

**ROUGE RIVER WATERSHED NONPOINT SOURCE MANAGEMENT:  
SIGNIFICANT COMPONENTS OF URBAN POLLUTANT LOADS -  
CROSSING THE FINAL HURDLES FOR ACHIEVING  
WATER QUALITY STANDARDS**

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**ABSTRACT**

Nonpoint source pollution control has failed to realize the same reductions as point source pollution because a number of impediments remain in the implementation of an effective nonpoint source program. This paper provides a brief summary of past nonpoint studies in southeast Michigan, the impediments which have prevented implementation, and some alternatives for overcoming these obstacles. The impediments identified by the Rouge River National Wet Weather Demonstration Program (RRNWWDP) are not technical but rather institutional. The RRNWWDP recognized that implementation of nonpoint source controls are best handled at the local level but the motivation to local governments, industries, and residents is not sufficient to initiate controls. The RRNWWDP will therefore attempt to forge a consensus between the regulators and the public in general to develop a holistic or consensus-based approach to nonpoint source control and pollution prevention.

**KEYWORDS**

Rouge River, Nonpoint Source Control, Pollution Prevention, Watershed-Wide Management, Public Participation, Consensus Building.

**INTRODUCTION**

In the last twenty-five years, tremendous progress has been made in reducing pollution in our nations waterways. Throughout this time, however, nonpoint source (NPS) control has remained elusive. The structural controls effective in reducing traditional nonpoint source pollution have been well documented. The challenge is to build upon the technical knowledge collected through the previous programs and address the short-comings of the current regulations which rely primarily on end-of-pipe solutions. Implementation of comprehensive NPS control will require assembling and supplementing the technical information prepared to date and convincing the diverse entities which will affect the required changes that the desired result is technically possible and politically achievable across a watershed.

Congress challenged the country to obtain feasible and swimmable waters within twenty years through the passage of the Clean Water Act of 1972 (PL92-500). While much progress has been made, most waters in urban areas still fail to meet water quality standards. As Congress grapples with the reauthorization of Clean Water Act (CWA) it seems appropriate to review what has worked and what has failed to work. This challenge is being voiced from all quarters. The successes are clear to most in the environmental community. The largest pollutant sources have been dramatically curtailed. Municipal wastewater treatment plants, industrial dischargers, hazardous waste generators, solid waste operators, and air pollution dischargers have all fallen under comprehensive regulations. Thus, the so called "point sources" can largely be viewed as being under control and well regulated. This does not preclude, however, a continued effort to reduce pollutant loads from point sources, particularly in the area of toxics. It is only meant to suggest that these programs are mature and can be expected to continue to succeed.

NPS control on the other hand remains an evolving program. While the CWA recognized that a significant pollutant contribution was categorized as NPS, comprehensive control of these sources remains elusive nearly 25 years later. Congress, the United States Environmental Protection Agency (USEPA), and state regulatory agencies recognize that these programs must be handled differently than the traditional point source programs but there fails to be consensus on how to proceed. Institutionally, it is easier to identify what won't work than to define a mechanism which will.

The purpose of this paper is to summarize how the Rouge River National Wet Weather Demonstration Program (RRNWWDP) can aid in shifting the focus from site specific storm water control to a watershed-wide management strategy. Past efforts, while substantial, have failed to result in programs implemented across watersheds. This paper will provide a brief summary of past nonpoint studies in southeast Michigan, outline some of the impediments which have prevented implementation and present some alternatives which we believe will aid in moving forward with implementation of watershed-wide strategy.

## **BACKGROUND**

The Rouge River has historically suffered and continues to suffer from the stress of pollutant loadings from various sources. The vast majority of continuous point source have been controlled through the issuance and enforcement of national Pollutant Discharge Elimination Systems (NPDES) permits for municipal and industrial discharges. Yet, the river remains polluted primarily because of sources associated with wet weather flow. CSO control by itself will not be sufficient to restore water quality to acceptable levels in the Rouge River and other similar urban rivers. To resolve this dilemma, the RRNWWDP has established a watershed-wide concept as its focus. The effort is not being conducted in isolation. The Rouge River Remedial Action Plan (RAP) provides the baseline from which the RRNWWDP efforts have begun. In fact, the RRNWWDP can be viewed as the key component of the initial implementation of the RAP.

