

**IMPLEMENTING A MODEL WATERSHED APPROACH
THROUGH A STATE GENERAL STORM WATER NPDES PERMIT**

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ABSTRACT

The Rouge River National Wet Weather Demonstration Project (Rouge Project), funded in part by U.S. Environmental Protection Agency (USEPA) grants and administered by the Wayne County Department of Environment, has expanded from a program to build and evaluate alternative approaches to control combined sewer overflows (CSOs) to a comprehensive watershed based pollution abatement initiative. The Rouge River Remedial Action Plan (RAP) identified the importance of controlling pollution emanating from diffuse storm water and non-point sources. A storm water management strategy was initiated for the watershed that culminated in a new regulatory framework centered around a watershed based general storm water permit. All 48 Rouge Watershed communities had the opportunity to participate in the design of the permit and reached consensus with the Michigan Department of Environmental Quality (MDEQ) on the required permit elements. The permit requires permittees to participate in watershed management planning for a self-determined subwatershed unit. The watershed management plan will form the basis for implementing watershed goals and objectives that will result in improved water quality and pollution control.

Several factors are key to the success of the watershed management plan. These factors are: size of the watershed management area; permit coverage; enforcement and accountability; minimum application requirements; permit requirements; integrating and coordinating plans within a watershed; and plans for future watershed management.

KEY WORDS

Rouge River National Wet Weather Demonstration Project, Rouge Project, General Storm Water NPDES Permit, Storm Water, Non-point Source Pollution, Watershed Management

INTRODUCTION

The Rouge River National Wet Weather Demonstration Project (Rouge Project) is a watershed-based effort, sponsored by the U.S. Environmental Protection Agency (USEPA), to manage wet weather pollution to the Rouge River, a tributary to the Detroit River in southeast Michigan (**See Figure 1 “Location of Rouge Watershed in Michigan”**) which is designated as a significant source of pollution to the Great Lakes system by the International Joint Commission. The Rouge River watershed is largely urbanized, spans approximately 438 square miles, and is home to over 1.5 million people in 48 communities and 3 counties. Sources of pollution to the river include industrial and municipal point sources, combined sewer overflows (CSOs), storm water runoff, interflow from abandoned dumps, discharges from illicit connections, discharges from failed on-site septic systems, and resuspension of contaminated sediment.

The Rouge Project is designed to identify the most efficient and cost effective controls of wet weather pollution,

while assuring maximum use of the resource. CSO controls are being implemented in phases. Under Phase 1, six communities are separating their sewers and eight communities are constructing 10 retention treatment basins. Each of these basins is sized for different design storms and several employ innovative technology. A two-year evaluation study of the CSO control basins began on June 1, 1997. These results coupled with efforts to control storm water and other pollution sources in the watershed will provide the basis for the Phase 2 CSO control program on the remaining CSO sources in the watershed. The information gained from the evaluation of design storms and control technologies will be useful nationwide on determining cost effective CSO controls to meet water quality standards.

The City of Detroit and 47 other communities are located wholly or partially within the Rouge River Watershed that encompasses portions of three counties. All sanitary and combined sewers in the watershed are connected to the Detroit Wastewater Treatment Plant that discharges outside of the watershed into the Detroit River. Twenty percent of the watershed is served by combined sewers. Separate sanitary and storms sewers serve most of the remaining areas of the watershed with the exception of isolated pockets and rural areas in the headwaters that still have on-site septic systems.

The watershed contains 11 subwatersheds that range between 19 and 89 square miles. Older communities served by combined sewers dominate downstream portions of the Rouge River Watershed, while the headwater areas are typically agricultural land, open space, or low density residential developments that are undergoing rapid change due to growth pressures. Fully developed areas, typical of the middle portions of the Rouge Watershed, have separated storm sewers and limited opportunities to address storm water problems with structural changes.

