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April 14, 2000

USDA Forest Service
Content Analysis Enterprise Team ATTN: UFP
Building 2, Suite 295
5500 Amelia Earhart Drive
Salt Lake City, UT 84116

RE: Comments on Unified Federal Policy for Ensuring a Watershed Approach to Federal Land and Resource Management

Dear Sir/Madam:

The American Farm Bureau Federation (AFBF) is the largest general farm organization in the country. AFBF represents the interests of more than 4.9 million member families nationwide and has affiliated state Farm Bureaus in all 50 states and Puerto Rico.

Farmers and ranchers will be significantly impacted by the proposed federal policy. Farmers and ranchers graze livestock on federal lands. They recreate on federal lands, and use federal lands for a number of other purposes. Moreover, farmers and ranchers most often reside near federal lands, within the watersheds that encompass these federal lands. As a result, we take a great interest in activities or policies that might affect their use or enjoyment of the federal lands, or impact the surrounding privately-owned lands. We have been heavily involved in the issue of nonpoint sources of pollution and the Total Maximum Daily Load (TMDL) process. Farm Bureau representatives attended the Milwaukee and Denver public meetings held on the draft policy.

AFBF supports clean water. Farmers and ranchers are taking many voluntary steps to increase the quality of water in agricultural watersheds.

One program that AFBF has initiated to help farmers achieve better water quality is sponsorship, for the past several years, of the Watershed Heroes Field Training Workshop and Conference. It is geared, in part, toward assisting farmers who want to voluntarily solve water quality challenges and increase the efficiency of their farms. The conference provides participants with the latest information on crop protectants and nutrients and their relationship to water quality, soil biology and human health. The conference reviews many potential water quality problems in a scientific perspective and provides practical and profitable ways to address them. In addition, the conference provides opportunities for teams of agricultural and community leaders to interact in a neutral setting and formulate systems and approaches to solve watershed-scale problems through voluntary, collective efforts.

This year's conference will be held at Amana, Iowa on June 5-7. It is cosponsored by the, Iowa Department of Natural Resources and Trees Forever as well as the American Farm Bureau Federation.

The federal government is generally recognized as a major polluter of our nation's waterways. We are pleased to see that federal agencies are taking steps to ensure the waters on federal lands are clean. We believe that the approach taken in this draft policy will help achieve that goal.

We also believe that the draft policy correctly focuses on a more localized, manageable watershed as the appropriate unit. Only by identification and monitoring on this type of watershed basis will proposed solutions be viable. It is necessary to get all contributors involved in a voluntary process where no single party or parties dominate the discussion. Only by coming together in this way to discuss mutual watershed concerns will progress be made.

At the public meeting in Milwaukee, it was explained that the draft policy had two main thrusts: to provide a uniform and consistent methodology among federal agencies for gathering information within a watershed using sound science that will afford all agencies a uniform interpretation of data, and to foster collaboration among states, tribes and private landowners within a watershed to identify and solve watershed problems.

We will discuss each of these separately.

1. Uniform and Consistent Methodology for Collecting Watershed Data.

One of the major purposes for the unified policy is to develop a uniform and consistent methodology for collecting data on a watershed basis. The primary vehicle for accomplishing this collection is through "watershed assessments." The draft policy states that such assessments will only be conducted on federal lands, even though state, tribal and private lands may be included in the watershed.

As part of this data collection, the draft policy states, among other things, that it will "identify and incorporate watershed management goals into our planning programs and actions." It also states that it will "help states and tribes develop science-based total maximum daily loads (TMDLs)." These statements sound ominously like this policy could be a regulatory or management program to create and advance a federal role in nonpoint source pollution management that has been traditionally left to the states. We strongly urge the agencies not to use this policy in that manner.

In our view, we would support a unified policy that had the following elements:

1. The watershed assessments are strictly for data collection only, and are not decision-making or decision-forcing documents.
2. Development of the unified methodology for watershed assessments and interpretation will be open to public scrutiny through notice and comment opportunities.

3. Use restrictions or water quality permits will not be considered as the only way to meet water quality standards.
4. Assessments will not be conducted on state, tribal or private lands without the written consent of the landowner.
5. Use restrictions will not be placed on private landowners as a result of watershed assessments.
6. Watershed assessments will be developed and interpreted on the basis of sound, scientific principles.
7. Watershed assessments and other data collection will be used only to provide technical assistance to the states in development of TMDLs, and not as imposing or otherwise unduly influencing a state's development of TMDLs.
8. State, not federal, guidance will be followed in addressing nonpoint sources of pollution.
9. The Unified Federal Policy will not create any new requirements or criteria with respect to planning on federal lands or implementation of federal plans, nor will the Unified Federal Policy rearrange priorities for planning or implementation.

We would support the unified policy to the extent that it can develop a scientifically based watershed assessment methodology that is consistent for all federal agencies. As a strictly data collection policy, it would perform a significant and valuable contribution. We strongly support the use of sound science as the basis for environmental decision-making, and we believe that a uniform watershed assessment methodology would be invaluable as a way to collect such data. We also support the concept of federal agencies making assessments on the lands they manage in order to meet state water quality standards.

We also support the attempts by the agencies to develop a uniform and consistent methodology for watershed assessments that puts all federal agencies "on the same page" with regard to conducting and interpreting the assessments. A consistent approach among agencies will benefit farmers, ranchers and other users because they will not be subject to different standards or interpretations depending on the federal agency. It will benefit the federal agencies because they will not have to "reinvent the wheel" when it comes to assessments.

In addition, properly done assessments will be able to determine impacts from natural and upstream influences. These important factors in water pollution are often overlooked because they are not considered.

On the other hand, we strongly oppose the use of this policy as a management or a regulatory tool. We strongly oppose the use of these assessments to impose restriction on uses to which farmers and ranchers can use federal lands. We oppose the use of watershed assessments to curtail or restrict livestock grazing permits, or to impose Best Management Practices (BMPs).

There is a fine line between a data collection policy (which we support) and a regulatory or management policy (which we oppose). We understand and accept that the watershed assessments are one piece of data that is considered in the planning or decision-making process. We also understand and accept the fact that in the course of planning or decision-making,

changes in management and use might occur. Watershed assessments, however, should not be decision-making or decision-forcing documents.

Because watershed assessments play such an important role in planning and implementation of land resource management, it is imperative that the public be given every opportunity to scrutinize the development of the methodology used in the unified policy. It is very important that the public be meaningfully involved at every step in this process. To be able to comment on assessment results alone means very little if the underlying methodology is not subject to public scrutiny. The draft policy contains no opportunity for public input at this important developmental stage. We strongly urge that the draft policy be amended to incorporate public involvement in the development of a unified assessment methodology.

We see the same role for watershed assessments in the development of TMDL's. Watershed assessments should be used to provide technical assistance to states ONLY in their development of TMDLs, as one piece of scientific information for the states to consider. We do not support the use of this policy as a means for the federal agencies to carve out a role or to justify a role in the development of TMDLs. We firmly believe that nonpoint source jurisdiction in the Clean Water Act resides exclusively with the states, and the federal government has no role in nonpoint source regulation. Any activities undertaken with regard to TMDL's should be to supplement state programs, and not to interject federal regulation.

2. **Collaboration to Identify and Solve Watershed Problems.**

In most cases, federal lands are merely one component comprising a "watershed." "Watershed management," on the other hand, cannot meaningfully be achieved if only one element of a watershed is involved. That is the problem facing federal land agencies in attempting to achieve watershed management.

Farm Bureau favors a watershed approach that contains the following features:

a. It must be a collaborative approach to watershed management that involves all the major users of a watershed.
b. The effort must be local in scope.
c. The collaborative effort must be truly voluntary on the part of all users. Federal agencies should not use this policy to attempt to mandate watershed management.
d. It must be a consensus-based program. All participants have equal status in the process.
e. All participants must be committed to identifying and solving any problems within a watershed.
f. All participants must go into the process with open minds that eliminate any pre-conceived ideas as to what might be causing watershed problems.
g. The assessment of the watershed must be done according to sound scientific principles.
h. Any results of the watershed assessment should not lead to regulations being imposed on any of the parties.

i. Solutions should be voluntary, and take into account the needs and capabilities of the water users.

There have been some successful collaborative efforts of this type that have been undertaken at the local level. Information describing some of these efforts is attached to our comments.

Another type of watershed enhancement program that garnered significant participation is found in Pepin County, Wisconsin. Pepin County offered a property tax rebate to any farmers or ranchers who voluntarily undertook water quality enhancement measures on their operations. A large number of area producers signed up and took advantage of this program. Additional information is provided about this program as well.

3. Watersheds of Special Protection.

One area of the draft policy that causes us problems is the section providing for the designation of "watersheds of special protection." The draft policy identifies those watersheds "that may have significant human health, public use, or aquatic ecosystem values."

The draft policy identifies no legal authority for designating such watersheds. There is no such authority in the Clean Water Act. Similarly, while the draft policy states that it would only designate the portion of watersheds for special protection that are on federal lands, the federal agencies acknowledged at the public meeting in Milwaukee that there may be changes in use that are made throughout the watershed as a result of the designation.

We have very serious concerns with this type of approach. As indicated above, we would oppose any unified federal policy that assumes additional regulatory authorities. Designation of "watersheds for special protection" is the type of new regulatory authority that we oppose.

As expressed by the federal agencies themselves, designation of such watersheds would trigger use restrictions and other changes within the watershed. This process transforms the use of watershed assessments from mere information collection documents to decision-making and decision-forcing documents. It makes the unified federal policy a regulatory program that we cannot support. We urge that the provisions relating to designation of "watersheds of special protection" be deleted from the final policy.

We appreciate the opportunity to participate in the public discussion of this policy.

Sincerely,

Richard W. Newpher
Executive Director
Washington Office

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December 1993

Market Incentives for Water Quality

A Case Study of the Tar-Pamlico River Basin, North Carolina

by

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About the Author

David Riggs is a doctoral candidate in economics at Clemson University. His research program focuses on environmental policy and the emergence of property rights. David's publications include other special reports, chapters in edited works and technical papers now being considered for publication in professional journals. His investigation of the Tar-Pamlico Association includes field visits as well as an extensive review of reports and background documents.

Executive Summary

The Tar-Pamlico Story

In 1983, local fishermen and citizens in the Tar-Pamlico region of North Carolina noticed sores on fish, algal blooms (aquatic foliage consuming water's available oxygen), and fish kills (dead fish floating to the surface due to lack of oxygen) in their local rivers and estuaries. Believing nutrients like nitrogen and phosphorus to be the cause, grassroots organizations soon expressed concern to the NC state government. In 1989, the region was declared Nutrient Sensitive Waters (NSW) by the North Carolina Department of Environmental Management (DEM). The NSW legislation designated the region as being vulnerable to nitrogen and phosphorous discharge and laid the groundwork for future regulation. The prospects for control were complicated by the mix of nutrient sources. Approximately 85% of the nutrient loads originate with nonpoint-sources, e.g., agricultural activities and natural phenomena. The remaining 15% came from point-source water sewage treatment facilities and local industry. Due to political and technological constraints of detecting, monitoring and enforcing nonpoint-source nutrient reduction, impending legislation targeted point-source discharge. Old style command-and-control regulation seemed inevitable.

Publicly Owned Treatment Works (POTWs) accounted for a large percentage of the nutrient discharge from point-sources, with local industry contributing the remaining discharge. Although quantified scientific evidence regarding linkages between nutrient discharge and ultimate water quality was lacking, the DEM proposed legislation to reduce nutrient discharge from the point-source facilities. Even before the legislation was passed, some of the POTWs in conjunction with a private firm asked the NC state government if a better solution could be attained. Further reductions by point-source dischargers would have little effect on the basin; and many of the POTWs had previously taken measures to control nutrients, making further reductions extremely expensive. The POTWs, private firms, and interested environmental groups came up with an alternative to the DEM's plan: Take the money that was to be spent on nutrient reduction from

point-sources and spend it on nonpoint-source reduction. That is, rather than reduce a point-source's pollution by another 5%, which already has been reduced about 90%, the same amount of money spent on a nonpoint-source could reduce more pollution by a factor of 3 to 4. Essentially, "more bang for the buck" could be attained if monies were spent on reducing nutrients from nonpoint-sources.

