Combined Downriver Watershed Management Plan

Prepared on behalf of the Combined Downriver Advisory Group and the Alliance of Downriver Watersheds

Alliance of Downriver Watersheds
OURS TO PROTECT

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Assistance provided by

OHM
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In association with Wade Trim and

Huron River Watershed Council

Combined Downriver Watershed Management Plan

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Inter-Municipality Committee

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Introduction to the Combined Downriver Watershed

The Combined Downriver Watershed is a relatively urban watershed within Wayne County in southeast Michigan. Originally, combined sewers serviced a portion of the area leading to water quality impairments of the creeks. The Michigan Department of Environmental Quality (MDEQ) required the separation of combined sewers in the 1980's and improvements to the Downriver Sewage System in the 1990's. Even after implementation of the required improvements, the water quality of the watershed is still threatened and in some cases impaired by urban storm water runoff.

Many of the drains within the watershed were originally designed to accept agricultural flows. As the watershed urbanized, the ability of these small drains was insufficient to handle the new, higher peak flows resulting in flooding and erosion. Conversely, the urbanization of the watershed led to an increase in impervious surface area that result in less rainwater being infiltrated into the ground which results in lower creek base flows. The combination of these two effects, higher peak flows during storm events and lower creek base flows, is devastating to the aquatic life in the streams. Consequently in 2007, the Michigan Department of Environmental Quality (MDEQ) developed a Total Maximum Daily Load (TMDL) for biota or aquatic life for the Frank & Poet Drain, Blakely Drain, and the Brownstown Creek to address impairments of the watershed's creeks and drains. Previous studies, sampling and the results of this Watershed Management Plan work point to the impairment as being caused by unstable flows and excessive sedimentation, which are resulting in the loss of stable habitat for aquatic life. It is apparent that implementing methods to reduce the effects of urban storm water runoff are essential to further improving the water quality of the Watershed.

The Combined Downriver Watershed is located within Wayne County, in southeast Michigan. The watershed drains an area of approximately 85.9 square miles in a relatively urbanized region (especially in the northeast and eastern half of the watershed) and has a watershed population of roughly 157,000 people. The Combined Downriver Watershed includes 14 entities. These entities are listed below:

- Brownstown Township
- Gibraltar
- Grosse Ile Township
- Huron Township
- Riverview
- Romulus
- Southgate
- Taylor
- Trenton
- Woodhaven
- Wyandotte
- Wayne County Airport Authority
- Woodhaven-Brownstown School District
- Wayne County

The Combined Downriver Watershed can be subdivided into 3 main subwatersheds. These include the Blakely Drain, the Frank & Poet Drain and the Detroit River South. Portions of Southgate and Wyandotte in the Detroit River South Subwatershed have a combined sewer system, which directs storm water to the Wayne County Wyandotte Wastewater Treatment Plant. Each of the subwatersheds contains many small tributaries and some larger drains such as the Brownstown Creek in the Blakely Drain Subwatershed and the Sutliff & Kenope Drain in the Frank & Poet Subwatershed

According to the Southeast Michigan Council of Governments (SEMCOG), approximately 62% of the land is considered developed with only 38% remaining as open space. The urbanization of the watershed is expected to continue with 92% of the land being developed and only 8% remaining as open space by the year 2030.

Purpose of the Combined Downriver Watershed Management Plan

On March 10, 2003 the entities within the Combined Downriver Watershed applied for a National Pollutant Discharge Elimination System (NPDES) permit under Michigan's Phase II Storm Water regulations. These regulations require certain "small" municipal separate storm sewer system entities that are located in urbanized areas to obtain a storm water permit. An initial requirement of the permit was the development of a comprehensive Watershed Management Plan that addresses the following elements:

- Watershed Condition
- Challenges and Goals
- Identify Management Alternatives
- Watershed Action Plan
- Methods and Milestones to Measure Progress.
- Sustainability
- Public Involvement

The goal of the Watershed Management Plan is to create a tool that the entities within the watershed can use to guide implementation of action items that will help achieve long-term goals of the watershed. The Combined Downriver Watershed Inter-Municipality Committee (ECIC) developed a Watershed Management Plan in 2006 that was approved (CMI) by the State in 2007. This document is an update to the 2006 Watershed Management Plan to include activities and data that have since been collected and/or developed. The plan was also updated to achieve 319 approval from the State.

Formation of the Combined Downriver Watershed Inter-Municipality Committee (CDWIC)

The entities within the Combined Downriver Watershed needed to legally establish a mechanism in order to fund the development of the Watershed Management Plan. The entities worked to develop a Memorandum of Agreement (MOA) to formalize the group and establish financial responsibilities and by-laws. Each entity adopted the MOA and the Combined Downriver Watershed Inter-Municipality Committee (CDWIC) was formed on March 30, 2004 through the Inter-Municipality Committee Act (PA 200, 1957; MCL 123.631, et seq.) The CDWIC evolved into the Alliance of Downriver Watersheds as is detailed below.

Formation of the Alliance of Downriver Watersheds

The Alliance of Downriver Watershed (ADW) members have been formally and informally working together for several years to manage the area's water resources on a watershed basis and to comply with federal regulations regarding the discharge of storm water. The ADW is a permanent watershed organization formed under Public Act 517 of the Public Laws of 2004. The ADW was formed in January 2007 and consists of 26 public agencies in the Ecorse Creek, Combined Downriver, and Lower Huron River Watersheds in southeast Michigan. The agencies and communities that comprise the ADW believe there are substantial benefits that can be derived by joining together and cooperatively managing the rivers, lakes, and streams within the watersheds and in providing mutual assistance in meeting state water discharge permit requirements of the members. The ADW is relatively urban in nature with more open and rural lands as you move south within the watershed boundaries. Based on 2000 Census data, approximately 453,436 people reside within the watershed boundaries. Article III of the ADW Bylaws details the assessment of cost to members methodology. The members of the ADW developed a cost allocation methodology based on each members total area (acres) in all 3 watersheds and total population in all 3 watersheds. Among other things, the annual membership dues provided by each member have been successful in serving as local match and leveraging several hundred thousand dollars in grant funds.

Combined Downriver Watershed Condition

The current condition of the Combined Downriver Watershed was determined through a review of existing reports, water quality sampling data and field investigations. The information reviewed came from the Michigan Department of Natural Resources, the Michigan Department of Environmental Quality, the U.S. Army Corps of Engineers, the U.S. Geological Survey, Wayne County Department of Environment and other sources. Field surveys utilizing the MDEQ's Stream Crossing Watershed Survey Procedure were also conducted at 78 locations throughout the Combined Downriver Watershed to provide habitat, water quality data and culvert/bridge structure information.

Portions of the Combined Downriver Watershed, including the Frank & Poet Drain, Blakely Drain, Brownstown Creek and the Detroit River subwatershed, were identified on Michigan's list of water-quality limited or threatened waters as failing to meet Michigan water quality standards for pathogens and/or for the protection of warm water aquatic life. The biota and E. coli TMDLs, which the MDEQ have developed, identify water quality indicators, and quantifiable pollutant load reductions to protect aquatic life and recreational uses. The Detroit River is also on the state's list for failing to meet water quality standards for mercury and pathogens and for fish contaminant advisories for dioxin, mercury and polychlorinated biphenyls. Because of this contamination, the Detroit River has been designated by the United States and Canada as an Area of Concern.

The water quality indicators used to assess the health of the aquatic life and a summary of the rating/observation for each are listed below:

Water Quality Indicator	Rating/Observation
Biological communities	Fair to Poor
Sedimentation/total suspended solids	Significant sedimentation generally in a range that would reduce fish populations
Hydrology	Flashy flows/extremely unstable hydrology
Imperviousness	Frank & Poet Drain: ex 30.2%, future 49.6% Blakely Drain: ex 21.4%, future 46.6% Detroit River South: ex 26.9%, future 45.1%
Phosphorus	2 to 4 times the recommended value of 0.05 mg/L TP
Dissolved oxygen	3 mg/L to 12 mg/L, recommended min value is 5 mg/L
Conductivity	200 µS/cm to 3,500 µS/cm, recommended value <800 µS/cm
Pathogens (e.coli)	1.5 to 6 times the recommended max. of 130 cts/100 mL

Field surveys were performed in October and November of 2004 to gain a hands-on assessment of the watershed. The field surveys focused on "areas of concern" identified by the CDWIC, 78 stream crossings and additional areas along the drains to obtain a general understanding of the creeks' conditions. In total, 28 different drains were evaluated at various locations. General findings revealed minimal riparian buffers, significant sedimentation and turbid water, evidence of flashy flows, eroded banks and debris piles.

Designated and Desired Uses and Pollutants

All surface waters in Michigan are designated for and protected for a variety of uses. The designated uses that are applicable to the Combined Downriver Watershed are shown in the following table. In addition to the designated uses, the CDWIC identified certain desired uses for the watershed. The desired uses are also shown in the table below.

Some of the uses are considered impaired, meaning the use is not being met. Threatened indicates that the use is being met, however, there is a good likelihood that the use could become impaired in the future. For those uses recognized as impaired, the CDWIC identified known (k) and suspected (s) pollutants. Sources and causes for the pollutants were also identified by the CDWIC.

Uses	Impaired	Potentially Impcted	Unknown	Known or Suspected Pollutant
Designated Use				
Partial Body Contact Recreation	X	X		E. coli and pathogens (k)
Warmwater Fishery		X		
Other Indigenous Aquatic Life and Wildlife	X			Lack of stable flow (k) Sedimentation (k) Low dissolved oxygen (k) Nutrients (s) Lack of habitat (k)
Total Body Contact Recreation (between May and Oct)	X			E. coli and pathogens (k)
Agriculture			X	
Industrial Water Supply			X	
Navigation			X	
Desired Use				
Flood Control (local)	X	X		Lack of stable flow/excessive surface runoff (k) Lack of hydraulic capacity (k) Inadequate protective measures (k)
Natural Features		X		
Native Vegetation/Unique Habitat/Natural Buffers		X		
Recreational Areas		X*		
Open Space		X		
Greenways		X		
Wetlands		X		
Agricultural Land		X		
Well Water Supply			X	

*designated as potentially impacted because more recreational areas are desired

Goals and Objectives

Once the CDWIC identified the designated and desired uses, determined pollutants and their sources and causes, and considered plan maintenance and sustainability issues, goals and objectives for the watershed were developed. A goal is a long-term qualitative description of a desired future condition stated in general terms without criteria of achievement while an objective is an action that can be either short-term or long-term that will reduce pollution from a source to protect or restore a designated or desired use. The CDWIC's 10 goals and the associated objectives are shown in the following table.

Goals	Objectives
Reduce Stream Flow Variability	Both Short- and Long-Term Objectives: ▪ Reduce runoff volume/rate ▪ Preserve & enhance native vegetation/naturalization Long-Term Objective ▪ Preserve & restore wetlands & open space
Reduce Flooding	Long-Term Objectives: ▪ Improve capacity of floodplains ▪ Preserve and restore wetlands & open space ▪ Reduce runoff volume/rate ▪ Improve understanding of streamflow volumes & distribution
Increase Public Education, Understanding, and Participation Regarding Watershed Issues	Short-Term Objective: ▪ Improve media coverage ▪ Create partnerships with institutions, schools, and the private sector ▪ Foster relationships with the County and neighboring communities Both Short- and Long-Term Objective: ▪ Improve education and awareness of watershed successes and failures
Improve Water Quality	Short-Term Objective: ▪ Eliminate/reduce illicit discharges Both Short- and Long-Term Objective: ▪ Protect, expand, and restore the riparian corridor ▪ Improve erosion and sedimentation controls ▪ Preserve and restore wetlands and open space Long-Term Objective: ▪ Reduce directly connected storm water discharges to sanitary systems
Protect Public Health	Both Short- and Long-Term Objective: ▪ Reduce secondary health concerns related to flooding Long-Term Objective: ▪ Meet partial body contact requirements ▪ Meet total body contact requirements

Goals	Objectives
Preserve, Increase, and Enhance Recreational Opportunities	Both Short- and Long-Term Objective: ▪ Protect and improve riparian corridor aesthetics Long-Term Objective: ▪ Obtain land for wetlands and passive parks ▪ Meet partial body contact requirements ▪ Increase public access to stream corridors ▪ Encourage recreation and open space planning in site plan/land use approval process
Protect, Enhance, and Restore Riparian and Insteam Habitat	Short-Term Objective: ▪ Integrate storm water management in planning and land use approval process Long-Term Objective: ▪ Restore warmwater fishery ▪ Restore diverse aquatic community
Watershed Management Sustainability	Short-Term Objective: ▪ Establish institutional relationships to ensure plan implementation Long-Term Objective: ▪ Determine long-term funding methodologies
Preserve & Protect Critical Areas	Long-Term Objective: ▪ Integrate agricultural preservation goals into land-use policy

Action Plan

After gathering information and input from various entities within the watershed and reviewing current policies and programs that are in place, a variety of management alternatives were discussed to address the priority pollutants and causes and to work toward achieving the goals of the Watershed Management Plan. The ADW, including the Combined Downriver Watershed communities have been working over the years to implement projects and activities that will have a positive impact on water quality, meet permit requirements, and document and measure progress. As is detailed in the annual ADW budget and financing plan, the ADW has organized its planned activities (over the next 5 years) into one of five categories:

- Illicit Connection/Discharge Elimination Plan (IDEP)
- Public Education
- Progress Evaluation Monitoring
- Planning and Reporting
- Other Storm Water Management Activities

As part of the 2012 WMP Update, each community within the watershed identified a number of projects that they would like to implement if funding is available (outside of permit requirements). This information was collected through a series of meetings with the individual communities. Storm Water Management Activities and best management practices were categorized into one of 16 categories:

- Green Roof
- Green Street
- Porous Pavement Installation
- Grow Zones/Native Plantings/Rain Gardens
- Bank Stabilization/Restoration of Bank or Riparian Features
- Culvert/Bridge Replacement
- Storm Water Detention/Retention
- Increase Floodplain
- Public Education/Stewardship
- Hydrodynamic Separators (Vortechnics/Stormceptor)
- Land Acquisition or Conservation Easements
- Water Efficiency
- Comprehensive Street Tree Planting Program
- Water Harvesting/Reuse
- Downspout Disconnection Program
- Other

Measuring Progress

The Watershed Management Plan includes ideas on how to measure the effectiveness of the various BMPs. Measuring progress will be done by both qualitative and quantitative techniques. Qualitative measures include: public surveys, ordinances passed, stream surveys, written evaluations following watershed activities, visual documentation, complaint records and citizen participation. Quantitative techniques include: aquatic life, suspended solids, pathogens/bacteria, dissolved oxygen, flow stability, geomorphology, and method and frequency of monitoring activities.

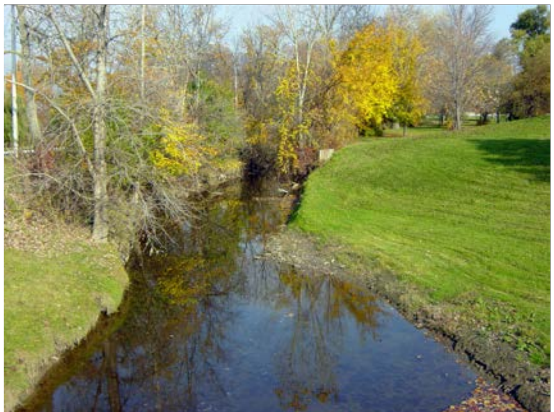
The ADW tracks and reports on progress with the Annual Report submitted to the MDEQ each November,as is required under the Storm Water General Permit. The Annual Report summarizes all activities completed by the ADW (both required and not required).

Sustainability

Sustainability is a required element of the Watershed Management Plan. It is important that implementation of the action items or BMPs occurs throughout the watershed and that the effectiveness is measured, so that revisions to the plan can be accomplished in a timely manner.

Working together as a team for the development of this Watershed Management Plan, the communities, Wayne County, the Wayne County Airport Authority and the Woodhaven-Brownstown School District have realized many benefits. Resources both technical and financial are easily shared resulting in an affordable, comprehensive plan addressing the goals of all involved. Similarly, in implementing the plan, it is anticipated that the entities will continue to realize the many positive benefits. The Alliance of Downriver Watersheds provides the means for continuing their efforts in working together for the benefit of the watershed as a whole and comply with permit requirements.

1. Introduction



The Combined Downriver Watershed

Chapter Contents

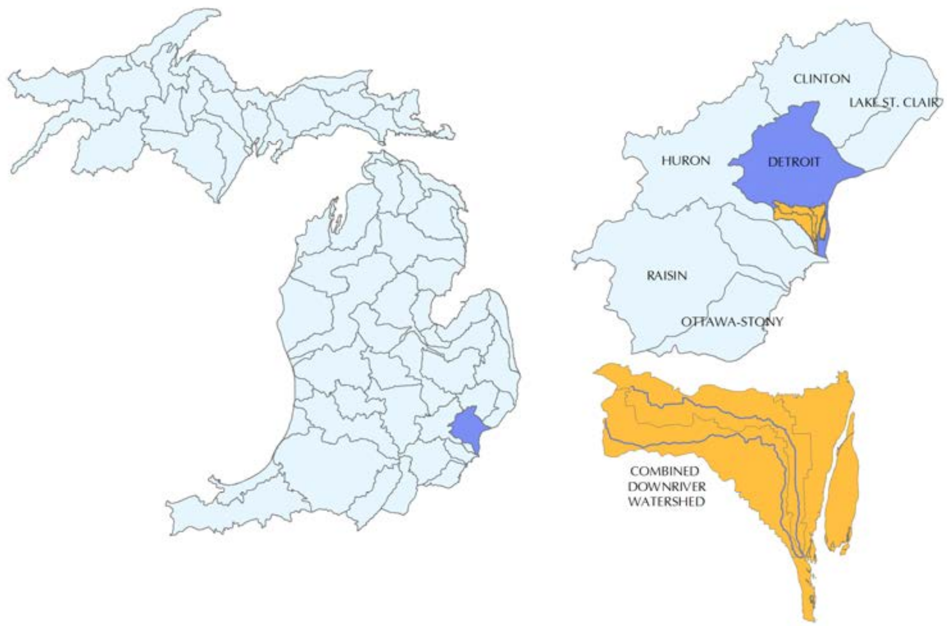
The Combined Downriver Watershed
Purpose of Watershed Management Plan

The Combined Downriver Watershed is located within Wayne County, in southeast Michigan. The Detroit River, the Frank & Poet Drain, and the Blakely Drain are the three primary water courses within the watershed. The watershed drains an area of approximately 85.9 square miles in a relatively urbanized region, including a portion of the Detroit Metropolitan Airport in the headwater region of the Frank & Poet Drain.

1.1 THE COMBINED DOWNRIVER WATERSHED OVERVIEW

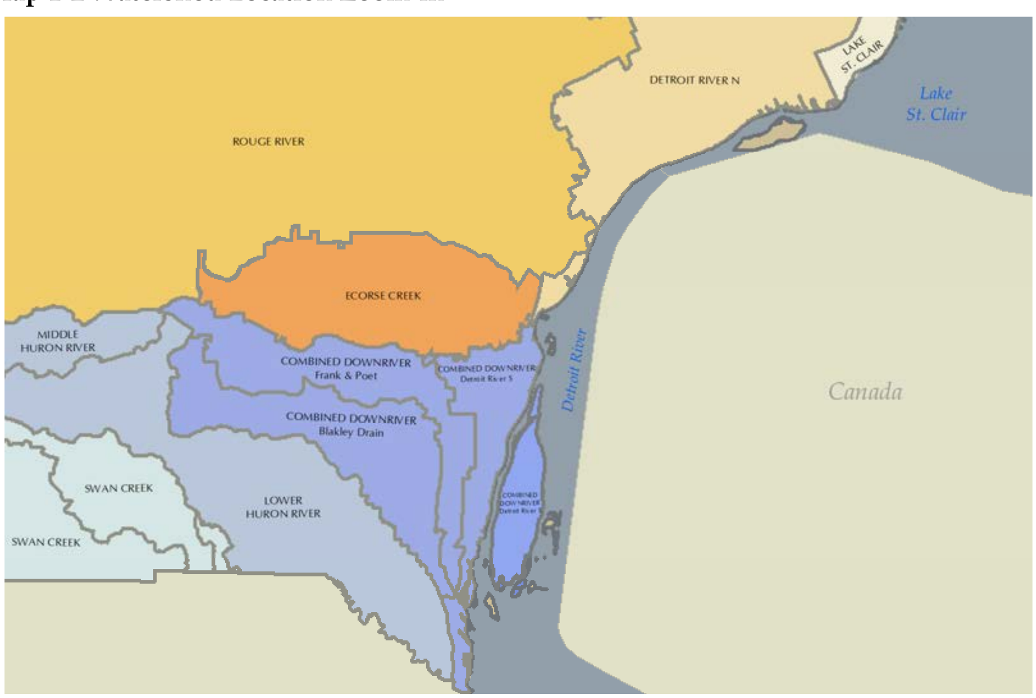
The Combined Downriver Watershed borders the Ecorse Creek Watershed to the north, the Lower Huron Watershed to the south and west, and the Detroit River to the east. Maps 1-1 and 1-2 show the location of the watershed.

Map 1-1 Watershed Location



Source: Michigan Center for Geographic Information

Map 1-2 Watershed Location Zoom-in



The Combined Downriver Watershed includes 11 communities (including Trenton who has an individual Jurisdictional permit) as well as the Wayne County Airport Authority (which is located within Romulus). Map 1-3 shows community boundaries within the watershed. The watershed encompasses 54,944 acres or 85.9 square miles. Brownstown Township, Taylor, Romulus, and Grosse Ile Township have the greatest amount of land area within the watershed (see Figure 1-1 and Table 1-1). It should be noted that nearly all of Wyandotte, and a portion of Southgate, are located in the Southgate-Wyandotte Drainage District. The majority of the flows in this area go directly to the Wastewater Treatment Plant (see Section 2.3).

Table 1-1

Land Area of Watershed by Entity

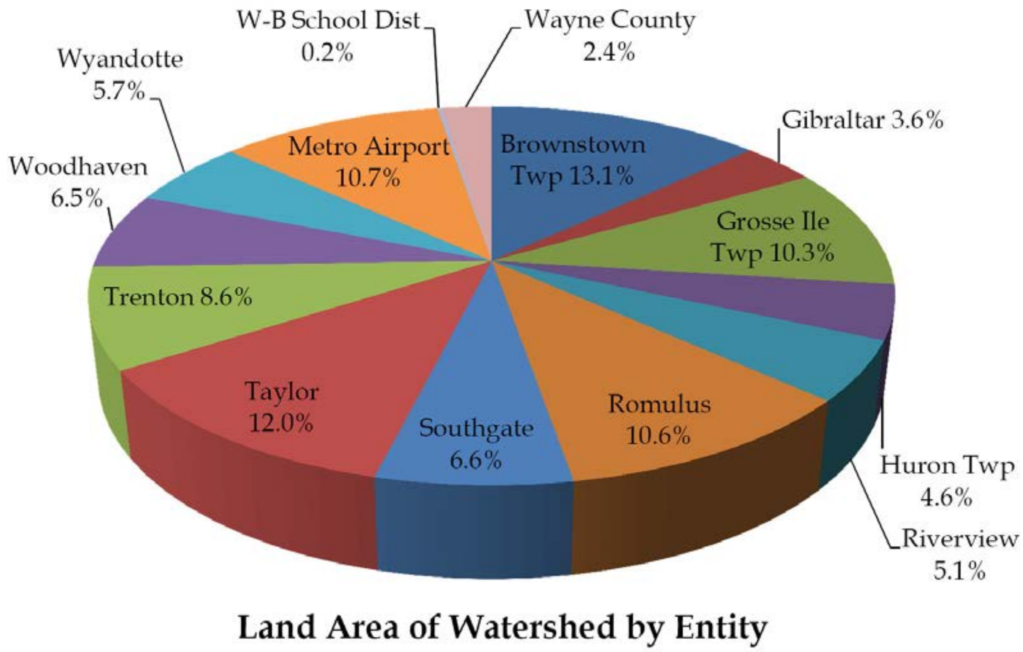
Community	Total Area of Community (Acres)	Area of Community in Watershed * (Acres)	Percent of Community in Watershed	Percent of Total Watershed
Brownstown Twp	14,566	7,185	49.3%	13.1%
Gibraltar	2,472	1,970	79.7%	3.6%
Grosse Ile Twp	5,930	5,665	95.5%	10.3%
Huron Twp	22,975	2,502	10.9%	4.6%
Riverview	2,837	2,796	98.6%	5.1%
Romulus	16,320	5,796	35.5%	10.6%
Southgate	4,420	3,615	81.8%	6.6%
Taylor	15,109	6,565	43.5%	12.0%
Trenton **	4,694	4,694	100.0%	8.6%
Woodhaven	4,164	3,580	86.0%	6.5%
Wyandotte	3,322	3,131	94.3%	5.7%
Metro Airport	6,700	5,878	87.7%	10.7%
W-B School Dist	NA	95	NA	0.2%
Wayne County	NA	1,341	NA	2.4%
Total	**103,509**	**54,813**		**100.0%**

* Excludes Wayne County property within the community.

