Diffuse pollution: lessons from soil conservation policies

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Abstract  Diffuse pollution of water from various land uses requires a control approach different from the uniform regulations that were successful for point sources. Local solutions, designed by local watershed councils, are preferred over national directives. Soil erosion control policy, based on voluntary measures coordinated by local conservation districts, provides a guide for improvement of water quality in watersheds. Local planning and action are supplemented by government provision of free technical advice, economic incentives and public education programs. There are no national standards, because land use decisions are a guarded prerogative of individual landowners. Among the lessons that can be transferred to diffuse pollution control are the practicality of the voluntary approach, the need for continuing financial incentives, local solutions to local problems, the wide range of effectiveness of local groups, the uncertainty whether the most critical problems are resolved and the need for education to foster a normative attitude of what we ought to do for watershed health.

Keywords  Conservation districts; land uses; watershed councils

Introduction
Diffuse pollution has replaced point sources as a major water quality concern in streams and water bodies. However, the methods for effective control differ and new methods have to be devised. These methods may be similar to those used for soil erosion control. This paper outlines the changing circumstances for today’s water quality concerns, examines soil conservation policy and the nature of diffuse pollution control, and concludes with the lessons we can transfer from the experience with erosion control.

Procedures for combating point source pollution have been developed over the past 40 years, but the approaches to diffuse pollution are newer and untried. Point source control involves regulations and laws passed by different levels of government and accepted by society, permits which are issued to limit the amount of a particular pollutant allowed in the discharge, and the technology to treat water for removing pollutants. Government money was available for the construction of wastewater treatment plants. This combination of regulation, technology, and money has been successful in reducing the amounts of point source pollutants reaching rivers and lakes.

These methods are unworkable for diffuse pollution. There is no source from a pipe that is easy to regulate. Pollutant sources are large areas of land, and any regulation of land uses is difficult and often unacceptable to landowners. Tight government budgets have decreased the money available to be spent on environmental quality. Finally, there is, if not a backlash against the economic costs of environmental quality controls, at least a strong sentiment to go more slowly. So, there are technical, economic and social reasons making diffuse pollution control difficult.

Diffuse pollution to water bodies arises from complex interactions of land with water that reaches the land surface. Water infiltrating into and moving through the soil contacts chemicals that are carried along and eventually reach streams at places where the groundwater discharges. This can occur many kilometers from the points of contact, and afterwards will flow through many soil changes. If the pollutant is ubiquitous in soils, it is impossible to trace the source. Water moving across the landscape can contact and carry...
pollutants in solution or suspension. Again, tracing the source is often difficult. The volumes of water or of soil that would need to be treated to remove pollutants is huge, and can be justified economically only in specific instances, e.g. a small pocket of very hazardous waste. Even these treatments are unsatisfactory because the pollutant is never completely removed and disposal of the waste is a problem.

Funding for point source control 30 years ago was more readily available for three reasons. First, there was more discretionary money available in government budgets, and society accepted pollution control as a valid expenditure of tax money. Second, tax money spent for wastewater treatment fostered invention and development of control technology, again seen as a desirable goal. Third, much of the money went into building new water treatment facilities, and hence had the support of the engineering, design and construction industries. Each of these factors has now changed, with less tax money and a lesser requirement in diffuse pollution control for technology and for the construction of facilities.

While polls measuring public attitudes continue to show wide support for pollution control, strong economic arguments are decreasing the political will to impose the costs of that control. A more important social factor is the strong reluctance of governments to impose land use controls on private property. The sanctity of private property is a vital part of the freedoms in society, and is a strong emotional issue. But diffuse pollution arises from the land, and feasible methods of control require managing the land in such a way that pollution does not occur. This necessitates use of different land management practices; changes that are not popular with landowners.

In many of its characteristics, diffuse pollution control resembles soil erosion control. It has the same mix of technical, economic and social components, and requires the same land-based activities. Erosion control has been a dominant concern for several generations in the management of agricultural land. What can we learn from this experience that can be applied to diffuse pollution control?

**Soil conservation successes**

Diffuse pollution arises on the land; the amounts of pollutants entering water bodies depend upon the conditions of the land surface. If erosion occurs, sediment and associated sorbed pollutants move with the runoff. Various types of barriers, most often vegetation on the surface, prevent detachment of soil or trap sediment before it reaches water bodies. Therefore, pollution control depends upon erosion control, or more generally on soil conservation, keeping soil and incoming water on the land surface. Techniques for erosion control are generally available although social and economic factors often prevent their use.