As mentioned, political and technological constraints exist for reducing nonpoint discharge. What seemed logical on paper was surely not simple to implement. On the technological end, the nature of nonpoint-source pollution makes it difficult to detect, monitor and enforce (against) nutrient discharge—by definition, nonpoint-source pollution is discharge from *diffuse* sources. The science of nutrient impact and removal is much more precise for point-source discharge. On the political end, much of the nonpoint nutrient source is from agriculture. Farmers do not look kindly when outsiders interfere in their operations and impose controls and management practices. Under the North Carolina Division of Soil and Water Conservation (DSWC), however, such practices were already being employed. The DSWC administers the Agricultural Cost Share Program (ACSP) which pays farmers to reduce nutrients and runoff. The program employs what are known as Best Management Practices (BMP). BMPs use recognized methods for controlling nutrient runoff, such as animal waste treatment lagoons. The political and technological costs associated with nonpoint nutrient reduction were diminished by the DSWC's involvement.

The group of point-source dischargers formed an organization called the *Association*. They put their sights on funding BMPs through the ACSP at local farms. With a few refinements the state accepted the Association's alternative plan and the Association agreed to the following: fund a computer model simulating nutrients' flow and impact, take weekly samples of phosphorus and nitrogen discharge, make annual payments to ACSP, meet allowable nutrient loads, and purchase BMPs when loads exceed the allowable limit. The emergence of this "nutrient market" is exhibited at two levels:

1. *Between Point-Sources.* The Association is a group of point-source dischargers with the option of members offsetting other members' discharge. In a somewhat different

light, the Association also acts as an information marketplace for members. At monthly meetings members can obtain information on scientific, political, and legal aspects of nutrient discharge.

2. *Between Point-Sources and Nonpoint-Sources.* "Nonpoint source trading is a new concept in which a waste-water discharger has the option of either treating its effluent to remove nutrients (phosphorus and nitrogen) or removing an equivalent level of nutrients from agricultural runoff through the ACSP."[a]

In part, the nutrient trading strategy was accepted because environmental groups realized more nutrients were being removed than what would have been the case under the state's original plan; point-sources could obtain potential cost-savings; nonpoint-sources, though they were more likely to be regulated due to increased funding, were being paid to reduce discharge; and the NC government was maintaining federal standards and a higher level of intergovernmental cooperation.

The result of this yields a rare outcome. The primary objective of environmental quality is being pursued in a cost-effective manner. Indeed, it appears as if a fortuitous equilibrium has been reached. But why did this happen for the Tar-Pamlico basin and not for other watersheds with similar use problems? What are the critical characteristics that set the Tar-Pamlico watershed apart from others?

Principles for the Emergence of a Water Quality Market

The Tar-Pamlico region of North Carolina offered unique circumstances for the emergence of a nutrient reduction trading strategy. The principal characteristics of this strategy are outlined below for the purpose of illustrating why a water quality market arose.

• **A Constraint.** A binding constraint on the amount of pollution discharge must be enforced. This constraint has to be believed; dischargers must recognize that some type

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a. North Carolina Department of Environmental Health, and Natural Resources, Division of Environmental Management, Water Quality Section. *Attachment A: Tar-Pamlico NSW Nutrient Management Strategy.* Sept. 13, 1990, p.1.

of pollution control is inevitable and that violation of the law is punishable.

For the North Carolina episode the constraint is evident at two levels:

1. The 1987 Clean Water Act was the federal binding constraint that affected nutrient reduction in the Tar-Pamlico watershed. A binding federal constraint will facilitate cooperation among state governmental agencies, thereby increasing the likelihood of implementing a cost-effective pollution reduction plan.

2. The NC Department of Environmental Management (DEM) was the governmental agency central to the issue at the state level. Their objective was to decrease the nutrient loads in the basin, with point-sources providing the low-cost means of achieving some reduction. It was DEM's flexibility and willingness to cooperate in the development of an alternative strategy that made a distinguishing difference for the Tar-Pamlico watershed. They allowed the point-source dischargers (the Association) time to come up with a better plan; but, if the Association had not come up with an acceptable nutrient reduction plan, the DEM's original strategy (constraint) was to be fully employed.

• **The Pollutant.** When the pollutant is common to all potential transacting parties, the costs of using the market are less. Put differently, it is easier to trade oranges for oranges than apples for oranges.

In North Carolina, both point- and nonpoint-sources discharge nitrogen and phosphorus. The nutrients are common to all dischargers. If they were not common, costs would increase scientifically—technological difficulties of offsetting one pollutant for another—and politically / economically—negotiation and cooperation difficulties of getting two distinct parties to transact. Transaction costs are lower when the dischargers emit the same pollutant.

• **Science.** Proper and credible assessment of the pollutant's impact and removal must be made. Scientific evidence showing adverse consequences from pollutant discharge and evidence showing positive consequences of pollutant removal will substantiate the

integrity of legislative restrictions. The research that had been conducted and collected on the Tar-Pamlico prior to legislation includes the following:

- Monitoring the flow (total fluid discharge) of relatively large point-sources (those with a flow greater than 0.5 MGD).

- Monitoring of total nitrogen and phosphorus discharge at these same (large) facilities.

The precise impact of nutrients and the results of their removal are unknown. In the legislation that was passed, the scientific research to be conducted and monitoring to follow includes:

- The Association funds a $400,000 computer model that simulates the flow of nutrients and forecasts impact and removal of nutrient discharge.

- Each point-source must monitor and report weekly samplings of nitrogen and phosphorus discharge.

The effort to obtain scientific evidence supports the legislation's foundation and improves upon the knowledge of the feasibility of point to nonpoint tradeoffs.

• **Differential Costs.** Differences in the cost of pollution control among potential transacting parties are required for gains from trade. Differential costs lead to an information system that supports transactions. In the Tar-Pamlico watershed cost differences are found between point-sources and between the group of point-sources and nonpoint-sources.

Point-Sources. Key cost differential characteristics regarding members of the Association include:

- 80% of the flow from the 13 members of the Association were from two large POTWs. Their initiative and involvement was instrumental.

- The remaining 11 members were approximately the same size in terms of flow.

Pollution control cost differences among members of the Association are related to firm size. Economies of scale are present. For example, large POTWs have their own labs to perform samplings, which are required by legislation. Small POTWs must contract

out for this service, thus they pay higher costs on a flow proportionate basis than large POTWs.

Point-Source to Nonpoint-Source. The cost differential between point- and nonpoint-source was instrumental for the emergence of the nutrient market. Holding constant the amount of nutrient discharge, collectively, point-sources would have to spend $50 to $100 million, whereas nonpoint would require only $11.7 million. Stated differently, it would cost point-sources 4 to 5 times more to reduce nutrients internally.

- **The Discovery Incentive.** A critical feature of a flexible, market style pollution abatement program is the incentive that firms are confronted with when reducing their pollution. In the pursuit of cost-minimization, firms will discover cost-effective methods of abating their pollution. Dischargers find cheaper ways to treat waste and protect and maintain the resource in the process. New methods of pollution abatement are often a consequence of such activity.

In the Tar-Pamlico watershed, the Association has found innovative ways to treat waste. The combined wealth of the Association was able to afford the hiring of a consulting firm that evaluated each member's facility. It was discovered that some facilities could be retrofitted to further reduce waste. The consulting firm discovered a cost-effective method of reducing total discharge for all members combined. Point-source discharge was minimized, while costs were also curtailed.

- **Inter-Group Cooperation.** The market works at two levels: 1) Point-source to point-source, and 2) Point-source to nonpoint-source. Cooperation among the point-sources at level 1 is essential if level 2 is to be attained. Some key characteristics among members of the Association that facilitate cooperation are:

  - The costs of nutrient reductions for POTWs are dispersed over a customer base that has few (if any) alternatives of water treatment service.

  - Members of the Association are homogeneous:
    1. All are point-source dischargers;
    2. Discharge comes in the form of a definable flow;

3. Final output is the same (with the exception of the private firm);
4. Each is a government municipality (except the private firm).

The fourth homogeneity characteristic carries many implications. The structure of the POTW industry is non-competitive—the customer base is geographically defined and enforced by law, with rates determined by a non-market process. This industrial structure may have facilitated cooperation among the Association members.

• **A Broker.** A broker who acts as an information processor between all of the groups involved in the plan will lower transaction costs. The broker would have expertise in the legal, political, technological, and economic characteristics of a water quality market. The Association hired John Hall, an attorney with the law firm Kirkpatrick & Cody, who fulfilled the role of information broker. Hall was instrumental in developing the market strategy and still plays a critical role in the communication among Association members and between the Association and external parties (e.g., government and environmental groups).

• **Peripheral Groups.** The actions and cooperation of environmental groups are of key concern. They commonly act as a liaison to explain and justify methods of pollution reduction to the public. The main purpose of the North Carolina Environmental Defense Fund (EDF) and the Pamlico-Tar River Foundation (PTRF) was to decrease nutrient loads. With that goal in mind, both groups supported the offset strategy and played a key role in public acceptance of the innovative plans of the Association. In addition, the environmental groups were instrumental (and still are) in many of the scientific studies.

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Acknowledgements

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D.W.R.

December 7, 1993

Part I

Introduction

Controversy over the consumption and allocation of water has challenged man's ingenuity and problem solving capacity for centuries. Externalities, or one person's use affecting another's use without compensation, are the source of controversy. Diving deeper, we find the rudimentary cause of an externality to be a lack of property rights—ownership rights to a body of water are either poorly defined or enforced, or both. Numerous methods have been used for relieving common access water use problems. The U.S. experience over the last 20 years has been one of statutory law: Property rights to many common access waters have remained undefined, while the users of that water have been subjected to rules and regulations. Assuming a primary objective of water quality, one must ask, "Does this type of public policy attain the greatest benefit at least cost and if not, does a better solution exist?"

Before this question can be addressed, and putting aside for the moment the issue of property rights, the negative consequences of an externality must be identified. What does science say about the effects different users have on a water body? What are the causes of a water quality problem? What is the natural state? What are the results of pollution reduction? Once quantifiable evidence is assembled, the issues of water consumption, allocation and quality can be more accurately addressed.

This report focuses on water quality problems and proposed solutions as they relate to the Tar-Pamlico River Basin located in eastern North Carolina. A review of the water quality problems and the actions taken to alleviate them raises a number of interesting questions. First, what does science conclude about the causes and effects of the water quality problems? From where and from whom does the pollution originate? What are the effects of pollution removal? The second section of the report describes the scientific conclusions and ambiguities associated with the Tar-Pamlico watershed. The section identifies the sources of discharge and, to the scientific extent possible, their effect on the basin.

Next, how have industry, agriculture, environmental groups, and local, state and federal governments addressed this issue? Section three focuses on the law that emerged from the interaction of these groups. The section describes in detail the water quality market that emerged in the Tar-Pamlico watershed. Section four builds off of the previous section and focuses on the key features and characteristics of the Tar-Pamlico water market. The section identifies some generic qualities necessary for a watershed market to evolve. Final thoughts and conclusions are given in section five.

