United States Environmental Protection Agency
Office of Water (WH-553) Washington, DC 20460
January – February 1992
#18

EPA News-Notes

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

A Commentary . . .

Kissimmee River Environmental Restoration Will Be A First-of-its-Kind Undertaking

It has been stated that environmental problems are emotional; environmental issues, political; and environmental solutions, technical. That statement seems to summarize the last sixteen years of Kissimmee River Restoration effort. — M. K. Loftin, Assistant Director, Water Resources Division and Project Manager, Kissimmee River Restoration, South Florida Water Management District.

This comment, made at the Kissimmee River Restoration Symposium, held in Orlando, October 1988, has stuck in your editor's mind as he reviewed a large stack of documents on the Kissimmee River restoration for the story that starts on page 10 of this issue.

It's the longest story we have ever run in *NEWS-NOTES*. We think it's worth the effort and the space. This is a first-ever sort of project. Watershed restoration is going to become more common, so we had better learn how to do it. The next few restoration projects will undoubtedly not be on the same grand scale as the Kissimmee River, but we should not forget that solutions to major environmental restorations — at whatever scale — must have a proper mix of emotions, politics and technology. Otherwise they're not solutions.

National Notes of Interest

Congress Requires Highway Nonpoint Erosion Controls Consistent W/State 319/CZM NPS Programs

On December 18, 1991 President Bush signed into law the Intermodal Surface Transportation Efficiency Act of 1991, the bill that, among other things, reauthorized federal highway legislation.

Among the other things was the provisions of section 1057, which, in three succinct paragraphs, deals with erosion control during highway construction, as follows:

INSIDE THIS ISSUE

Congress Requires Highway Nonpoint Erosion Controls Consistent W/State 319/CZM NPS Programs (continued)

*(a) **DEVELOPMENT.**— The Secretary shall develop erosion controls guidelines for States to follow in carrying out construction projects funded in whole or in part under this title.*

*(b) **MORE STRINGENT STATE REQUIREMENTS.**— Guidelines developed under subsection (a) shall not preempt any requirement made by or under State law if such requirement is more stringent than the guidelines.*

*(c) **CONSISTENCY WITH OTHER PROGRAMS.**— Guidelines developed under subsection (a) shall be consistent both nonpoint source management programs under section 319 of the Federal Water Pollution Control Act and coastal nonpoint pollution control guidance under section 6217(g) . . .*

EDITOR'S NOTE: It looks like Congress is going to continue to write 319/nonpoint consistency requirements into the law of the land. The first was the coastal management reauthorization act requirements. Now the highway act reauthorization. Watch for the Clean Water Act reauthorization. It's likely to require EPA to be consistent with its own actions (or the actions of the Secretaries of Commerce and Transporation) under both the coastal legislation and the highway bill.

STORET Modernization Emphasizes Data-Sharing

EDITOR'S NOTE: The article below is extracted from a briefing prepared in November 1991 for LaJuana Wilcher, EPA Assistant Administrator for Water.

STORET, BIOS and ODES, EPA's trio of electronic databases designed to store surface water monitoring data, are responding to EPA Administrator William Reilly's and the Science Advisory Board's challenge to integrate and share data with other state, federal and local programs, and even within EPA itself.

Together, the three databases contain data on surface water and groundwater quality, contaminated sediments, stream flows, tissue toxicity, macro-invertebrate, fish and marine NPDES permits.

STORET is a family of specific systems for storing and retrieving physical and chemical data on surface water and groundwater. Records date back to 1972. The STORET system contains information on more than 680,000 sampling sites and over 170 million on water column, sediment and fish tissue observations.

Created in 1986, BIOS contains biological field survey data on aquatic organisms. There are over 1 million observations in the database, and more than 85,000 taxa are represented.

ODES or Ocean Data Evaluation System was created in 1984 and stores federal and state monitoring data from marine programs like NEP, 403, 301(h), and the Ocean Dumping Program. Over 5,000 nationwide coastal sampling stations contribute to ODES's 3.5 million records.

The data are used for comparative risk analysis, enforcement support, criteria and standards, permitting and special studies. Fifty percent of the database system's 800 users are state agencies. Other users include EPA (headquarters and regions), other federal agencies, private industry and universities.

When the modernization is completed, the database system will provide a flexible and usable system that can respond to EPA's and the public's changing data and information needs. It is intended to provide a state-of-the-art information system on which to base groundwater and surface water quality decisions.

New directions within EPA and the national water quality community now demand a better capability to combine and integrate data across media and programs. Examples of such directions include the current emphasis on watershed protection and biomonitoring. A modernized system will promote participation from agencies outside EPA.

STORET Modernization Emphasizes Data-Sharing (continued)

The modernization addresses technical concerns as well:

- Current systems are obsolete and expensive to repair.
- The current non-standard structure prohibits standard links to other systems.
- Changing to a standard database management system will facilitate data integration and information-sharing.
- A commercially supported software will reduce long-term maintenance.

Begun in March 1990 with the establishment of a systems modernization fund, the effort will take a projected seven years and cost $7.4 million. User surveys have shown that their primary needs are for system links, QA/QC, a GIS interface, biological data storage and public access. Users have stressed the need for a user-friendly and well-documented system. Input from users of the present system has generated a set of long-term goals for the modernization project. These include the creation of a system that allows users to display water quality conditions geographically, describe trends over time and share information with other agencies and the public.

Until the new system is ready in 1997, the existing capabilities and functionality of STORET/BIOS/ODES will be maintained. Changes will be made only with the approval of the STORET modernization Executive Board. Only those changes necessary to prevent the erosion of current capabilities or those deemed necessary to meet emerging agency needs will be made.

Any person with access to the EPA National Computer Center IBM-3090 computer has access to STORET. Although agencies may lock their STORET data, almost all information is available to the public. To add or change information, you must have a special agency ID and password. Agencies may change only their own information. For information on how to gain access to STORET, call (800) 424-9067.

[For more information, contact Bob King, WH-553, U.S. EPA, 401 M. St.,SW, Washington, DC 20460. Phone:(202/FTS)260-7046.]

OWOW Issues Bulletin Updating Its Watershed Protection Approach

EPA's Office of Watersheds, Oceans, and Wetlands (OWOW) has recently issued an informative bulletin on its Watershed Protection Approach. Entitled *Watershed Events*, the bulletin

> *. . . is intended to update EPA offices and other interested parties on progress in the development and use of watershed protection approaches for improving the environmental quality of aquatic ecosystems. Watershed protection approaches are those that take an integrated, holistic view of an aquatic system, accounting for the dynamic relationships that sustain natural resources and their beneficial uses by society. In contrast to traditional water quality protection approaches, the watershed protection approach begins with a focus on the condition of and threats to specific watersheds, rather than on particular pollutants or pollutant sources as a starting point.*

In the bulletin, OWOW's Director Bob Wayland made these observations:

> *". . . to find the broad perspective necessary to achieve effective ecosystem protection on a rational geographic basis." That is the challenge put forth to us by Water Quality 2000, a consortium of more than 80 public, private and nonprofit organizations. A number of States have been out in front, showing us that watershed protection concepts can be integrated into our existing environmental protection and resource management framework—with promising results . . . We must continue to coordinate our own programs and provide greater opportunity for States and other interested parties to fashion their own watershed approaches. We are also committed to open the National dialogue on watershed protection and to help provide the "tools" necessary to accelerate watershed protection. I deeply appreciate the commitment of EPA's Regional offices to work with me in promoting this important concept.*

OWOW Issues Bulletin Updating Its Watershed Protection Approach (continued)

The final Watershed Protection Framework document was jointly issued by all four Office of Water office directors[1] on October 28, 1991. In that document the stated Watershed Protection Approach (WPA) goals included the following:

> *The goal of the WPA is to reorient EPA and other Federal agency, State, and local programs to address watershed protection in a holistic manner.*
>
> .....
>
> *The watershed approach is an integrated and holistic strategy for watershed protection. As such, the WPA provides a framework that:*
>
> *i. empowers Federal, State, Indian Tribes, and local agencies to implement watershed-specific plans that prevent, reduce or abate environmental degradation and risks to ecological systems and public health from all stressors and from all sources in the watershed;*
>
> *ii. encourages consideration of the cumulative chemical, physical, and biological effects throughout the watershed;*
>
> *iii. enhances coordination among all interested parties, including State, local, Federal agencies, Indian Tribes, and, most importantly, the public; and*
>
> *iv. enables States and EPA to assess progress and successfully develop and improve tools and programmatic methodologies.*

The Watershed Events bulletin concludes with this observation:

> *Effective watershed protection relies on teamwork within EPA, within government at all levels, and within all sectors of society. EPA headquarters is taking steps to help promote the watershed approach.*

[For more information on the Watershed Protection Approach, contact: Policy and Communications Staff, OWOW, (WH-556F), U.S.EPA, 401 M Street, SW, Washington DC 20460. Phone: (202) 260-7166, or Amy Sosin, Watershed Branch, AWPD (WH-553) same address. Phone: (202) 260-7058.]

Nonpoint Sources of Water Pollution To Be Theme of Upcoming EPA Journal

An upcoming issue of *EPA Journal* will be devoted to the topic of nonpoint sources of water pollution. The issue, expected out in mid-February, features an article by EPA Administrator William K. Reilly.

Divided into five sections, "The Problem," "Issues and Policy," "Forum," "Finding Solutions," and "Taking Action," the issue begins by exploring some of the causes of NPS: agricultural chemicals and sediment, urban runoff, logging, abandoned mines, and construction. Case studies illustrate each example for the lay reader.

In one section, the different views of EPA, USDA and the Office of Management and Budget are highlighted. In another, Robert Wayland III, director of EPA's Office of Wetlands, Oceans and Watersheds answers questions about nonpoint sources posed by readers.

NPS Lesson Plan Included

In the magazine's regular feature, "For the Classroom," the issue's theme provides the inspiration for a lesson plan on nonpoint source pollution.

[1] EPA's Office of Water's four offices and their directors who signed the document are: Robert H. Wayland III, Office of Wetlands, Oceans and Watersheds; Michael B. Cook, Office of Wastewater Enforcement and Compliance; James R. Elder, Office of Ground Water and Drinking Water; and Tudor T. Davies, Office of Science and Technology.

Nonpoint Sources of Water Pollution To Be Theme of Upcoming EPA Journal (continued)

"It's a real indication of the importance that is placed on nonpoint source control to have an entire issue of *EPA Journal* devoted to this subject," commented EPA Nonpoint Source Control Branch Chief Dov Weitman. "I hope that these articles will help to enhance the public's understanding of NPS."

