CLEAN WATER AND THE LAND:
LOCAL GOVERNMENT'S ROLE

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INTRODUCTION

A multi-billion dollar program to clean up our nation's polluted waters is now underway. While largely funded by the federal government, the program involves all levels of government, and many state and regional agencies that are doing much of the planning.

The most expensive part of the cleanup program is building new sewer systems and treatment plants, and upgrading existing systems that are below standard. The sewage that is now poured into the water in untreated or partially treated form is the major contributor, overall, to the water pollution problem. This sewage is called a "point source" because the pollution comes out the end of a pipe. As the major source, it makes sense to focus much of the money on stopping pollution discharges from point sources.

But even as point sources begin to contribute less to the pollution problem, the problem is far from solved. So-called "nonpoint sources" remain, and in some places severely pollute rivers, lakes, and streams. Nonpoint source pollution is generated over wide areas such as forests, fields, streambanks, roadways, or parking lots. The agencies now doing the planning are giving a great deal of attention to these sources.

Congress passed the Federal Water Pollution Control Act Amendments in 1972 that established a national goal to provide, wherever attainable, "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water" by 1983. Specific amounts of permitted point source discharges and treatment levels were established for 1977 and 1983 to help meet this goal. The act also recognized that identifying and controlling nonpoint sources would be necessary to achieve the goal.

The act is a milestone in efforts to expand and coordinate both cleanup and prevention of water pollution. First, it recognizes to a degree not recognize before that improved water quality will result not only from building sewers and treatment plants, but also from changes in land use and management practices that contribute to water pollution. Second, Section 208 of the act creates a comprehensive Water Quality Management Program to deal explicitly with both treatment and prevention of water pollution.

The 208 Water Quality Management Program

The 208 program differs from most other federally funded planning efforts. It includes a process for meeting the established water quality goals, by abating pollution from both point and nonpoint sources. But it does not stop there. The plans that are prepared must show that management institutions exist with adequate financial and legal authority to carry out the plan, or that new ones will be created.

These plans are being prepared on two levels--state and areawide. State plans are being drafted by official state agencies. For the most part, areawide plans for metropolitan communities are being prepared by designated metro-

politan agencies such as councils of government and, in rural areas, by regional planning agencies or the state. The two-year planning effort currently is underway in all regions of the country.

The Environmental Protection Agency (EPA) must approve each plan and management strategy. This approval is critically important to local governments because it becomes the basis for federal grants for wastewater collection and treatment, and for issuing National Pollution Discharge Elimination System (NPDES) permits.

Local Government's Role

Although Congress can articulate national objectives and provide most of the funds, the water pollution problem cannot be solved by the federal government alone. State and local participation is necessary. In the case of nonpoint sources of pollution and the 208 program, cooperative effort is even more critical and could spell the difference between success and failure. Decisions about land use, construction and landscaping practices, street cleaning, storm drainage, and other municipal planning and management questions affect nonpoint source pollution. While many local governments have taken actions to control nonpoint source runoff, concerted and cooperative efforts throughout entire watersheds are needed to really solve the problems.

The 208 program with its areawide structure creates an important opportunity to solve water quality problems and provides a number of specific opportunities for local officials, among them:

--gaining improved access to technical information useful for solving local water quality problems;

--developing intergovernmental programs to solve problems that individual localities cannot correct alone, which in turn assures that local actions are effective;

--finding lower-cost solutions to water quality problems than might otherwise be known;

--maintaining eligibility for financial aid after the areawide plan is completed; and

--assuring that water quality plans and other plans and objectives for local development are consistent.

These are compelling reasons for local officials to participate in the program.

This booklet has been prepared to show local officials how the 208 program can be used to coordinate their efforts to abate nonpoint source water pollution. Nonpoint source problems and solutions to them are emphasized here because of a growing awareness of the magnitude of the problem and the relative lack of information about it, but most important because it is a problem that can be dealt with very largely by local governments, often without huge capital outlays.

WATER POLLUTION AND THE LAND

Nonpoint sources are major contributors to water pollution. Their contribution will remain even when treatment of point source discharges is improved. While on a national level actual amounts are hard to determine, it has been estimated that even after the 1977 treatment requirements established by the 1972 Act are achieved (actually later than 1977) substantial waste loads would remain--largely due to nonpoint sources. Table 1 summarizes these estimates:

Table 1: National Summary of Waste Loads Remaining After the 1977 Requirements Are Achieved

Variable	Point Source*	Nonpoint Source	Total Point and Nonpoint	Percentage Remaining After 1977 Requirements are met
BOD ultimate†	24.0	13.9	37.9	37
Suspended Solids †	11.9	145.6	157.5	92
Total Nitrogen†	7.4	28.3	35.7	79
Total Phosphorus †	1.7	1.93	3.63	53
Fecal Coliform†	1.95	87.85	89.8	98
Total Coliform‡	15.0	1,268.0	1,383.0	99
Oil/Grease ‡	3.9	0.5	4.4	11
Cadmium §	6.4	1.5	7.9	19
Zinc §	67.6	51.4	119.0	43

*Estimated load remaining after achievement of the 1977 requirement
† In million pounds per day
‡ In number of bacteria--10^{15}/day
§ In thousand pounds per day

Source: Hydroscience, Inc., "An Overview of Waste Loads and Urban-Suburban Stream Quality Response" (August 1975) as reprinted in Journal Water Pollution Control Federation, January 1976.

Virtually all of the remaining coliform, for example--the bacterial contaminant that forces beaches to be closed because of the danger to health--is from nonpoint sources. Ninety-two per cent of the remaining suspended solids, largely silt from eroded soil, is estimated to be from nonpoint sources.