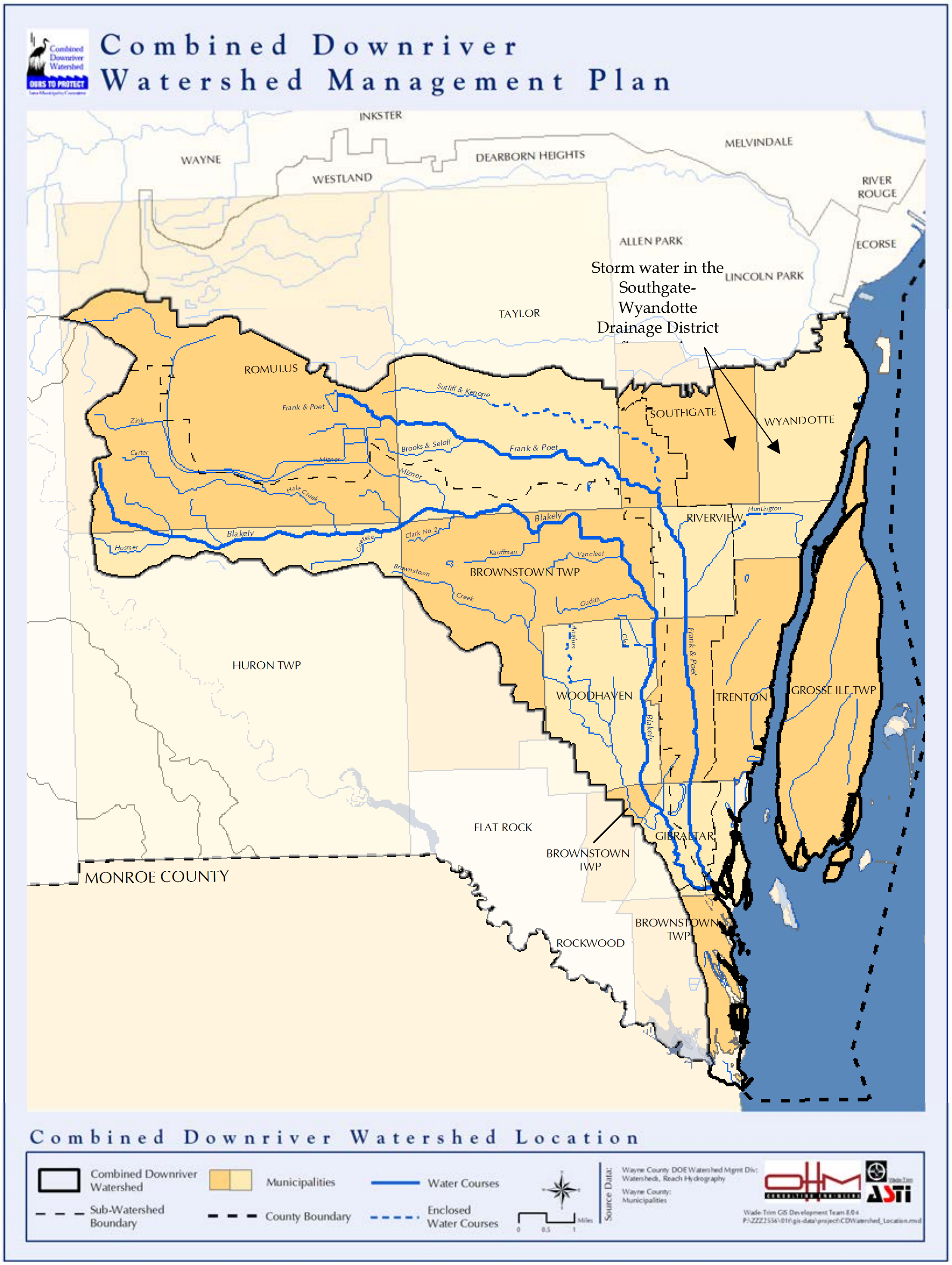
** Not participating in development of Watershed Management Plan.

Source: Combined Downriver IMC MOA Amendment 1, July 16, 2004.

Figure 1-1 Area of Land in Watershed by Entity



Map 1-3


Combined Downriver Watershed Management Plan
INKSTER
WAYNE
WESTLAND
DEARBORN HEIGHTS
MELVINDALE
RIVER ROUGE
ALLEN PARK
ECORSE
LINCOLN PARK
TAYLOR
Storm water in the Southgate-Wyandotte Drainage District
ROMULUS
SOUTHGATE
WYANDOTTE
RIVERVIEW
BROWNSTOWN TWP
HURON TWP
WOODHAVEN
TRENTON
GROSSE ILE TWP
FLAT ROCK
GIBRALTAR
MONROE COUNTY
ROCKWOOD
Frank & Poet
Sutliff & Kanope
Brooks & Seloff
Blakely
Zink
Carter
Hale Creek
Hosmer
Clark No. 2
Kaufman
Vancleef
Huntington
Combined Downriver Watershed Location
Combined Downriver Watershed
Municipalities
Water Courses
Sub-Watershed Boundary
County Boundary
Enclosed Water Courses
0 0.5 1 Miles
Source Data:
Wayne County DOE Watershed Mgmt Div: Watersheds, Reach Hydrography
Wayne County: Municipalities
Wade-Trim GIS Development Team 8/04
P:\ZZZ2556\01f\gis-data\project\CDWatershed_Location.mxd

1.2 PURPOSE OF THE WATERSHED MANAGEMENT PLAN

The National Pollutant Discharge Elimination System (NPDES) permit program was initiated by the Federal Water Pollution Control Act amendments of 1972. The purpose of the program is to control the discharge of pollutants into surface water. Most storm water discharges are considered point sources and require coverage by a NPDES permit. Phase I of the NPDES storm water program required operators of “medium” and “large” municipal separate storm sewer systems (MS4s), generally those serving a population of 100,000 or greater, to implement a storm water management program as a means to control polluted discharges. Phase II of the NPDES storm water program extends coverage to certain “small” MS4s that are located in urbanized areas, including those communities within the Combined Downriver Watershed.

The Combined Downriver communities are required to design a program that:

- Reduces the discharge of pollutants to the maximum extent practicable;
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

In Michigan, the Department of Environmental Quality administers the NPDES program. A Watershed Management Plan is necessary in order to satisfy requirements of the State of Michigan Phase II Watershed Based Storm Water General Permit (MIG619000). In order for the Combined Downriver Watershed Management Plan to be approved by the State of Michigan, it must contain the following:

- The geographic scope of the watershed.
- The designated uses and desired uses of the watershed.
- The water quality threats or impairments in the watershed.
- The causes of the impairments or threats, including pollutants.
- A clear statement of the water quality improvement or protection goals of the watershed management plan.
- The sources of the pollutants causing the impairments or threats and the sources that are critical to control in order to meet water quality standards or other water quality goals.
- The tasks that need to be completed to prevent or control the critical sources of pollution or address causes of impairment, including, as appropriate, all of the following:
    - The best management practices needed.
    - Revisions needed or proposed to local zoning ordinances and other land use management tools.
    - Informational and educational activities.
    - Activities needed to institutionalize watershed protection.
- The estimated cost of implementing the best management practices needed.
- A summary of the public participation process, including the opportunity for public comment, during watershed management plan development and the partners that were involved in the development of the watershed management plan.
- The estimated periods of time needed to complete each task and the proposed sequence of task completion.
- A description of the process that will be used to evaluate the effectiveness of implementing the plan and achieving its goals.

In 2003, the municipalities, County and School District formed the Combined Downriver Watershed Advisory Group whose mission was to provide:

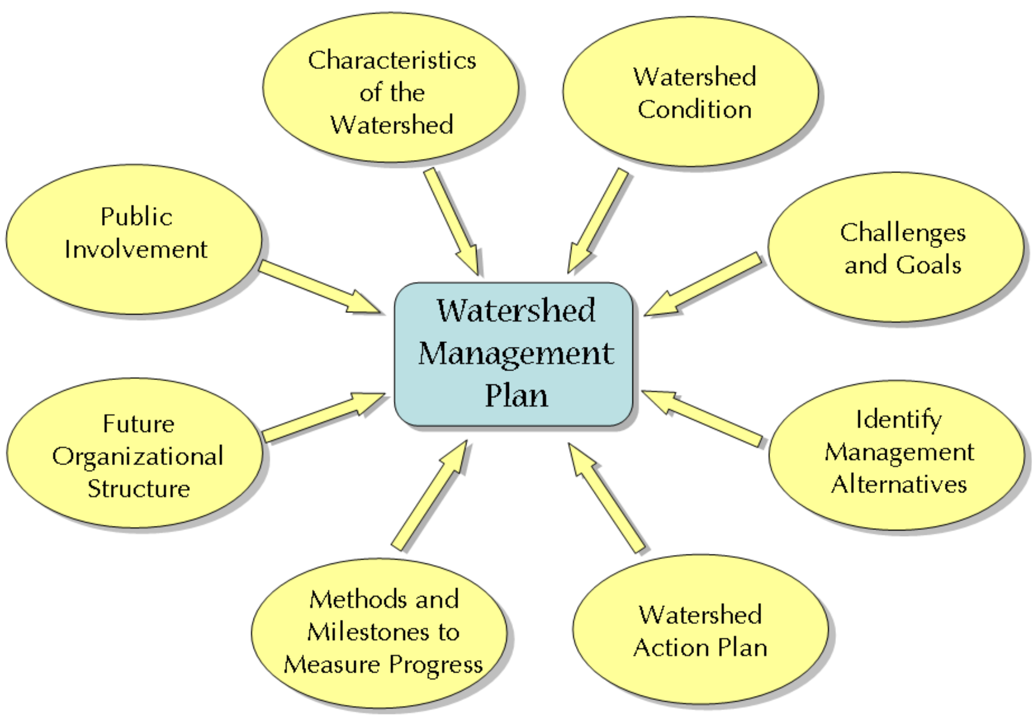
> *A Combined Downriver Watershed and riverine corridor system that is aesthetically pleasant, clean, healthy and safe so that watershed residents and visitors can enjoy an improved quality of life, with reduced risk of flooding and better coordination of storm water management throughout the region.*

In an effort to further this mission, and as required under the Phase II storm water rules, the municipalities filed an application with the MDEQ to obtain coverage under Michigan's NPDES Phase II Storm Water Permit (MIG619000). As has been stated, an initial requirement of the permit is to study, develop, and prepare a Watershed Management Plan.

The communities worked to develop a Memorandum of Agreement (MOA) to formalize the group, and establish financial responsibilities and by-laws. Each community adopted the MOA and the Combined Downriver Watershed Inter-Municipality Committee (CDWIC) was formed in December 2003 (Appendix A). The function of the CDWIC is to coordinate and facilitate the study, development, preparation and timely filing of a Watershed Management Plan with the MDEQ. The CDWIC developed a Watershed Management Plan (WMP) which was subsequently approved by the MDEQ in 2007. This document is an update to the original WMP and has been prepared by the Alliance of Downriver Watersheds (ADW) and the Combined Downriver Watershed Advisory Group (a subset of the ADW). Figure 1-2 illustrates the various components and elements that went into the development of this Watershed Management Plan.

Figure 1-2

Watershed Management Plan Elements



2. CHARACTERISTICS OF THE WATERSHED

Grosse Ile - Church Road

Chapter Contents

Blakely Drain SubWatershed
Frank & Poet Drain SubWatershed
Detroit River South SubWatershed
Population
Geology
Soils
Climate
Topography
Pre-Settlement Vegetation
Land Use
    Existing Land Use
    Future Land Use
Wetlands and Flood Prone Areas
Permitted Discharges

The Combined Downriver Watershed drains an area approximately 85.9 square miles in size and is comprised of three subwatersheds: the Blakely, Frank & Poet, and the Detroit River South (Map 2-1). The Blakely Drain subwatershed is located in the western portion of the watershed, the Frank & Poet drains the central portion, and the Detroit River South is the far eastern portion of the watershed and includes Grosse Ile.

2.1 BLAKELY DRAIN SUBWATERSHED

The Blakely Drain subwatershed receives storm water and runoff from approximately 20,392 acres, or 31.8 square miles of land. The Blakely Drain is the primary watercourse within the subwatershed. It is approximately 18.5 miles long with headwaters forming in the City of Romulus and ultimately flowing downstream into the Detroit River backwaters in the City of Gibraltar. The Blakely drainage district includes: Romulus, Huron Township, Brownstown Township, Taylor, Southgate, Riverview, Trenton, Woodhaven and Gibraltar. The Brownstown Creek is another major watercourse in the subwatershed. It begins near the Huron and Brownstown Township borders and flows southeast into the Blakely Drain in Gibraltar.

2.2 FRANK & POET DRAIN SUBWATERSHED

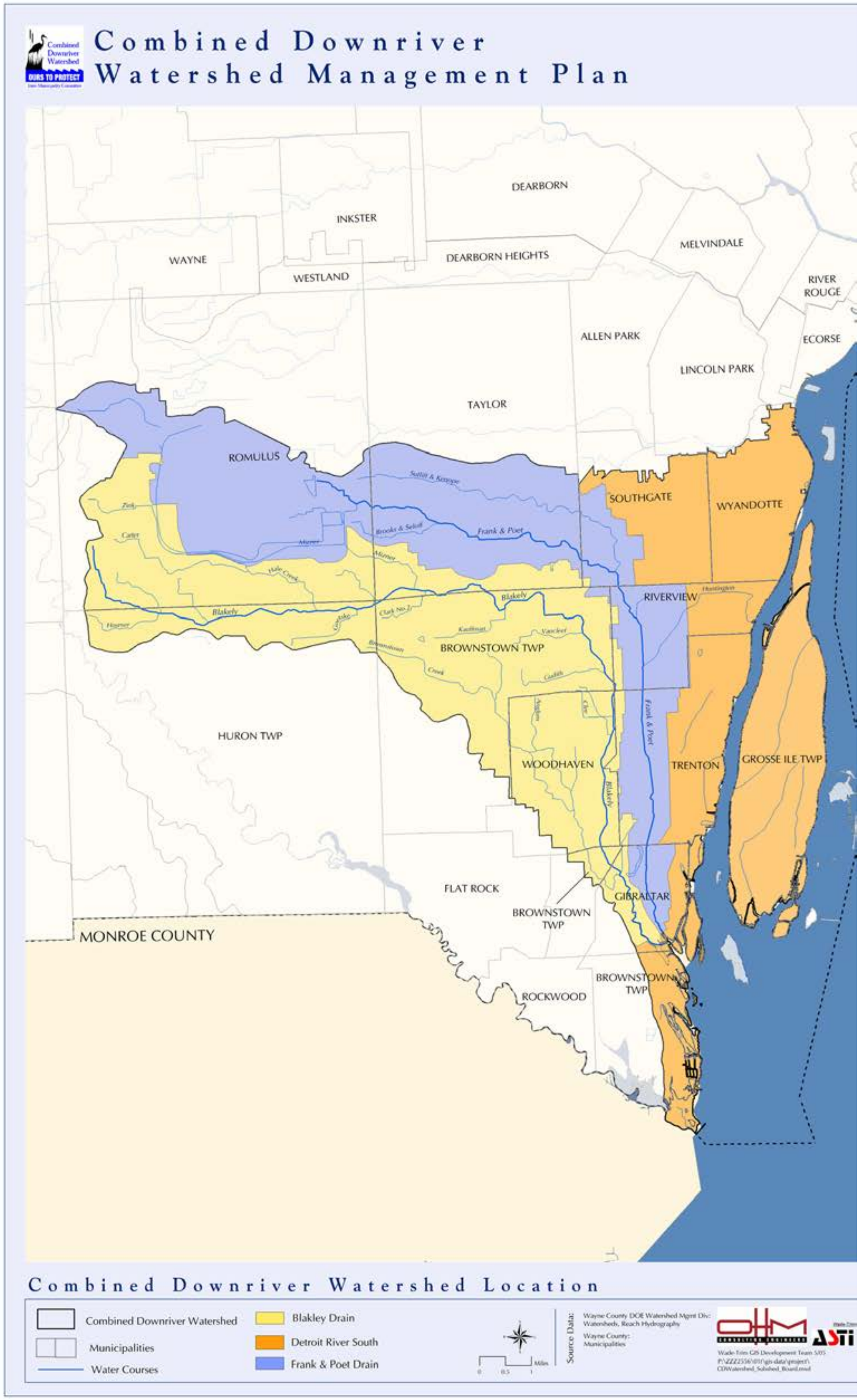
The Frank & Poet Drain subwatershed receives storm water and runoff from approximately 17,347 acres, or 27.1 square miles of land. The Frank & Poet Drain is the primary watercourse within the subwatershed. It is approximately 19.2 miles long with headwaters near Hannan Road in Romulus and flowing along the west and south boundaries of the Detroit Metropolitan Airport. The average slope within the drainage district is 5.3 feet per mile.[1] The Sutliff & Kenope is the primary drain that is tributary to the Frank & Poet. It begins in Romulus and flows in a southeast direction across Taylor and into Southgate where it meets the Frank & Poet Drain.

2.3 DETROIT RIVER SOUTH SUBWATERSHED

The Detroit River South subwatershed encompasses approximately 17,205 acres, or 26.9 square miles of land (including the City of Trenton). All storm water and runoff from this area flows directly to the Detroit River, with the exception of flow from communities with combined sewer systems including Wyandotte and portions of Southgate. During dry weather or low flow events, storm water from the combined portions of Wyandotte and Southgate go to the Wayne County Wyandotte Waste Water Treatment Plant (WWTP). During moderate events, flows go to the Pump Station No.5 facility, adjacent to the WWTP, receive primary treatment, retention, and are then discharged back to the WWTP. During heavy events, excess flows from these areas go to the Pine Street Pump Station and CSOs are discharged to the Detroit River.

[1] *City of Taylor Frank & Poet Drain Storm Drainage Study.* March 1991. Wade-Trim.

Map 2-1


Combined Downriver
Watershed Management Plan
DEARBORN
INKSTER
WAYNE
WESTLAND
DEARBORN HEIGHTS
MELVINDALE
RIVER ROUGE
ALLEN PARK
ECORSE
LINCOLN PARK
TAYLOR
ROMULUS
SOUTHGATE
WYANDOTTE
RIVERVIEW
BROWNSTOWN TWP
HURON TWP
WOODHAVEN
TRENTON
GROSSE ILE TWP
FLAT ROCK
GIBRALTAR
BROWNSTOWN TWP
MONROE COUNTY
ROCKWOOD
Combined Downriver Watershed Location
Combined Downriver Watershed
Municipalities
Water Courses
Blakley Drain
Detroit River South
Frank & Poet Drain
Source Data:

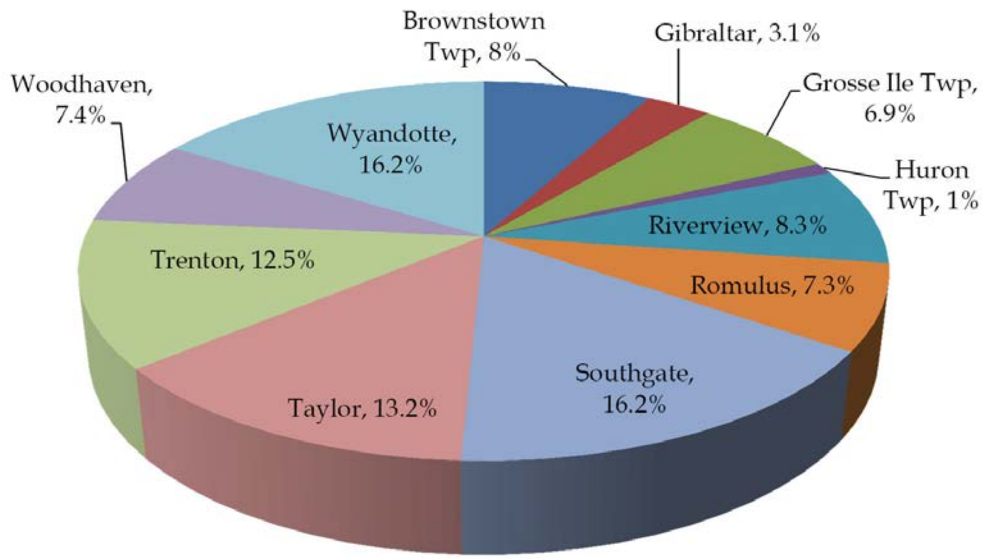
2.4 POPULATION

The Combined Downriver Watershed includes 11 communities (including Trenton who has an individual permit) as well as the Woodhaven-Brownstown School District, Wayne County, and the Wayne County Airport Authority. The watershed encompasses approximately 85.9 square miles and in 2000, had 248,797 people living within its boundaries, or 2,844 people per square mile. The distribution of the population of the watershed can be found in Figure 2-1 and Table 2-1. Wyandotte, Southgate, Taylor, and Trenton have the greatest number of residents living within the watershed. As is depicted on the Map 2-2, the greatest population densities are located in the central and eastern portions of the watershed, particularly in Wyandotte, Southgate (although the majority is located in the Southgate-Wyandotte Drainage District), Taylor, and Trenton.