Part II

Science and Politics

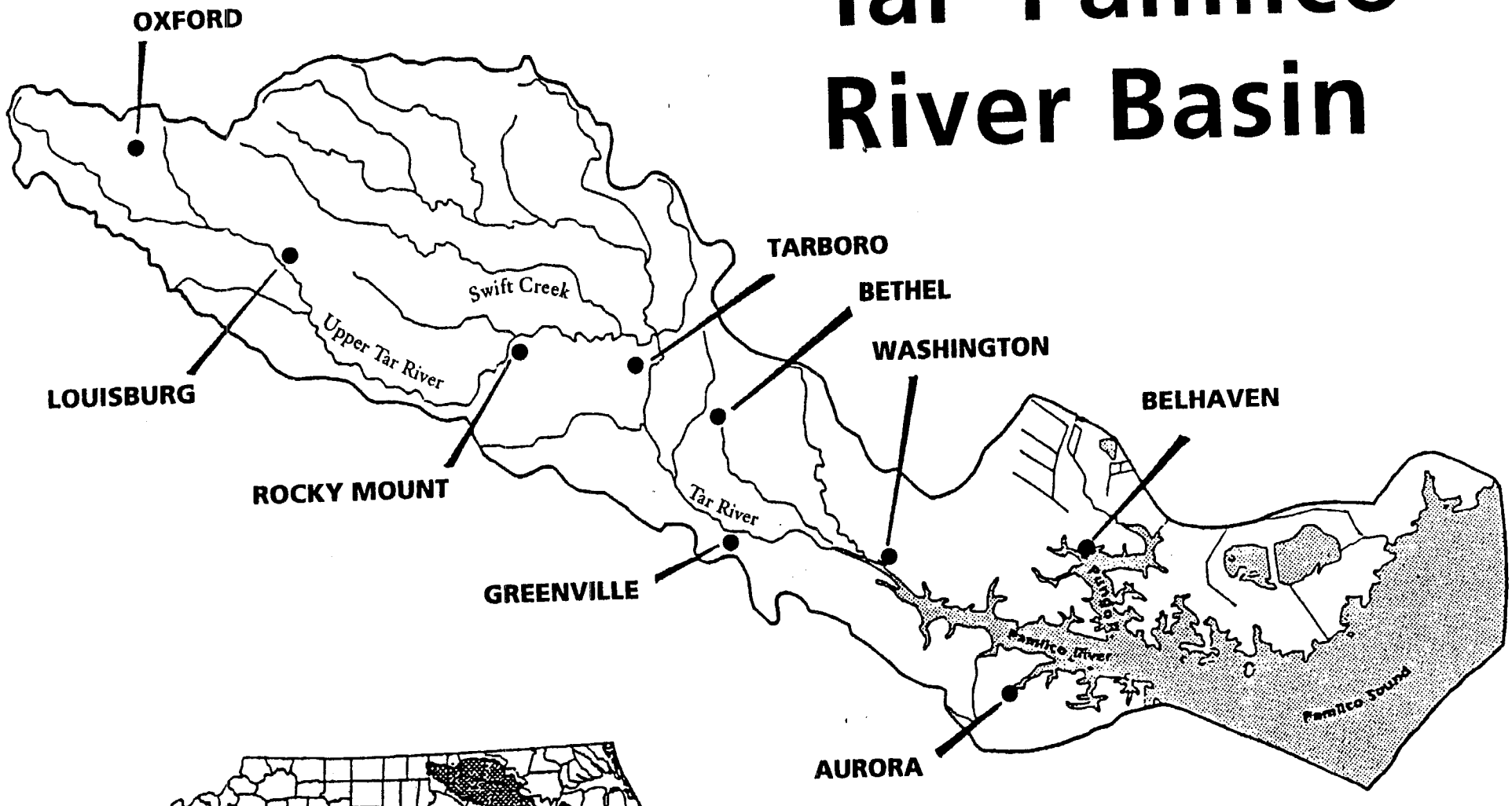
Water is a life-sustaining substance. It is used by an assortment of species for many different purposes—animals and plants live in water bodies; humans drink it and use it for recreational, commercial and personal use. It is of no surprise that one species' use of water can affect another's use. This section describes the Tar-Pamlico River Basin as an estuarine system, identifies users of the system, discusses the impact that competing users have on the basin, and cites legislation that oversees and regulates dischargers in the watershed. The section is concluded with a summary of the scientific evidence and ambiguities for the Tar-Pamlico watershed.

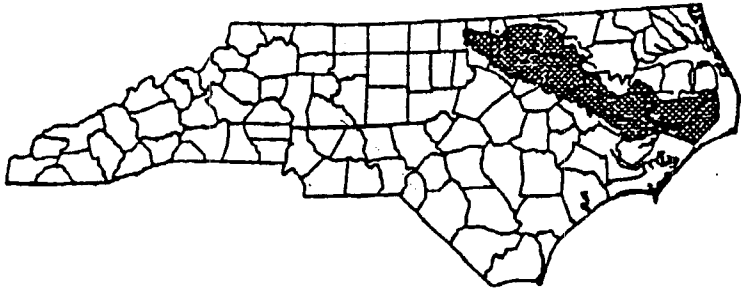
The Tar-Pamlico Watershed

The Tar-Pamlico watershed consists of numerous rivers and estuaries, all combining into a complex basin. The Tar and Pamlico rivers are the two primary rivers from which the basin gets its name. As the figure on the following page depicts,[1] the Tar River makes up the upper portion of the watershed and is centered in the Piedmont farmlands of North Carolina. This freshwater river and its tributaries comprise about

1. The figure was computer regenerated from: Pamlico-Tar River Foundation, Inc. *A River of Opportunity: A Pollution Abatement and Natural Resource Management Plan for the Pamlico Basin.* Washington, N.C., April 1991.

Tar–Pamlico River Basin





2,300 miles of streams. The Tar drains over 4,300 square land miles as it flows southeastward 140 miles through the coastal plain cities of Rocky Mount, Tarboro, Greenville and Washington.

The Tar River becomes an estuary, with its name changing to Pamlico, at Washington, NC. The Pamlico River has wide shallow waters that do not have a constant flow and whose currents are driven by the tide and wind. It is here where the freshwater Tar mixes with the salt waters from the Atlantic Ocean. The Pamlico is known to move both easterly toward the Ocean and westerly toward the Tar River. In places the estuary is up to 15 feet deep and is 5 miles wide where it meets the Pamlico Sound. Approximately 1,250 square miles of the watershed is drained by the Pamlico.[2] Most of the land use in the watershed is agricultural.

The region composes an immense ecosystem. Both the freshwater portion and estuary support important natural resources. The system contains one of the most productive estuaries in the Eastern United States, with valuable commercial and recreational fishing. Indeed, it is a rich and versatile habitat for fish, wildlife and people. Each entity's use of the ecosystem has an impact, however. Of obvious concern is the effect that man has on the system: What is man's impact on the watershed? If there are adverse consequences, what caused them? Who caused them and how? These are questions that prescribe scientific research.

Nutrients and Their Effects

Knowledge of the sources and understanding the effects nutrients have on the Tar-Pamlico's ecological system are essential if proper retroactive and proactive policy is to be implemented. Nitrogen and phosphorus are the two primary nutrients that are discharged from various sources in the Tar-Pamlico watershed. The most commonly cited problem resulting from increased nutrient loads is a process known as eutrophication—nutrients stimulate the growth of algae to a point where available oxygen

2. Ibid., pp. 3-4.

is absorbed and sunlight is closed out, both necessary for other water species to exist and thrive. The nutrients are present in natural or background levels between 0.05 and 0.3 mg/l. The activities of man add to these background levels, leading to potentially adverse ecological consequences.

In addition to (or coupled with) eutrophication, other physical signs thought to be related to nutrient discharge are numerous fish kills, red sores on fish, and holes in the shells of crabs. However, it is difficult to determine the extent of man's activity causing these problems. For example, "[T]he dinoflagellate has been linked to massive fish kills and bacterial diseases that have plagued the Pamlico River and other coastal estuaries in recent years."[3] Likewise, it is uncertain that preventing nutrients from being leached in the watershed will have any positive effects on water quality, even if the source of discharge is readily identifiable. Indeed, "[T]he natural variability inherent to all estuaries complicates identifying man's effects on the estuary."[4] In short, scientific quantification of nutrient impact and removal has yet to be fully collected in the Tar-Pamlico watershed.

Nutrient Discharge

Point-Source

Generally water quality problems can be defined as caused by point-source pollution, nonpoint-source pollution, or a combination of the two. Point-source pollution means "any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock,

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3. The dinoflagellate is a single-celled aquatic plant algae. It only reproduces sexually when it is in mid-kill of fish. Although research is on-going at North Carolina State University about "dino's" origin and capabilities, at least some of the fish kills are linked to this creature. Pellin, M.E. "Killer Algae too Strange for Fiction: Weird Creature Plays Part in Fish Kills in Pamlico River, Expert Says." *Washington News.* 1 July 1993.

4. North Carolina Department of Natural Resources and Community Development, Division of Environmental Management, Water Quality Section. *Tar-Pamlico River Basin Nutrient Sensitive Waters Designation & Nutrient Management Strategy.* April 1989, p.3.

concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged."[5] In general, point-source pollution is discharge from a well-defined origin. Regulations to control water quality for the past twenty years have focused on point-source dischargers. The National Pollutant Discharge Elimination System (NPDES) mandates that all point-source dischargers maintain a permit to discharge into bodies of water.[6] The partial effect of NPDES and other legislation has been decreased loads from point-source dischargers. Still, these regulations have not solved most water quality problems.

The Tar-Pamlico watershed is no different. There are approximately 130 point-source dischargers in the basin. The majority of the discharge from point-sources originates with municipal waste-water treatment plants (most are publicly owned) and a few industrial dischargers. Although each point-source in the basin has a NPDES permit, water quality problems began to arise in the mid-1980s.

Nonpoint-Source

Nonpoint-source pollution is defined as any water pollution outside of point-source pollution. Basically, it is the pollution of water from diffuse sources "caused by rainfall or snowmelt moving over and through the ground and carrying natural and manmade pollutants into lakes, rivers, streams, wetlands, estuaries, other coastal waters and ground water."[7]

The types of nonpoint-source pollution in the Tar-Pamlico watershed could include agriculture, mining, hydrologic and habitat modification, urban runoff, land disposal, silviculture, construction, atmospheric deposition and other undefined sources. According to a U.S. Environmental Protection Agency report, ecological risks posed by

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5. The United States Clean Water Act as amended by the Water Quality Act of 1987, PL 100-4, Doc. No. 73-355, Section 502(14), United States Government Printing Office.

6. See Section 402 of the Clean Water Act.

7. U.S. Environmental Protection Agency, Office of Water, *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* (WH-553), May 1991, p. 1-1.

nonpoint-source pollution are substantially more serious than those posed by point-source pollution.[8] Evidence from the Tar-Pamlico watershed supports this notion. As Table I displays, nonpoint discharge is responsible for 85% of the nutrients that are leached in the watershed. The single largest contributor of nonpoint-source discharge is agriculture, which is the sum of cropland, livestock and forestry in Table I.[9] Until recently, little control over nonpoint-source pollution had been attempted relative to point-source discharge.

Although science was still proceeding, federal (statutory) law already had some jurisdiction in the region and the North Carolina state government went ahead with its own rules, classifying the region as having water quality problems.[10]

Legislative Reaction

Federal

The Tar-Pamlico watershed falls under an array of legislation, ranging from the 1987 Clean Water Act (CWA) to North Carolina's Nutrient Sensitive Waters Act. Regulation of point-source discharge is politically cost-effective relative to nonpoint-source because point-source dischargers are identifiable and monitoring effluent is technically feasible. The federal government has been reluctant to deal directly with nonpoint-source pollution because of the political sensitivity over land use issues. The problem centers on the lack of documented evidence about the effects specific land areas and uses have on water quality. Monitoring data is not available to address most nonpoint problems so cause and effect relationships have been difficult to establish.

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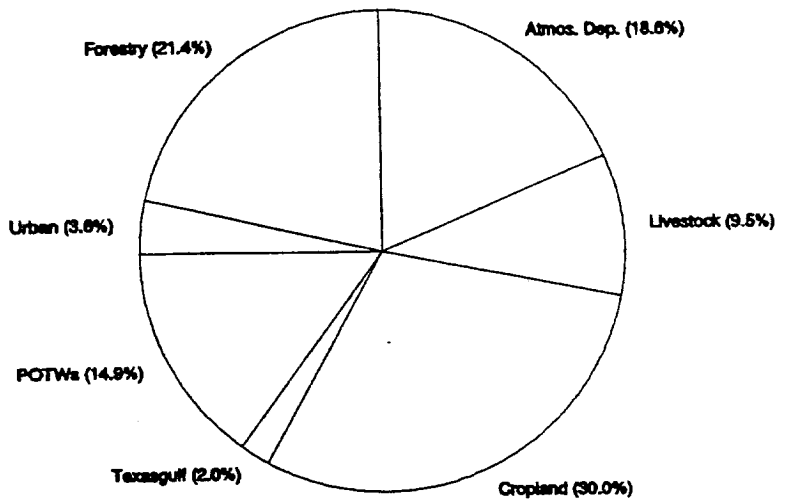
8. U. S. Environmental Protection Agency. *Comparing Risks and Setting Environmental Priorities.* Washington, D.C., August 1989.

