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WHO SHOULD PAY FOR NONPOINT POLLUTION ABATEMENT?

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ABSTRACT

Nonpoint pollution is an expensive social problem, but abatement of nonpoint costs society as well. Nonpoint policies involve implicit comparison of these two categories of cost and their distribution among policy participants. This paper assembles economic evidence of costs of nonpoint and cost of abatement, discusses distribution, and suggests policy direction.

Emerging policy in nonpoint abatement must place greater emphasis on national efforts rather than state or local. Because those who cause nonpoint are usually separated by both time and space from those damaged by pollution, institutions that bring these interests together are essential. Further, a "polluter pays" philosophy will become more prominent in nonpoint policy. Society will insist that the polluter bear a greater obligation for the impacts. Economic incentives that redistribute cost (a tax, control, or cross compliance) or benefit (benefit share) will improve chances for design of acceptable, workable policy.

Key Words: Nonpoint pollution policy, economics, institutions, distribution of cost.

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by
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Introduction

Nonpoint pollution is an expensive social problem. It imposes enormous costs on water users, a cost recently estimated to total about $6 billion a year (Clark, 1985a). Sediment and pollutants ruin the ecosystem habitat for fish, waterfowl and other organisms that are valued by people for various reasons. Clogged harbors and channels raise the cost of water transport. Nutrient enriched lakes and streams are less attractive for recreation or as part of a living environment; damaged ground and surface water must be treated before use in municipal systems. The costs and consequences of nonpoint have been discussed and documented throughout this conference. But abatement of nonpoint costs society also. Nonpoint policies involve implicit comparison of this cost of abatement with the cost of not abating and the distribution of the two categories of cost. Nonpoint is the unfortunate yet predictable side effect of activities that are generally worthwhile -- food production, construction, and others. Abatement, then, may mean less of that valued activity, or can be direct financial outlay to reduce the water runoff.

This paper addresses the economics of abatement -- both the efficiency and distributional implications of those actions taken to reduce nonpoint damage.Primary emphasis is on agricultural nonpoint pollution. Effficiency consideration basically establish the technical parameters, the feasible set within an abatement strategy may be selected. Distributional impacts influence choice by discribing who pays and who gains from the options available. The most economically efficient abatement technique, whatever it may be, has important distributional consequences. Thus it is just one among many abatement options, evaluated by political actors in terms of what it gives them at what price.

Purpose of this paper is to assemble the economic evidence being generated and draw conclusions that may be useful for this conference and for any subsequent policy recommendations that might be developed. A further purpose is to help set the stage for more specific technical sessions to follow.

First, a series of assertions about "the nature of things" in the political economy of nonpoint will establish context.

1. "Efficient" solution of the nonpoint problem implies the greatest possible abatement for the money spent, achievement of a given level of abatement at least possible cost and/or most importantly, comparing the cost of an additional increment of abatement to the benefits from achieving that increment. The assumption is that when

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an increment costs more than it gains, whoever gains or loses, society has acquired enough reduction of nonpoint pollution. Economists love to repeat this basic rule, but it has real meaning in the social process of allocating public effort among many valued services, of which clean water is just one.

2. Benefit, cost and therefore efficiency in resource use are defined within the structure of property rights that expand or constrain the rights of individual water users. These rights are established and reinforced by public authority. Thus any solution to pollution is valid or efficient only to the extent granted by publicly acknowledged and protected property rights. There is nothing meta-physical about economic efficiency, in abatement or any other production process. It is a fabrication, a result of transactions among actors granted the priviledge of commerce, with publicly protected rights to impose a price for a productive factor. Those rights could change, thus altering the efficient solution.

3. As with most forms of pollution, nonpoint agricultural pollution involves impacts that are separated in time and space from those causing the problem. Pollution is an additional output of a production process generating a "good" of some kind. Property rights protect the producer, limiting his liability for the cost of that undesireable output in the production decisions that determine quantity and form of output. Thus, the benefits of abating nonpoint are distributed differently from the costs of abatement. While those benefiting from abatement might be willing the "bribe" those causing the problem through some sort of compensation program, the costs of organizing the transaction would be formidable.

