, the best set of pollution control policies will involve a mix of market mechanisms and traditional regulatory measures. *Id.* at 15.

[32] See Kurt Stephenson & Leonard Shabman (Virginia Water Resource Research Center), *Effluent Allowance Trading: A New Approach to Watershed Management*, Water Science Reporter 2 (Oct. 1996).

[33] Water pollutant trading may be referred to as effluent trading or water quality trading.

[34] See Office of Water, U.S. EPA, Pub. No. EPA 800-R-96-001, Draft Framework for Watershed-Based Trading (1996), available at <http://www.epa.gov/owow/watershed/framwork.html> [hereinafter Draft Framework]. Optimally, all sources would control to the same marginal cost level, that is, the additional or incremental costs of achieving one additional unit of pollution reduction would be equal. See Hahn & Stavins, *supra* note 29, at 6. See EPA, Long Island Sound Study, Comprehensive Conservation and Management Plan 1, 2 (1994) [hereinafter LISS CCMP], available at <http://www.epa.gov/owow/watershed/summary.html> (last visited Apr. 19, 2003).

[35] See Hahn & Stavins, *supra* note 29, at 6; Emissions Trading, *supra* note 29, at 16; Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 Ecol. L. Q. 361, 364 (1989); Esther Bartfeld, *Point-Nonpoint Source Trading: Looking Beyond Potential Cost Savings*, 23 Env'tl. L. 43, 56-57 (1993).

[36] The acid deposition control provisions of the Clean Air Act, 42 U.S. C. §§ 7651-7651o (2002), are of this nature, as well as all of the existing water pollutant trading programs.

[37] Draft Framework, *supra* note 34.

[38] *Id.* at Executive Summary 2.

[39] *Id.*

[40] For a fuller discussion of the Draft Framework and the legal principles involved, see Powers, *supra* note 13.

[41] Indeed, the LIS rates its own section in the Clean Water Act, 33 U.S.C. § 1269, as does the Chesapeake Bay, 33 U.S.C. § 1267.

[42] See LISS CCMP, *supra* note 34, at 3.

[43] *Id.*

[44] Peter L. Sattler, *Surf's Up – Is it Safe?* Sound Update, Winter/Spring 2003, at 6.

[45] LISS CCMP, *supra* note 34, at 4; LISS, Summary of the Comprehensive Conservation and Management Plan, at 6 (1994) [hereinafter LISS CCMP Summary].

[46] LISS CCMP, *supra* note 34, at 20.

[47] The hypoxia problem caused by excessive discharges of nitrogen is exacerbated by the natural tendency of the waterbody to stratify during the warmer summer months. The fresher water on the surface is warmer but contains more oxygen than the lower layer, which is denser and saltier. This phenomenon creates a density difference called a pycnocline, which prevents mixing of the surface and bottom layers which would otherwise occur and bring oxygen to the lower level. LISS CCMP, *supra* note 34, at 16-18; LISS CCMP Summary, *supra* note 45, at 12.

[48] For sewage treatment plants this is referred to as "secondary treatment." Clean Water Act, 33 U.S.C. § 1311(b)(1)(B).

[49] *Id.* § 1311(b)(1)(B). See also § 1314(d). Sewage treatment plants typically are designed to treat the types of pollutants found in human waste, which include biochemical oxygen demanding pollutants (BOD) such as nitrogen, along with suspended solids (SS), and the potential of hydrogen (pH). Secondary treatment is defined by EPA regulations as a removal rate of at least 85% for BOD and SS. The 30-day average may not exceed 30 milligrams/liter, and the 7-day average may not exceed 45mg/l. 40 C.F.R. 133.102(a),(b). The pH of the discharge must be between 6.0 and 9.0. 40 C.F.R. 133.102(c).

[50] The Long Island Sound Study got underway as the result of a congressional appropriation for EPA

and the coastal states of Connecticut and New York to assess the water quality of the Sound. LISS CCMP, *supra* note 34, at 5. Following enactment of the Clean Water Act Amendments of 1987, Long Island Sound was selected to participate in the National Estuary Program, forming the Long Island Sound Study Management Conference, which included federal, state, and local officials, representatives of industry, public interest groups, and academic institutions. *See* Clean Water Act, 33 U.S.C. § 1330(c) (2002). The Conference was charged with gathering data and assessing the condition of the estuary, identifying the causes of environmental problems, and developing a Comprehensive Conservation and Management Plan to recommend priority corrective actions and compliance schedules to address those problems. *Id.* § 1330 (b). *See* LISS CCMP, *supra* note 34, at 27-45.