Table 2-1

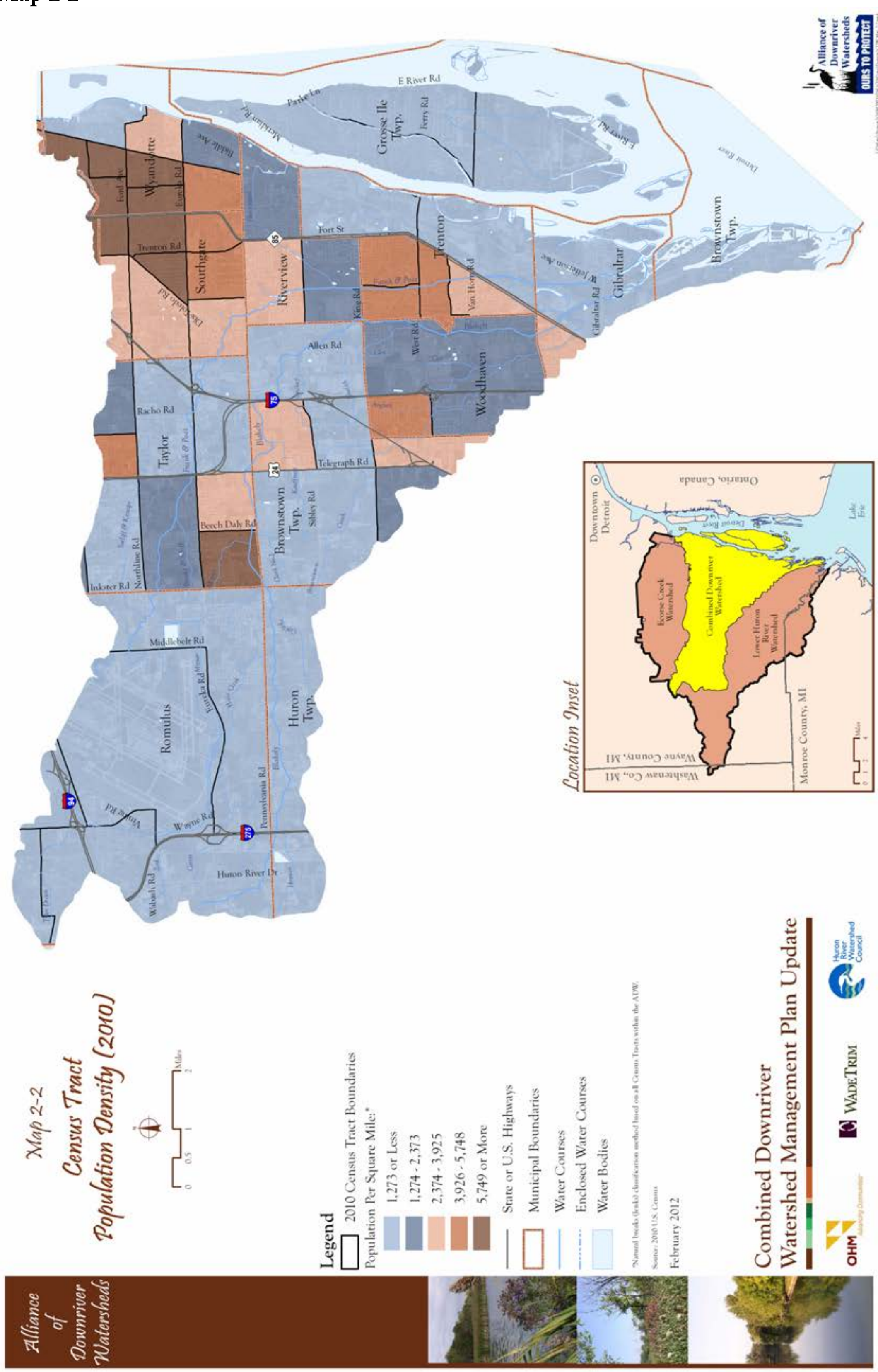
Population in Watershed by Entity				
Community	**2010 Population**	**2010 Population in Watershed**	**Percent of Watershed Population**	**Percent of Population in Watershed*** **
Brownstown Twp	30,627	12,106	8.0%	39.5%
Gibraltar	4,656	4,656	3.1%	100.0%
Grosse Ile Twp	10,371	10,371	6.9%	100.0%
Huron Twp	15,879	1,440	1.0%	9.1%
Riverview	12,486	12,486	8.3%	100.0%
Romulus	23,989	11,018	7.3%	45.9%
Southgate	30,047	24,427	16.2%	81.3%
Taylor	63,131	19,873	13.2%	31.5%
Trenton**	18,853	18,853	12.5%	100.0%
Woodhaven	12,875	11,158	7.4%	86.7%
Wyandotte	25,883	24,516	16.2%	94.7%
Metro Airport	NA	NA	NA	NA
W-B School Dist	NA	NA	NA	NA
Wayne County	NA	NA	NA	NA
Total	**248,797**	**150,904**	**100.0%**	
* Excludes Wayne County property within the community.				
** Not participating in development of Watershed Management Plan.				
Source: www.semcog.org				

Figure 2-1



Percent of Watershed Population

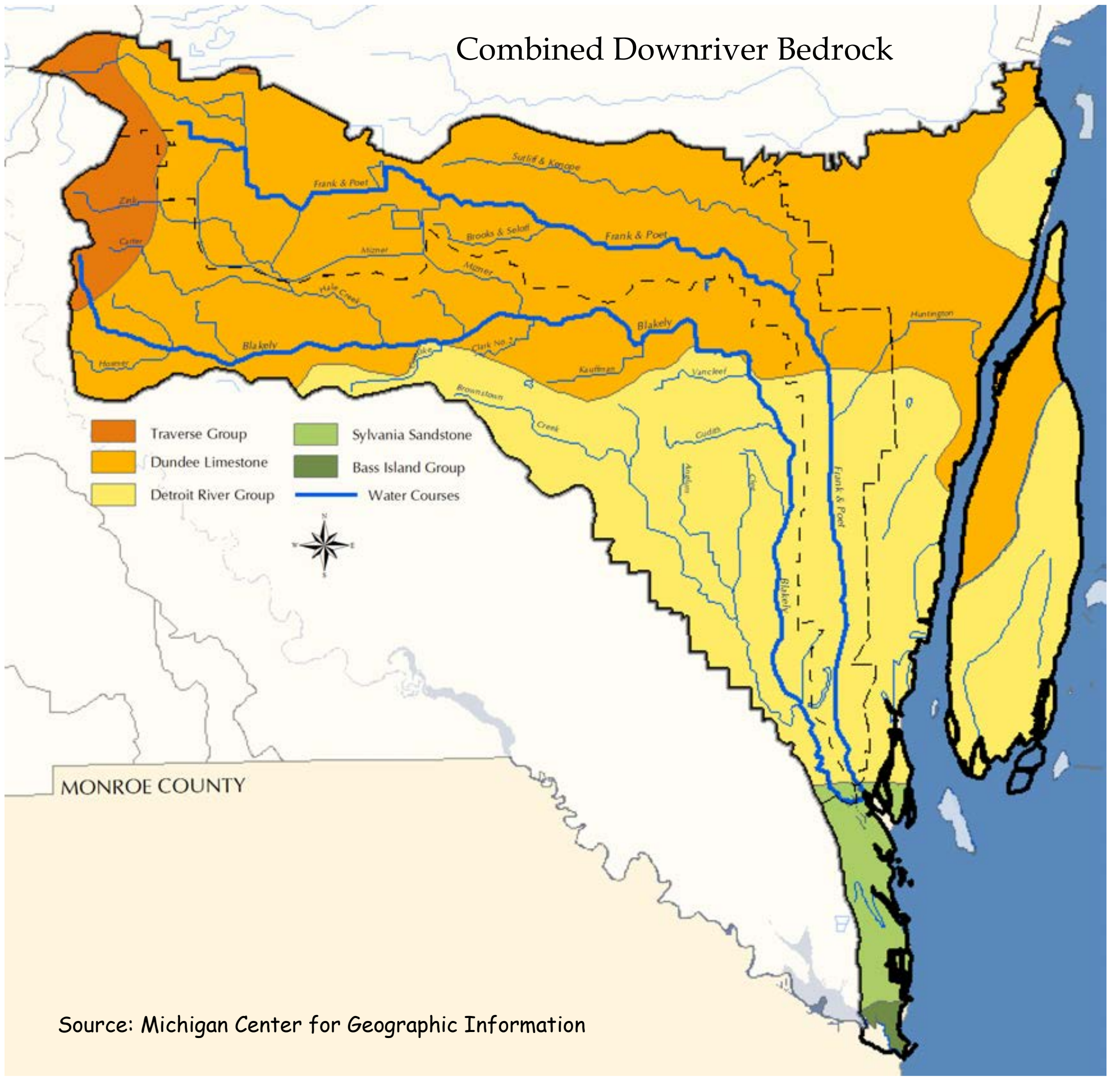
Map 2-2


Alliance of Downriver Watersheds
Map 2-2
Census Tract Population Density (2010)
Legend
2010 Census Tract Boundaries
Population Per Square Mile:*
1,273 or Less
1,274 - 2,373
2,374 - 3,925
3,926 - 5,748
5,749 or More
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
Source: 2010 U.S. Census
February 2012
Combined Downriver
Watershed Management Plan Update
OHM
WadeTrim
Huron River Watershed Council
Romulus
Huron Twp.
Taylor
Brownstown Twp.
Woodhaven
Riverview
Southgate
Wyandotte
Trenton
Gibraltar
Grosse Ile Twp.
Location Inset
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Downtown Detroit
Ontario, Canada
Alliance of Downriver Watersheds
OURS TO PROTECT

2.5 GEOLOGY

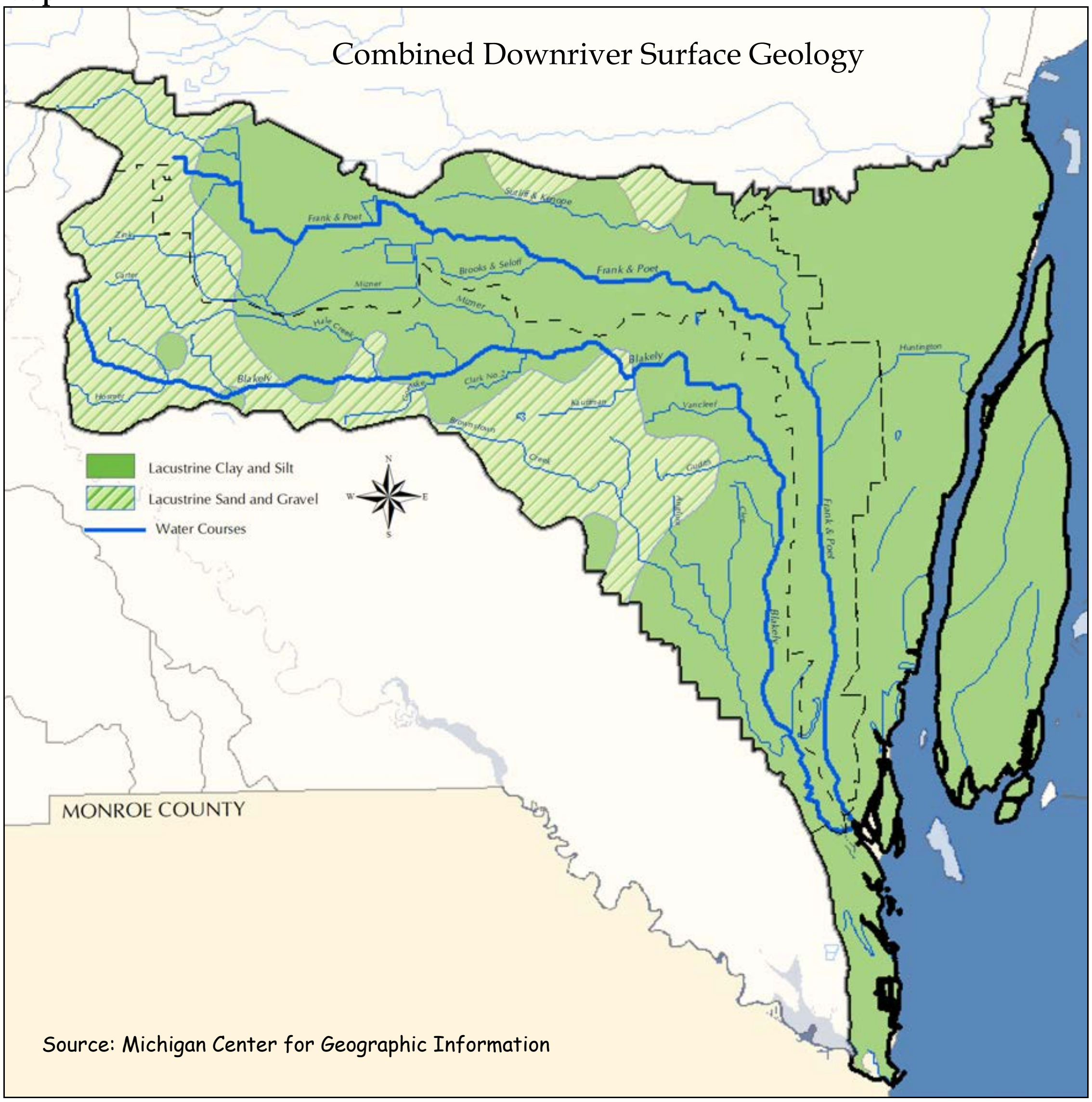
The general geology of the study area results from glacial action during the Wisconsin period. Bedrock is the solid rock at or near the earth's surface. It is generally concealed by an unattached layer of loose fragmented rock. The bedrock in the watershed is primarily Dundee Limestone and Detroit River Group (see Map 2-3).

Map 2-3



Quarternary, or surface, geology is a description of the surface features created by glaciers during the last 15,000 years. The majority of the watershed consists of lacustrine clay and silt with some lacustrine sand and gravel in the central portion and in the headwaters (see Map 2-4).

Map 2-4



2.6 SOILS

Soils in the Combined Downriver Watershed are generally level to gently sloping, and are generally very poorly drained to somewhat poorly drained. East of Telegraph Road, subsoils are generally moderately fine to fine textured, while west of Telegraph Road subsoils are coarse textured to moderately fine textured.

These soils exhibit low permeability and therefore inhibit the transmission of water through the soil. Clay soils can also contribute to the turbidity of the water courses throughout the year. Also, due in part to the low percolation rates of clay soils, as well as the effects of urbanization, stream flows in the watershed can be flashy and erratic.

As is illustrated on Map 2-5, the Soil Survey for Wayne County indicates that portions of the watershed are classified as Cut and Fill Land (original soils are impossible to identify) or, as is the case for Wyandotte and the eastern portion of Southgate, no soil survey data is available. The remaining land is characterized as one of numerous soil types found within the watershed with some of the primary soils including:

- BbB Blout loam, 0 to 4 percent slopes
- Ho Hoytville silty clay loam, 0 to 2 percent slopes
- TfA Tedrow loamy fine sand, 0 to 2 percent slopes
- SfA Selfridg-Pewamo, 0 to 2 percent slopes
- Pe Pewamo loam, 0 to 2 percent slopes
- NaB Nappanee silt loam, 0 to 4 percent slopes

2.7 CLIMATE

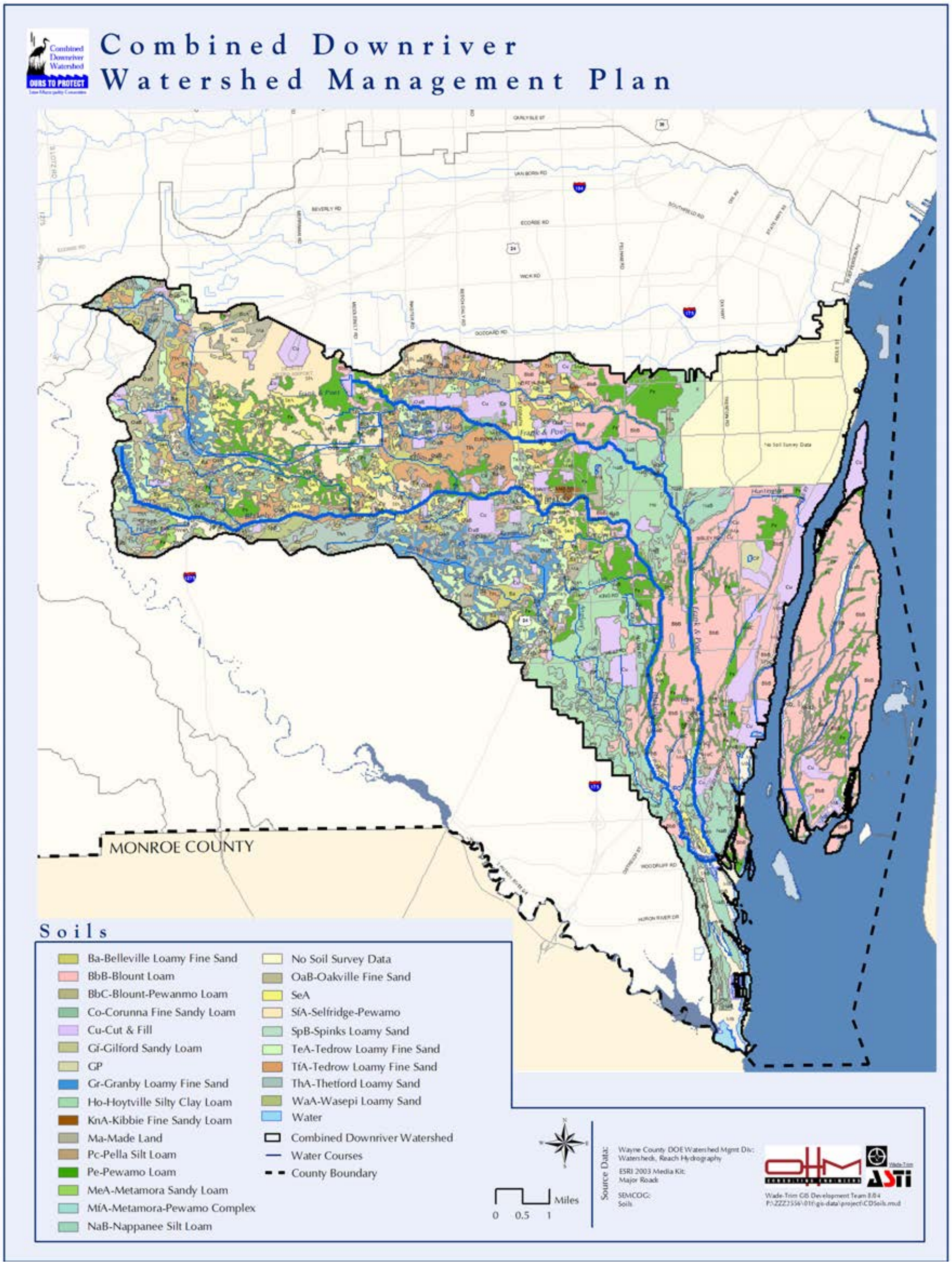
The watershed has a continental climate with mild winters and short, hot summers. The climate is controlled by its location with respect to major storm tracks and the influence of the Great Lakes. Rainfall is approximately 32 inches per year and total annual snowfall averages about 36 inches. The average date for the first freezing temperature is October 21. The average date for the last freezing temperature is April 23.[2] The average annual temperature is approximately 48°F. The maximum monthly average temperature of 72°F occurs in July, and the minimum monthly average temperature of 25°F occurs in January.

2.8 TOPOGRAPHY

The topography of the watershed has a gentle slope toward the Detroit River, as shown in Map 2-6. General elevations vary from 672 feet (USGS datum) at the northwest corner of the watershed to approximately 570 feet at the Detroit River. On Grosse Ile, elevations range from 590 feet to 570 feet at the water's edge.

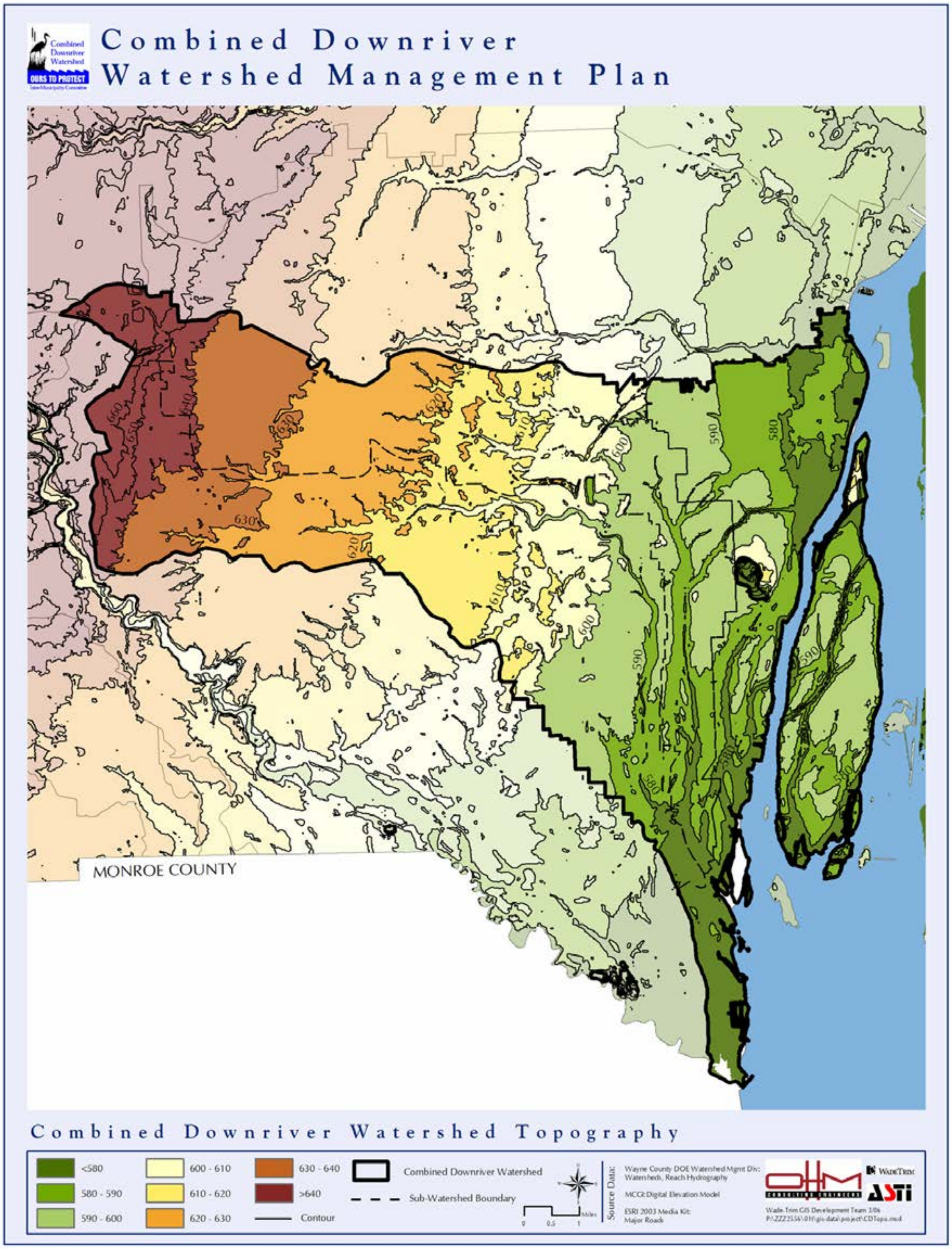
[2] *Ecorse Creek Drainage Basin, Wayne County, Michigan*. US Army Corps of Engineers. House Document 101-193. May 17, 1990.

Map 2-5



Combined Downriver Watershed Management Plan
MONROE COUNTY
No Soil Survey Data
Soils
Ba-Belleville Loamy Fine Sand
BbB-Blount Loam
BbC-Blount-Pewanmo Loam
Co-Corunna Fine Sandy Loam
Cu-Cut & Fill
Gf-Gilford Sandy Loam
GP
Gr-Granby Loamy Fine Sand
Ho-Hoytville Silty Clay Loam
KnA-Kibbie Fine Sandy Loam
Ma-Made Land
Pc-Pella Silt Loam
Pe-Pewamo Loam
MeA-Metamora Sandy Loam
MfA-Metamora-Pewamo Complex
NaB-Nappanee Silt Loam
No Soil Survey Data
OaB-Oakville Fine Sand
SeA
SfA-Selfridge-Pewamo
SpB-Spinks Loamy Sand
TeA-Tedrow Loamy Fine Sand
TfA-Tedrow Loamy Fine Sand
ThA-Thetford Loamy Sand
WaA-Wasepi Loamy Sand
Water
Combined Downriver Watershed
Water Courses
County Boundary
Miles
0 0.5 1
Source Data:
Wayne County DOE Watershed Mgmt Div: Watersheds, Reach Hydrography
ESRI 2003 Media Kit: Major Roads
SEMCOG: Soils
Wade-Trim GIS Development Team 8/04

Map 2-6


Combined Downriver
Watershed Management Plan
MONROE COUNTY
Combined Downriver Watershed Topography
<580
580 - 590
590 - 600
600 - 610
610 - 620
620 - 630
630 - 640
>640
Contour
Combined Downriver Watershed
Sub-Watershed Boundary
Miles
0
0.5
1
Source Data:
Wayne County DOE Watershed Mgmt Div.: Watersheds, Reach Hydrography
MCGI: Digital Elevation Model
ESRI 2003 Media Kit: Major Roads
Wade-Trim GIS Development Team 3/06

2.9 PRE-SETTLEMENT VEGETATION

The pre-settlement vegetation (circa 1800) was dominated by beech-sugar maple forest, wet prairie, mixed oak savanna, and mixed hardwood swamps (Map 2-7). The headwaters area was predominately mixed hardwood swamp, although there were areas of black oak barren, wet prairie, and beech-sugar maple forest. The central portion of the watershed was primarily mixed oak savanna and wet prairie, while the eastern portion of the watershed and Grosse Ile were dominated by beech-sugar maple forest. The eastern portion also included small pockets of mixed hardwood swamp and oak-hickory forest with swamps and marsh noted along the Frank & Poet Drain and near the Detroit River in Gibraltar and southern Brownstown.

2.10 LAND USE

The types of urban and suburban development found in the Combined Downriver Watershed have dramatic effects on surface waters in terms of altered runoff patterns, increased flashiness, increased suspended solids loading, and shifts in temperature characteristics, as well as other effects. The loss of vegetated riparian zone throughout the watershed, combined with substantial land coverage by surfaces impervious to precipitation (roads, parking lots, roof tops) and a curb, gutter, and storm drain system, combine to increase runoff rates. This efficient movement of water directly to the stream channel results in unstable and flashy flow conditions, stream bank erosion, and sedimentation of instream habitats.[3]

2.10.1 Existing Land Use

Land use data (2008) from the Southeast Michigan Council of Governments (SEMCOG) was utilized to gain a general understanding of land use patterns throughout the watershed (Map 2-8). The predominant land use is single-family residential, with more than 34% of the watershed occupied by this use. Industrial areas comprise the second largest category with over 8,800 acres or 16% of the watershed. Large areas of woodlands and wetlands are found in the central and southern portion of the watershed in Brownstown and Gibraltar. Transportation, Communication and Utility (TCU) comprises the third largest category with over 8,600 acres or 15.7% of the watershed. Table 2-2 details the existing land use for the watershed.

[3] Facility Planning Study Pollution Abatement of Ecorse Creek, Wade-Trim. November 1974.