4. Participants in the policy process form positions on options based on a comparison of separable benefits to separable costs. There is no inclination to pay or bear inconvenience if that action produces no obvious result of consequence to the actor. Some people will bear personal cost to create benefits for others out of a sense of community or altruism. But it is risky to construct nonpoint policy on the assumption that that will occur.

5. In nonpoint policy as in other areas, good policy is acceptable policy. Policy changes that may be technically correct but require too great a sacrifice of other valued services are irrelevant. "Non-degredation by 1985" is and has been such an irrelevant policy goal. Changes occur in incremental adjustments as competitors compare the relevant consequences of options and bargain on that basis. Policy goals and objectives may be stated and used as targets so long a participants do not expect to actually achieve them. Goals and objectives evolve in policy bargaining. They must be flexible enough to accomodate reality (Lindblom, 1979).

In nonpoint abatement, the efficiency questions involve comparing the consequences of pollution with the consequences of abatement. Policy participants must understand the cost of failing to reduce erosion and compare to the cost of cleaning up, to arrive at the marginal benefit/marginal cost comparisons discussed above.

The Evidence on Cost: A Brief Review

Various empirical studies have sought to establish the magnitudes of the two types of cost -- pollution and abatement. There is further development of methodology to improve the comprehensiveness and reliability of these estimates. Shortage of site specific water quality data continues to be a problem in seeking economic estimates of damage.

Cost of Nonpoint. The cost of nonpoint pollution represents a reasonable starting point for estimating benefits of abatement. Some non-user benefits might be omitted from the cost figures, thus cost of pollution may understate the actual benefits from abatement. But certain instream costs to the biological ecosystem are also omitted. There is an implicit property rights issue imbedded in this cost/benefit template of nonpoint pollution. Those hurt by pollution are basically trying to defend something they already have -- a clean water supply. The polluter, however, implicitly owns the right to convert that clean water into the combination of dirty water and a product,both of which are outputs of the production process in question. The payment that the downstream user would be willing to accept to part with clean water would likely be greater than what he would be willing to pay to acquire a new supply of clean water (Bishop and Heberlein, 1980). Initial allocation of property rights, therefore, will influence benefit estimates of nonpoint abatement. Magnitude of that difference would be a useful empirical question to pursue.

The most definitive national estimates of nonpoint costs have been generated recently by the Conservation Foundation(Clark, 1985b). Authors assemble the most useful empirical literature on the subject, impose a few defensible assumptions, and develop some estimates. While more specific case studies within particular watersheds could improve the quality of the national figures, the CF estimates are a significant contribution to policy development in the area. Pollutants include sediment, nutrients and chemicals. Instream damages are defined to include impacts on the aquatic environment, reduction in recreation benefits from fishing and other water sports, reduced water storage and holding capacity of reservoirs and lakes, increased cost of maintaining harbors and water ways, and loss of certain non-user values associated with clean water. Their estimate of these instream damages is \$4.3 billion per year, of which agriculture causes \$1.6 billion. Off-stream damages result from increased flooding associated with suspended sediment, less efficient water conveyance systems (canals), and more expensive water treatment systems for power generation. The total off-stream estimate is \$1.9 billion of which agriculture accounts for \$660 million. These are acknowledged to be "order of magnitude" estimates (Clark, 1985a, p. 22).

A recent case study of the Obion-Forked Deer River Basin in Tennessee estimated offsite damagaes from erosion totalling \$74 million per year plus losses associated with flooding of productive hardwood forests (USDA, 1980). Impact of declining water quality on value of waterside property along St. Albans Bay on Lake Champlian was estimated using an hedonic model. The water quality variable constituted approximately 20% of property value or \$4,500 per property difference attributed to quality of the adjacent waterbody. Total damage experienced by owners of 430 single family residences was \$2 million (Young and Teti, 1984). Other case studies are needed to get a more accurate fix on economic burdens associated with nonpoint pollution.

