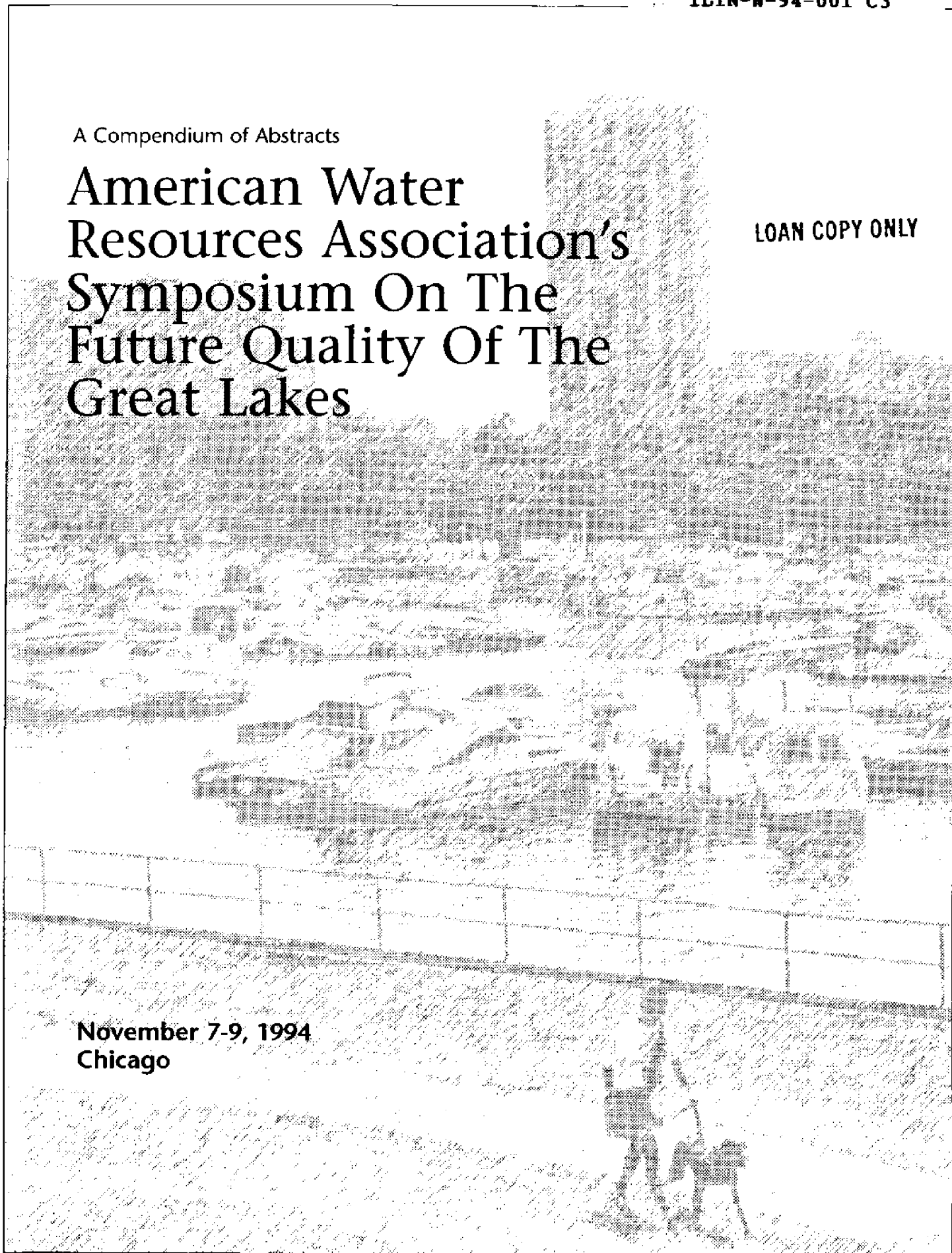


A Compendium of Abstracts

American Water Resources Association's Symposium On The Future Quality Of The Great Lakes

LOAN COPY ONLY

November 7-9, 1994
Chicago



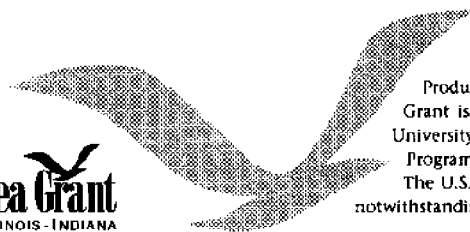
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American Water Resources Association's Symposium On The Future Quality Of The Great Lakes

November 7-9, 1994
Chicago

Compendium Editor *Christine H. Pennisi*
Publication Coordinator *Nancy F. Riggs*


Sea Grant
ILLINOIS-INDIANA



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INTRODUCTION

The American Water Resources Association (AWRA) held its 30th Annual Conference in Chicago, Illinois, November 7-9, 1994. The reason for holding the AWRA Conference in Chicago was because it had not been held in this City for over a decade; the Chicago Lake Michigan lakefront location provided an opportunity for focus on the Great Lakes situation where water quality is improving due to new programs; examples include the Remedial Action Plans and the Great Lakes Initiative. Furthermore, the US EPA's Region 5 and Great Lakes National Program Office (GLNPO) are located in Chicago. Consequently Tom Davenport, Chief of the Wetlands and Watersheds section of the regional US EPA office, organized a Symposium within the larger Conference entitled the "Future Quality of the Great Lakes."

