Nonpoint Source (NPS) Pollution

A series of fact sheets on nonpoint source (NPS) pollution
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NonPoint Source Pointers (Factsheets)

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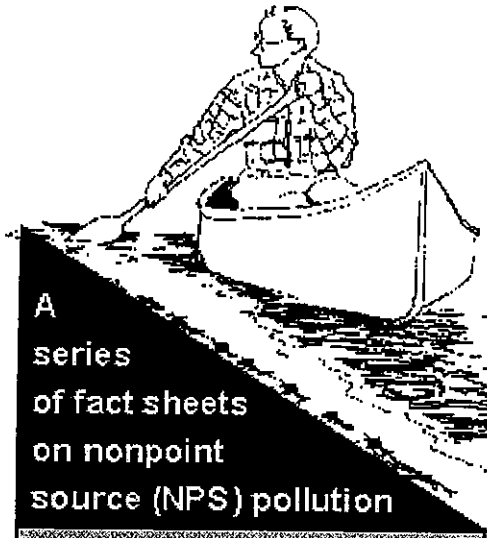
Pointer No. 1
EPA841-F-96-004A



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Three Leading Sources of Water Quality Impairment

Rank	Rivers	Lakes	Estuaries
1	Agriculture	Agriculture	Urban runoff
2	Municipal point sources	Municipal point sources	Municipal point sources
3	Stream/ habitat changes	Urban runoff	Agriculture

Source: Water National Quality Inventory 1994

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater

Nonpoint Source Pollution: The Nation's Largest Water Quality Problem

Why is there still water that's too dirty for swimming, fishing or drinking? Why are native species of plants and animals disappearing from many rivers, lakes, and coastal waters?

The United States has made tremendous advances in the past 25 years to clean up the aquatic environment by controlling pollution from industries and sewage treatment plants. Unfortunately, we did not do enough to control pollution from diffuse, or nonpoint, sources. Today, nonpoint source (NPS) pollution remains the Nation's largest source of water quality problems. It's the main reason that approximately 40 percent of our surveyed rivers, lakes, and estuaries are not clean enough to meet basic uses such as fishing or swimming.

NPS pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water. Imagine the path taken by a drop of rain from the time it hits the ground to when it reaches a river, ground water, or the ocean. Any pollutant it picks up on its journey can become part of the NPS problem. NPS pollution also includes adverse changes to the vegetation, shape, and flow of streams and other aquatic systems.

NPS pollution is widespread because it can occur any time activities disturb the land or water. Agriculture, forestry, grazing, septic systems, recreational boating, urban runoff, construction, physical changes to stream channels, and habitat degradation are potential sources of NPS pollution. Careless or uninformed household management also contributes to NPS pollution problems.

The latest *National Water Quality Inventory* indicates that agriculture is the leading contributor to water quality impairments, degrading 60 percent of the impaired river miles and half of the impaired lake acreage surveyed by states, territories, and tribes. Runoff from urban areas is

the largest source of water quality impairments to surveyed estuaries (areas near the coast where seawater mixes with freshwater).

The most common NPS pollutants are sediment and nutrients. These wash into water bodies from agricultural land, small and medium-sized animal feeding operations, construction sites, and other areas of disturbance. Other common NPS pollutants include pesticides, pathogens (bacteria and viruses), salts, oil, grease, toxic chemicals, and heavy metals. Beach closures, destroyed habitat, unsafe drinking water, fish kills, and many other severe environmental and human health problems result from NPS pollutants. The pollutants also ruin the beauty of healthy, clean water habitats. Each year the United States spends millions of dollars to restore and protect the areas damaged by NPS pollutants.

Progress

During the last 10 years, our country has made significant headway in addressing NPS pollution. At the federal level, recent NPS control programs include the Nonpoint Source Management Program established by the 1987 Clean Water Act Amendments, and the Coastal Nonpoint Pollution Program established by the 1990 Coastal Zone Act Reauthorization Amendments. Other recent federal programs, as well as state, territorial, tribal and local programs also tackle NPS problems.

In addition, public and private groups have developed and used pollution prevention and pollution reduction initiatives and NPS pollution controls, known as management measures, to clean up our water efficiently. Water quality monitoring and environmental education activities supported by government agencies, tribes, industry, volunteer groups, and schools have provided information about NPS pollution and have helped to determine the effectiveness of management techniques.

Also, use of the watershed approach has helped communities address water quality problems caused by NPS pollution. The watershed approach looks at not only a water body but also the entire area that drains into it. This allows communities to focus resources on a watersheds most serious environmental problems--which, in many instances, are caused by NPS pollution.

Just as important, more citizens are practicing water conservation and participating in stream walks, beach cleanups, and other environmental activities sponsored by community-based organizations. By helping out in such efforts, citizens address the Nation's largest water quality problem, and ensure that even more of our rivers, lakes, and coastal waters become safe for swimming, fishing, drinking, and aquatic life.

Pointer No. 2
EPA841-F-96-004B

A series of fact sheets on nonpoint source (NPS) pollution

Did you know that volunteers often collect information on the health of waterways and the extent of NPS pollution?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Opportunities for Public Involvement in Nonpoint Source Control

Over the last 25 years, communities have played an important role in addressing nonpoint source (NPS) pollution, the Nation's leading source of water quality problems. When coordinated with federal, state, and local environmental programs and initiatives, community-based NPS control efforts can be highly successful. To learn about and help control NPS pollution, contact the community-based organizations and environmental agencies in your area. These groups often have information about how citizens can get involved in the following types of NPS control activities.

Volunteer Monitoring

Local groups organize volunteers of all skill levels to gather water quality data. This information can help government agencies understand the magnitude of NPS pollution. More than 500 active volunteer monitoring groups currently operate throughout the United States. Monitoring groups may also have information about other NPS pollution projects, such as beach cleanups, stream walks, and restoration activities.

Ecological Restoration

Ecological restoration provides opportunities for the public to help out with a wide variety of projects, such as tree planting and bank stabilization in both urban and rural areas. Restoration efforts focus on degraded waters or habitats that have significant economic or ecological value.

Educational Activities

Teachers can integrate NPS pollution curricula into their classroom activities. The U.S. Environmental Protection Agency (EPA), federal and state agencies, private groups, and nonprofit

organizations offer teachers a wide variety of materials. Students can start on an NPS control project in the primary grades and carry their work through to the intermediate and secondary levels.