[51] The states agreed to achieve this "freeze," through various permit modifications and facility retrofits. LISS CCMP, *supra* note 34, at 27-29.

[52] *Id.*

[53] Conn. Dept. of Env'tl. Prot., A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound (2000) [hereinafter LIS TMDL]. *See also* Conn. Dept. of Env'tl. Prot., *The Long Island Sound TMDL*, available at <http://www.dep.state.ct.us/wtr/lis/nitrocntr/tmdlfs.pdf> (last visited June 24, 2003).

[54] EPA, Long Island Sound Office, EPA New England and EPA Region 2 TMDL Review (Apr. 3, 2001) [hereinafter EPA TMDL Approval]. The TMDL uses a maximum annual load rather than daily load limits, since hypoxia in the Sound is not sensitive to daily or short-term nitrogen loadings. LIS TMDL, *supra* note 53, at 39.

[55] Pollutants originating in the Connecticut and New York portions of the Sound's drainage basin are referred to as in-basin. Pollutants from sources outside that area, including northern tributaries, the East River or the ocean are designated as out-of-basin. LIS TMDL, *supra* note 53, at 11.

[56] Point sources contribute roughly 39,000 tons of nitrogen to the Sound a year. *Id.* at 14.

[57] Those targets are:

August 2004, first 40% of the 58.5% reduction (i.e., 23.4% of total load) = 9,534 tons/yr, removed.

August 2009, total of 75% of the 58.5% reduction (i.e., 43.9% of total) = 17,876 tons/yr, removed.

August 2014, 100% of the 58.5% reduction = 23,834 tons/yr, removed.

[58] LIS TMDL, *supra* note 53, at 35-37. Federal regulations provide that if technology-based treatment requirements applicable to the discharge are insufficient to achieve the standards, use of non-treatment alternatives to achieve WQS is permitted on a case-by-case basis. 40 C.F.R. § 125.3(f) (2002). However, the burden is on the discharger to demonstrate that the technique is preferable to others such as advanced wastewater treatment or recycling and reuse. 40 C.F.R. § 125.3(f)(3) (2002). Even after imposing advanced treatment requirements on point sources and pursuing aggressive nonpoint source reduction plans, Long Island Sound water quality models indicate that the WQS for dissolved oxygen will not be attained in all portions of the Sound. As a result, alternative technologies are under consideration as methods of achieving the TMDL. They include: (1) altering the basin morphology of the Sound; (2) constructing artificial wetlands; (3) mixing/aerating bottom waters; (4) relocating sewage treatment plant outfalls; (5) establishing seaweed farms; and (6) installing tidal gates. LIS TMDL, *supra* note 53, at 35-37.

[59] Clean Water Act § 303(d)(1)(C), 33 U.S.C. § 1313(d)(1)(C) (2001).

[60] U.S. EPA, Pub. No. 440/4-91-001, Guidance For Water Quality Based Decisions: The TMDL Process, available at <http://www.epa.gov/owow/tmdl/decisions/> (last visited on Apr. 19, 2002) (hereinafter TMDL Guidance).

[61] *Id.*

[62] *Id.*

[63] LIS TMDL, *supra* note 53, at 43; EPA TMDL Approval, *supra* note 54, at 16; *see infra* VI.B.2.

[64] EPA TMDL Approval, *supra* note 54, at 8.

[65] *Id.* at 9.

[66] *Id.*

[67] *Id.* at 12.

[68] *Id.* at 16.

[69] LISS CCMP, *supra* note 34, at 27-45.

[70] An Act Concerning Nitrogen Reduction in Long Island Sound, P.A. 01-180, 2001 Conn. Legis. Serv. P.A. 01-180 (S.S.B. 1012) (West) [hereinafter Conn. Nitrogen Reduction Act], *available at* <http://www.cga.state.ct.us/2001/act/Pa/2001PA-00180-R00SB-01012-PA.htm> (last visited Apr. 19, 2003).