Table 2-2

Existing Land Use (2008)		
Category	**Acreage**	**% of Total**
Agricultural	1,082.5	2.0%
Airport	4,616.0	8.4%
Commercial	4,622.9	8.4%
Governmental / Institutional	3,667.9	6.6%
Industrial	8,814.7	16.0%
Multiple-family residential	873.4	1.6%
Parks, Recreation, and Open Space	3,568.7	6.5%
Single-family residential	18,984.5	34.4%
TCU	8,658.2	15.7%
Water	272.0	0.5%
TOTALS	**55,160.8**	**100.0%**

2.10.2 Future Land Use

Future land use information also was gathered from SEMCOG. Map 2-9 shows general future land use within the watershed as projected based on municipal master plans and zoning ordinances. The majority of land within the watershed is planned to remain low- (8.7%), medium- (27.3%), and high-density (6.7%) residential. Industrial uses are anticipated to expand, particularly along the major transportation corridors and south of the airport. Commercial and office uses are planned to continue to be located along the primary roads and transportation corridors. Table 2-3 details the projected future land use for the watershed.

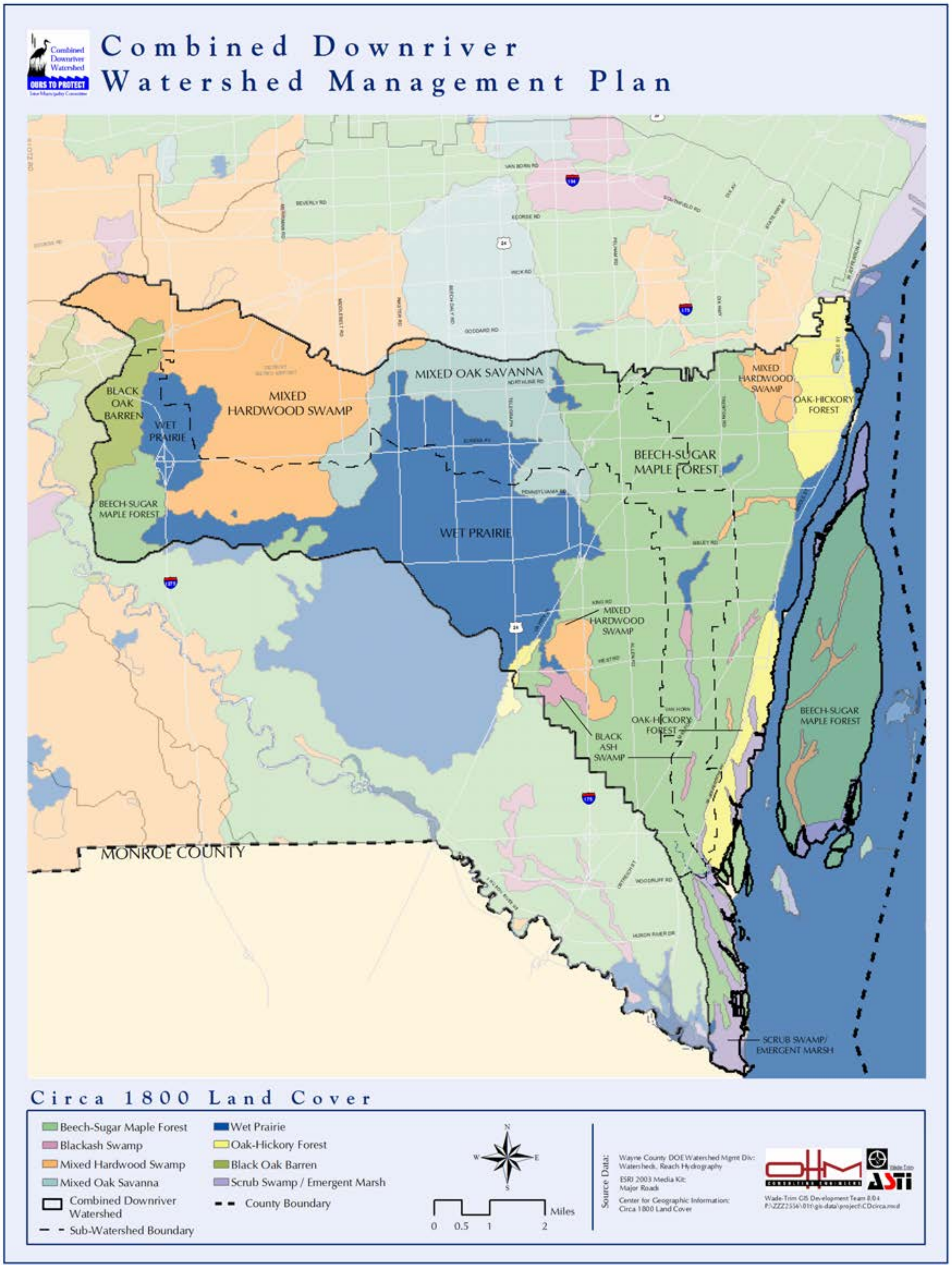
Table 2-3

Generalized Future Land Use

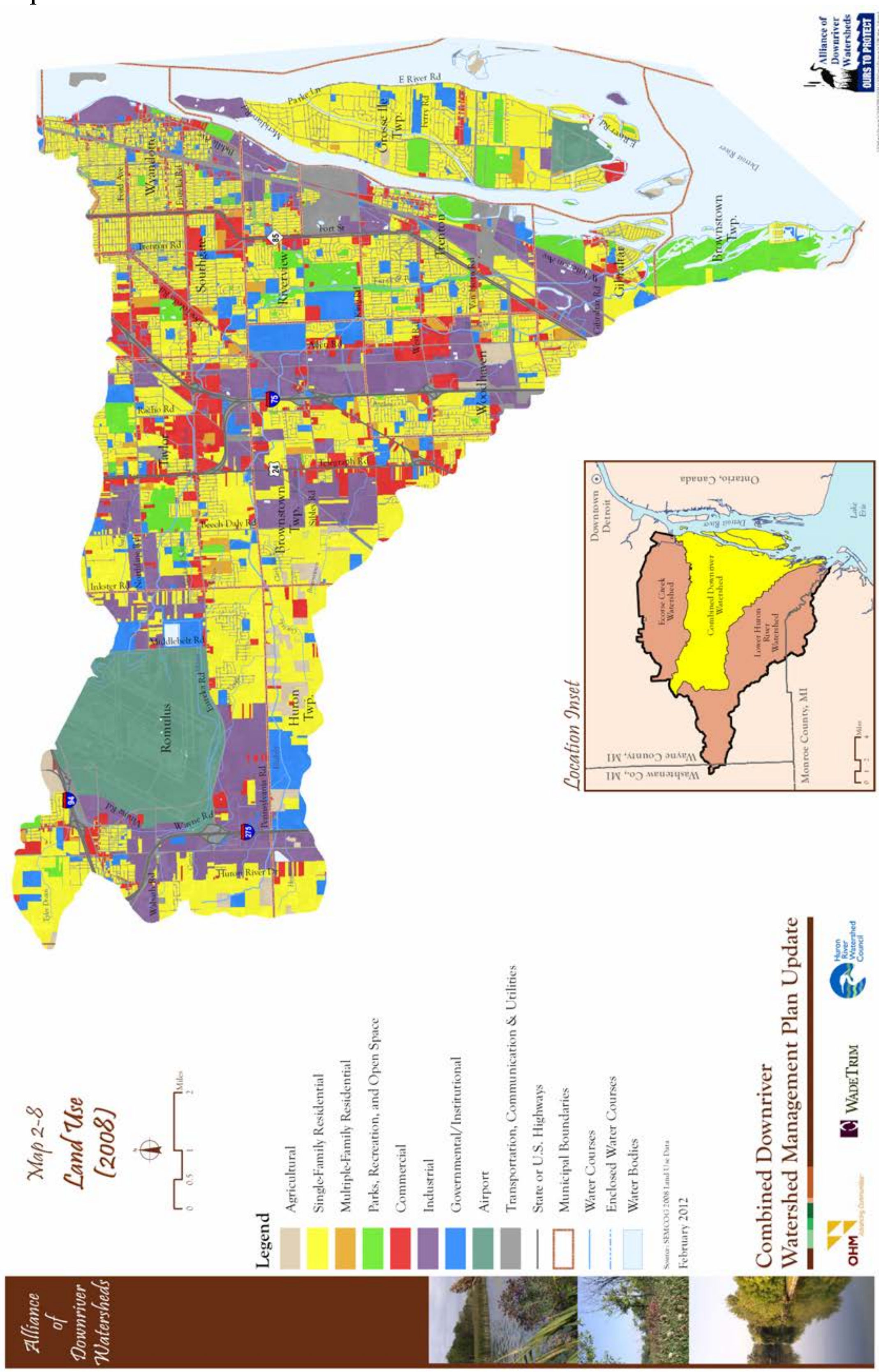
Land Use Category	Acres	Percent
Active Agriculture	1,761.6	3.2%
Commercial	3,737.3	6.8%
Commercial/Mixed Use	1,147.2	2.1%
High Density Residential	3,637.4	6.7%
Industrial	10,564.1	19.3%
Institutional/Public/Quasi Public	3,710.8	6.8%
Low Density Residential	4,776.0	8.7%
Medium Density Residential	14,928.6	27.3%
Office	700.7	1.3%
Open Space/Conservation	2,331.2	4.3%
Planned Unit Development/Other Use	878.8	1.6%
Transportation/Communication/Utility	6,089.6	11.1%
Water	412.0	0.8%
Total	54,675.3	100.0%

Source: SEMCOG Generalized Future Land Use

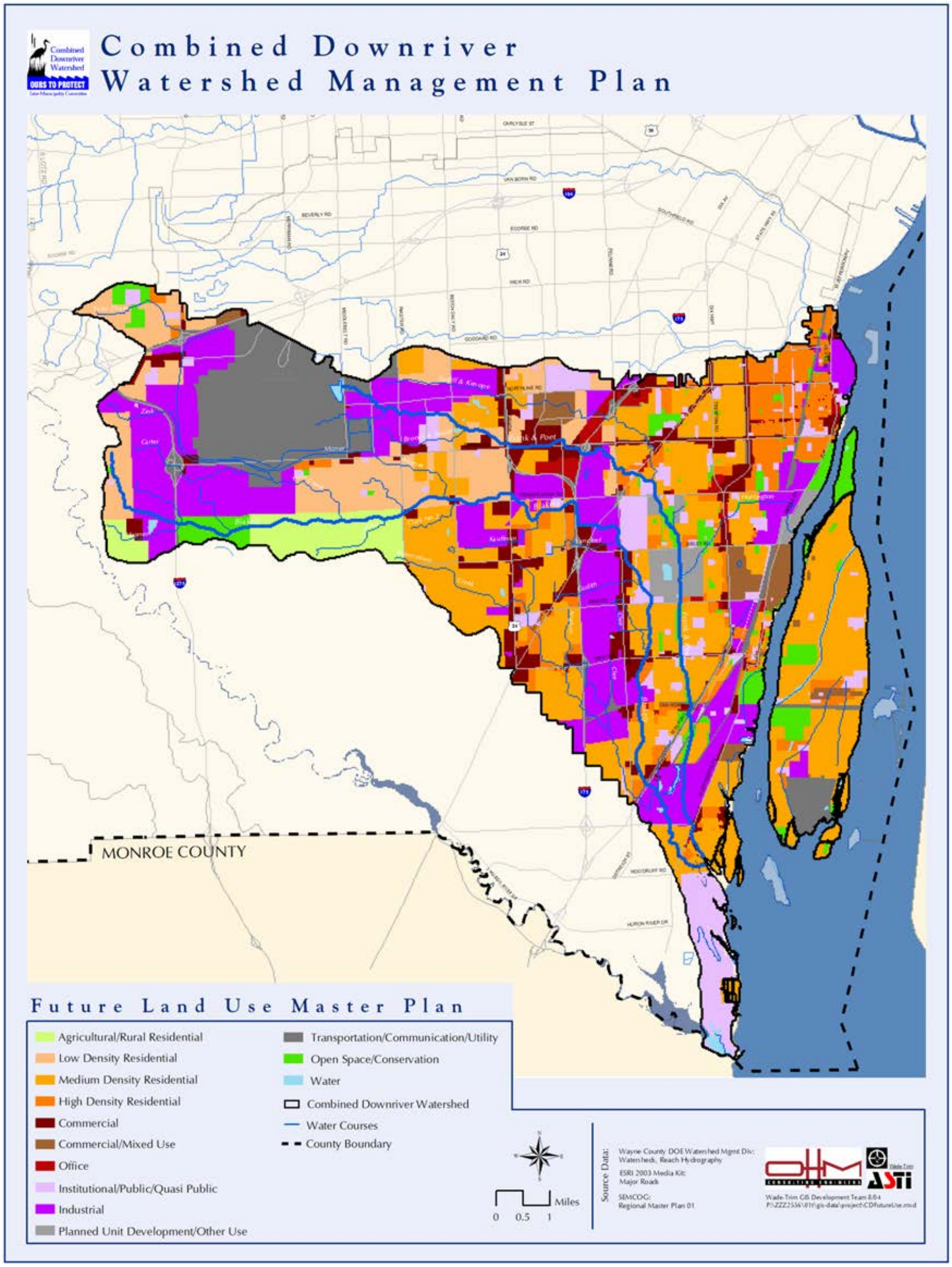
Map 2-7


Combined Downriver Watershed Management Plan
MIXED OAK SAVANNA
BLACK OAK BARREN
WET PRAIRIE
MIXED HARDWOOD SWAMP
BEECH-SUGAR MAPLE FOREST
MIXED HARDWOOD SWAMP
OAK-HICKORY FOREST
BEECH-SUGAR MAPLE FOREST
WET PRAIRIE
MIXED HARDWOOD SWAMP
OAK-HICKORY FOREST
BLACK ASH SWAMP
BEECH-SUGAR MAPLE FOREST
MONROE COUNTY
SCRUB SWAMP/ EMERGENT MARSH
Circa 1800 Land Cover
Beech-Sugar Maple Forest
Blackash Swamp
Mixed Hardwood Swamp
Mixed Oak Savanna
Combined Downriver Watershed
Sub-Watershed Boundary
Wet Prairie
Oak-Hickory Forest
Black Oak Barren
Scrub Swamp / Emergent Marsh
County Boundary
0 0.5 1 2 Miles
Source Data:

Map 2-8


Map 2-8
Land Use (2008)
Legend
Agricultural
Single-Family Residential
Multiple-Family Residential
Parks, Recreation, and Open Space
Commercial
Industrial
Governmental/Institutional
Airport
Transportation, Communication & Utilities
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver
Watershed Management Plan Update
Alliance of Downriver Watersheds
Location Inset
Romulus
Huron Twp.
Taylor
Brownstown Twp.
Southgate
Wyandotte
Riverview
Trenton
Woodhaven
Gibraltar
Grosse Ile Twp.
Detroit River
Downtown Detroit
Ontario, Canada
Lake Erie
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI

Map 2-9


Combined Downriver
Watershed Management Plan
MONROE COUNTY
Future Land Use Master Plan
Agricultural/Rural Residential
Low Density Residential
Medium Density Residential
High Density Residential
Commercial
Commercial/Mixed Use
Office
Institutional/Public/Quasi Public
Industrial
Planned Unit Development/Other Use
Transportation/Communication/Utility
Open Space/Conservation
Water
Combined Downriver Watershed
Water Courses
County Boundary
0 0.5 1 Miles
Source Data:
Wayne County DOE Watershed Mgmt Div:
Watersheds, Reach Hydrography
ESRI 2003 Media Kit:
Major Roads
SEMCOG:
Regional Master Plan 01
Wade-Trim GIS Development Team 8/04
P:\ZZZ2556\01t\gis-data\project\CDfutureUse.mxd

2.11 Wetlands

A wetland is an area of land that is saturated or flooded with water for a sufficient time and/or frequency to foster the growth of water-loving plants and the development of hydric soils. Wetlands are known to be the most biological productive ecosystem in the temperate regions of the world. Wetlands have multiple functions including:

- Water Quality
  - Nutrient Transformation
  - Sediment Retention
  - Shoreline Stabilization
- Hydrologic
  - Streamflow Maintenance
  - Surface Water Detention
  - Stream Shading
- Habitat
  - Fish/Shellfish
  - Waterfowl/Bird
  - Amphibian

The MDEQ completed a Landscape Level Wetland Functional Assessment (LLWFA) for the Alliance of Downriver Watersheds area in 2010. The LLWFA is a GIS based tool that can be used to identify and prioritize existing wetlands for protection or enhancement based on the ecological or water quality functions they provide. Table 2-4 summarizes the status and trends of wetlands in the ADW as a whole as well as in the Combined Downriver Watershed. Map 2-10 illustrates existing wetland areas within the Combined Downriver. The Combined Downriver has lost 91% of it's pre-settlement wetlands with only 2,044 acres of wetlands existing in 2005.

Table 2-4

Wetland Resources and Trends

Alliance of Downriver Watersheds	**Pre-Settlement**	**2005 Condition**	**Total Loss**	**Percent Loss**
Acres of Wetland	48,733	5,230	43,503	90%
Average Size (acres)	49	8.5		
Combined Downriver Watershed				
Acres of Wetland	20,471	2,044	18,427	91%
Average Size	49	9		

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The 100-year floodplain (FEMA) and Flood Prone Area (SEMCOG) delineations were also gathered for the watershed (Map 2-11). The 100-year floodplain is the area that is expected to flood when a 100-year flood event occurs. It is a flood elevation that has a 1% chance of being equaled or exceeded each year. The 100-year floodplain is most extensive along the Frank & Poet Drain, the Blakely Drain, the Brownstown Creek, the Detroit River in southern Brownstown, and the Sutliff & Kenope Drain in Taylor.

Flood prone areas are designated primarily along the middle and lower reaches of the Sutliff & Kenope, Frank & Poet Drain, Blakley Drain and Brownstown Creek, as well as areas along the Detroit River in southern Brownstown.

Communities Participating in the National Flood Program

Brownstown
Grosse Ile
Huron Township
Gibraltar
Riverview
Southgate
Taylor
Woodhaven
Wyandotte

Source: FEMA Website

2.12 PERMITTED DISCHARGES

Anyone discharging, or proposing to discharge, waste or wastewater into the surface waters of the State is required by law to obtain a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES program is intended to control direct discharge into the surface waters of the State by imposing effluent limits and other conditions necessary to meet State and federal requirements.[4]

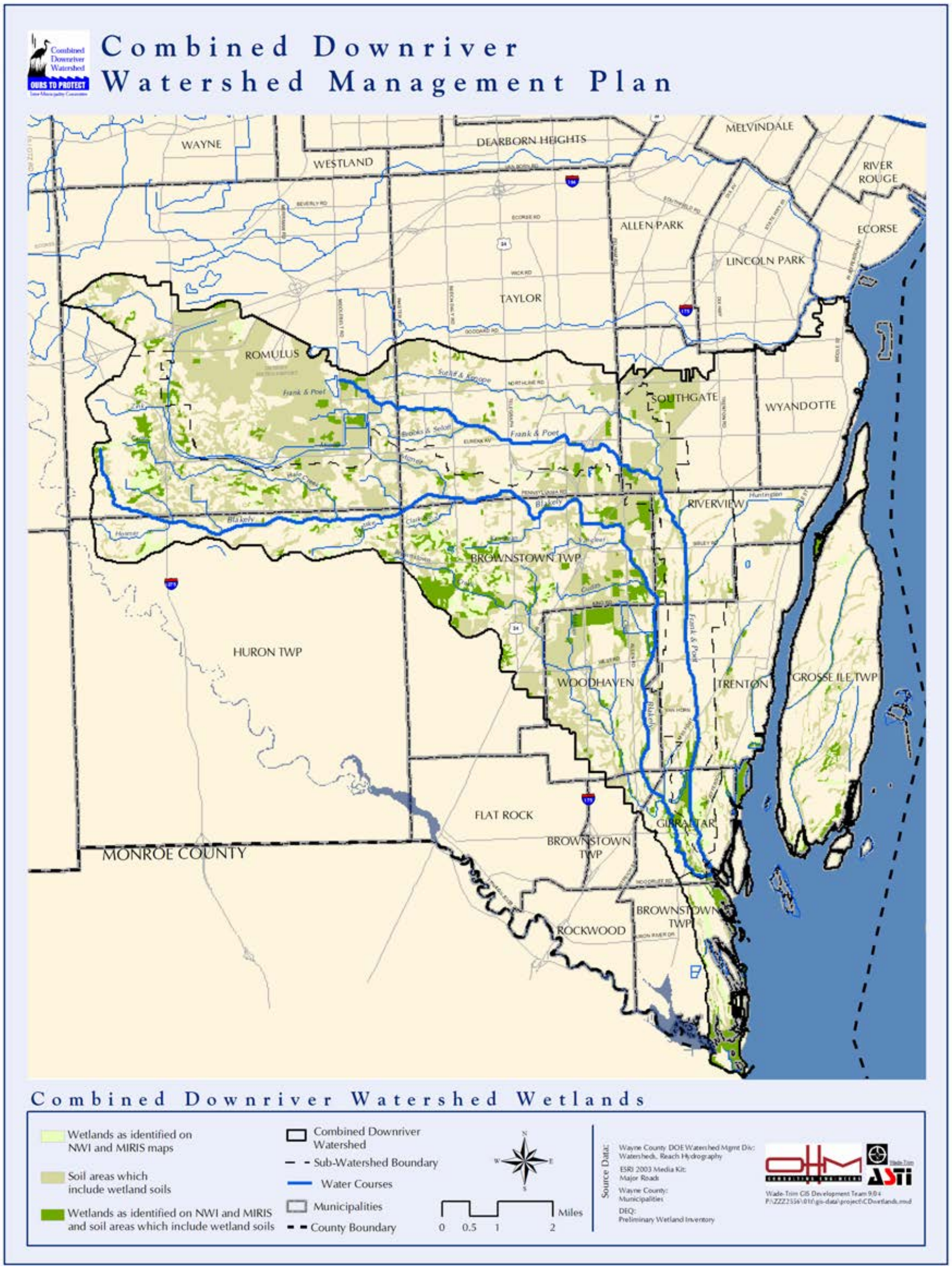
Information on current NPDES permitted point source discharges, permits on public notice, and specific facility information can be found at: http://www.deq.state.mi.us/owis/Page/main/Home.aspx

An individual NPDES permit is site specific. The limitations and requirements in an individual permit are based on the permittee's discharge type, the amount of discharge, facility operations (if applicable), and receiving stream characteristics.

A general permit is designed to cover permittees with similar operations and/or type of discharge. General permits contain effluent limitations protective of most surface waters statewide. Locations where more stringent requirements are necessary require an individual permit. Facilities that are determined to be eligible to be covered under a general permit receive a Certificate of Coverage (COC).

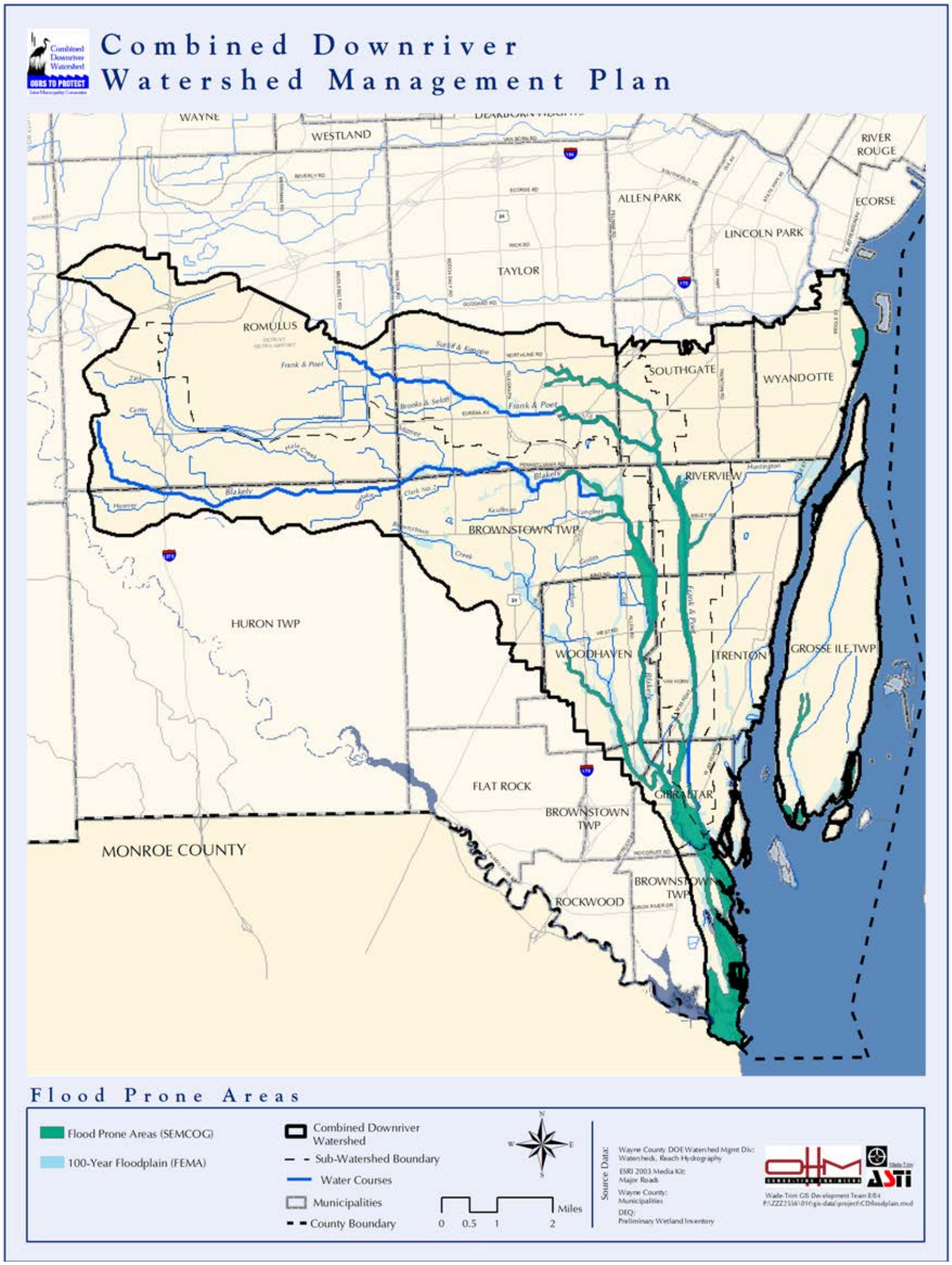
[4] MDEQ Website: Who Needs an NPDES Permit.