The soil conservation policies to be described here are largely based on the US experience, but similar programs with similar successes are found in other countries. Soil erosion control started more than 60 years ago in the USA, in response to problems of water erosion in the southeast and wind erosion in the midwest (Helms, 1992). The 1930s were a time of economic depression, and soil conservation policy became tied to money transferred to farmers to increase their income. This was done in the form of cost sharing for erosion control practices. The association of erosion control with income support for farmers has been present ever since. A federal government initiative established the national Soil Erosion Service, which later became the Soil Conservation Service, in the Department of Agriculture. Recently, in response to wider concerns about the interaction of soils with other resources in watersheds, the agency has become the Natural Resources Conservation Service.

It quickly became apparent that a national base for technical advice was not sufficient to solve the soil erosion problem; this had to be done on the land by landowners. Legislation was passed to enable the formation of soil and water conservation districts, of a size roughly
coincident with counties, in the range of 500–5000 km² (200–2000 square miles). Each district had a board of directors elected from within the district, and had legal status within the state and county levels of government. These districts made priority decisions for soil and water conservation work within their area. Technical services were provided, at no cost to the farmer, by employees of the Soil Conservation Service based in each district. The soil erosion control efforts by landowners were voluntary. For example, if a landowner decided to place terraces on a field, the technical support would survey slopes and plan contour terraces, while national money would cost-share a specified fraction of the cost. This basic procedure is still in operation.

The changes have been that practices approved for cost sharing are now often those with other benefits to environmental quality, for example buffer strips next to water bodies. Another change is that concern for land, for soil conservation and for environmental quality is now shared by a large part of the urban non-landowning community. The soil and water conservation districts, geared to farmers’ concerns, are being supplemented by local watershed councils representing the interests of all people living in the watershed. The councils are organized on a local basis, recognizing social as well as technical benefits, and the social and economic barriers to water quality management. Participation is voluntary and public money is generally required for on-land changes.

With these broadening interests, soil erosion control with a 60 year history and diffuse pollution control with a 10 year history meet. Technical inputs melded with rural sociology, agricultural and natural resource economics, and global markets for produce from the land are the mix for action in improving environmental quality.

**Diffuse pollution control**

While point source pollution could be effectively approached as a technical and regulatory problem, diffuse pollution is dominantly a socioeconomic problem, or a people problem. It arises from all land uses, urban, agriculture and forestry. Communities as well as rivers suffer when watershed health is compromised by diffuse pollution. Regulations for point source control had broad public support; this is less true for diffuse pollution control because it directly affects landowners’ use of their land. Variability in watersheds and local factors make each diffuse pollution event different, and make it difficult to both devise and accept uniform regulations. The principle of “polluter pays” is generally accepted for point source pollution, but not widely used for diffuse pollution.

Policies for diffuse pollution control have emphasized education and subsidies for management of land. Regulatory actions for many practices would be expensive, cumbersome, and difficult to enforce. Education programs have usually been designed from the top down, to be delivered through mass media to adults and children. The thinking behind the education approach is that once people understand the connections between their actions and diffuse pollution, they will voluntarily change their habits. The limited evidence suggests a weak correlation, and then only when few direct costs are incurred by the individual. Subsidies temporarily modify behavior, but it reverts when the subsidies are removed. The real value in education is when it can change a community ethic from control of symptoms to a concept of fostering health of watersheds, to considering what we “ought” to do. This is a long-term change. Actions follow such a change.

The most promising current approach to diffuse pollution control is based on the actions of local watershed councils. The model fits into the current concerns of society, more individual action and less central control. The names for these local entities and the rules under which they operate vary within and between countries, but the general method of operation is the same. The land care groups in Australia organize on a local basis to restore local landscapes (Lockie, 1993). The national government provides grants for projects, technical
assistance and education. Private corporations are also beginning to fund projects. The groups started with farmers interested in sustainable farming practices, and now include all segments of the community in water conservation projects. The panchayats of India have locally elected officials with concerns for local problems, which are supported by government grants. Les Parcs Naturels Regionnaux in France for the protection of both physical and demographic aspects of specific small ecosystems are controlled by decisions of local people (La Freniere, 1997).

The watershed councils in the USA operate as follows. A council is formed in a watershed or subwatershed of manageable size, e.g. 500 km². The councils are composed of local people, with representatives from different groups in the community – land users, urban businesses, environmental groups, consumers and local government. The council is formed by a unit of local government, following rules set out by the state government. These rules assure that the council is representative of people living in the watershed. The councils identify and set priorities for the problems causing deterioration of the watershed, identify solutions and choose the most appropriate ones, apply to the government or other sources for money to implement the solutions, and monitor their effectiveness in improving the quality of the watershed. At various stages in this process they request assistance from technical people. The council has a co-ordinator who calls meetings, facilitates discussion, keeps the focus toward solutions and administers funds.