Benefits of Abatement. Another perspective on the cost of pollution side of the nonpoint policy question may be gained by estimating benefits of cleaning up the water. Benefit is more than just damage avoided. It also includes the liklihood of continued availability of clean water and the impact of that liklihood on willingness to invest in waterside property or other services that require clean water.

The Economic Research Service of USDA is putting considerable effort into estimating benefits of abatement in the various rural clean water projects (RCWP) around the country. Work is still underway, but a few results are available. Improving the quality of water in St. Albans Bay in the northeastern part of Lake Champlain in Vermont would produce annual benefits estimated at \$230,300 through a contingent valuation technique and about twice that using a travel cost approach (Ribaudo, 1984).

The travel cost model involved estimating the cost that a recreator has been willing to bear to enjoy the bay for various recreation experiences and the amount of travel expense that recreator would pay if the bay were cleaner. Number and costs of trips from various origins in the region were estimated. Relationship between the willingness to bear travel cost and distance from St. Albans, availability of alternative sites and income levels was calculated for current water quality and for the hypothetical situation of a cleaner bay. Mean difference in willingess to pay for recreation attributable to improved water quality was \$123 per recreator, for a total recreation benefit of \$530,700. The contingent valuation model involved interviews of prospective recreators who were asked to rate several recreation opportunities involving St. Albans Bay and then re-rate those options with the possibility of a cleaner bay. These indifference maps were then converted to monetary benefits associated with improved water quality in the bay.

Benefit estimates of several other clean water projects will be published soon. Each is unique, with land use, soil, and water characteristics that differ significantly from site to site. Generalization is impossible. Yet these point estimates can improve chances for public agencies and various political participants involved in clean water debates to draw conclusions that are economically sound. With reasonable estimates of abatement costs and their distribution, one may draw a conclusion about the efficacy of a particular abatement program.

Cost of Abatement. The greatest amount of published work in the economics of agricultural nonpoint pollution deals with the costs that selected management techniques could impose on the farmer. These studies generally assume initial distribution of property rights that gives the farmer the right to decide for or against a reduction in run-off. In a 1976 linear programming analysis, Kasal examined farm income consequences of imposing limits on fertilizer use and soil loss as measures to reduce nonpoint pollution. For the sample farms selected and alternative measures imposed, nonpoint abatement reduced farm incomes by from 10 to 36 percent (Kasal, 1976). A national LP model run by Wade and Heady made similar kinds of estimates of increased production costs associated with nonpoint measures, within the overall requirement of meeting projected food demands. The minimum sediment solution to the production cost minimization model was 42% higher than the unrestricted solution. In both cases there was considerable cropland adjustment within the model to retain sufficient production to meet output requirements (Wade and Heady, 1977).

Alt, et al (1979) examined the farm level costs implicit in reducing sediment delivery to a specific reservoir in central Iowa from the Iowa River watershed. A 10 ton acre limit on gross erosion from farms in that watershed would increase production costs 17% while reducing sediment delivery by 91%. White and Partenheimer (1979) examined income consequences of erosion reduction plans for a sample of Pennsylvania dairy farms. Impacts varied among the specific farms studied, with two farms experiencing increased revenues from the recommend soil conserving plan, four with income reductions of less than 5% and six with reduction from 7% to 30%. A no-till option was introduced with the result that all but one farm showed increased returns. The net on-farm/off-farm economic consequences of erosion reduction were examined for a particular river basin in northeast Texas. The general conclusion reached in this analysis was that the positive on-farm impacts of soil conservation overshadowed whatever revenue reduction might be associated with complete attention to reducing off-farm damages. Thus, authors conclude, it is in the farmer's interest to conserve soil and no regulation or subsidy is warrented assuming that farmers are economically rational (Reneau and Taylor, 1979).

Results of these and many other case studies of the economic costs of various erosion control techniques have provided important analytical back-up for recommending best management practices in specific state and local water quality plans. The whole approach to nonpoint reduction has been local solutions to local problems, with "best practices" a function of the physical, economic and institutional circumstances prevailing in that area. A systematic approach for considering the various factors involved in selecting best management practices for a particular political/economic/hydrologic sub-region has been suggested by Bailey and Waddell (1979). The general policy goal has been to establish an abatement program that avoids major cost impact on local farmers. Procudures for considering the most important firm level costs have been recommended by USDA and EPA (1975) for the development of those BMP's (14). Inter-regional and national consequences of these strategies have been estimated also. The more aggregated the analysis or modeling becomes, the more imprecise and unreliable the estimates because of obvious differences among areas.