Map 2-10



Combined Downriver Watershed Management Plan
WAYNE
WESTLAND
DEARBORN HEIGHTS
MELVINDALE
RIVER ROUGE
ALLEN PARK
ECORSE
LINCOLN PARK
TAYLOR
ROMULUS
SOUTHGATE
WYANDOTTE
RIVERVIEW
BROWNSTOWN TWP
HURON TWP
WOODHAVEN
TRENTON
GROSSE ILE TWP
FLAT ROCK
GIBRALTAR
BROWNSTOWN TWP
MONROE COUNTY
ROCKWOOD
BROWNSTOWN TWP
Combined Downriver Watershed Wetlands
Wetlands as identified on NWI and MIRIS maps
Soil areas which include wetland soils
Wetlands as identified on NWI and MIRIS and soil areas which include wetland soils
Combined Downriver Watershed
Sub-Watershed Boundary
Water Courses
Municipalities
County Boundary
Miles
0 0.5 1 2
Source Data:
Wayne County DOE Watershed Mgmt Div: Watersheds, Reach Hydrography
ESRI 2003 Media Kit: Major Roads
Wayne County: Municipalities
DEQ: Preliminary Wetland Inventory

Map 2-11


Combined Downriver Watershed Management Plan
WAYNE
WESTLAND
RIVER ROUGE
ALLEN PARK
ECORSE
LINCOLN PARK
TAYLOR
ROMULUS
SOUTHGATE
WYANDOTTE
RIVERVIEW
BROWNSTOWN TWP
HURON TWP
WOODHAVEN
TRENTON
GROSSE ILE TWP
FLAT ROCK
BROWNSTOWN TWP
GIBRALTAR
MONROE COUNTY
BROWNSTOWN TWP
ROCKWOOD
Flood Prone Areas
Flood Prone Areas (SEMCOG)
100-Year Floodplain (FEMA)
Combined Downriver Watershed
Sub-Watershed Boundary
Water Courses
Municipalities
County Boundary
0 0.5 1 2 Miles
Source Data:
Wayne County DOE Watershed Mgmt Div: Watersheds, Reach Hydrography
ESRI 2003 Media Kit: Major Roads
Wayne County: Municipalities
DEQ: Preliminary Wetland Inventory
Wade-Trim GIS Development Team 8/04

3. Watershed Condition

Brownstown Creek at Carter Road

Chapter Contents

Historic & Current Conditions
- Introduction
- Descriptions of CDR Subwatersheds
- Biological Communities
- Sedimentation Deposition / Total Suspended Solids
- Hydrologic Modification / Stability
- Impervious Surfaces
- Phosphorus
- Dissolved Oxygen Concentrations (DO)
- Conductivity
- Pathogens (Bacteria)
- Additional Information

Field Inventory Summary
- Methodology
- Summary of Findings

Readily available reports and data concerning water quality and quantity characteristics of the streams in the Combined Downriver Watershed, and its tributary streams and drains, were compiled and reviewed to identify current conditions and relevant issues of concern within the Watershed. In addition, a field inventory was conducted to supplement the data reviewed.

3.1. HISTORIC & CURRENT CONDITIONS OF THE COMBINED DOWNRIVER WATERSHEDS

Readily available reports and data concerning water quality and quantity characteristics in the Combined Downriver (CDR) Watersheds of Brownstown Creek, and the Frank & Poet and Blakely Drains and their tributaries were compiled and reviewed to identify current conditions and relevant issues of concern within the Watershed. The information reviewed included reports and data from the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ), the U.S. Army Corps of Engineers (USACE), the U.S. Geological Survey (USGS), the Wayne County Department of Environment, (WCDE) and other sources. Particular emphasis was placed on recent biological surveys conducted by the MDEQ.[1,2,3,4,5] , as well as on the Total Maximum Daily Load Allocation for biota and *E. coli* in the Combined Downriver Watershed.

Field surveys utilizing the MDEQ's Stream Crossing Watershed Survey Procedure[6] were also conducted (as part of the original WMP development in 2004/05) at a total of 76 locations throughout the Combined Downriver Watershed to provide additional habitat and observational water quality data (Section 3.2).

3.1.1 Introduction

The Frank & Poet Drain, Blakely Drain (including downstream sections sometimes designated as Marsh Creek), and Brownstown Creek (a tributary to the Blakely Drain) in the CDR Watershed are all identified on Michigan's list of water-quality limited or threatened waters (Michigan's Integrated Report)[7] as failing to meet Michigan water quality standards for the protection of warm water aquatic life (poor macroinvertebrate communities). The Detroit River subwatershed is also identified as failing to meet water quality standards for pathogens (bacteria). Total Maximum Daily Load (TMDL) allocations have been developed for these waters within the CDR Watershed.

The aquatic biota TMDLs for the CDR Watershed is similar to the biota TMDL established for the Ecorse River (better known as Ecorse Creek), in the adjacent watershed to the north. The CDR TMDLs establish habitat assessment scores and scores rating the community composition and diversity of benthic macroinvertebrates as the primary measures of water quality improvements in the watershed. Benthic

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[1] Goodwin, K. 2008. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. June-August 2006 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/WB-08/054, July 2008.

[2] Jones, R.J. 1998. Sediment Survey of Monguagon Creek, Wayne County, Michigan, November 4, 1997. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-98/035, July 1998.

[3] Mulcrone, M. 1995. Frank and Poet Drain Diurnal Dissolved Oxygen Study March 1995. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-95/076, March 1992.

[4] Jones, R.J. 1992. A Biological Survey of Frank and Poet Drain, Wayne County, Michigan, August 13-14, 1991. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DNR/SWQ-92/205, March 1992.

[5] Jones, R.J. 1991. A Biological Survey of County Drains in the Vicinity of Detroit Metropolitan Airport, Wayne County, Michigan, July 12-13, 1990 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DNR/SWQ-91/059, May 1991.

[6] Bauer, C., G. Goudy, S. Hanshue, G. Kohlhepp, M. McMahon, and R. Reznick. 2002. Stream Crossing Watershed Survey Procedure. Michigan Department of Environmental Quality, Surface Water Quality Division. June 26, 2002.

[7] Water Quality and Pollution Control in Michigan Sections 303(d), 305(b), and 314 Integrated Report, 2010.

macroinvertebrates are bottom dwelling aquatic insects, mollusks, and crustaceans large enough to be seen without magnification. The TMDL also establishes wet weather (rain and snowmelt generated) total suspended solids (TSS) concentrations as a secondary measure of water quality improvement. The *E. Coli* TMDL establishes target *E. coli* levels in order to reach partial body and full body contact water quality standards. As such, assessments of the biological communities, aquatic habitat, imbeddedness, other key parameters with the potential to impact the biota and sedimentation (i.e. hydrology, impervious surfaces, nutrients [primarily phosphorus], bacteria concentrations, and dissolved oxygen), were selected as the principal parameters for this review. Table 3-1 summarizes each of the target water quality indicators, and, where available, provides the current data by subwatershed.

The Detroit River, which receives some of its drainage from the CDR Watershed, is also on the state's 303(d) list for failing to meet water quality standards for mercury and pathogens and for fish contaminant advisories for TCDD (dioxin), mercury, and polychlorinated biphenyls (PCBs). The Detroit River has been designated by the United States and Canada, under Annex 2 of the Great Lakes Water Quality Agreement, as an Area of Concern (AOC). Nine beneficial use impairments have been identified in the Detroit River. The known causes of impairments include urban and industrial development in the watershed, bacteria, PCBs, polycyclic aromatic hydrocarbons (PAHs), metals, and oils and greases. Combined sewer overflows (CSOs) and municipal and industrial discharges are major sources of contaminants within the AOC. Storm water runoff and tributaries in Michigan are also major sources of contaminants. Additional environmental concerns include exotic species, changes in the fish community structure, and reductions in wildlife populations. Detroit River priorities include control of combined sewer overflows (CSOs), control of sanitary sewer overflows (SSOs), point/nonpoint source pollution controls, remediation of contaminated sediments, habitat restoration, and pollution prevention.[8] Monguagon Creek (a.k.a. Huntington Creek), part of the Detroit River South subwatershed of the CDR Watershed, is part of the Detroit River AOC.

In light of the TMDL for the Frank & Poet Drain, Blakely Drain, and Brownstown Creek, assessments of the biological communities, TSS concentrations, other key parameters with the potential to impact the biota and sedimentation (i.e. hydrology, impervious surfaces, nutrients [primarily phosphorus], and dissolved oxygen), were selected as the principal parameters for this review. Information regarding bacteria as a component of water quality is also included here, although information regarding concentrations of bacteria or other pathogens specifically within the CDR Watershed is not available. Each of these parameters is described in general terms below, followed by specific descriptions of how each of these parameters are exhibited in the three subwatersheds of the CDR Watershed. Table 3-1 summarizes each of the target water quality indicators, and where available, provides the current data by subwatershed.

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[8] http://www.epa.gov/glnpo/aoc/detroit.html

Table 3-1. Summary of Water Quality Indicators

	Target	Frank & Poet	Blakely Creek	Detroit River South
Biological Communities	"Acceptable" Macroinvertebrate and Habitat scores (MDEQ Procedure 51)	Poor	Poor	Unknown
Sedimentation/ TSS	Suspended Sediment Concentration (SSC)	48 – 110 mg/L	5 – 200 mg/L (mean = 39.8 mg/L	Limited data: Huntington Creek = 5 mg/L
Hydrology	Ratio of mean monthly highs to mean monthly low flows: 2.1 to 5.0 Richard-Baker Index	Flashy, unknown ratio	Flashy, unknown ratio	Flashy, unknown ratio
Imperviousness	Less than 25%	29.7%	20.9%	28.0%
Phosphorus	< 0.05 mg/L	0.082 to 0.151 mg/L	0.068 to 0.34 mg/L	Limited data: Huntington Creek = 0.132 mg/L
Dissolved Oxygen	$\geq$ 5 mg/L	As low as 1.73 mg/L	Unknown	Limited data: Huntington Creek = 8.64 mg/L
Conductivity	Between 150 and 500 μS/cm	1,443 to 3,449 μS/cm	242 to 3,265 μS/cm	Limited data: Huntington Creek = 1,991 and 2,820 μS/cm
Pathogens (Bacteria)	< 130 E. coli/100 mL water	Unknown	Unknown	Unknown

3.1.2 Descriptions of CDR Subwatersheds

The CDR Watershed encompasses an area of approximately 85.9 square miles (54,944 acres), primarily within the Huron-Erie Lake Plain (HELP) ecoregion.[9,10] The Huron/Erie Lake Plain is a broad, fertile, nearly flat plain punctuated by relic sand dunes, beach ridges, and end moraines. Originally, soil drainage was typically poorer than in the adjacent Eastern Corn Belt Plains, and elm-ash swamp and beech forests were dominant. Oak savanna was typically restricted to sandy, well-drained dunes and beach ridges. Today, most of the area has been cleared and artificially drained and contains highly productive farms producing corn, soybeans, livestock, and vegetables; urban and industrial areas are also extensive. Stream habitat and quality have been degraded by channelization, ditching, and agricultural activities.

3.1.2.1 The Frank & Poet Drain Subwatershed

As described in Chapter 2, Characteristics of the Watershed, the Frank & Poet Drain subwatershed encompasses an area of approximately 17,347 acres. Its drainage area includes portions of the municipalities of Romulus, Taylor, Brownstown Township, Southgate, Riverview, Trenton, and Gibraltar. Prior to European-American settlement (circa 1830), the northwestern portions of the Frank & Poet subwatershed consisted of mixed hardwood swamp, in the headwaters, mixed oak savanna, and wet prairie. The eastern and southern portions of the subwatershed were dominated by beech-sugar maple forest. Today single-family residential development and transportation (primarily the Detroit Metropolitan Airport) are the largest land uses in the subwatershed (4,272.6 and 3,933.8 acres, respectively). Wetlands, forest, and open lands combined make up approximately 25.7% of the Frank & Poet Drain subwatershed by area.[11]

[9] SEMCOG (Southeast Michigan Council of Governments). 2000. Digital Land Use Data.
[10] http://www.hort.purdue.edu/newcrop/cropmap/michigan/maps/MIeco3.html
[11] SEMCOG (Southeast Michigan Council of Governments). 2000. Digital Land Use Data.

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3.1.2.2 The Blakely Drain Subwatershed

The Blakely Drain subwatershed is approximately 20,392 acres in area and includes portions of the Cities of Romulus, Taylor, Southgate, Riverview, Trenton, Woodhaven and Gibraltar, as well as portions of Brownstown and Huron Townships. Prior to Euro-American settlement, the central portion of the Blakely Drain subwatershed exhibited an extensive area of wet prairie. The headwaters of the Blakely Drain were a mosaic of black oak barrens, beech-sugar maple forest, wet prairie and hardwood swamp, while the southeastern portion of the watershed consisted primarily of beech-sugar maple forest with small areas of black ash and mixed-hardwoods swamps. Single-family residential development is currently the largest single land use in the subwatershed. Wetlands, forest, and open lands combined make up approximately 65.4% of the Blakely Drain subwatershed by area.

3.1.2.3 The Detroit River South Subwatershed

The Detroit River South subwatershed drains an area of approximately 16,974 acres (26.5 square miles) tributary to the Detroit River. The Detroit River is a 32-mile international connecting channel linking Lake St. Clair and the upper Great Lakes to Lake Erie. The Detroit River Area of Concern (AOC) includes the areas that drain directly to the river and the drainage area of its tributaries in Michigan and Ontario, Canada (700 square miles), as well as the City of Detroit "sewershed" area of 107 square miles. It is a binational AOC. Approximately 75 percent of the total land area of the Detroit River watershed is in Michigan (607.7 square miles).[12]

The Detroit River South subwatershed discussed in this watershed plan includes only 3.8% of the entire Detroit River Watershed. It includes portion of the cities of Southgate, Wyandotte, Trenton, and Gibraltar, and all of Grosse Ile Township. As is the case in the other subwatersheds of the CDR Watershed, single-family residential development is the largest single land use in the subwatershed. Wetlands, forest, and open lands combined make up approximately 20.7% of the Detroit River South subwatershed.

3.1.3 Biological Communities

Different species or other taxonomic groups of benthic macroinvertebrates (aquatic insects, mollusks, and crustaceans) and fish, have varying habitat requirements and tolerances of ecological degradation. The diversity and composition of these biological communities, therefore, tend to integrate the cumulative effects of chemical, physical, and biological conditions within a lake or stream over time.[13,14,15,16] In Michigan, the MDEQ conducts biological assessments of stream and river biota using Procedure 51 survey results and scoring.[17,18]

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[12] http://www.epa.gov/glnpo/aoc/detroit.html
[13] Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, 2nd Edition. United States Environmental protection Agency, Office of Water, Washington, DC. EPA 841-B-99-002.
[14] Davis, W.S. and T.P Simon (eds). 1995. Biological Assessment and Criteria: Tools for water resource planning and decision making. Lewis Publishers, Boca Raton, Florida.
[15] Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser. 1986. Assessing Biological Integrity in Running Waters: A Method and its Rationale. Illinois Natural History Survey Special Publication 5.
[16] Simon, T.P. (ed.) 1999. Assessing the Sustainability and Biological Integrity of Water Resources Using Fish Communities. CRC Press, Boca Raton, Florida.
[17] MDEQ. 2002. Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers. P51. MDEQ, Surface Water Quality Division, Lansing, Michigan. Revised May, 28, 2002.
[18] MDEQ. May 1996 Revision. Update of P51. Metric Scoring and Interpretation. MDEQ Report #MI/DEQ/SWQ-96/068

Procedure 51 is a multi-metric assessment and scoring system that combines measures of overall community diversity, evenness, and the preponderance of groups known to be either particularly tolerant or intolerant of poor water or habitat quality. Sites are scored relative to scores developed for reference (least-impacted) stream sites within the same ecoregion.[19]

Individual Procedure 51 metrics are scored on a scale of +1, 0, or -1 as described below:

+1 Community is performing better than the average condition found at excellent sites within the appropriate ecoregion

0 Community is performing between the average condition and (minus) 2 standard deviations from the average condition found at the excellent sites

-1 Community is performing outside of (minus) 2 standard deviations from the average condition found at the excellent sites[20]

There are nine (9) macroinvertebrate metrics and ten (10) fish metrics, resulting in potential scores ranging from +9 to -9 and +10 to -10, respectively. Scores of -5 or lower are considered poor, scores between -4 and +4 are considered acceptable, and those sites scoring +5 or higher are considered excellent. Procedure 51 also includes 10 metrics for the evaluation of habitat. Habitat scores, which assess the amount of stable in-stream structure such as woody debris, coarse substrate, overhanging banks and roots, the integrity of the riparian corridor, and the stability of a stream's hydrology, range from 0 to 200 and describe in-stream habitat as poor, marginal, good, or excellent.

3.1.3.1 Biological Communities in the Frank & Poet Drain Subwatershed

As noted above, the Frank & Poet Drain fails to attain designated uses for the protection of aquatic life, specifically benthic invertebrates.[21] Biological surveys conducted by the MDEQ in 1990, 1991, 2001 and 2006 all identified severely degraded conditions. Procedure 51 scores assessing the benthic invertebrate communities in the Frank & Poet Drain rated sites sampled in 1990 and 1991 as either "fair" or "poor." The 2001 biological survey rated all sites as "poor." An assessment of the fish community at 4 locations in the Frank & Poet Drain was conducted in 1991. Composition and diversity of the fish community was rated "good" (slightly impaired) at M-24 (Telegraph Road), Pennsylvania, and Gibraltar Roads. The fish community was rated "fair" (moderately impaired) at West Road. Habitat quality was rated "fair" (moderately impaired) at the four stations assessed in 2001 (i.e., Inkster, Telegraph, Pennsylvania, and West Roads) and "poor" (severely impaired) at the four stations evaluated in 1991 (i.e., Telegraph, Pennsylvania, West and Gibraltar Roads). Only one station, Inkster Road, was assessed in both 2001 and 2006. The macroinvertebrate community at Inkster Road rated poor in 2001 and acceptable in 2006.

The 2006 survey rated three of the macroinvertebrate communities poor and 1 station rated a low acceptable with total taxa ranging from 18 to 23. In general, most stations

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[19] Omernik, J.M. and A.L. Gallant. 1988. Ecoregions of the Upper Midwest States. USEPA, Environmental Research Laboratory, EPA/600/3-88/037.

[20] MDEQ. May 1996 Revision. Update of P51. Metric Scoring and Interpretation. MDEQ Report #MI/DEQ/SWQ-96/068

[21] Creal, W. and J. Wuycheck. 2002. Clean Water Act Section 303(d) List – Michigan Submittal for Year 2002. MDEQ Report #MI/DEQ/SWQ-02/013.

were characterized by high numbers of crustaceans, chironomid midges, and snails, similar to that of the Ecorse River subwatershed. The uppermost station in the watershed scored a mid-range acceptable with 28 taxa and a more even distribution, including 2 of each of the mayfly and caddisfly orders. All sites exhibited few sensitive insect species. Habitat scores and observations made by MDEQ biologists indicate that the Frank & Poet Drain lacks stable substrates that can be colonized by macroinvertebrates or that provide refuge for fish. Stable substrates, where present, exhibited heavy siltation. Habitat was found to lack the heterogeneity that would otherwise provide multiple niches for diverse assemblages of aquatic organisms. Much of the Frank & Poet Drain has been channelized, further limiting aquatic habitat, and is designated as a county drain. Channelization, coupled with increased runoff from adjacent urban areas, contributes to flashy flows and unstable hydrology noted in the biological assessments.

3.1.3.2 Biological Communities in the Blakely Drain Subwatershed

Like the Frank & Poet Drain, the Blakely Drain (including Brownstown Creek) also fails to attain designated uses for the protection of aquatic life, specifically benthic invertebrates.[22] Macroinvertebrate assemblages and habitat in Hale Creek, Blakely Drain, and Brownstown Creek were assessed by the MDEQ in 2001. Sites on the Hale Creek at Merriman and Pennsylvania Roads both exhibited "poor" macroinvertebrate communities. Sites on the Blakely Drain at Merriman and Middlebelt Roads exhibited acceptable macroinvertebrate scores. Sites on Blakely Drain at King and Vreeland Roads, and on Brownstown Creek at Hall, Vreeland, and Gibraltar Roads all exhibited macroinvertebrate assemblages rated as "poor." Habitat scores were "fair" for all sites except Brownstown Creek at Hall Road, which rated "poor." Biological surveys conducted in the Blakely Drain watershed indicated that the macroinvertebrate community rated poor at 10 of 13 stations. One site on Brownstown Creek showed improvement in the macroinvertebrate community from 2001 to 2006 while all other repeated sites continued to score poor. Habitat conditions for 1 station rated good while 12 others rated marginal in 2006.

3.1.3.3 Biological Communities in the Detroit River South Subwatershed

No assessment of fish or macroinvertebrate biota is available for streams within the Detroit River South subwatershed. A habitat survey was conducted on Monguagon Creek (Huntington Creek) in 2001, however. This survey, conducted at a single site at Electric Avenue, rated habitat in Monguagon Creek as fair. Specific problems exhibited included unstable hydrology and a lack of diverse habitats and a lack of stable vegetated banks.

As noted above, Monguagon Creek is included in the Detroit River AOC. The 1996 Remedial Action Plan report stated that degraded benthic communities had been noted on the Michigan shoreline of the Detroit River, from the Rouge River (north of the CDR Watershed) to the mouth (at Lake Erie - south of the CDR Watershed). Canadian and U.S. agencies have both conducted studies on sediments in the river. Six major areas have been identified for sediment remediation. Dredging, to remove contaminated sediments, within Monguagon Creek has been conducted and further dredging is planned. Dredging of contaminated sediments in the Trenton Channel of the Detroit River is underway currently.[23]

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[22] Creal, W. and J. Wuycheck. 2002. Clean Water Act Section 303(d) List – Michigan Submittal for Year 2002. MDEQ Report #MI/DEQ/SWQ-02/013.

[23] Detroit News. http://www.detnews.com/2004/metro/0412/17/D01-35904.htm

3.1.4 Sedimentation Deposition/Total Suspended Solids

The principal physical function of a stream or river system is the upstream to downstream transport of water and sediment. However, sediment inputs to the system in excess of equilibrium conditions can result in increased instream erosion, deposition of fine sediments, changes in stream morphology, and adverse impacts to fish and invertebrates. Deposition of finer-grained sediment, such as silts, clays, or sand, can fill the pore spaces between, or even bury gravels and other coarse substrates and fill pool habitat. Stream habitat is therefore simplified or made homogenous, resulting in the loss of aquatic species that require a variety of habitats or coarse substrates for colonization.

High sediment loads also degrade water quality. Instream erosion is accelerated, adding more sediment to the system. Streams can either erode the channel bottom (down-cutting or degradation) or the streambanks. Streambanks are generally made of softer material than the stream bottom, so a stream carrying excess water or excess sediment erodes laterally, resulting in a wide, shallow channel. Water is more readily heated in a shallow channel and the widening of the channel further exacerbates this effect as streamside vegetation has less cooling influence. Turbid water is also warmed easier. Warm water is able to hold less dissolved oxygen. Soil particles also bind with and carry pollutants, like phosphorus, which can lead to nutrient enrichment and increased algae and other plant growth. Plants as well the sediment itself can, in turn, further reduce dissolved oxygen levels.

