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EPA News-Notes

The Condition of the Environment and the Control of Nonpoint Sources of Water Pollution

A Commentary . . .

How Not to be Cowed — Livestock Grazing on the Public Lands: An Owner's Manual

This is the title of a newly published "owner's manual" for public lands. The authors tell us at the outset that the owners are "hikers and backpackers, hunters and anglers, photographers, river runners, native plant enthusiasts . . . in short, YOU (the public), as co-owners of millions of acres of public land in the West." Owners include local and state governments and local citizen groups interested in the restoration of riparian areas and damaged watersheds and in keeping nonpoint sources of pollution out of rivers and streams.

This 70-page informative booklet was written by Johanna Wood (Natural Resources Defense Council), Ken Rait (Southern Utah Wilderness Alliance), Rose Strickland (Public Lands Committee, Sierra Club), and Joe Feller (Arizona State University College of Law). It is a careful and user-friendly explanation of BLM's planning and decision-making process. The book clearly explains the statutes and policies under which the public lands are administered, together with the public's role in that process.

The various interests at play in the public lands drama — the concerned public and BLM's army of public servants as well as the growing numbers of environmentally-minded ranchers — will all welcome this book as a guide to the sound management of the public lands — to compatibly support multiple uses. Its use can help guarantee that each of the involved interests will remain in business for a long time on ecologically healthy and productive public lands, ripe with biodiversity, complete with the web of life.

[Copies of the book are $3.00 per copy. To order or for further information, contact Southern Utah Wilderness Alliance, 1471 South 1100 East, Salt Lake City, UT 84105. Phone (801) 486-3161. Or National Resources Defense Council (415) 777-0220.]

INSIDE THIS ISSUE

Noteworthy Governmental Happenings

EPA's Office of Water a "Partner in Flight"

EPA's Office of Water is a participant in an initiative to investigate and stem the decline in birds that breed in the higher latitudes of North America and winter in the tropics. Research has shown that populations of many neotropical migrant species are suffering serious reductions compared to other birds. These migrants include songbirds like the red-eyed vireo, which went from 41.5 breeding pairs in Washington, DC's Rock Creek Park in the 1940s to 5.8 pairs 40 years later. Other migrants are shorebirds or birds of prey like the endangered peregrine falcon.

Habitat Loss Contributes to Decline of Migrant Birds

Some of the causes, like reproductive failure caused by DDT, have been proven, while others are still being studied. One factor contributing to the decline is loss of habitat. In North America, grasslands, wetlands, forests, and estuaries where migrants breed and rest are shrinking. The birds' tropical wintering habitat is also contracting.

Partners in Flight — Aves de las Americas, launched in 1990, is working to clarify the complex of causes and reverse the downward trend in bird populations. The program links federal, state, and nongovernmental entities in an integrated effort of research, monitoring, and habitat management for migratory nongame birds.

Many species of migratory songbirds require large mature forests for successful breeding. Others depend on the food webs of wetlands and estuaries to raise their broods. Deforestation and fragmentation of habitat expose migrants to predators and nest parasites like the brown-headed cowbird.

Water Managers Can Help

Because many watershed management activities are beneficial to bird habitat as well as water resources, EPA feels that water program managers can make a vital contribution to the effort.

For instance, leaving large tracts of steep slopes forested can not only protect water quality and aquatic life but can provide the large forest areas that many of the neotropical migrants require. Riparian areas preserved as filter strips can serve as corridors for birds to travel between habitat "islands" fragmented by development.

According to Dave Davis, EPA's representative on the Interagency Steering Committee for Partners in Flight,

> *Clearly, one of the most direct linkages is through our efforts to protect coastal resources, wetlands, lakes, stream and river habitat, and riparian zones. Programs such as the National Estuary Program, Near Coastal Waters Program, Section 404 Program, Clean Lakes Program, the "Great Water Bodies" programs and other watershed protection projects are important vehicles to protect both the physical and chemical integrity of these systems. However, water people can also be critical members of the team through permitting and enforcement, development, and application of criteria and standards, construction and operation of waste- and stormwater treatment systems, protection of groundwater resources, monitoring and water quality planning.*
>
> *For the most part, the best way to help is simply to continue to do what we do best; that is, managing aquatic resources in a manner that retains their integrity and natural functions. However, knowledge of the special needs of neotropical migratory birds is also important in helping to protect or enhance those aquatic systems attributes that are critical to the birds.*

For example, at the BLM's San Pedro Riparian National Conservation Area, cottonwood- willow habitats have the highest avian densities and richness of species of all habitats included in a study of the San Pedro Valley. According to Dave Krueper, a BLM wildlife biologist, avian densities reached more than 2,000 individuals per 100 acres during spring migration and more than 1,500 during the summer breeding season. Many of the birds were neotropical migrants, including yellow-billed cuckoos, yellow warblers, gray and common black-hawks, brown-crested flycatchers, northern beardless-tyrannulets, seven species of vireos, and 40 warbler species.

Also at San Pedro, preliminary studies indicate that excluding cattle from riparian areas resulted in a significant increase in populations of ground-nesting or understory specialists like the yellow-breasted chat.

EPA's Office of Water a "Partner in Flight" (continued)

The participants in Partners in Flight are linked by a federal/NGO Memorandum of Understanding signed by 11 federal agencies and 19 nongovernmental organizations. In the annual report, NGO Committee Chair Stanley Senner said that 1992 would be a year of finalizing the program's structure and starting implementation.

[For more information, contact Dave Davis (202) 260-7166 or Janet Pawlukiewicz (202) 260-9194, both at WH-556F, U.S. EPA, 401 M St., SW, Washington, DC 20460. Or contact Peter Stangel, National Fish and Wildlife Foundation, 18th and C St., NW, Washington, DC 20240.]

EPA's Office of Water Releases Final Report to Congress On Nonpoint Sources of Water Pollution

Wildlife and recreation are the state-designated uses most affected by nonpoint source pollution in both lakes and streams. Fishing and shellfishing in the Great Lakes and other coastal waters are also impaired, as is groundwater as a drinking water source in at least nine states. This data, gleaned from state nonpoint source assessments, is reported in EPA's *Managing Nonpoint Source Pollution,* the final report to Congress[1] on section 319 of the Clean Water Act, released April 6, 1992.

The report said, "This information indicates very clearly that nonpoint source pollution has caused severe damage to aquatic communities nationwide and has destroyed the aesthetic values of many of our treasured recreational waters."

The report, required by CWA §319(m), describes the status of the national effort to control nonpoint source pollution as of October 1, 1989. Where possible, more current information concerning the final approval of state NPS assessments and management programs and the issuance of grants in 1990 is also provided.

Nutrients and Siltation Impact Streams and Lakes

In the 40 states that reported data on rivers and streams, 16 percent (206,179 miles) of the rivers were impacted by nonpoint source pollution. State data indicated that 20 percent, or 5.4 million surface acres (excluding the Great Lakes, the Great Salt Lake, and Alaska's lakes) of lakes were affected. In both rivers and lakes, nutrients and siltation had the greatest impacts. Not surprisingly, agriculture was the biggest source of pollutants.

Watershed Approaches Yield Water Quality Improvement

On the plus side, while the report acknowledges that 1989 was too early to look for significant water quality improvements from 319 programs, it notes that the Rural Clean Water Program (RCWP), begun in 1982, has had a number of successes. Florida, Idaho, Oregon, and Utah all documented water quality improvement in demonstration projects. The report points out that the RCWP projects were implemented effectively on local levels. "Knowing this," the report to Congress continues, "the states and EPA are working together to establish and implement targeted pollution control measures in high priority watersheds."

Federal, State, and Local Commitment

EPA saw "increased commitment at all levels to protect and enhance water quality by controlling nonpoint source pollution," as evidenced by the following:

- All states completed EPA-approved nonpoint source assessments and began to use the appropriated FY 1990 grant funds in their new and existing NPS programs and activities.
- Federal agencies did their part to facilitate progress. EPA fully approved 44 state NPS management programs and partially approved programs in the remaining states. EPA promulgated an initial set of stormwater regulations for large municipalities and some industrial stormwater discharges in November 1990. The USDA began to implement nonpoint source control technical assistance and cost-share activities under its Water Quality Initiative.

1 In the legislation enacting §319, Congress required EPA to report on progress in the implementation of the new nonpoint source program. Congress termed this a "final report." States will continue to report to EPA annually on their progress in implementing §319.

EPA's Office of Water Releases Final Report to Congress On Nonpoint Sources of Water Pollution (continued)

- Congress passed two important pieces of legislation to control nonpoint source pollution:
  - The 1990 Food Security Act, which expanded the set of water quality programs in the conservation title.
  - The Coastal Zone Act Reauthorization Amendments of 1990, which required states to develop coastal nonpoint pollution control programs.

According to the report,

> *While state assessments, management programs and grants were the primary focus of EPA's activities, EPA also continued or began other activities to promote national awareness and effective control of nonpoint source pollution.*

EPA's *Nonpoint Source Agenda for the Future,* published in January 1989, developed five themes for its goal of protecting and restoring the nation's waters: public awareness, successful solutions, economic forces, regulatory solutions, and good science.

The report to Congress included praise for *News-Notes'* function as EPA's major vehicle for sharing local, state, regional, and federal experiences concerning financial and regulatory solutions. Another highlight was EPA distribution of numerous information and education materials designed to raise public awareness on nonpoint sources of pollution.

Managing Nonpoint Source Pollution includes chapters on:

- Methodology and results of the state NPS assessments (nationally and by waterbody type)
- National and state statistics
- Regional activities and state programs
- Related programs implemented by EPA, other federal agencies, and nongovernmental organizations
- Selected NPS problems and solutions (animal waste and grazing impacts, sustainable agriculture, composting, irrigated agriculture, using market incentives to prevent and control NPS)

[The 197-page document is available from Ann Beier, OW (WH-553), U.S. EPA, 401 M St., SW, Washington, DC 20460. Or FAX your request (clearly written) to (202) 260-7024.]

Notes on NPS Technology

An Agencywide Work Group Is Drafting ORD Nonpoint Source Research Plan

This article reports on the current status of planning for nonpoint source research to be carried out by EPA's Office of Research and Development (ORD).

The Nonpoint Source Research Workshop was held on February 12-14, 1991, in Richmond, Virginia, to ascertain the highest priority research needs of the nonpoint source community. The workshop was jointly sponsored by ORD and the Assessment and Watershed Protection Division of the Office of Water (OW). Contributors at the workshop included representatives of EPA's ORD, OW, Office of Planning and Program Evaluation (OPPE), and EPA's regional offices. Other participants included the U.S. Department of Agriculture (USDA), the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the Tennessee Valley Authority (TVA), many states, and other organizations. The "Nonpoint Source Research Strategy" that evolved from that workshop was written by ORD and published August 28, 1991.[1]

Selected portions of the introductory Statement of Purpose from the Strategy speak directly to the approach taken:

1 The complete "Nonpoint Source Research Strategy" document is electronically stored on the *Nonpoint Source Electronic Bulletin Board (NPS BBS)* in the NPS Research & Development SIG Forum. It may be read there or downloaded to your personal computer. For instructions on how to access the *NPS BBS*, see the BBS News section of this edition of *News-Notes*.

An Agencywide Work Group Is Drafting ORD Nonpoint Source Research Plan (continued)

- *This Strategy presents an approach to meet the nonpoint source research needs of the Office of Water (OW), and the Regional, state and local nonpoint source program implementors and to provide federal leadership in assessing and ameliorating nonpoint source problems over the next decade. It is intended to focus discussion on the development of research priorities, and to establish a comprehensive plan for nonpoint source research.*
- *This Strategy will provide a risk-based approach to address five key questions:*
  - *(1) Which ecosystems or watersheds are at greatest risk from nonpoint sources?*
  - *(2) What are the most significant causes of the observed problems?*
  - *(3) Which of these causes are the most amenable to control?*
  - *(4) Which prevention and restoration techniques appear most promising?*
  - *(5) How do we determine the effectiveness of restoration and prevention efforts?*
- *Goals of the Strategy are to provide decision makers with quantitative tools and information to:*
  - *identify ecological and water quality problems for watersheds within a regional framework,*
  - *develop risk-based diagnostic approaches for ranking sources within this framework,*
  - *identify and select control options to achieve these goals,*
  - *evaluate the effectiveness of these selected control options in meeting watershed goals, and*
  - *assess the relative risk reduction by implementing these control options at regional scales.*
- *Research will include short-term evaluation of tools for rapid delivery of information to decision-makers, and long-term fundamental research. Research will have a watershed focus, formulate ecological criteria over traditional chemical specific approaches, emphasize topics not addressed by other agencies (e.g., urban runoff), and use a comparative risk framework, allowing a geographic targeting of watersheds and problem areas within watersheds. It will integrate effects of all stresses (physical, chemical, and biological) and consider designated uses.*
- *A technology transfer component will promote the transfer of effective control techniques to Regional, state, and local agencies and enable early feedback of additional research needs for projects in the development stage.*

The strategy report presented recommendations under four headings: assessment, control measures, evaluation, and technology transfer and concluded with a section on future funding of ORD nonpoint source research, stating:

> *An increase in the nonpoint source research budget could potentially provide within five years many of the tools and techniques needed by EPA Offices and states for establishing biocriteria for nonpoint source pollution, developing field methodologies to assess the scope and magnitude of the problem, and formulating models and decision support systems to screen and evaluate the feasibility of control and restoration procedures . . . An increase in environmental processes and fate research . . . would permit us to identify the interactions between surface-water and groundwater ecosystems, assess the assimilative capacity of these systems to chemical contaminants, improve our understanding and predictive capability of the ecological effects of nonpoint source pollution, and begin developing realistic biocriteria for nonpoint source pollution.*

In planning for its FY 1994 budget, ORD has instituted a new process this year for focused research of specific environmental problems. This is a dramatic and important change from the traditional "media" structure that has been used for planning and budgeting. NPS is one of 40 environmental issues that have been identified along with such items as habitat/biodiversity, wetlands, indoor air, global climate change, and innovative technology. The new structure includes a number of cross-cutting research issues, such as human exposure and ecological risk assessment. This structure for the research program will support EPA's new emphasis on holistic, multi-media approaches to solving environmental problems.

An Agencywide Work Group Is Drafting ORD Nonpoint Source Research Plan (continued)

For each research issue, ORD has prepared a strategy that briefly describes the major science questions and research directions. An ORD publication containing all of the issue strategies will be available this summer.

Agencywide work groups, including both program and regional office representatives, are now assisting in the preparation of research plans for each of the 40 issues. Burnell Vincent of ORD's Office of Technology Transfer and Regulatory Support has advised *News-Notes* that "... authors of the nonpoint source research plan now being prepared were participants in the Richmond workshop that spawned the NPS Research Strategy and will draw heavily upon elements of the Strategy in developing the plan."