The Marine Extension Educator (MEE) of the Illinois-Indiana Sea Grant Program, Chris Pennisi, cooperated with Tom Davenport to provide this Compendium of Abstracts from the Symposium presentations for several reasons:

1. The Compendium provides a quick overview update on the water quality situation of the Great Lakes that both water quality managers and knowledgeable Great Lakes-oriented citizens will find beneficial to keeping current on this complex issue. It is a good summary document for those that attended and those that did not, but still want this information;
2. The MEE, located in Chicago, is working in the water quality area of the Great Lakes;
3. Because of the Chicago location of the Symposium, many Illinois and Indiana presenters and attendees were at the conference whom the MEE would like to feature or assist respectively, and;
4. This cooperation benefits the public because the water quality expertise of the US EPA matched with the resources and educational expertise of the Illinois-Indiana Sea Grant Program is combined in the production of this Compendium.

Work is being done in many different areas of water quality remediation in the Great Lakes region. Some of it is innovative such as new agricultural conservation tillage techniques and urban combined sewer separations. All this activity in different areas is why the Symposium featured 38 speakers divided into eight different session areas:

1. Soil Erosion.
2. Habitat.
3. Institutional Aspects.
4. Assessing Where We Are Going.
5. Agricultural Nonpoint Sources.
6. Urban Nonpoint Sources.
7. Efforts to Control Great Lakes Pollution.
8. Remedial Action Plans.

This Compendium is organized by these eight session topics. Because only Abstracts are provided, complete names and addresses of primary authors are provided following Abstracts, so that more information on the topic can be easily gathered. It may be puzzling that some topic sessions contain only a few papers. The reason is that not all presenters were required to provide Abstracts.

SESSION GL-1 - CONTROLLING SOIL EROSION

WAUKEGAN RIVER RESTORATION PROJECT

Don Roseboom

The Waukegan Park District is demonstrating the effectiveness of vegetative stabilization on urban parks where high velocity floodwaters have destroyed park bridges and city sewer lines. Under provisions of Section 319 of the 1987 Clean Water Act, the Illinois EPA and Region V of the USEPA have funded innovative stream stabilization efforts, which increase instream habitat while controlling bank erosion. The bank stabilization projects on the north branch of the Waukegan River have successfully withstood the record floods of 1993. These techniques have been successful by increasing gamefish habitat in rural Illinois state parks in projects managed by the Illinois Department of Conservation.

In Washington Park on the Waukegan River, a major bank erosion site resulted from channel scour of the fill material over a major sewer line. The stream was eroding a new channel through the middle of Washington Park following the sewer line. Smaller erosion sites occurred downstream to the junction of the north and south branches of the Waukegan River.

The major restoration effort has been the installation of lunker and a-jack bank structures at these severe erosion sites since 1991. The latest restoration activity coincided with a stream restoration workshop at the EPA second national Nonpoint Pollution Monitoring Workshop in Chicago.

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LAKE COUNTY POLLUTION CONTROL EFFORTS

Richard Mollahan

A concise database is imperative to the development of an effective stormwater management program. Additionally, a well trained field staff, responsible for the documentation of the systems integrity and maintenance, determines whether resources are appropriately targeted to a critical system issues. Lake County Stormwater Commission, utilizing funds obtained through the Illinois EPA and U. S. EPA , has developed the protocols for data inventory, field staff tools and training, and community education in a large watershed area.

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THE CHALLENGE OF PROTECTING STREAMS AND LAKES FROM URBANIZATION

Thomas R. Schueler

Urban streams are arguably among the most degraded aquatic ecosystems in North America. The severity of degradation is linked to the degree of imperviousness in the contributing watershed. Imperviousness refers to the portion of the landscape that has been transformed from vegetative cover into impermeable surfaces, such as roads, roofs, parking lots and driveways. The increase in imperviousness results in dramatic changes in the hydrology, morphology, water quality and ecology of a stream.

Over two decades of research on these diverse and profound changes in stream quality is reviewed, including the increased frequency of erosive floods, the loss of stream habitat structure, stream warming, increased pollutant loadings, and the modification of wetlands, riparian forests, springs, and other critical stream components. The profound influences of these impacts on the biodiversity of the stream ecosystem is outlined.

Local government can play a key role in protecting stream quality during watershed development. A six step program, termed the stream protection approach, presented. The stream protection approach is a comprehensive effort by local government to protect streams through all phases of the development cycle. The six elements include: watershed master planning, environmental development criteria, site planning techniques to reduce imperviousness, erosion and sediment control during construction, implementation of urban stormwater best management practices after construction, and community stream restoration programs to actively involve residents in watershed stewardship activities.

Local governments can adopt the stream protection approach to protect their watersheds through a strengthened development review process, comprehensive stream protection ordinances, and local program development. These guidelines are contained in a recently published manual by the Center entitled "The Stream Protection Approach: guidance for developing effective local nonpoint source control programs in the Great Lakes Region" which is available from the Terrene Institute (202) 833-8317.

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SAGINAW BAY SOIL EROSION AND SEDIMENT DELIVERY TARGETING

Nancy J. Phillips

The Saginaw Bay Watershed, located in the southeastern Michigan, is one of the largest watersheds in the State of Michigan, comprising over 8,650 square miles of land area. Land use in the watershed include agriculture (61%), urban (3%), forests (22%), and recreational areas. The watershed supports aquatic and terrestrial habitat for several endangered species and numerous other fish and wildlife species.