Water Conservation

Using technologies that limit water use in the bathroom, kitchen, laundry room, lawn, driveway, and garden can reduce the demand on existing water supplies and limit the amount of water runoff. More than 40 states now have some type of water conservation program to help citizens and businesses implement conservation practices. Government agencies, utilities, and hardware stores have information about different products that help households conserve water.

Household Management

Learning to limit NPS pollution at the household level can reduce the overall impacts of NPS pollution on water quality. Households, for example, can irrigate during cooler hours of the day, limit fertilizer applications to lawns and gardens, and properly store chemicals to reduce runoff and keep runoff clean. Chemicals and oil should not be poured into sewers, where they can result in major water quality problems. Pet wastes, a significant source of nutrient contamination, should be disposed of properly. Households can also replace impervious surfaces with more porous materials.

Public Meetings and Hearings

Decisions made during public hearings on stormwater permitting and town planning can determine a community's capability to manage NPS pollution over the long term. Laws or regulations may require federal, state, or local agencies to hold public hearings when permits are issued or when town plans are formed. Notices about hearings often appear in the newspaper or in government office buildings.

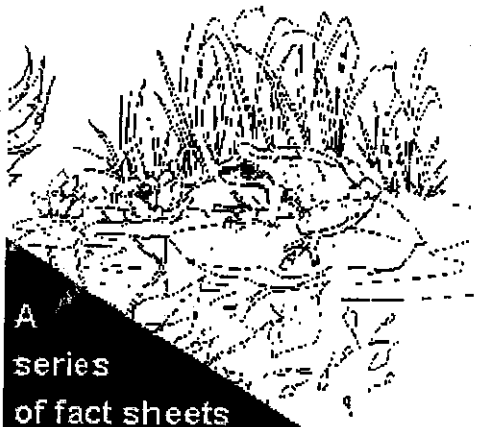
Community Organizations

Many communities have formed groups to protect local natural resources. These community-based groups provide citizens with information about upcoming environmental events in their watershed, such as ecological restoration, volunteer monitoring, and public meetings. Watershed-level associations are particularly effective at addressing a wide range of NPS pollution problems.

Environmental Information on the Internet

Citizens can obtain a tremendous amount of environmental data and educational material with a computer linked to the World Wide Web. EPA's site (http://www.epa.gov) on the World Wide Web provides up-to-date information on Agency activities and enables citizens to find out about air and water quality data in specific communities.

Pointer No. 3
EPA841-F-96-004C



A series of fact sheets on nonpoint source (NPS) pollution

Did you know that communities rely on government programs and alternative sources of funding, such as investing in water conservation, to help control NPS pollution?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Programs for Nonpoint Source Control

States, territories, and tribes identify nonpoint source (NPS) pollution as responsible for more than half of the Nation's existing and threatened water quality impairments. To address these water quality problems, federal, state, tribal, territorial, and local governments provide technical assistance and fund programs to implement NPS controls. Other sources of funding are also available. The U.S. Environmental Protection Agency's Environmental Financing Information Network Center in Washington, DC (202/260-1020) can provide communities with specific information on how to design and fund the most appropriate NPS pollution strategy.

Federal Programs

U.S. Environmental Protection Agency (EPA)

EPA administers section 319 of the Clean Water Act, also known as the Nonpoint Source Management Program. Under section 319, states, territories, and tribes apply for and receive grants from EPA to implement NPS pollution controls. As of 1995, EPA had awarded more than $370 million under section 319 to address NPS pollution problems.

EPA administers other sections of the Clean Water Act to help states, territories, and tribes to plan for and implement water pollution programs, which can include measures for NPS control. These include section 104(b)(3), Water Quality Cooperative Agreements; section 104(g), Small Community Outreach; section 106, Grants for Pollution Control Programs; section 314, Clean Lakes Program; section 320, National Estuary Program; and section 604(b), Water Quality Management Planning. Together with the National Oceanic Atmospheric Administration, EPA helps administer section 6217 of the 1990 Coastal Zone Act Reauthorization Amendments, a program that tackles nonpoint source pollution affecting coastal waters.

National Oceanic and Atmospheric Administration (NOAA)

NOAA administers section 306 of the Coastal Zone Management

Act that provides funds for water pollution control projects, including NPS management activities, in states with coastal zones. Together with the EPA, NOAA also helps administer section 6217 of the Coastal Zone Act Reauthorization Amendments. This requires the 29 states with approved Coastal Zone Management Programs to establish and implement Coastal Nonpoint Pollution Control Programs.

U.S. Department of Agriculture (USDA)

The USDA administers incentive-based conservation programs through the Consolidated Farm Services Agency, the Natural Resources Conservation Service, and the U.S. Forest Service to help control NPS pollution from agriculture, forestry, and urban sources.

U.S. Department of Transportation/Federal Highway Administration

Under the Intermodal Surface Transportation Efficiency Act of 1991, the Federal Highway Administration developed erosion control guidelines for federally funded construction projects on roads, highways, and bridges.

U.S. Department of the Interior

Within the U.S. Department of the Interior, the Bureau of Reclamation, the Bureau of Land Management, and the Fish and Wildlife Service administer several programs to help states manage NPS pollution by providing technical assistance and financial support. For example, the Fish and Wildlife Service administers the Clean Vessel Act, which provides grants to construct sewage pumpout stations at marinas.

Alternative Funding Sources

Some communities rely on a combination of alternative funding sources to implement NPS controls. In 1994, EPA published *A State and Local Government Guide to Environmental Program Funding Alternatives*. This brochure gives examples of how states can use the Clean Water State Revolving Fund, leases, grants, taxes, fees, and bonds to craft innovative and effective strategies to generate funds for NPS controls. In addition, government agencies can establish programs to encourage investments in water conservation technologies.