The work group developing the research plan for the nonpoint source issue is chaired by Dr. Rosemarie C. Russo, who is the director of the Athens Environmental Research Lab. The nonpoint source issue has been allocated $2 million in base funding and an additional $1 million target for potential new increases in budget. Unfortunately, this level of funding is not sufficient to undertake many of the research needs set out in the Strategy beyond work already underway on midwestern agriculture.

In a late March letter to her Core Writing Group (with copies to the NPS research work group), Dr. Russo indicated that most of the base funding would be required to support ORD's Midwest Agriculture Surface/Subsurface Transport and Effects Research program (called the MASTER program) already in the pipeline. MASTER is a cooperative research effort with USDA.

She concluded her letter with these comments:

> *The Issue Strategy calls for expansion in resources and scope beyond the current focus on agriculture-related nonpoint source problems. The NPS Research Strategy prepared from a national workshop in 1991 describes the broader need. My view is that current resource levels for this strategy do not permit expansion to these problems, especially in the near term. I am seeking additional guidance on how best to include those research project areas for which additional funding is required. Accordingly, please do include potential projects not currently planned under MASTER.*

At this point, then, funding for additional NPS Research as envisioned at the Richmond workshop does seem problematic.

When complete, the 40 ORD research plans are to be reviewed by EPA's Science Advisory board and a number of other scientific organizations, such as the Ecological Society of America and the American Chemical Society. The research plans will both guide the implementation of research and describe EPA's research program to interested audiences.

In addition to ORD HQ/Lab personnel, the nonpoint source work group includes the following program/regional EPA personnel:

> *Bruce Newton and Dov Weitman, Assessment and Watershed Protection Division, OWOW; Sherri Fields, Wetlands Division, OWOW; Russell Kinerson, Standards and Applied Science Division, OST; Betsy Behl, OPPTS/OPP; Andy Manale, OPPE; and Harry Wells, OPPTS/Pollution Prevention. Catherine Kuhlman, Water Quality Branch chief, Region IX, is the regional representative.*

As there are further new developments, *News-Notes* will report them.

EPA Accepts Voluntary Label Changes for Atrazine To Reduce Water Contamination

Atrazine, used primarily in corn and sorghum, is one of the most widely used pesticides in the United States. It is also the most widely detected pesticide in water monitoring studies in the Midwest corn belt.

On April 10, EPA announced its acceptance of a voluntary proposal by Ciba-Geigy Corporation aimed at reducing surface water contamination by atrazine, particularly in drinking water. The company will make label changes on atrazine products and carry out additional water monitoring and educational initiatives on the pesticide.

Label Changes Include Deletions of Some Uses

Some of the more pertinent label restrictions include:

- Deletion of non-crop uses, including rights-of-ways, highways, and railroads.
- Reduction in the application rates for corn and sorghum from three pounds per acre to a range of 1.6 to 2.5.
- No ground or aerial application within 200 feet around all natural or impounded waters (reservoirs and lakes) and within 66 feet of points where field surface runoff water enters perennial or intermittent streams and rivers (on highly erodible land, the 66-foot setback must be vegetated).
- All mixing and loading operations must have 50-foot setbacks from intermittent streams, rivers, reservoirs, impounded and natural lakes, and all wells, including drainage wells, abandoned wells, and sink holes.

The restrictions will go into effect for the 1993 crop season.

1991 Studies Show High Atrazine Levels in Midwestern Rivers

Atrazine has been registered and used in the U.S. since 1959 to control both broadleaf and grassy weeds, primarily in corn and sorghum. Approximately 80 to 90 million pounds of atrazine active ingredient are applied annually.

Not surprisingly, corn-growing regions often have high levels of the herbicide in water. The Maximum Contaminant Level (MCL) for atrazine in drinking water is an annual average value of 3 parts per billion (ppb), based on a minimum of four quarterly samples.

In November 1991, USGS released monitoring data from the Mississippi River and some of its tributaries for the period of April, May, and June 1991. The data showed that concentrations of dissolved atrazine above 3 ppb were sustained for four to six weeks from about mid-May to mid- or late June in the lower Platte River in Nebraska, the lower White River in Indiana, the lower Illinois River in Illinois, and the lower Missouri River in Missouri. Atrazine exceeded the MCL of 3 ppb in 27 percent of the individual samples collected during these months.

Maximum Contaminant Levels

MCLs are enforceable standards for public water systems set by EPA under the Safe Drinking Water Act. These regulatory standards set achievable levels of drinking water quality to protect human health. If average levels measured in quarterly samples exceed MCLs, communities may be required to treat drinking water to achieve acceptable levels.

Although a single sample may exceed the MCL, a water system remains in compliance with federal regulations until it *exceeds the annual average*. EPA considers the annual average to be a better indicator of the long-term exposure and risk than a single sample. The full year's worth of samples in the study areas must be collected and analyzed before it can be determined whether water suppliers are out of compliance with federal regulations.

The MCL for atrazine was promulgated by EPA on January 30, 1991, and becomes effective on July 30, 1992. Public water suppliers are required to begin monitoring for atrazine beginning January 1993. EPA requires states to designate one-third of their water systems to sample in 1993 and a second third to sample in 1994. States must begin sampling of the final third by 1995. However, EPA encourages public water suppliers using surface water in areas where atrazine is used to begin sampling early.

Label Restrictions a "Step in Right Direction"

While the above USGS study indicates that public water suppliers in the affected areas should be aware of atrazine and other herbicides, EPA does not believe that there is an immediate or serious health threat posed by these herbicides in the Mississippi River and its tributaries. These samples represent what are likely to be the peak levels of atrazine because they coincide with the months (April, May, June) during which it is used. Samples from fall and winter may show lower levels. Also, the MCL for atrazine is based on risk over a lifetime of exposure, and it includes a margin of public safety. Occasional or short-term exposure to levels slightly exceeding the MCL are not believed to pose a serious health risk.

EPA Accepts Voluntary Label Changes for Atrazine To Reduce Water Contamination (continued)

However, according to Al Havinga of EPA's Office of Groundwater and Drinking Water, "EPA has information that lakes and reservoirs used as drinking water sources in areas where atrazine is used may continue to have elevated levels throughout the year and these situations may pose year-round rather than seasonal problems." For example, atrazine samples exceeded the 3 ppb MCL from late March 1991 through January 1992 in Osceolo, IA's West Lake. Other lakes and reservoirs are showing similar trends.

In response to the USGS study and other surface water quality data, Ciba-Geigy proposed the voluntary label changes. According to Daniel Barolo, director, EPA Special Review and Reregistration Division in the Office of Pesticide Programs, "While we believe that the atrazine label restrictions will reduce surface water contamination, the agency recognizes that some states may have to impose additional water quality protection measures in areas that are particularly vulnerable to runoff. However, Ciba-Geigy's voluntary label changes are a step in the right direction."

[For more information, please contact Kathy Pearce, EPA, Office of Pesticide Programs, Special Review Branch at (703) 308-8016 and Al Havinga, EPA, Office of Ground Water and Drinking Water at (202) 260-5555.]

New Registry of Soil and Plant Laboratories Released

A first-ever compilation of services offered by more than 200 U.S. and Canadian laboratories testing soils, plants, water, and animal/municipal wastes is now available, according to the Council on Soil Testing and Plant Analysis, publisher of the laboratory registry. The *Soil and Plant Analysis Laboratory Registry for the United States and Canada* was sponsored by USDA Soil Conservation Service and USDA Extension Service. Stated the registry foreword,

> *This registry will be an important reference for nutrient management specialists, farmers, and others seeking to improve nutrient management in North American agriculture through the use of the basic tools of soil testing and plant analysis.*

The 246-page registry clusters information into four sections: soil testing, plant tissue analysis, water testing, and animal/municipal waste analysis. Elements analyzed and methods used are reported for each lab as well as information on quality assurance and control programs used by each laboratory and the accreditation or certification status of each laboratory.

Copies of the *Soil and Plant Analysis Laboratory Registry* may be obtained from the Council on Soil Testing and Plant Analysis, Georgia University Station, P.O. Box 2007, Athens, GA 30612-2007. The cost is $15.

EDITOR'S NOTE: The analysis of soil, plants, and animal/municipal waste to be added to the soil is a most important step in nutrient management. It allows managers to factor in nutrients in the soil and in field applications of manure and sludge when planning fertilization schedules. More and more farmers are relying on nutrient testing to avoid over-fertilization of crops and prevent pollution of groundwater and surface waters. *News-Notes* #19 describes how Iowa corn farmers cut nitrogen applications dramatically by employing nitrate soil tests as one part of a management program.

EPA Begins TMDL Case Study Series

In this issue of *News-Notes*, the Watershed Branch inaugurates a new series of section 303(d) total maximum daily load (TMDL) case examples. This series will provide everyday, practical and specific examples of TMDL development. Over time, the series will feature TMDLs incorporating nonpoint source load allocations, and it will illustrate the use of TMDLs as an integral part of the Watershed Protection Approach (WPA). The first case example is included in this issue as a center-of-the-book, pull-out supplement.

The TMDL process is established by the Clean Water Act to develop wasteload allocations for point sources and load allocations for nonpoint sources based on the assimilative capacity and maximum possible pollution load that can be absorbed by a waterbody and to assure that water quality standards will be maintained. The TMDL process is key to the holistic approach envisioned by the WPA. It encourages federal, state, local, and other agencies concerned with water quality management to analyze all water quality problems and stressors and recommend controls on a basin rather than on individual sources.

EPA Begins TMDL Case Study Series (continued)

This is a new emphasis for the TMDL program. In the past, TMDLs were commonly thought to be applicable only to chemical stressors from point sources. EPA and the states are now using the process established by section 303(d) to determine needed reductions in pollution beyond simple chemical loads. In the WPA context, TMDLs can address other types of water quality stressors that result from nonpoint sources of pollution. Habitat alteration and the health and diversity of biological communities may also be addressed through the use of TMDLs. In short, the TMDL process is being used to encourage consideration of all sources of pollution on a watershed basis. Equally important, the TMDL process is becoming an important vehicle for engaging the attention of all stakeholders.

Thousands of TMDLs and wasteload allocations have been developed over the years and many involve innovative approaches. EPA, working with state, local, and other federal agencies, is documenting straightforward basic TMDLs, TMDLs for challenging water quality problems, innovative approaches, and creative solutions. Over 70 potential case studies representing a broad mix of water quality and institutional challenges have been identified. Case examples will be published as they are finished.

If you want to receive future examples, contact your EPA regional section 303(d) coordinator. Comments on this first example would be appreciated and should be directed to Donald Brady, chief, Watershed Management Section (WH-553), Washington, DC 20460 (202) 260-5368.

EDITOR'S NOTE: Also of interest is a new document released by EPA Region IX, *Development of the San Luis Obispo Creek Demonstration TMDL*. This is a practical, real-world example of how to develop a phased TMDL using available data, information, and EPA guidance. This report is available in limited numbers through Dave Smith, 303(d) coordinator, U.S. EPA, Region IX, 75 Hawthorne St., San Francisco, CA 94105. Phone: (415) 744-1078)]

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Cover Crops for Clean Water

This book, edited by William L. Hargrove, looks at the positive and negative implications of using cover crops to achieve water quality and soil conservation goals. In one example found in the book, the growth of the rye cover crop during the fall and winter following corn harvest removed more than 134 pounds of nitrate-N per acre from the soil profile, substantially reducing the soil nitrate pool.

Topics include:

- The effects of cover crops on water runoff and soil erosion and on surface and groundwater quality.
- The role of cover crops in nitrogen cycling, maintenance of soil productivity, weed management, integrated crop and livestock production, and pest management.
- The development of cover crop germplasm.
- Use of cover crops in sustainable agriculture.

[Copies of the 207-page, softbound book may be ordered from JSWC, Soil and Water Conservation Society, 7515 Northeast Ankeny Road, Ankeny, IA 50021-9764. Phone: (515) 289-2331 or call 1-800-THE-SOIL. Single copies, $15.00 ($13.00 for SWCS members); 10 or more copies, $12.00 postpaid. Iowa residents must add 4% sales tax.]

Notes on Watershed Management

U.S. Fish & Wildlife Service Studies Irrigation Return Flows, Impacts, and Management Options

EDITOR'S NOTE: Since the enactment of the Clean Water Act of 1977, § 402(l) has exempted "discharges composed entirely of return flows from irrigated agriculture" from the requirement of a federal NPDES permit. Section 502 (14) contains a definition of "point source." All point sources are subject to the permit requirement. To make sure the permit exemption sticks, the definition section contains a provision that the term "point source," so defined, "does not include return flows from irrigated agriculture." States that have received authority to issue their own permits are not bound by this federal permit exemption language. In fact, California has issued a permit to the Bureau of Reclamation covering the discharge of return flows of irrigation water to the Kesterson National Wildlife Refuge.

To assist EPA in developing policies under the Clean Water Act, the U.S. Fish and Wildlife Service (US FWS) and EPA entered into a Memorandum of Understanding in 1991 wherein the US FWS would describe the impacts of irrigation drainwater (return flow) and its constituents on fish and wildlife and their habitats. The final report, completed early in May 1992, was prepared by the US FWS's Division of Environmental Contaminants for EPA's Office of Policy Analysis (OPPE).

The principal findings of the Fish and Wildlife Service's report are summarized below.