Use impairments in the watershed include restricted bathing, eutrophication, loss of fish and wildlife habitat, restrictions on fish consumption, bird deformities, degradation of benthos, drinking water taste and odor problems, degradation of phytoplankton and zooplankton, tainting of fish flavor, and restrictions on dredging to support navigation. Of primary concern within the watershed is the detrimental effect sediment has on water quality. In this watershed, sediment is acting as a long term reservoir for pollutants including phosphorus, heavy metals and poly-chlorinated biphenyls (PCB's). Sedimentation within the watershed results in the smothering of aquatic habitat, interference of light transmission, and respiration of aquatic plants and animals.

A geographic information system (GIS) was used to analyze and study the watershed to enhance program implementation through identification of critical areas. The data scale selected for an analysis of this size watershed was 1:250,000, with limited scale use of 1:100,000. Critical areas were defined as those areas where sediment delivery and erosion potential were the highest. This was accomplished with a methodology which quantified physical characteristics of the land and its use, utilized the universal soil loss equation (USLE) as the primary algorithm, and developed overall unit area calculations.

Assumptions made during the study included a zone of contribution around streams of 1/4 mile, a sediment delivery ratio of 1.0, and a cover of continuous row crop with conventional tillage. A variable factor matrix using percent slope and erodibility indices was developed to identify potential priority areas within the watershed. Unit area analysis was used to further prioritize areas based upon sediment delivery and erosion potential.

Results of the sediment delivery analysis placed the Tittabawasee River subwatershed first, followed by the Pigeon-Wiscoggin subwatershed, and then the Pine River subwatershed. Unit area analysis of sediment delivery placed the Pigeon-Wiscoggin subwatershed first, followed by the Tittabawasee River subwatershed, and then the Cass River watershed. Results of the erosion potential analysis placed the Shiawasee River subwatershed first, followed by the Tittabawasee River subwatershed, and then the Flint River subwatershed. Unit area analysis of erosion potential placed the Shiawasee River subwatershed first, followed by the Pigeon-Wiscoggin River subwatershed, and then the Cass River subwatershed.

A field study was conducted for a single county to determine to what extent this predictive approach at this particular scale was effective. Within the county, field investigations revealed that four areas had active erosion and sediment delivery. Of these four sites, two had been predicted with this approach.

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URBAN RESOURCE CONSERVATION IN THE GRAND CALUMET BASIN

Roger Nanny

Northwest Indiana is one of the 43 Areas of Concern on the Great Lakes designated by the International Joint Commission. Due to the toxic sediment in the Grand Calumet River that discharges into Lake Michigan, the areas waters have limited development of fish and other aquatic life and impaired potential for public use. The 43,000 ac. river basin is heavily industrialized with steel and petrochemical based land uses. In 1987 a Citizen Advisory Committee for the Remediation of the Environment was formed through the Indiana Department of Environmental Management (IDEM) Remedial Action Plan to address the problems in the area. Through the Region 5 EPA and IDEM the Lake County Soil and Water Conservation District and the USDA Natural Resources Conservation Service have developed a report on "Urban Targeting of Nonpoint Source Pollution in the Grand Calumet River Watershed". This report has resulted in the accelerated implementation of several Section 319 nonpoint source Best Management Practice demonstrations being installed in the area, i.e. shoreline stabilization, streambank protection, an artificial wetland, and sand filters.

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SESSION GL-2 - HABITAT

RESTORATION OF WETLANDS IMPACTED BY AGRICULTURAL CROP PRODUCTION

Lawrence N. Ludwig¹ and Dante Zettler²

Much of the natural wetlands that occurred in glaciated regions of the Great Lakes Basin have been converted to agricultural use. Wetland quality and quantity have declined dramatically since the first settlers arrived in this region. Many of the wet meadows, marshes, and wet forests that once existed are now drained croplands.

This study involved investigating the ability of a local drainage basin to support a wetland environment on a site impacted by heavy agricultural use. The site, historically a wetland area, had been converted to cropland within the last fifty years.

A hydrologic analysis was performed using the Hydrologic Engineering Center HEC-1E model to examine the long-term moisture balance relationships in the project area. The computer model was used to analyze runoff and interflow volumes, losses due to groundwater infiltration, evaporation and transpiration, and estimate the temporal variation in stored water volume at the potential wetland site. The analysis examined one-year periods of time to account for seasonal variability in precipitation.

Based upon the modeling results, a wet meadow was chosen as the most suitable type of wetland to be constructed on the site. Site-specific goals were established to evaluate the degree to which the functional recreation of a natural system was achieved. A long-term monitoring plan was developed to ensure the continuing viability of the constructed wetland and provide baseline information for future projects of this type.

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HYDROLOGY OF DEAD DOG CREEK, NEARBY WETLANDS, AND THEIR RELATIONSHIP TO LAKE MICHIGAN

Sandy Kubillus

As Dead Dog Creek flows downstream from its headwaters in a rural area west of Winthrop Harbor, Illinois, it runs through a steep ravine, flows through extensive wetlands in Illinois Beach State Park - North Unit, and discharges into Lake Michigan.