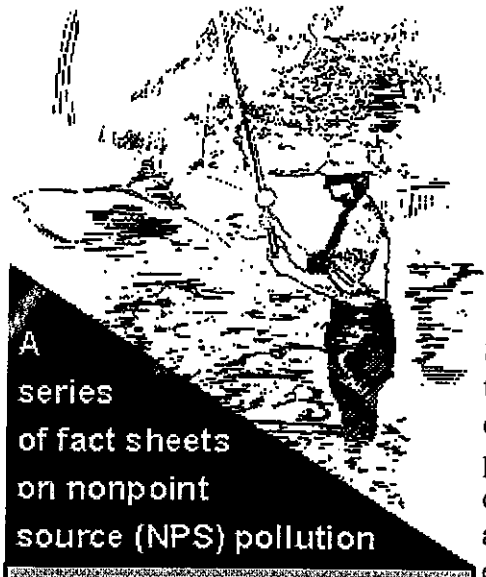
RELATED PUBLICATIONS

Additional fact sheets in the Nonpoint Pointers series (EPA-841-F-96-004)

Clean Water in Your Watershed, Terrene Institute, Washington, DC, 1993

The Clean Water State Revolving Fund: Financing Americas Environmental InfrastructureA Report to Congress (EPA-832-R-95-001)

Pointer No. 4
EPA841-F-96-004D



A series of fact sheets on nonpoint source (NPS) pollution

Did you know that at least 50% of water quality problems in the U.S. result from NPS pollution?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

The Nonpoint Source Management Program

The Clean Water Act of 1972 helped clean up of many of our country's waters, often achieving dramatic improvements. Despite those successes, approximately 36 percent of the Nation's surveyed river miles, 37 percent of its surveyed lake acreage, and 37 percent of its surveyed estuarine square miles are not safe for basic uses such as swimming or fishing.

States, territories, and tribes estimate that at least half of these impairments, as well as significant ground water contamination, are caused by nonpoint source (NPS) pollution, making it the Nation's leading source of water quality problems. To address these problems, Congress amended the Clean Water Act in 1987. Congress established the NPS Pollution Management Program under section 319 of the amendments. The program provides states, territories, and tribes with grants to implement NPS pollution controls described in approved NPS pollution management programs.

In 1990, the U.S. Environmental Protection Agency (EPA) began awarding grants to states, territories, and tribes with approved programs. By 1991, all 50 states and the territories had received EPA approval; by 1995, 7 tribes also had received approval. Since 1990, recipients of 319 grants have directed approximately 40 percent of awarded funds toward controlling NPS pollution from agricultural lands. In addition, nearly one-quarter of the money was used for general assistance purposes, including funding for outreach and technical assistance. Efforts to control runoff from urban sources, septic systems, and construction also received significant funding under section 319, as did projects to manage wetlands and NPS pollution from forestry, habitat degradation, and changes to stream channels.

In 1991, EPA established the National Monitoring Program to evaluate the effectiveness of NPS pollution control projects. Fourteen state-proposed projects will be evaluated over a 6- to 10-year period. The findings from this effort will help states, territories, and tribes develop more successful NPS pollution controls in other watersheds.

As of 1995, EPA had awarded states, territories, and tribes $370 million under section 319 to implement NPS pollution control. *Section 319 Success Stories* provides examples of how states, territories, and tribes chose to use section 319 funds.

How Section 319 Works

Assessment Reports

All states, territories, and some tribes have met two basic requirements to be eligible for a section 319 grant, the first of which is to develop and gain EPA approval of a NPS pollution assessment report. In the assessment report, the state, territory, or tribe identifies waters impacted or threatened by NPS pollution. The state, territory, or tribe also describes the categories of NPS pollution, such as agriculture, urban runoff, or forestry, that are causing water quality.

Management Programs

To meet the second requirement a state, territory, or tribe must develop and obtain EPA approval of a NPS pollution management program. This program becomes the framework for controlling NPS pollution, given the existing and potential water quality problems described in the NPS pollution assessment report. A well-developed management program supports activities with the greatest potential to produce early, demonstrable water quality results; assists in the building of long-term institutional capacity to address NPS pollution problems; and encourages strong interagency coordination and ample opportunity for public involvement in the decision-making process.

How to Get Involved

The addresses and telephone numbers of state and territory nonpoint source officials are listed in the *Nonpoint Source Water Quality Contacts Directory*. These individuals can inform citizens about section 319 program activities in their home state or territory. They can also let citizens know how to become involved in the periodic updates of section 319 NPS assessments and NPS management programs.

RELATED PUBLICATIONS

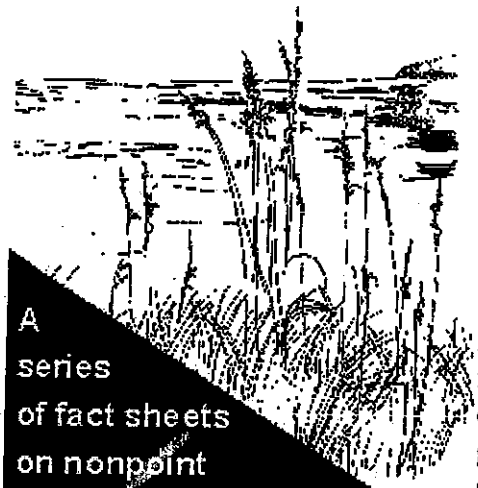
Additional fact sheets in the Nonpoint Pointers series (EPA-841-F-96-004)

Managing Nonpoint Source Pollution: Final Report to Congress on Section 319 of the Clean Water Act (EPA-506/9-90)

Nonpoint Source Water Quality Contacts Directory, Conservation Technology Information Center, West Lafayette, Indiana

The Quality of Our Nation's Water: 1994 (EPA-841-S-95-004)

Pointer No. 5
EPA841-F-96-004E



A series of fact sheets on nonpoint source (NPS) pollution

Did you know that by 2010, almost one-half of the U.S. population will live near coastal waters in regions that make up only 10 percent of our country's land areas?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Protecting Coastal Waters from Nonpoint Source Pollution

Coastal waters provide homes for an amazing array of plants and animals and are recreational havens for more than 180 million visitors each year. Yet, high levels of pollution prevented people from swimming safely at coastal beaches on more than 12,000 occasions from 1988 through 1994, and the latest *National Water Quality Inventory* reports that one-third of surveyed estuaries (areas near the coast where seawater and freshwater mixing occurs) are damaged. Rapidly increasing population growth and development in coastal regions could be a source of even more coastal water quality problems in the future.

A significant portion of the threats to coastal waters are caused by nonpoint source pollution (NPS). Major sources in coastal waters include agriculture and urban runoff. Other significant sources include faulty septic systems, forestry, marinas and recreational boating, physical changes to stream channels, and habitat degradation, especially the destruction of wetlands and vegetated areas near streams.

In 1990, Congress passed the Coastal Zone Act Reauthorization Amendments (CZARA) to tackle the nonpoint source pollution problem in coastal waters. Section 6217 of CZARA requires the 29 states and territories with approved Coastal Zone Management Programs to develop Coastal Nonpoint Pollution Control Programs. In its program, a state or territory describes how it will implement nonpoint source pollution controls, known as management measures, that conform with those described in *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*.