All regular subscribers to *EPA Journal* will receive the special NPS issue. A limited number of single copies will be available from the Nonpoint Source Control Branch through Anne Weinberg, WH-553, U.S. EPA, 401 M St., SW, Washington, DC 20460.

Available on NPS Electronic Bulletin Board (NPS BBS)

In addition, all of the articles dealing with nonpoint source pollution will be available in files on the *NPS BBS*. These files may be downloaded and read, and they may be reprinted in state and local newsletters. Watch the *BBS* for these files during the month of February.

National RCWP Symposium to be Held in September

The National Rural Clean Water Program (RCWP) Symposium will be held September 13-17, 1992, at the Orlando Marriott in Orlando, Florida, according to Boyd Gunsalus, South Florida Water Management District. This symposium will present the results of the 10-year experimental RCWP to federal, state, and local project managers, landowners, and others interested in solutions to nonpoint source pollution. Successes as well as obstacles will be addressed in the interest of providing guidance for state nonpoint source management programs.

The symposium will open on Sunday, September 13, with registration, poster and exhibit viewing, and an evening reception. Sessions will be held Monday, Tuesday, and Thursday. A Wednesday field trip will visit selected best management practice sites in the Lake Okeechobee watershed. The symposium will be hosted by the South Florida Water Management District in cooperation with U.S. EPA and U.S.D.A's Agricultural Stabilization and Conservation Service, Soil Conservation Service, and Cooperative Extension Service.

[For information, contact Lisa Grayson, The National RCWP Symposium, The Terrene Institute, 1000 Connecticut Ave., NW, Suite 802, Washington, DC 20036. Phone: (202)833-3380, FAX:(202)466-8554.]

Notes from The States and Localities (where the action is)

Boulder Creek, CO: Nonpoint Source Meets Point Source in Win-Win Situation

In 1985, downstream of Boulder, CO's wastewater treatment plant (WWTP), Boulder Creek was exceeding water quality standards for un-ionized ammonia. Channelization compounded by nonpoint source pollution prevented the creek from attaining its designated beneficial use of Warm Water Aquatic Life, according a paper by J.T. Windell (University of Colorado at Boulder), L.P. Rink (Aquatic and Wetland Consultants) and Chris Rudkin (Water Quality Coordinator, City of Boulder).

The paper, "Compatibility of Stream Habitat Reclamation With Point and Nonpoint Source Controls" in *Water Environment and Technology, January 1991,* reported that the city of Boulder did several studies to determine the extent of the problems, their sources, and solutions and found that degradation of the riparian habitat affected not only the biology of the creek, but its chemistry as well:

Absence of functional riparian habitat and lack of shading compounded normal [seasonal] water temperature increases. Increased channel width from channelization resulted in many miles of shallow water depth and a lush growth of photosynthesizing aquatic vegetation. Consequently, high water temperature and high pH resulting from high photosynthetic activity facilitated conversion of total ammonia to the toxic un-ionized form and daily excess of the state standard.

While the studies recommended an expansion and update of the 20-year-old WWTP, a feasibility study cited in the paper concluded that,

aquatic and riparian habitat reclamation using selected best management practices (BMPs) would serve as a complement to advanced wastewater treatment. The aquatic life use could be attained by reclaiming aquatic and riparian habitat, controlling NPS pollution, and correcting poor land-use practices.

Lower water temperatures could be maintained by concentrating water in a restored thalweg (low flow channel). Lower pH could be maintained during the spring and fall by reducing photosynthesizing aquatic vegetation.

Furthermore, the feasibility study suggested that rehabilitating the creek's biology and hydrology might save the city money in the future by eliminating the need for additional denitrification towers. Based on the studies (two planning studies, a use attainability study, two water quality studies and a feasibility study), the city upgraded the WWTP (with one denitrification tower) to meet NPDES water quality standards, and began an aquatic and riparian habitat improvement project.

The demonstration project, which was funded 60% (state)/40% (city) under the state of Colorado's nonpoint source control program, focused on using BMPs to attain the beneficial use. Another objective was to improve water quality in conjunction with the WWTP upgrade. The plan, according to Windell, Rink and Rudkin, "was to implement those BMPs that would reduce un-ionized ammonia excursions, control NPS pollution, restore aquatic and riparian habitat function, and encourage good land-use practice."

In Phase I, six BMPs were designed and constructed in a creek segment downstream of the WWTP. According to the paper,

The BMPS included constructing high-tensile, wildlife-compatible fencing to exclude cattle from riparian habitat; restoring streambank stability by using log revetments; . . . planting 9,000 willow and cottonwood cuttings; . . . removing streambank berms so that vegetation would be closer to the water table and could grow; excavating.5 miles of thalweg to concentrate and deepen water flow; reducing the amount of aquatic vegetation; and creating three boulder aeration structures to increase instream oxygen and carbon dioxide concentrations. An increase in carbon dioxide—although small—would replace that used in photosynthesis and help maintain a lower pH.

Funded like Phase I, the second phase was begun in January 1990, and targeted another reach of Boulder Creek where similar problems loomed. An year-round irrigation return flow ditch was an additional problem, dealt with by routing the flow through existing and constructed wetlands.

Public support for the project is impressive. Boulder County citizens donated time, labor, and material with a value of about $250,000 to Phases I and II. A local television station featured a documentary video explaining the problems and showing BMP implementation.

Phase III, which will begin in spring 1992, seeks to reduce the impact of surface gravel mining through biotechnical streambank stabilization, revegetation, and creation of wetlands. The project will use abandoned gravel pits as small settling basins, from which runoff will spill over into wetlands and finally into the creek.

Monitoring efforts include Rapid Bioassessment, fish and invertebrate Indices of Biotic Integrity, and temperature, vegetation and water quality analyses. The relationship between maximum-minimum water temperature, canopy density, fish, and discharge of effluent from

the WWTP is also being studied. The city plans to use Phase I and II demonstration reaches as reference sites for future nonpoint source and land-use control.

Windell, Rink, and Rudkin concluded that,

> *Reported observations and documentation indicated that a final water quality management plan for the Boulder Creek Basin should include point source and NPS pollution controls. Neither control type alone will result in a stream that consistently meets its intended uses or water quality standards. The implemented BMPs will permit NPS pollution control, result in physical habitat reclamation, and facilitate attaining the heretofore unattainable aquatic life use.*

Boulder Creek Enhancement Project Update

Recently, *News-Notes* interviewed one of the paper's authors, Chris Rudkin, who is project manager of the Boulder Creek enhancement project. Rudkin reported that since the publication of the paper over a year ago, two phases of the project have been completed. Phase III has been designed and will be constructed in the spring of 1992.

The phased implementation approach, in which the creek is treated in segments, has been useful. "We're learning as we go," said Rudkin. "We can show the city of Boulder, the state, landowners and EPA what we're doing on a segment and then project future improvements for the creek as a whole."

"Evolutions in Thinking" About BMPs

The approach also allows the perfecting of BMPs. "Some of these BMPs haven't been used in this type of situation before. The phased approach lets us see what works in the field," Rudkin said.

By remaining flexible and viewing technical imperfections as opportunities for improvement, Rudkin's team fine-tunes its arsenal of BMPs with each phase.

Fencing, for example, is a simple, straightforward BMP with a high pay-off. But Rudkin discovered that he not only had to keep cows off streambanks, he had to please the farmer. In Phase I, the first attempt at a cattle-crossing structure proved inconvenient for the landowner, a farmer, to use. The structure's gates were often left hanging open across the streambed, where they became clogged with debris during high flows. Rudkin's team worked with the farmer on a new design. What they came up with presented a *visual* barrier to the cows but allowed boaters and flood-driven debris through.

Constructed of four-foot-wide plastic mesh panels suspended across the creek and attached to PVC pipes floating on the water's surface, the structure looks solid to cattle. It is more convenient for farmers since they don't have to worry about opening or closing it. The panels are also inexpensive to repair. "We've learned that it is extremely important to keep the landowners happy with the project," said Rudkin.

Rudkin has become expert at looking at things from a cow's perspective. Another of what he calls "evolutions in thinking" involved access of cattle to drinking water. Once the project designers stopped thinking that cattle absolutely had to have access to the creek for water, they were able to protect a Phase II riparian zone by constructing watering holes away from the creek.

Revegetation Essential to Project Goals

An integral step toward achieving the project's goals lies in the revegetation of the streambanks. The creek's denuded banks allow excessive sunlight to reach the water. The resulting increases in water temperature and pH favor the conversion of total ammonia to the un-ionized form.

Historically and ecologically, willows and cottonwoods are important plants for Boulder Creek. Cottonwood has proven difficult to propagate, in part because the plant relies on a flood cycle that no longer occurs on the creek. The Boulder Creek team's early attempts to grow the tree failed as the young seedlings were outcompeted by opportunistic plants. Presently, botanists are researching the tree's germination requirements, and in Phase III, cottonwood regeneration will be a priority.

Willow trees have been easier to re-establish. In Phase I, willows were planted using the standard method of inserting cuttings upright into holes punched in the soil. Phase II saw the development of a brush-layering technique, in which soil is back-filled over willow cuttings laid horizontally on the soil with the leaves hanging into the water. Brush-layered cuttings produce more shoots than the conventional method, while having the immediate hydrologic benefit of breaking up the current's erosional power.

In a third instance that might be termed "creative field engineering," Boulder found that they could overcome tight finances for stabilizing cutback streambanks by "tucking" the bank—undercutting it further, allowing the vegetated top to slump down, creating a sloping, vegetated streambank.

Long-term vs. Short-term Results

The project's goals—restoring Boulder Creek's water quality and achieving the state-designated Warm Water Aquatic Life Use—will take time to attain. The project's full impact on un-ionized ammonia won't be seen until the vegetation matures enough to shade the banks, but Rudkin is pleased with shorter-term results, like BMP implementation.

He reported that he now has quantitative data showing regrowth of native riparian species. "Fencing is an unqualified success. There is intensive growth inside the protected areas," Rudkin noted.

Revetment structures—rocks or logs placed beneath banks to reduce erosion—appear to be working, although the hydrologic scheme is still establishing itself. Rudkin explained that when streams are redesigned based on computer analysis the forces of water are not entirely predictable. "There is a lot of local variation," he said. "What we do is often very much an in-the-field adjustment. We're still trying to understand new hydrologic regimes—studying, learning, anticipating."