What Nonpoint Sources Do

Nonpoint source pollutants cause many of our most common and familiar pollution problems, including polluted well water; polluted and clogged rivers and streams; an overgrowth of weeds and algae, plus sediment in lakes and ponds; and loss of wildlife. A description of these problems will demonstrate why we

must give unprecedented attention to a balanced control program that includes both treating point sources and limiting discharges from nonpoint sources.

Polluted Well Water: When the groundwater that supplies municipal and private wells becomes polluted, the water can no longer be used for drinking without costly treatment--treatment that may be impractical in the case of private wells. Over 50 per cent of the nation's population depends on groundwater for its drinking water supply. Groundwater becomes polluted when bacteria, chemicals, or salts find their way into aquifers, the water-bearing underground rock formations.

A primary source of bacterial pollution of groundwater is septic tanks. Septic tanks often are placed where the soil cannot do its proper filtering job because it is either too hard (like clay) or too wet. Disease-carrying bacteria may get into the water supply. Similarly, leaks that develop in sewer pipes--and they often do--will contribute to groundwater pollution.

Improperly located, designed and managed landfills, feedlots, chemical or petroleum storage facilities, mining operations, and facilities for deep-well injection of liquid wastes also may contribute to both chemical and bacterial groundwater pollution. The concentration of pollutants works its way through the soil and reaches the aquifer. And especially in coastal areas, freshwater wells may turn brackish as the water that is revoved is replaced by the ocean's salt water.

Polluted and Clogged Streams: Pollution of rivers and streams and the accumulation of silt or other sediment is a serious problem in many areas. When organic matter is washed into streams, there is an increased demand for oxygen (biological oxygen demand or BOD), which reduces the oxygen available for fish and other aquatic life, sometimes to a point where the water can no longer support life. It also may make the water unfit for swimming or other recreational uses.

A stream that is filled with sediment can no longer support aquatic life, supply reliable amounts of water, and offer boating and other recreational opportunities. Since rain water and melting snow must go somewhere, a sediment-choked stream may also cause serious downstream flooding.

While much stream pollution comes from inadequately treated point source waste discharges, a substantial amount comes from the following nonpoint sources:

- Urban storm runoff carries with it debris; concentrations of chemicals and fertilizers that have accumulated on the earth's surface during dry weather; leaves, twigs and other organic matter; grease and spilled gasoline from roads, parking lots, and gas stations; animal droppings; and during winter thaws, salt used to melt ice on streets and sidewalks. The extent of pollution from urban runoff is partly due to the large areas of impervious surfaces which increase runoff water and do not allow contaminants to be absorbed into the soil where they can be filtered.

- Agricultural runoff from croplands, feedlots, and pastures carries sediment, fertilizer, pesticides, herbicides, and animal waste into the water.

- Construction sites, where the land has been stripped of soil-holding vegetation, may erode and contribute locally heavy sediment.

- Forestry (silviculture) practices that destroy underbrush and disturb the soil, can result in a heavy contribution of sediment and organic matter from the forest floor.

- Hydrographic modification, i.e., changing the character of the stream itself by such measures as channelizing, building reservoirs, or removing groundwater may lead to increased flooding in unprotected downstream areas or modifying of fish and wildlife habitats.

- Solid waste sites (including landfills and dumps), chemical or petroleum storage areas, or mining operations, if poorly designed and operated, may contaminate both surface and underground water supplies with toxic chemicals or bacteria.

Weeds, Algae, and Sediment in Lakes and Ponds: Weeds and algae in lakes and ponds have a number of unpleasant effects. Besides disrupting the ecological balance of the water body and reducing fish production, excessive weed and algae growth interferes with swimming and boating, and it is generally unpleasant to look at. Algae smells as it decays. Excessive sediment can significantly reduce the depth of lakes, eventually filling them in. Adding too many organic nutrients to the water accelerates the eutrophication or aging process of lakes: the growth and decay of weeds and algae is speeded up, using up the oxygen supply and killing off fish and other water life.

The nonpoint sources that contribute to this problem are similar to those contributing to stream pollution:

- Urban runoff carries lawn fertilizer and organic matter such as leaves into the lake, providing additional nutrients that encourage the growth of weeds and algae.

- Fertilizer and animal wastes from agricultural operations add nutrients with the same effect.

- Septic tanks that are located too close to shorelines or are malfunctioning add inadequately treated human wastes to the water, increasing the oxygen demand placed on the water body.

Adding to this problem is the loss of almost half of the nation's wetlands in the last 100 years. Wetlands such as swamps and marshes are like nature's treatment plants. They act as retention basins and filtering systems, removing and storing many of the nutrients in agricultural and urban runoff before they reach lakes. By filling wetlands deliberately to make land for development, or unintentionally by sedimentation, runoff and flooding has increased, and the natural system's capacity to deal effectively with

such runoff has decreased. Disturbing the stored-up nutrients releases them into the water supply. By interfering with the efficient natural system, we have had to create new, expensive, and often less successful systems to replace what nature orginally provided for free.

Fish Kills, Poisoned Fish, and Loss of Wildlife: A severe consequence of nonpoint problems is the loss of wildlife. Wetlands, for example, offer habitat and spawning grounds for many types of wildfowl and fish. Filling and polluting the wetland habitats reduces wildlife populations, with an attendant loss of hunting and fishing opportunties. When water is heavily polluted game fish such as trout may be replaced with such scavenger fish as carp, that feed off waste and can survive under more adverse conditions. Siltation similarly reduces wildlife diversity and further upsets the balance of life. This loss is particularly tragic in urban areas where wetlands are filled for development. In many cases these wetlands could have provided a near-home recreational resource, something of growing importance in an era of prospective energy shortage.

Usually the damage occurs slowly, such as when pesticides run off cropland. Sometimes it is dramatic: a flood carrying large quantities of sediment, or an overload of toxic chemicals such as pesticides can kill fish or make them inedible. In a number of cases, commercial fishing has been ordered to cease with a significant income loss, and sport fishing has been abruptly restricted or stopped.