A significant and widely acknowledged gap in the evidence on alternative nonpoint strategies is the link between technique and water quality improvement (Christensen, 1983). We know that nonpoint costs money; we know that abatement costs money; we even know that the two costs are distributed differently. But we need much better evidence on the aggregate water quality results of farm level practices that reduce run off, so that the estimates of economic benefit of those actions may be improved.

Reduced tillage alternatives show particular promise since they can, under some circumstances, lead to increased net farm revenue while reducing run-off. Pope, et al (1983) concluded from their study of Iowa agriculture that conservation tillage systems have less negative impact on farm income than is true for conventional systems. Study of alternative tillage systems on Ohio farms found that no-till options that reduced erosion to T or less also produced higher net revenue than the base solution of fall plowing on soybeans (USDA, 1983). In his study of cash grain farms in the Jackson Purchase Area of Kentucky, Kugler found that for nearly all farms there was a tillage conversion that would increase net returns while reducing erosion (1984). Black, et al (1984) concluded that since yield is not affected by tillage system for the sample of Michigan farms studied in the Saginaw Bay watershed, the net revenue advantage for conservation tillage comes from reduced machinery and labor costs. Determination as to whether or not reduced tillage makes sense as a best management practice for nonpoint abatement depends on the net effect of that practice on the environment. While conservation tillage often reduces soil movement and runoff, it may also result in increased chemical concentration in the run-off water that does leave the field. The plant residue left in the field as part of the reduced tillage system tends to increase insect problems and reduce the effectiveness of some herbicides (Baker, and Laflen, 1984). Any calculation of the cost of nonpoint abatement using reduced tillage or any other erosion reducing technique must consider offsite damage as well as income impacts for the farmer. Conservation tillage may reduce erosion at little direct economic cost to the farmer but if it also increases chemical contamination of rivers and streams because of increased use of pesticides, its viability as a best management practice is questionable.

The real difficulty for an individual or government in reaching an efficiency decision on nonpoint investment is that information comes in fragments. Cost and benefit are not felt at the same time or place. At the farm level, an action that reduces nonpoint may have advantages in net revenue. On the other hand, a practice that reduces erosion and increases the farmer's revenue, may worsen the water quality problem. As analysts we try to isolate factors, examine them one at a time for their positive and negative consequences. In fact, however, the farmer makes decisions within a complex of incentives, risks, and options. It may be that an incentive necessary to attract socially rational investment in nonpoint abatement should be artifically linked to the action that would reduce runoff. That is the general idea behind cross-compliance in soil conservation policy. As long as the positve incentive is greater than any income burden from the resulting nonpoint technique, it can be a rational choice for the farmer (Dinehart and Libby, 1981). So long as the public cost of the incentive, including whatever unintended side impacts it may cause, in less than the incremental cost of pollution it can be an improvement.

Success of alternative policies to reduce nonpoint pollution will depend primarily on the distribution of both the cost of pollution and the cost of abatement. In policy we are more concerned with who pays than with the overall size of the bill.

Who Pays?

Distributing the burden for reducing agricultural nonpoint pollution, assuming there is general agreement that nonpoint should be reduced, is the central policy question in this area. The prevailing theories are 1) those who benefit from abatement should pay for it, and 2) those who cause the problem should pay for its solution. The former implies that the right to permit run-off remains with the polluter; those who want less pollution because they currently experience a pollution cost, must pay for abatement. The problem, then, is to decide who benefits and levy a tax accordingly. In large measure this is the current system. Farmers and other polluters retain the right to pollute; abatement is voluntary; cost sharing and technical assistance are paid for by taxpayers. State level cost sharing programs exist in many states, implying that benefits are received by all state taxpayers. As of 1983, sixteen states have their own cost share programs (Braden and Uchtmann, 1984). Federal cost sharing, through ASCS of the US Department of Agriculture, implies that all US taxpayers would benefit from reduced pollution and should therefore pay for it. In practice, state programs actually supplement this federal support.