The hydrology of Dead Dog Creek was studied by measuring stage height and discharge at three stream locations. The upper creek responded quickly to precipitation events, while the lower creek was influenced by wetlands and showed a delayed response. The average discharge in the creek was 2.28 cfs during the study period.

Local precipitation of 51.91 inches was monitored from March 1992 through June 1993. Evapotranspiration was estimated at 30.71 inches, and a change in storage of 4.0 inches was calculated with the hydrologic equation.

Piezometers placed into the sand aquifer showed that groundwater flowed regionally toward lake Michigan. The creek and the wetlands were areas of groundwater discharge.

A time-of-travel study showed that Rhodamine WT flowed 11,000 feet in 10 - 20 hours depending on discharge rates.

Water quality of the creek and wetlands was tested by using biological and chemical methods.

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AQUATIC BEACH MEIOFAUNA OF SOUTHERN LAKE MICHIGAN; COMPOSITION, OCCURRENCE, AND RESPONSE TO WATER QUALITY DEGRADATION.

Richard L. Whitman

The interstitial meiofauna of southern Lake Michigan beaches were studied during ice free months of 1990-91 and thaw periods of winter 1992. Aquatic sand fauna were retrieved in integrated and partitioned core samples at 1,2,3,4,5,10,20 and 30 m from the splash zone shoreward and to a depth of 30cm below the piezometric surface. Four transects were selected representing pollution gradients originating from Burns Harbor, IN. Interstitial water quality, sediment texture, and organic content were concurrently determined. The study revealed a well developed interstitial beach community occurring throughout the years, depths and beach distances sampled. The data suggest that the community is a sensitive indicator of organic and silt loading for Lake Michigan.

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THE MISSING PIECE OF THE PUZZLE: OKLAHOMA'S STREAM HEALTH MONITORING PROGRAM

John A. Hassell

The Oklahoma Conservation Commission is Oklahoma's soil and water conservation agency. Water quality has been incorporated within the Commission's programs since the late 1970's. Until the mid-1980's the Commission was primarily taking stormwater samples to determine the impacts nonpoint sources were having on the water quality within the State. Stormwater sampling provided limited information relative to the entire system. Evaluation of the program led to adding sampling components that would provide further information concerning the stream systems being sampled. Toward the end of the 1980's, the Commission added different levels of sampling to include fish, macro-invertebrates collections, and productivity determinations based on the use of artificial substrates. A rudimentary habitat assessment was included as a part of the biological collections. Since then the habitat assessment has evolved into an integrated method of collecting numerical instream and riparian habitat data to allow unbiased computer generation of habitat metrics for comparison among streams. The evolution of the habitat assessment process into its present form filled in the vital missing information that was necessary to make determinations about the health of Oklahoma streams. The information collected is on both impacted and unimpacted streams. The impacted streams provide areas to management, while the unimpacted areas give us a target to manage toward. Even though the puzzle looks complete, as technology changes and understanding of stream systems change other missing pieces could become evident.

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SESSION GL-3 - INSTITUTIONAL ASPECTS

FINANCING ENVIRONMENTAL FUNCTIONS IN THE GREAT LAKES REGION

Greg Lindsey¹ and Alicia Gebhardt²

Water quality in the Great Lakes is limited by a number of factors, including both point and nonpoint source pollution. Numerous studies have documented declines in the condition of water pollution control and stormwater management infrastructure. Additional investment is needed to rehabilitate and upgrade aging facilities and to achieve water quality objectives. Using data from the Census of Governments and Survey of Governments (United States Bureau of Census 1977, 1980-1991), this paper presents a comprehensive review and comparison of recent, historical outlays for water-related infrastructure at the state, county, and local levels in the eight states in the Great Lakes Basin. Differences in use of revenue measures such as property taxes and user charges are identified. Factors related to investment in water-related infrastructure are evaluated, and investments by jurisdictions contiguous to the Great Lakes are compared with investments by other jurisdictions in the Basin. Conclusions about the adequacy of current approaches to financing are drawn, and implications for achievement of water quality objectives are discussed.

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INTERNATIONAL GREAT LAKES WATER RESOURCES-NEW STRESSES DEMAND NEW MANAGEMENT

Leonard B. Dworsky¹, David J. Allee², and Albert E. Ulton³

The management of transboundary water resources between the United States and Canada is in a changing mode. For nearly 100 years the two governments have depended on the Boundary Waters Treaty of 1909 for the "principles and mechanism's to help prevent and resolve disputes." The International Joint Commission has been the government's major vehicle to this end.

In the first of the only two formal pollution References on the entire Great Lakes addressed by the governments to the IJC, the 1918 Report concluded, "it is advisable to confer upon the IJC ample jurisdiction to regulate and prohibit the pollution of boundary waters and waters crossing the boundary." In the second 1964 Reference reported in 1970, the IJC recommended nearly a dozen specific activities including the responsibility for program implementation. All recommendations were favored except the one on implementation. As in 1920 no direct powers of implementation other than the good sense and persuasive characteristics of the IJC were granted or authorized.

In the 1971 debate on the Federal Water Pollution Control Act, Senator Muskie proposed the change from water quality standards to efficient limits for enforcement purposes. While adopted with success in the U.S. under P.L. 92-500, it has not been approved for enforcement by other governments in the Great Lakes.