Land Use Practices

Most of these problems are caused by relatively few practices, most of which have to do with the way we use the land. Our choice is to use land wisely by either limiting the production of pollutants or to keep pollutants from entering the water and affecting its quality. Or land can be used poorly, as it often is, and lead to serious and expensive consequences.

A list of poor land use practices, those that lead to lowered water quality, includes the following:

--Using unnecessarily large areas of pavement in cities and suburbs which increases urban runoff.

--Cleaning streets infrequently, with the possible result that the "first flush" after a storm in an urban area carries large quantities of chemicals, debris, and organic materials.

--Overusing lawn fertilizer or road salt, or piling leaves in the gutters of urban streets.

--Overusing agricultural fertilizers, allowing animals direct access to streams, and other agricultural practices.

--Failing to take measures to reduce soil erosion during construction, or during agricultural and forestry operations.

--Failure to take measures to reduce or prevent mine wastes and petroleum and chemical spills from reaching the waters.

--Locating housing with septic tanks on unsuitable soils.

--Filling and using wetlands for urban development and agriculture.

--Locating and designing waste disposal sites so that they leach (filter down) into water sources.

Efforts to clean up and prevent water pollution from nonpoint sources are aimed at halting or remedying these kinds of practices. These solutions focus on the major sources of nonpoint pollution, grouped into nine categories:

--Urban runoff
--Agricultural runoff
--Construction activities
--Mining
--On-site disposal systems
--Forestry
--Hydrographic modification
--Surface and subsurface disposal of liquid and solid waste
--Saltwater intrusion

The next section offers some examples of techniques that have been used and are now being further explored by many 208 agencies to deal with these sources. Case studies of communities that have taken effective corrective actions also are presented.

WHAT CAN BE DONE

The solutions to water quality problems flow out of a simple premise: all water in the ground and on the surface is part of a single system. Since the same water is constantly being recycled, what we do in one part of the system affects other parts. The water that we collect for domestic or industrial use, for example, must be returned to the same system for others to use. If it is returned dirty, it must be cleaned before it can be reused.

The water system has a great capacity to clean itself by using the soil or bedrock as a filter, by dilution, or by natural chemical or biological action. But the capacity is not unlimited. When it is overloaded with too much waste, we have to accomplish mechanically what the natural system can no longer handle: filter it, add more water, or collect and treat it. These processes are all very costly. For some uses of water, like fishing or swimming, such solutions are impractical or prohibitively costly.

Solutions to point source pollution problems almost always lie in treating the waste before it is returned to the water system. Treatment is expensive, but is is practical and necessary if water quality goals and standards are to be met.

Solutions to pollution problems from nonpoint sources tend to be more varied. Many options are available to growing suburbs; these generally involve preventive measures through land use controls and related management practices. In built-up cities, there are fewer options, and sometimes the only real answers are costly. For example, most cities deal with the drainage problem by building a storm sewage system. This system usually is separate from the sanitary sewage system. We are now learning that the water that runs off a city's streets and parking lots can be badly contaminated with oils, grease, animal waste, and auto exhaust bi-products, as well as debris. Lawns treated with fetilizer and pesticides can add to a further deterioration of water quality.

In the cities with separate drainage and sanitary systems, stormwater receives no treatment. Here, street sweeping, auto pollution controls, litter prevention programs, and controls on lawn care may pay off. Diversion of the water that runs off at the beginning of a storm ("first flush") into the treatment system may be considered, but is likely to be prohibitively expensive.

Cities with combined storm and sanitary systems have a different problem. Both stormwater and sewage receive the same treatment. But the first flush may produce a terrific wasteload, exceeding the capacity of the treatment system. When this happens, both the excess runoff and raw sewage are released untreated directly into the river or lake.

In Chicago, with its combined system and high level of treatment, sewer overflows occur at least a dozen times a year. Few fish exist in the Chicago river. Swimming is unsafe and boating, to say the least, is unpleasant. Huge tunnels now are being built deep underground by the Metropolitan Sanitary District to hold the water during storms and treat it later. The project will cost upwards of $1 billion.

In largely built-up parts of metropolitan areas, such dramatic and expensive measures, although not necessarily on this scale, may be necessary to deal with the runoff problem, in combination with other controls and management techniques.

Less built-up and newly-developing areas can choose the most appropriate of a wide variety of remedies. These generally follow from a single principle: keep the water where it falls and use the land's natural capacity to absorb water and filter out pollutants. This principle leads to a number of regulatory, management, and, where needed, construction techniques. The 208 program in each area is charged with exploring these options and choosing the best ones, those that will be most effective and least expensive.

Figure 1 shows a way of illustrating and classifying the many land use strategies to improve water quality and the techniques to carry them out. The chart can help planners and public officials recognize that water quality problems must be dealt with in a comprehensive way, coordinated with other local and regional programs. And while most land use practices focus on remedying pollution problems from nonpoint sources, they can also help to "balance and reduce point dishcarges."

Nonpoint Source Pollution: Problem-Solving Techniques

The following section shows how land use and management techniques can be applied to the nine major nonpoint sources. It is not an exhaustive list and certainly careful study must go into selecting the best techniques. While there may be relatively simple solutions to some specific problems, public and private costs, methods of financing, the complex relationship between different parts of the water system and between the water quality problem and other local goals, all must be weighed. This kind of study, analysis, and decision making, including the coordination of local actions on a regional basis, is an integral part of the 208 process.

Urban Runoff

Purposes: To retain as much rainwater and snowmelt as possible where it falls to prevent both flooding and contamination of both ground and surface water.

Techniques: To reduce both the volume of water that flows over impermeable surfaces and the amount of contaminants in urban runoff. . .