[71] *See Water Quality Trading – An Innovative Approach to Achieving Water Quality Goals on a Watershed Basis: Hearing Before the House Comm. On Transp. & Infrastructure, Subcomm. on Water Res. and Env't*, 107th Cong., 2d Sess. (June 13, 2002) (testimony of Thomas Morrissey, Director, Planning & Stds. Div., Water Mgmt. Bur., Conn. Dept. Env'tl. Prot.), *available at* <http://www.house.gov/transportation/water/06-13-02/morrissey.html> (last visited Apr. 19, 2003). The savings would accrue primarily because some facilities may find it less expensive to purchase credits than to fully upgrade for nitrogen removal.

[72] Email communication with Lee Dunbar, Conn. Dept. of Env'tl. Prot. (Apr. 21, 2003) (on file with author).

[73] Conn. Nitrogen Reduction Act § 2.

[74] *Id.* Although a POTW might conceivably wish to opt out of the program, it is not clear that the law permits that. And practically speaking, it is unlikely that such a request would be made since the plant's individual permit would then have to include a nitrogen limit based on the TMDL and would be effective on issuance, rather than phased in over time. Email communication with Lee Dunbar, *supra* note 72.

[75] *See* Conn. Gen. Stat. § 22a-430 (2001) (permit for new discharge).

[76] Individual permits will only include nitrogen limitations when the discharge of ammonia nitrogen must be curtailed to protect against impairment of the receiving water. Email communication with Lee Dunbar, *supra* note 72.

[77] Conn. Nitrogen Reduction Act § 4(c)(2).

[78] *Id.* § 1(8).

[79] *Id.* § 4(b)(3). Establishing the ratio at which pollutant units from various sources or locations have an equivalent environmental impact may often be a necessary step in developing a trading program. For a summary of trading ratios in several programs, *see* Chesapeake Bay Program, Nutrient Trading Fundamental Principles and Guidelines 2-3, EPA 903-B-01-001, CBP/TRS 254/01 (Mar. 2001) [hereinafter Fundamental Principles], *available at* <http://www.chesapeakebay.net/pubs/subcommittee/nsc/final15guidancedoc.pdf> (last visited Apr. 19, 2003).

[80] LIS TMDL, *supra* note 53, at 12.

[81] Conn. Nitrogen Reduction Act § 1(2) (2001).

[82] *Id.* § 3.

[83] *Id.* § 3(a).

[84] *Id.* § 4(b)(9).

[85] *Id.* §§ 4(b)(8), (9).

[86] *Id.* § 4(b)(10). Selling credits to other entities would expand the program and reduce the financial burden on the state.

[87] *Id.* §§ 4(c)(1), (2), 5.

[88] Conn.Gen. Stat. § 22a-416 (2001).

[89] Conn. Dept. of Env'tl. Prot., *Connecticut's Nitrogen Control Program: General Permit for Nitrogen Discharges* (Sept. 2001) (fact sheet), available at <http://www.dep.state.ct.us/wtr/lis/nitrogengp/ngpfs.pdf>. Although EPA approved the general permit there is some question whether it fully comports with Clean Water Act statutory and regulatory requirements. See Testimony of Nancy Stoner, Natural Resources Defense Council, on Proposed General Permit for Nitrogen Discharges into Long Island Sound, October 24, 2001 (on file with author). The Clean Water Act requires that a facility's permit contain water quality based limits, § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C), and general permits are only authorized by the Agency when all of the dischargers "[r]equire the same effluent limitations." 40 C.F.R. § 122.28(a)(2)(ii)(B) (2002).

[90] *Id.* See also LIS TMDL, *supra* note 53, § VII.

[91] EPA TMDL Approval, *supra* note 54, at 11.

[92] *Id.*

[93] See Telephone Interview with Lee Dunbar, Conn. Dept. of Env'tl. Prot. (Apr. 11, 2003) (on file with author).