In 1990 Barry Sadler, Institute of the North American West, Victoria, Canada wrote, "The main burden of criticism placed on the IJC is not directed at the institution at all but at the way it is used or, more accurately, not used by the two governments."

In 1992 after 20 years of experience under the Great Lakes Water Quality Agreement, the IJC in its 6th Biennial Report wrote, "Are humans and our environment in danger from persistent toxic substances now?" "Are future generations in danger?" "Based on a review of the scientific studies and other recent information, we believe the answer to both questions is yes."

These illustrations point to needed change in Great Lakes management. Other Forces for Change involve Ecological Processes, Bio-Diversity and Sustainability of Renewable Resources. With Ford Foundation support, a Tri-National conference was convened to consider major issues involved in such change. These were Emerging Boundary Environmental Challenges; Improving Management Capacity Of Governments And Commissions; Commissions Relation To State And Provinces; Improving Public Participation; Ecosystem Management; and, How To Accommodate An Uncertain Future. This paper proposes to review and report on the conference findings applicable to the Great Lakes as well as identify six overriding issues of concern to Great Lakes Management.

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INFRASTRUCTURE PLANNING AND MANAGEMENT FOR SUSTAINABILITY

Stephen J. Thorp

Publicly-funded facilities for transportation, water supply and wastewater treatment support and sustain most economic activity and entail significant environmental impacts and benefits. Sound investment in public works infrastructure requires the linkage of economic and environmental goals. As a sector-specific example, the Great Lakes region's transportation system is characterized by a well-developed multiple mode infrastructure and strong internodal connections. Infrastructure investment requirements are high and system degradation is an on-going concern. Transportation is a prodigious consumer of energy and entails substantial land use and environmental impacts. Improvements to freight and passenger transportation infrastructure should be carefully evaluated with respect to potential environmental consequences. Comprehensive planning involving assessment of alternatives along with modal shift potential is necessary to meet current environmental and fiscal challenges. Long-term management strategies are needed to preserve system integrity and environmental benefits.

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PAYING FOR NONPOINT SOURCE CONTROL MAINTENANCE AND OPERATION

Richard Mollahan

The Pike Co. Soil and Water Conservation District and the City of Pittsfield have implemented a watershed management effort to correct excessive sediment loading problems to Lake Pittsfield, a public water supply. Corrective measures include dredging of the Lake, additional in-lake corrective measures, and the construction of sediment basins throughout the watershed. Long term operation and maintenance is necessary to allow for successful performance of the systems over their projected effective life. Contractual agreements and dedicated Municipal funds are needed to assure that the system is operated and maintained.

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SESSION GL-4 - ASSESSING WHERE WE ARE GOING

RECENT NUTRIENT TRENDS IN ONTARIO GREAT LAKES TRIBUTARIES

Byron A. Bodo

Long term temporal trends in major nutrient species are assessed at 100+ downstream monitoring sites on Ontario streams tributary to the Great Lakes. Examined are total phosphorus [P], total nitrates [$\text{NO}_x = \text{NO}_2 + \text{NO}_3$], and where available, filtered reactive P and total Kjeldahl nitrogen. Trend analyses are accomplished by (1) simple time series model $X_i = T_i + S_i + \epsilon_i$, where T_i is the trend (local central tendency) component, S_i is the seasonal term, and ϵ_i is residual noise; supported by (2) formal statistical trend tests. Recent 1991/93 concentration levels are referenced to 1975/77, the period of Pollution From Land Use Activities Reference Group {PLUARG} studies, for which 109 sites have records. Generally, at sites draining the Precambrian Shield [Lake Superior and Lake Huron north of Georgian Bay] nutrient levels are low and there has been little appreciable long term change. Sites draining Paleozoic sedimentary lowlands of southern Ontario [Lakes Ontario, Erie, St. Clair, and Huron south of Severn Sound] show widespread decreases in P that seem to be associated mainly with point source effluent reductions, and widespread increases in NO_x that are most likely attributable to increased nitrogen fertilizer usage. Despite declines, P levels at sites draining to Lakes St. Clair and Erie from intensely agricultural southwestern Ontario remain well above the $30\mu\text{g/L}$ criterion intended to protect against in stream eutrophication.

Abstract prepared for *Great Lakes, 30th Annual AWRA Conference, Nov. 6-10, 1994 Chicago, IL.*

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TOXICS MANAGEMENT ON THE GREAT LAKES-WHERE HAVE WE BEEN AND WHERE ARE WE GOING?

Walter A. Lyon

This paper will review the history of toxics management on the Great Lakes particularly with regard to the work of the International Joint Commission, the Province of Ontario, the Great Lakes States, and Federal Agencies, both in Canada and the United States.

This paper will analyze various efforts to manage toxics and measure toxics loadings to the Great Lakes. I intend to obtain information regarding results including changes in ambient conditions.

The paper will summarize reports and toxics management strategies in order to provide a critical analysis of those strategies and their success in implementation. The paper will then make recommendations for a future toxics strategy on the Great Lakes.