The latter approach to distributing the cost of pollution implies that the polluter has full liability for his actions and that any cost of abatement must be included in the cost of production for the commodity or service that creates to pollution. Thus far, the only method for implementing this approach to distributing abatement cost has been through regulation. County soil conservation districts in most states have the authority to impose regulation against excessive erosion, though few have exercised that authority. Five states have sediment control ordinances that include agriculture. Iowa has the most aggressive and comprehensive regulations against excess erosion. Illinois has a newly enacted law designed to "jawbone" farmers toward acceptable erosion levels by the year 2000. Pennsylvania has an innovative permit system functioning through the state's Clean Stream Law (Holmes, 1979, p. 63-93).

Other mandatory approaches being examined for soil conservation programs include various cross compliance measures that would require soil conservation as pre-condition for eligibililty for price supports and other income support programs. While these have not really been designed as nonpoint abatement measures, they could help meet water quality goals.

The matter of "who should pay" for nonpoint is obviously a matter of opinion. Conclusions presented here are based not on perception of right and wrong (though some element of that may creep into the discussion) but on a judgement of what is likely to happen. The "benefits received" approach is well received in the agricultural community including, incidentally, most of the Land Grant system. The obvious problem is, however, that it has not worked. Policy development for the next decade will shift more generally toward the "polluter pays" approach reflecting concern for cost effectiveness in nonpoint and other natural resource policy as well as a growing impatience among the pollution control professionals about progress toward reducing nonpoint. The magnitude of the estimated national cost of nonpoint pollution and agriculture's portion of that total has the attention of the Soil Conservation Service. Estimated annual costs imposed by agricultural nonpoint pollution are several orders of magnitude higher than annual cost of soil productivity lost to erosion. SCS must give greater attention to off-site consequences of erosion in these days of national budget stringency for agriculture natural resources and for SCS in particular.

Policy Conclusions. The following conclusions on the general trends in policy and cost distribution are based on a review of the economic evidence on nonpoint summarized briefly above, review of policy literature concerned both with soil conservation and water pollution, and a general "testing of the wind." Following these brief conclusion, is a list of suggested innovations for policy in this area.

1. Abatement of nonpoint must be a national program, not just the sum of state programs. Despite the fact that 208 water quality planning, the Model Implementation Program and the Rural Clean Water Program emphasize state action, and the Reagan administration prefers decentralization, water pollution is just as is national as national defense. The implicit assumption that beneficiaries of abatement are only the first line pollutees who directly feel the results of dirty water, and that they reside in the same state as those causing the problem cannot be sustained. In fact, benefits of a clean water supply go well beyond immediate users. They include various non-user benefits from continious availability of water when and if it might be used. They include various multiplier impacts on the overall economic environment of a region where the farms, cities and countryside become attractive places to live and work. Clean water is part of a broad sense of well being or security that will encourage investment and general popular support for change.

A recent article in the Journal of Soil and Water Conservation was entitled "Saving the Chesapeake: Maryland's Agricultural Education Program," (Magette, 1985). Even if the title were changed to refer to "Maryland's Ironclad Regulation Against Erosion," it would be wishful thinking. There is just no way that the problems of the Chesapeake Bay can be handled separately by Pennsylvania and Maryland. Even when the pollution problem is reasonably well confined as in Saginaw Bay, Michigan or Green Bay, Wisconsin benefits of abatement extend well beyond. There has been important institutional innovation in states, and that must be supported. The Wisconsin nonpoint program is an exceptional example of a balanced and integrated program with all components from problem identification to implementation (Konrad, et al, 1985). RCWP's have become testing grounds for coordination among federal and state agencies. They have been strongly endorsed by EPA and UDSA (Groszyk, 1979; Unger, 1979). But beyond these intermediate purposes, reducing nonpoint to acceptable levels will require federal action. It is unreasonable to expect an agricultural state to enact abatement measures sufficient to produce adequate water quality benefits for downstream users in other states. To a large extent we have allowed the traditions of state and local prerogative on land use management to run the nonpoint program. We begin with the irrevocable presumption that locals know best when it comes to land use. Perhaps that is true, but it will not solve the nonpoint problem. If land use controls are the only solution to nonpoint, and land control must be a local government function, then nonpoint will be with us for a long time.