The RRNWWDP is intended to evaluate each of the various sources of wet weather pollution; implement alternative remedial measures to evaluate their effectiveness; investigate wet weather waste load allocations; establish pollutant load reductions; examine the financial and institutional impediments to wet weather pollution control; and recommend a strategy for watershed-wide pollution control which is "implementable" in the Rouge and can be readily transferred to similar urban watersheds throughout the country.

## **BASELINE NONPOINT SOURCE STUDIES**

One of the primary goals of the RRNWWDP is to evaluate existing available data developed under local and national NPS programs including; Clean Water Act - Section 208 programs, Nationwide Urban Runoff Program (NURP) and Rouge River RAP (Quasebarth and Cave, 1994).

Southeast Michigan Council of Governments 208 SEMCOG Study. The 208 study performed much of the initial work which laid the foundation for the RRNWWDP. In this project, a major sampling, analysis and modeling effort was completed. There were also recommendations for changes in institutional arrangements. The key findings which are applicable to the current nonpoint source effort were presented in a study of nonurban watersheds in southeast Michigan to determine the quantity and quality of storm water runoff in southeast Michigan (Collings and Ridgway, 1980). The SEMCOG 208 study concluded that the water quality of storm water discharges from urban watersheds in the Detroit area exhibited less variability than was reported by similar studies in other locations. Analysis of the limited particle size data indicated that the distribution of particle sizes in runoff were disproportionately smaller than the particle sizes typically found on street surfaces. The SEMCOG study also found the masses of total organic nitrogen, total phosphorus, lead and iron were highly correlated with the mass of suspended solids.

This early work demonstrated that collecting solids in runoff would substantially reduce other pollutants. The results of these studies provided sufficient technical information to initiate certain storm water controls.

Urban Nonpoint Pollution Source Investigations of the Nationwide Urban Runoff Program (NURP). The Nationwide Urban Runoff Program (NURP) was initiated by the U.S. Environmental Protection Agency (EPA) to build upon the Section 208 studies by characterizing the water quality of urban runoff and the potential for water quality impacts in receiving waters. The overall objective was to develop a database that would assist the EPA, States, and local governments in determining whether or not urban runoff is causing water quality problems. It was also to aid in developing water quality management plans in areas where urban runoff is determined to be a water quality problem. To date NURP represents the largest research effort targeting urban storm water runoff. The NURP studies were performed cooperatively with 28 project sites across the U.S. Each individual NURP project site also prepared a summary report. Relevant individual NURP projects included projects located in Oakland County, Ann Arbor, and Lansing, Michigan.

These studies provide much more detailed information on storm water quality and the effectiveness of various control methods than was available from the 208 studies. The goal of this research effort was not focused on implementation strategies, but rather on further quantifications of loadings from sources and evaluating various treatment technologies.

Rouge River Remedial Action Plan (RAP). Recognizing that the Rouge River continued to be major pollutant source to the Great lakes, the Michigan Department of Natural Resources in cooperation with local entities developed a remedial action plan which identifies the sources of pollution for the Upper, Middle, Lower, and Main branches of the Rouge River. The findings are summarized below:

Combined sewer overflows (CSOs) contribute nutrients, solids, and pathogens. These pollutants impact the river in the vicinity of the discharge points located along the middle and lower reaches of the four branches.

Nonpoint source runoff is major contributor to flow, suspended solids, biochemical oxygen demand (BOD), nutrients and trace contaminants. Nonpoint pollution is a major concern in the upper and middle reaches of all branches of the Rouge River.

Industrial and municipal discharges, controlled under NPDES regulations, are considered a minor source of pollution to the Rouge River, although in downstream reaches they are major contributors to flow. Nonpoint source runoff from industrial sites can have many times the concentration of toxicants in typical urban nonpoint pollution runoff.

Sediments from portions of the Rouge River are source of heavy metals (cadmium, chromium, copper, lead, mercury, nickel, and zinc) and polychlorinated biphenyl (PCB) contamination (MDNR, 1992). Sediment contamination increases from the headwaters to the downstream reaches to the heavily contaminated mouth of the river.

The RAP did much to bring into focus the importance of nonpoint pollution within the Rouge River Watershed. While it prioritized the future efforts and recommended a general strategy for nonpoint source control, it was unable to affect the practical changes in institutional arrangements necessary to initiate such an effort. In general, all of the interested parties agreed that nonpoint source pollution should be controlled. This general agreement, however, did not succeed in getting individual communities to change their ongoing activities.