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SESSION GL-5 - AGRICULTURAL NONPOINT SOURCES

THE GREAT LAKES BASIN PROGRAM FOR SOIL EROSION AND SEDIMENT CONTROL: ACCOMPLISHMENTS AND CHALLENGES IN IMPROVING GREAT LAKES WATER QUALITY *Thomas R. Crane¹, Michael J. Donahue², Katherine Glassner-Shwayder³, Mary Frances Repko⁴*

In August, 1991, the Great Lakes Commission, with support from the U.S. EPA Region V and guidance from a federal/state task force, initiated the Great Lakes Basin Program for Soil Erosion and Sediment Control. The goal of the program is to improve Great Lakes water quality by promoting dedicated, reliable, long-term funding for erosion and sediment control programs in the Great Lakes Basin, sponsoring demonstration projects, providing technical assistance, and by better coordinating efforts, roles and initiatives between relevant federal, state and local agencies and organizations in the Basin. Program activities are pursued in three distinct areas: administration and program coordination, demonstration grants, and information/education programming.

This paper will examine the origin of the program, the unmet needs it addresses, program objectives and elements and progress to date. A status report will be provided on current program elements, including an account of the demonstration projects and information/education activities completed, underway or being planned.

The review and analysis of the Great Lakes Basin Program will also identify emerging issues and priorities in soil erosion and sediment control and, more generally, in nonpoint source pollution control. Some priorities identified through the Great Lakes Basin Program include: the need for coalition-building for regional program support within a diversified Great Lakes community; moving from control to prevention strategies in the mitigation of soil erosion and sedimentation problems; evaluating the benefits rendered by program activities; and sustaining long-term financial and programmatic commitments to erosion and sedimentation issues.

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AGRICULTURAL NONPOINT POLLUTION CONTROL: A TAILORED APPROACH TO REGULATION

John Herring

Nonpoint pollution from agricultural sources is highly variable, with physiographic and cultural practices exhibiting wide variation. For these reasons, as well as historical and economic considerations, regulation of agricultural nonpoint pollution has lagged behind even that of other nonpoint sources. Several recent initiatives in New York State attempt to address this variability through the use of regulations which are highly tailored to individual agricultural operations. Resistance by those regulated is reduced through such means as the avoidance of multiple regulatory authorities, partial protection from nuisance suits, and cost sharing. Implications of such an individualized approach to pollution control are discussed.

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MODELING AGRICULTURAL NONPOINT SOURCE POLLUTION POTENTIAL AT

THE WATERSHED SCALE IN SUPPORT OF ENVIRONMENTAL DECISION MAKING

Chansheng He

Agricultural nonpoint source contamination of water resources from pesticide application, animal manure, and soil erosion is a major problem in the Saginaw Bay watershed and much of the Great Lakes Basin. This study integrates physically-based simulation models with geographic information systems (GISs) at the watershed scale to quantify the combined loading potential of agricultural sedimentation, animal manure, and fertilizers and pesticides to surface water and groundwater. Analytical and simulation models are used to estimate streambank and overland erosion. The Census of Agriculture data of 1987 and 1992 are used to calculate the loading potential of animal manure by the 5-digit zip code. Estimates of fertilizers and pesticides uses for different crops at county level are used to computer agricultural chemical loading potential at the watershed level. Based on the loading potential of sediments, animal, manure, and agricultural chemicals, total agricultural nonpoint source loading indices are derived for each grid and for the entire watershed. These indices are combined with digital data of stream features and aquifer vulnerability to identify areas with high contamination potential for implementation of water quality programs. These results will aid management agencies in prioritizing their water quality programs in the critical risk areas. Such information can also be used to facilitate the decision making and resource allocation process for planning and implementing integrated watershed management programs relative to minimizing nonpoint source pollution by animal manure, agricultural chemicals, and sedimentation at the watershed scale.

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PESTICIDE USE IN THE GREAT LAKES BASIN

Bruce A. Kirschner

Present pesticide usage patterns have resulted in concerns over pesticide residue levels in ground water and surface water in the Great Lakes Basin. Preliminary efforts have been undertaken in both the United States and Canada in order to better define the problem and to begin remedial activities. However, no comprehensive basin-wide strategy has been developed to address the problem in a proactive manner. The International Joint Commission has conducted a facilitated workshop to confirm that significant reductions in pesticide usage can be readily achieved in the major agricultural areas of the Great lakes Basin and has begun exploring possible coordination efforts among various agencies and interest groups in the Basin. This paper will examine the nonpoint source problem that has been created by the widespread use of agricultural pesticides in the Basin and will outline a strategy for bi-national effort to reduce agricultural pesticide usage and the resultant pesticide loading to the Great Lakes.

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CONSERVATION TILLAGE TRENDS

L.T. Kirschner

The Great Lakes Basin is subject to very intensive land use. Erosion within the Basin is estimated at 63 million tons annually. Over six times as much sediment is delivered to Lake Erie as is delivered to the Chesapeake Bay. The author has estimated the 1990 pesticide use of corn and soybeans within the Basin to be over 32 million pounds. To date, there is no coordinated program to reduce the adverse impacts of intensive agricultural activities within the Basin. The Great Lakes Water Quality Agreement which was signed by the U.S. and Canada calls for widespread use of tillage practices to reduce nonpoint source loading. The author examined the potential impacts of widespread application of enhanced crop residue management especially conservation tillage within the Great Lakes Basin. Reductions in erosion and sediment loading and changes in pesticide use will be examined.