[94] See *id.*

[95] See *id.* The plants achieved a collective reduction 15 percent below the limit set by the general permit. Environmental Trading Network, *Draft, March 5, 2003 Conference Call Summary*, at 4, available at <http://www.envtn.org/calls/march2003call.PDF> (last visited Apr. 19, 2003) [hereinafter *March 5, 2003 Conference Call*].

[96] The plant generating the most credits was New Haven East, with \$624,413. The largest purchaser was Danbury, at \$272,602. Conn. Dept. of Env'tl. Prot., LIS Total Nitrogen Credit Exchange: Final Balance—2002, available at http://www.envtn.org/docs/ct_Nbalance_table.PDF (last visited June 24, 2003).

[97] Chesapeake Bay Foundation, *The Chesapeake Bay: General Bay Facts*, available at http://www.cbf.org/site/PageServer?pagename=resources_facts_bay (last visited Apr. 19, 2003) [hereinafter *General Bay Facts*].

[98] Chesapeake Bay Foundation, *CBF Fact Sheet: General Information About Chesapeake Bay*, available at http://www.cbf.org/site/PageServer?pagename=resources_facts_general (last visited Apr. 19, 2003). See also Chesapeake Bay Program, *About the Bay*, at <http://www.chesapeakebay.net/>

[info/about.cfm](#) (last visited Apr. 19, 2003); Chesapeake Bay Foundation, *The Land's Effect on the Bay: What is a Watershed, Anyway?*, available at http://www.cbf.org/site/PageServer?pagename=sotb_2001_land_watershed (last visited Apr. 19, 2003).

[99] See *General Bay Facts*, *supra* note 97.

[100] *Id.*

[101] *Id.*

[102] *Id.*

[103] *Id.*

[104] *Id.*

[105] Chesapeake Bay Foundation, *Water Pollution in the Chesapeake Bay: Too Much Nitrogen Is Bad for Bay*, available at http://www.cbf.org/site/PageServer?pagename=resources_facts_water_pollution (last visited Apr. 19, 2003).

[106] *Id.*

[107] *Id.*

[108] *Id.*

[109] *Id.* Although nonpoint sources of pollution do dominate in the Bay, sewage treatment facilities contribute a significant amount of nutrient pollution. The Bay watershed has 288 major wastewater treatment plants. Wastewater treatment plants contribute 61 million pounds of nitrogen to the Bay each year. Chesapeake Bay Foundation, *Reducing Nitrogen and Phosphorus Pollution from Wastewater Treatment Facilities*, available at http://www.cbf.org/site/PageServer?pagename=resources_facts_nutrient_red_ww (last visited Apr. 19, 2003).

[110] Chesapeake Bay Program, *A Work in Progress - A Retrospective on the First Decade of the Chesapeake Bay Restoration 2* (1998).

[111] Chesapeake Bay Program, *1983 Chesapeake Bay Agreement*, available at <http://www.chesapeakebay.net/pubs/199.pdf>. A short summary of the various Bay agreements is found in *Fundamental Principles*, *supra* note 79, at 2-3.

[112] Chesapeake Bay Program, *Chesapeake 2000*, available at <http://www.chesapeakebay.net/agreement.htm> (last visited Apr. 19, 2003).

[113]

Chesapeake Bay Program, *1983 Chesapeake Bay Agreement*, *supra* note 111.

[114] Chesapeake Bay Program, *1987 Chesapeake Bay Agreement*, available at <http://www.chesapeakebay.net/pubs/1987ChesapeakeBayAgreement.pdf> (last visited Apr. 19, 2003). The baseline for the reduction is 1985 levels of the two pollutants.

[115] *Id.*

[116] Chesapeake Bay Program, *Chesapeake Bay Agreement: 1992 Amendments*, available at <http://www.chesapeakebay.net/pubs/1992ChesapeakeBayAmendments.pdf> (last visited Apr. 19, 2003); Chesapeake Bay Program, *The 40% Nutrient Reduction Goal*, available at <http://www.chesapeakebay.net/info/nutr2.cfm> (last visited Apr. 19, 2003).

[117] Chesapeake Executive Council, Joint Tributary Strategy Statement, Directive No. 93-1 (1993), available at <http://www.chesapeakebay.net/./pubs/DirectivesAgreementsandAmendments.pdf> (last visited Apr. 19, 2003).