Extent and Nature of Irrigated Agriculture and the Problem

The US FWS reported that irrigation accounts for about 90 percent of the water used in the western United States, and that by 1977, 50 million acres in 17 western states were irrigated. Irrigated farming produces 25 percent of the total U.S. crop production but occupies less than 15 percent of all agricultural lands. The report says:

> *Most irrigation practices use open ditches for water transport and simply flood fields to irrigate the crops. As the water evaporates, increasing concentrations of many salts and trace elements are left behind. The potential for toxicity to wildlife from these salts (salinity) and trace elements has only been recognized in recent years. Prior to the 1980's, environmental studies on agricultural contaminants focused primarily on nitrates, phosphates, and pesticides. In the early 1980's, attention was focused on deformities and reduced reproductive capacity of aquatic birds at the Kesterson National Wildlife Refuge (NWR) in California. Suddenly, selenium and other trace elements associated with irrigation drainage became topics of concern.*

Irrigation Operations/Practices

- *The water collected from irrigation activities by aboveground ditches or underground tile drains is disposed of by one or a combination of methods including: discharge to holding ponds or local waterbodies (i.e., rivers or streams, evaporation ponds or fallow fields); injection into deep wells; or reintroduction into the local irrigation system.*
- *High rates of evapotranspiration in the western states have led to increased concentrations of toxic constituents in evaporation ponds, where most of the documented drainage-related impacts to wildlife have been observed.*

Constituents of Concern/Impact Levels

- *The San Joaquin Valley Drainage Program (SJVDP) identified selenium, boron, molybdenum, chromium and salts as the primary drainwater elements of concern at sites in the western United States.*
- *Selenium levels in bird eggs (population mean) and bird livers above 20 ppm and 30 ppm, respectively, are typically associated with a biological risk. Waterbody levels of selenium above 12 ppb have also been associated with biological risk to aquatic birds.*
- *Reduced reproductive success and/or survival of young aquatic birds has been documented at evaporation ponds representing nearly 60 percent of the total acreage of the ponds in the San Joaquin Valley, CA.*
- *Selenium concentrations were elevated in the water (i.e., 5 ppm) at 80 percent of the ponds and in the sediments (0.5 ppm dry weight) at all of the ponds investigated in a San Joaquin Valley investigation.*

Biotic Concerns

- *Elevated concentrations of various drainwater constituents impact both fishery and wildlife resources by causing decreased hatching success, decreased hatching weight, reduced survival, reduced growth, and altered behavioral patterns.*
- *Aquatic plants and animals can accumulate tissue concentrations of some drainage contaminants 100 to 10,000 times greater than ambient water levels via bioconcentration and biomagnification.*
- *Selenium was identified as the cause of the disappearance of fish, the decrease in aquatic bird hatching rates, and a high rate (64 percent) of deformed and dead bird embryos at Kesterson NWR.*
- *Based on selenium concentrations in bird eggs (range 2.6-74 ppm), 63 percent of the Tulare Basin in the southern San Joaquin Valley is considered a high risk area for waterbird eggs.*
- *Many National Wildlife Refuges depend on irrigation drainage for water to maintain wetland habitats. When these water supplies are contaminated migratory and resident aquatic and semi-aquatic birds are at risk.*

Drainwater Treatment/Disposal

- *In the San Joaquin Valley there are approximately 6,850 acres of evaporation ponds with an additional 10-20,000 acres of ponds in various stages of planning, development and construction.*
- *Evaporation pond systems which are non-toxic are not only preferable, but crucial, to the survival of many fish and wildlife populations that inhabit or frequent these systems.*
- *Source control measures such as water conservation (e.g., drip irrigation), drainage management, crop management, and alternate land uses are the four approaches that use less irrigation water.*

Research Needs

- *Determine if the present levels of "other" drainwater constituents (in addition to selenium) are "acceptable" or "safe." New research should focus on the most critical fish and wildlife species inhabiting the agricultural areas, the most commonly occurring chemical forms impacting those species, and impacts occurring from varying environmental conditions.*

EDITOR'S NOTE #2: Several recommendations emerge from the Fish & Wildlife Service's report for consideration by EPA and state water quality managers. Among such are the following general considerations:

- Provide incentives to farmers to conserve water by adopting ecologically sound irrigation methods.
- Fully utilize provisions of the 1990 Farm Bill and Food Security Act of 1985 to provide technical support and monetary incentives for farmers.
- Review existing water quality criteria and standards for inconsistencies and flaws and revise to provide greater protection for fish and wildlife resources.
- Incorporate into the Clean Water Act a formal systems (ecosystems) approach to water quality protection that is responsive to change, and recognizes the dynamic properties of hydrologic systems.
- Conduct additional research to determine cumulative impacts of various irrigation drainwater constituents and the potential for antagonistic, additive, and synergistic effects on biota.

[For further information, contact Molly Whitworth, Water and Agriculture Policy Division, Office of Policy, Planning and Evaluation (PM-221), U.S. EPA, 401 M St., SW, Washington, DC 20460. Phone: (202/FTS) 260-7561. Or Mary Gessner, Division of Environmental Contaminants, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Arlington, VA 22203. Phone: (703) 358-2148.]

Nooksack Tribe Asks For Policy Consistency In Applying The Watershed Approach

EDITOR'S NOTE: The following note was received from Doug Dobyns, who is the director of Water Programs for the Nooksack Indian Tribe. He used ***The Coupon*** to share his Clean Water Experience with our readers. If other readers want to share their experiences or comment on Doug's note, we'd like to hear from them. Here's what Doug had to say:

The Nooksack Tribe has been participating in watershed planning to correct nonpoint pollution problems through grants from the State of Washington Centennial Clean Water Fund. This work is now in its fifth year and has moved into implementation on two watersheds.

The Nooksack Tribe subcontracts for rehabilitation work through the lead agencies for these two streams and has been landscaping, planting, fencing, and making plans for fish enhancement. The programs are on the low end of financing and have more of a training and educational function than making wide-scale corrections of the damaged ecosystems.

Problems we have encountered are institutional and show us that more work needs to be done at the coordination level, especially between state and county levels of governments. Tribal and rural residents have more of a pragmatic interest, while there appears to me to be more of a regulatory and political interest in the agencies.

Overhead expenses and preparation costs have been borne by the tribes and locals to a large degree, and the costs of bureaucratic changes of policy which may make substantial delays and undo community work are never accounted for. The result of this has brought me to conclude that nonpoint pollution needs to be solved in the communities with more flexibility to tailor programs to watersheds, and it has a high degree of resistance to regulatory solutions. Where jurisdictional status is confused (as between state and Indian governments), there need to be policy guidelines brought forward in clarifying the rights of tribes to all levels of state bureaucracies. Tribes should not have to suffer from the lack of state knowledge on this and have lost patience with rotations of staff in agencies which continue the problem.

[For more information, contact Douglas Dobyns, director of Water Programs, Nooksack Indian Tribe, P.O. Box 157, Deming, WA 98244. Phone: (206) 592-5176. FAX: (206) 592-4721.]

The Anacostia: An Urban Watershed Begins Restoration

Rural watersheds have claimed most of the spotlight when it comes to restoration. Yet urban watersheds are often more severely affected and harder to clean up.

Because so much acreage is impervious, the total sediment load can equal or exceed that of rural areas. Fifty to one hundred percent of soil eroded from construction sites can end up in streams, compared to less than 10 percent from most agricultural fields. Phosphorus from that soil combines with fertilizer spills, runoff from yard wastes, and orthophosphate in vehicle exhaust to raise phosphorus loads per acre above that in rural areas. Urban toxics are different, too. They include lead, zinc, pesticides, and other toxics like benzene and PCBs.[1]

Still other water quality problems are bacteria, elevated B.O.D. and thermal loading from both heat collected by runoff from impervious surfaces and the absence of canopy.

In urban areas, one of the greatest impacts on watersheds is not a pollutant but rather the sheer volume and velocity of stormwater rushing off pavement into storm drains and then into receiving streams. The erosive power of storm runoff has completely changed the biology and hydrology of many urban streams.

Urban watershed problems are unique and require different solutions: there is little physical space for structural BMPs. And reaching farmers in an agricultural watershed is one thing — changing the behavior of 600,000 people in a 170-square-mile urban watershed is another.

If this scenario sounds nightmarish, Washington, DC's Anacostia River and watershed is a water resources manager's hell. If ever an ecological challenge existed, reclaiming the Anacostia is it. Flanked upstream by farmland and construction sites, its downstream watershed 30 percent paved,[2] channelized, stripped of its wetlands, and choking in sediment, the river is dirty and ecologically impoverished from three centuries of abuse.

Daunting as it might be to contemplate, Maryland's Prince Georges and Montgomery counties and the District of Columbia have organized to reverse the river's degradation. Led by the Anacostia Watershed Restoration Committee (AWRC) and administered by the Metropolitan Washington Council of Governments (COG), local and state governments are guided by a 1987 agreement (renewed in 1991) and a six-point action plan.

The plan, according to the *Watershed Restoration SourceBook*, is a "comprehensive approach towards restoring an urban watershed, addressing all of the functional components — including land use, stormwater hydrology, stream habitat, wetlands and forests."

The six goals of the plan and their strategies are set forth in the "Commitment to Restore Our Home River: A Six Point Action Plan":

Goal 1: Reduce Pollutant Loads to Tidal Estuary

- *Sewage overflow controls*
- *Urban stormwater retrofits*
- *Urban BMPs for new development*
- *Control of trash and debris*

Goal 2: Restore Ecological Integrity of Streams

- *Urban stream restoration*
- *Urban stream protection*

Goal 3: Restore Habitat for Fish

- *Removal of fish barriers*
- *Habitat improvement*

Goal 4: Restore and Enhance Wetlands

- *Wetlands protection*
- *Urban wetland restoration*
- *Urban wetland creation*

Goal 5: Restore and Expand Forest Cover

- *Forest protection*
- *Watershed reforestation*
- *Riparian reforestation*

Goal 6: Increase Public Involvement

- *Watershed outreach and education*
- *Restoration stewardship*

These goals are not merely grand-sounding words. The signatories have committed to restoring miles and acreages of forest and wetland, for example. In FY 1991, local and state government invested more than 10 million taxpayer dollars in the restoration effort.

1 See "Urban Notes" section of *Keeping Current* newsletter, Jan/Feb 1992, UW-Environmental Resources Center, Rm. 216 Agricultural Hall, 1450 Linden Dr., Madison, WI 53706.

2 This is an average. Some parts of the watershed are more than 60 percent impervious, according to COG's Peter Kumble.

The Anacostia: An Urban Watershed Begins Restoration (continued)

Not only has COG's Anacostia Restoration Team, the workhorse of the effort, been vigorously attacking technical problems, it also held a conference last fall and recently put together an indispensable manual on urban watershed restoration techniques. The *Watershed Restoration SourceBook* includes the details of the Six Point Action Plan and 14 other papers; including Mitigating the Adverse Impacts of Urbanization on Streams; Developing Effective BMP Systems for Urban Watersheds; Finding Retrofit Opportunities in Urban Watersheds; Wheaton Branch Stream Restoration Project; Summary of Stream Restoration and Bio-Engineering Techniques; Restoring Tidal Wetlands in the Anacostia Estuary; Native Plant Pondscaping Guide; Environmental Impacts of Stormwater Ponds; Peat Sand Filters; Riparian Reforestation; Protecting Forests During Development; Anacostia Watershed Restoration Small Habitat Improvement Program; and Involving the Public in Restoration of an Urban Watershed.

Restoring the water quality and habitat of the Anacostia is a challenge, but the successes and failures of its restoration will benefit similar efforts in other urban watersheds. For those involved in planning the future of undeveloped areas, the Anacostia experience contains some warnings:

> *For the past two decades, governments in the Washington metropolitan area have attempted to deal with the complex impacts of urban growth on streams by creating an equally complex series of regulations, programs, and controls on the urban development process. The success of these measures in mitigating the impacts on streams, however, has been less than anticipated. The primary reason has been that individual measures are developed in response to a single impact that occurs during a unique phase of the development cycle. Until recently, little effort has been made to craft a comprehensive stream protection strategy throughout the entire development cycle, from development of watershed master plans to the ultimate realization of that development.*
>
> *. . . Unique areas, such as cold-water trout streams . . . and extensive stream, wetland, and floodplain complexes should be targeted for special protection. The upland watersheds draining to these unique areas can be protected only through a combination of low density zoning, open space preservation, and stream valley park acquisition, as well as strict subdivision, sediment, and stormwater controls during the . . . development process. Based on experience in the Washington area, it is almost impossible to maintain the quality of these unique systems if upland imperviousness exceeds 10 to 15 percent.*
>
> — From the *Watershed Restoration SourceBook*'s "Mitigating the Adverse Impacts of Urbanization on Streams" by Thomas R. Schueler

[Also in this issue of News-Notes, see the review section for a review of a video about the Anacostia River. For more information about the Anacostia restoration or to order the Watershed Restoration SourceBook ($35 post paid), contact: Metropolitan Washington Council of Governments, 777 N. Capital St., NE, Suite 300, Washington, DC 20002-4201.]

Nature Conservancy Says It Is Set To Participate In Local Nonpoint Watershed Projects

EDITOR'S NOTE: The following article was prepared and submitted to *News-Notes* by The Nature Conservancy. We are pleased to pass this information along to our readers in the interest of restoring and maintaining the biodiversity of the watersheds of the nation.[1]

While many environmental groups take an adversarial approach, especially to government, in their quest for conservation results, The Nature Conservancy, an international nonprofit based in Arlington, Virginia, looks for partners in its efforts to preserve biodiversity.

A special opportunity is presented by EPA's Office of Water's innovative watershed protection approach, a close match for the Conservancy's bioreserve planning approach. In many bioreserves, such as the Cache River of southern Illinois and Big Darby Creek in central Ohio, Conservancy planning is directed toward the comprehensive protection of an entire watershed, its water quality, its natural communities and diverse life. In these cases, in fact, the ecological landscapes that the Conservancy is working to protect have had the advantage of nonpoint source grant funding awarded by EPA Region V to the states of Illinois and Ohio.

The Conservancy is already benefitting from EPA water quality programs—in wetland and estuary protection planning, for example, as well as in nonpoint source control—that conserve habitat and protect biological diversity. The organization is very interested in expanding its relationships and joint ventures with EPA (in most cases this will be in cooperation with the

1 See also in this issue, "EPA's Office of Water a 'Partner in Flight'" for a description of how water quality programs can protect and enhance migratory bird habitat.

conservation and environmental protection agencies of the states). To this end, Conservancy field office staff expect to meet and work more closely with EPA regional office people.

The group has worked with numerous federal agencies, as well as countless other public and private partners, to identify and preserve natural areas needing protection. Federal partners with which the Conservancy has accomplished conservation goals include the Environmental Protection Agency, the Department of Defense, the Bureau of Land Management, the Fish and Wildlife Service and the Forest Service.

The Conservancy's mission is to preserve plants, animals and natural communities that represent life's diversity by preserving the lands and water they need to survive. In the decades since its founding in 1951, the Conservancy and its members, who now number approximately 640,000, have been responsible for the protection of more than 6.2 million acres in 50 states and Canada. It has helped like-minded nongovernmental partner organizations to preserve millions of additional acres in Latin America and the Caribbean.

Over the years, the Conservancy has built a reputation as a quiet force in conservation, often purchasing land in order to preserve rare and endangered species. Besides fee acquisition, the Conservancy uses conservation easements and voluntary landowner agreements to ensure habitat protection. Some Conservancy-acquired areas are transferred for management to other conservation groups, both public and private. But the Conservancy owns more than 1,300 preserves—the largest private system of nature sanctuaries in the world. Stewardship staff and volunteers who maintain the preserves employ techniques like prescribed burnings, reforestation and fencing to protect, and encourage the growth of, endangered plants and animals.

