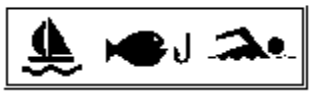
THE ROUGE RIVER PROJECT
A WORLD CLASS EFFORT



BRINGING OUR RIVER BACK TO LIFE

Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

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ROUGE RIVER WATERSHED MANAGEMENT: IMPLEMENTING A REMEDIAL ACTION PLAN

James E. Murray*
Department of Environment
415 Clifford, Detroit, Michigan 48226
Telephone (313) 224-3631/Facsimile (313) 224-0045

ABSTRACT

Water quality within the Great Lakes and their connecting waterways has historically been viewed as an issue by both local, state, and national officials, and by our Canadian neighbors. In its 1981 study of the Great Lakes, the International Joint Commission (IJC) identified as mist severe, that portion of Southeast Michigan tributary to the Detroit River, including flows from the Rouge River.

INTRODUCTION

Water quality within the Great Lakes and their connecting waterways has historically been viewed as an issue both by local, state and national officials and by our Canadian neighbors. The International Joint Commission (IJC) was charged with evaluating the condition of these water bodies and prioritizing problem areas. In their 1981 water quality study they identified 43 Areas of Concern within the Great Lakes from Lake Superior to the St. Lawrence River.

One of those identified as most severe was that portion of Southeast Michigan tributary to the Detroit River, including flows from the Rouge River. *Figure 1* shows the location of the Rouge River Watershed within the State of Michigan and the Great Lakes.

The Rouge Watershed is 426 square miles in area. It is made up of four primary branches: the Main, the Lower, the Middle and the Upper. The Main Branch of the Rouge River flows generally southerly from its headwaters to the river's confluence with the Detroit River. The Upper, Middle and Lower Branches of the Rouge River each flow generally eastwardly from headwaters in the western and northwestern portions of the watershed to junctions with the Main Branch. The four branches total over 120 miles in length, and each have numerous smaller tributary streams.

Within the boundaries of the watershed exist of a number of governmental units. The Rouge Watershed contains parts of three different counties. Headwaters areas of the Main and Upper Branches lie within Oakland County. The majority of the Main, Middle and Lower Branches as well as part of the Upper Branch lie within Wayne County. A small portion of the headwaters of the Middle and Lower Branches lie within Washtenaw County.

Within these three counties all or parts of 48 individual cities, villages and townships lay claim to a portion of the Rouge River tributary area. *Figure 1A* shows these communities and their location with respect to the watershed and the main branches. The population within the watershed is approximately 1,500,000. Besides the three counties and 48 communities six sewage collection districts and dozens of designated county drainage districts provide sewage collection and storm water management services to portions of the area.

The Rouge watershed is heavily urbanized. The cities of Detroit and Dearborn comprise much of the eastern quarter of the tributary area. These areas were typically developed as heavy industrial areas, and older dense residential communities. Ford Motor Company's Rouge Steel complex, other steel mills, and similar heavy manufacturing facilities line the banks of the lower portion of the Main Branch. The development in this part of the watershed took place mainly between 1910 and 1930 and is very similar to other older urban areas within the northeast.

During this same time period Henry Ford also had significant influence on the Middle Branch of the Rouge. He and his newly forming automotive company built a series of low head dams along this branch to provide hydro-mechanical power to "cottage industries" which were being fostered to supply parts for the automobile manufacturing industry.

As the auto industry grew and Detroit's population expanded, a ring of suburban communities developed west and north of the city within the watershed. The cities of Inkster and Dearborn Heights, and the Township of Redford are examples. These areas mirrored the Detroit development pattern of industrial clusters surrounded by high density single family residential areas. These areas contained much of the urban growth to the beginning of the baby boom in the late 1940s and 1950s.

Development pressures on mid portions of the watershed grew throughout the 1950s and 1960s as the Detroit area began to suburbanize. These developments consisted of automobile parts manufacturing and assembly facilities, "shopping centers", and residential subdivisions on "larger" 55 X 100 foot lots. Garden City, Livonia, Westland, Farmington, Southfield, Bloomfield Hills and Birmingham are examples.

From the 1970s until today increasing development pressure has been seen in the outlying suburban areas. Large portions of communities such as Canton, Plymouth, Northville, West Bloomfield Townships, and the cities of Farmington Hills and Novi are already developed or under heavy development pressure. Only the extreme headwaters areas in the far western and northwestern parts of the watershed have thus far escaped urban or suburbanization.