Data gathered for Wayne County and the MDEQ by the Rouge Project has shown the following:

- C All areas of the watershed have reported problems with high bacteria levels and low dissolved oxygen levels during wet weather events,
- C In eight of the 11 subwatersheds fish consumption is restricted beyond the standard restrictions due to the threat to human health,
- C Nine of 11 subwatersheds have moderate to severe degradation of wildlife habitats,
- C Fish populations have suffered severe impairment in six of the subwatersheds,
- C There is moderate to severe impairment of aesthetic enjoyment in eight of the subwatersheds, and
- C Restrictions to navigation resulting from log jams, garbage and sedimentation, are a moderate to severe impairment in seven subwatersheds.

Although the early focus of the Rouge Project was on the control of CSOs in the older urban core portion of the watershed, in recent years the project has learned that many pollution problems stem from a lack of coordinated storm water management and non-point source pollution upstream of CSO discharges.

METHODOLOGY

A storm water management strategy was initiated in 1995 that culminated in a locally-based request to the MDEQ in 1997 to promulgate a new watershed-based, general storm water National Pollutant Discharge Elimination System (NPDES) permit. The genesis of this new regulatory framework subsequently adopted by the MDEQ was outlined in a report *Adapting Regulatory Frameworks to Accommodating Watershed Approaches to Storm Water Management* (Fredericks, Cave and Bails, et al., 1997).

Rouge communities believed that a general storm water permit would be an alternative regulatory mechanism that would provide incentives for watershed management and improve water quality. Communities are interested in applying for the permit because they know that it provides them optimum flexibility to solve the most pressing problems in their subwatershed. Other advantages of the general permit include:

- C Communities will address storm water problems several years before state and federal mandates will

- C come into effect and will be covered under future laws;
- C Supports innovative approaches to storm water management including land use controls and flow management to reduce impacts to the river, not simply command and control;
- C Communities or public agencies may request coverage for whole jurisdictional area or portion within hydrologic boundary;
- C MDEQ may temporarily waive management plan requirements for applicant until significant number of municipalities request coverage within hydrologic unit;
- C Local agencies and stakeholders will set own goals and objectives within broad guidelines; and
- C Penalties do not apply if applicant covered is in compliance and declines coverage before Pollution Prevention (P2) Initiative schedules go into effect.

There have been a number of lessons learned in the application of this model approach that could prove beneficial in its adaptation to other areas of the country under the U.S. Environmental Protection Agency's *Draft Phase II Federal Storm Water Regulations and Initiatives (40 CFR Part 122 & 123)*. The lessons learned are presented in the discussion section of this paper.

RESULTS

As of June 1, 1998, 28 letters of intent have been submitted by communities in the Rouge Watershed indicating they plan on applying for the general storm water permit. Seventeen communities have passed resolutions through their councils that indicate support for the general permit, and eight communities plan on applying within the next six months.

Seven major subwatershed groups have formed from the original 11 delineated by the Rouge Project. Three demonstration subwatersheds have been working towards application by preparing missions and visions, goals and objectives, and storm water management plans for their subwatershed.

- C Communities within the Upper 2 subwatershed, have decided to form an Upper Rouge River subwatershed group by adding the Upper 1 and the Upper 2 geographic area to form a subwatershed hydrologic unit. Most communities located in the Upper 2 have territory in both areas and have agreed that it will be advantageous to combine resources. Communities have decided to apply for the general permit within the next six months. Many storm water management activities were explored in this subwatershed when a management study of the Upper 2 area was prepared with the assistance of the Rouge Project.
- C The Middle 1 subwatershed has involved over seven communities and three counties in their subwatershed management planning group. The anticipated date that they will apply for the general permit is January 1999. The Middle 1 group has a significant head start on a watershed management plan because of the study of the subwatershed performed with assistance from the Rouge Project.
- C The Middle 3 subwatershed group, which involves four major communities, anticipates permit applications to be made within the next six months. This group will also rely on the storm water subwatershed management study prepared with the assistance of the Rouge Project.
- C All of the communities in the Lower 1 subwatershed and most of the communities in the Lower 2 subwatershed have passed resolutions indicating their intent to apply. Although these communities were not chosen as demonstration projects through the Rouge Project, they have received some assistance via pilot project grants. Over the last year, these communities have dedicated significant staffing resources to the application process and intend to make application within the next six months.
- C In the headwaters of the Main Rouge River, communities have asked the Oakland County Drain