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SESSION GL-6 - URBAN NONPOINT SOURCES

COMBINED SEWER SEPARATION IN GRAND RAPIDS, MICHIGAN

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The purpose of this paper is to discuss the status of the combined sewer separation program in Grand Rapids, Michigan. This program is by far the largest in the State of Michigan at an estimated cost of \$100 million and involves the following:

- Combined sewer separation of a 2,000 acre area representing 40 percent of the total combined sewer area. This sewer separation will eliminate 23 percent of the combined sewer overflows and prevent basement backups in the areas prone to flooding.
- Construction of 5.9 miles of reinforced concrete box conduits for stormwater conveyance ranging in size from 5ft. x 3ft. to 16ft. x 8ft.
- Construction of 37.3 miles of storm sewer pipes ranging in size from 12" to 90" in diameter.
- Construction and rehabilitation of 30.1 miles of sanitary sewers ranging in size from 8" to 66" in diameter.
- Replacement of 40.8 miles of water mains ranging in size from 6" to 12".
- Construction of two stormwater pumping stations with a combined capacity of 1,225 MGD.

To date, 69.4 percent of the box conduits; 42.3 percent of the storm sewer pipes; 33.7 percent of the sanitary sewers; 40.8 percent of the water mains; and a 490 MGD stormwater pumping station have been completed since April 1992. The sewer separation program will be completed in 1995.

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URBAN STORMWATER POLLUTANTS IN THE LAKE SUPERIOR DRAINAGE BASIN

Jeff Prey¹, Roger Bannerman², Jeff Steuer³, John Thomas⁴

The States of Wisconsin, Minnesota, Michigan and the USGS have sampled eleven municipalities with a population of 5,000 or greater for stormwater pollutants within the Lake Superior drainage basin. Sampling was conducted on three levels. The first level was fixed station sampling which included a minimum of eight samples. The second level of effort was grab sampling with a minimum of three samples; and the third level was source areas with a minimum of 8 samples. Constituents sampled for included conventional pollutants, bacteria, metals, PAH's and nine bioaccumulative substances listed in the Binational program for Lake Superior. In addition to the sampling, bioassay's were performed on a limited number of events. Results of the sampling indicate that urban stormwater does exceed Great Lakes numerical limits and certain events had positive bioassay results. The sampling results will be used in part to estimate urban stormwater pollutant loads for the Lake Superior drainage basin.

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EFFECT OF INTEREVENT DRY PERIODS ON DETENTION POND VOLUME

Nancy Phillips

The design of detention ponds for water quality purposes is in part based upon the selection of a "design storm" from which to calculate pond volumes. Work done during the National Urban Runoff Program provided a general design storm from which to calculate volumes. Additional efforts of Schueler and Wanielista have shown that consideration of regional precipitation patterns and interevent periods can be critical to determining "design storms". A review of these methods will be conducted, and applied in a case study manner to illustrate the variability of methods and resultant pond volumes.

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URBAN RESOURCE PARTNERSHIP

Gary Parker

No single agency has either the budget or the expertise to solve the myriad of problems affecting urban areas. However by combining resources and working with partners, the ability to deal with these same problems is greatly enhanced. In response to this need, an interagency, cooperative Federal partnership has been established in four major cities. The partnership has developed and is implementing an ecosystem approach to improve resource planning in urban areas. The concept is prevention-oriented and founded upon locally-driven, community-based projects to improve social, natural, and economic conditions within these communities.

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Session GL-7 - Efforts to Control Great Lakes Pollution

GREAT LAKES WATER QUALITY INITIATIVE

John O'Grady

The proposed Water Quality Guidance for the Great Lakes System was developed through a cooperative process between the U.S. Environmental Protection Agency and the States, Indian Tribes, environmental groups, industries, and municipalities in the Great Lakes Basin. Congress endorsed the effort in the Great Lakes Critical Programs Act of 1990, imposing deadlines for completion of the proposed and final water quality guidance. The proposed Guidance will establish minimum water quality criteria, antidegradation policies, and implementation procedures to be used to control discharges from industries and municipalities into the Great Lakes Basin.

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GREAT LAKES FISH CONSUMPTION ADVISORIES

Walter L. Redmon

The Great Lakes, their tributaries, and connecting channels have been one of the developing grounds for the fish consumption advisory. The first, for mercury contaminated fish in the St. Clair River, Lake St. Clair, and then the Detroit River and Lake Erie, was issued by the Michigan, Ohio, and the Province of Ontario in 1969-1970. Over subsequent years, the existence of several advanced state health and environmental agencies, combined with physical and biological characteristics of the region, heavy industrial and agricultural development, and advanced university and government research programs has kept the region at the forefront of problem identification and advisory development. In 1985, the four Lake Michigan States agreed on a uniform advisory for fish from that Lake. Since that time these states, under the direction of the Council of Great Lakes Governors have been working on a uniform protocol to be used throughout the U.S. portion of the basin. It is now completed, awaiting endorsement of the Great Lakes Governors. The new protocol addresses human reproductive dangers and concern risk, abandoning the prior reliance on FDA Action levels. Two other features of the new protocol are: A new format, which should make the advice easier to understand, and; new advice that applies to less frequent users such as tourists and occasional charterboat anglers.