## **IMPEDIMENTS TO IMPLEMENTATION**

The studies summarized above and numerous others, have two common elements: their strong focus on technical aspects of pollutant generation and transport to the water course and their inability to initiate regulatory and programmatic changes that effectively control nonpoint source pollution on a watershed basis.

There has been a failure to institutionalize the knowledge gained from previous efforts. Grant programs have encouraged change on a site or source specific basis while Federal laws

have mandated major efforts in a manner which has been difficult to implement. Neither of these approaches has succeeded in enlisting support and involvement from the public in general. Past short comings must be overcome and means of building a larger consensus must be identified.

The 208 program studied storm water, CSOx and municipal discharges and their effect on water quality on a regional basis. The Construction Grants program, however, was applicable only to sanitary sewage collection and treatment. The results show success in those areas in which funding for remediation is easily identifiable such as addressing the problems in the sanitary sewerage systems. The Clean Water Act also required each grantee to enact user-charge system which would pay for the on-going operation and maintenance of the system. These same funding mechanisms began addressing CSO control more recently. Storm water, control for water quality purposes, however, remains largely unfunded and unimplemented.

The raw data and information resulting from NURP has not, in and of itself, affected change. As a research effort it was a success, but it did not include a mandate to address practical applications of the findings. Furthermore, there were no concerted efforts to educate the public about the results of the study.

The RAP was the only effort which began to address one of the hardest aspects of NPS control-consensus building. The RAP and its advisory group has done much to involve a larger body of watershed residents. This approach recognizes that storm water must be controlled from the bottom-up rather than the top down. There are simply too many potential nonpoint source contributions to rely solely on a command and control approach.

In spite of this progress, there is still the need to address several remaining impediments to implementation. They include the following:

Educating the general public to realize the impacts of their behaviors on water quality,

Overcoming outdated and/or incorrect information in the minds of the general public,

Involving local officials in solving water quality problems in times of fiscal constraint,

Funding long-term education programs and ongoing management operations, and

Providing regulatory oversight which supports innovation and provides incentives for local governments to make real progress.

The RRNWWDP has concluded that the areas in which southeast Michigan have had success are those which are most easily identified and for which enforcement is easily directed. In short, the responsibility for the pollution can be assigned to a given entity. This should not be misinterpreted to infer that these successes were easily obtained. In fact, in most cases it is quite the contrary. However, in each of these cases one could identify:

How much pollution was being generated,

Who caused the pollution, and

What it would cost to reduce the pollution.

From this point it was a matter of designing an enforcement mechanism to assure that pollution reduction activities were implemented.

The successes from point source control were many. Under the NPDES program municipal and industrial treatment plants demonstrated substantial reductions in phosphorus, biochemical oxygen demand and suspended solids. These coincidentally reduced other contaminants associated with the solids. Other efforts focused on eliminating toxics from the waterways. The manufacture of PCB and DDT was banned, dioxins were substantially reduced from bleach pulp mills, and lead was eliminated in most gasolines.

All of these efforts can be viewed as a direct result of top down, command and control management of the resource. To overcome the remaining impediments, a broad consensus must be formed which includes homeowners, commercial establishments, small businesses, developing communities, older urban communities and the regulatory agencies. Only then can there be effective NPS control.

## **THE RRNWWDP NONPOINT SOURCE CONTROL PROGRAM**

After assessing the existing knowledge base from local, regional, and national levels, a nonpoint source control program was designed to refine available information, address data gaps, and identify a range of costs associated with treating nonpoint source (storm water) pollutants. In addition to the use of existing data, proposed field investigations will include monitoring programs performed at pilot sites to quantify nonpoint source loadings to the Rouge River Watershed and estimate water quality improvements that can be achieved by structural and nonstructural Best Management Practices (BMPs). The field investigating will also serve to establish the relative costs associated with construction, operation and maintenance (O&M) of various prototype BMPs.

*Figure 1* presents an overview of the nonpoint strategy. These efforts in addition to those activities already mandated under the NPDES program. Under the investigation effort, the loadings associated with air deposition, sediment resuspension and runoff from the various sources will be quantified. The marginal cost of removing each source will be estimated. This information will be used to guide the implementation efforts.