Data Inventory Helps Conservation Planning

Science-based since its inception, the Conservancy developed the methodology now used by Natural Heritage Programs (NHPs) and Conservation Data Centers (CDCs)—a network of continually updated, computer-assisted inventories of the biological and ecological features of the country or region in which they are located. There are now 82 data centers operating in the Western Hemisphere, including one in each of the 50 states, where they are usually run by state governments (most are called NHPs). The other 32 are located in U.S. Bioreserves, National Parks and National Forests, Puerto Rico, Canadian provinces and 13 Latin American and Caribbean countries (most of these are called CDCs).

The data center network helps the Conservancy's planners decide which areas most need help from the organization, and in which order. The network also responds to more than 200,000 requests each year from governments, educational institutions, and industry for information that will help in development planning, natural resource management, and environmental impact assessment.

In addition to its headquarters office, the organization has eight regional offices and 60 state offices. Over the last 18 years, the group has developed a strong program in Latin America and the Caribbean, working with partners in 17 countries. Reflecting an increasingly global perspective, the Conservancy last year also established a program in the Pacific.

The "Last Great Places" Initiative

Building on its accomplishments through direct action, the Conservancy has recently begun placing more emphasis on the need to work with an even greater range of partners, in order to protect ecosystems as well as individual species and communities—a goal that cannot be accomplished by the Conservancy alone. The organization has called for a conservation approach that will include both people and nature, and last year launched an initiative it calls "Last Great Places." Large-scale bioreserve projects—an initial dozen were introduced last year, with more than 60 additional sites to come—are serving as models for the Conservancy's new conservation vision. The projects, which consist of still-intact natural systems that are under threat, typically include a core natural area that should be fully protected, surrounded by a buffer zone where appropriate sustainable development can be encouraged. Government agencies, private citizens' groups, responsible businesses, educational institutions and other conservation groups are among the many partners with whom the Conservancy is working on Last Great Places projects.

[EPA, state, and local staff wishing to locate Conservancy bioreserve projects in their jurisdictions should feel free to contact Nature Conservancy's state offices for information; addresses and phone numbers are available on the NPS Electronic Bulletin Board (BBS). Or contact The Nature Conservancy's headquarters office at 1815 North Lynn Street, Arlington, Virginia 22209. Phone: (703) 841-5300. Overall liaison with federal agencies is provided by John Humke at the Arlington office (703) 841-8761.]

News FromThe States

Texas Vows a Clean Environment by 2000

A statewide pollution prevention campaign involving business, industry, government, communities, and citizens is off the ground in Texas, launched by Governor Ann Richards and the Texas Water Commission (TWC). While "Clean Texas 2000" focuses broadly on reducing household and hazardous waste, many of its initiatives are aimed specifically at protecting water quality.

One initiative that employs volunteers is the Groundwater Protection Program. In this program, the TWC provides technical assistance to local communities, water supply corporations, and investor-owned utilities in setting up groundwater protection areas around community drinking water wells. TWC trains local citizens to conduct an inventory of potential sources of contamination around the wells. Based on the inventory and the local hydrology, TWC writes a site-specific report recommending a plan of action for the community to protect its groundwater supply. Janette E. Hansen, chief of the Source Management Section of EPA's Groundwater Protection Division, commented, "Texas took the initiative to go beyond what is required of state wellhead protection programs by the Safe Drinking Water Act. Using volunteers helps reduce costs and promotes awareness of groundwater issues."

Another program involves the expansion of the TWC's citizen volunteer water quality monitoring program. Citizens from schoolchildren to senior citizens can participate in this program as individuals or in groups. TWC provides intensive volunteer training, assists with monitoring design, and provides QA/QC.

TWC is also using Clean Texas 2000 as an opportunity for a complete review of its own operations, streamlining and enhancing them where appropriate. "We intend to provide for Texas the very best environmental protection and leadership possible for every tax dollar spent," said TWC Chairman John Hall.

In kicking off the campaign at a press conference April 7, Governor Richards said that Texas needs to shed its role as the nation's largest producer of both household garbage and hazardous wastes. "We must seriously change the way we think and act, or we will wake up one day in a state unfit for the next generation of Texans."

Clean Texas 2000 asks cities to develop programs for proper disposal of household solid and hazardous wastes and to develop community composting projects for yard wastes.

Waste generating industries can participate in the campaign by conducting environmental audits, meeting voluntary pollution reduction goals, adopting a citizens' activity, or creating a citizens' advisory group. These industries will be eligible for the Clean Texas 2000 Honor Roll.

Businesses, local governments, community groups, schools, and other individuals are invited to become Clean Texas 2000 "partners" in environmental projects or education efforts. The Governor's Awards for Environmental Excellence will be presented annually to outstanding partners.

[For more information, contact Brad Cross, Community Support Section, TWC, P.O. Box 13087, Austin, TX 78711-3087. Phone: (512) 371-6470.]

Agricultural Notes

EPA/USDA Enter into Memorandum of Agreement on Agricultural Pollution Prevention

The U.S. Environmental Protection Agency recently announced that a Memorandum of Agreement (MOA) was signed with the U.S. Department of Agriculture (USDA) to implement increased pollution prevention in the agricultural sector. The MOA puts into place a plan to address agriculturally related environmental problems.

The agreement, signed by Linda Fisher, EPA's assistant administrator for the Office of Prevention, Pesticides, and Toxic Substances; and James R. Moseley, USDA's assistant secretary of Natural Resources and the Environment, calls for EPA and USDA to work cooperatively to minimize agricultural pollution.

EPA/USDA Enter into Memorandum of Agreement on Agricultural Pollution Prevention (continued)

Geoffrey H. Grubbs, director of EPA's Assessment and Watershed Protection Division, in commenting on the agreement said, "This is the first time the two agencies have agreed on and written down a cooperative initiative to adopt and apply a pollution prevention approach. It is an important step for the agencies to agree to work cooperatively to minimize agriculturally related pollution and reduce environmental risk."

Four basic strategies are outlined in the agreement:

- Implementation of a nationwide pollution prevention program,
- Establishment of a coordinated research and technology development and transfer system,
- Implementation of a comprehensive marketing strategy to promote voluntary pollution prevention, and
- A strengthened working relationship between EPA and USDA, using existing incentive programs, voluntary initiatives, and regulatory programs.

The MOA calls for a senior-level interagency task force to develop, by October 1, 1992, a detailed agricultural pollution prevention strategy. The following five areas, with appropriate measurable environmental goals, have been targeted for emphasis in the near term:

1) Nutrient Management,
2) Total Resource Management Planning,
3) Voluntary Livestock or Poultry Management Agreements,
4) Safer Pesticide Registration, and
5) Voluntary Action Projects in Selected Watersheds.

[For further information, contact: Anne Weinberg, Nonpoint Source Control Branch, AWPD (WH-553), Phone: (FTS-202) 260-7107 or Harry Wells, Pollution Prevention Division (PM-222B), Phone: (FTS-202) 260-4472. Both at U.S. EPA, 401 M St., SW, Washington, DC 20460.]

Coordinated Resource Management is a Vehicle for Agreement

Coordinated Resource Management and Planning (CRMP), a concept that originated in the early 1950s, continues to be an effective vehicle to reach agreement on natural resource issues, including water quality. CRMP is a resource planning, problem solving, and management process that allows everyone concerned with natural resource management to participate. The concept of coordinating resource uses results in improved resource management and minimizes conflict among land users, landowners, governmental agencies, and interest groups, according to the California CRMP Handbook. There are currently some 80 CRMP projects, covering more than 6.6 million acres in California.

Local Focus Key to CRMP Success

In California, CRMP is guided by a state CRMP group, but the primary focus of all CRMP efforts remains at the local level. Local participation and control is what distinguishes CRMP from other planning efforts and is the key to a plan's success. The California CRMP effort is dedicated to stimulating and facilitating this local action. According to the CPMP handbook, all conflicts are resolved at the local level, and decisions are reached by consensus of the local participants. Plans are implemented through appropriate agreements between participating individuals and agencies.

E. William Anderson, range consultant, Lake Oswego, OR, and Robert C. Baum, NACD regional representative, Salem, OR wrote in the May–June 1988 issue of the *Journal of Soil and Water Conservation:*

> *Preferably, a coordinated plan is initiated at the local level by a request from a person, group, organization, or agency that perceives the need for a group-action approach to resolving or averting a local resource problem. Coordinated planning is usually initiated because of a resource problem or conflict that those involved want resolved.*

Local representatives of government agencies often initiate and administer the CRMP effort to develop a coordinated resource plan for lands they manage. Individuals and interest groups often present their problems to a Resource Conservation District or Soil and Water Conservation District. If requested, the CRMP Technical Advisory Council will assist with the planning process. Steps in the CRMP process are described in the California CRMP Handbook.

Coordinated Resource Management is a Vehicle for Agreement (continued)

Working through the CRMP process, private landowners and resource management professionals identify the issues and initiate positive actions to solve resource-related concerns.

CRMP Process in Operation

The Feather River watershed, one of California's major water-producing regions, has been using the CRMP approach since 1985, according to Betty Harris, former CRMP executive officer. Watershed interests include a consortium of public and private partnerships using innovative funding strategies and technologies. As a result, 758,000 acres in the watershed have been inventoried for water quality problems; 10 miles of severely degraded streambanks have been restored; 3,000 acres of degraded wetlands, meadows, and rangelands have been restored; and many fish and waterfowl have returned.

CRMP in Other States

The CRMP process is used in California and other western states for addressing natural resource issues, reaching a consensus of agreement, and achieving mutual objectives. In addition to California, Arizona, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Washington, Montana and Wyoming are using CRMP. Wyoming calls the process Coordinated Resource Management (CRM).

Handbook Available

A CRMP process handbook that serves as a helpful reference is now available. The handbook costs $5.00 (25 copies or more are $4.00 each). Make check payable to CARCD-CRMP and send to CARCD, 3830 U St., Sacramento, CA 95817.

[For more information, contact: Elaine Marquis, chief, Biologic Resources Branch, USDI Bureau of Land Management, 2800 Cottage Way, Rm. E-2841, Sacramento, CA 95825-1889. Phone: (916)978-4725. FAX (916)978-4364.]

Waste From Single Farm Harmful to MD Lake

Waste management from a single dairy farm is necessary to abate severe water pollution in the 10-acre Lake Merhl, which drains a 345-acre watershed in Frederick County, MD. The 100-head dairy operation is the major pollutant source to the lake.

Although a small increment in the management program for the Linganore sub-basin of the Monocacy River watershed, Lake Merhl lies at the heart of a residential community that would like to use the lake for swimming. According to Water Resources Biologist Frank Payer of the Maryland Department of the Environment, high bacteria counts in Lake Merhl presently preclude swimming.

Extensive BMP plans have been developed by the Frederick Soil Conservation District and the installation of these BMPs is scheduled for the summer of 1992, according to Payer.

Recommended BMPs for the dairy operation include a waste containment facility that stores dairy effluent, stanchion barn waste, manure, and barnyard runoff. Also planned are a stream cattle crossing, and fencing of a vegetative setback that borders the stream. Elsewhere on the farm, stripcropping will be employed to reduce erosion and sediment contributions to the lake.

Section 319 funds support staffing for this case study. Generous USDA and state cost-sharing programs have helped provide BMP installation. PL-566 watershed funds to Linganore watershed are "piggy-backed" with Maryland's MAC funds for water storage. USDA-SCS and MAC funds provide fencing and vegatative buffers below the cattle exercise lot. The various funds total 87.5 percent of the project's cost.

According to Payer, Lake Merhl was chosen for this particular case study because local water quality impacts could be readily abated. Bacteria sampling in the two main tributaries of the lake (a control stream and the impacted stream) has taken place for the last seven months. These streams converge just before reaching the lake. Substantial differences in levels of bacteria have been evident between the tributary, which originates at the dairy farm's barnyard, and the control stream, whose watershed is primarily well established in pasture and meadow. Sampling of both streams will continue, following implementation of the BMPs. An eventual decrease in the level of eutrophication of the lake is also anticipated.

[For more information, contact: Frank Payer, water resources biologist, Maryland Department of the Environment, 2500 Broening Hwy., Baltimore, MD 21224. Phone: (410)631-3548. FAX (410)631-4883.]

In Missouri, The Ag Industries Council Spearheads Pesticide Container Recycling

During the fall of 1991, the Missouri-Ag Industries Council, Inc. (Mo-Ag), in cooperation with Missouri's agri-chemical dealers and growers, initiated a broad, voluntary, statewide program to recycle agriculture pesticide containers. During the 1991 program, 70,000 plastic pesticide containers were collected, ground into pellets, and recycled into new pesticide containers and other products.

The successful 1991 program is being continued in 1992 "to ensure the safety and cleanliness of our environment," acccording to Mo-Ag. In announcing the 1992 campaign to its members, ag-chemical dealers, and growers, Mo-Ag stated

> *Among our goals for the program are ones we know you share:*
>
> - *Educating dealers and growers in the proper methods of cleaning containers as required by law.*
> - *Providing an environmentally sound method of disposing of used, clean containers.*
> - *Protecting surface and groundwater and the general environment.*
> - *Providing economic advantages to users by extending their accessibility to agrichemcials and avoiding waste of expensive products.*
> - *Helping to avoid mandated recycle programs.*
> - *Facilitating a more attractive rural landscape.*
> - *Providing a concrete way for dealers and growers to show they're actively working to safeguard the environment.*

A recent Mo-Ag newsletter described the 1991 campaign with a certain amount of pride:

> *It took the voluntary efforts from one hundred participating chemical dealers, at least twenty-six chemical manufacturers' representatives, twenty-seven Missouri Farm Bureau members, dozens of employees from Mo-Ag member firms, seven different grinding locations across the state, countless hours of travel time, and cold cash from twenty-four different corporations . . . but Missouri's first-ever, statewide "Clean Pesticide Container Recycling Program" was an unprecedented success.*
>
> *During the last three weeks of August, you could find a sixty-foot, state-of-the-art grinding rig, designed to granulate high quality plastic containers into little chips, traversing the backroads and interstates of Missouri, stopping periodically, sometimes for days at a time, at predetermined grinding sites to recycle the empty containers collected from area dealers.*
>
> *The success of the program can be attributed to the cooperative efforts of all the participants and, more importantly, will account for approximately seventy thousand fewer plastic containers landing in Missouri landfills or filling the air with noxious fumes. That's somewhere in the neighborhood of thirty tons of high density polyethylene plastic that was returned, recycled and reused. The extremely low four-percent rejection rate statewide is testimony to the efforts of growers and dealers who took the time to properly rinse their containers.*

Mo-Ag's aim is to double the 1991 recycling performance in 1992. Betty Gagnon, nonpoint source/agriculture environmental specialist of the Missouri Department of Natural Resources, commented on the program to *News-Notes*:

> *This project is an example of an industry trying to "clean up its act." Mo-Ag Industries, the project organizer, has also been a key to Missouri's developing secondary containment regs for commercial applicator mix sites. We have a high regard for their promises and their performance.*

[For further information, contact: Betty Gagnon, Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102. Phone: (314) 751-7225. Or, Missouri Ag Industries Council, Inc., P.O. Box 1728, Jefferson City, MO 65102. Phone: (314) 636-6130.]