If these original management measures fail to produce the necessary coastal water quality improvements, a state or territory then must implement additional management measures to address remaining water quality problems. Approved programs will update and expand upon NPS Management Programs developed under section 319 of the Clean Water Act and Coastal Zone Management Programs developed under section 306 of the Coastal Zone Management Act.

The coastal nonpoint program strengthens the links between federal and state/territory coastal zone management and water quality programs in order to enhance efforts to manage land management activities that degrade coastal

waters and coastal habitats. State and territorial coastal zone agencies and water quality agencies have coequal roles, as do the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) at the federal level.

Coastal Nonpoint Pollution Control Programs

In 1995, coastal states and territories submitted their coastal nonpoint programs to EPA and NOAA for review and approval. States and territories are scheduled to implement the first phase of their approved program by 2004 and, if necessary, the second phase by 2009. Approved programs include several key elements, described below.

Boundary. The boundary defines the region where land and water uses have a significant impact on a states or territorys coastal waters. It also includes areas where future land uses reasonably can be expected to impair coastal waters. To define the boundary, a state or territory may choose a region suggested by NOAA or may propose its own boundary based on geologic, hydrologic, and other scientific data.

Management Measures. The state or territory coastal nonpoint program describes how a state or territory plans to control NPS pollution within the boundary. To help states and territories identify appropriate technologies and tools, EPA issued *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. This technical guidance describes the best available, economically achievable approaches used to control NPS pollution from the major categories of land management activities that can degrade coastal water quality. States or territories may elect to implement alternative measurement measures as long as the alternative measures will achieve the same environmental results as those described in the guidance.

Enforceable Policies and Mechanisms. States and territories need to ensure the implementation of the management measures. Mechanisms may include, for example, permit programs, zoning, bad actor laws, enforceable water quality standards, and general environmental laws and prohibitions. States and territories may also use voluntary approaches like economic incentives if they are backed by appropriate regulations.

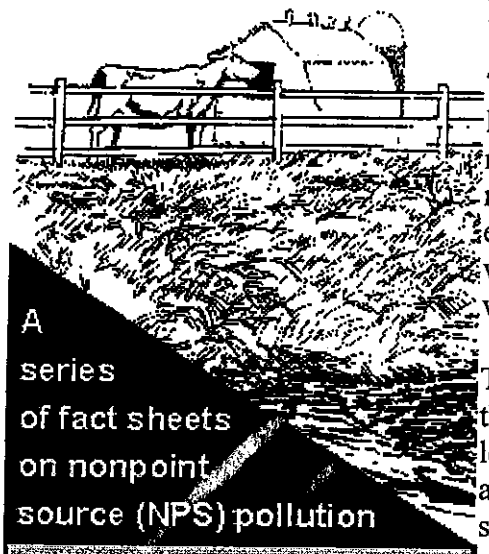
Final Approval and Conditional Approval

In certain circumstances, NOAA and EPA may grant a program conditional approval for up to 5 years. Conditional approval provides a state or territory additional time to fully develop its management program while it begins initial program implementation. Conditional approval would include benchmarks for progress toward eventual full program development and approval.

RELATED PUBLICATIONS

Additional fact sheets in the Nonpoint Pointers series (EPA-841-F-96-004)

Pointer No. 6
EPA841-F-96-004F



A series of fact sheets on nonpoint source (NPS) pollution

Did you know that NPS pollution from agriculture is the leading source of impairments to surveyed rivers and lakes?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Managing Nonpoint Source Pollution from Agriculture

The United States has over 330 million acres of agricultural land that produce an abundant supply of low-cost, nutritious food and other products. American agriculture is noted worldwide for its high productivity, quality, and efficiency in delivering goods to the consumer. However, when improperly managed, agricultural activities can affect water quality.

The most recent *National Water Quality Inventory* reports that agricultural nonpoint source (NPS) pollution is the leading source of water quality impacts to surveyed rivers and lakes, the third largest source of impairments to surveyed estuaries, and also a major contributor to ground water contamination and wetlands degradation.

Agricultural activities that cause NPS pollution include confined animal facilities, grazing, plowing, pesticide spraying, irrigation, fertilizing, planting, and harvesting. The major agricultural NPS pollutants that result from these activities are sediment, nutrients, pathogens, pesticides, and salts. Agricultural activities also can damage habitat and stream channels. Agricultural impacts on surface water and ground water can be minimized by properly managing activities that can cause NPS pollution.

Numerous government programs are available to help people design and pay for management approaches to prevent and control NPS pollution. For example, over 40 percent of section 319 Clean Water Act grants were used to control agricultural NPS pollution. Also, several U.S. Department of Agriculture and state-funded programs provide cost-share, technical assistance, and economic incentives to implement NPS pollution management practices. Many people use their own resources to adopt technologies and practices to limit water quality impacts caused by agricultural activities.

Managing Sedimentation. Sedimentation occurs when wind or water runoff carries soil particles from an area, such as a farm field, and transports them to a water body, such as a stream or lake. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants; covers fish spawning areas and food supplies; and clogs the gills of fish. In addition, other pollutants like phosphorus, pathogens, and heavy metals are often attached to the soil particles and wind up in the water bodies with the sediment. Farmers and ranchers can reduce erosion and sedimentation by 20 to 90 percent by applying management measures to control the volume and flow rate of runoff water, keep the soil in place, and reduce soil transport.

Managing Nutrients. Nutrients such as phosphorus, nitrogen, and potassium in the form of fertilizers, manure, sludge, irrigation water, legumes, and crop residues are applied to enhance production. When they are applied in excess of plant needs, nutrients can wash into aquatic ecosystems where they can cause excessive plant growth, which reduces swimming and boating opportunities, creates a foul taste and odor in drinking water, and kills fish. In drinking water, high concentrations of nitrate can cause methemoglobinemia, a potentially fatal disease in infants also known as blue baby syndrome. Farmers can implement nutrient management plans which help maintain high yields and save money on the use of fertilizers while reducing NPS pollution.

Managing Confined Animal Facilities. By confining animals to areas or lots, farmers and ranchers can efficiently feed and maintain livestock. But these confined areas become major sources of animal waste. Runoff from poorly managed facilities can carry pathogens (bacteria and viruses), nutrients, and oxygen-demanding substances that contaminate shellfishing areas and other major water quality problems. Ground water can also be contaminated by seepage. Discharges can be limited by storing and managing facility wastewater and runoff with an appropriate waste management system.