In the nearer-term, results from a bioassessment study will be available within a year. The project will be using invertebrates as bioindicators to measure stream health and pinpoint areas of the greatest nonpoint source impacts. Rudkin expects gradual increases in the numbers and diversity of aquatic animals. Higher pool-to-riffle ratio and more canopy resulting from the restoration project will provide important habitat for fish and macro-invertebrates.

Restoration Cost-Effective

The creek restoration project is viewed as a valuable adjunct to the wastewater treatment plant's recent $21 million expansion. Certainly it will be more cost-effective to reclaim and maintain the healthy riparian system than to plan continual expansions of the treatment plant. Realizing this led Boulder's wastewater treatment division to contribute the city's portion of funding, according to Rudkin.

Other NPS Projects in Boulder

Boulder is pursuing other projects to curtail the nonpoint source load in the Boulder Creek watershed. Among them are highway, stormwater and urban runoff projects and the city's "Tributary Greenway" project that filters sediment through a bikeway/buffer strip along secondary streams and creeks.

Boulder Creek, CO: Nonpoint Source Meets Point Source in Win-Win Situation (continued)

The easy scapegoat in this tale would have been the treatment plant. But a closer look revealed a complex situation where point source and nonpoint source pollution were inter-related. For Boulder Creek, improved water quality and restoration of the beneficial use has meant recognizing that relationship and designing innovative solutions.

[For more information, contact Chris Rudkin, Water Quality Coordinator, City of Boulder, 4049 N. 76th St., Boulder, CO 80301. Phone: (303) 441-3251. Or contact: Bill McKee, Colorado Department of Health, Water Quality Control Division, 4210 East 11th Ave., Denver, CO 80220.]

Southern California Groundwater Worse Than Sewage Treatment Plant Effluent

EDITOR'S NOTE: The following story was submitted to *News-Notes* by Ed Lui, Regional Monitoring Coordinator for EPA Region IX.

Southern California. The home of Disneyland, Universal Studios, and the Stealth Bomber program (now you know where all those graphite tennis rackets were designed!) is also where you find the highest concentration of dairies in the world. That's right, in the world. It all occurs in the Chino Basin, where feedlot dairies are located next to each other cheek-by-jowl, and cows think it's normal to roam on eight-foot mountains of animal waste.

The issue, of course, is groundwater. Dairy country in Southern California lies within the boundaries of the Santa Ana Regional Water Quality Control Board, one of nine units in the state that operate as the field arms of the State Water Resources Control Board in Sacramento. The local citizens who make up the Regional Board meet monthly to approve NPDES permits, issue Waste Discharge Requirements, levy fines on enforcement actions, and try to figure out what to do with the 460,000 tons of manure that are produced each year by 289,600 cows in the Chino Basin.

Underneath it all, rights to groundwater in the Chino Basin are adjudicated. Of the 9.4 million acre-ft of producible water in the basin, 140,000 acre-ft/yr is considered the safe yield, and water pumped up from the basin is divided among three supply pools: agricultural (primarily dairies), industrial, and municipal. Over the years, the quality of water pumped from the Chino Basin has declined, and it is expected to decline further in the future:

	Chino Sub-Basin 3		
	1950	1986	2045(projected)
Nitrate(NO3)	15ppm	63ppm	211ppm
Total Salts(TDS)	300-500ppm	700ppm	995ppm

(Source: *Dairies and Their Relationship to Water Quality Problems in The Chino Basin* by Roger Turner.)

Chino Basin's groundwater problems surface to impact the quality of the Santa Ana River, the major waterbody in the region. The Santa Ana River is an effluent-dominated waterbody—discharges from municipal sewage treatment plants make up 80-90% of the river base flow. At the southern end of the Chino Basin, groundwater rises to make up 5-10% of the Santa Ana River's flow. The quality of the rising groundwater is worse than any of the treatment plant discharges; the 10% of groundwater contributes 30-40% of the nitrate load and about 50% of the total salt load of the Santa Ana River.

What's more, Santa Ana River water rights are also adjudicated; 40,000 acre-ft/yr belongs to Orange County, downstream. Orange County captures the Santa Ana River water in spreading basins a few miles east of Knott's Berry Farm. The water sinks underground, and accounts for about 60% of the recharge of the Orange County groundwater basin, which is a major source of drinking water for the gold coast.

Southern California Groundwater Worse Than Sewage Treatment Plant Effluent (continued)

The labyrinthine movement of pollutants through the Santa Ana Region waterbodies is typical of regions that support populations much larger than the carrying capacity of the environment (7 inches of precipitation/yr). The Chino Basin groundwater story points out how closely groundwater and surface waters are linked, and the large impact of agricultural nonpoint source activities on those water sources. The Santa Ana Regional Water Quality Control Board has published a document, *Dairies and Their Relationship to Water Quality Problems in the Chino Basin.* It is recommended reading for people interested in dairy and groundwater issues. The author, Mr. Roger Turner, is the Dairy Coordinator for the Santa Ana Regional Board, and he can be contacted directly to request copies of the dairy report or to ask for more information. His address is: Roger W. Turner, Santa Ana Regional Water Quality Control Board, 2010 Iowa Ave., Suite 100, Riverside, CA 92507. Phone: (714) 782-4494. Fax (714) 781-6288.

[For more information, contact: Edwin H. Liu, EPA Region IX, 75 Hawthorne St., San Francisco, CA 94105. Phone:(415) 484-2012 or (FTS) 744-2012.]

Notes on Environmental Restoration

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions

Introduction: This article reports on the proposed environmental restoration of the Kissimmee River and its floodplain in south-central Florida. It is a story containing several important and significant (and sometimes very exciting) elements, such as:

1) patience over a period in excess of twenty years;

2) a relentless search for a mutually acceptable identification of the public interest by all levels of concerned government;

3) a truly interdisiplinary effort, wherein teams including biologists, hydraulic engineers and public administrators searched for restoration answers that all disciplines could live with, while maintaining the essential flood control features in urban and other economically essential areas; and

4) innovative scientific discovery and verification in the restoration of an almost totally destroyed ecosystem.

In the end, each of these elements of the Kissimmee River restoration experience are part of a whole — blending, supporting and contributing to the bigger story of the political science of accomplishing such a fundamental, vast and vital environmental restoration.

The South Florida Water Management District (SFWMD) has increasingly taken on the role of lead agency for the state of Florida since 1983. In the preface to their *Alternative Plan Evaluation & Preliminary Design Report* issued in June 1990, they said:

> *Kissimmee River Restoration is deceptively simple and extraordinarily complex. This study is built upon nearly twenty years of previous studies and extensive new work conducted since 1984.*

In reporting on this monumental effort, we have come to believe that this story contains landmark lessons for all of us who are concerned with the business of restoring and maintaining water quality and the water-related environment and its ecosystems. We're anxious to share with our readers what we have learned.

A Flood Control Project in Central Florida — Then and Now (1961-1992)

Thirty years ago, the Army Corps of Engineers (COE), in partnership with the state of Florida, began construction of a massive flood control project on the Kissimmee River in south-central Florida. The flood control solution was the channelization of the river, converting its 103-plus

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

miles of shallow, meandering river channel and floodplain to a geometric, essentially straight-as-an-arrow, fifty-six-mile-long excavated canal, known as C-38. The canal, completed in 1971, runs from Lake Kissimmee to Lake Okeechobee.

The canal is actually composed of six water control structures that create six stair-step pools which drop the river a total of 36 feet over its length. Each structure is equipped with a 30-foot by 90-foot navigation lock to raise and lower boats with drafts of up to 5.5 feet.

Now, twenty years after construction was completed, the COE, in response to a 1990-enacted Congressional directive, has completed a feasibility report and environmental impact statement that calls for the environmental restoration of the Kissimmee River and the return of the river's original meandering state at an estimated cost of some $422,667,000. Fifteen years will be necessary to complete the reconstruction project, at an average annual cost on the order of $45 million. The report calls for federal (75%)/state (25%) cost-sharing, with Florida providing all land and easement acquisitions prior to the start of construction.[1]

In Florida, the Legislature and three successive governors have endorsed the restoration idea. The Corps circulated its draft plan and environmental impact statement widely, inviting comments. It held public hearings on the proposed plan in the Kissimmee River region in October 1991. The report was made final in December 1991. It sets out the next steps in the process:

> *Following public review of this feasibility report and environmental impact statement, the final documents will be transmitted through the Division Engineer [the Jacksonville Division — eds.] and the Washington-level Federal report review process, which will include reviews by the Washington Level Review Center, the Board of Engineers for Rivers and Harbors, the Chief of Engineers, and the Secretary of the Army. The Assistant Secretary of the Army for Civil Works, representing the Secretary of the Army, will coordinate the documents with the Office of Management and Budget, and send them to Congress. The study authority[i.e., the Congressional Action — eds.] states that the Secretary shall transmit the final report of the Chief of Engineers to Congress not later than April 1, 1992.*

What Happened Between Then and Now (1954-1992)

It is important to recognize at the outset that the 1961-71 flood control work on the Kissimmee River was a continuation of past federal concerns and the development of the river that began with the construction of a federal channel for commercial navigation in the early 1900s. In 1954, basin improvements for flood damage reduction were authorized. Upper Basin works built under that authorization consist of channels and structures in the vicinity of Orlando that control water flows through eighteen natural lakes into Lake Kissimmee. The Lower Basin works are the canal and the six water control structures described earlier.

The flood control project was conceived, planned, and designed between 1954 and 1960. Federal law and policy dealing with the water-related environment did not at that time include the Clean Water Act of 1972, the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, or numerous other bits of environmental law and policy that are now on the books, both at the federal level and in Florida.

At the time of authorization and construction there were certainly stirrings of environmental awareness throughout the country, but even so, the first Earth Day had yet to be held.

Governmental processes were relatively single-purpose-minded. The charge in the 1954 authorization was pure and simple: *flood damage reduction—in the most cost-efficient fashion.* And that was what was done.

As it turned out, the results were an environmental disaster.

---

[1] The Corps of Engineers report indicates that fee acquisition of the floodplain up to the five-year flood line will involve approximately 58,487 acres, and an easement acquisition of lands between the five-year and the 100-year flood lines will involve an additional 9,143 acres. The costs of such acquisition will be credited against the state's required 25% match. Florida has its land acquisition program well underway under the state's Save Our Rivers legislation enacted in 1981.

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

The very encouraging side of this matter is that this disaster is being dealt with today in a period of environmental awareness and concern, within the framework of contemporary federal and state environmental law and policy.