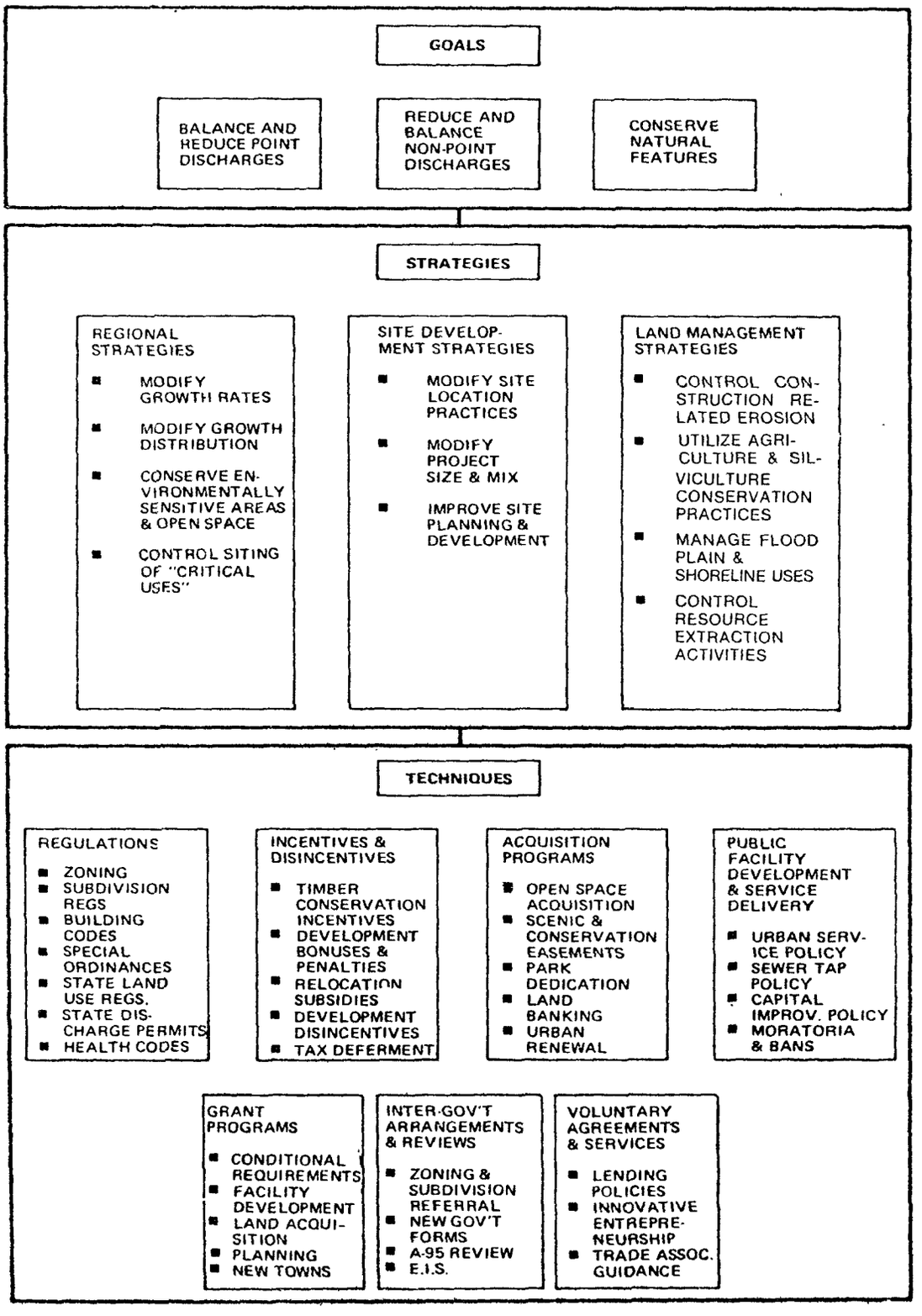
. . . retain land in open space through purchase, tax measures, and protection of environmentally sensitive areas such as floodplains and hillsides;

. . . use zoning and subdivision controls to require buildings to be clustered and to limit ground coverage by impermeable surfaces;

. . . adopt "performance regulations" limiting runoff after development to the natural runoff before development (Tallahassee, Florida [see below] is an example of this approach);

Figure 1

The Role of Land Use Planning and Control in Water Quality Management



Source: Environments for Tomorrow, Inter-Relationships of Land-Use Planning and Control to Water Quality Management Planning, U.S. Environmental Protection Agency, 1973, p. 95.

. . . improve the techniques and frequency of street sweeping, install waste receptacles on public streets, and enact regulations requiring leaves and other yard debris to be bagged for pickup;

. . . limit fertilizers and pest control chemicals on lawns and open spaces;

. . . institute these same management practices on public property to control runoff pollution and to set an example of good practice.

Agricultural Runoff

Purposes: To reduce erosion and then sedimentation in receiving waters such as lakes, ponds, and rivers; to reduce chemical and biological pollution from fertilizers, pesticides, and animal wastes.

Techniques: To control erosion and sedimentation; limit fertilizer and pesticide use; and control feedlots and other concentrated sources of animal waste. . .

. . . adopt erosion and sediment control regulations, possibly models developed by the U.S. Soil Conservation Service; selectively build sediment retaining structures such as dams;

. . . educate farmers or give incentives to use such soil conservation practices as contour plowing, strip cropping, crop rotation, or planting vegetative cover to bind topsoil or prevent streambank erosion;

. . . time the use of pesticides and fertilizers to reduce their runoff (for example by not spreading manure on frozen ground), or ban the sale or use of toxic pesticides;

. . . retain feedlot runoff and process water in holding ponds and then spread it on agricultural land in keeping with sound agricultural practice.