A national program for nonpoint abatement means that the cost will be shared among payers of national income tax. State programs may supplement but never replace the national focus. Taxpayers in agricultural states will pay more than taxpayers elsewhere since farmers in those states will likely have sufficient political clout toshift the abatement cost and get additional cost sharing programs installed.

2. Farmers and others causing nonpoint pollution will pay an increasing portion of the abatement cost. Most of this cost will be indirect, in the form of fewer property rights to use land in ways that cause nonpoint pollution and through any reduced revenue associated with less erosive farming systems that might reduce output. There is simply no possible way that continued reliance on technical assistance, cost sharing and voluntary action can satisfactorily cope with the nonpoint problem. Reduced tillage has really been the only hope for this softer approach and recent evidence on the pollutant concentration in run-off raises serious question about the viability of these techniques. This should not suggest that the voluntary approach with or without the other elements is inadequate in every case. There have been important successes. But in a national nonpoint program, these measures are simply inadequate.

There is nothing earthshaking about this conclusion. Resource policy professionals have known for somtime that only by changes in farmer behavior will agricultural nonpoint be reduced, and current incentives do not favor the necessary changes. The RCWP era in water quality policy has been one of support building and institutional design within the prevailing balance of power and responsibility among levels of government. It has been necessary. But there will be pronounced shift in philosophy toward the "polluter pays" approach. Those who stand to gain from abatement, a broadly defined community of water users, will be unwilling to leave all of the land use discretion in the hands of those who cause the problem. Epp and Shortle suggest that given this inevitable policy shift, the water quality agencies and research community should focus on design of effective and economically efficient mandatory programs (Epp and Shortle, 1985, p.111). That is sound advice.

Distribution of burden within agriculture deserves policy attention as well. Farmers on erosive land will find it particularly painful to meet mandatory limits. They suffer the initial disadvantage of less productive land and then the higher cost of compliance. The inevitable result will be further concentration of agricultural production on the most responsive and easily protected lands of the country. Additional people and areas will be displaced from agriculture. There must be special attention to these poeple to facilitate transition and limit the hardship involved. But attempting to mask the inherent disadvantage of farming these lands through special credit or disaster payments would be an expensive and apparently inappropriate policy response. With mandated erosion and run-off standards, the inherent advantage of some lands would likely be reflected in land price. Technology may reduce the differences between erosive and non-erosive lands, however.

Directions for Policy Innovation

The major needs in nonpoint involve, first, new organizational strategies for getting those who cause the problem together with those who gain from its reduction. As noted, costs of pollution and costs abatement are distributed differently. Only by creating a political environment conducive to negotiations between these categories of participants can lasting policy change be accomplished. The second major need is for financing schemes that take advantage of the economic facts of pollution and abatement. Economists have long been reviled for seeking social purpose through inherent selfishness of the individual. That is an unfair assertion, of course. The more positive perspective is to facilitate expression of the true consequences of alternative actions so that private choices will yield results that are socially responsible.

1. The first suggestion is not new at all but entails giving new life and new missions to an old institution -- the river basin commission. There is logic in hydrologic units! As water resource professionals have known for many years, the river basin unit can overcome much of the transaction cost associated with bargaining between gainers and losers from a pattern of water use. This capacity can be particularly important in nonpoint abatement where the source of the problem is diffuse, benefits widely distributed in small increments. Some of these inter-state linkages have been established for the Chesapeake. Experience in the Deleware and Susquehanna River Basins has been well documented (Libby, 1970). Bay area regional commissions with multi-state memberships could be established or focused more clearly on nonpoint problems. Purpose of the water shed, or more generally "problem-shed", is to establish the setting for bargaining over the terms of nonpoint policy. There should be no claims of designing the optimal water management program. Instead, interested parties could iterate toward acceptable levels of pollution and abatement, and a distribution of burden that is tolerable. With focus clearly on nonpoint, voting and membership rules would have to encompass the essential parties involved. A different organization might be appropriate for other resource problems in the basin.