NPS Electronic Bulletin Board (BBS) News

Nonpoint Source Computer Bulletin Board System — (NPS BBS). The *NPS BBS*, through the user's personal computer, provides timely, relevant NPS information, a nationwide forum for open discussion, and the ability to exchange computer text and program files.

To access the NPS BBS, you will need • a PC or terminal, • telecommunications software (such as Crosstalk or ProComm), • a modem (1200 or 2400 baud), and • a phone line.

The *NPS BBS* phone number is (301) 589-0205.

For a copy of the user's manual, complete *THE COUPON* on page 27 and mail or fax it in.

The WATER MONITOR Will Be A Regular NPS BBS Feature

The EPA *Water Monitor* newsletter is now a regular feature on the *Nonpoint Source Electronic Bulletin Board System (NPS BBS)*. The *Water Monitor* is issued by the Assessment Branch of the Assessment and Watershed Protection Division and reports monthly on surface water monitoring activities in the states. Articles are submitted by regional monitoring and TMDL coordinators, the states, and EPA's Office of Wetlands, Oceans, and Watersheds.

The *NPS BBS* version of the *Water Monitor* will be in ASCII format so it can be downloaded to, and printed from, any computer type. The files containing the *Water Monitor* will always be located in the Main Board File Area 1 and will begin with the letters "WM."

Each individual issue of the *Water Monitor* will be compressed into a single file using a "zip" utility program. For instance, the February 1992, issue of the *Water Monitor* is WM-0292.zip. (For instructions on how to "unzip" these files for use on your personal computer, read Bulletin 4 on the *BBS*.)

Non-BBS types (are there any still not logged on?) can get on the *Water Monitor's* mailing list by contacting the editor, Alice Mayio, AWPD, WH-553, U.S. EPA, 401 M St., SW, Washington, DC 20460. FAX (FTS/202) 260-7025.

Message Function Is Where The Action Is

In the *NPS BBS* News section of *News-Notes*, we usually announce fancy new features, like the NPS Research SIG Forum, or we highlight exciting files like the *EPA Journal* special NPS issue file. But the most dynamic of all the *BBS*'s functions has gotten short shrift here.

But just because we've forgotten to remind you about the BBS message system doesn't mean you should neglect it. It is where the day-to-day, nitty-gritty, down-to-earth action is happening. You can use the message functions to post questions, announce events and publications, describe your projects, take a stand, *whatever*. You can address the water environment community at large or send a private message to a peer.

Even if the Main Board informs you that you have no mail, reading the messages posted by other *BBS* users can open up opportunities and stimulate dialogue. To read all the messages left since the last time you logged on, type **r s** and press **<ENTER>** at the "Main Board Command?" prompt.[1] If you want to respond to a particular message, type **r e** at the "End of Message Command?" prompt. Your reply will automatically be addressed to the sender of the message you've just read.

To stop reading messages and return to the Main Board menu, type **n** at the "End of Message Command?" prompt.

If you want to enter a new message, type **e** at the "Main Board Command?" prompt. There are several levels of message security, ranging from messages meant to be read by all users to those sent privately to an individual. Always choose the Full Screen Editor, which gives you word processor-type capabilities. (Some software may not be capable of supporting the Full Screen Editor, in which case you will still be able to enter messages but will have to edit them on a line-by-line basis.) See the *NPS BBS* users' manual for more details on messages.

1 If you are a first-time user, this will show you all public messages ever posted that are still active. In the future, this command will show you only *new* public and private messages.

Message Function Is Where The Action Is (continued)

While you're logged on, don't forget to read the messages in the Agriculture, Fish Consumption, Waterbody System Support, and Research SIGs. And if your session online prompts an idea for how we can improve the *BBS*, please leave a message for Judy Trimarchi or Elaine Bloom. We'd appreciate hearing from you.

Reviews

Decisionmakers Stormwater Handbook — A Primer

A primer on stormwater management has recently been completed by the Water Quality Workgroup of U.S. EPA Region I and the Watershed Unit of Region V.

The handbook was conceived in response to the need to educate local officials and citizenry on the basic concepts of stormwater management: why it is a concern, what to do about it, and where to get help and more information. The handbook includes blueprints of a "typical" watershed, highlighting the resource areas of freshwater, groundwater, wetlands, and salt water, and shows the various stormwater best management practices in a systems approach.

[A copy of the handbook is available from: Terrene Institute, 1700 K Street, NW, Suite 1005, Washington, DC 20006. Phone: (202) 833-8317. FAX: (202) 296-4071.]

Turning The Tide

Spectacular aerial shots of Buzzard Bay are part of the beautiful photography in the new 30-minute video, *Turning the Tide,* which explores problems caused by nonpoint source pollution in an estuary near Cape Cod in Massachusetts. The video explains the pollution's serious impact on shellfishing and recreation areas, and the effects it has had on local business and the quality of life in Buzzard Bay communities. Local people, including shellfishermen, relate their concerns very effectively on the tape.

The video is intended for the general public, particularly planning boards, conservation commissions, watershed groups, and individuals whose day-to-day decisions affect water quality. It carefully explains the causes of fecal coliform pollution and nitrogen loading, the two primary kinds of pollution in estuaries.

The good news is the many successes of people and organizations who are "turning the tide" on pollution in Buzzard Bay. There is the young woman who initiated a citizen monitoring program. There is Buttermilk Bay (a small embayment of the main bay), where three towns voted to limit their own growth to protect the bay.

This is a particularly appealing video because of the wonderful photography, which uses historic photos, old maps, and paintings to explain the history of the area and the diffuse sources of pollution affecting it. The musical accompaniment also adds to the ambience with vocal renditions of familiar songs that relate to the narration.

Turning the Tide was produced by EPA Region 1 with funds from EPA's Near Coastal Waters Program. It is available for purchase ($25) or rental ($10) from New England Interstate Environmental Training Center, 2 Fort Rd., South Portland, ME 04106.

[For more information, call NEIETC at (207) 767-2539 or Melissa Paly at (617) 565-4863.]

A Year In The Life Of A River

Calling the Anacostia River "a symbol of the distressed state of our nation's waterways," Prince Georges county, the state of Maryland, and America's Clean Water Foundation released a video depicting the county's efforts to restore one of the most polluted tributaries of the Chesapeake Bay. "A Year in the Life of a River" outlines the uses and misuses of the Anacostia in a brief history and describes corrective projects currently underway.

The Anacostia River joins the Potomac just south of the nation's capital in Washington, D.C. Unlike the Potomac River, which made dramatic strides in recovery when point sources of pollution were eliminated, the Anacostia suffers largely from nonpoint source pollution, and

A Year In The Life Of A River (continued)

its cleanup requires cooperation between two counties and the District of Columbia, not to mention the commitment of citizens and corporate leaders.

The 28-minute video emphasizes raising public awareness and is ideal for viewing by local officials and community groups. Community action is illustrated in the video by different groups of people (Boy Scouts, private citizens, and city employees) shown cooperating in a household hazardous waste cleanup and in stream cleanup events.

The 14-page guide that accompanies the video states that, while state and federal resources are important, "the driving force for timely effective improvements should be at the local level." The guide suggests a comprehensive approach for cleaning up waterways, using Prince Georges program as a model. According to the guide, the Prince Georges plan has five components:

- Implementing strict sediment controls,
- Planning and constructing facilities to correct the stormwater management mistakes of the past,
- Identifying and controlling unauthorized discharges,
- Enacting and enforcing laws to prevent illegal dumping and other unlawful acts that are degrading the stream, and
- Protecting and enhancing wetlands and vegetated stream buffers.

"A Year in the Life of A River" documents how one county is implementing these restoration activities on "the nation's forgotten river."

[To order the video, send $10 to Prince Georges County, Department of Environmental Resources, Community Outreach and Public Information, Inglewood Center 3, 9400 Peppercorn Place, Suite 540, Landover, MD 20785.]

Diet For A Small Lake

EDITOR'S NOTE: This is a real-life story of, and by, our associate editor, Elaine Bloom, who is a member of her town's lake committee in Maryland.

As a new member of my town's lake committee, my ears perked up when I received a flyer announcing a manual called *Diet for a Small Lake: A New Yorker's Guide to Lake Management*. After all, what our town optimistically calls "Maple Lake" is a one-acre, spring-fed swimming hole. That's small. And I'm a transplanted New Yorker. This book is me, I thought.

So I settled down to savor the 11-chapter manual, figuring on becoming the town hero by getting the real scoop on how to solve Maple Lake's two most pressing problems: weeds and algae.

First, *Diet* reminded me that weeds are not weeds. They are integral to the the ecosystem of our lake and are only problems because they interfere with one of the primary uses of our pond: swimming. The aquatic vegetation probably enhances another of our town's designated uses of the lake — fishing.

As I read on and on through the guide, through the chapters on lake management plans, lake ecology, lake problems, I was forced to face up to the fundamental conflict inherent in the two uses we wanted from our tiny lake. And that is where this manual shines—in its reality-based discussions of lake user constituencies, "best uses," and the mythical "ideal" lake.

In or near the manual's ideal lake, Dear Lake, there is a forested watershed; private waterfront homes, beautiful vistas; clear water; great fishing; warm, inviting water for swimmers; abundant wildlife; convenient malls; and accessible roads. In Maple Lake, we only want to have clear water and good fishing. Alas! it is not to be; as *Diet* points out, "A lake cannot be all things to even a few people, let alone all people."

Add the user conflicts to the ubiquitous assault of nonpoint source pollution, and you've got lake problems. Maple Lake is an oasis perched on the creeping edge of suburbia with all its accompanying runoff. Its small size makes it even more vulnerable to the effects of nutrient

Diet For A Small Lake (continued)

enrichment and sedimentation than a larger lake would be. Of course the macrophytes and algae love it.

Emphasizing that lake management "is the art (not the science) of balancing the demands of various users of the land and water," the manual urges lake users to take responsibility for managing their lake and not pass the job off on governments or private consultants.

Some of the science and diagnostic information seemed a bit muddled, but the book got better and better as I read on. The best sections in the manual were the chapters on lake and watershed management techniques, organizing for action, evaluating alternatives, implementation, and monitoring. Especially helpful to me was the chart on physical, chemical, biological, and institutional controls for various problems, from nuisance aquatic plants to acidified conditions. I was able to pick out weed and algae control methods and compare advantages, drawbacks, cost, and duration of effectiveness of the different methods. Lest management decisions be made lightly based on the chart, it is followed by a section that explores each technique in more detail.

Every once in a while, you find a book that contains a hidden gem in the form of a wonderfully complete and useful appendix. *Diet* contains such a section: Appendix B, "Public Involvement," is a how-to guide for a successful public involvement program covering everything from program planning to preparing news releases and using radio talk shows effectively. While I doubt that the Maple Lake Committee will need anything higher-powered than a piece in the town newsletter and some flyers to involve our 700 townsfolk, this appendix will be handy for those with larger constituencies.

Diet for a Small Lake was a joint effort of the New York State Department of Environmental Conservation and the Federation of Lake Associations of New York. While the book contains much information specific to New York lakes, like the sections on New York's state, local, and town laws, most of it can benefit lakes anywhere.

And any size. For, though Maple Lake may be little more than a puddle, it is a microcosm of the social and environmental challenges that face many lake communities today.

[To order the manual, send $10 plus $2 postage and handling to Federation of Lake Associations, Inc., Publications Department, 2175 Ten Eyck Ave., Cazenovia, NY 13035.]

Announcements of Interest

EPA Journal Special NPS Issue Still Available

Demand for the special nonpoint source issue of the *EPA Journal* has been so great that the NPS Control Branch has ordered a special printing. If you haven't gotten a copy and would like one, contact Anne Weinberg, Nonpoint Source Control Branch, WH-553, U.S. EPA, 401 M St., SW, Washington, DC 20460. FAX: (FTS/202)260-7024.

Wetlands and Nonpoint Sources Featured In First Issue of New Journal

The inaugural issue of *Ecological Engineering—The Journal of Ecotechnology* investigates the role of wetlands, particularly constructed wetlands, in the control of nonpoint source pollution of our waterways. The ten papers in the March 1992 issue explore both the science/engineering/research aspects and the policy/regulatory aspects of using wetlands for application of ecotechnology.

This special issue, edited by Richard K. Olson of ManTech Environmental Technology, Corvallis, OR, was the result of a workshop sponsored by EPA in June 1991. Copies of this issue (*Ecological Engineering*, 1992, Vol. 1, No. 1) and information about subscriptions can be obtained free by writing to Elsevier Science Publishers, P.O. Box 181, AD Amsterdam, The Netherlands. Or FAX 3120-5803-598.

The journal's editor-in-chief is William J. Mitsch, School of Natural Resources, Ohio State University.

Datebook

This DATEBOOK has been assembled with the cooperation of our readers. If there is a meeting or event that you would like placed in the DATEBOOK, contact the *NPS NEWS-NOTES* editors. Because of an irregular printing schedule, notices should be in our hands at least two months in advance to ensure timely publication. A more complete listing can be found on the *NPS BBS*.

MEETINGS AND EVENTS

1992

June

3-4 — *Urban Runoff Training Workshop*, Chicago, IL. Contact: Lisa Grayson, Terrene Institute, 1000 Connecticut Ave., NW, Suite 802, Washington, DC 20036. (202) 833-3380. The purpose of this workshop is to address the widespread need for information and material on local stormwater quality program implementation. Topics will be resource protection, education and training efforts as program components, and urban runoff research. The material covered in this workshop will relate stormwater quality program implementation to §319 opportunities and NPDES. In addition, the material will help states develop their coastal NPS programs. The workshop is sponsored by EPA Region 5 Water Division, Terrene Institute, and EPA's Center for Environmental Research Information.

10-12 — *Workshop on Water Quality Standards/Criteria and Related Programs*, New Orleans, LA. Contact: Michele Vuotto, Dynamac Corporation, 2275 Research Blvd., Suite 500, Rockville, MD 20850-3268. Sponsored by U.S. EPA's Office of Water, Office of Science and Technology. A block of rooms has been reserved at the Hyatt Regency. Single rooms are $65. Make room reservation for "SASD Workshop" by calling (504) 561-1234 by May 17. Topics: Proposed revisions to the WQS Regulation, interagency agreement with the U.S. FWS/Endangered Species Act, Fish Consumption Advisory database (demonstration), national criteria guidelines, contaminated sediment management and criteria. Also, setting site-specific criteria, developing biocriteria, inter-/intra-state issues in water quality standards, fish advisories/consumption, toxicology and risk assessment, national wildlife criteria program. The *NPS BBS* and its Fish Consumption Forum and database will be demonstrated at the workshop.