9. The data on phosphorus displayed in Table I is from 1988. Since that time Texasgulf has reduced its phosphorus discharge by over 90%.

10. For a similar scenario of federal legislation that moves ahead without respect to scientific analysis, see, David W. Riggs, *Acid Rain and the Clean Air Act: Lessons in Damage Control.* in Taking the Environment Seriously. Roger E. Meiners and Bruce Yandle, eds. Lanham, MD: Rowman and Littlefield, 1993.

1988 Tar-Pam Nitrogen Distribution



1988 Tar-Pam Phosphorus Distribution

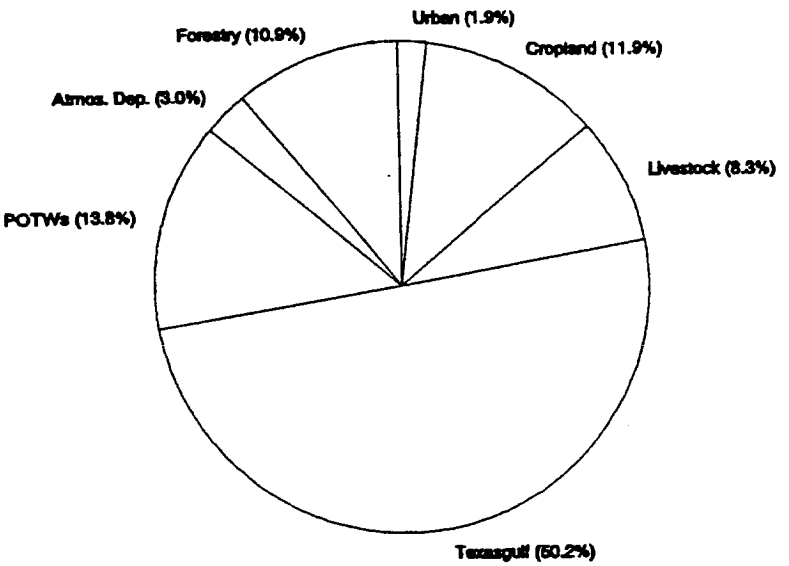


Table I Nitrogen and Phosphorus Distribution
Source: NCDEM. *Tar-Pamlico River Basin NSW Designation & Nutrient Management Strategy.* April 1989.

A growing awareness, however, of nonpoint-source pollution's role in water quality degradation led Congress to amend the Clean Water Act of 1972. In the Water Quality Act of 1987, Congress stated:

> It is the national policy that programs for the control of nonpoint-sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint-sources of pollution.[11]

Section 319 of the 1987 CWA addresses nonpoint-source pollution. The plan is for states to assess the water quality problems within their state and then adopt management plans to address those problems. Under the Act, funds are issued by the EPA to help states in administering their management plans. By and large, however, most of the burden of developing pollution control strategies are placed at the state level, with the EPA filling a supervisory role.

State

A petition was made in early 1989 to the North Carolina Environmental Management Commission (EMC) to classify the Tar-Pamlico River Basin as Nutrient Sensitive Waters (NSW). NSW is a designation used by the state of North Carolina to describe a waterbody that has water quality problems caused by nutrients, e.g., phosphorus and nitrogen. The NSW designation sets separate limits on total phosphorus (TP) and total nitrogen (TN), with a year-round phosphorus effluent limit and a seasonally varying nitrogen limit: The limits were set at 2 mg/l of phosphorus and 4 mg/l of nitrogen in the summer and 8 mg/l in the winter for all expanding point-source facilities and any new facilities. These limits were set by year with the ultimate goal of reducing phosphorus and nitrogen loads by 200,000 kg/yr by 1995. The goal was based upon projections that annual loads from point-sources in the watershed would reach 625,000 kg/yr by 1995.

The NSW designation allows the North Carolina Department of Environmental Management (DEM) to set stricter limits on the discharge of nutrients from *point-sources*.

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11. U.S. EPA, *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, op. cit., p. 1-2

Once the Tar-Pamlico was designated as NSW, the DEM developed a strategy to reduce nutrients entering the river.[12] It was unknown, however, what the strategy would mean in terms of reduced fish kills, sensitivity to nutrients, and historical flow of nutrients. Most of the public meetings held to discuss the NSW designation and strategy were emotional and dramatic with examples of dead fish displayed in the meetings and little discussion pertaining to the effects of the limitations on actual water quality or the costs of achieving the reductions.

Affected Sectors

Industry

Of all the point-source dischargers in the Tar-Pamlico watershed, Publicly Owned Treatment Works (POTWs) are the most visible. These facilities treat the sewage of townships in the basin and discharge the treated water.

While the NSW legislation was pending, POTWs voiced concern about how regulations would effect their costs.[13] Several point-source dischargers were facing expansion in the near future and would need to spend a large amount of money in new pollution control technology to be in compliance.[14] These POTWs and other point-source dischargers saw their long-term options limited by the state's strategy. The limitations set by the state would reduce nutrient levels by 10 to 20% of current discharge. The state authorities knew that the POTWs were only 15% of the problem but lacked the power to limit the discharge from nonpoint-sources, which made up the remaining 85%.

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12. The proposed legislation was: NCDEM, Water Quality Section, *Tar-Pamlico River Basin Nutrient Sensitive Waters Designation & Nutrient Management Strategy*, April 1989.

13. One previous designation of a river basin as NSW in NC, the Chowan basin, resulted in POTWs using land application instead of discharging into the river. The smaller towns could not afford the higher costs of building new facilities to control the nutrients at the lower levels.

14. The towns of Greenville, Rocky Mount, Belhaven and Pinetops, for example.

Agriculture

Agriculture is the single largest contributor of nonpoint-source pollution in rivers, lakes and wetlands for both the Tar-Pamlico watershed and across the U.S.[15] The agricultural activities that cause nonpoint-source pollution are:

1. Erosion of agricultural land;
2. Concentrated animal production facilities;
3. Commercial fertilizing, animal wastes, and sludge;
4. Land receiving pesticide applications;
5. Land used for grazing; and
6. Irrigated lands.[16]

The pollution resulting from these activities comes from nutrients like phosphorus and nitrogen, and sediment, animal wastes, salts and pesticides. Nutrients are present in soil's natural state, but are often added to farmland by applying commercial fertilizers and manure to increase output per acre. Heavy rains and erosion can wash nutrients applied to a field into a stream or river.

When nutrients enter a waterbody, algae consume the dissolved nutrients, often resulting in algal blooms. Sediment, animal wastes, salts and pesticides also contribute to water quality problems due to agriculture. Sediment from topsoil erodes easier and is richer in nutrients than subsurface soil, thus sediment has a higher pollution potential. Animal waste from the fecal remains of livestock and poultry can contribute nutrients, organic materials, and pathogens to receiving waters. Not only does suspended animal waste cause nutrient concentrations to rise, but it also reduces the quantity of dissolved oxygen because of decay. Salts and other natural minerals and metals damage crop production and plant growth in aquatic environments.

Estuarine waters can be adversely affected by large concentrations of soluble salts. Pesticides applied to topsoil and plants can be washed into water bodies and become

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15. U.S. EPA, *Managing Nonpoint Source Pollution: Final Report to Congress on Section 319 of the Clean Water Act (1989)*. January 1992, pp. 15 - 29.

16. U.S. EPA, *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*, pp. 2-8 - 2-9.

embedded into the food chain. The residue from pesticides can induce eutrophication and abortion in fish.

To varying degrees, all of these activities are present in the Tar-Pamlico watershed. The North Carolina Division of Soil and Water Conservation (DSWC) uses Best Management Practices (BMPs) in an effort to control nonpoint source discharge. For example, with respect to the fecal wastes of livestock, animal waste treatment lagoons can be set up on site at a farm. These lagoons will greatly decrease nutrient discharge into water bodies. Use of BMPs are subject to the DSWC's discretion, however. There is very little legislation that oversees discharge from nonpoint-sources.

Summary

Much has been done with regard to scientific assessment of nutrients' origins and how to remove their presence in the watershed. Some scientific conclusions follow:

- Nonpoint-sources are responsible for 85% of nutrient loads.
- Agriculture comprises most of the nonpoint-source discharge.
- Technology exists to control nonpoint-source pollution (BMPs).
- POTWs (point-source) are responsible for the remaining 15% of nutrient discharge.
- Technology exists (chemical and/or biological) for nutrients to be reduced at point-sources.

In spite of the scientific studies that have been completed on the Tar-Pamlico watershed, a number of uncertainties remain. These include:

- What are the results of decreased nutrient loads?
- Does nutrient reduction from one area impact the entire basin?
- Are BMPs a feasible technology over many nonpoint-source sites?

As stated in the NSW Nutrient Management Strategy, "...the Pamlico has demonstrated the potential for over-enrichment [of nutrients] which may become problematic. Changes in land use throughout the watershed in recent decades and problems with aquatic life

measured instream have created concern for the health of the estuary."[17] To some extent the legislation has mandated that an effort be put forth to answer these scientific questions.

In the face of these uncertainties, however, the region was designated NSW, paving the way for the DEM to mandate more costly controls on point-source dischargers. With the POTWs being targeted and the scientific ambiguities remaining, an interesting development occurred: While seeking to minimize costs, POTWs realized that nutrients could be removed from the waters more cost-effectively through nonpoint-sources than point-sources. Here started the birth of the point to nonpoint trading strategy.

17. NCDEM, Water Quality Section, *Tar-Pamlico River Basin Nutrient Sensitive Waters Designation & Nutrient Management Strategy*, April 1989, p.3.

Part III
The Tar-Pamlico Nutrient Market

To resolve the water quality problems of the Tar-Pamlico watershed a different regulatory approach was discovered. A nutrient trading program to reduce the amount of nutrients, particularly phosphorus and nitrogen, entering the Tar-Pamlico water basin has been implemented. Its origin was not, per se, with the state or federal government, but rather with local municipalities, industry and environmental groups. That is, its origins were with the competing users, formed through their cooperation, not by broad, sweeping statutory law. The program, now in its first phase of completion, marks the beginning of a marketable permits program that allows point-source dischargers to purchase higher nutrient emissions by paying for nonpoint-source pollution control programs. This section focuses on the development and accomplishments of the Tar-Pamlico water quality market.

The Tar-Pamlico Watershed Market

When the North Carolina Environmental Management Commission (EMC)—the board that makes decisions on environmental policy for the DEM—considered classifying the Tar-Pamlico River as NSW, the EMC asked the DEM to develop a strategy to reduce nutrients. In the summer of 1989, the DEM proposed a nutrient management strategy that emphasized strict limits on new and expanding point-source dischargers. The

strategy did not address phosphate levels from current dischargers, it only imposed stricter limits on expanding facilities—those with planned design flows of greater than 0.5 million gallons per day (MGD). There were several POTWs that supported the NSW designation but opposed the DEM's strategy to deal with the designation. Doing some rough economic estimating, the POTWs found that they would have to spend between $50 - $100 million to be in compliance with the state's plan.[18] Furthermore, compliance offered no long-term assurance that the state would not impose stricter limits at a later time. Moreover, environmentalists were unhappy with the plan because it did not adequately address existing point-source discharge and nonpoint-source pollution. In summary, industry and environmental groups were unhappy with the plan because:

1. There was no baseline for judging the standards set by the strategy.
2. There was little scientific data on which to base nutrient reductions.
3. The plan was unfairly targeting POTWs who were only 15% of the problem.
4. Implementing stricter reductions would be very costly.
5. No guarantee was given that the state would not impose stricter limits later.
6. The plan was technology based; It did not allow POTWs flexibility in how to control nutrient discharge.

A *coalition* of point-source dischargers emerged to deal with these problems. The coalition was lead by Malcolm Green, the general manager of the Greenville Utilities Commission, one of the POTWs facing plant expansion. The Greenville Utilities Commission hired a consultant to coordinate the coalition's plans and ideas and put them into a legal framework.

In September 1989, the EMC met for its quarterly meeting and was considering acceptance of the NSW designation and DEM's strategy. The coalition accepted the NSW designation but requested that they be allowed to develop another strategy. The EMC accepted the NSW designation and referred the strategy back to the DEM to work with the coalition and environmental groups to develop a new strategy. The EMC gave the groups ninety days to develop a new strategy, or the state's original strategy would be implemented.