Commissioner to facilitate their efforts in a combined Main 1 and 2 subwatershed. Over 16 communities are involved in this recently initiated effort. The anticipated date that they will apply for the general permit is January 1999.

Institutional arrangements and financing options necessary to implement the general permit and subwatershed management plans are one of the many elements which the local communities are addressing in their working groups. Discussions to date indicate that these arrangements are likely to be substantially different in different subwatersheds. For example, some subwatersheds are likely to utilize the Michigan Drain Code (*Review of Michigan Drain Code of 1956*, RPO-NPS-SR02.00) to formalize their intergovernmental arrangements and financing. Other subwatersheds are likely to utilize existing organizations and relationships (e.g., public authorities such as sanitation agencies) to accomplish activities which require coordination beyond individual municipal boundaries.

As part of the subwatershed planning process, communities and agencies are also identifying issues which cross subwatershed boundaries. Rouge Project staff and the MDEQ are currently providing coordination of the individual subwatershed efforts and are assisting subwatersheds in developing a comprehensive strategy for addressing watershed-wide issues. The subwatershed communities are also identifying those activities such as public education and water quality monitoring which may be most cost-effectively performed throughout the entire watershed by a single entity. Institutional arrangements necessary for implementation of watershed-wide activities are also under investigation.

DISCUSSION

Before communities and/or agencies apply for a general storm water permit, several important decisions should be made about size of the watershed management area, permit coverage, enforcement and accountability, elements of the watershed plan, and the future of watershed management. After those decisions are made, other critical factors come into play, such as sharing resources required for public education, and staff for implementing the plan, once the application is made. This section discusses the decisions made by permittees in the process of applying for a general storm water permit.

Size of the Watershed Management Area.

Schueler in his paper, *Crafting Better Urban Watershed Protection Plans*, suggests that subwatersheds having a drainage area of 518 to 3885 hectares (2 to 15 square miles) in size provide the best scale from both a technical and a political basis on which to base management plans (Schueler, 1996). In part, his conclusion on optimum size was based upon the fact that with smaller units, a planning area would most likely be contained within one political jurisdiction. Of the 11 subwatersheds within the Rouge Watershed (**See Figure 2 "Rouge Watershed Communities with Subwatershed Boundaries"**), the smallest number of communities involved is four; and most have more than 6. Further, the number of government agencies or organizations that influence water quality within a subwatershed is difficult to quantify. Because there are so many different governmental units within a subwatershed, self selection of the hydrologic unit to form storm water management plan works best.

The most important factors influencing the size of the subwatersheds for the development of storm water management plans have been the ability of adjacent communities within a hydrologic area to identify common concerns and opportunities for partnerships. The Rouge River Watershed is highly diverse in terms of population density, level of development, household income, and in-place storm and sanitary sewer infrastructure. The opportunities for restoring or protecting water quality are very different in areas where the land area is 90 percent developed versus those areas that are just undergoing rapid development of existing open, rural areas.

While the MDEQ has reserved final judgment on determining the size of the subwatersheds, the new general permit provides flexibility on the size selected and gives the local public agencies the opportunity to propose the watershed boundaries in their application for coverage that best meets their needs. The communities have

resoundingly rejected proposals that would impose a new management authority over the entire Rouge River Watershed. Such an authority, according to the communities, would limit representation of local jurisdictions and fails to recognize the diversity and strong “home rule” in the region.