Sediment is transported through a stream system either along the bottom (bed-load) or mixed in the water column. The latter component is more readily sampled and is measured as total suspended solids (TSS). In a review of the scientific literature, the European Inland Fisheries Advisory Commission (EIFAC)[24] documented impacts on fishes' reproductive success, growth, behavior, and health – even mortality – attributed to suspended sediment. Although cold-water fish appear to be more sensitive to suspended solids than warm water fish, fish are known to avoid areas of high turbidity, resulting in stretches of river devoid of fish. Fish have also been shown to reduce feeding in highly turbid waters due to reduced visibility and ability to find prey, which in turn reduces growth. High TSS concentrations have been shown to increase fish's susceptibility to disease and toxicants, to abrade gill and other tissue, and in some cases cause acute mortality, particularly in young fish. The EIFAC report established tentative criteria for TSS concentrations:

- Continuous TSS concentrations less than 25 mg/L were found not harmful to fish,
- Concentrations between 25 and 80 mg/L were found to reduce fish yields,
- Good fisheries were unlikely at concentrations between 80 and 400 mg/L, and
- Concentrations greater than 400 mg/L resulted in poor fish populations.[25]

Macroinvertebrate communities also exhibit reduced densities at concentrations greater than 80 mg/L TSS.[26] TMDL targets for the watershed have a numeric target for mean, annual, in-stream TSS concentrations of less than or equal to 80 mg/L during wet weather and snowmelt .

[24] EIFAC (European Inland Fisheries Advisory Commission). 1965. Water quality criteria for European freshwater fish. Report on finely divided solids and inland fisheries. International Journal of Air and Water Pollution 9:151-168. Cited in: Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7.

[25] Ibid

[26] Ibid

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3.1.4.1 Sediment Deposition/TSS in the Frank & Poet Drain Subwatershed

The 2001 biological assessment of the Frank & Poet Drain recorded TSS concentrations ranging from 48 mg/L to 110 mg/L two days following 1.02-inches of rain. Biological assessments conducted in 1991 and 2001 both noted significant sedimentation and embedded substrates in the Frank & Poet Drain.[27]

3.1.4.2 Sediment Deposition/TSS in the Blakely Drain Subwatershed

2001 water chemistry analysis recorded TSS concentrations ranging from 5 mg/L to 220 mg/L (Mean = 39.8 mg/L) during dry weather conditions. Biological assessments conducted in 1991 and 2001 both noted significant sedimentation and embedded substrates in the Blakely Drain/Brownstown Creek subwatershed.[28]

3.1.4.3 Sediment Deposition/TSS in the Detroit River South Subwatershed

Water chemistry analysis conducted at the same time as the 2001 assessment of the Blakely Drain, recorded a TSS concentration in Monguagon (Huntington) Creek of 5 mg/L.[29]

3.1.5 Hydrologic Modification/Stability

Flow stability, incorporating the relative magnitude, pattern, frequency, and duration of high and low stream flows, is a critical factor in determining the chemical, physical, and biological integrity of river systems. Streams that exhibit rapid fluctuations in flow are described as "flashy." Flashy flows destabilize banks, scour, dislodge and destroy habitat, strand and kill organisms, and inhibit recreational uses of rivers. Flow stability, especially during the period of May through July, is important for most warm water fish species to ensure adequate reproduction. High flows from spring storms can wash away nests, eggs, and newly hatched fry.[30] These types of river systems are likely to exhibit reduced ecological integrity.[31]

The Richard-Baker Flashiness Index is the preferred method of determining flow stability as it allows comparison to other rivers statewide. The R-B Index uses data from U.S. Geological Survey (USGS) gaging stations to quantify the frequency and rapidity of short term changes in stream flow. The yearly-averaged R-B Index values for Michigan watersheds range from 0.006 to 1.009. Fluctuations over time are apparent in a stream's R-B Index values. Some fluctuations in the R-B Index values are expected from year to year simply because of natural weather variations. Longer term trends result from hydrologic alterations within the watershed.[1] The lower the R-B Index, the more stable the flows. The higher the R-B Index, the flashier the flows. As expected, the rivers and streams in the southeast part of the State exhibit the higher indices.

Surficial geology in the Combined Downriver Watershed is defined by its location in the lake plain of Lake Erie's larger glacial predecessor. Soils in the watershed are predominantly fine-grained. This affects the availability and distribution of ground water

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[27] Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September 2001 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-02/020, January 2002.

[28] Ibid

[29] Ibid

[30] Beam, Jennifer D. and Jeffrey J. Braunscheidel. 1998. Rouge River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 22. Ann Arbor, Michigan.

[31] Hay-Chmielewski, E.M., P.W. Seelbach, G.E. Whelan, and D.B. Jester, Jr. 1995. Huron River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report Number 16. Ann Arbor, Michigan.

inputs to the river system and, hence, the balance between groundwater and surface water contributions to stream flow, the topography of the land, and the erosivity of the stream bed and banks.

3.1.5.1 Hydrologic Modification/Flow Stability in the Frank & Poet Drain Subwatershed

Stream discharge monitoring in the Frank & Poet Drain Watershed as part of the Grow Zone Evaluation Report[32] indicated that drain is characterized by low base flow followed by sharp increases in discharge in response to storm events. The highest peak flow measured was 207 cfs – the highest of all sites measured. The Frank & Poet tends to maintain higher flows over a longer period of time, however, and thus has a somewhat lower flashiness index of 0.68[33]. This index value is still among the highest (most flashy / least natural) quartile in Michigan.

3.1.5.2 Hydrologic Modification/Flow Stability in the Blakely Drain Subwatershed

Streams within the Blakely Drain / Brownstown Creek subwatershed also exhibit evidence of flashy hydrology. MDEQ habitat scores indicate that this subwatershed is impacted by storm water flows from agricultural runoff and suburban development.

Stream discharge monitoring in the Blakely Drain subwatershed as part of the Grow Zone Evaluation Report indicated that the drain produces a median flow of 2.30 cfs. It also maintains a low base flow followed by sharp increases to peak flows in response to storm events. The highest peak flow measured was 78 cfs. Unlike several of the other sites, Blakely Drain maintains measurable flow most of the time and rarely declines to zero discharge. This contributes to a lower flashiness index of 0.53. This index value places the Blakely Drain site among the highest (most flashy / least natural) quartile in Michigan. However, it is lower than the median for streams of comparable size in the wider Midwestern region.

3.1.5.3 Hydrologic Modification/Flow Stability in the Detroit River South Subwatershed

Only Monguagon (Huntington) Creek was evaluated in MDEQ biological assessments. The majority of the Creek, all except the last (downstream-most) mile, is contained within a pipe. One station downstream of the piped section exhibited evidence of flashy hydrology and the downstream-most 1 / 2 mile is influenced by water levels in the Detroit River. The Monguagon Creek subwatershed is heavily developed as residential and industrial / commercial uses and is assumed to contribute storm water flows that would lead to unstable hydrology. Flows in all of these subwatersheds are assumed to be similar to those in the adjacent Ecorse Creek Watershed; exhibiting flashy flows in response to precipitation.

3.1.6 Geomorphology of Stream Sites

As part of the Grow Zone Evaluation Report, 3 sites within the Combined Downriver Watershed were evaluated for tractive force stability, one on the Blakely Drain, one on the Frank and Poet at Homeister, and one on the Brownstown Creek at Hall Road. The tractive force for the Blakely and Frank and Poet were 14.6 and 6.3, respectively. This suggests that the stream channels are unstable and erosive. The measured peak flow at these sites were 78 and 207 cfs, respectively. It appears that significant erosion may be occurring at this site near or above the bankfull discharge.

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[32] Wayne County. 2010. Evaluation Report, Grow Zones Across the Alliance of Downriver Watersheds.

[33] MDEQ Application of Richard-Baker Flashiness Index to Gaged Michigan Rivers and Streams, August 2007.

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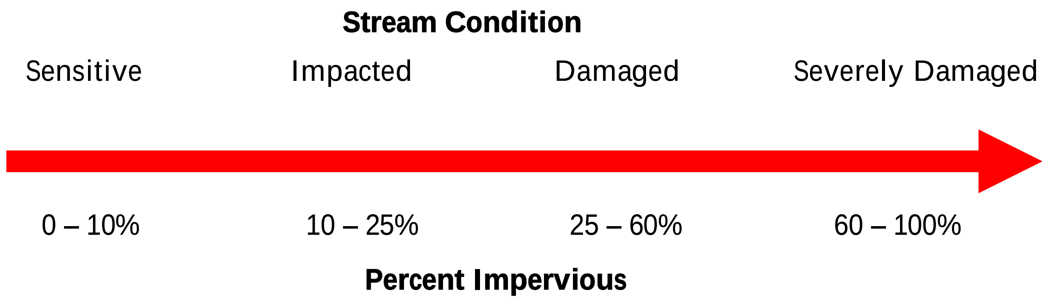
The site on the Brownstown Creek had a tractive force of 0.05, indicating unstable, probably aggrading(i.e. filling with sediment) channels. The site has a bankfull depth of 2.3m. The measured peak flow at this site was 77.5 cfs. Discharge below this level is likely to drop sediment at this site.

3.1.7 Impervious Surfaces

Imperviousness, which is a measure of the amount of non-porous surfaces (e.g. rooftops, roads, parking lots, driveways, etc.) in a watershed, is a driving factor in the degradation of stream and river systems in urban areas. The amount of imperviousness in a watershed has been shown to be directly related to the physical, chemical, and biological quality or integrity of aquatic ecosystems. Schueler,[34] reviewing studies from across the United States, determined that predevelopment stream quality is lost when watershed imperviousness exceeds 10%. He showed that watersheds with greater than 10% impervious surface coverage exhibited degraded conditions. Research conducted locally by the Huron River Watershed Council (HRWC) found that this degradation may be noted at lower levels. Data from the HRWC's Adopt-A-Stream program found impacts evidenced in habitat scores, macroinvertebrate communities, and elevated conductivity measurements at subwatershed impervious surface levels equal to or greater than 8 percent of the total landscape.[35] Schueler classified streams with greater than 25% imperviousness as non-supporting of designated uses (Figure 3-1). At high levels of imperviousness, watershed degradation may be irreparable.

Figure 3-1. Schueler's Scale of Watershed Imperviousness and Stream Condition



In an undeveloped landscape, most of the water falling as rain or snow is intercepted by the forest canopy, or other vegetation. This water is returned to the atmosphere through the processes of evaporation or transpiration without ever reaching the ground surface. Under natural conditions, water that does reach the ground is able to percolate through the soil surface. Some of this water is utilized by plants, some feeds local waterbodies as throughflow, and some continues to flow downward through the soil until it reaches the water table and recharges local groundwater supplies.

As the landscape is developed, the protective layer of trees, shrubs, and grasses are stripped away and replaced by hardened surfaces. Under these conditions, much more water reaches the ground surface when it rains than previously, and this water is then

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[34] Schueler, T. 1994. The Importance of Imperviousness. Watershed Protection Techniques 1(3):100-111. Center for Watershed Protection. Ellicott City, Maryland.

[35] Martin, J. and M.J. Wiley. 1999. The Current Conditions, Recent Changes, and Major Threats to the Huron River: A report on eight years of an ongoing study. Huron River Watershed Council, Ann Arbor, Michigan. http://www.hrwc.org/pdf/5yearreport.pdf

unable to infiltrate through the soil surface. Instead it runs off of roofs and roads, often carried more quickly through piped drainage systems, to local stream, rivers, and lakes.

The shape and dimensions of stream systems change over time to be in equilibrium with the amount of water and sediment the stream normally carries. Stream channels are generally formed to carry the largest flows experienced every one to two years.[36,37] As a stream's watershed is developed, more and more water and sediment are carried to the stream, increasing both the magnitude and frequency of those channel-forming storms. Large storm events, such as the “5-year storm,” (that storm event that normally would have a 1 in 5 chance of occurring in any given year), becomes the norm – occurring as many as five (5) times *per* year.[38] The result is that the streams become "flashy" - they experience higher highs, being driven by overland runoff and flood flows, and lower lows, since lower infiltration rates can reduce groundwater recharge and baseflow inputs to streams during summer low flow periods or drought. Additionally, these changes to stream channel morphology and hydrology, lead to greater erosion, deposition, and pollution as described previously.

Estimates of existing and future levels of impervious surface coverage within the watershed were calculated using available land use data and land-use specific imperviousness averages measured within the neighboring Rouge River Watershed. Levels of imperviousness grouped according to Schueler’s threshold categories are presented in Maps 3-1 and 3-2.

Data used for these calculations and mapping were based upon the southeast Michigan Council of Government’s (SEMCOG) digital land use data from 2000 (existing land use) and SEMCOG’s 2030 build-out analysis based upon the merging of individual community Master Plans. Some seeming anomalies are evident when reviewing the maps (i.e., areas where imperviousness seems to decrease for a specific area in the future). This stems from differences in the source for the two data sets: aerial photography for the current land use coverage and zoning and Master Plans for the future estimates. Despite these occasional oddities, the overall picture painted is evident; existing planning policies in the CDR communities will result in significantly higher impervious coverage across the watershed given current development trends.

3.1.7.1 Green Infrastructure Assessment for the Combined Downriver Watershed

A Green Infrastructure Assessment was conducted using 2008 land cover data interpreted from aerial photography from United States Geologic Survey (USGS).[39] Land cover data was assessed to estimate stormwater storage capacity, air pollution removal and carbon sequestration of the existing green infrastructure in each watershed of the ADW. A monetary value of the existing green infrastructure was also calculated for the current green infrastructure.

An existing conditions green infrastructure(GI) benefits assessment was performed on each of the three major watersheds using CityGreen© software and the 2008 aerial imagery. Storm water storage capacity changes, air pollution benefits, carbon storage and

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[36] Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

[37] Leopold, L.B., M.G. Wolman, and J.P. Miller. 1992. Fluvial Processes in Geomorphology. Dover Publications, Inc. New York.

[38] Booth, D.B. 1990. Stream-channel Incision Following Drainage-basin Urbanization. Water Resources Bulletin 26(3): 407-417.

[39] United States Geologic Survey (USGS) leaf –off ADS-40 imagery at 1 m resolution 4-band data including near infra-red, spring 2008. Imagery special accuracy of 5 m c.e.

sequestering, and water quality pollutant loading reductions were calculated. The individual watershed benefits were than aggregated to provide an estimate of GI benefits for the full ADW. A desk-top assessment was also made to evaluate the stormwater management and maintenance impacts of each of the ten native plant Grow Zone projects.

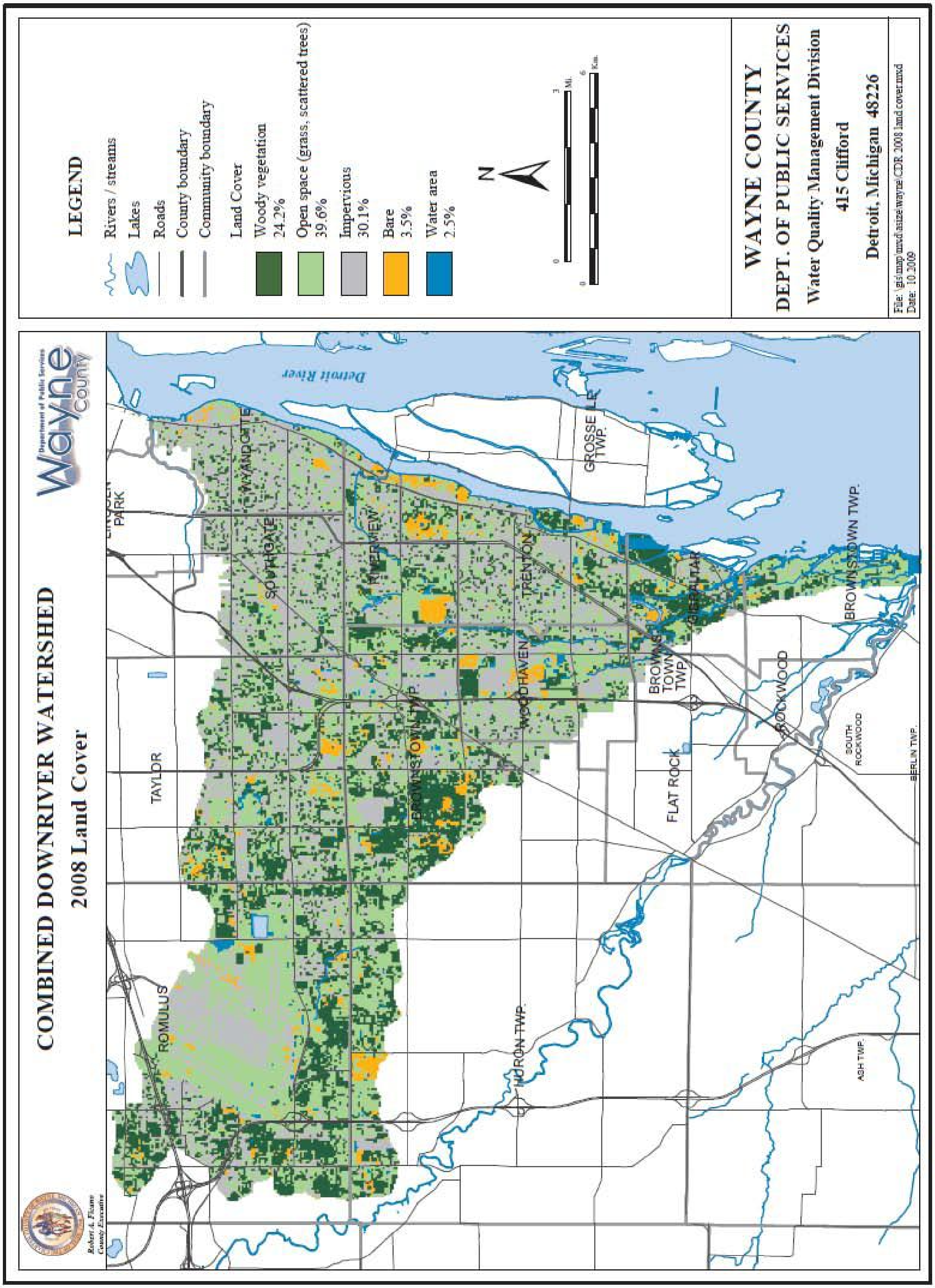
Maintenance cost savings were also calculated using a literature value.

The Green Infrastructure Assessment for the Combined Downriver watershed(Map 3-1) summarizes the watershed as approximately 64% green infrastructure (woody vegetation, open space) and 34% impervious surface (urban, urban bare). Air pollution benefits provided by the existing green infrastructure include the annual removal of approximately 1,027,006 pounds of air pollutants. In financial terms, this level of air pollution removal represents a $2,436,254.00 annual cost savings benefit to the local communities and citizens within the Combined Downriver watershed. The existing green infrastructure is also providing carbon storage benefits of approximately 569,853 tons at this time and is sequestering an additional 4,436 tons per year. Based on the 2-year, 24-hour storm event the Combined Downriver existing green infrastructure is providing approximately 55,764,282 cubic feet of storm water storage. Replacement of this storm water storage would cost over $111,528,564.

Table 3-2 Green Infrastructure 2008 Land Cover Assessment

		Blakely Drain	**Detroit River South**	**Frank & Poet**	**Combined Downriver Totals**
Open	Acres	8,292.80	6,135.80	7,435.20	21,863.80
	%	40.7%	35.8%	42.9%	
Trees	Acres	5,896.30	3,992.30	3,224.40	13,113.00
	%	28.9%	23.3%	18.6%	
Urban	Acres	5,074.10	5,764.90	5,909.70	16,748.70
	%	24.9%	33.6%	34.1%	
Bare	Acres	892.30	552.00	491.20	1,935.50
	%	4.4%	3.2%	2.8%	
Water	Acres	233.90	715.00	288.70	1,237.60
	%	1.1%	4.2%	1.7%	
Total Acres		20,389.40	17,160.00	17,349.20	54,898.60

Map 3-1



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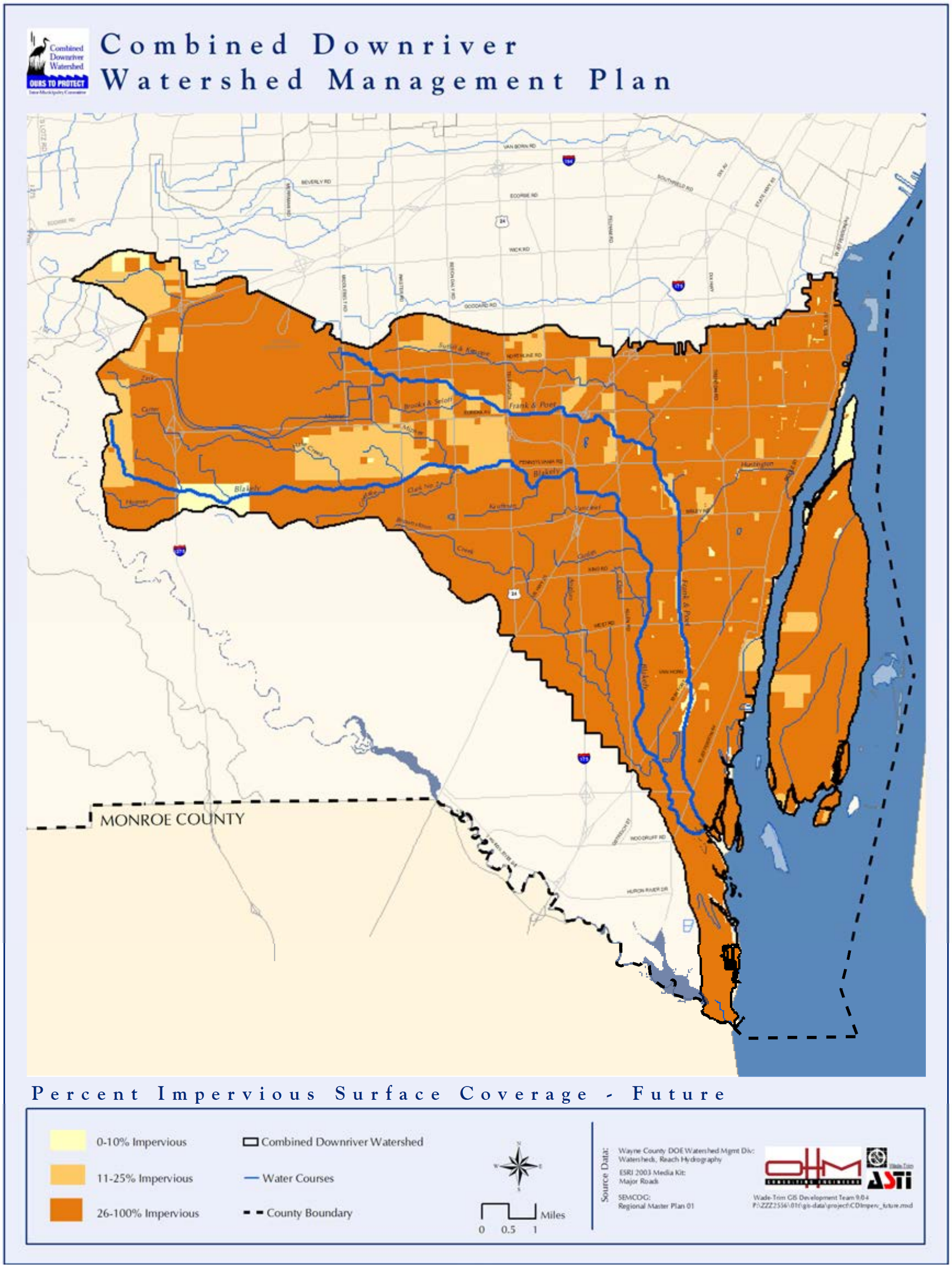
Map 3-2


Combined Downriver
Watershed Management Plan
MONROE COUNTY
Percent Impervious Surface Coverage - Future
0-10% Impervious
11-25% Impervious
26-100% Impervious
Combined Downriver Watershed
Water Courses
County Boundary
Miles
0 0.5 1
Source Data:

3.1.8 Phosphorus

Phosphorus and other nutrients are essential for plant growth. In Michigan waters, phosphorus is generally considered the limiting nutrient, meaning that the amount of available phosphorus generally determines the rate and amount of plant growth. As such, phosphorus is a key water quality concern. Phosphorus binds to soil particles, and is thereby delivered to streams and lakes with eroded soil. Phosphorus is also a chief component of lawn, garden, and agricultural fertilizers, detergents, fuels, and animal wastes. Phosphorus from these sources is carried in storm water runoff, and enters rivers and lakes from failing septic systems and from wastewater treatment plants. Excessive phosphorus can, in turn, lead to excessive growth of algae and other aquatic plants, which can then deplete the available dissolved oxygen in the water. This can result in a change in the species composition of fish and aquatic invertebrates or even result in fish kills. High nutrient concentrations and the resulting growth of nuisance plant levels can also inhibit recreation and enjoyment of our waters. The MDEQ considers total phosphorus concentrations higher than 0.05 mg/L to have the potential to cause eutrophic conditions (e.g. nuisance algae and plants growth, widely fluctuating DO concentrations, etc.).