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18. Personal Conversation with Malcolm Green, Chairman of the Association, February 11, 1993.

During the 90-day period, the DEM, the NC Environmental Defense Fund (NCEDF), the Pamlico-Tar River Foundation (PTRF), and the coalition met and worked on a plan. The first step was to develop a baseline for judging the removal of nutrients and the effects that the nutrients have on the water quality. Discharge levels were known for 1988, so it was established as a baseline year. Projections on plant discharge for 1995, which was the year the state's plan was to be implemented, were made based on the 1988 data. Plant expansions and growth were included in the projections. It was estimated that the coalition would increase discharge by 200,000 kg/yr by 1995. A simple offset/trading strategy developed among point-source dischargers to reduce the 200,000 kg/yr.

The trading strategy did not, however, address nonpoint-source pollution. The Division of Soil and Water Conservation (DSWC) was brought into the discussion to address agricultural nutrient loads. The coalition did some calculations based upon the cost of reducing agricultural nonpoint-source nutrient loads and found that they could buy three to four times the reductions of phosphorus and nitrogen from agricultural loading. That is, if it cost $X to retrofit a point-source facility, the same $X spent on reducing nonpoint-source nutrients would yield three to four times the nutrient reductions. The DSWC already was using the NC Agricultural Cost Share Plan (ACSP) on farmland by implementing best management practices (BMPs) to control nutrient loading. By supplementing ACSP to implement more BMPs, the coalition realized they could meet the 200,000 kg/yr reduction for about $11.7 million, which was a significant cost savings compared to the estimated $50 - 100 million. This strategy came to be known as the Nutrient Reduction Trading Strategy (NRTS).

The baseline for nutrient load reduction was agreed upon by all parties involved. The DEM calculated the reductions based on the number of members in the coalition. To fix the nutrient goal, the coalition had to have a fixed number of members. A deadline for joining the coalition was set. The coalition became incorporated as the Tar-Pamlico Basin Association referred to as the *Association*. All point-source dischargers along the Tar-Pamlico River were invited to join. Mostly POTWs joined the

Association with one industrial firm, National Spinning, Inc., as the exception. In December of 1989, the NRTS was adopted.

Not all of the POTWs and point-source dischargers joined the Association. Some POTWs decided not to join based upon the risk involved. For instance, there was no guarantee the Association would succeed in reducing the 200,000 kg/yr by 1995. If the Association failed, the investment in BMPs, membership costs, and trading agreements would be forfeited, and the State's plan would be implemented. Some of the POTWs had already planned upgrades in plant facilities or were in the process of building them when the Association formed.[19] They could meet the state's stricter limits set for 1995 without the need to trade.

Although it is not necessary to join the Association to utilize the nonpoint-source trading concept, incentives exist for joining the Association. A discharger, who is not a member, interested in trading would not have the immediate benefit of the computer model that will be developed by the Association, which may indicate modification be required for nutrient removal.

Texasgulf, a phosphate mining and fertilizer company, had a design flow almost as large as the entire Association but refused to join. The company was in the process of negotiating a new NPDES permit when the Association formed. By spending $30 million to redesign the operational flow of water in its facilities, Texasgulf reduced its discharge of phosphorus by 94%.[20] Joining the Association was not a wealth-enhancing option for Texasgulf.

The Nutrient Reduction Trading Strategy

The Nutrient Reduction Trading Strategy uses a two phase approach: Phase I goes through 1994; Phase II begins in 1995. Phase I focuses on developing a computer model

19. The towns of Tarboro and Robersonville, for example.

20. Telephone conversation with Rann Carpenter and Jeff Furness of Texasgulf, Inc., January 29, 1993

for the basin,[21] making engineering evaluations of waste-water treatment plants and implementing operational and minor capital improvements, monitoring effluent from POTWs, and using a nutrient-trading program.[22] The Association found that they could meet the allowable loads mostly by making engineering or operational changes. But in order to keep the option of trading excess load by buying BMPs, the Association agreed to make minimum payments each year. The total contribution to the nutrient trading fund is $500,000 until 1995. A transfer of $350,000 to the DSWC has already been made to demonstrate BMP effectiveness at Chicod Creek "in reducing nutrient loading as well as their cost-effectiveness as part of the Tar-Pamlico nutrient trading program."[23]

Each year a minimum payment is made and is counted towards future excess loading payments. If the Association goes above allowable loads in a given year, they must make excess loading payments. The excess loading payments are calculated based upon the following formula:

> **Excess Loading Payment = (Association actual annual loading - allowable nutrient loading) x $56/kg/yr - prior payments (minimum + excess loading).**[24]

Prior minimum payments refers to annual contributions that were previously made by the Association to the nutrient reduction trading fund. Excess loading refers to previous annual payments to the fund.

Members of the Association may trade nutrient loads among themselves as long as the Association does not discharge more than the allowable amount. The Association allocates the allowable load by the NPDES permit design for each facility. Each facility has a NPDES permit specifying the facility's design flow. Each Association member is

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21. The computer model is designed to monitor the flow of phosphorus throughout the basin. It identifies the quantity of phosphorus entering the Basin and pinpoints high concentrations.

22. U.S. Environmental Protection Agency, *Incentive Analysis for Clean Water Act Reauthorization: Point Source/Nonpoint Source Trading for Nutrient Discharge Reductions*, April, 1992, p. B-8

23. Memo from Steve Tedder to David Sides, February 10, 1993. Available upon requests.

24. *Tar-Pamlico Nutrient Sensitive Waters Implementation Strategy*, adopted December 14, 1989, revised February 13, 1992, p. 5.

given a percentage of the allowable load based on its permitted flow as a portion of the Association's total permitted flow. Payments are made in the same way. Minimum payments are based upon the design flow. If the Association exceeds the allowable level of nutrient discharge, it has the option of purchasing BMP reductions through the ACSP or face the state's stricter limits. Incentives to falsify monitoring reports are discouraged by fines and penalties enforced by the DEM.

Individual members can also expand their facility during this plan. If a member expands nutrient removal capabilities, the credit is given to the allowable amount of nutrient load. This credit is tradeable with other Association members who need to discharge higher loads.[25] New limits will not be written into an Association member's permit.

Expanding non-Association facilities can also participate in the nutrient reduction trading program through the ACSP. The nonmember must pay a one-time upfront fee:

BMP payment ($)= New Design Flow (MGD) x Excess Nutrients (mg/l) x $62/kg/yr x Conversion Factor,

where

Excess Nutrients = (TP limit - 2 mg/l) + (TN limit - 6 mg/l).

The excess nutrients are total phosphorus (TP) and total nitrogen (TN) in milligrams per liter (mg/l) added together, and the

Conversion Factor = 1382 = 3.7854 l/gal x 365 day/year.[26]

The Non-Association member must pay the one-time fee to cover modeling costs for BMPs. The higher BMP cost covers the administrative fees for implementing the BMPs.

New entrants to the basin must meet a no-discharge criteria or show that it is economically or technically infeasible. If the no-discharge criteria is infeasible, the new discharger is subject to the same restrictions as an expanding facility. New dischargers will receive permit limitations based on the following schedule:

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25. Greenville and Washington POTWs are anticipating banking excess credits.

26. *Tar-Pamlico NSW Implementation Strategy*, p. 7.

1. If discharge is greater than or equal to 50,000 gdp: 2 mg/l TP year round.

2. If discharge is greater than or equal to 100,000 gdp: 2 mg/l TP year round; 4 mg/l TN May-October and 8 mg/l TN November-April.[27]

New dischargers cannot participate in the nutrient reduction trading program nor can they become members of the Association.

The Association's Responsibilities

The Tar-Pamlico Basin Association is composed of the publicly-owned treatment works (POTWs) of Belhaven, Bunn, Enfield, Franklin Water and Sewer Authority, Greenville, Louisburg, Oxford, Pinetops, Rocky Mount, Spring Hope, Warrenton and Washington. National Spinning, a textile firm, is also a member. Under the trading plan, the members of the Association agree to:

1. Develop and fund (approximately $400,000) an estuarine computer model to recommend future nutrient reductions.
2. Do an engineering evaluation of existing water-treatment works to determine if minor improvements can be made.
3. Begin weekly monitoring of total phosphorus (TP) and total nitrogen (TN) loads and submit them in an annual report to the DEM.
4. Make minimum payment to the Agricultural Cost Share Program each year.
5. Provide funding for 2 additional staff members of the DSWC.
6. Meet allowable nutrient loadings each year.
7. Purchase BMPs through ACSP, if loading is above allowable loads.

The computer model is to be used to run "what if scenarios" and to "assess the relative importance of nitrogen and phosphorus from waste water dischargers, nonpoint-sources (NPS), sediments, and atmosphere to algal growth and oxygen stress."[28] Coordinating efforts with DEM, NCEDF, and PTRF are a part of the model. The model is estimated to cost $400,000 and was scheduled for completion in July 1993. The model has been completed and will be used to track and target the best areas for implementing BMPs.

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27. Ibid., p. 5.

28. Ibid., p. 2.

The engineering evaluation was a coordinated effort by the Association. The Association agreed to pool its resources and hire a consulting firm to conduct evaluations of each plant. The consultant suggested modifications in the operations of the facilities. When the modifications were carried out, the Association came out 13% below the allowable load for the nutrients in 1991.

The Association agreed to conduct weekly samplings of water discharged from each facility. The samples are to be collected by the plant and tested either at a state approved lab or at the plant's lab, which has been a continuing point of controversy for the Association members because some members are too small to make weekly sampling cost-effective. The monitoring samples are submitted to the DEM in an annual report. DEM checks the reports for errors and misinformation. These monitoring reports are used to determine the Association's discharge of phosphorus and nitrogen. The nutrients discharged by the members are added together. If the discharge is greater than the allowable amount, the load is used to calculate the excess loading payment made into the ACSP.

The Association also agreed to make minimum payments to the ACSP for the purpose of maintaining the right to trade with nonpoint-sources. The minimum payments add up to $500,000 over three years. In addition, the Association agreed to provide $150,000 for two DSWC personnel to coordinate BMPs in the Tar-Pamlico River Basin.[29] The DSWC personnel along with DEM locate problem areas in a watershed and provide assistance to BMP projects in those areas.

The North Carolina Agricultural Cost Share Program

The North Carolina Agricultural Cost Share Program (ACSP) was initiated in 1984 as a test program to address nonpoint-source pollution (NPS) problems in the "nutrient sensitive" waters of Jordan Lake, Falls Lake and the Chowan River. Over time the plan grew to include other regions of the state, and in July 1989 the ACSP was

29. Details of Association responsibilities are included in: North Carolina Department of Environmental Health, and Natural Resources, Division of Environmental Management, Water Quality Section. *Attachment B: Tar-Pamlico NSW Implementation Strategy An Estimation of Major Requirements.* Sept. 13, 1990.

expanded to include the entire state.[30] North Carolina is divided into several soil and water conservation districts, each of which carries out its own regional plan. State money is allocated to the Districts by the Division of Soil and Water Conservation (DSWC). The allocation is based upon the District's annual strategy plan, which prioritized funding on water quality needs and limiting factors such as:

1. Availability of contractors, engineering assistance, and/or materials;
2. Landowners' agreements to complete work;
3. Length of growing season; and
4. Degree of water quality impact from BMP installation.[31]

Districts must develop alternative plans for each year to take account of weather, crop prices, governmental actions, and corporate decisions to change farming practices. The funding each District receives is determined by the DSWC by using predetermined formulas with variables corresponding to aspects of each District's need. These variables are assigned numeric values, and the formulas are run on computers to calculate the amount of funding given to each District. The funding process is subject to final approval by the Soil and Water Conservation Commission.

The process begins in one of two ways. First landowners fill out an application based on their need to control nutrients. Non-landowners can apply provided they show a long term written lease indicating control over the land for the life of the applied for contract. The application has a checklist of needs, which each farmer completes. Each District has a technical assistant to evaluate the water quality problem. The technical assistant walks the applicant's land and makes suggestions as to which best management practices (BMPs) would prevent the water quality problem. The farmer gets to choose how to manage the BMP. The type of BMP chosen is dependent on how the water quality problem originates on the farmer's land and the type of BMPs approved by the

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30. Established under North Carolina General Statutes Chapter 143 Article 21 Section 149. (a), effective May 1, 1987. The details of the plan are found in North Carolina Administrative Code Title 15, Chapter 6, Section 6E, June 4, 1992.