Local government leaders have been working in three demonstration subwatersheds as part of the Rouge Project over the last three years. The three demonstration subwatersheds include: the Upper 2 (portions of the cities of Livonia, Farmington Hills, Farmington, Novi, and Northville and Redford Townships); the Middle 1 (the City of Northville, portions of the City of Novi and Northville, Salem, and Plymouth Townships); and the Middle 3 (the cities of Dearborn Heights and Garden City and some portions of Westland).

These three subwatersheds represent the range of development, population and water quality problems found among Rouge River subwatersheds. The Middle 3 represents an older, fully developed community where portions of the sewer system are combined, and CSO basins and/or sewer separation projects are currently planned or under construction. The Middle 1 has rapidly developing residential and commercial areas with separated sewers and it encompasses a significant rural area served primarily by on-site septic systems. The Upper 2 is the most diverse of the three demonstration subwatersheds. Both CSO basin construction and sewer separation projects are underway in the older developed portions of the Upper 2 subwatershed. Septic systems are also present in some residential areas of the Upper 2 and urbanization is still occurring in the last remaining open space areas of the subwatershed.

Government leaders have been able to develop a shared vision, goals and action plans in each of the Rouge Project demonstration subwatersheds through the formation of subwatershed advisory groups dedicated to discussing storm water management. Each group has established a mission and vision, identified problems for their area, set goals and objectives and initiated a storm water management study.

For example, after identifying problems and establishing goals and objectives, leaders in the Upper 2 group decided that it would be advantageous to add the land mass contained within the Upper 1 subwatershed since many of the political jurisdictions located in the Upper 1 were the same as in the Upper 2. Although this committed the group to examining a larger land area, officials realized the effort would be more efficient than going through two planning processes for an adjacent area. By allowing flexibility within the permit for this to happen naturally, the general permit process facilitated a better watershed approach.

Permit Coverage

Ideally, a watershed-based regulatory framework should encompass all dischargers so that pollution sources can be addressed holistically. Practically, it must be recognized that prior NPDES permit programs at the state and federal level are already in place for municipal and industrial point source waste treatment discharges, and for many industrial and commercial storm water discharges. The MDEQ watershed-based, general storm water permit covers only public agencies that own, operate or control storm water conveyance systems that were not covered under the Phase I federal storm water regulations.

The MDEQ general permit does give communities the flexibility and encouragement to incorporate non-point source controls and pollution prevention activities as part of the required watershed management plan. While the coverage is limited to public agencies and their storm water discharges, credit for local actions to prevent pollution, control storm water flows, and regulate land uses has been included in the general permit.

For example, many communities have initiated pilot projects to evaluate how storm water best management practices (BMPs) will control storm water flows and prevent pollution. In some cases these pilot projects have permanently changed the way communities and/or government agencies deal with storm water. These management practices will be included as part of a watershed management plan, and credit will be given to the entities that are performing those functions.

Enforcement and Accountability

While the coverage is granted to individual public agencies under the MDEQ general storm water permit, joint applications are encouraged and a joint management plan is required for a defined hydrologic unit. Enforcement is based upon individual public agency P2 Initiatives and the schedules for implementing those initiatives. The P2 Initiatives must be consistent with the jointly developed subwatershed management plan.

The general permit is outcome-oriented, giving the communities the opportunity to develop innovative approaches and their own schedules to achieve the priority water quality goals and objectives outlined in the locally generated subwatershed plan. The plan itself is subject to only MDEQ review and comment. The individual P2 Initiatives and schedules, however, must be approved by MDEQ. The application for coverage is voluntary (e.g. there is no current state or federal requirement mandating a storm water permit for communities serving populations under 100,000 population with separated sewers); however, once the P2 Initiative has been approved by MDEQ and accepted by the public agency, the required actions and schedules are enforceable.