Total Phosphate should not exceed 0.05 mg/L

Among intensively monitored river sites on Michigan tributaries to the Great Lakes, the Au Sable River exhibits the lowest median total phosphorus concentrations and the Clinton River exhibited the highest (0.01 mg/L and 0.17 mg/L, respectively).[40] The MDEQ generally limits total phosphorus in wastewater treatment plant discharges to an average of 1.0 mg/L,[41] although some wastewater treatment facilities are now being more strictly permitted. The United States Environmental Protection Agency (U.S. EPA) recommends that total phosphate not exceed 0.05 mg/L (as total phosphorus) in streams or rivers at the point where they enter a lake or reservoir, and should not exceed 0.1 mg/L in streams that do not discharge directly into lakes or reservoirs.[42]

3.1.8.1 Phosphorus in the Frank & Poet Drain Subwatershed

Water quality samples were collected on September 11 and 12, 2001 as part of the MDEQ's most recent biological survey of the Frank & Poet Drain. These were analyzed for total phosphorus (TP) and ortho-phosphate (Ortho-P).[43] TP concentrations ranged from 0.082 to 0.151 mg/L – all in excess of the U.S. EPA recommended value of 0.05 mg/L. The mean for all Frank & Poet Drain sampling stations equaled 0.124 mg/L. Orthophosphate, the form of phosphorus available for uptake by plants, averaged 0.015 mg/L in the Frank & Poet Drain in 2001. For comparison, the summer mean for orthophosphate concentrations in all monitored Michigan streams and rivers in the Huron-Erie Lake Plain equals 0.0354 mg/L (range equals 0.0125 to 0.06 mg/L).[44]

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[40] MDEQ (Michigan Department of Environmental Quality). 2004. Michigan Water Chemistry Monitoring: Great Lakes Tributaries, 2002 Report. MDEQ Report # MI/DEQ/WD-04/049. http://www.deq.state.mi.us/documents/deq-wb-swas-2002trendreport.pdf

[41] http://www.deq.state.mi.us/documents/deq-swq-npdes-Phosphorus.pdf

[42] Mueller, D.K and D.R. Hellsel. 1996. Nutrients in the Nation's Waters – Too Much of a Good Thing?. U.S. Geological Survey. Electronic Version of Circular 1136. http://water.usgs.gov/nawqa/circ-1136.html

[43] Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September 2001. MDEQ Report #MI/DEQ/SWQ-02/020.

[44] U.S. EPA. 2000. Ambient Water Quality Criteria Recommendations: Information supporting the development of state and tribal nutrient criteria, Rivers and streams in nutrient ecoregion VI. United States Environmental Protection Agency, Office of Water, 4304, EPA 822-B-00-017. December 2000.

3.1.8.2 Phosphorus in the Blakely Drain Subwatershed

Water quality samples were collected by the MDEQ, June 26 and 27, 2001, at stations within the Blakely Drain/Brownstown Creek subwatershed and on Monguagon (Huntington) Creek. TP concentrations in the Blakely Drain subwatershed ranged from 0.068 to 0.34 mg/L – all in excess of the U.S. EPA recommended value of 0.05 mg/L. The mean for all Blakely Drain/Brownstown Creek sampling stations equaled 0.177 mg/L. Orthophosphate, the form of phosphorus available for uptake by plants, averaged 0.078 mg/L in the Blakely Drain/Brownstown Creek.

3.1.8.3 Phosphorus in the Detroit River South Subwatershed

Monguagon (Huntington) Creek exhibited a TP concentration of 0.132 mg/L at the one station sampled in 2001. Orthophosphate was measured as 0.082 mg/L.[45] All sampled stations within the Combined Downriver Watershed appear nutrient enriched.

3.1.9 Dissolved Oxygen Concentrations (DO)

Oxygen dissolved in water (DO) is necessary for life of both aquatic plants and animals. Oxygen enters water either through plant photosynthesis or across the air-water interface through turbulence and osmosis. The amount of oxygen that can be held by the water is temperature dependent. Solubility increases with decreasing temperature (colder water holds more oxygen). Oxygen is lost or reduced when water temperatures rise, when plants and animals respire, and when aerobic microorganisms decompose organic matter. Plants produce excess oxygen during the daylight hours through photosynthesis. During the night, they must continue to use oxygen while no photosynthesis is occurring. Thus, DO levels decrease at night, and are generally lowest just before dawn.

As stated above, introduction of excess nutrients (driving nuisance plant growth) and/or excess warming may result in oxygen depletion. Prolonged exposure to low dissolved oxygen levels (less than 5 to 6 mg/L oxygen) may not directly kill organisms, but can increase their susceptibility to environmental stresses. Exposure to less than 30% saturation (less than 2 mg/L oxygen) for periods of one to four days may kill most life in aquatic systems.[46]

Rule 64 of the Michigan Water Quality Standards (Part 4 of Act 451)[47] includes minimum concentrations of dissolved oxygen that must be met in Michigan surface waters. This rule states that surface waters protected for warm water fish and aquatic life must meet a minimum dissolved oxygen standard of 5 mg/L.

> Surface waters protected for warm water fish and aquatic life must meet a minimum dissolved oxygen standard of 5 mg/L.

3.1.9.1 Dissolved Oxygen in the Frank & Poet Drain Subwatershed

The MDEQ conducted a diurnal dissolved oxygen study on the Frank & Poet Drain in March of 1995. In that study, they found that DO was significantly reduced during and following discharge of storm water and attendant de-icing agents from the Detroit Metropolitan Airport, in the Frank & Poet Drain, although DO concentrations did not fall below Michigan Water Quality Standards. In general, warm water holds less oxygen than cold water. Further investigation would be required to determine DO concentrations in the Frank & Poet Drain during summer months.

[45] Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September

[46] http://www.deq.state.mi.us/documents/deq-swq-npdes-DissolvedOxygen.pdf

[47] http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=

DO sampling was also conducted by ASTI Environmental during the summer of 2004. DO concentrations at Frank & Poet Drain sites ranged from 2.91 at 11.86° C (27.2% of saturation) to 11.54 mg/L at 14.74° C (114.6% of saturation). Measured DO concentrations were below Michigan's 5 mg/L warmwater quality standard at four (4) out of seven (7) sites sampled within the Frank & Poet Drain subwatershed. The mean DO concentration equaled 5.25 mg/L. It should be noted that DO measurements were collected at mid-morning or later in the day, at times when photosynthetic activity would be expected to increase DO values. DO concentrations would be expected to be at their lowest shortly before dawn. Therefore, it is likely that additional sites may experience DO concentrations below the warmwater quality standard and that sites with already low DO concentrations might exhibit even lower values at that time.

3.1.9.2 Dissolved Oxygen in the Blakely Drain Subwatershed

Data collected during the summer of 2004 showed DO values below Michigan's 5 mg/L warmwater quality standard at five (5) out of fourteen (14) locations sampled. DO concentrations ranged from 1.73 at 12.59° C (16.4% of saturation) to 9.32 mg/L at 16.21° C (95.6% of saturation) at all sites sampled, and from 1.73 to 4.13 mg/L at those five sites below the water quality standard. The mean DO concentration at all sites within the Blakely Drain subwatershed equaled 6.52 mg/L. However, there was a noticeable difference between sites on Blakely Drain and its smaller tributaries (Mean = 5.82 mg/L) and sites on Brownstown Creek (Mean = 8.46 mg/L).

3.1.9.3 Dissolved Oxygen in the Detroit River South Subwatershed

The Grosse Ile Drain (at Groh Road) exhibited a DO concentration of 8.64 mg/L at 10.77° C (78.5% of saturation) when measured during the summer of 2004.

3.1.10 Conductivity

Conductivity is a measure of the ability of water to pass an electrical current and, as such, is an indirect measurement of the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Conductivity is affected by temperature: the warmer the water, the higher the conductivity. Conductivity is frequently measured as micro-Siemens per centimeter (µS/cm). Because it is related to temperature, conductivity is generally standardized as conductivity at 25 degrees Celsius (25° C).

Conductivity in streams and rivers is affected primarily by the geology of the watershed. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. Streams that run through areas with clay soils tend to have higher conductivity because of the presence of ionizing materials. Ground water inflows can have the same effects depending on the bedrock they flow through.

Conductivity of rivers in the United States generally ranges from 50 to 1500 µmhos/cm. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µS/cm. Industrial waters can range as high as 10,000 µS/cm. Conductivity values outside of 150 to 500 µS/cm range may indicate the presence of anthropogenic inputs and water unsuitable for certain species of fish or macroinvertebrates. In the Huron River, in southeast Michigan, average conductivity values less than or equal to 800 µS/cm are considered natural.[48] Conductivity values greater than 800 µS/cm were correlated with imperviousness values greater than 8% and impaired macroinvertebrate communities.[49]

3.1.10.1 Conductivity in the Frank & Poet Drain Subwatershed

Water quality samples, collected on September 11 and 12, 2001 as part of the MDEQ's most recent biological survey of the Frank & Poet Drain, exhibited conductivity ranging from 662 to 819 µS/cm. The mean for all Frank & Poet Drain sampling stations equaled 728 µS/cm. Conductivity values within the Frank & Poet Drain subwatershed collected by ASTI Environmental during the summer of 2004 ranged from 1,443 to 3,449 µS/cm (Mean = 2,395 µS/cm). The highest value observed, and the only one greater than 3,000 µS/cm, was in the Sutliff & Kenope Drain at Beech Daly Road.

3.1.10.2 Conductivity in the Blakely Drain Subwatershed

Water quality samples were collected by the MDEQ, June 26 and 27, 2001, at stations within the Blakely Drain/Brownstown Creek subwatershed and on Monguagon Creek. Conductivity ranged from 722 to 2,110 µS/cm for Blakely Drain/Brownstown Creek sampling stations (Mean = 1,382 µS/cm). Conductivity values within the Blakely Drain subwatershed collected by ASTI Environmental in 2004 ranged from 242 to 3,265 µS/cm (Mean = 1,442 µS/cm). Values were somewhat lower in the Brownstown Creek portions of the Blakely Drain subwatershed than in the Blakely Drain and its other tributaries.

3.1.10.3 Conductivity in the Detroit River South Subwatershed

Monguagon (Huntington) Creek exhibited a conductivity of 2,820 µS/cm at the one station sampled by the MDEQ in 2001. Specific conductance equaling 1,991 µS/cm was measured by ASTI Environmental at one location on the Grosse Ile Drain (at Groh Road) during the summer of 2004.

3.1.11 Pathogens (Bacteria)

Bacteria are simple, single-celled organisms that can reproduce rapidly by binary fission. While over 60 genera of bacteria are naturally present in waters of the U.S., certain types of bacteria can increase as a result of human use of a watershed and may indicate sources of water pollution[50].

Most bacteria are harmless, however some have the potential to cause illness or disease in humans. These are referred to as *pathogens*. Examples of waterborne diseases caused by bacteria include cholera, dysentery, shigellosis and typhoid fever. Minor gastro-intestinal discomfort is probably the most common ailment associated with water-borne bacteria, however, pathogens that cause only minor discomfort to some may cause serious illness or even death in other individuals, particularly those with compromised immune systems or the young and elderly.[51,52]

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[48] Dakin, T.D. and J.S. Martin. 2003. The Quality of a Hidden Treasure: The Davis Creek Report. Huron River Watershed Council. Ann Arbor, Michigan.
[49] Martin, J. and M.J. Wiley. 1999. The Current Conditions, Recent Changes, and Major Threats to the Huron River: A report on eight years of an ongoing study. Huron River Watershed Council, Ann Arbor, Michigan. http://www.hrwc.org/pdf/5yearreport.pdf
[50] Gregory, M.B. and E.A. Frick. 2000. Fecal-coliform bacteria concentrations in streams of the Chattahoochee River National Recreation Area, Metropolitan Atlanta, Georgia, May-October 1994 and 1995. U.S. Geological Survey Water Resources Investigation Report 00-4139, August 2000.
[51] Ibid
[52] Schueler, T.R. 1999. Microbes and Urban Watersheds II. Concentrations, Sources, and Pathways. Watershed Protection Techniques 3(1): 1-12.

Of particular interest or concern is a sub-group called coliform bacteria, typically found in the digestive systems of warm-blooded animals. Coliform bacteria include total coliforms, fecal coliforms, and the group *Escherichia coli* (*E. coli*). Each of these indicates the presence of fecal waste in surface waters.[53] The fecal-coliform bacteria group was the preferred indicator for potential water quality concerns, however, recent advances in the use and analysis of indicator bacteria have shown that *E. coli* are more reliable for predicting the presence of disease causing organisms.[54]

Rule 62 of the Michigan Water Quality Standards (Part 4 of Act 451)[55] limits the concentration of microorganisms in surface waters of the state and surface water discharges. Waters of the state which are protected for total body contact recreation must meet limits of 130 *E. coli* per 100 milliliters (mL) water as a 30-day average and 300 *E. coli* per 100 mL water at any time. The limit for waters of the state that are protected for partial body contact recreation is 1000 *E. coli* per 100 mL water during any one sampling event.

Bacteria from human sources can enter waters through either point or nonpoint sources of contamination. Point sources are those that are readily identifiable and typically discharge water through a system of pipes (e.g. an industrial or wastewater discharge). Point source discharges can also include "illicit" connections to storm drainage systems, wherein wastewater that would normally require treatment prior to discharge is instead routed through storm drains without treatment. Nonpoint sources are diffuse, with contamination entering waters through overland runoff or seepage through the soil. Fecal coliform and *E. coli* concentrations in urban storm water frequently exceed water quality standards by a factor of 35 to 75.[56] Failed septic systems in residential or rural areas can contribute bacteria to surface water and groundwater. Other sources include combined sewer overflows, sanitary sewer overflows, illegal connections between sanitary sewers and storm drainage systems, dumping of wastewater, and animal wastes from livestock, pets, wildlife and waterfowl. Domestic dogs and cats were found to be the primary source of fecal coliforms in urban subwatersheds near Puget Sound in Washington State.[57]

Recent bacteriological sampling information for the Frank & Poet Drain, the Blakely Drain, or the Detroit River South subwatersheds was not found. However, given the similarity in land use, it is assumed that these subwatersheds are similar to the adjacent Ecorse Creek Watershed. There, data collected by the Wayne County Health Department, June through August of 2000 and 2001[58] found daily geometric mean *E. coli* concentrations (from throughout the watershed) between 330 and 781 organisms/100 mL. Individual sample values from all sites, on all days sampled, exceeded the 130 per 100 mL water quality standard. Urban storm water inputs and suspected illicit

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[53] Ibid

[54] Gregory, M.B. and E.A. Frick. 2000. Fecal-coliform bacteria concentrations in streams of the Chattahoochee River National Recreation Area, Metropolitan Atlanta, Georgia, May-October 1994 and 1995. U.S. Geological Survey Water Resources Investigation Report 00-4139, August 2000.

[55] http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=

[56] Schueler, T.R. 1999. Microbes and Urban Watersheds II. Concentrations, Sources, and Pathways. Watershed Protection Techniques 3(1): 1-12.

[57] Trial W. et. al. 1993., cited in Schueler, T.R. 1999. Microbes and Urban Watersheds II. Concentrations, Sources, and Pathways. Watershed Protection Techniques 3(1): 1-12.

[58] WCHD (Wayne County Health Department). 2000/2001. Water Quality Results for Natural Bathing/Recreational Areas. E. coli sampling results for Ecorse Creek, June through August, 2000 & 2001 spreadsheets. Wayne County Health Department, Division of Environmental Health

connections between sanitary and storm sewer systems are potential sources for elevated bacteria concentrations. It is anticipated that the CDR Watershed exhibits high bacteria concentrations similar to other urbanized waters in southeast Michigan, including the Ecorse and Rouge Rivers to the north and the Huron River to the south.

3.1.12 Additional Information

3.1.12.1 Additional Water Quality Information for the Frank & Poet Drain Subwatershed

As part of their 2001 biological assessment of the Combined Downriver Watersheds,[59] the MDEQ collected sediment samples at three locations in the Frank & Poet Drain: at Van Horn, Vreeland, and Gibraltar Roads. Analysis was conducted to detect the presence and concentrations of polynuclear aromatic hydrocarbons (PNAs) and select metals.

Analytical results from the Frank & Poet Drain sediment sampling are summarized in Table 3-2. Table 3-2 also presents a summary of stream sediment sample results from unimpacted (reference) stream sites within the Huron-Erie Lake Plain (HELP) ecoregion[60] as well as toxicity threshold concentrations employed by the U.S. EPA and the MDEQ.[61,62] Mean concentrations for individual metals found in Frank & Poet Drain samples are shown in bold print where they exceed the consensus-based threshold effect concentrations (TECs) developed by McDonald et.al. or U.S. EPA Region V screening levels where TECs are not available.

Samples collected at Van Horn and Vreeland Roads exhibited copper, lead, silver (Van Horn Road only), and zinc concentrations in exceedance of U.S. EPA ecological screening thresholds and consensus-based Threshold Effect Concentrations (TECs).. At Gibraltar Road, metals did not exceed screening or threshold effect values, but concentrations of five PNA parameters were found in exceedance of U.S. EPA ecological screening thresholds[63] and consensus-based TECs). TEC values are concentrations *below* which adverse effects are not expected to occur. Probable Effect Concentrations (PECs) are values *above* which adverse effects are expected to occur more often than not. Exceedance of PECs indicates that adverse effects on sediment-dwelling aquatic organisms are likely.[64] No sediment samples exceeded PECs for either metals or PNAs.

Samples with contaminant concentrations between the TEC and PEC values are neither predicted to be toxic nor nontoxic. So, in essence, sediment metals concentrations at Van Horn and Vreeland Roads, and PNA concentrations at Gibraltar Road, are elevated

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59 Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September 2001 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-02/020, January 2002.

60 Gerard, K. and R. Jones. 1999. Reference Site Chemistry Report for Wadable Streams 1994, 1997, and 1998. Michigan Department of Environmental Quality, Surface Water Division Staff Report MI/DEQ/SWQ-99/060, March 1999. http://www.deq.state.mi.us/documents/deq-swq-gleas-sedrefreport.pdf

61 MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39:20-31.

62 U.S. EPA (U.S. Environmental Protection Agency). 2003. U.S. EPA, Region 5, RCRA Ecological Screening Levels. August 22, 2003. http://www.epa.gov/RCRIS-Region-5/ca/ESL.pdf

63 U.S. EPA (U.S. Environmental Protection Agency). 2003. U.S. EPA, Region 5, RCRA Ecological Screening Levels. August 22, 2003. http://www.epa.gov/RCRIS-Region-5/ca/ESL.pdf

64 MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39:20-31.

above regional background levels and are high enough to warrant concern, however, concentrations are not high enough to be judged definitively toxic.

The MDEQ also analyzed water samples during the same biological survey. Water quality samples did not exhibit concentrations in exceedance of Michigan Water Quality Standards (MWQS).

Table 3-3

Comparison of Frank & Poet Drain Sediment Concentrations to Reference Site Values & Sediment Quality Guidelines

Parameters (units)	HELP Reference Site	HELP Reference Site	US EPA, Region V RCRA Ecological Screening	Consensus-Based Threshold Effect Conc (TECs)	Consensus-Based Probable Effect Conc (PEC)			
Metals (mg/Kg)	**Mean Sediment Conc[1]**	**Sediment Conc Ranges[1]**	**Levels for Sediments[2]**	**Sediment Quality Guidelines[3]**	**Sediment Quality Guidelines[3]**	**Frank & Poet at Van Horn**	**Frank & Poet at Vreeland**	**Frank & Poet at Gibraltar**
Total Arsenic	4.8	1.7 – 15	9.79	9.79	33	5.8	6.5	3.4
Total Barium	29	5.0 – 80				68	104	33
Total Cadmium	nd	---	.99	0.99	4.98	K2	K2	K2
Total Chromium	6	2.0 – 11	43.4	43.4	111	27	39	16
Total Copper	5.3	K2.0 – 11	31.6	31.6	149	**39**	**53**	27
Total Lead	8.2	K5.0 – 23	35.8	35.8	128	**76**	**66**	28
Total Manganese	260	47 – 740				454	600	214
Total Mercury	nd	---	0.174	0.18	1.06	K0.1	K0.15	K0.05
Total Selenium	nd	---				K0.5	0.90	0.70
Total Silver	nd	---	0.5			**0.8**	0.5	K0.25
Total Zinc	29	16 – 29	121	121	459	**238**	**304**	105
PNA Analysis (µg/Kg)								
Benzo (a) anthracene			108	108	1,050	NA	NA	**370**
Benzo (a) pyrene			150	150	1,450	NA	NA	53
Benzo (b) fluoranthene			10,400			NA	NA	990
Chrysene			166	166	1,290	NA	NA	**740**
Fluoranthene			423	423	2,230	NA	NA	**1,400**
Phenanthrene			204	204	1,170	NA	NA	**390**
Pyrene			195	195	1,520	NA	NA	**1,400**

[1]Gerard, K. and R. Jones. 1999. Reference Site Chemistry Report for Wadable Streams 1994, 1997, and 1998. Michigan Department of Environmental Quality, Surface Water Division Staff Report MI/DEQ/SWQ-99/060, March 1999. http://www.state.mi.us/documents/deq-swq-gleas-sedrefreport.pdf

[2]US EPA (US Environmental Protection Agency). 203. US EPA, Region 5, RCRA Ecological Screening Levels. August 22, 2003. http://www.epa.gov/RCRIS-Region-5/ca/ESL.pdf

[3]MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology, 39:20-31.

[4]Michigan Department of Environmental Quality Table 1. Soil: Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria and Screening Levels.

Bold Type – Mean Concentration Met or Exceeded US EPA, Region V, RCRA Ecological Screening Criteria or Consensus-Based TEC Values

3.1.12.2 Additional Water Quality Information for the Blakely Drain Subwatershed

The MDEQ collected and analyzed water samples from ten (10) sites on Brownstown, Hale Creek, and the Blakely Drain during their 2001 biological survey. Water quality samples did not exhibit concentrations in exceedance of Michigan Water Quality Standards (MWQS).[65]

3.1.12.3 Additional Water Quality Information for the Detroit River South Subwatershed

The MDEQ collected and analyzed water samples at one site on Monguagon (Huntington) Creek in 2001. Water quality samples did not exhibit concentrations in exceedance of Michigan Water Quality Standards (MWQS).[66]

[65] Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September 2001 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-02/020, January 2002.

[66] Ibid

3.2. FIELD INVENTORY SUMMARY

While previously written reports were reviewed to gain an understanding of the condition of the Combined Downriver Watershed, a supplementary field inventory was conducted in order to gain a more hands-on assessment of the watershed. Field observations were made in October and November 2004 and represent the physical conditions and characteristics of the watershed during that period.

3.2.1 Methodology

A team of planners, engineers, biologists and ecologists surveyed the Combined Downriver Watershed at various locations. Observations were made at stream-road crossing locations throughout the watershed as well as at various reaches of the streams and drains. There are approximately 361 stream-road crossings throughout the watershed.[67] Observations were made at approximately 76 of these stream-road crossings and were selected so that observation points were geographically dispersed across the entire watershed. Map 3-3 shows the locations of road-stream crossings observations. Additional observation points were chosen based on specific priority areas of concern within the watershed identified by the communities in the CDWIC. Once all areas of concern were visited, supplemental locations were selected based on the goal of getting an understanding of the entire watershed.