THE REMEDIAL ACTION PLAN

The pollution problems within the Rouge were identified by the IJC as part of the Southeast Michigan Area of Concern. In response to this and other Areas of Concern within the state, the Michigan Department of Natural Resources (MDNR) undertook the development of a series of

Remedial Action Plans (RAPs) to identify the specific problems within each area and establish a plan for the remediation of the identified problems. The RAP process combined the knowledge and resources of MDNR with local planning agencies, communities, industry, and grass roots environmental organizations. A high level of local community leader and citizen involvement characterized the RAP development process.

The Rouge River RAP contained a number of recommended actions, both general and specific, deemed necessary for the reduction of current pollution sources, and the remediation of the effects of past pollution sources. The RAP anticipated a phased approach to the effort. The phases as quoted from the RAP Executive Summary included recommended actions in three phases as follows:

Phase I to 1993:

Construct separate sanitary improvement projects at a capital cost of approximately $370,000,000.
Monitor and optimize the existing combined sewer system.
Conduct detailed local planning for combined sewer overflow (CSO) controls.
Implement programs to remove improper connections to storm drains.
Implement new or updated stormwater management plans.
Study and implement resource improvements, such as log jam removal and habitat enhancement.
Control industrial pollutants at the source through National Pollution Discharge Elimination System (NPDES) permits for direct dischargers and through source controls for dischargers to the sewer system.
Continue regular monitoring and conduct special intensive studies in identified problem areas.
Implement financing methods at the local, state, and federal levels to pay for improvements.
Issue NPDES permits that specify requirements for CSO's and stormwater discharges.

Phase II 1994-2005:

Implement CSO improvements that will eliminate untreated raw sewage discharges. Meet the minimum objective of point-by-point control with settling, skimming, and disinfection for all overflows, at a capital cost of approximately $500,000,000.
Complete implementation of improper connections program and other programs that address problems identified in special studies.
Implement further stormwater controls as needed based on monitoring and the stormwater management plans.

Phase III after Phase II completion:

Evaluate results of CSO controls and initiate planning and implementation of further improvements necessary to meet Water Quality Standards.

Evaluate further needs for stormwater discharge controls and implement where needed to meet Water Quality Standards.
Evaluate effect of reductions in pollutant loadings on sediment contamination and determine appropriate remedial actions, if necessary.

The most significant source of pollution identified by the RAP was from CSOs. The cities of Detroit and Dearborn as well as many of the older suburban communities, were built with combined sewers. The wet weather flow from these areas together with the dry weather flow from both these areas and much of the remaining developed area within the Rouge watershed is conveyed through a system of interceptor sewers for treatment at the Detroit Wastewater Treatment Plant. This facility discharges treated effluent to the Detroit River. *Figure 2* shows the relationship of the combined sewer service area to the whole watershed.

About one third of the total area of the watershed is currently served by combined sewers. These sewer systems, in Detroit, western Wayne County, and central Oakland County, discharge excess combined flow to the Rouge River at over 160 locations.

These CSOs remained as the last of the municipal and industrial facilities un-permitted under the NPDES within the watershed as of the late 1980s. Municipal waste treatment facilities had been previously permitted, and have come into compliance. Industrial facilities within the Rouge watershed had been previously brought into compliance with either their own NPDES permits or pretreatment requirements of the sanitary collection system to which they discharged.

MDNR is the agency designated by U.S. Environmental Protection Agency (EPA) to issue and enforce NPDES permits within Michigan. As an initial implementation action of the RAP recommendations, MDNR, in 1989, issued draft permits to each of the communities with CSO discharges to the Rouge River. These draft permits required total capture for eventual secondary treatment of all flows up to those generated by the one year one hour storm event, and capture with 30 minute detention and chlorination of excess flows up to those generated by the ten year one hour storm event.

The communities questioned the rationale for these limits as well as the effects that were likely to be seen on water quality within the Rouge based upon their implementation. None of the communities stood ready to accept MDNR permit requirements and they began the process of legally contesting the permit requirements.

Key among the concerns expressed by the local officials was the question raised by the RAP that even once the Rouge CSOs were controlled the water quality of the river would remain unacceptable due to other wet weather pollutant sources. Many questioned the expense of the required high level of control when little or no increase in use attainability would be seen. Also, within the watershed, little attention was being paid to urban runoff and other nonpoint sources of pollution.