The communities rejected the concept of a joint permit that would leave all communities involved in a subwatershed management area subject to penalties for the failure of one to meet requirements. Most communities embrace the concept of joint planning and in some cases shared responsibilities for joint actions— provided that they are only held individually accountable for those things for which they can exercise control. Community peer pressure may reinforce joint planning and shared responsibilities that emerge from subwatershed plans.

During the application stage, communities have found that sharing resources as part of joint planning is beneficial for accountability and economic purposes. For example, several communities have agreed to share staff resources to implement public information campaigns. These communities agreed that the problems they faced due to storm water were similar, and that one person could fulfill the information needs of the two communities; thus an agreement was made to split time between the two communities and to utilize the same type of public education tactics whenever possible. Other communities are exploring ways to share responsibilities such as log jam removal, and other river maintenance activities required after wet weather events. Communities that share these type of responsibilities also share the accountability for fulfilling obligations.

Minimum Application Requirements

The communities requested that the application and permit process for the MDEQ general storm water permit limit the number of required actions and focus instead on establishing required outcomes. The MDEQ general storm water permit has just four substantive program elements required in the application. The application for coverage must include: the area of coverage and delineate known point sources of separate storm water discharges; an illicit connection elimination plan; and, a public education plan to reduce the discharge of pollutants. Even these limited application requirements and the prescribed elements created some concerns.

The communities recognized that the task of identifying each and every storm water discharge could be costly, time consuming and unproductive at the application stage. In many cases actual ownership and control of visible discharge pipes to the river may not even be known. During the comment period on the draft, the MDEQ responded to this concern by amending the permit so that maps of the separate storm water drainage system could be substituted for the enumeration of individual discharges. After the final permit was issued, some communities indicated that conducting a program to detect illegal connections to relatively new separate storm sewers was not as high of a priority as correcting failed on-site septic systems that dominate in some subwatersheds. In a permit workshop, the MDEQ concurred that it was illicit discharges from either improper sanitary connections or failed septic systems that needed to be addressed in a plan submitted at the time of application.

While the communities understood the need and support public education to reduce individual actions that result in pollution of storm water, they question the importance of specific plan requirements such as the need

for “procedures for residential car washing.” Whereas, car washing can certainly be a concern in a residential area with paved streets, curb and catch basins, those communities representing rural suburbs with gravel roads and driveways questioned why developing public information on car washing should be a priority over other types of public information on pollution prevention relevant to their areas.

The point is that a regulation that requires specific actions of all communities regardless of circumstances or without regard to the potential beneficial outcomes, dilutes the resources available to address real problems and undermines the credibility of the regulation. One-size-fits-all requirements do not work well with diffuse sources of pollution. Requirements need to be flexible and they need to be outcome oriented.

Permit Requirements

Another key element in this regulatory framework is the requirement that the public agencies granted coverage under the permit must develop a joint watershed management plan by a specified date for an identified hydrologic area. The management plan requirements of the MDEQ general storm water permit are focused on elements that must be considered, expected outcomes and process. The permit requirements include: assessment of existing conditions; goal and objective setting through a public participation process; identification of local priorities, problems and opportunities; consideration of options and selection of action plans; implementation schedules; and, a process for evaluating results and updating the action plan. Once the plan is reviewed with local stakeholders, adopted by the public agencies seeking coverage and commented upon by the MDEQ, each entity seeking coverage within the subwatershed must submit its own P2 Initiative consistent with the goals, objectives and actions outlined in the subwatershed management plan.

While the long-term goal of each plan is to achieve water quality standards, the emphasis and priorities change between subwatersheds. If the draft subwatershed plans already developed with the Rouge Project are good examples, local subwatershed plans may encompass issues that go beyond state requirements for on-site storm water retention to reduce flow variability, and for other land development controls to reduce the amount of impermeable surfaces created. The draft plans have also allowed local stakeholders to examine how, working together, they can more cost-effectively undertake actions to educate their citizens, develop monitoring plans to evaluate progress, and consider joint operations or capital improvements to address specific problems.