Construction Activities

Purposes: To reduce erosion and construction activities by leaving the soil exposed for as short a period as possible; to collect sediment and debris before it enters receiving waters.

Techniques: To assure use of vegetation and catch basins. . .

. . . require developers to prepare erosion control plans before starting construction and require them to post bonds as guarantees of performance (this requirement often appears in subdivision regulations);

. . . require use of vegetative measures to retain soil through temporary or permanent seeding, straw mulch, or sodding;

. . . require use of mechanical measures such as staged grading activities, building channels to divert runoff from erodable slopes, or building temporary or permanent sediment basins.

Mining

Purposes: To prevent erosion from mining sites; to reduce drainage of acid mine wastes (mainly from coal mines) into water bodies.

Techniques: To control erosion, sediment, and acid production from surface mined lands . . .

. . . require vegetative buffer strips along streams affected by erosion from mines;

. . . require reclamation plans for worked-out extraction areas such as strip mines and sand and gravel pits;

. . . prevent or control in-stream extraction of sand and gravel;

. . . require construction of holding basins for wastes from mining operations.

On-Site Disposal Systems

Purposes: To keep contaminants in individual septic tanks, cesspools, and other disposal systems from entering the surface or groundwater supply.

Techniques: To control the use, location, and operation of individual systems so that their individual and cumulative effect does not endanger water supplies. . .

. . . revise subdivision and sanitary regulations to prohibit individual systems on small lots, and in groundwater (aquifer) recharge areas, floodplains, wetlands, and areas with wet, hard or otherwise unsuitable soils;

. . . replace individual systems with public sewers where contamination already exists or where it is projected, and where costs are not prohibitive;

. . . establish minimum standards for septic tanks and assure their acceptable performance by periodic inspection, by monitoring groundwater quality, and by collecting data on septic tank failures.

Forestry (Silviculture) Activities

Purposes: To decrease the contribution of pollutants (chiefly sediment) to surface waters from logging operations, logging road construction and maintenance, and site preparation for reforestation.

Techniques: To improve forestry practices while minimizing increased operating costs. . .

. . . require or encourage use of practices that reduce exposure of bare soil, including patch cutting, reforestation of denuded sites, sediment retention devices, and similar measures;

. . . prohibit logging of steeply sloped sites or other areas particularly susceptible to erosion;

. . . purchase critical sites where logging should not occur.

Hydrographic Modification

Purposes: To prevent the changes in stream characteristics that might reduce water quality.

Techniques: To limit channelization, water impoundments, the location and type of development, and dredging and dredge spoil disposal. . .

. . . require that river and stream channels and their banks be preserved in their natural state to the greatest degree possible to retain natural flows;

. . . require the maintenance of stream bank vegetation (or replanting if disturbed) to prevent pollutants from directly entering the water;

. . . use structural means such as levees, floodways, retarding basins, and dams when there are no other satisfactory alternatives;

. . . in impoundments such as reservoirs and man-made ponds, use multi-level outlets, aeration of releases, and devices to assure mixing of the water to take full advantage of the water's dilution potential;

. . . enact controls to prevent organic wastes from entering the water, which contributes to BOD and to the reduction of oxygen available for fish and other aquatic life;

. . . use zoning and subdivision regulations to control the amount and location of impervious surfaces on stream banks and consequently the entrance of more urban runoff;

. . . require dredging permits to prevent, through proper disposal or treatment, the reintroduction of polluted dredge spoil into the water source;

. . . use management practices that puts soil to productive use by creating wildlife habitats and, if appropriate, land reclamation.

Surface and Subsurface Disposal of Liquid and Solid Waste

Purposes: To prevent ground and surface water pollution by limiting the gradual flow of liquid pollutants and leaching of solid pollutants from disposal sites.

Techniques: The measures vary depending on the nature and location of the source. Selected practices include . . .

for liquid waste disposal. . .

. . . design and locate disposal lagoons, basins, and pits to make best use of the natural filtration capacity of the soil and dilution of the water; avoid unsuitable locations;

. . . modernize, inspect, and repair sewers at regular intervals (five years is recommended) to minimize leakage;

. . . use corrosion-preventing materials; automatic shutoff valves, and regular inspections to prevent leakage from tanks and pipelines containing chemicals, oils, or other potential contaminants;

. . . require that the storage and disposal of brine, waste, and radioactive materials is designed and located to prevent leaks.

for solid waste disposal. . .

. . . select disposal sites where soil, groundwater, and geologic conditions will filter and dilute toxic wastes sufficiently to maintain acceptable water quality standards;

. . . divert streams around disposal sites;

. . . cover existing landfills or dumps with vegetation to minimize transfer of pollutants by runoff;

. . . use sound landfill practices such as compacting each day's waste and covering it with a layer of soil.

Salt Water Intrusion

Purposes: To maintain fresh groundwater supplies in coastal areas.

Techniques: To establish and maintain a limit on the amount of water that can be withdrawn from coastal aquifers to prevent its replacement by saltwater from the ocean. . .

. . . adopt legislation prescribing the amount of water that can be removed from the groundwater, based on the rate of replenishment;

. . . inject treated wastewater into the groundwater to maintain the separation of freshwater from saltwater.

Local Experience

Each of these measures has been tried. Almost all are within the ability of local governments, through improved governmental practice, through enacting laws that require private parties to take preventive or remedial action, or through education. Some may require new state enabling legislation and financial help from federal or state sources.

The underlying point is that ways to remedy nonpoint source problems not only exist, but are generally far less costly than the alternative of treatment, even when treatment is possible. Most involve land use regulations to prevent one person's actions from harming others. At the same time, regulations require the one who generates the waste to bear the cost of keeping it out of the general water supply. Decisions to impose these regulations involve questions not only of how much it will cost or save, but who is responsible for bearing the costs. These are certainly important issues for local officials.