Implementation can be divided into two groups: efforts which are controlled by government entities (street sweeping, household hazardous waste collection, stormwater ordinance adoption) and those which require changes in the behavior of watershed residents,

businesses and governments. This latter category is the area in which consensus building can be successful. We must all agree that NPS control is a priority and that it must be a part of the cost of doing business.

## **FORGOING A CONSENSUS**

Most environmental laws today require that the regulatory authorities seek input from the general public. One of the earlier findings of the RRNWWDP is that the public is often armed with out-dated or inaccurate information. In a recent memo to the EPA management staff, Carol M. Browner, EPA Administrator expressed an interest in increasing the dialogue with EPA's many constituencies about where the agency should be heading in environmental protection. She asked agency staff to organize a series of meeting around the country that will give people an opportunity to share their environmental concerns and expectations. Given our recent experiences under the RRNWWDP, the general public is likely to give her misleading guidance.

In a random survey of 400 residents of the Rouge River conducted between September 21-23, 1993, forty-two percent of those interviewed still believe the continuing primary cause of the degradation of the Rouge River is "waste from business and industrial facilities flowing directly into the river". While this may have been true in the 1960s and 1970s, the NPDES program has significantly controlled this source of pollution.

While combined sewer overflow and nonpoint source pollution are the largest remaining sources of pollution to the River, only about 25 percent of the survey respondents identified them as significant pollutant sources. The fact that the majority of the public continues to place the blame on industry can skew environmental policies, particularly at the local level. Misperceptions of this type did not misdirect the focus of the NPDES program away from policing industrial sources. Most industries understood their contribution to the problem and the regulators had the tools to ensure responsible industries complied with appropriate regulations. In this case the general public only needed a cursory knowledge of the problem in order to philosophically support the program. In contrast, since much of the nonpoint source control will be regulated and policed at the local level, the public must have a thorough understanding of the problem if they are expected to support local ordinances and associated controls.

Changing Federal Regulatory Requirements. The major problem with controlling NPS is the fact that the sources are diverse and numerous. Command and control cannot work because neither the Federal or state governments have sufficient resources to address all the problems. These realities have led to varying degrees of support for the concept of watershed management. In Michigan, the Department of Natural Resources recently prepared a position paper on the reauthorization of the Clean Water Act in which initial signs of support for a watershed-wide management approach can be seen. The first four recommendations of the DNR paper were:

The Clean Water Act should establish a permanent nonpoint source abatement program with sufficient appropriation for continued support;

The Clean Water Act should supersede the requirements of Section 6317 of the Coastal Zone Management Act (CZMA);

While a watershed approach to addressing water quality problems is desirable, it is inappropriate to mandate State implementation of watershed programs within the Clean Water Act; and

The Clean Water Act should authorize EPA to develop regulations to allow efficient trading, where appropriate between different point and nonpoint sources within watersheds for specified pollutants.

Of these recommendation, the fourth is most significant. To truly manage the watershed as a whole, the regulatory agencies must be able to "trade" high cost pollutant abatement for lower cost abatement if the resource (the river) will recognize equal, or better water quality benefit. This, of course, will lead to conflicts between municipalities and the mechanism for negotiating these tradeoffs will be difficult. Without this concept, however, there would be insufficient flexibility to realize cost effective improvement.

Congress took the advise of Michigan and other states when crafting the Clean Water Act reauthorization. These recommendations were incorporated (by and large) into HR3948 by Representative Norman Y. Mineta (D, California) and Representative Sherwood L. Boehlert (R, California). In his introduction of the Water Quality Act of 1994 to Congress, Representative Mineta stated that the bill would accomplish the following:

Would require the states to have their own legally enforceable nonpoint source pollution plans;

Would also substantially increase the funding available to states to help them do nonpoint pollution work;

Clarify that the non-point plans and program were intended to cover both rural and urban watershed runoff problems;

Authorize state to designate watersheds where they believe it would be helpful; and

Would change planning and permit cycles so that once the watersheds were designated, all point-source permits within that watershed, as well as the non-point source and watershed planning cycles in that watershed, would be made to coincide on the same five year intervals. In this way, the state would be able to make trade-offs between point source, and between point and nonpoint sources, in order to achieve water quality standards in the watershed in the most efficient, least burdensome way.