The Dimensions of the Environmental Disaster (1971)

In its *Kissimmee River Environmental Restoration Report* (December 1991), the COE made these observations on the river's historic natural environment:

> *Historically, the Kissimmee River meandered approximately 103 miles within a one- to two-mile floodplain. The floodplain, approximately 56 miles long, sloped gradually to the south from an elevation of about 51 feet at Lake Kissimmee to about 15 feet at Lake Okeechobee; falling an average of about one-third of a foot in elevation over each mile of the river. Under historic conditions, river flows generally exceeded 250 cubic feet per second (cfs) 95 percent of the time, while overbank flooding occurred when flows exceeded 1,400 cfs in the upper reaches to 2,000 cfs in the lower reaches. The river moved very slowly, with normal river velocities averaging less than two feet per second . . .*
>
> *The historic floodplain was 49,000 acres . . . [including] wetlands, wildlife, waterfowl, fisheries and other components of an integrated and resilient river-floodplain ecosystem that provided an estimated 340,000 habitat units. Resilience and persistence were emergent properties of the ecosystem which were derived from the spatial mosaic of habitats, intricate food webs, stable energy flow, and other complex physical, chemical and biological interactions and processes.*
>
> *Distribution and maintenance of plant communities within the river wetlands depended on prolonged inundation and seasonally fluctuating water levels . . . A fluctuating hydroperiod, along with the undulating topography of the floodplain, a meandering river channel, oxbows, and natural discontinuous levees, enhanced and maintained habitat diversity, including a mosaic of intermixed vegetation types.*

The report deals in detail with the great diversity of waterfowl, wading birds and game fish supported by these vast south Florida wetlands, concluding by stating:

> *The river and floodplain were not discreet and independent ecosystems, and the ebb and flow of their life was closely interrelated. In November, ducks and probers, such as snipe and ibis, fed in the sloughs, potholes and wet prairies in upland areas near the tree line. Many of the same populations used the potholes, oxbows, backwaters of the floodplain in February, and the river and the deepest marshes and cypress swamps near the river in May. In the 1950's, peak populations of ducks and wading birds centered in and around Lake Okeechobee ranged out to the Kissimmee . . . and the northern reaches of the Everglades National Park when and where water and feeding conditions were the most favorable.*

The Corps' document reports on ecological degradation brought about by straightening out the river to manage its flow:

> *River channelization, upland drainage practices, and other hydrologic modifications have caused numerous environmental changes in the Kissimmee River ecosystem, including a loss of the basin's biological resources. These changes stem from alteration of key determinates of ecological integrity of the river and the floodplain ecosystem.*
>
> *. . . About 20,000 of the original 35,000 acres of floodplain wetlands were either drained, covered with material dredged during canal construction, or converted to canal.*
>
> *In summary, in addition to the loss of river and floodplain habitat which resulted from canal excavation and deposition of dredged material, channelization and other basin modifications have significantly affected the environmental values of the Kissimmee river ecosystem primarily through altered hydrologic regimes. Ecological consequences of altered floodplain hydrology and drainage of former swamps, marshes and backwater habitat include diminished floodplain diversity, reduction in waterfowl and wading bird usage of the floodplain, and loss of habitat for forage, as well as larger riverine fish species. Elimination or modification of river and floodplain interactions has affected the functional integrity of both the river and floodplain. Other river impacts have resulted from interruption of flow. Lack of flow associated with a meandering river*

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

system has degraded water quality, led to excessive sedimentation of river substrates, diminished habitat quality and diversity, and degradation of river biological communities.

The Response of the State of Florida (1973-1983)

In June 1990, the South Florida Water Management District issued its *Kissimmee River Restoration, Alternative Plan Evaluation and Preliminary Design Report* [2]. The report deals at its outset with some historic background:

There was opposition to the flood control project even before construction began [in 1961]. Opposition centered on fear of environmental damage that the flood control project . . . might cause. The opposition was poorly organized, but the U.S. Fish and Wildlife Service is on record as having opposed the project.

During the construction of the project, a grassroots movement to restore the Kissimmee River became organized. Early issues in the restoration movement centered around physical destruction caused by excavation of the canal and placement of spoil.

The "birth" of Kissimmee River restoration occurred in 1972 when the first public hearing on this subject was held by the Central and Southern Flood Control District (predecessor to the South Florida Water Management District) . . .

In 1976, after four years of public debate, the Florida legislature passed the Kissimmee River Restoration Act. This legislation created the Coordinating Council on the Restoration of the Kissimmee River Valley and Taylor Creek-Nubbin Slough Basin which was more informally called the Kissimmee River Coordinating Council (KRCC). The KRCC was charged with broad responsibilities of solving many water resource problems of the region, including developing measures

> *" . . . to minimize and ultimately remove the threats to the agriculture industry, the wildlife, and the people of central and southern Florida posed by land uses and water-management practices . . . "*

This legislation specifically directed the KRCC to seek to:

- *Restore the natural seasonal water level fluctuations in the lakes of the Kissimmee River and in its natural floodplains and marshlands.*
- *Recreate conditions favorable to increases in production of wetland vegetation, native aquatic life, and wetland wildlife.*
- *Utilize the natural and free energies of the river system to the greatest extent possible.*

Between 1976 and 1983, the State of Florida, through the KRCC, funded a variety of studies designed to evaluate different Kissimmee River restoration approaches. These studies improved understanding of hydraulic, biologic, and water quality issues in the basin. As a result, many early hypotheses have been validated or discarded. Especially important are clarifications of water quality issues and establishment of restoration of lost environmental values via habitat restoration as a primary goal.

The SFWMD report indicates that in 1978 Florida's Congressional delegation reopened the question of the Kissimmee River. The Senate Committee on Environment and Public Works and the House Committee on Public Works and Transportation passed identical resolutions asking the Corps of Engineers to review the flood control project. The Congress asked the Corps to determine whether any modification in the project as built was advisable in light of questions regarding water quality, flood control, recreation, fish and wildlife and "other current and foreseeable environmental problems, and other loss of environmental amenities."

The Corps was further instructed that " . . . potential modification alternatives, if any, shall include . . . consideration of restoration of all or parts of the Kissimmee River below Lake Kissimmee . . . "

---

[2] The report was authored by M. Kent Loften, Assistant Director, Water Resources Division, Resource Management Department, South Florida Water Management District and Project Manager; Louis A. Toth, Chief Biologist; and Jayantha Obeysekera, Chief Hydraulic Engineer.

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

The SFWMD report states that in response to these requests the Corps undertook extensive studies of various restoration measures. A study report to the Secretary of Army in 1985 concluded that modifications could greatly improve the environment, but no federal action was recommended.[3]

The 1990 SFWMD report's historical summary continues:

> *The KRCC led the state's coordination with the Corps throughout the Corps' study process. In 1983 . . . the Corps completed their plan evaluation and disseminated the results. At that time, the KRCC adopted backfilling as the restoration approach to be used by the state.*
>
> *Later in 1983, then-Governor Bob Graham signed an Executive Order that created the Kissimmee River-Lake Okeechobee-Everglades Coordinating Council (KOECC) as the successor to the KRCC. The KOECC was directed to oversee restoration of the Kissimmee River through involvement and review of various interagency actions that were occurring during the early 1980s.*

These legislative instructions and gubernatorial directives to KOECC led directly to SFWMD's restoration demonstration efforts and five years of intensive enginering studies and environmental monitoring on what should be done, how things should proceed, and the environmental consequences of such actions.

The Kissimmee River Demonstration Project (1984-1989)

SFWMD's initial restoration project involved the construction of a backfilling demonstration in the second pool of the channelized river (Pool B of C-38.) This consisted of an earthen plug, and

> *. . . resulted in identification of significant, valid, technical issues regarding backfilled soil stability. As a result, the selected demonstration plan utilized sheet steel pile weirs instead of soil to block the canal. Construction of this "Phase I Demonstration Project" was initiated in 1984 and completed in 1985. Effects of the project were monitored and evaluated from 1984 through 1989.*[4]

Louis A. Toth, SFWMD Chief Biologist, authored a SFWMD report, *Environmental Responses To The Kissimmee River Demonstration Project*, published in March 1991, in which he reported:

> *. . . The Demonstration Project was conducted in Pool B, a 19.5 km [12.117 miles - eds] section of canal, remnant river and floodplain . . . The project had four major components: construction of three notched weirs across C-38, implementation of a pool stage fluctuation schedule, creation of a "flow-through" marsh, and hydrologic and hydraulic modeling studies.*
>
> *Prior to initiation of the Demonstration Project, the SFWMD, Florida Game and Fresh Water Fish Commission (GFC) and Florida Department of Environmental Regulation (DER) endorsed a multi-agency Memorandum of Agreement and assumed joint responsibility to monitor and evaluate environmental effects of the Demonstration Project. Staff scientists from the SFWMD, GFC and DER collaborated in the development of this joint monitoring program. The SFWMD assumed responsibility for monitoring (1) effects of Demonstration Project-related changes in the Pool B hydrologic regime on floodplain vegetation and secondary productivity and (2) effects of reintroduced flow on benthic invertebrate communities and river channel habitat characteristics.*

Environmental monitoring data were collected between July 1984, and November 1988, allowing Toth to report:

> *Plant community responses to Demonstration Project components showed that restoration of wetland communities on the Kissimmee River floodplain is feasible . . .*
>
> *The Demonstration Project also provided evidence of the feasibility of restoring several components of floodplain function, including waterfowl and wading bird utilization, small fish and invertebrate productivity, and processes that could enhance water quality . . .*

---

[3] SFWMD's 1990 report commented on COE's 1985 report: "*The Secretary of Army has not made his final recommendations to Congress pursuant to the 1978 resolutions.*"

[4] See the 1990 SFWMD *Preliminary Design Report* cited above.

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

Results of Demonstration Project monitoring also indicate that restoration of ecological integrity of the river channel is possible . . .

Monitoring results indicate that ecological integrity of the Kissimmee River can be restored only with a holistic approach which succeeds in restoring both the form and function of the former ecosystem . . .

The Kissimmee River restoration could be an unprecedented project of global significance. The scope of its value will be determined largely by the quality and rigor of the ecological studies and monitoring program that are conducted in association with the restoration project. Ecological monitoring studies must be the "heart" of this model restoration program. Demonstration Project results provided refined direction guidelines for required ecosystem monitoring studies. In preparation for implementation of . . . the restoration program, baseline data on all components of the ecosystem, including wading birds, waterfowl, fisheries, fish communities, habitat, water quality, and ecosystem function should begin immediately. Two to three years of pre-construction studies, followed by a five-year, post-construction evaluation phase are recommended.