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Session GL-8 - Remedial Action Plans

THE GRAND TRAVERSE BAY WATERSHED INITIATIVE: A LOCAL PARTNERSHIP AT WORK

Jeanna M. Paluzzi

The Grand Traverse Bay is a deep, cold water inlet of Lake Michigan noted for nearly pristine water quality. The 1000 square mile watershed includes two major rivers, 10 creeks and 50 inland lakes dominated by agricultural forestry land uses. Forty+ local governments are experiencing some of the highest rates of population increase in Michigan. Nutrient and sediment loading and atmospheric deposition are primary threats to water quality.

The Grand Traverse Bay Watershed Initiative is a long-term watershed management program endorsed by the International Joint Commission as a model for locally-driven pollution prevention for other rapidly developing Great Lakes communities and in newly restored areas of the future. The local partnership agreement between 120 citizens, businesses, and agency groups serves as a powerful mechanism to seek a balance between increasing development pressures and the need to preserve high quality resources essential to the area's tourism and recreation industries.

Initiative successes include reaching consensus on a vision statement and specific goals, identifying the preferred institutional arrangement, completing several watershed planning and pollution control projects, creating a development handbook, establishing an independent office and employing a full-time coordinator and fostering self-directed subcommittees to pursue action towards Initiative goals.

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AFTER REMEDIAL ACTION PLANNING, WHO WILL PROTECT GREAT LAKES RIVER SYSTEMS?

Erich P. Ditschman¹ and Peggy B. Johnson²

A state and local partnership is paramount to successfully coordinating a Remedial Action Planning and implementation program. The partnership must leave a legacy beyond the federal and state RAP funding so there is an institutional framework for attaining restored uses and sustaining them over subsequent years.

The Clinton River is a designated Area of Concern located north of Detroit, Michigan. The 22 year old Clinton River Watershed Council (CRWC) COMPLETED A 2 year study and transition from an association of local governments to a multi-stakeholder watershed management not-for-profit forum. Its Board of Directors is composed of equal representation from business, local government, citizens, and interest organization. The transition reflects a continued shift from federal and state government away from funding local water resources management and increased local government, corporate and personal responsibility for the environment.

The Council is the lead organization for coordinating local river management and the Michigan Department of natural Resources coordinates federal funding and state agency activities for the RAP. This paper describes the two year study and transition, and one year evaluation as a possible model to other Great Lakes river basin communities for creating a multi-stakeholder watershed management forum and developing local and state partnerships for RAPs.

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SUMMARY AND CONCLUSION

The diversity of presentations at the Symposium illustrated that many approaches are needed to clean up and maintain Great Lakes water quality.

In the "Soil Erosion" session, important projects concerned geographic information systems (GIS) use, shoreline stabilization, stream bank protection, artificial wetlands and sand filters. Because soil erosion is a type of "nonpoint source pollution," these variously described solutions make important contributions to solving this general water quality problem.

In the "Habitat" session, two watershed habitat monitoring programs were presented including a comprehensive one that provided unbiased computer generated metrics. Also, an artificial wetland methodology was presented. Finally, using interstitial beach meiofauna was shown to be a good indicator of organic and silt loading to a Great Lake.

One paper in the third session, "Institutional Aspects," provided an overview of six critical issues facing Great Lakes managers ranging from boundary water jurisdiction to ecosystem management. Several other papers focussed on the public work's infrastructure and the need for creative financing, sustainability and environmental sensitivity.

In the fourth session, "Assessing Where We Are Going," one presentation examined the nutrient load to Lake Ontario and in general showed some decline in phosphorous loading which is a good sign. Another paper analyzed current toxic management strategies and made recommendations for improvement.

The "Agricultural Nonpoint Sources (NPS)," session contained many approaches to reduce this type of pollution including funding opportunities, one stop permitting, nuisance suit protection, using GIS and simulation modeling, binational pesticide reduction strategies and enhanced crop residue management programs, particularly that of conservation tillage.

The sixth session on "Urban Nonpoint Sources," provided presentations on not only how urban storm water pollutants could be measured but how they could be minimized through such projects as combined sewer separation, more accurate detention pond design and urban agency partnerships.

In the session on "Efforts to Control Great Lakes Pollution," other important water quality issues were addressed such as the new point source control effort often called the Great Lakes Water Quality Initiative and the nearly finalized sport fish consumption advisory protocol that will be uniform for the Great Lakes region.

The two Abstracts included for the eighth and final session of the Symposium, "Remedial Action Plans (RAP's)," are both from Areas of Concern in Michigan. Although one Michigan plan on the Lake Michigan side and was more of a pollution prevention effort, while the other on the Lake St. Clair side of the state was an Area Of Concern, both projects emphasized that the key to most of their successes has been the cooperative partnership among all levels of government, the private sector and concerned citizen groups and individuals.

So as is highlighted above, many important approaches are being taken around the Great Lakes region in combating pollution both from rural and urban areas. They range from refining the point source pollution control efforts, to preventing the pollution in the first place. Many presentations featured nonpoint source control efforts. The solutions presented range from engineering and computerized ones to management based ones. Engineering ones include such concepts as artificial wetlands and more accurate detention pond design. The use of computerized Geographic Information Systems is now beginning to be employed to help in understanding watersheds, stream habitats and nonpoint source determination. Management based solutions include new ways of financing NPS control and new strategies for toxics management. Overall then, the future quality of the Great Lakes will depend on utilizing this variety of approaches around the Great Lakes watershed.

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