Managing Irrigation. Irrigation water is applied to supplement natural precipitation or to protect crops against freezing or wilting. Inefficient irrigation can cause water quality problems. In arid areas, for example, where rainwater does not carry residues deep into the soil, excessive irrigation can concentrate pesticides, nutrients, disease-carrying microorganisms, and salts-all of which impact water quality-in the top layer of soil. Farmers can reduce NPS pollution from irrigation by improving water use efficiency. Actual crop needs can be measured with a variety of equipment.

Managing Pesticides. Pesticides, herbicides, and fungicides are used to kill pests and control the growth of weeds and fungus. These chemicals can enter and contaminate water through direct application, runoff, wind transport, and atmospheric deposition. They can kill fish and wildlife, poison food sources, and destroy the habitat that animals use for protective cover. To reduce NPS contamination from pesticides, people can apply Integrated Pest Management (IPM) techniques based on the specific soils, climate, pest history, and crop for a particular field. IPM helps limit pesticide use and manages necessary applications to minimize pesticide movement from the field.

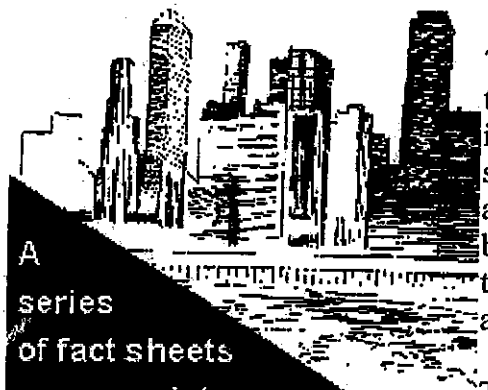
Managing Livestock Grazing. Overgrazing exposes soils, increases erosion, encourages invasion by undesirable plants, destroys fish habitat, and reduces the filtration of sediment necessary for building streambanks, wet meadows, and floodplains. To reduce the impacts of grazing on water quality, farmers and ranchers can adjust grazing intensity, keep livestock out of sensitive areas, provide alternative sources of water and shade, and revegetate rangeland and pastureland.

RELATED PUBLICATIONS

Additional fact sheets in the Nonpoint Pointers series (EPA-841-F-96-004)

Agriculture and Wetlands: A Compilation of Factsheets (EPA-503/9-92-003)

Pointer No. 7
EPA841-F-96-004G



A series of fact sheets on nonpoint source (NPS) pollution

Did you know that because of impervious surfaces such as pavement and rooftops, a typical city block generates 9 times more runoff than a woodland area of the same size?

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Managing Urban Runoff

The most recent *National Water Quality Inventory* reports that runoff from urban areas is the leading source of impairments to surveyed estuaries and the third largest source of water quality impairments to surveyed lakes. In addition, population and development trends indicate that by 2010 more than half of the Nation will live in coastal towns and cities. Runoff from these rapidly growing urban areas will continue to degrade coastal waters.

To protect surface water and ground water quality, urban development and household activities must be guided by plans that limit runoff and reduce pollutant loadings. To this end, communities can address urban water quality problems on both a local and watershed level and garner the institutional support to help address urban runoff problems.

How Urban Areas Affect Runoff

Increased Runoff. The porous and varied terrain of natural landscapes like forests, wetlands, and grasslands trap rainwater and snowmelt and allow it to slowly filter into the ground. Runoff tends to reach receiving waters gradually. In contrast, nonporous urban landscapes like roads, bridges, parking lots, and buildings don't let runoff slowly percolate into the ground. Water remains above the surface, accumulates, and runs off in large amounts.

Cities install storm sewer systems that quickly channel this runoff from roads and other impervious surfaces. Runoff gathers speed once it enters the storm sewer system. When it leaves the system and empties into a stream, large volumes of quickly flowing runoff erode streambanks, damage streamside vegetation, and widen stream channels. In turn, this will result in lower water depths during non-storm periods, higher than normal water levels during wet weather periods, increased sediment loads, and higher water temperatures. Native fish and other aquatic life cannot survive in urban streams severely impacted by urban runoff.

Increased Pollutant Loads. Urbanization also increases the variety and amount of pollutants transported to receiving waters. Sediment from

development and new construction; oil, grease, and toxic chemicals from automobiles; nutrients and pesticides from turf management and gardening; viruses and bacteria from failing septic systems; road salts; and heavy metals are examples of pollutants generated in urban areas. Sediments and solids constitute the largest volume of pollutant loads to receiving waters in urban areas.

When runoff enters storm drains, it carries many of these pollutants with it. In older cities, this polluted runoff is often released directly into the water without any treatment. Increased pollutant loads can harm fish and wildlife populations, kill native vegetation, foul drinking water supplies, and make recreational areas unsafe.

Point and Nonpoint Distinctions

There are two different types of laws that help control urban runoff: one focusing on urban point sources and the other focusing on urban nonpoint sources. Urban point source pollution is addressed by the National Pollution Discharge Elimination System permit program of the Clean Water Act, which regulates stormwater discharges. Urban nonpoint source pollution is covered by nonpoint source management programs developed by states, territories, and tribes under the Clean Water Act. In states and territories with coastal zones, programs to protect coastal waters from nonpoint source pollution also are required by section 6217 of the Coastal Zone Act Reauthorization Amendments.

Measures to Manage Urban Runoff

Plans for New Development. New developments should attempt to maintain the volume of runoff at predevelopment levels by using structural controls and pollution prevention strategies. Plans for the management of runoff, sediment, toxics, and nutrients can establish guidelines to help achieve both goals. Management plans are designed to protect sensitive ecological areas, minimize land disturbances, and retain natural drainage and vegetation.

Plans for Existing Development. Controlling runoff from existing urban areas tends to be relatively expensive compared to managing runoff from new developments. However, existing urban areas can target their urban runoff control projects to make them more economical. Runoff management plans for existing areas can first identify priority pollutant reduction opportunities, then protect natural areas that help control runoff, and finally begin ecological restoration and retrofit activities to clean up degraded water bodies. Citizens can help prioritize the clean-up strategies, volunteer to become involved with restoration efforts, and help protect ecologically valuable areas.

Plans for Onsite Disposal Systems. The control of nutrient and pathogen loadings to surface waters can begin with the proper design, installation, and operation of onsite disposal systems (OSDSs). These septic systems should be situated away from open waters and sensitive resources such as wetlands and floodplains. They should also be inspected, pumped out, and repaired at regular time intervals. Household maintenance of septic systems can play a large role in preventing excessive system discharges.