31. James R. Cummings, *Nonpoint Source Section Chief for Division of Soil and Water Conservation, "North Carolina Agricultural Cost Share Program For NPS Pollution Control: Soil & Water Conservation District Prioritization*, Memo, March 27, 1989.

commission for the current program year. Each BMP selection comes from the annual Detailed Implementation Plan. This list also contains the cost figures for constructing or implementing the BMP, and the BMP's projected life. The cost is determined based upon the average cost of previous BMPs. The application is then sent to the District Board where all the cost figures for the District are totalled. These figures are used to construct the District's annual strategy plan. Based upon the District's priority for funding, a contract will be made between the District and the applicant. The District agrees to provide 75 percent of the cost, and the farmer provides 25 percent, which can be provided through in-kind contributions. The process can also begin from the District's standpoint by assigning priority to areas with high water quality problems.

When the plan has been approved, the farmer can build the BMP. It is up to the farmer to contract the work out and to assure the design meets the state's specifications. The farmers know how much funding they will receive from the ACSP based upon the BMP's average cost. When the farmer finishes building the BMP and the District's technical assistant reviews the BMP, the District informs the DSWC to make payment to the farmer. Knowing the amount of funding he will receive from the state, the farmer can work to minimize the cost of constructing the BMP. The ongoing management of the BMP is up to the farmer. These decisions can be instrumental in the development of the BMP because they are site specific.

The District's technical assistant carries out inspections to make sure BMPs are still in place. If an applicant's BMP is found not to meet the specifications, then the applicant has 30 days to reimplement the BMP. If an applicant does not reimplement the BMP, the applicant will be required to repay the DSWC a prorated refund based on the life of the BMP. When land ownership changes, the new owner is encouraged but not forced to maintain the BMP.

The Association's contributions and payments to the ACSP are placed in a specific fund rather than the general ACSP fund allocated by the DSWC to the Districts. In the nutrient trading strategy, the Association agreed to give $150,000 to the DSWC to fund two personnel to coordinate BMP projects in the Tar-Pamlico River Basin. At this time

there is only one person employed in the Tar-Pamlico River Basin to coordinate BMP implementation. The main focus is on reducing nutrient loads in watersheds where there are high concentrations of animal operations. The Department of Environmental Management helps the DSWC in locating areas with high concentrations of nutrients and possible water quality problems. The decision to implement BMPs in a particular area is left up to the DSWC and the personnel funded by the Association.

Realized Gains from Trade

The nutrient reduction trading strategy has accomplished several things. First the engineering evaluation conducted at each facility brought the Association 13% below the allowable loading for 1991. The Association has also been successful in getting three line item grants from Congress to fund the strategy. The first grant was for $400,000 to document the computer model and put it into GSI format. The other two grants have gone directly into the ACSP funding. For nutrients, the state deals with the Association and not individual dischargers, lowering monitoring and enforcement costs for all involved. The cost savings from introducing the trading plan were large. Collectively, the point-source dischargers would have to spend between $50 to $100 million to meet the tighter state standards. Under the trading plan, however, the estimated cost of reducing the same quantity of nutrients was (only) $11.7 million.

The trading plan provided benefits to the state, the public and the dischargers. The state can focus on the water quality itself, rather than the type of pollution control to be implemented. Politically, the state's efforts to control water pollution in the Tar-Pamlico River Basin can be measured by the quality of water attained and not by the technology mandated. The public was also given the opportunity to negotiate acceptable water quality standards. The environmental groups are now able to concentrate their resources on the water quality standards and the Association's compliance with those standards.

Members of the Association now have the incentive to control pollution in order to meet water quality standards. Each member has an incentive to find lower-cost ways

to control pollution. Several of the members are even considering building new facilities that would allow them to trade excess control capacity with other members. There is even potential to trade outside of the Association with the farmers in the area. The payments made into the Agricultural Cost Share Program, so far, indicate that trading is economically and politically promising.

Part IV

Markets and Watersheds

Issues of water quantity and quality are a major subject of controversy between users. In the recent past, attempts at controlling water quantity and quality have been through regulation. Command-and-control techniques were the typical methods employed, which focus on the technology implemented, not the results achieved, for managing the use of water rights.[32] Rarely, if ever, does this method effectively alleviate conflicts of interest between users.

In contrast, the use of a market process to harness pollution problems is a viable method of abatement and increasingly commonplace.[33] When properly implemented the benefits of pollution markets are substantial. "Properly implemented" is a critical concern

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32. The reasons for this type of environmental legislation being mandated reach beyond the scope of this report. The interested reader is referred to Bruce Yandle, *The Political Limits of Environmental Regulation: Tracking the Unicorn.* Quorum: New York, 1989, and for a more general assessment of the theory of economic regulation see, Peltzman, Sam, *The Economic Theory of Regulation after a Decade of Deregulation.* in Brookings Papers on Economic Activity: Microeconomics, Brookings Institution: Washington, D.C., 1989.

33. See, for example, Title IV of the 1990 Clean Air Act, where a market of sulfur dioxide permits has been created to control acid rain. Use of the market for pollution control has its origins in Dales, J.H. Pollution, Property and Prices. Toronto: University of Toronto Press, 1968.

because clearly what works on paper does not always hold in practice.[34] This section of the report identifies the general characteristics of a pollution market and how they relate to the Tar-Pamlico Nutrient Market. The purpose is to illustrate why the market process came to be used for the Tar-Pamlico watershed and how this process might be implemented for other regions and pollutants.

The Assignment of Property Rights

At the root of the usage controversy is the issue of who owns the water rights and if that right is excludable. A *credit* holds such property: It is the quantity of pollution that can be discharged into a defined environmental media such as the air or water. The owner of a credit is entitled to discharge the quantity of pollution that the credit sanctions. Simply, a credit is a specified right to use the environment. When the total number of credits is controlled (i.e., limited), the credits have a value attached to them. The value of the credit is determined by the quantity of pollution a credit is worth and the total number of credits available. These credits assign property rights to the owners, who can buy more credits from other owners or sell their credits to other buyers.

When the number of credits is defined and restricted to a geographic area a pollution *bubble* is established. Inside a bubble there may be multiple discharge points. Dischargers within a bubble are allowed to buy and sell credits from one another so long as total discharge for the bubble does not exceed the legislated limit. Importantly, if ownership rights are limited and assigned, that discharger's incentive is to manage the resource to its best use. Buying and selling the right to use water results in the water rights going to the highest valued use.

Under an old-style command-and-control system, a discharger had to obtain a NPDES permit and meet specific technology standards mandated by government. The

34. Some past attempts at using a market-style pollution abatement program have been unsuccessful. In theory the programs worked well but upon implementation failed. The Fox River of Wisconsin is an example, see Erhard F. Joeres and Martin H. David, eds., *Buying a Better Environment*, Land Economic Monograph No.6, Madison: University of Wisconsin Press, 1983 and Bruce Yandle, *A Primer on Marketable Permits*, Journal of Regulation and Social Costs, 1(1991): 25-41.

firm's focus was on lowering production costs and was of ecological importance; the technological standards caused firms to focus on the type of pollution control and not on environmental quality.

The market-style pollution abatement program in the Tar-Pamlico watershed has created a different set of incentives. The Association was sanctioned a nutrient limit for all members combined not to exceed. A bubble was established. Members of the Association can now buy, sell and offset nutrient discharge of other members. A discharger is given the choice of internally controlling the pollution (retrofitting the facility) or externally offsetting (purchasing) the nutrient discharge of another facility. The enforced legislated limit coupled with dischargers given the flexibility in attaining the nutrient limit creates an incentive structure that protects and maintains the quality of the watershed, while simultaneously curtailing costs. Science and legislation dictated the nutrient limits, and Association members find cost-effective pollution control methods.

The Discovery Incentive

The old-style command-and-control regulatory process involved substantial bureaucratic and abatement costs. Pollution control innovation was not encouraged. A critical feature of a flexible, market-style pollution abatement program is the incentive that firms are confronted with when reducing their pollution: Firms will discover cost-effective methods of abating pollution when attempting to minimize costs and maximize profits. Dischargers will seek the least cost method to treat waste because excess pollution credits can be sold for profit. New methods of pollution abatement are often a consequence of such activity.

The Association has discovered innovative ways to treat waste. The combined wealth of the Association was able to afford the hiring of a consulting firm that evaluated each member's facility. It was found that some POTWs could be retrofitted to further reduce discharge. The consulting firm discovered a cost-effective method of reducing total discharge among all members. Point-source discharge was minimized, while costs were also waned.

Cost Differences

A market-based credit system is driven by the costs of controlling pollution, with an emphasis on environmental quality. A firm is given a choice to pollute or to control the pollution. If the cost of controlling pollution within the firm is less than the cost of a credit, the producer will choose to control the pollution and sell their credits. The opposite holds as well—purchase credits and expand operations. Science, via legislation, determines environmental quality by limiting the amount of credits, and a credit holder is penalized for violating the law if it discharges more pollution than it has in credits.

The market-system vanishes, however, if cost differences between dischargers are not present. When two potential transacting parties have equal marginal abatement cost functions, the net gains from trade are zero. Trading discharge permits presents no advantage. If, on the other hand, two firms face different marginal abatement cost schedules, tradable discharge permits enable gains from trade. Having the lower-cost firm increase its pollution abatement by one increment and simultaneously having the higher-cost firm reduce its pollution abatement by one increment, environmental quality is maintained (the additional abatement exactly offset the reduced abatement) and the cost-savings to the higher-cost firm exceed the rise in costs to the lower-cost firm. The higher-cost firm compensates the lower-cost firm for reducing discharge. The cost differences lead to an information system that supports transactions.

In the Tar-Pamlico watershed, the cost differences are found between point-sources and between the group of point-sources and nonpoint-sources, with the latter providing the initial spark for the emergence of a market. The group of point-source dischargers estimated their costs of reduction to be $50 to $100 million collectively for compliance with pending legislation. In contrast, for the same amount of nutrient abatement, nonpoint-source reduction was estimated at $11.7 million. Stated differently, it would cost point-sources 4 to 5 times more than nonpoint-source to reduce nutrients. The gains from trade and cost-savings were substantial.

The cost differential between point-sources was also instrumental for the emergence of a nutrient market. The differential is evident in terms of plant-size between

members of the Association. Eighty percent of the discharge flow from the 13 members were from two large POTWs; the remaining 11 members were approximately the same size in terms of flow. Economies of scale are present. The large POTWs have their own labs to perform water samplings, which are required by legislation. Small POTWs must contract out for this service, thus they pay higher costs on a flow proportionate basis than large POTWs.

Transaction Costs

When using a credit market, several hurdles or costs must be incorporated by the potential transacting parties. In general, these costs are referred to as transaction costs. A transaction cost is the "friction" in the transfer of a good or service across a separable user.[35] This friction is similar to the friction found in machine parts. The more the machine parts grind, the less efficient is the machine. In a market, transaction costs are part of a firm's decision to produce internally or purchase in the market. Some types of transaction costs are finding suppliers, writing contracts, and monitoring the quality of parts needed for production. The lower the transaction costs, the smoother the market mechanism works.

Under command-and-control regulation, a producer that creates pollution has to control it internally. The only choice for the firm is to reduce the internal cost of control given specific technology standards. The market approach gives a producer the option to control or discharge the pollution based on relative costs. If the transaction costs of doing business in the market are low enough, the firm will choose to use the market, thereby lowering the firm's cost of pollution control.

A credit market has transaction costs. Depending on idiosyncratic circumstances, different transaction costs would be incurred for different markets. Some of the key transaction costs for a water quality market are:

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35. Oliver E. Williamson, The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting, The Free Press, New York, 1985, p. 1

1. The waterbody (market) has to be geographically defined.
2. A water quality goal for the market has to be established.
3. Dischargers with similar pollutants must be identified.
4. Government restrictions on trading cannot make transactions too costly.
5. Trading terms and values of credits have to be established.
6. An institutional structure needs to allocate credits, monitor discharge, and penalize violators.[36]

Each of the six transaction cost factors is found in the Tar-Pamlico market. The terms of trade have to be defined and contracts have to be written based on the location and area of the market used. The geographic definition of the Tar-Pamlico watershed market was shown in Figure 1 of Part II. The physical boundaries of the market accord with the flow and contours of the watershed.