Local government has had great experience identifying the problems and their sources, developing effective and economical solutions using all available financial sources, and carrying them out. The following examples show how different localities responded to particular nonpoint problems.

Urban Runoff from New Development. To prevent pollutant-carrying runoff and sediment from reaching streams, Tallahassee and Leon County, Florida adopted standards requiring that runoff from new developments not exceed natural flow. A developer may use a variety of methods to achieve this effect, including retaining a portion of land in vegetative cover, constructing parking lots and roads from porous materials such as gravel, or constructing retention facilities. These measures keep the runoff on-site where it is absorbed into the ground. The result is a need for a less extensive and expensive stormwater drainage and treatment system.

Construction Erosion. Michigan instituted controls on construction site runoff to protect waterways from filling with sediment and hence prevent clogged channels and maintain aquatic life. A soil erosion plan must be approved before a permit can be issued for a development of one or more acres or one within 500 feet of a lake or stream. The plans are based on several principles: development should fit the topography of the site; the smallest practical land area should be exposed for the shortest possible time (accomplished through improved scheduling and coordination of construction operations); and both on-site and off-site erosion should be minimized with vegetative buffers, surface roughening, and temporary or permanent runoff controls structures (for example, diversion ditches, sediment basins, and sediment traps constructed with sand bags or bales of straw).

County agencies generally enforce the legislation with approval of their program by the Michigan Department of Natural Resources. The law also allows capable local governments to create an enforcement agency. The enforcement agency may prepare manuals, design requirements, and permit criteria. Public agencies such as the highway department enforce sedimentation controls on their own projects. Administrative costs of county agencies are covered by permit fees.

Septic Tanks and Other Sources Affecting Groundwater. The Edwards Aquifer near San Antonio, Texas, is subject to pollution from a number of sources, including septic tanks and polluted streams in its recharge area. Elected officials from several counties served by the Alamo Area Council of Governments (AACOG) have been involved in a continuing effort to protect the quality of the aquifer. In March 1974, the Texas Water Quality Board issued an order to control waste disposal facilities in the recharge zone and strengthen septic tank regulations. The Edwards Task Force, appointed by the AACOG executive committee, objected to that order as too weak. They proposed that a number of stronger proposals be considered:

1. Areas adjacent to recharge zone: The task force urged that controls apply to certain areas located near the recharge zone. Urban activities in these "buffer zones" pose a threat to the aquifer's water quality.

2. Effluent standards: To protect the high quality of the water in the aquifer, the task force has urged adoption of much higher effluent standards for wastes discharged in the recharge zone. At present, the groundwater is of such high quality that the only treatment it needs is chlorination.

3. Construction standards: The task force urged that comprehensive construction, testing and inspection procedures be required for projects in the recharge zone and adjacent areas to prevent such mishaps as leakage from sewer mains carrying raw sewage.

4. Stream standards: Water from the streams flowing across the zone serves as the major recharge source for the aquifer. The task force proposed a set of standards for streams entering the recharge zone that would provide a way to identify pollution sources upstream, to protect the water that flows across it, and to maintain the present excellent stream quality.

5. Development standards: The task force members feel that minimum development standards, including minimum sizes for lots with individual wells and septic tank systems, are necessary before permits are issued for development in the recharge zone.

In January 1975, the Texas Water Quality Board adopted an order that resolved some of these questions. But local officials in this area continue to take a highly active role to further protect their groundwater supply. Working together they have developed a comprehensive proposal, with an imaginative combination of techniques.

Agricultural Erosion and Sedimentation. Conservation practices to reduce agricultural erosion have been widely applied through the efforts of the U.S. Soil Conservation Service (SCS). The Latah Soil Conservation District in Northern Idaho, in cooperation with the SCS and the University of Idaho, has carried out a program to protect its prime agricultural land from soil erosion and loss of nutrients. The program combines five conservation practices to protect the rolling hill farmland: minimum tillage, contour farming, row cropping, seeding of critical areas, and elimination of summer fallow. Water quality will be improved by cutting soil erosion between 75 and 90 per cent on more than 26,000 acres of wheatland.

Eighteen farms adopted the practice of dividing steep slopes by annually alternating heavy stubble crops (such as wheat) at higher elevations and plants with little residue (e.g. peas) below. The Agricultural Stabilization and Conservation Service (ASCS) provided some financial aid to these farmers. ASCS paid $5 per acre for the first year of practice only to farmers who agreed to maintain the practice for five years. Consideration now is being given to additional cost-sharing measures.

While it is more expensive to divide the slopes, it has been estimated that each inch of soil loss is equivalent to a $5 per acre loss of productivity. As a result of these savings, other farmers have adopted some of the practices.

Urban Runoff, Flooding, and Sedimentation. Flooding invariably brings with it sediment and debris, and when floodwaters pass through an urban area, oil, grease, and other urban waste. This may contaminate water downstream by adding to the organic waste load, depleting the oxygen supply, and disrupting habitat. Control of flooding, therefore, plays a key role in water quality improvement, and prevents the loss of property and sometimes life that commonly accompanies floods.

Wilmore, a central Kentucky town of 3,500 has suffered from periodic flood damage that instigated a rash of citizen demands for action. The mayor felt that some action should be taken, and first considered adding more drainage pipes in the main flood-prone area. The consulting planner and engineer pointed out that such an action would simply pass the problem downstream and increase the flooding problems of neighboring communities. Consequently, the city asked their consultants to develop a three-part stormwater management plan, that included a stormwater facilities plan, a floodplain zoning ordinance, and an application for HUD's Federal Flood Insurance Program.