[118] See Fundamental Principles, *supra* note 79, at 3.

[119] *Id.* at i

[120] *Id.* at 15-16.

[121] *Id.* at 27, 29.

[122] *Id.* at 7.

[123] *Id.* at 6.

[124] Great Lakes Trading Network, *Draft, Sept. 25, 2002 Conference Call*, available at <http://www.envtn.org/calls/sept2002call.PDF> (last visited Apr. 19, 2003).

[125] *March 5, 2003 Conference Call*, *supra* note 95, at 2.

[126] H.R. Res. 361, 2000 Sess. (Penn. 2000) (enacted), available at <http://www.legis.state.pa.us/WU01/LI/BI/BT/1999/0/HR0361P2946.HTM>; see Fundamental Principles, *supra* note 79, at 7.

[127]

See Karl Blankenship, *Is it Time for a Trade for the Bay?*, 13 Bay J. 1, 1 (2003), available at <http://www.bayjournal.com/03-03/trading.htm> (last visited Apr. 19, 2003).

[128] See Press Release, EPA, EPA Releases Innovative Approach to Cleaner Water (Jan. 2003), at <http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/7f1b0616de4dc2a285256cad006a60a7?OpenDocument> (last visited Apr. 19, 2003); see also EPA, Office of Water, *Water Quality Trading Projects*, http://www.envtn.org/docs/EPA_kickoff_projects.PDF (last visited Apr. 19, 2003). The agency has also funded development of an internet-based marketplace for nitrogen trading in the Chesapeake Bay watershed. See also *March 5, 2003 Conference Call*, *supra* note 95, at 1-2.

[129] See *id.* See also Chesapeake Bay Program, *Chesapeake Bay Program Announces New Nutrient Reduction Goals to Restore the Bay*, at <http://www.chesapeakebay.net/nutrientreduction2003.htm> (last visited Apr. 19, 2003).

[130] See *supra* Part II.

[131] See Fundamental Principles, *supra* note 79, at 3.

[132] Clean Water Act, 33 U.S.C. § 1313(d)(2) (2002) (amended 1972).

[133] *Natural Res. Def. Council v. Fox*, 93 F. Supp. 2d 531, 539 (S.D.N.Y. 2000) (Carol Browner, then EPA Administrator, acknowledged in congressional testimony that TMDLs had not been given the same priority as implementing the general pollution control regulations of the CWA).

[134] See *supra* note 6.

[135] Litigants have argued that the EPA has violated Sections 706(1) and 706(2)(A) of the Administrative Procedure Act by approving inadequate or inappropriate TMDLs, or by approving extended timetables for submissions. When states that have been delinquent in submitting TMDLs plaintiffs have often sought to have the court find that there has been a constructive submission. The

constructive submission argument has failed where there is evidence of some affirmative steps taken to submit TMDLs, even if that amounts to only one or two submissions. *See generally* *Sierra Club v. Hankinson*, 939 F. Supp. 872 (N.D. Ga. 1996); *Natural Res. Def. Council v. Fox*, 93 F. Supp. 2d 531 (S.D.N.Y. 2000). *But see generally* *Kingman Park Civic Association v. EPA*, 84 F. Supp. 2d 1 (D.D.C. 1999) (EPA's duty to promulgate TMDLs for state triggered where there has been only one TMDL submitted in eighteen years); *American Canoe Association, Inc. v. EPA*, 54 F. Supp. 2d 621 (E.D. Va. 1999). Where the constructive submission doctrine failed, the APA claims were usually successful. *See generally* *Friends of the Wild Swan, Inc. v. U.S. E.P.A.*, 130 F. Supp. 2d 1199 (D. Mont. 2000) (CWA imperative was for quick development of TMDLs as evidenced by the short deadlines implicit in the statutes; thirteen years of inactivity clearly violated this imperative). *See generally* *Sierra Club v. Hankinson*, 939 F. Supp. 872 (N.D. Ga. 1996) (EPA's approval of a schedule for the submission of TMDLs was arbitrary and capricious because it would take Georgia one hundred years to comply with the CWA).