15-17 — *Remote Sensing for Marine and Coastal Environments*, New Orleans, LA. Contact: Nancy Wallman, ERIM/Marine Environment Conf., PO Box 134001, Ann Arbor, MI 48113-4001. (313) 994-1200. Theme: "Needs and Solutions for Pollution Monitoring, Control and Abatement." Topics: oil pollution, water quality, coastal processes, coastal habitat, and emerging technologies and systems.

15-17 — *Uncovering the Hidden Resource: Groundwater Law, Hydrology, and Policy in the 1990s*, Boulder, CO. Contact: Katherine Taylor, Campus Box 401, Boulder, CO 80309-0401. (303) 492-1288. Registration $350 ($150/day) before 6/1; $400 after. Meeting will be held in conjunction with the Rocky Mountain Groundwater Conference and will be addressing both legal and engineering issues. Sponsored by the Colorado Groundwater Assn. and the Natural Resources Law Center at University of Colorado.

15-18 — *Designing Stormwater Quality Management Practices*, Portland, OR. Contact: Patrick Eagan, The Wisconsin Center, 702 Langdon St., Madison, WI 53706. (800) 462-0876. Sponsored by the City of Portland Bureau of Environmental Services and the OR Chapter of the American Public Works Association. Attendees receive a copy of DETPOND software. Reserve room at Benson Hotel (503) 228-2000, ext. 102. Topics: NPDES program, flow and water quality management, source control, infiltration management, biofiltration, etc.

17-19 — *Workshop on Water Quality Standards/Criteria and Related Programs*, San Francisco, CA. See June 10 for details. A block of rooms has been reserved at the Hyatt at Fisherman's Wharf. Single rooms are $88. Make room reservation for "SASD Workshop" by calling (415) 563-1234 by May 26.

24-26 — *Partnerships Protecting Mississippi River Resources*, St. Peters, MO. Contact: Ross Braun/Dave King, Soil and Water Conservation Society, West Northcentral Region. (314) 724-2237.

25-26 — *Environmental Planning & Growth Management Symposium: "Environmental Issues and Policies in Coastal Georgia,"* St. Simons Island, GA. Contact: David Kylar, Coastal GA Regional Development Center, PO Box 1917, Brunswick, GA 31521. (912) 264-7363. FAX 262-2313. Rooms and meals available at nominal cost. Two-day symposium covering a wide variety of resources, programs, and issues: wetlands, water quality, endangered species, marshland protection, erosion control, environmental audits.

1992

June

28-7/1 — *Urban and Agricultural Water Reuse*, Orlando, FL. Contact: Salvadore D'Angelo, Boyle Engineering Corp., 320 East South St., Orlando, FL 32801. (407) 425-1100.

28-7/2 — *National Forum on Water Management Policy*, Washington, DC. Contact: Martin Reuss, HQ, US Army Corps of Engineers, Office of History, Kingman Bldg., Fort Belvoir, VA 22060-5577. (703) 355-3560.

July

7-9 — *Workshop on Water Quality Standards/Criteria and Related Programs*, Saratoga, NY. See June 10 for details. A block of rooms has been reserved at the Ramada Renaissance. Single rooms are $60. Make room reservation for "SASD Workshop" by calling (518) 584-4000 by June 15.

11-13 — *Texas Watch Volunteer Monitoring Conference*, Corpus Christi, TX. Contact: Dave Buzan, Texas Watch, PO Box 13087, Austin, TX 78711-3087. (512) 463-8206. For volunteer monitors, educators, representatives from coastal cities. Teachers can earn AAT credit by attending workshops for Adopt-A-Wetland, Texas Watch, GREEN, and other student-related projects.

19-22 — *Annual Meeting of the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)*, Alexandria, VA. Contact: Roberta Savage, ASIWPCA, 750 First St., NE, Suite 910, Washington, DC 20002. (202) 898-0905. FAX: 898-0929.

20-22 — *Growing Into the 21st Century: 1992 Sustainable Agriculture Symposium*, Memphis, TN. Contact: NACD, 504 Capitol Court, NE, Washington, DC 20002. (202) 547-6223. Highlights food and fiber production systems that allow producers to safeguard the environment while remaining profitable. Sponsored by NACD and 36 other organizations and agencies.

20-24 — *Workshop on Pesticide and Industrial Chemical Risk Analysis and Hazard Assessment (PIRANHA) Computer-assisted Analysis Technology*, Athens, GA. Contact: Joyce Wool, AScI Corp., USEPA-ERL, College Station Rd., Athens, GA 30613-0801. (404) 546-3210. FAX: 546-3340. Sponsored by U.S. EPA, Center for Exposure Assessment Modeling, University of Georgia Center for Continuing Education. Attendance is limited.

23 — *12th Milan No-Till Field Day*, Milan, TN. Contact: John Bradley, superintendent, Milan Experiment Station, 205 Ellington Dr., Milan, TN 38358. (901) 686-7362. The largest event of its kind. In 1991, 6,000 people from 31 states and 16 countries attended. Features tours, demonstrations, research reports, educational booths, and equipment displays.

August

2-5 — *Water Forum '92: Saving A Threatened Resource*, Baltimore, MD. Contact: ASCE Conference Dep., 345 E. 47 St, New York, NY 10017. (800) 548-ASCE.

9-12 — *Resource Management in a Dynamic World: 47th Annual Meeting of the Soil and Water Conservation Society*, Baltimore, MD. Contact: Tony Vrana/Tim Kautza, SWCS, 7515 Northeast Ankeny Rd., Ankeny, IA 50021-9764. (515) 289-2331. Emphasizes the role human resources play in using and managing natural resources. Three sub-themes are: environmental values, economics, and policy.

31-9/2 — *National Irrigation-induced Erosion and Water Quality Conference*, Boise, ID. Contact: William Carmack, USDA-SCS, South Ag Building, 14th and Independence Ave., SW, Washington, DC 20013. (202) 720-6037. FAX: 720-0428. Papers and posters invited. Details available late May. Topics: Water rights; legislation, policy, technical assistance, financial assistance, research and technology transfer needs; sociological barriers; cost-benefit; impact and treatment of irrigation return flow; impacts on fisheries, recreation; etc.

September

1-3 — *3rd National Meeting: Water Quality Standards for the 21st Century*, Las Vegas, NV. Contact: Patti Morris, Office of Science & Technology, U.S. EPA (WH-585), 401 M St., SW, Washington, DC 20460. (202) 260-9830. Theme: Fiscal Year 1994-1996 Water Quality Standards Priorities.

8-9 — *Lake Champlain: Its Future Depends On Us*, South Burlington, VT. Contact: Don Hipes, Rt. 2, Box 92, Jericho, VT 05465. (802) 244-4510. Co-sponsored by the New Hampshire, Vermont, and Empire State (NY) chapters of the Soil and Water Conservation Society.

1992

9-10 *The District Role in Remedial Action Plans Workshop*, Milwaukee, WI. Contact: Bill Horvath, NACD, 1052 Main, Stevens Point, WI 54481-2895. (715) 341-1022. FAX: 341-1023. Focuses on Lake Michigan.

13-17 *National RCWP Symposium: Ten Years of Controlling Agricultural Nonpoint Source Pollution: The RCWP Experience*, Orlando, FL. Contact: Lisa Grayson, Terrene Institute, 1000 Connecticut Ave., NW, Suite 802, Washington, DC 20036. (202) 833-3380. Symposium offers the opportunity to present and discuss the outcome of projects related to the 10-year experimental Rural Clean Water Program. Hosted by the South Florida Water Management District with U.S. EPA, ASCS, SCS, and Extension Service.

13-17 *The Year 2000: Will We Be Ready Technically? Socially? Politically? 1992 Annual Meeting of the American Fisheries Society*, Rapid City, SD. Contact: Bud Griswold, National Sea Grant Program, 1335 East-West Highway, Room 5216, Silver Spring, MD 20910. (301) 427-2431.

13-17 *Fourth International Wetlands Conference*, Columbus, OH. Contact: William Mitsch, School of Natural Resources, OSU, 2021 Coffey Rd., Columbus, OH 53210. (614) 292-9774.

14-16 *The District Role in Remedial Action Plans Workshop*, Rochester, NY. Focuses on Lake Ontario. See Sept. 9 for details.

20-24 *Surface Water Quality and Ecology: 1992 Annual Water Environment Federation Conference*, New Orleans, LA. Contact: Maureen Novotne, WEF Technical Services, 601 Wythe St., Alexandria, VA 22314-1994. (703) 684-2400.

October

1-2 *3rd Annual Utah Nonpoint Source Water Quality Conference*, Ogden, UT. Contact: Jack Wilbur, Utah Dept. of Agriculture, Environmental Quality Section, 350 N. Redwood Rd., Salt Lake City, UT 84116. (801) 538-7098. Theme: Urban Runoff and Stormwater Management.

14-16 *Watershed Resources: Balancing Environmental, Social, Political, and Economic Factors in Large Basins*, Portland, OR. Contact: Conference Assistant, OSU College of Forestry, Peavy Hall 202, Corvallis, OR 97331. (503) 737-2329. Explores how environmental and human factors interact and must be considered in order to meet current and future watershed management challenges. Topics: major ecological, political, social, economic, legal, and institutional issues; regional, national, international approaches and experience in addressing major watershed issues; new concepts and visions for future watershed management. An evening session will highlight posters and other displays.

16-22 *Interdisciplinary Approaches in Hydrology and Hydrogeology*, Portland, OR. Contact: Helen Klose, American Instit. of Hydrology, 3416 University Ave., SW, Minneapolis, MN 55414-3328. (612) 379-1030. Cost: AIH members $240, non-members $260. After Sept. 15, $25 more. Topics: water policy, competing water needs, surface/ground water relations, geochemistry, climate, hazardous and toxic information systems.

November

2-7 *12th Annual International Symposium on Lake and Reservoir Management*, Cincinnati, OH. Contact: Bob Mason, (513) 521-7275. Sponsored by the North American Lake Management Society.

24-25 *Stormwater Management and Combined Sewer Overflow Technology Transfer Seminar*, Contact: Ms. B. Pasian, conference secretary, Wastewater Technology Center, P.O. Box 5068, Burlington, Ontario L7R 4L7. (416) 336-4588. FAX 336-4765.

December

14-15 *6th National Drainage Symposium*, Nashville, TN. Contact: ASAE, 2950 Niles Rd., St Joseph, MI 49085-9659.

January

10-13 *The Development of Soil and Groundwater Cleanup Standards for Contaminated Sites*, Washington, DC. Contact: Dr. Eileen O'Neill, Water Environment Federation, 601 Wythe St., Alexandria, VA 22314-1992. (703) 684-2400. FAX: 684-2492.

February

8-11 *Geologic Remote Sensing: Exploration, Environment, and Engineering*, Pasadena, CA. Contact: Dr. Robert Rogers, ERIM, Box 134001, Ann Arbor, MI 48113-4001. (313) 994-1200. FAX: 994-5123.

The Coupon

Nonpoint Source Information Exchange Coupon #21

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- ❑ *Make a Suggestion*

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Attach additional pages if necessary.

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Phone: _____ ***Fax:*** _____

Nonpoint Source NEWS-NOTES is an occasional bulletin dealing with the condition of the environment and the control of nonpoint sources of water pollution. NPS pollution comes from many sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground waters. NPS pollution is normally associated with agricultural, silvicultural, mining, and urban runoff. Hydrologic modification is a form of NPS pollution that often adversely affects the biological integrity of surface waters.

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April 1992

TMDL CASE STUDY
Denver Metro — The South Platte River Segment 15

Key Features:	Revision of TMDLs to meet Water Quality Standards
Project Name:	Denver Metro — The South Platte River Segment 15
Location:	EPA Region VIII/Denver, Colorado
Scope/Size:	River, drainage area 380 mi^2
Land Type:	Smooth to irregular plains
Type of Activity:	Urban
Pollutant(s):	Toxic ammonia (NH_3), BOD/DO, toxics, metals
TMDL Development:	PS, NPS, Toxics
Data Sources:	Site-specific data from NPDES permittee and localities
Data Mechanisms:	STREAMDO and Colorado Ammonia Model
Monitoring Plan:	Yes
Control Measures:	NPDES permit

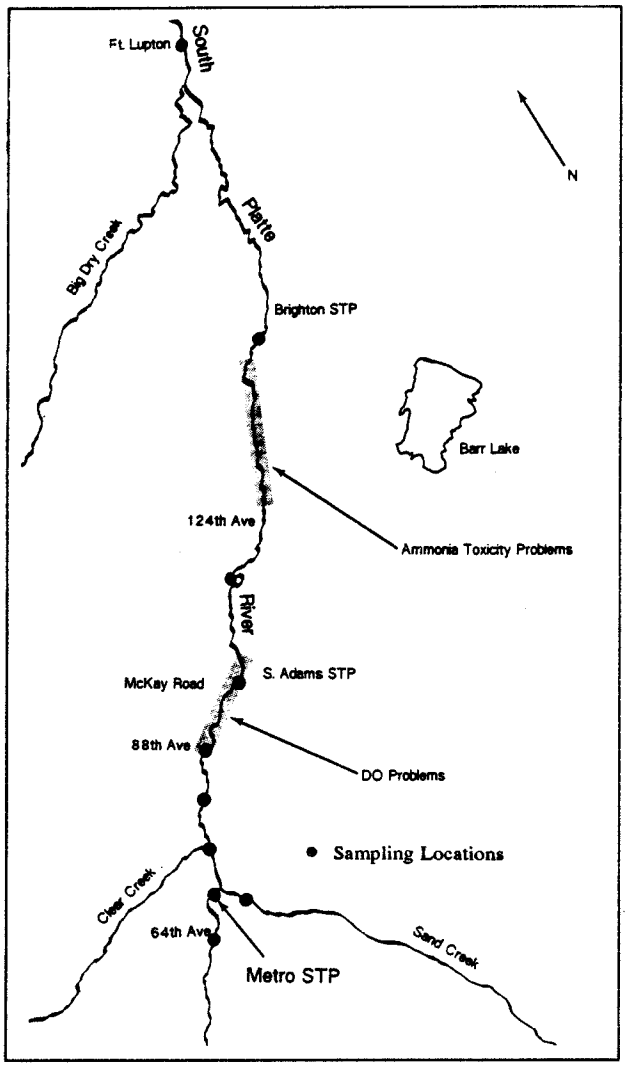

FIGURE 1. South Platte River/Segment 15

Summary: In 1986, low dissolved oxygen (DO) and the presence of toxic ammonia, other toxics, and metals convinced the Colorado Water Quality Control Commission to identify Segment 15 of the South Platte River as water quality impaired and a high priority for TMDL development. EPA Region VIII developed TMDLs for the segment after assuming authority to issue the NPDES permit for the Denver Metro Wastewater Reclamation District's Central Facility. Although numerous point sources discharge to the river upstream from Segment 15 and nonpoint source pollution was also known to contribute to its pollutant load, these were considered insignificant when compared with the discharge from the Central Facility at low flow. Almost the entire flow of the South Platte is diverted immediately above Metro's discharge. Using the extensive data that were key to identifying the water quality problems in this segment of the South Platte, TMDL development proceeded for metals, nitrates, nitrites, and ammonia. Ammonia was of primary concern because it contributed to both un-ionized ammonia toxicity and DO problems. Wasteload allocations based on the TMDLs were incorporated into the Central Facility's NPDES permit when it came up for renewal in 1986. Unfortunately, water quality data gathered since then indicate that DO continues to be below required concentrations in sections of Segment 15. As a result, the Region is now working to revise the TMDLs for those parameters that affect DO so that the DO standard will be achieved throughout the reach. The revised TMDLs may include "non-chemical" components, such as habitat restoration.