Integrating Subwatershed Plans

A significant concern of the federal court overseeing the clean up of the Rouge River has been how individual subwatershed management plans can be integrated to make sure that there is a comprehensive strategy for addressing basin-wide issues that cross subwatershed boundaries. The communities petitioned the federal court to delay any orders that would formally establish a basin-wide coordinating entity and allow the communities to develop their own concepts for basin-wide coordination. The communities are developing a proposal that will identify the role of a basin-wide coordinating entity, its membership, responsibilities, and financial support.

The communities have determined that most of the water quality problems are resolvable at the local subwatershed level. The need for a basin-wide entity is largely based upon economic savings that can be realized through pooling resources to create a common database and geographic information system; develop and implement a basin-wide water quality monitoring plan; and, construct predictive flow and water quality models. If pollution control trading ever matures to the point where it is widely accepted by regulatory agencies, a basin-wide entity could serve as the screener and broker for potential trades.

Future of Watershed Management

This model approach of using a general storm water permit to initiate water quality management on a watershed basis may have broad application in urban areas that fall under the federal storm water permit requirements for the first time under Phase II storm water regulations. While it falls short of a totally holistic approach to managing all discharges within the context of a single watershed plan, it at least brings currently unregulated storm water and non-point sources within a regulatory framework. Once a watershed plan is created,

integrating all water quality regulatory programs so that they conform to common goals and objectives will at least be possible.

The key features of the MDEQ watershed-based, general storm water permit is its flexibility to accommodate the diversity found in various watersheds, and its bottom-up approach in establishing goals, objectives, action plans and schedules at the local level under outcome oriented guidelines provided by the state.

CONCLUSIONS

Local communities in southeast Michigan and the state regulatory agency are attempting, for the first time, a consensus, cooperative approach to storm water management and regulation under the NPDES program. The Michigan general permit is a watershed-based, general storm water permit issued under the National Pollutant Discharge Elimination System. The permit requires permittees to immediately initiate some activities such as illicit discharge elimination and to participate in watershed management planning for a self-determined subwatershed unit. The watershed management plan will form the basis for implementing watershed goals and objectives that will result in improved water quality and pollution control. This new regulatory program implements the watershed approach endorsed by USEPA and others and should facilitate watershed-based intergration of control programs for different pollution sources such as storm water and combined sewer overflows which may be present with a large, urban watershed. This program empowers local government and their stakeholders in identifying problems, choosing from alternative solutions, establishing priorities and schedules, and developing common strategies with neighbors. Communities and others involved in this new program are also addressing issues such as coordination of subwatershed efforts within larger subwatersheds. It is hoped that this effort and the work of the Rouge River National Wet Weather Demonstration Project will continue to identify and quantify the benefits of cooperative, watershed-based efforts to protect and restore our nations water resources.