The Kissimmee River Restoration Symposium (1988)

Following five years of scientific exploration and on-the-ground demonstration, SFWMD convened the Kissimmee River Restoration Symposium[5] in Orlando, in 1988. In the foreword to the proceedings Project Manager M. Kent Loften wrote:

> *This symposium provided a forum for experts in various fields associated with the restoration to offer their findings on ecological and engineering research and to address policy/institutional issues and concerns as they relate to options for restoration . . .*
>
> *This symposium is a major milestone—sort of a starting line for the final lap in a race to restore the Kissimmee River. By the end of 1989, the technical studies presented here will be complete. Though we may not have all the answers, we probably have more answers about Kissimmee River Restoration than most do on which to base a major water resources decision. It has been a thoroughly studied river. Great strides have been made since it was last in a public forum. What is learned from, and finalized subsequent to, this symposium will position this project so it can proceed on a sound basis.*

In his introduction and opening remarks to the symposium, John R. Wodtaska, former SFWMD Executive Director, said:

> *Our agency is celebrating its 40th anniversary this year, and probably the one project that symbolizes the District's evolution from a flood control, single-purpose agency to a multipurpose water resources management agency is the Kissimmee River Restoration project . . .*
>
> *This is a unique time in history. We have an opportunity to shape the future of the State and to decide the values that Florida will be noted for, and how to establish them.*
>
> *It's my belief, as we look through the Kissimmee, Okeechobee, Everglades system, that restoration projects or revitalization projects are going to become more common. What we learn from this experience is going to be of utmost importance . . .*

The papers and wide-ranging discussion covered a broad spectrum of ecological and engineering topics as well as policy/institutional issues. The proceedings are a complete record of what was expertly presented and thoughtfully and thoroughly discussed.

The idea was, as Wodraska indicated, "to learn from one another" and as Loftin said, to "position this project so it can proceed on a sound basis."

---

[5] While SFWMD was the primary sponsor of the symposium, co-sponsors were: the American Fisheries Society, American Geophysical Union, American Society of Civil Engineers, American Water Resources Association, Ecological Society of America, Florida Academy of Sciences, Florida Lake Management Society, North American Lake Management Society, and Wildlife Society. The Symposium Organizing Committee included members from, in addition to SFWMD, the Office of the Governor, Florida Game and Fresh Water Fish Commission, Department of Environmental Regulation, Florida Dairy Farmers, Inc., and Florida Sierra Club. The symposium was well attended, having nearly 200 registrants. Twenty-seven papers were presented and were published in the proceedings along with transcripts of pertinent moderator comments and group discussions.

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

SFWMD Alternative Plan and Preliminary Design Report (1988-1990)

The Restoration Symposium in October 1988, clarified many issues and gave sharper focus and direction to SFWMD's work on the Kissimmee. Following the symposium, the District turned to the production and evaluation of a set of specific alternative plans for restoration. These efforts resulted in a document, *Alternative Plan Evaluation and Preliminary Design Report,* published two years after the symposium, in June of 1990.[6] That plan document begun by reciting the contributions made by the symposium to the Kissimmee River restoration process. It said:

> *A clear outcome of the symposium was to center the focus of Kissimmee River restoration on the ecosystem and its emergent properties, rather than individual or discrete biological components.*

The report also states:

> *The symposium's ecological review panel concurred with participating scientists that reestablishment of lost ecological values and goals established by the Governor's Executive Order and state and federal legislative mandates will be achieved only with a holistic ecosystem restoration perspective (Karr, 1990a)[7]. In accordance, reestablishment of the ecological integrity of the Kissimmee River ecosystem was promoted as the primary restoration goal. By definition, this goal requires reestablishment of an ecosystem that is "capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition comparable to that of the natural habitat of the region" (Karr and Dudley, 1981).*

To develop the *Plan Evaluation and Preliminary Design Report,* a team of biologists, chemists, hydrologists, and ecologists was assembled to tackle the definition of environmental restoration criteria. The team included staff from the Florida Game and Fresh Water Fish Commission, U.S. Fish and Wildlife Service, Florida Department of Environmental Regulation and SFWMD, all of whom had been actively involved in previous Kissimmee River environmental studies and resource management.

The team recognized that ecological integrity of riverine systems is determined by five classes of variables, according to the report:

1) ***energy source:*** *type, amount, and particle size of allocthonous inputs, primary production, and seasonal pattern of available energy*
2) ***water quality:*** *temperature, turbidity, dissolved oxygen regimes, nutrients, organic and inorganic chemicals (natural and synthetic), heavy metals and toxic substances, pH*
3) ***habitat quality:*** *substrate type; water depth; current velocity; availability of refuges and reproductive, nursery and feeding habits; habitat diversity*
4) ***flow regime:*** *water volume, temporal variability of discharge*
5) ***biotic interactions:*** *competition, predation, disease, parasitism.*

---

[6] The report's comments on the study team and how it operated are instructive: *"The SFWMD study team was interdisciplinary. The team adopted some non-traditional views of interaction among these disciplines. The problem-solving approaches of engineering were applied to ecosystem restoration. Tasks were divided into three areas: ecosystem restoration, flood control and other hydraulic engineering concerns, and other related studies and issues. The first two were assigned to the chief biologist (Louis A. Toth) and chief hydraulic engineer (Jayantha Obeysekera), respectively. These team members were asked to play the role of advocate for their issue and challenge each other in these often conflicting interests. This was done to assure that diametric views of certain interest groups would get consideration. Other duties were managed or delegated to other team members by the project manager (M. Kent Loftin). This approach created more than usual interaction between team members and was partly responsible for the high degree of interdisciplinary integration. In their advocacy roles, team members were responsible for being the SFWMD point of information for their respective concerns with other agencies, interest groups, and the public."*

[7] James R. Karr, then Professor of Biology, Virginia Polytechnical Institute & State University, was moderator of the Ecological Topics session at the symposium and later was a member of the three-person peer review team for SFWMD's Kissimmee River restoration plan development and design evaluation. Professor Karr is currently the Director of the Institute for Environmental Studies and Professor of Zoology and Fisheries, University of Washington.

In Florida, Corps of Engineers' Kissimmee River Restoration Aims To Return to Pre-Channelization Environmental Conditions (continued)

With these determinants of ecological integrity in hand, the team developed restoration guidelines, objectives and criteria. Along with these went the clear understanding that,

> *Because hydrological processes created and maintained the ecosystem, restoration of the environmental values of that system can best be achieved by returning control of the system to these natural processes. That is, given a chance, natural hydrologic processes will restore the complex ecosystem attributes and insure the return and preservation of the system's environmental values.*

In short, restore the pre-channelization hydrology, and the ecosystem and its environment will be restored. With these understandings, alternative plans to achieve the goals of the restoration could be developed and tested.[8]

Four alternative plans with varying costs and complexity were developed to provide options.

- **The first plan** would place weirs at ten locations along the canal to return flow to the ten most extensive remanent river runs. Fixed or gated weirs are variations of this plan.
- **The second,** a plugging plan, uses stabilized earthen fill at the same locations as the ten weirs. The plans are otherwise identical.
- **The third plan** is similar to the plugging plan and is called the Level I Backfilling Plan. Plug locations are duplicated, except plugs are extended longitudinally to fill a greater canal length. This filling is adjacent to original remaining river channels. The canal would remain intact at junctions and serve as a linkage between original river channels and between junctions of river channels and spillways and boat locks.
- **The fourth plan,** the Level II Backfilling Plan, expands on the Level I plan by filling remaining canal sections between plugs. Level II Backfilling fills as much of the length of the canal as possible without affecting flood control in the Upper Basin and at the outlet of the lower basin.

The SFWMD evaluation report concludes:

> *. . . restoration criteria cannot be met by the Weir, Plugging and Level I Backfilling Plans. [These . . .] Plans would result in excessive river channel velocities, rapid stage recession rates, inadequate floodplain inundation and would not restore the ecological integrity of the river ecosystem. The Level II Backfilling Plan would meet restoration goals and criteria by reestablishing prechannelization hydrologic characteristics along 52 contiguous miles of river channel and 24,000 acres of floodplain. The Level II Backfilling Plan would restore the ecological integrity of approximately 35 square miles of river ecosystem.*[9, 10]

Re-enter: The U. S. Army Corps of Engineers (1990-1991)

The Corps of Engineers' *Integrated Feasibility Report and Environmental Impact Statement for the Environmental Restoration of the Kissimmee River* (December 1991) sets forth the Congressional authority for undertaking its "second Federal feasibility study" as follows:

> *In November 1990, shortly after the completion of the SFWMD restoration study, Congress authorized a second Federal feasibility study in section 116(h) of the Water Resources*

---

[8] The University of California at Berkeley (UCB) under contract with SFWMD, conducted physical and mathematical modeling studies primarily to evaluate sedimentation and erosion issues, preliminary designs of fixed and gated weirs, and feasibilities, shapes, and profiles of plugged and backfilled canal sections. A 60 by 80 foot physical model was constructed representing 400 acres in pool B. SFWMD reports indicated that "*. . . model studies vividly demonstrated that soil backfill can be placed in the canal and flow returned to the river channel and floodplain while preventing erosion and the transfer of sediment to Lake Okeechobee and insuring flood protection for private property.*" The studies were initiated and directed by Professor H.W. Shen, internationally noted for his river engineering studies.

[9] During the Corps of Engineers' reevaluation and recommendation of SFWMD's Level II Backfilling Plan, these figures became 56 contiguous miles of river channel, 29,000 acres of floodplain, and 50 square miles of river ecosystems.

[10] An extensive peer review of the *Plan Evaluation and Preliminary Design Report* was undertaken by a panel of experts who also evaluated the work done at UCB. In addition to James R. Karr, PhD, Landscape/Community Ecologist, mentioned earlier, the panel included Heinz G. Stefan, Dr. Ing., Civil/Hydraulic Engineer, Professor and Associate Director, Saint Anthony Falls Hydraulic Labratory, University of Minnesota, and William A. Thomas, Civil/Hydraulic Engineer, Waterways Experiment Station, U.S. Army Corps of Engineers.

Development Act of 1990. This section of the Act authorized the Secretary of the Army to conduct a feasibility study of the Kissimmee River flood control project to identify modifications necessary to provide a comprehensive plan for the river's environmental restoration. The authority states that the feasibility study,

> *" . . . shall be based on implementing the Level II Backfilling Plan specified in the Kissimmee River Restoration, Alternative Plan Evaluation and Preliminary Design Report, dated June 1990, published by the South Florida Water Management District."*

The urgency to quickly complete the study was expressed in the authority's requirement that the Secretary of the Army submit to Congress the final report of the Chief of Engineers on the results of this study by April 1, 1992.