Once the physical market is delineated, a water quality goal can be mandated. The goal is based on what science dictates to be the total quantity of nutrients to be released into the water body. A binding constraint on the amount of pollution discharge must be enforced. This constraint has to be believed. Dischargers must recognize that some type of pollution control is inevitable and that violation of the law is punishable. The constraint is evident at federal and state levels for the Tar-Pamlico watershed:

1. The 1987 Clean Water Act was the federal binding constraint that fostered cooperation among the NC state governmental agencies. The federal constraint ensured a state government water quality objective.

2. The NC Department of Environmental Management (DEM) was the governmental agency central to the issue at the state level. Their objective was to decrease the nutrient loads in the basin, with point-sources providing the low-cost means of achieving some reduction. It was DEM's flexibility and willingness to cooperate in the development of an alternative strategy that made a distinguishing difference for the Tar-Pamlico watershed. They allowed the point-source dischargers (the Association) time to come up with a better plan; but, if the Association had not come up with an acceptable nutrient reduction plan, the DEM's original strategy (constraint) was to be fully employed.

Trading will work best between dischargers who have similar production types and pollution discharge. When the pollutant is common to all potential transacting parties,

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36. U.S. EPA, *Incentive Analysis for Clean Water Act Reauthorization: Point Source/Nonpoint Source Trading For Nutrient Discharge Reductions*, April 1992, pp. 8 - 11.

the costs of using the market are less. If firms and governing bodies must convert one type of pollution into another for the purpose of transacting, costs will rise relative to the situation where identical pollutants are offset. Put differently, it is easier to trade oranges for oranges, than apples for oranges.

In North Carolina, both point- and nonpoint-sources discharge nitrogen and phosphorus. The nutrients are common to all dischargers. If they were not common, costs would increase scientifically due to the technological difficulties of offsetting one pollutant for another, and politically / economically due to negotiation and cooperation difficulties of getting two distinct parties to transact. Transaction costs are lower when the dischargers emit the same pollutant.

Government restrictions on trading could raise the cost of transacting above the cost of internally controlling pollution. The Association and other groups central to the Tar-Pamlico market helped to reduce these bureaucratic costs, which are shown below:

- **Inter-Group Cooperation.** The market works at two levels: 1) Point-source to point-source, and 2) Point-source to nonpoint-source. Cooperation among the point-sources at level 1 is essential if level 2 is to be attained. Some key characteristics among members of the Association that facilitate transactions are:
  - The costs of nutrient reductions for POTWs are dispersed over a customer base that has few (if any) alternatives of water treatment service.
  - Members of the Association are homogeneous:
    1. All are point-source dischargers;
    2. Discharge comes in the form of a definable flow;
    3. Final output is the same (with the exception of the private firm);
    4. Each is a government municipality (except the private firm).

  The fourth homogeneity characteristic carries many implications. The structure of the POTW industry is non-competitive—the customer base is geographically defined and enforced by law, with rates determined by a non-market process. The members are not competing with one another for consumer dollars. Hence, intra-industry transfers through regulation are not as likely. This industrial structure may have facilitated cooperation within the Association.

- **A Broker.** A broker that acts as an information processor between all of the groups involved in the plan will lower transaction costs. The broker would have expertise in the legal, political, technological, and economic characteristics of a water quality market. The Association hired John Hall, an attorney with the law firm Kirkpatrick & Cody, who fulfilled the role of information broker. Hall was instrumental in developing the market strategy and still plays a critical role in the communication among Association members and between the Association and external parties (e.g., government and environmental groups).
- **Peripheral Groups.** Participants such as environmental groups commonly act as a liaison to explain and justify methods of pollution reduction to the public. The main purpose of the North Carolina Environmental Defense Fund (EDF) and the Pamlico-Tar River Foundation (PTRF) was to decrease nutrient loads. With that goal in mind, both groups supported the offset strategy and played a key role in public acceptance of the innovative plans of the Association. In addition, the environmental groups were instrumental (and still are) in many of the scientific studies. Support from these groups will help to lower transaction costs.

Once the first four transaction cost factors are sufficiently low, the number of credits that will be traded can then be determined. The ongoing monitoring and enforcement of water quality will have to be handled by some institutional structure. This, again, was one of the primary functions of the Association which acted to ensure that each member monitor and perform water quality samplings.

Trading pollution permits or rights offers the prospect for reducing pollution control costs and for achieving the goals of water quality statutes. In the absence of property rights, pollution control will continue to be costly and controversial. Water quality goals will not be achieved. But while we understand these things, we also know that organizations are costly to form and markets are costly to use. Transaction costs stand as a barrier to the promise of lower costs. As the cost of transacting rises, the less efficient a market alternative will be for controlling pollution costs. Stated differently, the gains from markets are only theoretical if transaction costs are insurmountable.

Part V

Concluding Thoughts

When allowed to operate as designed, water quality markets can demonstrate the effectiveness of economic incentives in achieving environmental improvements. In particular, a market strategy creates incentives for industry to further reduce pollution, since dischargers can directly benefit from developing cost-effective methods of nutrient abatement. Also, these policies have afforded savings to the consumers of products made with nutrient discharging production processes. The market strategy allows for nutrient reduction to be achieved at a lower cost, which translates into lower prices. These are the accomplishments and results often heralded by proponents of a market strategy. But the Tar-Pamlico watershed market offers this and more.

Upon being confronted with higher water quality standards and imminent command-and-control regulation, nutrient dischargers were motivated to find lower cost alternatives. In their search for an alternative, a system of property rights was established. The nutrient dischargers formed the Association and were allocated a limited right of discharge. The nutrient bubble of the Association formed through the threat of regulation, not through mandated legislation. Simply, the industry caused the structure of the current regulation.

The next logical step was to find the low-cost alternative. Agriculture was targeted. But why would nutrient offsets ever take place between point-sources (the

Association) and nonpoint-sources (agriculture)? Answering this question was perhaps the most novel consequence of the Tar-Pamlico watershed market. Because the point-sources were faced with imminent nutrient reductions, they formed the Association to act as an intermediary between them and agriculture. Agriculture, foreseeing possible nutrient regulations in their near future, realize the potential gains from trade. By modifying their operations, the farmers are paid to reduce nutrient loads.

The future holds the possibility for more pollution trading markets to arise. The Neuse river basin of North Carolina, located immediately south of the Tar-Pamlico, is just one example of a developing market. The sources of discharge and potential market participants are quite similar to those in the Tar-Pamlico watershed. One can only hope that many of the principles and characteristics of the Tar-Pamlico watershed market will be recognized and incorporated in the Neuse and other potential markets—our quality of life and environment depend on it.

April 27, 1994

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CONSERVATION CREDIT INITIATIVE/WATER QUALITY

EXECUTIVE SUMMARY

During the past year, residents of Pepin County have expressed strong concerns regarding water quality. Public meetings were held in June 1992, where county residents raised concerns relating to groundwater contamination as a important health issue in Pepin County.

Given the current level of concern expressed in 1992 by county residents, the Pepin County Land Conservation Committee would like to test the effectiveness of a Conservation Credit concept in a more comprehensive resource environment. Furthermore, the Soil Conservation Service and Pepin County need to find mechanisms to ensure that the "maintenance" of land treatment in the old and new PL 566 projects is continued. Maintenance of on farm conservation systems are essential to the realization of long term benefits.

The Conservation Credit approach encourages the commitment of local, state and federal entities to a equitable partnership, thereby reducing the federal/state funding for conservation incentive programs.

In many farm periodicals and within various agricultural groups, which include the National Association of Conservation Districts, you will find that they are encouraging review and evaluation of new cost effective approaches in getting farmers to modify their behavior.

Farmers in Pepin County and in several other counties, after considering all available program concepts, have identified the Conservation Credit approach as the simplest and most cost effective way to change farm behavior.

The original Resource Conservation Act sponsored Conservation Credit project only dealt with cropland soil erosion on individual farms and did not address the nutrient management issues, rural well contamination, wetland protection and holistic watershed protection.
Pepin County is now interested in submitting a proposal (Phase II) of the Conservation Credit approach in the various PL 566 watershed areas that will address a total resource conservation approach for all the resources.

Pepin County has the mechanism of putting the Conservation Credit program in place and implement a broader based resource protection program. The county has broad based support for this program in both urban and rural areas.

The Pepin County Land Conservation Committee is proposing a Phase II maintenance effort in the PL 566 watersheds, the watersheds are Bogus Creek, Lost Creek and Plum Creek. The total cropland acres are 11,269. The tax credit incentive would be $2.00 per/acre for cropland protection; $4.00 per/acre for nutrient management; Perennial Streambank Management is $2.00 per acre; Upland Intermittent Stream is $1.00 per acre; $.25 per acre bonus when 75% of the watershed is protected; additional $ .25 per acre bonus when 85% of the watershed is protected; making a total of $9.50 per acre credit. The project will be based on fiscal years 1995, 1996, 1997 and 1998.

In this proposal, Pepin County is only submitting a short term budget for fiscal year 1995, with the remaining fiscal years by October, 1994. The short term budget demonstrates the partnerships. The total cost for fiscal year 1995 is $43,668.42.

Education and assistance for the Farm*A*Syst portion of the plan will be under the direction of the UW-Extension, with assistance from other staff.
The Well Abandonment incentive is through the Pepin County cost shared program, where rural or urban residents can receive 50% of the cost not to exceed $200.00 to seal unused or improperly abandoned wells. These wells are a threat to the ground water contamination.

Introduction:

Landowners, conservationists, and farm organizations have raised concerns with current soil and water conservation policy and practices. In Wisconsin, farmers have concluded that conservation programs are flawed in that they only reward those landowners who have misused the resources and offer limited or no help to landowners who avoid conservation problems through continued good stewardship.

In an effort to address this issue, Wisconsin landowners under the federal Resource Conservation Act began to experiment with a new method now known as the Conservation Credit Initiative. The original idea was piloted in Pepin County from 1984-1991.

The idea of this program is to annually reward landowners who choose to practice good conservation to protect soil and water resources. By 1993, it was evident in Pepin County that by rewarding good stewardship, a successful low cost way to protect natural resources was identified.

The Conservation Credit Program is an alternative incentive approach which rewards landowners for maintaining sound conservation practices on their land.

In Pepin County, during this pilot period, the conservation credit was shown on the tax statement, but in the future this process will be changed to a voucher system.

The conservation credit approach has: (1) achieved a greater proportion of participating landowners than in other programs, (2) resulted in more total acres of cropland protected in a given area, (3) increased retention of conservation practices over more traditional conservation programs at a lower cost.

The following proposal outlines a plan which utilizes the Conservation Credit/Water Quality Program in a partnership of federal, state and local level government.

Proposal
Guiding Principal

Experience gained in the Pepin County Project suggest an essential set of principles for optimal program effectiveness.

These principles will be carried out in the Conservation Credit/Water Quality proposal.

1. Voluntary landowners participation is an important part of this program. Mandate and regulation leads to resistance, whereas freedom of choice brings about a greater investment of self in the program. In our past experience we found that neighbors sharing ideas on stewardship leads to acceptance of good management practices.

2. Rewards positive behavior that supports positive results achieved by landowners who protect natural resources. It has been historical policy to provide funds to correct either poor conservation or bad resource management practices. The Conservation Credit Program provides training and education to landowner's and in turn, supports the landowner's in striving for continuous improvements.

3. Annual Participation through yearly signup allows landowner's to have optimum flexibility under the guidance of the local Land Conservation Committee. The total resource plan will be updated annually and will be modified to address the landowner's changing needs.

4. Locally Directed is a positive key in the success of this program. This program must be administered and modified by the local partnership that will address the conservation needs and local farm enterprises.

5. Simplicity, Flexibility and Adaptability are characteristics that must be maintained so that a wide range of conservation objectives and conditions can be addressed simultaneously within our county.

6. Partnership of Local, State and Federal Government is imperative. With the reinventing of government it is important that these three entities in coordination with landowner's, conservationist, and private sector providers develop a quality improvement plan to meet the customer conservation needs.