Contact: Bruce Zander, U.S. EPA Region VIII, Water Division, 999 18th St., Ste. 500, Denver, CO 80202-2466, phone (303)293-1580

BACKGROUND

Programmatic Issues

The Metro Wastewater Reclamation District (Metro District) provides wastewater treatment for a major portion of metropolitan Denver and portions of surrounding Adams, Arapahoe, and Jefferson Counties. It consists of 20 municipalities and service districts that are "Member Municipalities," 23 "special connectors," and 17 "connectors to connectors," discharging approximately 210 million gallons per day (mgd) into the South Platte River near Sand Creek (Figure 1). The river below this discharge is considered to be effluent dominated because estimated background flow is only about 20 mgd.

The Colorado Department of Health is delegated to issue permits in the State of Colorado. EPA Region VIII assumed authority to issue an NPDES permit for the Denver Metro municipal facility in 1986, however, because of the facility's consistent violations under the Clean Water Act (CWA). When excessive nutrients, low dissolved oxygen (DO), and the presence of toxic ammonia, other toxics, and metals convinced the Colorado Water Quality Control Commission (WQCC) to target Segment 15 of the South Platte River as a high priority for TMDL development, the Region established TMDLs to address these water quality problems. Wasteload allocations (WLAs) were incorporated into Denver Metro's NPDES permit. Metro District was the major cause of water quality impairment.

TMDL development begins with a thorough evaluation of available data and information. The Region evaluated the WLA that had already been established for Denver Metro by the Department of Health. It was deemed insufficient. The Region also considered the quality and abundance of available data to determine whether the data were adequate to calculate a TMDL and allocate pollutant loads for each parameter with a reasonable assurance that water quality standards would be met. The data appeared sufficient, and TMDLs were promulgated. A new NPDES permit, with limits based on the TMDLs calculated for each pollutant of concern, was issued to the Denver Metro facility in December 1986 (USEPA, 1986).

NOTE: Had there been substantial uncertainty that any TMDL would result in the attainment of water quality standards, a phased approach to TMDL development could have been chosen. Under this approach, a formal monitoring plan is adopted as part of the TMDL to assess attainment of standards and to support revision of the TMDL if standards are not attained.

Denver Metro—the NPDES permittee—installed pollution controls and collected data over the next 4 years so that the effectiveness of these controls could be evaluated. A review of the data in 1990 revealed that past problems with chlorine toxicity and ammonia toxicity appeared to have been resolved by upgrades of the Central Facility. The data also indicated that low DO concentrations continued to be a problem. Water quality standards had not yet been attained. (The DO profile along this segment of the river is shown in Figure 2.) This information forced a reassessment of the TMDLs for those parameters that affect DO in the stream, followed by a decision by the Region to update those TMDLs. The possibility of developing new, phased TMDLs that incorporate non-chemical parameters is currently being discussed because, while water quality problems are largely the result of various point source discharges, habitat degradation is a significant exacerbating factor.

To facilitate development of the new TMDLs, the State and EPA Region VIII are working closely with Metro District to collect and interpret additional data, as well as to model water quality. EPA's Office of Water is also continuing to review new approaches, technology, and tools to better assist in implementing the TMDL process (USEPA, 1991b). Metro District is funding the monitoring, modeling, and site-specific criteria development for the TMDLs.

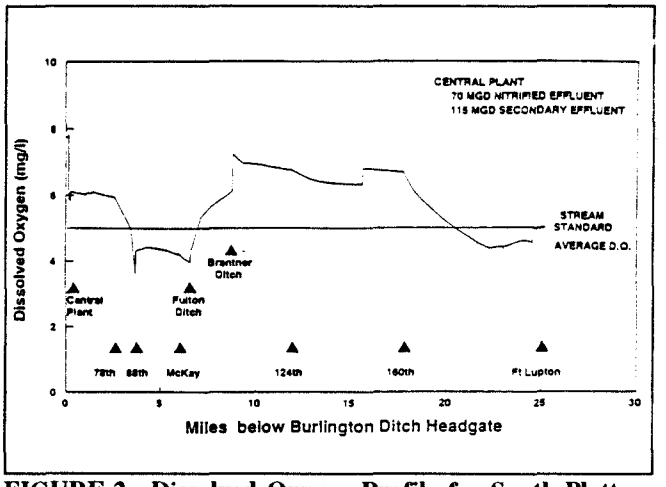

FIGURE 2. Dissolved Oxygen Profile for South Platte River Segment 15 (Camp, Dresser & McKee, 1992)

The Resource

The South Platte River originates in the center of Colorado and flows generally northeast for 270 miles to Nebraska. Approximately 65 percent of the population of Colorado is concentrated in a 30-mile-wide strip along the South Platte River, beginning 18 miles south of Denver and extending 80 miles northward. The land type in the watershed is mainly smooth western high plains. Natural vegetation on the plains tends toward gana, or buffalo grass. The soil types typical of this area are dry Mollisols (Omernik, 1987). The Denver area receives approximately 12 to 16 inches of annual rainfall, and annual natural runoff in the

area ranges from 0.1 to 1 inch (USGS, 1985). Runoff from urbanized areas, however, is greater. Low-flow conditions are most common from July to October, and high flows generally occur during the spring (May to June).

Segment 15 of the South Platte River, shown in Figure 1, flows north from the Denver metropolitan area to Fort Lupton, Colorado. This segment of the river extends 26 miles and its drainage area is approximately 380 square miles.

Upstream of Clear Creek, Segment 15 is characterized by heavy commercial and industrial land uses. Along Segment 15 itself there are active gravel mines, flooded gravel mines, pasture lands, and agricultural lands. Erosion control, which has extensively modified the upstream channel of Segment 15, has negatively affected the riparian zone, river hydrology, and assimilative capacity of the river. Dewatering flows from gravel-mining operations along the river contribute sediments and also affect the river hydrology. DO problems tend to occur in large ponded areas, which are a result of in-stream gravel mining and small dams built for irrigation withdrawal and utility line protection. Low species diversity throughout segments of the South Platte indicates that poor water quality and habitat degradation are impairing the health of aquatic communities.

Figure 1 illustrates the major pollution sources and quality-impaired areas along Segment 15. The location of point source inflows, nonpoint source loadings, irrigation return flows, tributary flows, and water supply withdrawals along the segment are indicated in Figure 3.

The WQCC has classified Segment 15 for the following uses: (1) Class 2 warm water aquatic life, (2) Class 2 recreation, (3) water supply, and (4) agricultural use. Table 1 presents the water quality standards that were in effect at the time of TMDL development so that the river reach would support these uses. It is possible that in the future the WQCC will adopt more stringent standards for un-ionized ammonia and a tiered standard for DO. Effluent limits for phosphorus are not currently in effect for Metro District's Central Facility. In addition, the State and EPA are investigating the development of site-specific standards for DO in the South Platte River. Changes in water quality standards could require TMDL revision.

ASSESSING AND CHARACTERIZING THE PROBLEM

Targeting and Prioritizing

Although each State decides how to prioritize impaired waters for TMDL development, the CWA provides that the severity of pollution and the intended uses of a waterbody be considered. EPA policy guidelines (USEPA, 1991a) suggest additional criteria. TMDL development for Segment 15 of the South Platte River was targeted and assigned a high priority because (1) available data indicated water quality was impaired, and (2) there was an urgent need to reissue the Metro Facility's NPDES permit.

Monitoring and Data Bases

Denver Metro conducted voluntary ambient monitoring at various points along Segment 15 for many years prior to 1986 in order to assess the water quality impacts of its discharges to the river. This information provided the first indication that there was a DO problem in sections of the reach, prompting EPA Region VIII to initiate more intensive water quality monitoring. EPA and the State conducted a joint data collection effort for approximately 6 months in 1985. The monitoring revealed that, in addition to low DO, the problems included chlorine and ammonia toxicity, as well as high concentrations of various metals.

The data from Denver Metro's ambient monitoring, the EPA/State intensive monitoring efforts, the water quality records from the South Adams County Water and Sanitation District and the City of Brighton, and effluent chemistry data from wastewater treatment facilities on Segment 15 were combined to form a fairly complete data base, with a period of record beginning in 1980, for numerous water quality parameters. This data base was very useful in characterizing water quality trends in Segment 15 over time and in completing TMDL analyses for the pollutants of concern.

After 1986, Denver Metro's ambient monitoring program was formally modified to provide more complete water quality data and information. Weekly water quality data are now collected at designated sampling locations along the South Platte River, including Segment 15, and in certain tributaries. In addition, Denver Metro collects a series of 24-hour (diel) water quality samples two times each year. Diel data can greatly increase the accuracy of a water quality model when used to calibrate for diel variations in DO and other parameters. This monitoring program was initially outlined in the 1986 EPA-issued NPDES permit for the Central Facility and has been sustained through annual CWA section 308 letters to Denver Metro.

The current data base is particularly valuable because of its long period of record, broad spatial coverage, and consistency in sampling and analytical methods. It is quite useful for (1) determining whether water quality standards are being met, (2) indicating water quality trends, and (3) providing better information to revise established TMDLs, if necessary. In addition, the expanded data base better supports water quality modeling efforts.

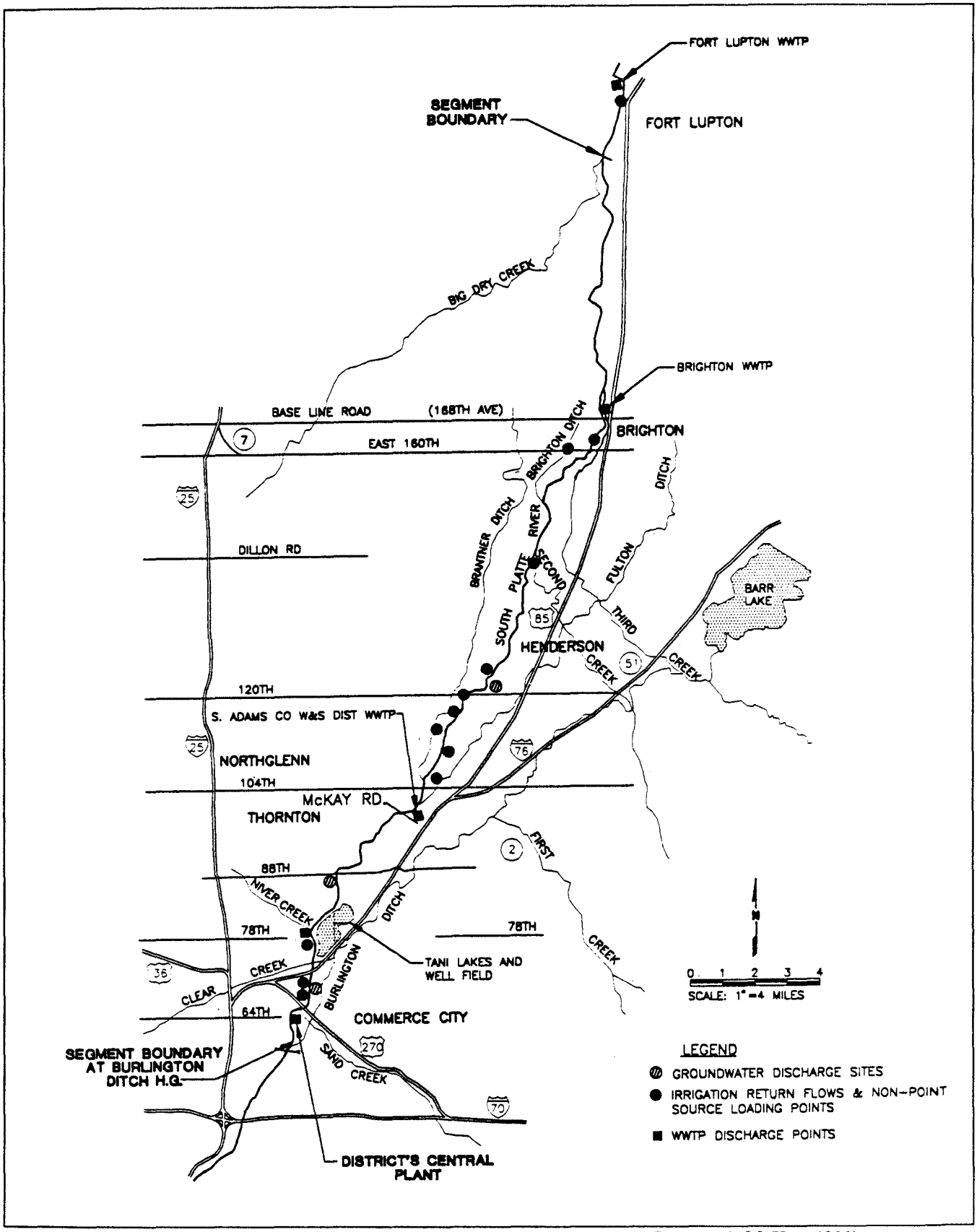

FIGURE 3. Segment 15 Pollution Loading Sources (after Camp Dresser & McKee, 1992)

TMDL DEVELOPMENT — 1986

Determining the Load/Waste Load Allocation Scheme

The objective of a TMDL is to allocate allowable loads among all of the pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. To do this, EPA Region VIII followed five distinct steps.

The first step taken to develop the TMDLs for Denver Metro was selecting the pollutants to consider. Water quality data for Segment 15 of the South Platte were reviewed to identify existing water quality problems and their probable causes. In 1986, Denver Metro concentrated on ammonia and chlorine toxicity, DO problems, and metals. Ammonia was of particular concern because it contributed to the un-ionized ammonia toxicity and DO problems in Segment 15 of the river (B. Zander, correspondence, May 23, 1991).