The feasibility report was prepared following all normal COE analyses and processes. Modifications to the SFWMD plans were made as necessary. Costs were then re-analyzed and increased where indicated.

The report lists the names and expertise of the fifteen persons who prepared the integrated feasibility study and environmental impact statement, together with their experience and role in the preparation of the document. Their listed talents are:

Biology	5
Civil Engineer	3
Water Resources Planning	2
Aquatic Biology	1
Fish and Wildlife	1
Environmental Engineer	1
Archaeology	1
Outdoor Recreation Planner	1

In the end, the Corps of Engineers' recommendation was, essentially, the 1990 SFWMD plan. On page 239 of the COE's Jacksonville District report, it states:

> *I recommend that the Central and Southern Florida Project be modified to allow for the environmental restoration of the Kissimmee River, and that the modified Level II Backfilling plan for the restoration of the Kissimmee River, described in the chapter of this report entitled "The Recommended Plan," be implemented with such modifications thereof as in the discretion of the Commander, HQUSACE, may be advisable. The total estimated cost of the recommended plan is $422,677,000.*
>
> *TERRENCE C. SALT*
> *Colonel, Corps of Engineers*
> *Commanding*

Conclusion and an Observation (1992-2002 and Beyond)

Presumably, the Corps of Engineers' report and recommendations will be transmitted to the Congress on schedule, as directed (April 1, 1992). Whatever the outcome of subsequent Congressional deliberations, the people and public officials in Florida have tenaciously pursued their convictions to put right an environmental wrong. They have demonstrated an outstanding level of professionalism in the identification of the public interest in this case. We suspect that the Congress will look with favor on the reports and recommendations of the Corps of Engineers and the South Florida Water Management District. We can then look forward to ten to fifteen years of precedent-setting environmental restoration work that can establish new norms for public works improvements in the civilized world.

[For more information contact: Kathy Copeland, South Florida Water Management District, 3301 Gun Club Road, P.O. Box 24680, West Palm Beach, FL 33416-4680. Phone: (407) 687-6303.]

Farming Corporation Pays a $680,000 Settlement For Destruction of Wetlands in Florida

In a matter related geographically and spiritually to the Kissimmee River restoration recited above, the Thursday, November 28, 1991 issue of *The Palm Beach Post* reported an out-of-court settlement to a South Florida Water Management District suit for wetlands environmental damage near Lake Okeechobee. As the Post reported:

> *Cattle and citrus firm Lykes Bros. Inc. would pay $680,000 in fines and legal fees for digging canals that threatened 4,900 acres of wetlands near Lake Okeechobee under a settlement announced Wednesday.*

Headlines in the newspaper reported:

> ***Lykes Bros. agrees to pay $680,000 to end wetlands case***
>
> ***The company must restore marshlands and fill at least 16 miles of illegally dug canals***
>
> ***Company calls canals a 'colossal mistake'***

The newspaper story reported:

> *Wetlands are important as wildlife habitats and to recharge groundwater supply. The Florida Game and Fresh Water Fish Commission says the Lykes property is within the range of the Florida panther and also is home to threatened and endangered birds.*

The canals were discovered during a routine District surveillance flight in September 1989. The Post report stated:

> *As the District and Lykes argued about the extent of environmental damage, the district prepared a lawsuit, which it filed in September 1990. The suit sought to make the company restore the property and pay up to $10,000 a day in fines. The maximum fine had reached $7 million before the tentative settlement was struck.*
>
> *Under the agreement, Lykes will pay a $550,000 fine and $105,000 for attorney and investigative fees. It will also pay for a $25,000 University of Florida study on how canals affect wetlands.*

Tilford Creel, SFWMD executive director, was quoted in the Post story as saying:

> *What started out as an environmental disaster can be turned into an environmental success.*
>
> *The size of the fine sends a message to developers that they must follow proper procedures.*

Notes on Watershed Management

Forestry Project Assists In Improving Water Quality in the Monocacy River Watershed

EDITOR'S NOTE: George Eberling is with the Forestry Division of the Maryland Department of Natural Resources. His job title is Monocacy Watershed Forester. He read our article concerning the USDA Monocacy River Water Quality Demonstration Project operating through Frederick and Carroll Counties, the Maryland Cooperative Extension Service and ASCS (*News-Notes*, October-November 1991, Issue #16). He penned the following article, filled out The COUPON and sent it in. (See Dispatch #1 below) It's a good story about forestry's role in cleaning up the river. This project is partially funded with CWA 319, nonpoint source control funds. Dispatch #2 developed when we asked George for more information on the cost-sharing programs he is using. We've taken the liberty of editing his work slightly to fit the *News-Notes* style. Thanks for sharing all of this good information with us, George.

Forestry Project Assists In Improving Water Quality in the Monocacy River Watershed (continued)

Dispatch #1

In the last issue (#16) of *News-Notes*, there was a feature on the Monocacy River Watershed Water Quality Demonstration Project. I would like to share with you a different type of water quality project in the Monocacy Watershed called the Monocacy River Basin Forestry Project (MRBFP). This project, sponsored through annual grants from EPA, is administered by the Maryland Resource Conservation Service's Forestry Division. The project began in late spring of 1989, and it focuses on controlling nonpoint source pollution throughout Maryland's portion of the Monocacy Watershed. Unlike other projects in the watershed, the MRBFP uses forest buffers along the waterways to control NPS. Depending on site conditions, a forest buffer as little as fifty feet wide will filter the majority of nonpoint source pollutants out of agricultural and urban runoff before they can reach the waterway. This is very important, especially in the Monocacy watershed where the northern two-thirds is still heavily agricultural while the southern one-third is quickly urbanizing.

The filtering effect of a forest buffer is two-fold. Nutrient-type pollutants (primarily nitrogen and phosphorous) are actually taken up by the trees and used for growth. Non-nutrient pollutants (soil, chemicals, etc.) are filtered out and incorporated in the many organic layers of the forest floor. The floor of a forest buffer can effectively filter up to six inches of rainfall per hour.

This figure, impressive enough on its own, is exceptional when added to the other benefits provided by forest buffers. Due to their proximity to water and open areas, forest buffers are extremely important habitat for numerous wildlife species as well as serving as travel corridors between different habitat types. Trees shade and cool the waterways underneath them, thus improving aquatic habitat via lower water temperatures and higher dissolved oxygen levels. Overhanging branches and roots provide cover for aquatic life. Leaves, twigs and other detritus provide the fundamental food source in the aquatic food chain. Trees also produce oxygen, filter pollutants from the atmosphere, and furnish timber products. [Streamside tree buffers also help in streambank stabilization – eds.]

Establishing a forest buffer simply involves planting seedlings on open land. In Maryland, there are several valuable incentives to encourage private landowners to plant forest buffers. First, through the Maryland Green Shores Buffer Incentive Program (BIP)[1], a landowner may receive a $200 per acre payment for each acre of forest buffer planted. Seedlings for these conservation plantings are available through the State Nursery at a very low cost. On public land (local parks, schools, etc.), seedlings are available free of charge for buffer planting through the Maryland Green Shores Program and are generally planted by volunteers.

Second, these plantings may also be cost-shared through the USDA Agricultural Conservation and Stabilization Service (ASCS). If a forest buffer already exists on a site, the effort does not stop here. Existing forest is often in need of some type of cultural treatment to maintain an effective filtering function. Forests that are not growing well due to overcrowding, senescence, insect or disease occurrence, etc., are inefficient filters of nonpoint source pollution. They may require thinning to remain functional as filters. Activities such as non-commercial thinning are also cost-sharable through the ASCS.

Two MRBFP foresters develop individual plans for each landowner or municipality interested in forested buffers, along with administering the various cost-share programs for private landowners. After only two planting seasons (the springs of 1990 and 1991), over 45,000 linear feet of forest buffer have been planted. This has resulted in a little over 8.5 miles of newly buffered waterways. A total of 135 acres of trees have been planted so far. The project has developed Resource Conservation Plans for another 1,400 acres, including recommendations for another 25 miles of forest buffer. Two forest buffer demonstration areas have been developed by the MRBFP and are open to the public, and a project display and brochure have also been developed and are used extensively. Two other similar projects, also funded by EPA, exist in Maryland. One covers Maryland's portion of the Susquehanna Watershed, and a new project covers the highly urbanized Anacostia Watershed.

[1] The Maryland Green Shores Private Land Buffer Incentives Program has been established to encourage the planting and maintenance of forested buffers around the Chesapeake Bay and its tributaries.

Dispatch #2

EDITOR'S NOTE: In the following supplement to be above article, MRBFP'S George Eberling uses a landowner case study to illustrate how the project integrates several cost-share programs.

Although planting trees is an inexpensive controller of nonpoint source pollution, it often times still requires a cash outlay that many landowners cannot afford. In order to encourage these types of tree plantings, several cost-share programs have been developed.

ASCS Programs

First, a landowner may get up to 65% of tree planting expenses cost-shared through one of two USDA Agricultural Stabilization and Conservation Service (ASCS) programs. These are the Agricultural Conservation Program (ACP) and the Forestry Incentive Program (FIP). These programs are virtually the same in their cost-shares, except that FIP covers only forestry activities and is only for larger plantings (10 acres or more), while ACP covers many other agricultural cost-share activities. Either of these may be used to cost-share any type of conservation tree planting, not just buffer plantings.

Maryland Green Shores Buffer Incentive Program

In order to complement the ASCS programs and to encourage more people to plant forested stream buffers, the Maryland Department of Natural Resources Forestry Division developed the Green Shores Buffer Incentive Program (BIP). BIP may be used alone or in conjunction with either ACP or FIP and allows for a $200 per acre payment to a landowner. It is strictly for forested stream buffer plantings. There is a minimum requirement of one acre and a 50-foot buffer width (either 50 feet of planting or enough planting to make an existing buffer 50 feet wide).

Fifty feet is the minimum buffer width that will provide effective filtering of runoff. A fifty-foot-wide forest buffer will trap virtually all sediment and thus most of the phosphorous bound in sediment. It will trap about 85% of the soluble nitrogen from runoff. Forest buffers are also extremely valuable in the urban environment for filtering out toxics (petroleums, pesticides, etc.).