[136] *See generally, e.g., Sierra Club v. Hankinson*, 939 F. Supp. 872 (N.D. Ga. 1996) (challenging Georgia's TMDLs because they do not establish daily loads and they ignore seasonal variations as required by the CWA.); *San Francisco Bay Keeper, Inc. v. Browner*, 147 F. Supp. 2d 991 (N.D. Cal. 2001) (plaintiffs contend water quality report submitted and approved does not meet the statutory definition of TMDLs; seasonal measurement of loads and phased reduction plan violate statute); *Natural Res. Def. Council v. Muszynski*, 268 F.3d 91 (2^d Cir. 2001) (plaintiffs sought judicial review of EPA's decision to approve TMDLs for eight New York reservoirs where annual loads were substituted for daily loads).

[137] *See generally, e.g., American Iron and Steel Inst. v. EPA*, 115 F.3d 979 (D.C. Cir. 1997) (industry groups challenged EPA published guidance for Great Lakes, including total maximum daily loads, as arbitrary and capricious).

[138] Several recent decisions, however, hold that past noncompliance is irrelevant and stress the discretionary power of the EPA. As long as some affirmative steps have been taken to submit TMDLs, such as a memorandum of understanding or a schedule of submission, the courts have declined to find the EPA has violated any non-discretionary duty. *See generally* *Natural Res. Def. Council v. Fox*, 93 F. Supp. 2d 531 (S.D.N.Y. 2000), *San Francisco Bay Keeper, Inc. v. Browner*, 147 F. Supp. 2d 991 (N.D. Cal. 2001); *Sierra Club v. EPA*, F. Supp. 2d 406 (D. Md. 2001).

[139] EPA's recently proposed Water Quality Trading Policy Statement specifically requires the "[a]ll water quality trading should occur within a watershed [for which a trading program has been established] or a defined area for which a TMDL has been approved." *Final Water Quality Trading Policy Statement*, *supra* note 11.

[140] *See* EPA, *Restoring Bay Water Quality Taking a Cooperative Approach*, available at <http://www.chesapeakebay.net/info/wqcriteriatech/index.cfm> (last visited Apr. 19, 2003).

[141] Telephone Interview by Kirstin Etela with Linda Stoll, Executive Director, Fox-Wolf Basin 2000, Appleton, Wis. (Nov. 16, 2001) (on file with author); Telephone Interview by Kirstin Etela with Dick Parachini, Colo. Dep't of Public Health and Env't, Water Quality Control Div., Denver, Colo. (Nov. 16, 2001) (on file with author).

[142] Telephone Interview by Kirstin Etela with Dick Parachini, Colo. Dep't of Pub. Health and Env't, Water Quality Control Div., Denver, Colo. (Nov. 16, 2001) (on file with author).

[143] *Id.*

[144] *Id.*

[145] For more detailed information on these and other trading initiatives, *see*, Environomics, EPA, Office of Water, A Summary of U.S. Effluent Trading and Offset Projects (Nov. 1999), available at <http://www.epa.gov/owow/watershed/trading/traenvrn.pdf> (summary of 37 projects) (last visited Apr. 19,

2003) [hereinafter *Environomics*]; Powers, *supra* note 13, at 191-193. A list of eleven trading projects supported by EPA can be found, available at http://www.envtn.org/docs/EPA_kickoff_projects.PDF (last visited April 19, 2003). See also Nat'l Wildlife Fed'n, *A New Tool for Water Quality: Making Watershed-Based Trading Work for You*, *supra* note 13, at 33 (state contacts); Fundamental Principles, *supra* note 79, at 48 (trading ratios); Richard T. Woodward, *Effluent Trading: Tradable Pollution Permits for Improved Environmental Quality*, at <http://ageco.tamu.edu/faculty/woodward/ET.htm> (last visited Apr. 19, 2003) (website with numerous links to trading programs). A directory of contacts for the Environmental Trading Network can be found available at http://www.envtn.org/cgi-bin/contacts/display_users.cgi (last visited Apr. 2, 2003).

[146] Draft Framework, *supra* note 34.

[147] See Final Water Quality Trading Policy Statement, *supra* note 11.

[148] See *Environomics*, *supra* note 145.