7. Compliments existing programs. The Conservation Credit/Water Quality program may be blended with other programs to provide a total framework which will be cost effective, simple and will induce landowners to participate.

Introduction:
Resource Characteristics

The project area and physical data in the proposed project is as follows.

Watershed	Farmland Acres	Cropland Acres
Bogus	7,421	3,831
Lost Creek	5,289	2,624
Plum Creek	11,976	4,814

The major treatment needs for this proposal is based on water quality concerns. Nutrient management will be the main focus along with maintaining practices that control erosion.

PHYSICAL DATA - PROJECT AREA:

The project areas will be the three PL 566 WAtersheds, Bogus Creek, Lost Creek and Plum Creek. There is total of 24,686 acres of farmland, of which 11,269 acres are cropland. Of that cropland number, 75-85% can be considered highly erodible land. There are 205 landowners in these areas. Bogus and Lost Creek Watersheds are part of the upper Mississippi Drainage Basin.

The Bogus Creek is a tributary of Lake Pepin and flows into the Mississippi River. The water is clear, hard and alkaline. Sand is the main bottom type followed by lesser amounts of silt, gravel, boulder and bedrock. Forage fish are present. Muskrats are significant and beaver are present. Wood ducks nest along the stream and migrating puddle ducks use the water. The soils in Bogus Creek are derived from the underlying bedrock, loess and water-lain sediments. The soils are loams, fine sandy loams and silt loams.

Lost Creek is also a tributary of Chippewa River and flows into the Mississippi River. Physical description of this Creek is similar to Bogus Creek. Nesting ducks and a few migrating waterfowl use the stream. There are several impoundments located on or along the stream. The creation of these impoundments was authorized by the Watershed Protection and Flood Prevention (PL 566). The soils in Lost Creek are mostly loams and silt loams of moderate depth.

Plum Creek is a tributary of the Chippewa River which flows into the Mississippi River. Water is clear, hard and alkaline. The main bottom type is and followed by silt, gravel, rubble, detritus, bolder and clay in abundance. Forage fish are present. Muskrat and beaver activity is significant. Nesting wood ducks and migrating puddle ducks use the stream. The soils in Plum Creek are derived from wind-blown silt, weathered bedrock, alluvial and glacial till. This watershed has an area of 61,055 acres, but only approximately 37% is located in Pepin County.

Project Area Concerns:

Pepin County has been concerned about the point and non point pollution that is occurring in the three watersheds. In 1958, and up to 1970 eight PL 566 structures for flood control were constructed. Pepin County has maintained these structures, but since the time of construction, farming has changed to more cash farming, beef operations, etc., which in the long run produces more non and point source pollution.

Some of the County's direct concerns are:

1) Soil eroding from cropland, often carrying with it fertilizer and pesticides.

2) Nutrients, organic matter and bacteria from barnyards and improperly spread manure.

3) Unused wells or improperly abandoned wells.

4) Bogus Creek and Lost Creek watersheds drain into the Mississippi River.

Goals and Objectives:

The goals of this three year proposed project would achieve the reduction of non point agricultural pollutants in a economically sound manner by providing landowners a credit to implement and maintain best management practices. The Land Conservation Department along with assistance from Soil Conservation Service and UW-Extension in cooperation with Farm Cooperatives and Ag. Consultants, will provide education and technical assistance that would require landowners to make changes in their management systems to restore or enhance the water resources where agricultural non point source pollution is occurring and is producing a detrimental effect on the water resource. The Credit approach will produce a long term "maintenance" to prevent future impairments.

The objectives are to:

1) Reduce nutrient runoff into the surface water.

2) Manage the application of commercial and manure fertilizer to reduce phosphorus loading and nitrogen leaching within the soil.

3) Credit nitrate production from alfalfa and other legumes.

4) Reduce barnyard run off.

5) Reduction of pesticide usage thru scouting and timely use of pesticides.

2. A nutrient and Pest Management plan that meets Technical Guide 590 and 595.
Farmers that produce more manure annually than can be properly applied to their own land must have contracts with other farmers to apply manure to their fields. SCS 590 Standards must always be followed. Current soil tests and a nutrient management plan must be completed for the fields that will be receiving manure applications.

The types of services that will be provided by the agency staff:

1. Manure spreader calibration. W.Q. Pl. - U.W.- Ext.
2. Manure spreading plan. W.Q. Pl. (590 - SCS Technical Guide)
3. Demonstration test plots and analysis. U.W. Ext., DNR, SCS
4. Information and education activities. U.W.- Extension - Water Quality Plan
5. Soil Erosion reduction plans. Water Quality Plan - Soil Conservation Service

The types of services that will be provided by the private sector:

1. Whole-farm nutrient and pest management planning.
2. Soil sampling and analysis.
3. Field scouting.
4. Trouble shooting (identifying problems before the start).

3. Pasture/Perennial Stream Management:
Banks and streams will be managed according to the approved resource conservation plan. This could include such items as sloping, seeding, controlled grazing, cattle crossings if needed.

4. Upland Pasture Management:
The purpose of this practice is to provide soil protection and reduce water loss that will improve the water quality in specific streams. This practice will also prolong the life of desirable forage species and will maintain or improve the quality and quantity of forage. This practice will be managed according to the approved resource conservation plan.

Operations:

Owner's of land in the three Watershed areas are eligible to participate. The Land Conservation Committee along with representatives from state and federal will verify land ownership and establish eligibility based on total resource needs.

Eligible landowner will enter into non-contractual agreements with the Land Conservation Committee. The Committee will be responsible for approving or disapproving application.

The partnership of local, state and federal will establish local conservation standards. These standards must meet, but may be more restrictive than State or Federal.

The technical assistance will be provided by Land Conservation Department, Soil Conservation Service and U.W. Extension, along with enlisting the private sector for assistance in developing total plans that deal with the resources.

Spot checking for maintenance will be a continual process. The Land Conservation Committee wants to instill with participants a maintenance philosophy whereby, the landowners are encouraged maintain the total resource plan as a continued quality improvement process.

Landowners will be asked to self certify their compliance in the program, before vouchers are issued.

Monitoring and Evaluation:

A team of local, state and federal individuals will conduct an annual audit of operations, program evaluation and compliance with the levels of standards established by the respective funding agencies. The results will be shared with the local conservation partnership as a part of the quality improvement process. This evaluation will be completed annually by county, state and federal partners.

Other evaluation criteria will include:

1. Evaluating landowners motivations for participating or not participating through a survey instrument that will be created.
2. Economic benefits to farmers and ag. service industry.
3. Administration and technical cost/savings.
4. Evaluation of best management practices that are used with this particular program.

Sources of Financing:

The funding for the Conservation Credit will be as follows:

County of Pepin: Pepin County will provide administrative, secretarial and technical services. Technical services will be for providing design work needed along streambanks. Pepin County will also provide Conservation Credit dollars.

Department of Natural Resources:	Conservation Credit dollars.
Soil Conservation Service:	Conservation Credit dollars.
Department of Agriculture, Trade and Consumer Protection:	Funding for one technical position for Nutrient Management Coordinator
Private Sector:	Nutrient Management Planning, soil sampling field scouting.

See Table 1, 1A and 2.

Forms:
Exhibit 1 - Application
Exhibit 2 - Credit Voucher

Conservation Credit
Pepin County

Table 1A.

		County	State	Fed.	Total
1.	Cropland: Soil Erosion Control - (Resource Conservation plan that meets "T")	$ .66	$ .67	$ .67	$ 2.00
2.	Nutrient Management: (Managing the amount, form, placement and timing of application, soils test, nitrogen credit. Work with private sector.	1.33	1.33	1.34	4.00
3.	Pasture - Perennial Stream Mgt: Sloping, seeding, controlled grazing, cattle crossing if needed per resource conservation plan.	.66	.67	.67	2.00
4.	Upland Intermittent Stream Pasture Mgt. per resource conservation plan.	.33	.34	.33	1.00
	Total per acre	$ 2.98	3.01	3.01	9.00
	Bonuses: 75% - Watershed Protected:	.08	.09	.08	.25
	85% - Watershed Protected:	.08	.08	.09	.25
	Total Cost per acre	$3.14	$3.18	$3.18	$9.50

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Table 1. - Example of resources that maybe addressed.

		County	State	Fed.	Total
1.	Cropland: Soil Erosion Control - Tillable Acres				
2.	Nutrient Management Plan: Managing the amount, form, placement and timing of application. Soils test, nitrogen credit. Work with private sector.				
3.	Pasture/Stream (Perennial Stream Mgt.) Bank slope, seeding, controlled grazing				
4.	Pasture Intermittent Stream Mgt.				
5.	Wind Erosion				
6.	Wetland Management				
7.	Woodland Mgt.				
8.	Farm*A*Syst - (County Extension)				
9.	Wells - (Abandonment)				
	Total per Acre	-	-	-	-
10.	Bonuses: 75% - Watershed Protected:				
	85% - Watershed Protected:				
11.	Total Cost per acre	$	$	$	$

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Short Term Budget
Fiscal Year 1995
2,000 Acres

Table 2.

Items	County	DNR	SCS	DATCP	Total
Administration, Secretarial, Technical Engineering, I&E Activities	$1,500.00 (In-Kind)	-	-	-	$ 1,500.00
U.W. Extension	750.00 (In-Kind)	-	-	-	750.00
Conservation Credit (Dollars)	3,500.00	5,750.00	5,750.00	(1566 hrs)	*15,000.00
Technical - WQ Coordinator		-	-	26,418.42	26,418.42
Total	$5,750.00	$5,750.00	$5,750.00	$26,418.42	$43,668.42

*Based on 1000 acres at $9.00 per acre with Conservation Plan, Nutrient Mgt., Streambank and Upland Pasture Mgt. in place.

1000 acres at $6.00 per acre based on Conservation Plan and Nutrient Mgt. in place.

Exhibit 2

62

Conservation Credit Voucher

_____ Certification
Year

I. Owner: _____

Address: _____

Township(s) _____ Section(s)_____

Watershed _____Total Cropland Acres Owned _____

II. Certification:

1. I certify that all my cropland is under a current resource conservation plan.
   All Cropland Acres _____ x $2.00 per acre = $_____

2. I certify that I am following a nutrient management plan that meets technical standards on all my cropland.
   All Cropland Acres _____ x $4.00 per acre = $_____

3. I certify that I have protected all lands affecting perennial streams according to my plan.
   All Cropland Acres _____ x $2.00 per acre + $_____

4. I certify that I have protected all lands affecting upland intermittent stream cropland acres.
   All Cropland Acres _____ x $1.00 per acre = $_____

   Total Cropland Acres for Conservation Credit
   _____ = $_____

My Conservation Credit voucher of $_____ will be applied as payment to:

1. Town of _____ for property taxes

   Town of _____ for property taxes

2. Consulting Service: _____

   _____

   for carrying out all provisions that I have agreed to.

_____ _____
Owner's Signature Date

_____ _____
Water Quality Coordinator Date

_____ _____
Land Conservation Committee Date

Check Number _____ Dated _____

Exhibiit 1 62

_____ County Conservation Credit Initiative

APPLICATION FOR CONSERVATION CREDIT VOUCHER: Year _____

_____ County Land Conservation Committee

_____

1. NAME OF APPLICANT _____

   Address: _____

   Telephone: _____

2. Type of Ownership: Owner ___; Partnership ___; Trust ___; Corporation ___; Guardianship ___;

3. Property Information: County _____; Township _____;

   Section - Twp - Range _____.

   Number of cropland acres eligible for the Conservation Credit Voucher: Acres _____.

   Is there a resource conservation plan for above acres: Yes _____ No _____

4. Is there a stream located on your property: Yes ____ No ____

   If yes, what section is it in _____

   If cropland is located in two difference townships, list number of acres in each township that is eligible for the Conservation Credit Voucher.

   _____ Township _____ Acres

   _____ Township _____ Acres

5. Application:

   I declare that I will carry out all provisions of my Total Resource Conservation Plan.

   I further declare that my conservation credit maybe applied against any payment payable to the Township of _____, or Consulting Services of _____.

   This application has been examined by me and to the best of my knowledge is true and correct.

   I understand that my records maybe reviewed upon request by the Land Conservation Department Staff/Land Conservation Committee.

   _____ Signature of Owner _____ Date

CAET RECEIVED