Though not directly involved in the contested permits, Federal District Court Judge John Feikens took interest in the proceedings. His court has been the determinater in a number of cases over the past 20 years concerning pollution and sewage related matters in southeast Michigan. Judge Feikens, with the approval of MDNR and local communities, appointed a moderator to assist in the permit negotiations.

Through the intervention of the court appointed moderator, Professor Jonathan Bulkley, a settlement was proposed allowing for a two phased permit to be issued to Rouge Watershed communities. Under phase one a group of demonstration facilities would be designed and constructed using various retention specifications. Upon completion of these facilities and a year of testing, the remaining facilities would be designed and constructed. Also, if any of the phase one facilities were determined to be insufficient they would be upgraded under phase two.

Yet, the plan still considered only one pollutant source to the river. Although the RAP stressed CSO remediation, it also identified nonpoint sources which were not being addressed anywhere within the watershed. EPA urban stormwater permitting process had identified two communities within the watershed in the "over 100,000" population category: Detroit and Livonia. Since Detroit is served exclusively by combined sewers it was exempt from permit requirements. Livonia's population exclusive of areas served by combined sewers fell just below the 100,000 limitation thus it was also exempt from permit requirements. While the RAP identified a range of problems within the Rouge Watershed, no adequate mechanism was in place for the requisite comprehensive approach to be implemented.

THE ROUGE PROJECT

Wayne County became aware that, only through a comprehensive watershed-wide approach to pollution from all sources would beneficial uses ever be restored to the river. In 1990 the County developed an outline of an approach to this effort and presented it to the members of the Michigan congressional delegation. It was organized as a wet weather demonstration effort targeted at the Rouge River, yet transferable to other urban watersheds faced with degraded water quality from a range of sources. These efforts took place in parallel with the NPDES negotiations being assisted by Professor Bulkley.

In 1991 Congressmen John Dingell and William Ford successfully introduced legislation funding the Rouge River National Wet Weather Demonstration Project. These funds were made available to Wayne County through a grant from EPA under section 104(b)(3) of the Clean Water Act. While Wayne County is the grantee, they have made a commitment to conduct the project throughout the watershed and funds are being shared both within and outside of the County.

PROGRAM ELEMENTS

The program, as currently funded, will take place over a three year period and will establish the levels of pollution control within the Rouge Watershed to further the goals and objectives of the Rouge River RAP. The overall program effort is comprised of a number of technical components including the following:

> A computerized **Geographic Information System (GIS)** will be prepared. This GIS will accurately locate the river and each of its many tributaries, provide for the management and display of existing and expected water quality, define the locations of combined sewer and storm drainage discharges, relate land use and potential pollutant sources to both river location and water quality, and allow for other similar comparisons of complex data.

The GIS will function as a locational database, linking the capabilities of a relational database with those of automated mapping. Planners will be able to answer questions which require a combination of spatial and attribute data. This system will allow analytical data from water quality studies to be stored, sorted, and displayed in map formats. It will also allow land cover, soil type, and typographical data to be directly accessed by the computer models developed for this project.

An extensive program of **Water Quality Sampling** will be conducted. These tests will establish a baseline level of Rouge River water quality prior to the implementation of remedial activities. It will also help to pinpoint sources of pollution and establish their severity. Samples will be taken at permanent locations throughout the watershed on frequent regular intervals. Sampling will be performed at known and suspected pollution sources to help quantify both their local impacts and their effects on the river as a whole.

Additionally, sampling will be performed after the various control measures are implemented to assess the effectiveness of each alternative. Special sampling efforts will be undertaken as part of the program. They will attempt to: estimate the portion of the nonpoint pollution attributable to atmospheric deposition, estimate the extent and severity of pollutants in sediments, and establish removal efficiencies of various control measures under a range of operational scenarios.

A group of **Computer Models** will be developed and implemented for the Rouge. A set of models will simulate the hydrological response of the watershed to rainfall and will predict the hydraulic transport levels of drainage and combined sewer systems in wet weather. They will be capable of predicting the magnitude and frequency of combined sewer overflow, and establish the quantities of stormwater runoff for various rain events. Other models will simulate the pollutant loading associated with the rainfall and predict the quality of water throughout the Rouge during and following rain storms.