The second step taken was to estimate the maximum allowable loading of the pollutant(s) of concern that would not violate water quality standards. The critical flow condition that resulted in the lowest dilution of pollutants was identified as the 7Q10 (the 7-day consecutive low flow, reoccurring every 10 years).

Next, all point and nonpoint sources to Segment 15 were identified and their contributions estimated. Point source discharges along the South Platte and its tributaries include publicly owned treatment works and industrial dischargers (see Figure 4). The Denver Metro District's Central Facility, at the head of Segment 15, is the largest discharger in the area with a design capacity of 185 mgd (287 cfs). The South Adams County Waste and Sanitation District wastewater facility and the wastewater facility for the City of Brighton have design capacities of only 4.3 mgd (6.7 cfs) and 2.6 mgd (4.1 cfs), respectively. Various industrial discharges to the river are also relatively small. Nonpoint source pollution contributions, including ground water inflow, were also estimated. When compared with the discharge from Metro's Central Facility at low flow, however, these other loadings were considered much less significant. For this reason, TMDL development was centered around this facility and the other pollutant sources were considered to be background.

Predictive analysis of pollutants in Segment 15 of the South Platte and determination of total allowable loads were performed using the model and mass balance equations developed for the second step. WLAs for point sources and load allocations for nonpoint sources were developed and are shown in Table 1. The margin of safety (MOS), which is required when calculating a TMDL, was incorporated through the conservative assumptions used during TMDL development. If these conservative assumptions had been deemed insufficient, an additional MOS would have been added as a separate component of the TMDL.

The final step was to determine the limits to be placed on individual pollution sources so that the total loading for each pollutant would be within the specified TMDL. Because the Central Facility was identified as the most significant source of pollutants to Segment 15, the facility was required to upgrade to advanced wastewater treatment. The other municipal facilities in Segment 15 are required to treat only to secondary levels. Best management practices to control nonpoint sources were not recommended.

The WLAs for the Central Facility were incorporated into its NPDES permit. The TMDLs required the Denver Metro Facility to be very near water quality standards at the end of the pipe for many pollutants (e.g., metals and other inorganics) because of the low dilution during critical conditions.

Modeling

To predict stream response to various pollutant loading scenarios, the staff of EPA Region VIII developed STREAMDO, a steady state, one-dimensional water quality model. STREAMDO was used for Section 15 of the South Platte to model dissolved oxygen and un-ionized ammonia. There were numerous advantages to using this model. It was accepted by the regulatory authorities, was not overly complex, and was easily modified and understood. Also, it ran on Lotus 1-2-3, a common spreadsheet software package.

Features of the STREAMDO model included a mass balance approach; subdivision of stream segments; and representative equations for physical, biological, and chemical processes. To determine allowable concentrations for effluent parameters other than biological oxygen demand and ammonia, modelers used a simple mass balance calculation.

STREAMDO was calibrated and verified in 1986 using available historical water quality data. The model coefficients and inputs used to calculate TMDLs for Segment 15 were also based on these data. The TMDLs are presented in Table 1.

FOLLOW-UP

Monitoring

Reporting requirements in the NPDES permit and letters from EPA issued under CWA section 308 required the Central Facility to collect ambient water quality,

TABLE 1. Total Maximum Daily Loads for the South Platte River at the Points of Discharge for Denver Metro

PARAMETER		WASTE LOAD ALLOCATION[a] (e.g., Permit Limit)	LOAD ALLOCATION[a] (Background)	TMDL (lb/day)	WATER QUALITY STANDARD[c] (µg/L)
Arsenic (Total)	lb/day (µg/L)	91.0 (52.0)	5.0 (30.0)	96.0	50.0
Cadmium	lb/day (µg/L)	1.8 (1.0)	0.1 (1.0)	1.9	1.0
Chromium (Hex)	lb/day (µg/L)	47.0 (27.0)	1.0 (8.0)	48.0	25.0
Chromium (Tri)	lb/day (µg/L)	95.0 (54.0)	1.0 (12.0)	96.0	50.0
Copper	lb/day (µg/L)	46.0 (26.0)	2.0 (18.0)	48.0	25.0
Lead	lb/day (µg/L)	46.0 (26.0)	2.0 (14.0)	48.0	25.0
Manganese (Diss)	lb/day (µg/L)	280.0 (160.0)	27.0 (160.0)	307.0	160.0
Mercury	lb/day (µg/L)	0.09 (0.05)	0.01 (0.05)	0.1	0.05
Nickel	lb/day (µg/L)	189.0 (108.0)	3.0 (11.0)	192.0	100.0
Selenium (total)	lb/day (µg/L)	18.0 (10.0)	1.0 (10.0)	19.0	10.0
Silver	lb/day (µg/L)	0.2 (0.10)	0.02 (0.1)	0.2	0.1
Zinc	lb/day (µg/L)	252.0 (144.0)	17.0 (99.0)	269.0	140.0
Nitrite	1000 lb/day (mg/L)[b]	1.8 (1.0)	----------	1.9	1.0 (mg/L)
Nitrate	1000 lb/day (mg/L)[b]	18.0 (10.0)	----------	19.0	10.0 (mg/L)
Ammonia	1000 lb/day (mg/L)	June-Sept. 10.5 (6.0) Oct. 15.8 (9.0) Nov.-Dec. 22.8 (13.0) Jan. 35.0 (20.0) Feb.-Mar. 22.8 (13.0) Apr.-May 15.8 (9.0)	0.5 (3.0) 0.5 (3.0) 0.5 (3.0) 0.5 (3.0) 0.5 (3.0) 0.5 (3.0)	11.0 16.3 23.3 36.0 23.3 16.3	0.1 (mg/L)
Dissolved Oxygen May 1 - July 14 July 15 - Apr. 30	 mg/L mg/L				 5.0 (mg/L) 4.5 (mg/L)
pH	s.u.				6.5 - 9.0 (s.u.)
Total Residual Chlorine	mg/L				0.003 (mg/L)

Based on 210-mgd effluent flow and 20-mgd background flow in the South Platte River.
[a]The load allocation includes loadings from all PSs and NPSs upstream from the permittee's discharge (ΣWLA+ΣLA+MOS=TMDL).
[b]Nitrite and nitrate limits are based on meeting State water quality standards at the end of the pipe.
[c]Site-specific water quality standards in place at the time this TMDL was set.

hydrologic, and biological data to ensure that the facility was complying with its permit, to monitor water quality trends, and to evaluate whether the TMDLs adequately protect water quality and the aquatic community. This monitoring has shown that, while the ammonia toxicity problem appears to have been resolved, low DO concentrations persist in specific sections of Segment 15. This finding has forced EPA to re-evaluate the TMDLs established in 1986 for pollutants that exert an oxygen demand.

Modeling

STREAMDO was used for this re-evaluation using the additional data from the follow-up monitoring. The Colorado Ammonia Model was also incorporated to produce the Segment 15 Water Quality Model (Camp Dresser & McKee, Inc., 1992). This latest round of DO modeling for the South Platte shows that benthic oxygen demand plays a key role in causing excursions below the standard. As a result, more field work is planned to further

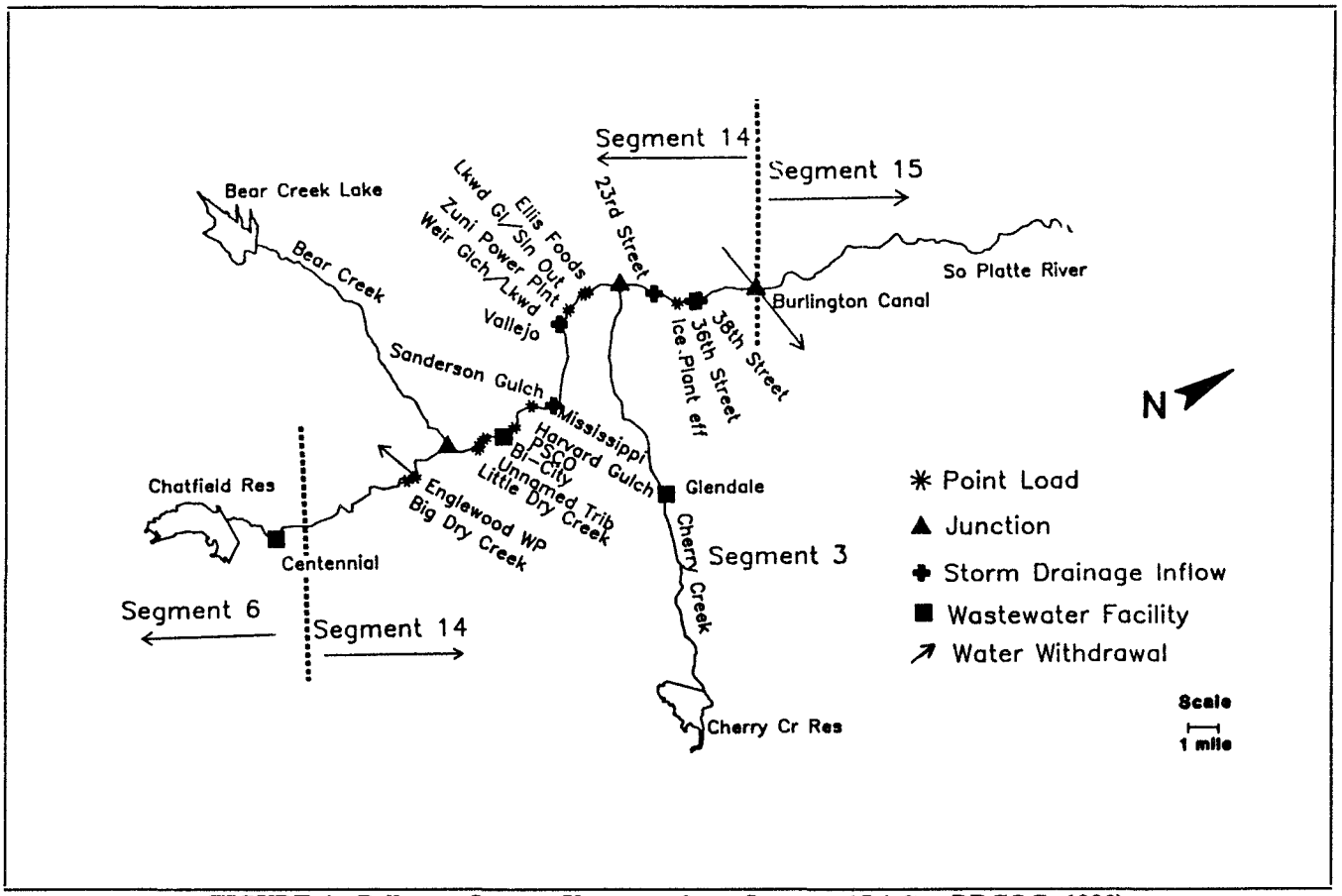

FIGURE 4. Pollutant Sources Upstream from Segment 15 (after DRCOG, 1990)

characterize the link between the quality of Denver Metro's effluent and the benthic oxygen demand. The water quality model, as well as certain TMDLs, will be updated based on information collected this year on the benthic processes.

Although it is anticipated that the TMDLs for several pollutants will change, Metro District has been required to conduct engineering studies on alternative solutions to the DO problem. One solution may involve additional nitrification/denitrification of the effluent of the South Complex of the Central Facility; although the Segment 15 Model indicated this will not necessarily alleviate the DO problem in Segment 15. Modeling also indicated that ponding above the 88th Avenue bridge and at the Fulton Ditch diversion is a major cause of oxygen depletion in the river. As a result, several nontraditional solutions are being examined. Channel restoration to improve natural stream aeration is one possibility. By restoring the river's natural cross-section—alternating riffles and pools to improve reaeration and increase velocities—it is thought that the benthic layer will have much less influence on DO. According to the model, a variety of combinations of improvements at the Denver Metro treatment facility, physical habitat improvements, and artificial reaeration may achieve the specified in-stream DO targets. The artificial reaeration involves an off-channel facility in which water is pumped over a cascade structure in a park setting.

Alternative Pollution Controls

The alternative methods to increase DO along Segment 15 of the South Platte River are currently being ranked and costed by the discharger. The alternatives and their associated costs are presented in Table 2.

Ranking of the alternatives is based on four criteria: (1) implementability and relative magnitude of activity; (2) operatability and reliability; (3) environmental comparability; and (4) public support. Implementability and relative magnitude rates each alternative on the likelihood that the alternative will actually be implemented. At this stage of the screening process, capital and operating costs are not listed as separate criteria, but are considered qualitatively in formulating a rating for this criterion. Operatability and reliability rates each alternative on how easy or difficult it is to operate from the District's standpoint. The evaluation considers the risk that the Metro District would assume in the operation if water quality standards are not met. By necessity, multiple-jurisdiction involvement would be rated at the low end of

TABLE 2. Alternative Methods to Increase DO Concentrations and Facilitate Meeting Water Quality Standards for DO Along Segment 15 of the South Platte River

DESCRIPTION OF ALTERNATIVE	CAPITAL COST ($ Million)	ANNUAL O&M COST ($ K/Yr)
• Nitrification/denitrification facilities for Central Plant's 115-mgd South Complex	72-112[a]	2,000-4,500[a]
• Stream modification above and below 88th Ave. • Effluent dispersal to 3 ditches via ditches	32	630
• Stream modification above and below 88th Ave. • Effluent dispersal to 3 ditches via pipeline	44	480
• Stream modification above and below 88th Ave. • Artificial reaeration at 168th Ave.	32	670
• Stream modification above and below 88th Ave. • Artificial reaeration at 168th Ave. • Effluent dispersal to 2 ditches via ditches	52	1970
• Stream modification above and below 88th Ave. • Artificial reaeration at 168th Ave. • Effluent dispersal to 2 ditches via pipeline	59	840
• Stream and drop structure modification at 88th Ave. • Artificial reaeration below 88th Ave. • Artificial reaeration at 168th Ave.	56	880
• Filter all Metro effluent • Chlorination/dechlorination	102	3,950
• Stream modification above and below 88th Ave. • Nitrify South Complex effluent to 5 mg/L (NH_3-N) • Chlorination/dechlorination	114	4,636

[a] 1989 cost.

the scale. Environmental comparability ratings are based on an alternative's ability to enhance land use, surface water quality, and fish and wildlife habitat, as well as air quality considerations. Public support is the most subjective of all the criteria. Under this criterion each alternative is rated on its ability to provide additional community benefits and to garner support from a high percentage of the surrounding community.

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This case study prepared by Tetra Tech, Inc., Fairfax, VA in conjunction with USEPA, Watershed Management Section, Office of Wetlands, Oceans, and Watersheds, and Region VIII.