In a society that rewards competition and individual initiative, it often takes some time before a group such as a watershed council acts in a coordinated and cooperative fashion. It is usually easy to identify problems, less easy to set priorities to choose the problem to be first addressed and harder to derive solutions because they will affect different groups in a different way. Solutions can have major economic consequences for different groups. For example, restrictions on building near water bodies decrease options for developers and buffer zones decrease the amount of productive land available to a farmer or forester.

A more general public concern is that different local groups will set different standards for quality of their watersheds. This would be the concern, for example, of national environmental groups such as the Sierra Club. Lower standards will not effectively protect environmental quality, and varying standards from one watershed to the next may lead to relocation of industries to areas of lower standards. This could have large disruptive effects on communities.

As expected, the watershed council process works better in some communities than in others. Local leadership and commitment is a major factor in success. The diversity of interests found in most communities also slows the process. Some council members may represent their interest-group constituencies and feel unable to compromise for the broader good. Progress is generally best when an overall normative vision of the watershed is first established and shared by participants. But it is too early in the life of watershed councils to grade their performance.

**Lessons learned**

Several lessons from 60 years of soil conservation apply to diffuse pollution control. Based on the experience of soil and water conservation districts, the watershed councils can expect:

1. A wide range in effectiveness of local citizen groups.
2. Councils that may not address the most critical problems.
3. A wide range of attitudes and values when non-landowning citizens join landowners in making decisions.
4. Subsidies will be necessary to initiate and to continue diffuse pollution control.
5. Money for pollution control projects will be less available because of decreased government funding.
6. Litigation can disrupt local priorities and projects.
7. Competition from national groups can attract funds away from councils to larger regional restoration projects.
8. Long-term effort for voluntary activities can come from councils.
9. Councils become more productive as attitudes and expectations change with successes.

There is a wide range in effectiveness of soil and water conservation districts, partly in response to different local needs but more often based on leadership available. This has not been erased in half a century, so we should not expect equally high performance from all watershed councils. Both the districts and the councils are voluntary and make decisions based on their interests, so they may not work on the most severe problems. There is a strong aversion in districts to targeting the worst erosion problems; they prefer to base their priorities on working with landowners who cooperate willingly. The parcels of land receiving treatment are those managed by the more progressive land users.

The relative unanimity in districts composed of farmers cannot be expected in councils with the interests of all watershed residents represented. Agreement is much harder to achieve and will take longer. While they all have the health of the watershed as their common goal, each group represented on the council will have different values, different economic interests and different preferred solutions.

Some land management changes do not continue after subsidies for soil conservation practices are removed. The same is to be expected for diffuse pollution control. Financial incentives will have to be continued, and society will have to agree that this is a good use of public money. This requires broad public acceptance of the goals of diffuse pollution control, and of the concept that it is in the public good. One difficulty is that financial incentives or subsidies soon come to be seen as entitlements by those receiving them. Attitudes and concepts of the public good are now different from when soil conservation started. An economic depression in the 1930s followed by rapid economic growth in the 1940s and 1950s provided the environment for investment in strategies to improve the condition of natural resources. Present conditions of strained budgets, less acceptance of public policies for social programs, and fragmentation of society into special interest groups all mitigate against rapid solution of diffuse pollution problems.

Another major difference is that diffuse pollution control is often subject to court action, including suits from private groups and the requirements of legislation such as the Endangered Species Act. Soil erosion was not an issue that brought suits from individuals or interest groups. No one sued a district or a farmer for erosion resulting from certain management practices. Public nuisance suits were rare and minor. But many interest groups have gone to court to influence water quality management. It must be expected that suits will continue, and the watershed councils will operate in that context. This may make consensus more difficult to achieve and may set a timetable for change that is too rushed for a group process.

The soil and water conservation districts have not had competition from national or state, public and private organizations with potential interest in assuming their functions. The same is not true for watershed councils. The high-profile concerns about watershed health and water quality attract environmental conservation associations wanting to solve large restoration problems rapidly, and governments that see the political advantages of acting in this arena. These national organizations, with much more sophisticated leadership, have better access to money. In times of limited budgets, this could result in less funding for watershed councils. The top-down bureaucratic nature of the large groups is also of concern to the councils, who would prefer to see these larger groups restrict themselves to coordination functions and education. On the side of the larger groups is the question of how much improvement can really be expected from small, isolated restoration projects done on parts of subwatersheds.
Conclusion
As our thinking and our public policy recognizes watersheds as the units where diffuse pollution must be controlled, soil conservation and water quality enhancement are tied more closely. The model of conservation districts as the local on-site entities for soil conservation has survived and has been successful. This bodes well for watershed councils. Soil conservation has continued as a voluntary activity, although increasingly subject to regulations and restrictions, especially on those land management practices that are subsidized. Education by itself is insufficient to change practice, unless it first changes our expectations. Then we can achieve healthy watersheds through local action.

References