Public Education. Schools can conduct education projects that teach students how to prevent pollution and keep water clean. In addition, educational outreach can target specific enterprises, such as service stations, that have opportunities to control runoff onsite. Many communities have implemented storm drain stenciling programs that discourage people from dumping trash directly into storm sewer systems.

Pointer No. 8
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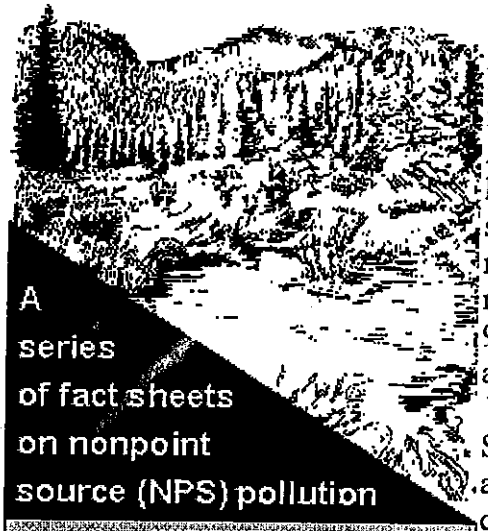


A series of fact sheets on nonpoint source (NPS) pollution

Did you know that streamside vegetation protects streams, lakes, and other waters from NPS pollution caused by forestry activities?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Managing Nonpoint Source Pollution from Forestry

Nearly 500 million acres of forested lands are managed for the production of timber in the United States. Although only a very small percentage of this land is harvested each year, forestry activities can cause significant water quality problems if improperly managed. The latest *National Water Quality Inventory* reports that forestry activities contribute to approximately 9 percent of the water quality problems in surveyed rivers and streams.

Sources of NPS pollution associated with forestry activities include removal of streamside vegetation, road construction and use, timber harvesting, and mechanical preparation for the planting of trees. Road construction and road use are the primary sources of NPS pollution on forested lands, contributing up to 90 percent of the total sediment from forestry operations. Harvesting trees in the area beside a stream can affect water quality by reducing the streambank shading that regulates water temperature and by removing vegetation that stabilizes the streambanks. These changes can harm aquatic life by limiting sources of food, shade, and shelter.

Preharvest Planning: Opportunities to Prevent NPS Pollution

To limit water quality impacts caused by forestry, public and private forest managers have developed and followed site-specific forest management plans.

Following properly designed preharvest plans can result in logging activities that are both profitable and highly protective of water quality. Such plans address the full range of forestry activities that can cause NPS pollution. They clearly identify the area to be harvested; locate special areas of protection, such as wetlands and streamside vegetation; plan for the proper timing of forestry activities; describe management measures for road layout, design, construction, and maintenance, as well as for harvesting methods and forest regeneration.

Public meetings held under the authority of federal and state laws provide citizens with a good opportunity to review and comment on the development of forest management plans.

Factors Considered in the Preharvest Plan

Surveying the Site. Preactivity surveys can help identify areas that might need special protection or management during forestry operations. Sensitive landscapes usually have steep slopes, a greater potential for landslides, sensitive rock formations, high precipitation levels, snowpack, or special ecological functions such as those provided by streamside vegetation. Forestry activities occurring in these areas have a high potential of affecting water quality.

Timing. Because most forestry activities disturb soil and contribute to erosion and runoff, timing operations carefully can significantly reduce their impact on water quality and aquatic life. Rainy seasons and fish migration and spawning seasons, for example, should be avoided when conducting forestry activities.

Establishing Streamside Management Areas (SMAs). Plans often restrict forestry activities in vegetated areas near streams (also known as buffer strips or riparian zones), thereby establishing special SMAs. The vegetation in an SMA is highly beneficial to water quality and aquatic habitat. Vegetation in the SMA stabilizes streambanks, reduces runoff and nutrient levels in runoff, and traps sediment generated from upslope activities before it reaches surface waters. SMA vegetation moderates water temperature by shading surface water and provides habitat for aquatic life. For example, large trees provide shade while alive and provide aquatic habitat after they die and fall into the stream as large woody debris.

Managing Road Construction, Layout, Use, and Maintenance. Good road location and design can greatly reduce the transport of sediment to water bodies. Whenever possible, road systems should be designed to minimize road length, road width, and the number of places where water bodies are crossed. Roads should also follow the natural contours of the land and be located away from steep gradients, landslide-prone areas, and areas with poor drainage. Proper road maintenance and closure of unneeded roads can help reduce NPS impacts from erosion over the long term.

Managing Timber Harvesting. Most detrimental effects of harvesting are related to the access and movement of vehicles and machinery, and the dragging and loading of trees or logs. These effects include soil disturbance, soil compaction, and direct disturbance of stream channels. Poor harvesting and transport techniques can increase sediment production by 10 to 20 times and disturb as much as 40 percent of the soil surface. In contrast, careful logging disturbs as little as 8 percent of the soil surface.

Careful selection of equipment and methods for transporting logs from the harvest area to areas where logs are gathered can significantly reduce the amount of soil disturbed and delivered to water bodies. Stream channels should be protected from logging debris at all times during harvesting operations.

Managing Replanting. Forests can be regenerated from either seed or seedlings. Seeding usually requires that the soil surface be prepared before planting. Seedlings can be directly planted with machines after minimal soil preparation. In either case, the use of heavy machinery can result in significant soil disturbance if not performed carefully.

United States Environmental Protection Agency
Office of Watersheds 3WP10
EPA-841-F-96-004J

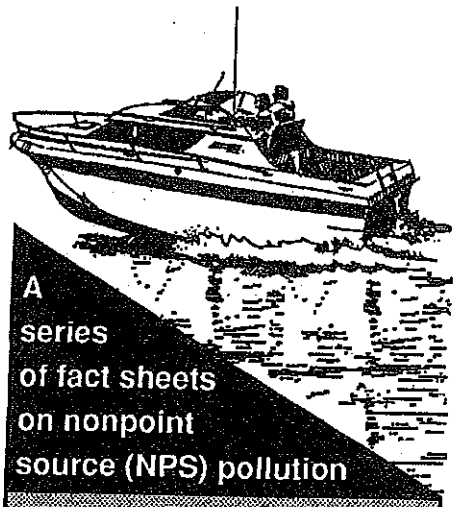
EPA

Nonpoint Pointers

Understanding and managing nonpoint source pollution in your community

Pointer No. 9

Managing Nonpoint Source Pollution from Boating and Marinas



A series of fact sheets on nonpoint source (NPS) pollution

Millions of people regularly enjoy recreational boating and more than 10,000 marinas dot the coastline and waterfront property of North America. The growing number of recreational boaters and marina managers must take special care to limit water pollution.