Two options were considered for stormwater facilities. The first involved a maintenance program to remove sediment, debris, and vegetation from existing pipes and channels, and installation of detention basins to hold back stormwater until it could be released safely. The basins also would retain on site many of the pollutants that otherwise would be carried into the stream. The second option was building more underground storm sewers. The first option was selected at an estimated savings in capital costs of 53 per cent, or $800,000 less than concentrating on storm sewers. The maintenance program was put into effect, detention basins were completed, and indications are that the flooding problem is on the way to being solved.

Approximately 30 to 40 property owners received direct benefits from reduced flooding. Others, particularly those downstream, will receive benefits in improved water quality. The same kinds of measures--maintenance of stormwater collection systems and detention basins--are important in controlling the nonpoint source pollution from urban runoff.

Agricultural Runoff and Sedimentation. In Chariton, Iowa, sedimentation from agricultural runoff had reduced Lake Morris by more than a fourth of its capacity, stimulated algae growth, and generated bacterial pollution. The lake was the city's source of potable water. In cooperation with the Chariton

Valley Resource Conservation and Development Committee, local elected officials developed a plan to build seven earthen dams to control erosion and keep most of the polluting sediment out of the lake.

The Soil Conservation Service selected the dam sites based on drainage patterns, and land rights were obtained by the city through negotiations by the city manager. The Agricultural Stabilization and Conservation Service financed the dams at a cost of $178,000 as an alternative to reconstructing the lake at a cost of $700,000. Costs to the city were limited to the costs of fencing around the ponds at each dam to keep out animals, and stocking the ponds with fish. The city expects to save $8,000 annually in water treatment costs due to the improvement in water quality. And a portion of adjacent U.S. Highway 34 no longer washes out during storms, thus reducing road maintenance and reconstruction costs.

Summary

Neither this list of methods nor the examples show all the solutions to nonpoint source problems. They do show that solutions are possible, and that localities are implementing them now through careful planning and management, cooperation among governmental officials and citizens, and use of available powers and financial aids.

The examples clearly indicate that in almost every case solutions can be found close to the source. Most important, these solutions are less costly to the public and private landowners than the alternative of major construction or treatment. For example, it was far less costly in Chariton, Iowa, to build erosion control dams than to reconstruct the lake. In many cases there are secondary benefits from controls at the source: In Wilmore, Kentucky the program improved both flood control and water quality. In Latah, Idaho agricultural productivity is maintained. Moreover, the actions to solve these problems were initiated by local officials and could not have succeeded without their efforts.

Finally, there is some evidence that cleaning up waterways will increase the value of nearby property. Along the Willamette River near Portland, Oregon, a major cleanup effort has raised riverfront property values by as much as 25 per cent. It has been estimated that cleaning up all our waterways would raise residential and recreational property values by as much as $3 billion nationally.

The 208 program can provide the forum to examine and carry out these kinds of programs throughout the country. The final section of this booklet tells how 208 works and how local officials can become involved in the program.

208: THE INTERGOVERNMENTAL PARTNERSHIP FOR WATER QUALITY

The 208 program is designed to combine the strengths and knowledge of all levels of government to find the best possible solutions for our most pressing water pollution problems. Although the planning is now being conducted at the state and areawide levels, local government holds the key to successful action. By getting involved, local officials can help shape the results. And it is in the interest of areawide and state agencies to involve them so the program will work.

Areas and plannning agencies for the 208 program usually are designated by the governors after consulting with locally elected officials. EPA approves the designation if the area is one "which, as a result of urban industrial concentration or other factors, [has] substantial water quality control problems." In most cases, the designated planning agency is one that already exists in the area--a regional planning commission, a council of governments, or other body. In a few cases, the existing agency's area does not conform to the problem area (for example, a watershed) and a special agency has been established by joint efforts of state, local and federal officials. In the other areas--often referred to as nondesignated areas--the state assumes direct planning responsibility.

Each 208 program's structure will vary within the general guidelines provided by EPA but all offer opportunities for local officials to get involved in decision making. In designated areas, there usually are several important bodies and activities: the designated agency and its board, a policy advisory committee, citizen and technical advisory committees, and a public participation program. For designated substate areas, states must establish at least one policy advisory commitee which must include local elected officials.

Getting Involved in the Program

Designated Areawide Agency. The designated areawide agency, and its board or council plays a central role in the 208 program. This agency must manage the planning program, carry out the citizen participation activities, and work with local decision makers in developing the plan and management program. This process may include developing model regulations and other measures for solving nonpoint source pollution problems. The agency and its board must approve the plan before submitting it to the governor or state agency and then to the EPA.

The designated agency's board must be composed at least partly of local government officials, who are thus assured a major role in the overall direction of the program and in the final decisions. Many important questions that set the stage for decisions are considered by advisory committees, and it is important for local officials to become involved in these aspects of the program as well.

Policy Advisory Committees. The designated planning agencies must create a policy advisory committee (PAC) to help the staff obtain the views of knowledgeable agencies and citizens. This committee normally includes representatives of federal departments such as Agriculture, Interior, and the Army, as well as the state and general public and a large representation of local officials (at the state level, at least half the members of the PAC usually must be local officials.) The committee also may include representatives from agencies, including local government, responsible for other environmental programs, particularly those that may help manage the chosen program.

Citizen and Technical Advisory Committees. Citizen and technical advisory comittees will be established in most programs to enable the agency to seek special help or advice on specific issues: In some cases, they may be subcommittees responsible to the policy committee; in others they may be established by the designated agency's board or may be standing committees of the "parent" agency.

Public Participation Activities. A well-developed and effective public participation program is a requirement of 208 agencies. EPA's 208 guidelines provide that the elected officials and representatives of local, state and federal agencies who must approve or disapprove the final plan should be involved in all significant planning decisions. Forms of public participation will include the work of advisory committees, informational meetings, hearings and other activities.