Congress has recognized that adoption and enforcement of watershed-wide management approaches will not occur until there is some motivating action. The mandate for

states to develop "legally enforceable nonpoint source pollution plans" will clearly impact decision making in local communities. While communities are interested in cooperating, approaches to NPS control must be appropriate and at the lowest cost level. The RRNWWDP contends that a watershed-wide approach would be less costly to individual communities than to address their storm water problems on an individual basis.

Watershed Permitting. The RRNWWDP is attempting to demonstrate the effectiveness of this approach by assembling a group of communities which would be willing to accept a watershed-wide NPDES permit. The three questions which are most difficult to answer are:

- 1) To whom is the permit issued,
- 2) How will enforcement be directed, and
- 3) How will implementation be financed?

These three questions continue to challenge efforts for watershed-wide NPDES permit. Thus, a second alternative has been discussed.

The State of Michigan currently has the authority to issue a "Permit by Rule". State laws and their Administrative Rules governing water quality would provide this option. Under this scenario the Permit by Rule would apply to the entire watershed (or a significant portion thereof) so long as communities comply with a predetermined list of requirements. These communities would then be exempt from obtaining their own NPDES permits. This would clearly be an advantage to communities who may need storm water NPDES permits would be more difficult to encourage to join the effort. However, inclusion of a small number of the largest communities will address a significant portion of the drainage area in the Rouge Basin.

Criteria for issuance of a watershed permit will be developed through the legislative process but will likely include:

- 1) Household hazardous waste collection,
- 2) Storm drain stenciling,
- 3) Community education,
- 4) Waste oil collection,
- 5) Clean neighborhood program,
- 6) Clean business program,
- 7) Ongoing storm water monitoring,
- 8) Ongoing stream channel stabilization,
- 9) Adoption of model storm water ordinance,
- 10) Illicit connection program, and a
- 11) Storm water controls inventory.

The Permit by Rule has several advantages. First, since there is no actual "permit" issued the question of whom it should be issued to becomes mute. When a community fails to abide by the predetermined requirements, the State can issue an enforceable order against the individual community. This solves the problem of identifying the entity targeted for enforcement. It also has the further benefit of forcing people to think watershed-wide.

Public Support. Regardless of the final mechanics of developing a "legally enforceable program" the regulatory agencies realize a new approach is necessary. This new approach will be developed openly with much public input. Therefore, it is vital that the general public support the program. Fortunately, in the Rouge River Watershed we are well on our way to ensuring that this support will exist.

The survey of Rouge River residents found that the public appears willing to make some sacrifices to help clean up the river. Sixty-five percent support increased public expenditures for improving the water quality of rivers and streams in their area. Support is greatest among residents of Detroit (66 percent), African-Americans (81 percent), and the young (71 percent of respondents aged under 25 years).

Eighty-three percent of respondents believe that nonpoint source pollution is a very or somewhat significant source of pollution. When given specific options to reduce this type of pollution, people appear willing to change personal behavior through limiting the use of fertilizer (90 percent said they would be willing to do so), taking automobile oil and wastes to recycling centers (97 percent), properly disposing of hazardous household waste (95 percent), and doing business with concerns that voluntarily control their nonpoint source pollution (87 percent).

Three surveys lead one to believe the general public is ready to do their part in reporting the Rouge River is presented with sufficient information on which they can make an informed decision. The Public Involvement work element of the RRNWWDP is charged with providing that information in a manner which makes it available to the broadest audience. At the same time, the Financial/institutional work element will be working with both local officials and the regulatory authorities to provide them with the information they need to comply with future storm water control mandate and do so in the most cost effective manner.

## **CONCLUSION**

The technical aspects of addressing NPS control are well known. Implementation, however, has been delayed by regulatory and political barriers. The Senate and House versions of the CWA reauthorization address many of these shortcomings. Should the CWA be authorized in its current form the flexibility granted the state agencies provides the opportunity for position progress on NPS control. The Rouge River Watershed residents appear poised to accept this challenge. The remaining challenge is in formulating an arrangement which allows the resource to be managed on a watershed basis but enforced against individual entities.

The holistic or consensus-based approach used in the RRNWWDP addresses the shortcomings of earlier effort and the realities of the existing institutional frameworks. This effort will support broad-based initiatives aimed at the ultimate goal of issuing an enforceable watershed-wide permit.