Individual boats and marinas usually release only small amounts of pollutants. Yet, when multiplied by thousands of boaters and marinas, they can cause distinct water quality problems in lakes, rivers, and coastal waters. The U.S. Environmental Protection Agency has identified the following potential environmental impacts from boating and marinas: high toxicity in the water; increased pollutant concentrations in aquatic organisms and sediments; higher erosion rates; more nutrients, leading to an increase in algae and a decrease in oxygen (eutrophication); and high levels of pathogens. In addition, construction at marinas can destroy sensitive ecosystems and bottom-dwelling aquatic communities.

Carefully fueling boat engines, recycling used oil, and discarding worn motor parts into proper receptacles can prevent needless petroleum spills.

Water pollution from boating and marinas is caused by poorly flushed waterways, boat maintenance, discharge of sewage from boats, storm water runoff from marina parking lots, and the physical alteration of shoreline, wetlands, and aquatic habitat during the construction and operation of marinas.

Proper marina planning and an informed boating public will limit pollution from these sources, promote long-term economic benefits and environmental health, and help recreational boating to remain a healthy, fun-filled experience. Clean boats, clean boating habits, and clean marinas benefit the entire boating community as well as aquatic life.

Managing Boat Operation and Maintenance

A significant amount of solvent, paint, oil, and other pollutants can seep into the ground water or be washed directly into surface water. The chemicals and metals in anti-fouling paint can limit bottom growth. Many boat cleaners contain chlorine, ammonia, and phosphates — substances that can

Did you know that the Clean Vessel Act provides grants to build sewage pumpout facilities at marinas?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into ground water.

harm plankton and fish. Small oil spills from motors and refueling activities contain petroleum hydrocarbons that attach to waterborne sediments. These persist in aquatic ecosystems and harm the bottom-dwelling organisms at the base of the marine food chain.

To reduce pollution from boats and marinas, boaters can use nontoxic cleaning products. Using a drop cloth, cleaning and maintaining boats away from the water, and vacuuming up loose paint chips and paint dust prevent paint and other chemical substances from entering waters. Carefully fueling boat engines, recycling used oil, and discarding worn motor parts into proper receptacles can prevent needless spills. Draining water out of all waterlines and tanks during winter eliminates the possibility of burst pipes. And perhaps most important, keeping boat motors well-tuned prevents fuel and lubricant leaks and boost fuel efficiency. These guidelines not only can keep water clean, but also can keep boats running smoothly.

Managing Boat Sewage and Waste

Often underestimated or ignored by the public, the discharge of sewage and waste from boats, can degrade water quality. Improper disposal of human waste can make water unsightly and unsuitable for recreation, destroy shellfishing areas, and cause severe health problems. Sewage discharged from boats also stimulates algae growth, which can reduce the available oxygen needed by fish and other organisms. Although fish parts are biodegradable, when many fish are gutted and cleaned in the same area on the same day, water quality problems can result, including algae growth.

Boaters should attempt to achieve zero discharge of all sewage into recreational waters. While on the boat, fecal matter and other solid waste should be contained in a U.S. Coast Guard-approved marine sanitation device (MSD). Upon return to shore, portable toilets should be emptied into approved shoreside waste handling facilities, and MSDs should be discharged into approved pumpout stations.

Managing Siting and Design for Marinas

Poorly planned marinas can disrupt natural water circulation and cause shoreline soil erosion and habitat destruction. To reduce activities that cause NPS pollution, marinas should be located and designed so that natural flushing regularly renews marina waters. In addition, predevelopment water quality and habitat assessments should be conducted to protect ecologically valuable areas. Grass and ground cover planting or, where necessary, structural stabilization measures can help prevent erosion during and after marina construction. Stormwater runoff can be controlled with pollution prevention strategies and containing hull maintenance areas. Marina fueling and sewage collection stations should be designed and maintained to make cleanup of spills easier. When completed, the final marina design should deliver the most desirable combination of marina capacity, services, and access, while minimizing environmental impacts and onsite development costs.

Pointer No. 10
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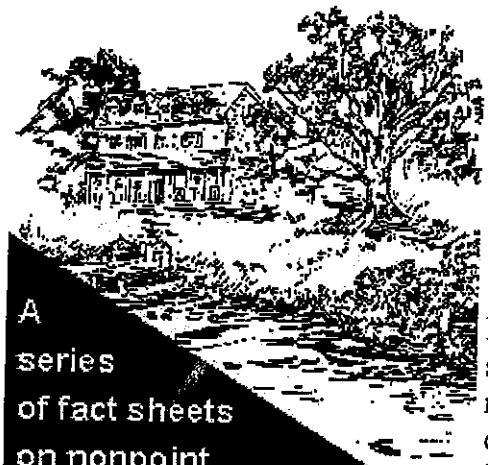

A series of fact sheets on nonpoint source (NPS) pollution

Did you know that homes with xeriscape landscapes use natural contours and native plants to conserve water, limit runoff, and reduce chemical use?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Managing Nonpoint Source Pollution from Households

The well-known stories about environmental problems tend to focus on big, recognizable targets such as smoking industrial facilities, leaking toxic waste dumps, and messy oil spills. As a result, people often forget about water pollution caused by smaller nonpoint sources--especially pollution at the household level.

However, nonpoint source (NPS) pollution is the Nation's leading source of water quality degradation. Although individual homes might contribute only minor amounts of NPS pollution, the combined effect of an entire neighborhood can be serious. These include eutrophication, sedimentation, and contamination with unwanted pollutants.

To prevent and control NPS pollution, households can learn about the causes of such pollution and take the appropriate (and often money-saving) steps to limit runoff and make sure runoff stays clean.

Limit Paved Surfaces

Urban and suburban landscapes are covered by paved surfaces like sidewalks, parking lots, roads, and driveways. They prevent water from percolating down into the ground, cause runoff to accumulate, and funnel into storm drains at high speeds. When quickly flowing runoff empties into receiving waters, it can severely erode streambanks. Paved surfaces also transfer heat to runoff, thereby increasing the temperature of receiving waters. Native species of fish and other aquatic life cannot survive in these warmer waters.