To put this in terms of dollars, here is a brief landowner case study: In the spring of 1990, a landowner with property on the Monocacy River signed up for ACP and FIP and planted six acres of forest buffer. About half was to widen an existing narrow buffer along the river, and the other half was to buffer both sides of a tributary that crossed the property. The surrounding land was primarily cropland with some hayland and pastureland. The minimum recommended buffer width of 50 feet was used. This translates into almost one mile of effectively buffered waterways for this property. Hardwood and shrub seedlings were purchased from the state nursery at a cost of $750 for the six acres. The landowner paid a contractor to machine plant the area for another $750. Total expenditure for seedlings and planting was $1500. Nine hundred and seventy-five dollars in ACP funds were paid to the landowner upon presentation of the bills and approval by Maryland's Forestry Division.

A survival check was performed one growing season after planting for BIP funding. Provided acceptable survival (65%) is found, the landowner is paid $200 per acre. This helps to insure that initial planting maintenance (mowing, etc.) is performed to successfully establish the seedlings. In this case, the survival rate was 80%, which is considered very good. Through BIP, the landowner was paid $1200 for six acres.

Total payments to the landowner for planting six acres of forest buffer were $2175, while the landowner's costs were only $1500. The landowner ended up receiving $675 in net revenue for planting almost a mile of forest buffer. Pretty good incentive, huh?

Although costs will vary some with geographical region and planting scheme, the costs shown here are average for the Monocacy watershed. I've worked with buffer plantings from one acre up to 30 acres, and the one acre plantings are as important as the larger ones to me. One acre of buffer at 50 feet wide translates into almost 900 linear feet of waterway being protected.

Forestry Project Assists In Improving Water Quality in the Monocacy River Watershed (continued)

Anytime you can effectively filter the runoff to 900 feet of waterway by doing something as simple as planting an acres of trees, I think you're doing a pretty good thing.

[For more information, contact: George Eberling, Monocacy Watershed Forester, Monocacy River Basin Forestry Project, 1260 Maryland Ave., Hagerstown, MD 21740. Phone: (301) 416-4010. FAX: (301) 791-0173. We suggest you ask George for a copy of his very informative and attractive brochure.]

Index of Biotic Integrity Expectations Cooperatively Developed for Indiana Ecoregions

EDITOR'S NOTE: Thomas P. Simon, Aquatic Biologist with EPA Region V's Central Regional Laboratory in Chicago, used The COUPON, to share this story with our readers. We are happy to pass it along.

A cooperative project between the state of Indiana, Department of Environmental Management, and the U. S. Environmental Protection Agency, Central Regional Laboratory, Region V, recently completed an analysis of the expectations for a biological characterization of the fish communities of northwestern Indiana. The study utilized the ecoregion approach developed by Omernik (1987) and expanded upon by Omernik and Gallant (1988) in examining regional expectations for assessing degradation caused by point and nonpoint source inputs on the aquatic community.

The Calumet Region of northwestern Indiana has been exposed to a variety of anthropogenic alterations from urbanization, industrialization, agriculture, and extensive ditching in the Grand Calumet, Little Calumet, Kankakee, and Iroquois River Basins. The basins were divided into three study segments to assess regional heterogeneity based on known historical alterations within the Lake Michigan, Kankakee and Iroquois drainages. Graphical analysis of the data enabled the construction of maximum species richness lines for calibrating the Index of Biotic Integrity for 17 metrics as modified for the application to the regions of Indiana. Metrics were primarily based on the previous work of Karr (1981), Karr et al. (1986), and Ohio EPA (1987). A few additional metrics are original to the study and were evaluated to quantify water quality degradation characteristics.

Separate metrics were developed for headwater (< 20 miles^2) and wading sites (> 20 miles^2) drainage area following the rationale of Ohio EPA (1987). Separate scoring criteria and batteries of metrics were developed for the Lake Michigan drainage while the Kankakee and Iroquois River drainages were evaluated with similar metric categories. Within the Lake Michigan drainage, two divisions were recognized based primarily on the presence of salmonid species. Trout and salmon, as keystone species, determine the fish community where they are residents. The East Branch of the Little Calumet River Division includes the salmonid metric and includes the area from Burns Ditch, the East Branch of the Little Calumet River, and all tributaries. The Lake Michigan Division includes the West Branch of the Little Calumet River and tributaries and the Grand Calumet River.

The water resources of the three drainages were evaluated based on criteria calibrated for the Central Corn Belt ecoregion using the Indiana adapted version of the Index of Biotic Integrity. The distribution of the Index of Biotic Integrity scores approximate a normal curve for the Kankakee and Iroquois River basins, with respect to site-specific water quality classification. A trend towards improved water resource quality was evident with increasing drainage area. The Lake Michigan drainage showed a highly skewed site distribution towards the lower extremes of water resource quality. The trend was toward a declining water resource with increasing drainage area in both divisions, although the East Branch Little Calumet Division possessed a considerably better resource at the headwaters. Site specific data, locality information, species specific scoring criteria for tolerance classification, trophic guilds, and reproductive guilds were scored for Indiana taxa.

The project is part of an ongoing study of the biological expectations for the ecoregions of Indiana project. Sampling completed during 1990 included the Huron-Erie Lake Plain and Southern Michigan-Northern Indiana Till Plain ecoregions. The Central Corn Belt Plain study will be available by mid-February 1992 as an EPA Technical Report, EPA 905/9-91/025.

Literature Cited

Karr, J.R. 1981 Assessment of biotic integrity using fish communities. Fisheries 6: 21-27.

Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser, 1986. Assessing biological integrity in running waters: a method and its rationale. Ill. Nat. Hist. Surv. Spec. Pub. 5. 28 pp.

Omernik, J.M. 1987. Ecoregions of the conterminous United States. Ann. Ass. Am. Geo. 77:118-125.

Omernik, J.M. and A.L. Gallant. 1988. Ecoregions of the upper Midwest States. USEPA, ERL, Corvallis, OR. EPA/ 600/3-88/037.

[For further information contact Thomas P. Simon, Aquatic Biologist, U.S. EPA, Central Regional Laboratory, 536 South Clark Street, Chicago, IL 60605. Phone: (FTS/312) 353-5524. FAX (FTS/312) 886-2591.]

Agricultural Notes

*Farm*A*Syst Demonstrations Established in Michigan; Program Goes Nationwide*

"Seeing is believing," an old education axiom, is being used in a water pollution prevention demonstration in Michigan. Two farms in the Grand Traverse Bay area of Michigan are serving as sites to demonstrate the Farmstead Assessment System (Farm*A*Syst), a new groundwater pollution prevention tool for farmsteads and rural residents.

According to the Farmstead Assessment Program's October 1991 newsletter, the demonstration farms offer the public an opportunity to view and discuss Farm*A*Syst in action. The use of Farm*A*Syst, developed in Wisconsin and Minnesota, is being expanded nationally so that all states will be able to adapt the prototype materials and start their own Farm*A*Syst programs.

Farm*A*Syst worksheets were used by the Cooperative Extension Service (CES), Soil Conservation Service (SCS), and Soil Conservation District staff while conducting farmstead assessments with the two Michigan landowners. High potential risks to groundwater were found. To reduce these pollution risks, the landowners agreed to modify and install control structures and change their management practices. On one farm, an animal waste storage and runoff control system was constructed, and a below-ground petroleum storage system was replaced with an above-ground system.

On a second farm, the cooperating farmer's highest risks were related to pesticide storage and mixing. The farmer, a fruit tree grower, also had risks associated with handling and storing petroleum products. At this site a pesticide storage area on a pad, with spill containment features, is being designed, and an above-ground petroleum product storage system will be installed.

Improved farmstead management to reduce pollution risks is also being implemented at both sites. These practices include better fertilizer and manure management, better pesticide and petroleum tank-filling practices, improved chemical storage practices, anti-backsiphon precautions, and installation of check valves.

In *NPS NEWS-NOTES* issues #9 and #16, we reported on the development of Farm*A*Syst's pilot versions in Wisconsin and Minnesota, and the funding received from the U.S. EPA, and U.S. Department of Agriculture Extension Service and SCS to expand the project nationally.

How The Assessment Works

Farm*A*Syst works by using a series of 12 worksheets that evaluate the risk of well water contamination from farm and rural activities. For example, worksheet #1 of the series assesses groundwater contamination risk based on the condition of drinking-water wells. This groundwater protection tool is especially important because the vast majority of the nation's rural residents use groundwater to supply their drinking water and farmstead needs. The assessment system also includes educational materials that aid farmers in conducting

*Farm*A*Syst Demonstrations Established in Michigan; Program Goes Nationwide (continued)*

farmstead inventories and evaluating contamination sources. Assessment results are used to develop a voluntary action plan to reduce pollution risks.

The assessment can be done individually or in group-education sessions. Group sessions normally involve local professionals and agency technical staff who help farm operators choose corrective actions.

Farm*A*Syst is a unique program because it examines a wide range of potential contaminants and remedies in a comprehensive, easy-to-use format. This means that there is now a mechanism available that allows farmers and rural residents to assess pollution risks associated with their farmsteads and home sites and take decisive action to preserve the quality of their drinking water.

Program Goes Nationwide

A cooperative core program team staffed by EPA, CES, and SCS, located at the University of Wisconsin-Madison, will provide guidelines and educational support to states interested in starting their own Farm*A*Syst programs. Inquiries for Farm*A*Syst information, use, and possibilities for adaptation have been received from more than 40 states.

As a part of their support of the Farm*A*Syst adaptation in other states, the Farm*A*Syst staff will:

- Provide Wisconsin and Minnesota Farm*A*Syst packets including worksheets and fact sheets. These packets can be modified by other states for their own programs. The packets can be purchased for $12.00 plus shipping. Order Wisconsin packets from: Agricultural Bulletin, Rm. 245, 30 N. Murray St., Madison, WI 53715. Phone: (608)262-3346. Minnesota packets can be ordered from University of Minnesota Distribution Center, 1420 Eckles Ave., St. Paul, MN 55108.
- Provide word processed versions of the Wisconsin packet that states can edit on disk. These cost $25.00 plus shipping. Contact the Farm*A*Syst staff for ordering information. Disks are available in four formats: MacIntosh Pagemaker, IBM Pagemaker, IBM WordPerfect, or ASCII.
- Conduct regional training workshops for states.

*[For more information, contact: Susan A. Jones, EPA Coordinator, Jerry Griswold, SCS Coordinator, or Gary W. Jackson, Extension Coordinator, Farm*A*Syst Program, B142 Steenbock Library, 550 Babcock Drive, Madison, WI 53706-1293. Phone: (608)262-0024. FAX: (608)265-2775.]*

USDA Stresses Nitrogen Management in Water Quality Funding

In 1991, the USDA Cooperative State Research Service(CSRS) awarded Special Research Grants to 32 Water Quality Initiative projects involving nitrogen. The projects included ten related to management practices, five related to nitrogen leaching and movement, five related to manure, seven related to groundwater contamination, and two involving nitrogen requirements.