A call to the 208 agency should be sufficient to find out what roles a local official can play in public participation activities. Most agencies have hired public participation specialists to provide information to and seek the help of both public officials and the general public. In many cases the agency will have sought out local officials early and they already will be involved. In others, the sheer number and complexity of local governments coupled with the problems of starting up a new program will indicate that local officials should take the initiative.

In the nondesignated areas, the state 208 agency should be contacted for detailed information.

The Planning Process. Issues of vital concern to local communities will be considered throughout the planning process. These questions will be considered by the public at large, the advisory committees, and the agency board. Involvement in each phase is very important. Decisions made and conclusions reached at one stage will affect the next stage. While local government has a final review opportunity, their review of suggestions in the early stages will greatly affect the outcome. The process most often will have several stages.

1. Establishment of goals and objectives: This is the stage at which basic information is collected and initial priorities set for solving various water quality problems. Even this early stage is likely to include consideration of the use of land use controls, regional treatment, land disposal of sludge, and other actions. While choices and priorities may change, decisions here will shape the final results and merit much attention. Here is where communities will begin to see how water quality objectives can reinforce, or

in some cases conflict, with other local objectives. For example, there may be the traditional conflicts between the environmental goals of the 208 program and local economic development goals that will need resolving early, and as plans progress.

2. Design of alternatives: The agency must consider a variety of solutions to both point and nonpoint sources of pollution. For nonpoint sources, the agency will have to consider the use of various land use control measures such as zoning or sedimentation controls, changes in municipal practices on such matters as street cleaning, and the other measures discussed earlier. The roles of various agencies as ongoing management bodies for implementing different aspects of the plan will also be considered. For point sources, alternatives will relate to location, impact, timing, and level of treatment including the issue of regional treatment facilities.

Since many solutions are likely to be areawide in nature and require consistent actions in several localities, the intergovernmental questions considered at this point will have a great impact on local government. Full involvement in this debate is essential if a practical and acceptable combination of local and areawide implementation is to be developed.

3. Impact assessment: The social, economic, environmental, financial, and institutional impacts of the alternative plans are to be assessed before the agency chooses a recommended plan. The Environmental Protection Agency recommends that the selected plan be the least costly one, and that it incorporates the best management practices for nonpoint sources--unless there are other significant impacts that logically suggest that some other plan is superior. In addition, the final recommendations may cover financing methods, recommended changes in local ordinances, and other local government actions. It is particularly important to consider the impact of potential nonpoint source solutions on local development plans and management practices during this phase. It is also critical to assure that the proposed financing and regulatory schemes are within local capabilities, and that new proposed management systems have support.

The Approval Process. Following the assessment of impacts, the agency's board will select a plan. It then will submit this plan to each local governing body which will have 30 days to review and forward its comments to the agency. It it takes no action, a favorable recommendation will be assumed. Local review is not a veto, however. Even if one or more localities disapprove, the agency may submit the plan along with local comments to the state reviewing agency or the governor for review and certification of approval. EPA strongly encourages the 208 agency to resolve all local concerns before the plan is submitted to the state.

Following state certification, the plan is submitted to EPA and, if accepted and approved by the agency, becomes the basis for all future wastewater treatment grants and for the issuance of National Pollution Discharge Elimination System permits. In other words, the plan has real authority behind it because both the grant money and the permits must be consistent with it. EPA will consider local comments and will not approve any plan that does not include the proposed designation of management agencies.

The review and approval process provides one last opportunity for local government involvement in the planning program. If, however, there has not been full participation at earlier stages, it is unlikely that a plan and program that satisfies local needs will be formulated. The earlier activities will set the agenda for the final plan. Getting involved at the end of the process, rather than at the beginning, may either limit opportunities to influence the result, or make it impossible to produce a plan within the two years provided.

Summary

The 208 program has been structured to provide several opportunities for local officials to assure that their problems, needs, and views are incorporated in the recommended plan for improving water quality. The area planning agencies include local official on their governing body; the policy and technical advisory committees provide an opportunity for additional public official input; the citizen or public participation activities mandated are extensive and open. It is important that meaningful local government involvement take place.

There is a great opportunity to solve major local problems in the area of water quality; there is an equally great danger that without local involvement the recommendations will prove impractical because many of the solutions, especially controls on nonpoint sources, will require action by local government. Involvement in most programs will involve initiation by the designated agency, but even where that does not occur, local officials should take the initiative to ensure that they have maximum possible impact on the plan and recommendations--and that they receive the most help possible in solving the water pollution problems of their communities.

Who to Contact

Governmental: 208 Agencies, Regional Agencies, Council of Governments, Regional Economic Development or Transportation Agencies

State Offices, Water Resources Division

Environmental Protection Agency (EPA), Regional Offices

Non-Governmental:

National Association of Counties (NACO) (or your state league)
1735 New York Avenue, N.W.
Washington, D.C. 20006
(202) 785-9577

National Association of Regional Councils (NARC)
1700 K Street, N.W.
Washington, D.C. 20006
(202) 296-5253

National Conference of State Legislatures
1405 Curtis Street, 23rd Floor
Denver, Colorado
(303) 623-6600

National League of Cities (or your state league)
1620 Eye Street, N.W.
Washington, D.C. 20006
(202) 293-7300

National Recreation and Parks Association
1601 N. Kent Street
Arlington, Virginia 22209
(703) 525-0606

National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036
(202) 797-6800

Izaak Walton League of America
1800 N. Kent Street, Suite 806
Arlington, Virginia 22209
(703) 528-1818

League of Women Voters of the United States
1730 M Street, N.W.
Washington, D.C. 20036
(202) 296-1770

Sierra Club
1050 Mills Tower
San Francisco, California 94104
(915) 981-8634

Urban Environment Conference
1714 Massachusetts Avenue, N.W.
Washington, D.C. 20036
(202) 462-0660

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