To limit NPS pollution from paved surfaces households can substitute alternatives to areas traditionally covered by nonporous surfaces. Grasses and natural ground cover, for example, can be attractive and practical substitutes for asphalt driveways, walkways, and patios. Some homes effectively incorporate a system of natural grasses, trees, and mulch to limit continuous impervious surface area. Wooden decks, gravel or brick paths, and rock gardens keep the natural ground cover intact and allow rainwater to slowly seep into the ground.

Landscape With Nature

Altering the natural contours of yards during landscaping and planting with non-native plants that need fertilizer and extra water can increase the potential for higher runoff volumes, increase erosion, and introduce chemicals into the path of runoff. In contrast, xeriscape landscaping provides households with a framework that can dramatically reduce the potential for NPS pollution.

Xeriscape incorporates many environmental factors into landscape design--soil type, use of native plants, practical turf areas, proper irrigation, mulches, and appropriate maintenance schedules. By using native plants that are well-suited to a regions climate and pests, xeriscape drastically reduces the need for irrigation and chemical applications. Less irrigation results in less runoff, while less chemical application keeps runoff clean.

Proper Septic System Management

Malfunctioning or overflowing septic systems release bacteria and nutrients into the water cycle, contaminating nearby lakes, streams, and estuaries, and ground water. Septic systems must be built in the right place. Trampling ground above the system compacts soil and can cause the systems pipes to collapse. Also, septic systems should be located away from trees because tree roots can crack pipes or obstruct the flow of wastewater through drain lines. Proper septic system management is also important, and a system should be inspected and emptied every 3 to 5 years.

By maintaining water fixtures and by purchasing water-efficient showerheads, faucets, and toilets, households can limit wastewater levels, reducing the likelihood of septic system overflow. Most water conservation technologies provide long-term economic and environmental benefits.

Proper Chemical Use, Storage, and Disposal

Household cleaners, grease, oil, plastics, and some food or paper products should not be flushed down drains or washed down the street. Over time chemicals can corrode septic system pipes and might not be completely removed during the filtration process. Chemicals poured down the drain can also interfere with the chemical and biological breakdown of the wastes in the septic tank.

On household lawns and gardens, homeowners can try natural alternatives to chemical fertilizers and pesticides and apply no more than the recommended amounts. Natural predators like insects and bats, composting, and use of native plants can reduce or entirely negate the need for chemicals. Xeriscape can limit chemical applications to lawns and gardens.

If chemicals are needed around the home, they should be stored properly to prevent leaks and access by children. Most cities have designated sites for the proper disposal of used chemicals.

Pointer No. 11
EPA841-F-96-004K

A series of fact sheets on nonpoint source (NPS) pollution

Did you know that wetlands receive significant amounts of NPS pollution because they are typically the lowest point on the landscape?

NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them in surface waters or introduces them into groundwater.

Managing Wetlands to Control Nonpoint Source Pollution

States, territories, and tribes identify nonpoint source (NPS) pollution as the Nation's leading source of surface water and ground water quality impairments. When properly managed, wetlands can help prevent NPS pollution from degrading water quality. Wetlands include swamps, marshes, fens, and bogs.

Properly managed wetlands can intercept runoff and transform and store NPS pollutants like sediment, nutrients, and certain heavy metals without being degraded. In addition, wetlands vegetation can keep stream channels intact by slowing runoff and by evenly distributing the energy in runoff. Wetlands vegetation also regulates stream temperature by providing streamside shading. Some cities have started to experiment with wetlands as an effective tool to control runoff and protect urban streams.

Improper development or excessive pollutant loads can damage wetlands. The degraded wetlands can no longer provide water quality benefits and become significant sources of NPS pollution. Excessive amounts of decaying wetlands vegetation, for example, can increase biochemical oxygen demand, making habitat unsuitable for fish and other aquatic life. Degraded wetlands also release stored nutrients and other chemicals into surface water and ground water.

The U.S. Environmental Protection Agency (EPA) recommends three management strategies to maintain the water quality benefits provided by wetlands: preservation, restoration, and construction of engineered systems that pretreat runoff before it reaches receiving waters and wetlands.

Wetlands Preservation

The first strategy protects the full range of wetlands functions by discouraging development activity. At the same time, this strategy encourages proper management of upstream watershed activities, such as agriculture, forestry,

and urban development. Several programs administered by EPA, the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration, the U.S. Army Corps of engineers, and the U.S. Department of the Interior, as well as other government agencies, protect wetlands by either controlling development activities that would affect wetlands or providing financial assistance to people who wish to protect them. In addition, nongovernmental groups that purchase wetlands for conservation purposes, such as The Nature Conservancy, The Trust for Public Land, and local land trusts, are playing an increasingly important role in protecting water quality.

Wetlands/Riparian Restoration

The second strategy promotes the restoration of degraded wetlands and riparian zones with NPS pollution control potential. Riparian zones are the vegetated ecosystems along a water body through which energy, materials, and water pass. Riparian areas characteristically have high-water tables and are subject to periodic flooding and influence from the adjacent water body. They encompass wetlands and uplands, or some combination of these two landforms.

Restoration activities should recreate the full range of preexisting wetlands functions. That means replanting degraded wetlands with native plant species and, depending on the location and the degree of degradation, using structural devices to control water flows. Restoration projects factor in ecological principles, such as habitat diversity and the connections between different aquatic and riparian habitat types, which distinguish these kinds of projects from wetlands that are constructed for runoff pretreatment.

Engineered Systems

The third strategy promotes the use of engineered vegetated treatment systems (VTS). VTS are especially effective at removing suspended solids and sediment from NPS pollution before the runoff reaches natural wetlands.

One type of VTS, the vegetated filter strip (VFS), is a swath of land planted with grasses and trees that intercepts uniform sheet flows of runoff, before the runoff reaches wetlands. VFSs are most effective at sediment removal, with removal rates usually greater than 70%. Constructed wetlands, another type of VTS, are typically engineered complexes of water, plants, and animal life that simulate naturally occurring wetlands. Studies indicate that constructed wetlands can achieve sediment removal rates greater than 90 percent. Like VFS, constructed wetlands offer an alternative to other systems that are more structural in design.

Saving a Precious Resource

Healthy wetlands benefit fish, wildlife, and humans because they protect many natural resources, only one of which is clean water. Unfortunately, over half of the wetlands in the lower-48 states were lost between the late 1700s and the mid-1980s, and undisturbed wetlands still face threats from development. To help prevent NPS pollution from further degrading the Nation's waters and to protect many other natural resources, wetlands protection must remain a focal point for national education campaigns, watershed protection plans, and local conservation efforts.