Hydrologic units are awkward to adminster. They cross many jurisdictional boundaries and lack political legitimacy. The administrative overhead can be substantial. The problems are not much different from those of multidisciplinary research is an acedmic institution. But there can be no lasting reduction of nonpoint pollution without some mechanism of forcing confrontation among the interested parties. Provision must be made for beneficiaries outside the basin and some basic understanding of problem source and benefit of improvement. Water quality standards would help establish targets. Even with mandatory controls on erosion, the mechanism for bargaining would be valuable.

2. Within a decision or bargaining unit such as a river basin, a mechanism for redistributing the benefits of abatement could improve chances for incremental resolution of the nonpoint problem. Such an innovation has been analyzed by Park and Shabman (1981) for the Occoquan River Basin in Virginia. Under such a scheme, those who gain from abatement could spread the benefits sufficiently to generate support necessary for a compensation scheme that will bribe the polluter not to pollute. Alternatively, this system might produce the plurality to enact mandatory controls. Areas receiving major measurable benefit from abatement could compensate areas that would benefit less to help finance installation of BMP's with the basin commission acting as banker. As long as net benefits to all parties benefits are positive, it is in their interest to share to build support. The basin commission's role is to reduce transaction cost associated with bargaining both among beneficiaries and between those who cause and those hurt by nonpoint pollution.

The Chesapeake Bay situation would seem to lend itself to the type of innovation suggested by Park and Shabman. Any such system would require improved information on water quality benefits and impacts of alternative abatement techniques.

3. Another device for employing an economic incentive to encourage private actions with a social purpose is installation of a tax in pollution. Economists like this idea particularly well because it forces the producer to internalize social costs of the production process. The tax also creates the incentive to reduce pollution to avoid the tax. While there apparently is no real experience with a tax on nonpoint pollution, Seitz

et al used a linear programming model of hypothetical farms representing western Illinois agriculture to conclude that a soil loss tax would be more efficient than an erosion restriction in reducing nonpoint (Seitz, et al, 1979, p. 375-376). Under a tax scheme, the farmer would seek the least costly means for reducing run-off, unique to the land conditions on that farm. The erosion standard or restriction, on the other hand, might impose a more costly technique than is necessary.

The obvious difficulty with tax schemes is absense of specific information on performance of practices, cost of pollution and other essential variables for a given farm. It may be that trial and error would be a reasonable research design in this area of building institutions. The theory of tax schemes is well developed, but implementation is lacking. Selected pilot studies could be a reasonable use of scarce research funds.

4. Marketable or tradeable rights to pollute constitute a third type of innovation for marshalling the forces of greed in the interest of society. The sediment and waste assimilative capacity of a stream or lake might be allocated among farmers on the basis of some readily determinable index such as frontage on water course or acreage adjusted by an indicator of accessibility to water. Then the farmer would have the right to sell or trade those rights when their value exceeds the cost of reducing run-off. Implementation of such a scheme would require monitering to determine compliance for a particular farm. There might also be a problem of localized pollution, where farmers decide to acquire pollution rights and let the pollution occur. Those farming areas that can reduce run-off most readily will have much cleaner water. The average , or overall assimilative capacity, could hide extreme situations that impose local hardship. There would be overhead cost involved for the basin commission or other managing unit in defining terms of trade and upholding the result.

After thorough review of the economics and institutional literature related to nonpoint pollution one could easily conclude that there is really very little that is new. There are few revolutionary new ideas. In fact, there is a fair amount of repetition at the conceptual level. What is lacking is experience, empirical observation of various means of coping with disparate patterns of distribution of the cost of pollution and cost of abatement. There are limits on acceptable means for redistributing those burdens, but the limits are less severe than traditionally assumed. Acceptability is a function of prevailing attitudes about who can or should shoulder more of the burden for meeting a widely held social objective for clean water.

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