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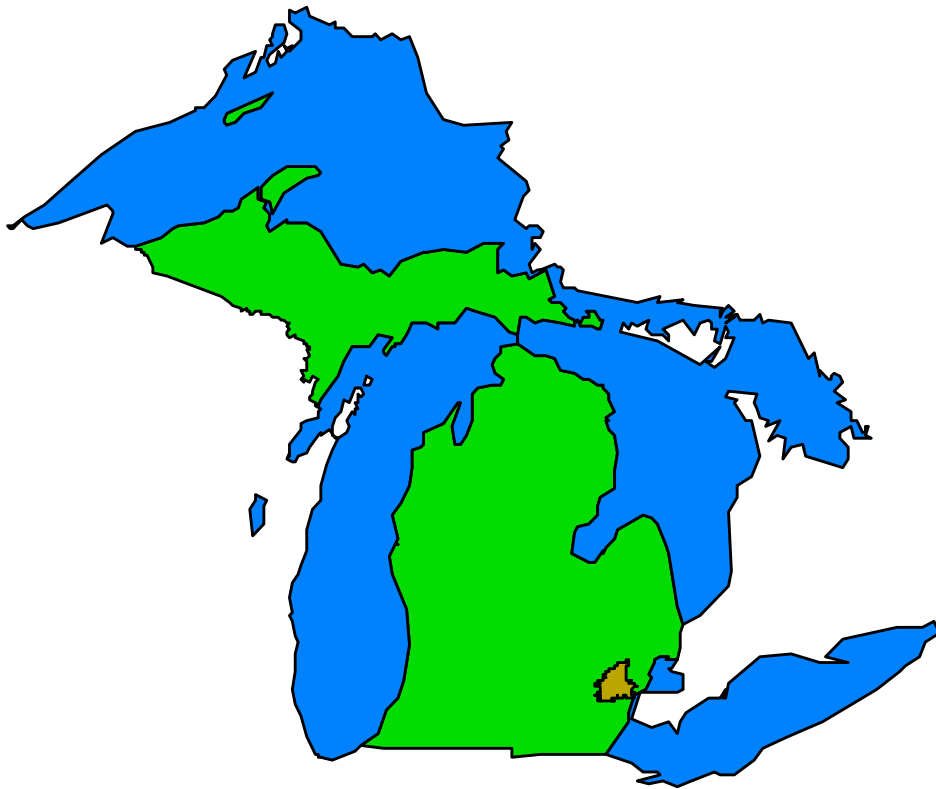


FIGURE 1 - LOCATION OF ROUGE WATERSHED IN MICHIGAN

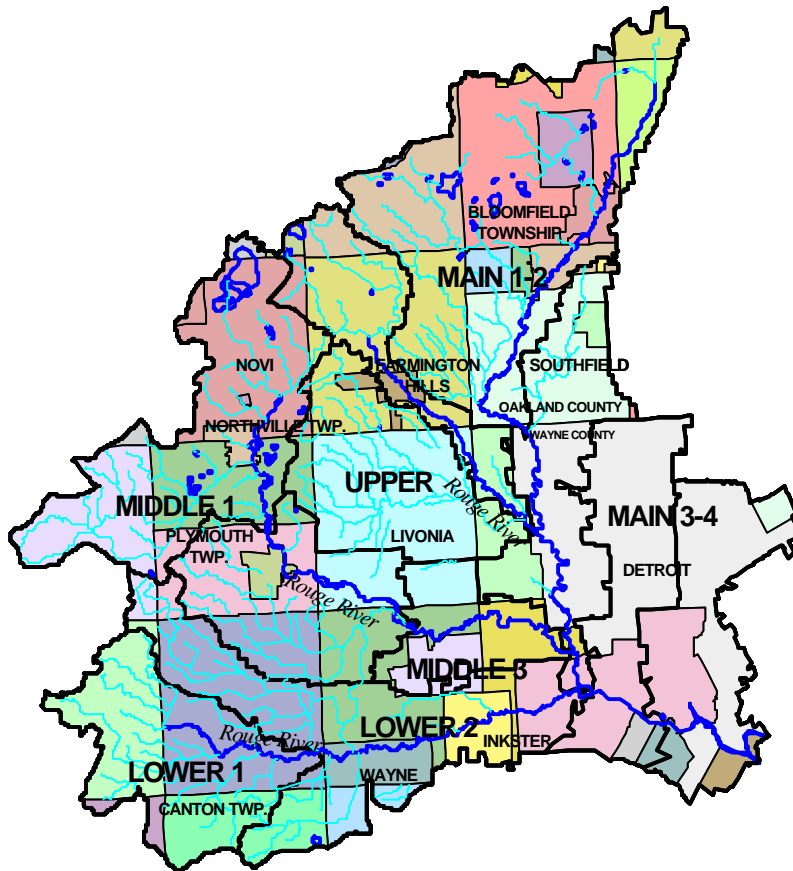


Figure 2 “Rouge Watershed Communities with Subwatershed Boundaries