These models will be used as planning tools to indicate how the river reacts today, and how various combinations of planned improvements will affect overall river quality. The models will become the backbone of a formal decision support system which will assist both technicians and policy planners in determining which combination of physical improvements and policy decisions will have the most favorable affect on the overall water quality of the Rouge.

As part of their current NPDES permit requirements each of the combined sewer operating agencies within the Rouge watershed have agreed to a phased program for the **construction of CSO Abatement Facilities**. These proposed facilities will consist of both sewer separation and detention basins. Under the Rouge Program, final designs will completed, and plans and specifications will be prepared for at least eleven CSO control structures (detention basins), and at least six community sewer separations. Following this design effort, the local agencies are committed to construct these facilities and monitor their operation.

While final design decisions will remain with the local agencies and their designers, the program will provide overall coordination to encourage substantial variance among the designs commensurate with the intent of the demonstration program. The efforts within this demonstration, together with the required ongoing monitoring, will provide the basis for determination of the design standards for structural improvements which will eventually be required throughout the Rouge watershed in those areas served by combined sewers.

An assessment of pollutant loads from each of the currently identified **Nonpoint Sources** within the Rouge will be undertaken. The program will also implement and evaluate various alternative methods of reducing these pollutant loadings. Both structural and non-structural best management practices will be included within the range of alternatives to be implemented and evaluated. Included within this program element are evaluations of the water quality impacts due to illicit connections to storm drainage facilities as well as runoff and ground water interflow from abandoned municipal and private dumps. In order to estimate water quality impacts during wet weather, the program will also consider the effects of polluted sediments which can be resuspended during periods of high flow.

The work performed as past of this project element will allow for a comparison with pollutant load reductions obtained from combined sewer overflow controls. The program will then be able to develop a comprehensive overall plan to logically reduce wet weather pollution within the Rouge, and to identify the levels of control required on both CSO and nonpoint sources in order to approach water quality standards.

As a parallel effort to the technical work elements identified above, the demonstration effort will evaluate the current **Institutional and Financial Framework** which is in place to deal with wet weather water pollution control in the Rouge watershed. If the solutions recommended by this program are to be successful they must be able to be implemented within either the existing governmental structure or within a logical modification to current responsibilities and contractual arrangements.

Likewise, a fair and equitable method of financing the remedial actions needs to be developed. The program will analyze current contractual arrangements between local units of government and other operating agencies as to their applicability for ongoing program implementation. And, if necessary, the program staff will explore a range of alternative institutional and financial relationships capable of controlling CSO and nonpoint sources of pollution.

The program sees **Public Involvement and Education** as one of its major goals. The Rouge, like urban rivers throughout the country, is a valuable resource. Each person who lives within its watershed boundaries needs to be educated as to how their individual daily actions affect the conditions of the river. From elected officials, to businessmen, to manufacturers, to homeowners, to school children, every person must be made aware of the

part they must play in returning the Rouge to its past vitality. The program will solicit community input into the program through public meetings, special presentations to local officials and community leaders, and formal community educational programs.

A key element in this educational process will be an ongoing educational program targeted at junior high and high school students throughout the watershed. Through this innovative program students will be introduced to the dynamics of urban watersheds and will learn about the sources of pollution which impact the river. They will conduct hands on sampling of the river within their own neighborhoods, and assess its quality. In addition, the students will also become part of an unique watershed-wide computer network allowing them to share and compare their findings with students who have conducted sampling in other parts of the river.

The RAP as developed for the Rouge River provided a starting point for a difficult process of implementation. A large number of obstacles, both technical and institutional, need to be overcome before this or any similar remedial plan can be successful. The Rouge Community has been fortunate to have obtained assistance toward this implementation. The section above has given a brief overview of the components included within the Rouge Project, and likely required in similar form within any watershed-wide remedial effort.

The papers which follow will more closely examine the various aspects of the program, both technical and institutional. In the first year and a half of the project the most obvious result has been the need to balance technical activities with the appropriate attention to public involvement, community education, and financial/institutional capabilities. It is obvious to those who have worked together within this effort that pollution control based on watersheds rather than political subdivisions needs to be the direction that the nation adopts. However, it is also just as obvious that the institutions, the regulations, and the processes that are currently in place may need to be restructured to address larger scale implementation. Watershed-wide pollution control may have reached the point where agencies need to move away from the traditional, and comfortable, **command and control** to the innovative, and difficult, **educate and assist**.

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