[149] *Id.* at 8; Telephone Interview by Kirstin Etela with Bill McKee, Colo. Dep't of Pub. Health and Env't, Water Quality Control Div., Denver, Colo. (Nov. 9, 2001). See also Richard T. Woodward, *Lessons About Effluent Trading from A Single Trade*, at <http://ageco.tamu.edu/faculty/woodward/paps/CaseStudy.pdf> (last visited Apr. 19, 2003) [hereinafter *Lessons About Effluent Trading*].

[150] See *Environomics*, *supra* note 145, at 8.

[151]

See *Lessons About Effluent Trading*, *supra* note 149, at 3.

[152] *Id.*

[153] *Id.*

[154] *Id.*

[155] Unless otherwise indicated, information is based on a Telephone Interview by Kirstin Etela with Dick Parachini, Colo. Dep't of Pub. Health and Env't, Water Quality Control Div., Denver, Colo. (Nov. 16, 2001) (on file with author). See also Powers, *supra* note 13, at 193-194.

[156] *Environomics*, *supra* note 145, at 6.

[157] See N.C. Dept. of Env't & Nat. Res., Nonpoint Source Mgmt. Program, *Tar-Pamlico Nutrient Strategy*, available at <http://h2o.enr.state.nc.us/nps/tarpam.htm> (last visited Apr. 19, 2003); *Environomics*, *supra* note 145, at 26. See also Powers, *supra* note 13, at 190.

[158] See N.C. Dept. of Env't & Nat. Res., *supra* note 157.

[159] See Powers, *supra* note 13, at 190.

¹⁶⁰ *Id.*, at 189-190; N.C. Dept. of Env't & Nat. Res., *supra* note 157.

[161] See N.C. Dept. of Env't & Nat. Res., *supra* note 157.

[162] See *Water Quality Trading – An Innovative Approach to Achieving Water Quality Goals on a Watershed Basis: Hearing Before the House Comm. On Transp. & Infrastructure, Subcomm. on Water Res. and Env't*, 107th Cong., (June 13, 2002) (testimony of Anne Coan, Natural Res. Director, N.C. Farm Bur. Fed.), available at <http://www.house.gov/transportation/water/06-13-02/coan.html> (last visited Apr. 19, 2003).

[163] *Id.*

[164] Telephone Interview by Kirstin Etela with Linda Stoll, Executive Dir., Fox-Wolf Basin 2000, Appleton, Wis. (Nov. 16, 2001) (on file with author). *See also* Powers, *supra* note 13, at 186-188; Environomics, *supra* note 145, at 35.

[165] *See Lessons About Effluent Trading*, *supra* note 149, at 2; Draft Framework, *supra* note 34, at 5-13.

[166] Wis. Dept. of Natural Res., *Fourth Progress Report on the Trading of Water Pollution Credits*, Exec. Summ. (Oct. 2002), available at <http://www.dnr.state.wi.us/org/water/wm/nps/pt/index.htm> (last visited Apr. 19, 2003).

[167] *Id.* In the report the state analyzes the problems which it encountered in various trading projects, and the lessons learned. It is useful reading.

[168] Telephone Interview by Kirstin Etela with Claire Schary, Office of Innovation, United States Environmental Prot. Agency Region 10, Seattle, Wash. (Nov. 9, 2001) (on file with author). *See* Idaho Dept. of Env'tl. Quality, *Lower Boise River Effluent Trading Demonstration Project*, available at http://www.deq.state.id.us/water/tmdls/lowerboise_effluent/lowerboiseriver_effluent.htm (last visited Apr. 19, 2003); Idaho Dept. of Env'tl. Quality, *Lower Boise River Effluent Trading Demonstration Project, Summary of Participant Recommendation For a Trading Framework*, available at http://www.deq.state.id.us/water/tmdls/lowerboise_effluent/effluent_summaryreport.pdf (last visited Apr. 19, 2003); Idaho Dept. of Env'tl. Quality, *2d Annual Status Report, Lower Boise River Effluent Trading Demonstration Project*, at http://www.deq.state.id.us/water/tmdls/lowerboise_effluent/Effluent_AR_June02.pdf (last visited Apr. 19, 2003).

[169] Mich. Admin. Code r. 323.3001-3027 (2002).