CSRS, in cooperation with the Agricultural Research Service, EPA and other agencies, recently sponsored a workshop in Washington, D.C. to identify problem areas to be addressed in an expanded soil testing research grants program. The workshop brought together 40 experts in agriculture, water quality, and related disciplines to assess current research needs concerning nitrates in the soil and water. Objectives of the research are to determine nitrogen levels needed for crop production and to identify excess nitrates that may leach into groundwater from the soil.

The USDA Extension Service funded 36 nutrient management projects in 1991 as part of an effort to strengthen state Extension water quality education programs. The primary goal of these projects is to encourage more farmers to adopt improved nutrient management practices, especially for nitrogen. Projects include the development of bulletins, fact sheets, and other educational materials explaining the effects of nutrient management practices on water

USDA Stresses Nitrogen Management in Water Quality Funding (continued)

quality. Other projects emphasize on-farm demonstrations and the refinement of improved nutrient management practices. Extension field staff will be trained in water quality principles and practices so that they can educate producers in the latest nutrient management technologies.

[For additional information, contact: Maurice L. Horton, USDA-CSRS, Rm. 329 Q, Aerospace Center, 910 D St., SW, Washington, D.C. 20250-2200. Phone: (202)401-4504. FAX: (202)401-1706; or contact: Francis Thicke, National Program Leader, Soil Science, USDA-ES, Rm 3346-S, Washington, D.C. 20250. Phone: (202)720-7165. FAX: (202)690-0289.]

Nonpoint Source Electronic Bulletin Board (BBS) News

Update for On-Line News-Notes

The on-line searchable *News-Notes* database has been updated. *NPS BBS* users will now find issues #1 through #17 in Door 2 of the *BBS*. Users will be able to search the articles by article number, title, text or keywords.

The list of keywords has been updated to reflect emerging trends and technology in the water quality world. Users who wish to search articles by assigned keywords should print out Bulletin #5, which contains instructions for using the database, as well as a list of the new keywords. This is the only place the new keywords are listed at the present time.

To use the database, type "OPEN 2" from the main board command prompt. Once in the *News-Notes* database, users will be guided through the user-friendly system.

To access the *BBS*, use your telecommunications software and modem (1200 or 2400 baud) to dail (301) 589-0205. For more information, use the COUPON in back of this *News-Notes* to write for the free *NPS BBS* user's manual.

Datebook

This DATEBOOK has been assembled with the cooperation of our readers and the Conservation Technology Information Center, 1220 Potter Dr., Rm. 170, West Lafayette, IN 47906-1334. If there is a meeting or event that you would like placed in the DATEBOOK, contact the *NPS NEWS-NOTES* editors. Due to an irregular printing schedule, notices should be in our hands at least two months in advance to ensure timely publication.

Correction: *In News-Notes #17, we inadvertantly printed the deadline for abstracts for WEF's "Surface Water Quality and Ecology" Symposium as July 15, 1992. The correct deadline is January 15, 1992. We apologize for any inconvenience caused by this error.—eds.*

MEETINGS AND EVENTS

1992

March

3-4 — *Integrated State and Local Wetland Management*, Houston, TX. Contact: John Custler, Association of State Wetland Managers, (518) 872-1804. Theme: Integrating wetland protection, riparian habitat management, stormwater management, and point and nonpoint source pollution control.

10 — *National Monitoring and Evaluation Conference and Nonpoint Source Workshop*, Chicago, IL. Contact: Bob Kirschner, Northeastern IL Planning Comm., 400 W. Madison St., Chicago, IL 60606. (312) 454-0400. Registration: $65 before 2/21, $85 later. Sponsors: EPA Region V and CERI, Northeastern IL Planning Commission, SCS, CTIC, and OK Conservation Commission. Topics include: measuring biological impacts of nonpoint source pollution, national monitoring guidance.

16-17 — *Living With Wetland Policies and Politics: 1992 Nebraska Water Conference*, Lincoln, Nebraska. Contact: Bob Kuzelka, 103 Natural Resources Hall, Lincoln, NE 68583-0844. (402) 472-3305. There are 12 different registration options, ranging in cost from $10 to $80. Free 2-hour workshop on wetlands management for landowners. Topics: Nature of NE wetlands; wetlands as habitat; economics of wetlands; etc.

19-21 — *Southeast Regional Lake Management Conference*, Marietta, GA. Contact: NALMS, 1 Progress Blvd., Alachua, FL 32615. (904) 462-2554.

1992

March

21-22 *New England Environmental Conference,* Medford. MA. Contact: Environmental Citizenship Program, Lincoln Filene Center, Tufts University, Medford, MA 02155. (617) 627-3451. Fifty workshops. Speakers include: Phillip Berry, President, National Sierra Club; Julie Belaga, EPA Region 1 Administrator; Nemiah Arap Rotich, Exec. Dir., East Africa Wildlife Society; Brock Evans, Vice President, National Audubon Society; Jane Pratt, Environmental Operation, World Bank. On Friday, March 20, there will be a symposium on zero pollution discharge.

24-26 *State/EPA Water Quality Data Assessment Seminar,* Wagoner, OK. Contact: Charlie Howell, Regional Monitoring Coord., (6E-SA), U.S. EPA Region 6, 1445 Ross Ave., Dallas, TX 75202. (214) 655-2289. Sponsor: EPA Region 6. Topics include wet weather monitoring techniques and data analyses.

25-26 *North Dakota Water Quality Symposium,* Bismark, ND. Contact: Bruce Seelig, Water Quality Specialist, Ag. Engineering, North Dakota State University, Box 5626, Fargo, ND 58105. (701) 237-8690. A forum for exchange of research, information and ideas on a range of water quality topics.

25-26 *Water Quality Standards on Indian Lands,* Denver, CO. Contact: Patti Morris, Office of Science & Technology, U.S. EPA (WH-585), 401 M St., SW, Washington, DC 20460. FAX (202) 260-9830. Sponsored by EPA. Purpose: Assist Indian Tribes to develop WQS.

29-4/2 *3rd National Citizens' Volunteer Water Monitoring Conference,* Annapolis, MD. Contact: Volunteer Monitoring Conf., IWLA, 1401 Wilson Blvd., Arlington, VA 22209. (703) 528-1818. "Building Partnerships in the Year of Clean Water." Sponsors: EPA, Izaak Walton League of America, Alliance for the Chesapeake Bay and America's Clean Water Foundation.

April

5-8 *Organizing for the Coast: Coastal Society Annual Conference,* Washington, DC. Contact: Lauriston King, Office of University Research, Texas A & M University, College Station, TX 77843. (409) 845-1811. Possible topics: Estuarine and coastal research, communicating scientific advice to policymakers, citizen participation, marine education.

12-16 *Availability of Groundwater Resources,* Raleigh, NC. Contact: Robert C. Borden, Technical Comm. Chair, Dept. of Civil Engineering, North Carolina State University, PO Box 7908, Raleigh, NC 27895. (919) 515-7665.

13-16 *National Wildlife Criteria Methodologies Meeting,* Charlottesville, VA. Contact: Lisa Grayson, JT&A, 1000 Connecticut Ave., NW, Washington, DC 20036. (202) 833-3380. EPA-sponsored forum for discussion of proposed ways for defining wildlife-protective water quality criteria. Register by 3/6. Make room reservations at Boar's Head Inn in Charlottesville by 3/13. Limited to 40. Others welcome as observers.

May

6-8 *Enhancing States' Lake Management Programs: Strengthening State and Local Interactions,* Chicago, IL. Contact: Bob Kirshner, Northeastern IL Planning Comm., Natural Resource Dept., 400 Madison St., Chicago, IL 60606. (312) 454-0400. Sponsors: EPA, Clean Lakes Program, Northeastern Illinois Planning Comm., NALMS.

27-29 *Forest Practices and Water Quality Workshop,* Green Bay, WI. Contact: Edward Eckert,Forest Resource Planner, Forest Management Division, MI Dept. of Natural Resources, PO Box 30028, Lansing, MI 48909. (517) 335-3351. Sponsor: Lake States Forestry Alliance. Purpose: To develop ways of properly addressing the intent of the CWA as directed at timber harvesting and its effects on groundwater and surface water quality in MI, MN and WI.

August

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 of human resources in natural resources.

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. FAX: (202) 260-9830. Theme: FY 94-96 WQS Priorities.

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

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.

The Coupon

Nonpoint Source Information Exchange Coupon #18

(Clip or Photocopy and Mail or FAX this coupon to us)

Our Mailing Address: **NPS News-Notes (WH-553),** Assessment and Watershed Protection Division U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460

Our Fax Number: **NPS News-Notes**, (202) 260-1517

Use this Coupon to: (check one or more)

- ❑ *Share your Clean Water Experiences, OR*
- ❑ *Ask for Information, OR*
- ❑ *Make a Suggestion*

Write your story, ask your question, or make your suggestions here:
Attach additional pages if necessary.

- ❑ *I want the revised NPS/BBS Users' Manual. Please send me a copy.*
- ❑ *Please add my name to the mailing list to receive News-Notes.*

Your Name: _____

Organization: _____

Address: _____

City/State: _____ **Zip:** _____

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 which often adversely affects the biological integrity of surface waters.

NPS NEWS-NOTES is published under the authority of section 319(l) of the Clean Water Act by the Nonpoint Source Information Exchange, (WH-553), Assessment and Watershed Protection Division, Office of Wetlands, Oceans and Watersheds, Office of Water, U.S. Environmental Protection Agency, 401 M St., SW, Washington, DC 20460. FAX (FTS/202) 260-1517. Hal Wise, Editor; Elaine Bloom, Associate Editor. Corresponding Editors: Margherita Pryor, Oceans and Coastal Protection Division, OWOW, and John Reeder, Office of Ground Water and Drinking Water. For inquiries on editorial matters call (FTS/202) 260-3665. For additions or changes to the mailing list please use the COUPON on page 27 and mail or FAX it in. We cannot accept mailing list additions or changes over the telephone.

Moving?
Send present mailing label and new address including zip code to:

NPS NEWS-NOTES (WH-553)
Nonpoint Source Information Exchange
Assessment and Watershed Protection Division
Office of Wetlands, Oceans and Watersheds
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

First Class
U.S. Postage
PAID
Permit No. 328
Merrifield, VA