Survey information for stream-road crossings was collected using the Stream Crossing Watershed Survey Procedure, prepared by the MDEQ[68]. Where possible, the following data was collected at each crossing:

- Background Information
  - Event Conditions
  - Days since rain
  - Water color
  - Waterbody type
  - Stream width
  - Average stream depth
  - Stream flow type
- Substrate of river bottom
- River Morphology
  - Presence of riffles
  - Presence of pools
  - Channel-natural, recovered, or maintained
  - Designated drain status
  - Highest water mark
- Physical Appearance
  - Presence of aquatic plants
  - Presence of floating algae
  - Presence of filamentous algae
  - Presence of bacterial sheen / slimes
  - Presence of turbidity
  - Presence of oil sheen

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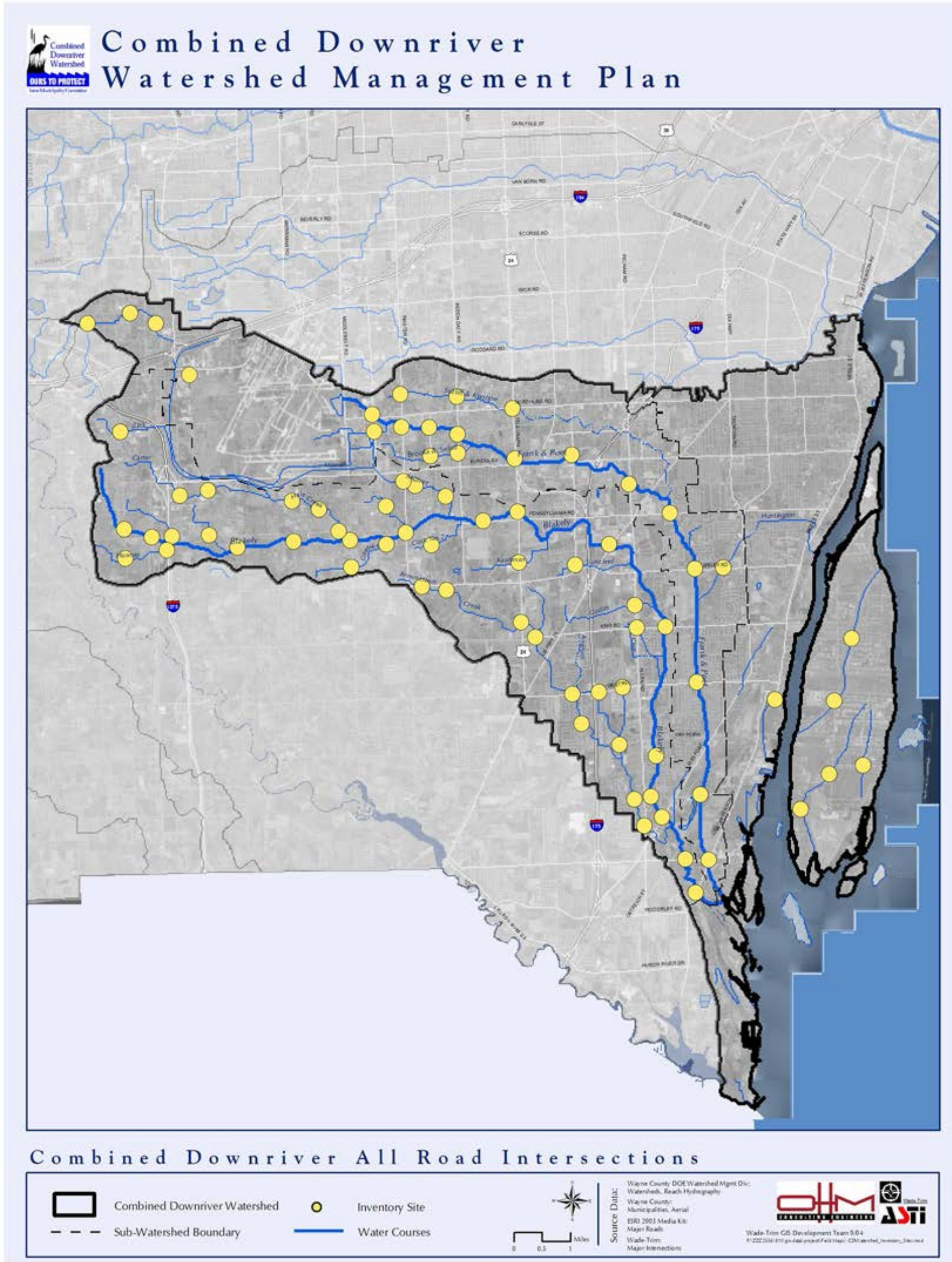
67 Determined by running a script in GIS to identify all points where the roads intersected with the drains.
68 Bauer, C., G. Goudy, S. Hanshue, G. Kohlhepp, M. McMahon, and R. Reznick. 2002. Stream Crossing Watershed Survey Procedure. Michigan Department of Environmental Quality, Surface Water Quality Division. June 26, 2002.

- Presence of foam
  - Presence of trash
- Instream Cover
  - Presence of undercut banks
  - Presence of overhanging vegetation
  - Presence of deep pools
  - Presence of boulders
  - Presence of aquatic plants
  - Presence of logs or woody debris
- Stream Corridor
  - Riparian vegetative width
  - Severity of bank erosion
  - Type of streamside land cover
  - Amount of stream canopy
  - Types of adjacent land uses
- Potential pollutant sources

Similar information was noted at the areas of concern and other supplemental field locations. In addition to the collected information, photographs were taken at each of the sites visited. The following section includes some photographs taken during the inventories. Additional photographs, along with their descriptions, can be found in Appendix B.

Map 3-3


Combined Downriver
Watershed Management Plan
Combined Downriver All Road Intersections
Combined Downriver Watershed
Sub-Watershed Boundary
Inventory Site
Water Courses
Source Data:

3.2.2 Summary of Findings

The CDR Watershed has been divided into three major drainage areas, the Frank & Poet Drain, the Blakely Drain, and areas in the Detroit River South District. Field findings have been summarized and are presented in the following pages by Drainage Area, which include those drains and creeks that are tributary to the two primary water courses.

3.2.2.1 Frank & Poet Drain and Tributaries

Frank & Poet Drain

The approximately 19.2 mile long Frank & Poet Drain flows east along the north side of the watershed before it turns and flows south. The drain was inspected at 13 different points along this length. General characteristics were observed and noted. The water of the Frank & Poet Drain is generally clear, but further downstream becomes more brown and turbid. In addition, sediment deposition was observed throughout the length of the drain. This may be due in part to undercut and exposed banks, which were observed at several of the visited locations. Eroded streambanks are caused by excessive flow rates. In general, the Frank & Poet Drain can be considered “flashy”, as the observed high water mark reached over 5 feet in several locations. This indicates that flow rates in the drain can vary significantly after a storm event. At the majority of visited sites, the dominating adjacent land use is maintained lawns and impervious surfaces. Because of this, excessive stream flow results. In addition, this runoff carries pollutants as it travels across impervious surfaces. Algae was observed at about half of the visited sites and may be a result of the nutrient loading to the stream. There is little chance for pollutants to be filtered from the runoff before it reaches the drain since there was only a very small vegetative buffer observed along the stream. The width of this buffer was often 10 feet or less. Because of this, the amount of canopy over the drain was very limited at most locations. A canopy is important in providing shade to help prevent heating of the stream water. Trash was present at the majority of the visited sites.

Sediment deposition and lack of vegetative buffer along Frank & Poet Drain - Blain & Marian, west of M-85

Tyler Drain

The Tyler Drain is the furthest upstream drain in the Frank & Poet subwatershed. Observations were made at 3 locations along the drain. The drain generally flows through residential areas and the adjacent land uses observed were maintained lawns and impervious surfaces. These maintained lawns and impervious surfaces appeared to encroach, leaving very little vegetative buffer surrounding the drain. Generally the small buffer that is present has some overhanging vegetation or shrubs, but doesn't provide much canopy. The stream generally is not very wide and was less than 10 feet in width at the two sites visited. No erosion was observed at the sites visited and the drain doesn't appear to be flashy based on the high water mark. The drain was dry at the time of the site visits.

Development near the Tyler Drain - Cogswell between Hannan & Ozga in Romulus

Parallel Frank & Poet Drain

What is known as the Parallel Frank & Poet Drain begins in the Detroit Metropolitan Airport and as the name indicates, it flows parallel with the Frank & Poet Drain on the south side of the airport. The drain flows to a retention pond (known as Pond 6) where the basins then discharge into the Frank & Poet Drain. All of the storm water runoff from the airport (except from de-icing) is carried by the Parallel Frank & Poet Drain. At the time of observation, the water was clear. There is no canopy provided due to lack of trees and shrubs on the adjacent land, which consists of grass and impervious surfaces. The drain is 10-25 feet in width.

Parallel Frank & Poet Drain – Starting point in Detroit Metropolitan Airport

Brooks & Seloff

The Brooks & Seloff Drain originates just east of Harrison Road and merges with the Frank & Poet Drain just east of Beech Daly Road. Two sites were visited along the drain. The drain is relatively small and is generally less than 10 feet wide. At both visited sites, the water was clear. The drain does not appear to be flashy based on the observed high water marks but slight erosion was observed at the further downstream site. The vegetative buffer width ranges from 10-15 feet at the two visited sites and overhanging vegetation provides good canopy in most spots. However, parts of the drain are exposed. Land uses adjacent to the Brooks & Seloff Drain include impervious surfaces, maintained lawns and shrub fields. Algae was observed at 1 of the 2 visited locations.

Brooks & Seloff Drain - Mercier & McGuire (just west of Beech Daly between Northline & Eureka) in Taylor

Sutliff & Kenope

The Sutliff & Kenope Drain originates east of Harrison Road and merges with the Frank & Poet Drain east of Allen Road. The majority of the drain is enclosed and only the most upstream stretch of the drain is an open watercourse. The drain was visited at two separate sites upstream of the point of enclosure. At the more upstream site, the drain was less than 10 feet wide but widened to about 35 feet at the more downstream site, which is approximately 1 mile downstream. At both sites, the observed water color was brown. Aquatic plants were abundant in the stream while the streamside land cover was mostly grass. The instream cover of aquatic plants provides a slight canopy. Adjacent land uses include both maintained lawns and impervious surfaces. In addition, large amounts of gravel/sand were being stored very close to the edge of the drain, making it easy for the piles to be washed into the drain by storm water runoff. Trash was observed at both sites.

Piles of sand/gravel in parking lot along Sutliff & Kenope – Beech Daly between Northline and Eureka in Taylor

Huntington

The Huntington Drain originates west of Fort Street and merges with the Frank & Poet Drain south of Sibley Road. One site was visited just upstream of the confluence. At this site, a detention or retention pond is located upstream of the road crossing. Downstream of the road crossing, water was stagnant with an abundance of algae growth. The water observed was brownish-green. Sheen, turbidity, and trash also were noted. There is no canopy over this ponded area. This area of standing water outlets downstream to the drain. The drain at this point has overhanging vegetation that provides a good canopy. However, the vegetative buffer is only 10 feet or less surrounding the drain. Only a slight amount of erosion on the streambanks was observed and the drain doesn't appear to be flashy based on the high water mark observations.

Algal growth just downstream of an impoundment in Huntington Drain – Sibley Road between Fort Street and Allen Road

3.2.2.2 Blakely Drain and its Tributaries

Blakely Drain

The Blakely Drain originates in Romulus and flows east before it turns south and discharges into the Detroit River. The drain is approximately 18.5 miles long. Twenty-three sites were visited in order to get a general idea of the condition of the drain. The width of the Blakely Drain ranges from less than 10 feet upstream to about 50 feet at the most downstream point. Because of the length of the drain, many of the observations differed from site to site. In general the observed water color was brown at the downstream sites and varied from clear to brown at the upstream sites. Turbidity also increased going downstream. The drain appears to be flashy, especially in the middle and downstream portions of the drain. Erosion was slight to moderate throughout with 1 location being ranked as severe. Undercut banks were observed at a couple locations. Compared to the rest of the watershed, the Blakely Drain had a relatively wide vegetative buffer that averages about 20 feet wide. In general, landside cover consisted of trees and shrubs. Overhanging vegetation and woody debris was present at most sites and provided a canopy and habitat for wildlife. Overall, the canopy shades approximately an average of 40% of the drain. Aquatic plants were observed at many of the upstream locations.

Trash was observed at almost every site visited. A sheen was present at 3 sites, located in different sections of the drain. Dead fish were observed in the sheen at one of these locations. Algae was observed at 4 sites, generally located in the upstream and middle portions of the drain. Other general observations include grass clippings in the drain and a commercial lawn service spraying 10 feet from drain's edge.

No vegetative buffer present along the Blakely Drain as it flows through farmland – Merriman Road in Huron Township


Debris and scum buildup in the Blakely Drain - Allen Road north of Sibley in Brownstown Township


Erosion and exposed tree roots along the Blakely Drain - West Road east of Allen Road in Woodhaven

Hosmer

The Hosmer Drain originates in Huron Township and flows east until it joins with the Blakely Drain just east of I-275. The drain was observed at 2 locations. The width of the drain varied from less than 10 feet at the more upstream location to between 10-25 feet further downstream. The drain at the upstream site had been recently dredged at the time of observation. All streambank vegetation had been removed and the water was brown and very turbid. No soil erosion or sediment control measures were visible. Adjacent land uses include maintained lawns and impervious surfaces. At the downstream site, the vegetative buffer was much larger and exceeded 100 feet in width. Overhanging vegetation and aquatic plants were also observed at the site. In addition, both floating and filamentous algae was observed. The water was turbid, possibly as a result of upstream dredging activities. In addition to maintained lawns and impervious surfaces, wetlands and shrubs/fields were adjacent to the stream. It appears that the large vegetative buffer observed downstream is threatened by construction.

Dredging of the Hosmer Drain – Huron River Drive, south of Pennsylvania in Huron Township

Unnamed Tributary to Blakely Drain – Romulus

This tributary begins in Romulus just east of Huron River Drive between Eureka and Pennsylvania Roads and flows into the Blakely Drain just south of Pennsylvania Road. One site along this drain was visited. At the time of the visit, the drain was dry. The high water mark appeared to be less than a foot and therefore the drain does not appear to be flashy. There was slight erosion observed, as parts of the banks were undercut. The vegetative width was less than 10 feet and streamside landcover of trees and shrubs provided a canopy over about 25% of the drain. These trees and shrubs also provided woody debris and overhanging vegetation.

Trees and shrubs along the drain- Unnamed Tributary to Blakely Drain in Romulus

Unnamed Tributary to Blakely Drain – Romulus/Huron Twp

This tributary to the Blakely Drain originates in Romulus and flows south into Huron Township before joining with the Blakely Drain between Wahrman and Vining Roads. Observations of this drain were made at 1 location. At the time of observation there was no flow in the drain. Also, the high water mark observed was relatively low and it doesn't appear that the drain is flashy. An abundance of aquatic plants was present in the drain. A relatively wide vegetative width of 50-100 feet was observed. This was mainly due to adjacent shrub fields. Other adjacent land uses include maintained lawns and impervious surfaces. A canopy was provided by the instream aquatic plants.

Abundant aquatic plants in drain - Unnamed Tributary to Blakely Drain in Romulus

Carter

The Carter Drain originates in Romulus and flows east before its confluence with the Hale Creek just south of the airport. The Hale Creek eventually flows into the Blakely Drain. Two sites were visited along the Carter Drain. The drain was less than 10 feet wide at both of the sites. The water in the drain was clear. Some algae was observed at both sites. Aquatic plants were abundant in the stream and there was only a slight amount of erosion present. Currently, there is open land adjacent to the stream. However, it appears that this buffer is disappearing due to new construction.

The Carter Drain – Wahrman Road between Eureka and Pennsylvania Roads in Romulus

Hale Creek

Hale Creek originates in Romulus and flows in an easterly direction on the south side of the Detroit Metropolitan Airport before joining the Blakely Drain in Huron Township. Three sites were visited along the Hale Creek. In general, the width of the stream varied from less than 10 feet to 15 feet. At the two most upstream sites, the water was clear. However, the water was brown at the most downstream site and turbidity was observed. There was a slight amount of erosion observed at all sites, as undercut banks were noted. There was no sign of flashiness based on the estimated high water mark. Overhanging vegetation and woody debris was present at all sites and provides a canopy over approximately 50% of the creek. The width of the vegetative buffer adjacent to the creek was only 10 feet on either side of the creek at all sites. Maintained lawns and impervious surfaces were the predominant adjacent land uses. However, croplands do lie next to the creek at one of the observed locations. Algae and a sheen/slime were observed at 2 out of the 3 sites.

Limited riparian buffer along Hale Creek, looking downstream at Pennsylvania

Goetske

Goetske Drain starts in Huron Township and flows in a northeasterly direction before joining the Blakely Drain. The Goetske was observed at 2 separate locations. At the downstream site, it appeared that the drain had been recently dredged and grass was beginning to grow again along the streambanks. Frogs and dead fish were observed at this site. Unidentified foam was present that could be a possible illicit discharge. Filamentous algae was observed at both locations. In addition, a sheen was present at the upstream location. In general, adjacent grass was cut up to the streambanks and only a 10 foot wide vegetative buffer was observed. Maintained lawns and impervious surfaces are the adjacent land uses. Based on the high water mark, the drain doesn't appear to be flashy and a slight amount of erosion was observed.

Recent dredging of the Goetske Drain – South of Pennsylvania between Middlebelt and Inkster Roads

Unnamed Tributary to Blakely Drain - Romulus

This tributary to the Blakely Drain originates in Romulus and flows southeast until it merges with the Blakely Drain at Inkster Road. One site was visited along this drain. The width of the drain observed was less than 10 feet. A high water mark of 4 feet indicated that the drain is flashy. Slight to moderate bank erosion and turbidity were observed. Maintained lawns and impervious surfaces were the adjacent land uses at the site. The vegetative width along the stream was less than 20 feet and provided overhanging vegetation and woody debris for shade and habitat. Aquatic plants were present in the drain. An abundance of frogs and dead fish were observed at the site. This may be the result of an illicit discharge from a nearby water main being flushed into the drain or another suspicious substance observed that could also be an illicit discharge. In addition, an unknown sheen and an abundance of trash were observed.

Unnamed tributary to Blakely Drain - Harrison & Sequoia (north of Pennsylvania) in Romulus

Mizner

The Mizner Drain begins in Romulus near Harrison and Eureka and flows southeast until it reaches the Blakely Drain in Taylor. It flows through residential areas as well as open areas. Three sites along this stretch were visited to obtain general observations of the drain. The water was clear at the time of observation at all 3 sites and the stream width was 10 feet or less. Bank erosion was slight to moderate and the observed high water mark indicated that the drain is susceptible to flashy flows. At the sites visited that were in residential areas, maintained lawns and impervious surfaces were adjacent to the stream and no vegetative buffer was present. Further upstream, shrubs and forests surround the drain and overhanging vegetation is more prominent. Woody debris was observed at all of the visited sites. A sheen was observed at the two most upstream sites and algae was observed at the most downstream site. Trash was noted at all sites.

Mizner Drain at Kerstyn – southeast of Eureka and Inkster in Taylor

Clark No. 2

The Clark No. 2 Drain flows northeast from Inkster Road in Brownstown Township until it discharges into the Blakely Drain just north of Pennsylvania in Taylor. One site was visited along this small drain, which was less than 10 feet wide at the point of observation. The site had no apparent erosion and a relatively low high water mark. The instream channel was covered with grass, and little or no vegetative buffer was present. Therefore, very little shade is provided along the drain. Maintained lawns and impervious surfaces are the adjacent land uses. A sheen and algae were present and may be the result of urban runoff.

Lack of vegetative buffer along the Clark No. 2 Drain – Hazel & Nelson in Brownstown Township

Kauffman

The Kauffman Drain begins in Brownstown Township just east of Beech Daly Road and flows east before turning north and discharging into the Blakely Drain between Telegraph and Racho Roads. Two sites were visited along the Kauffman Drain to get a general idea of the condition of the drain. At both sites, the drain was less than 10 feet in width. Bank erosion was rated slight to moderate and undercut banks were observed at both sites. The surrounding land use differed between the two sites. The more downstream site was surrounded by maintained lawns and impervious surfaces while the more upstream site had shrub fields adjacent. In addition, the more upstream site had a 15-40 foot wide vegetative buffer while the more downstream site had no vegetative buffer present. The water at both sites was clear or brownish in color and turbidity was noted. The more upstream site also had aquatic plants, floating algae, and foam present. A scum and debris buildup, with a strong rotting odor, was observed at the more downstream site. Abundant trash was found at both sites.

Silt and debris build-up in the Kauffman Drain – Northwest of Telegraph and Sibley in Brownstown Township

Vancleef

The Vancleef Drain originates in Brownstown Township west of Racho Road and flows east before it merges with the Blakely Drain just west of Allen Road. The drain was observed at 1 location. The width of the drain at this point is less than 10 feet. At the time of observation, the water in the drain was clear. Based on the high water mark, the drain does not appear to be flashy. Only a slight amount of erosion was noted. Instream cover consisted of aquatic plants which provided little canopy over the drain. The vegetative buffer width was approximately 10 feet on either side of the stream. Any open space that was left is being replaced with new construction along this buffer. Maintained lawns and impervious surfaces are the land uses surrounding the drain. Trash was present in the drain.

New construction along the Vancleef Drain – Racho north of Sibley in Brownstown Township

Gudith

The Gudith Drain originates west of Dix Toledo and flows to the east until it joins with the Blakely Drain east of Allen Road. One site was visited along the Gudith Drain in order to get an idea of the general conditions of the drain. The width of the drain was less than 10 feet wide at the point of observation. Based on the high water mark, the drain does not appear to be susceptible to flashy flows. There was evidence of slight erosion and undercut banks. The vegetative width to the right of the drain was less than 10 feet while the left width was between 30 and 100 feet. Streamside land cover consisted mostly of shrubs, which didn't provide much of a canopy. Maintained lawns, impervious surfaces, and a shrub field were adjacent to the drain at the point of observation.

Gudith Drain – Allen Road between Sibley and King Roads

Unnamed Tributary to Blakely Drain – Woodhaven

This drain was enclosed at all of the road-crossing locations that were visited and, therefore, no observations were made.

Brownstown Creek

The Brownstown Creek is one of the larger waterways in the Combined Downriver Watershed. It forms west of Inkster Road in Huron Township and travels southeast until it meets the Blakely Drain in Gibraltar. A total of 9 sites were visited along the creek. In general, the water in the creek was observed to be clear or grayish. At the upstream sites, the width of the creek was generally less than 10 feet but then widens to 10-25 feet further downstream towards its confluence with the Blakely Drain. High water marks (mostly 3-5 feet) indicate that the creek is susceptible to flashy flows. Overall the observed erosion was slight to moderate, with one site noted as severe. Undercut banks also were observed at the furthest downstream sites. Concrete slabs seen lining the channel are also an indication that bank slope stability is a problem in the Brownstown Creek. Turbidity also was observed at almost all of the sites, except the most upstream sites. Aquatic plants provided instream cover at the most upstream sites. The adjacent land uses at all sites included impervious surfaces and maintained lawns. In addition, a couple sites also had shrub fields adjacent. Streamside land cover provided woody debris and overhanging vegetation at many of the sites, but the vegetative buffer width surrounding the creek was generally small and averaged less than 20 feet at the visited sites. A vegetative canopy covered approximately 25% of the creek. Trash was observed at all sites.

Woody debris and overhanging vegetation present in parts of the Brownstown Creek – Gudith Road, just north of West Road in Woodhaven

Steep and reinforced banks with lawns mowed to the banks of the Brownstown Creek – Carter Road, northeast of Dix Highway and West Road in Brownstown Township

Construction along the Brownstown Creek – Allen Road between Vreeland and Gibraltar in Brownstown Township

Combined Downriver Watershed
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Inter-Municipality Committee

Anglum

The Anglum Drain is a tributary to the Brownstown Creek. It originates at King Road and flows south until it meets with the Clee Drain and eventually joins with the Brownstown Creek near Van Horn Road. The Anglum Drain appears to be enclosed for much of its length. One site of the open drainage course was visited. The water color at this site varied from upstream to downstream of the road crossing and was gray and green. The width of the drain was less than 10 feet. The flow at the time of observation was high and the water level was deeper than 3 feet. The high water mark was 1-3 feet higher than the observed water level, indicating that the stream flow may be flashy. Parts of the streambanks were also concreted, indicating that erosion and streambank instability may be a problem in this drain. Turbidity was also observed. The vegetative buffer width was less than 10 feet on either side of the stream and very little canopy was provided by the grassy streamside land cover. Maintained lawns and impervious surfaces were the adjacent land uses. Aquatic plants were present in the stream. In addition, floating algae, foam and trash were also present.

Lack of vegetative buffer along the Anglum Drain – West Road and I-75 in Woodhaven

Clee

The Clee Drain is also a tributary to the Brownstown Creek. It forms near King Road between I-75 and Allen Road and flows south until it joins with the Anglum Drain and meets the Brownstown Creek south of Van Horn Road. One site was visited along this drain. The same site was visited during both wet and dry weather conditions and the observations made differed between visits. In dry weather, the water in the drain was clear while it was brown/gray and highly turbid during wet conditions. A slight amount of erosion was observed. During dry conditions, an abundance of minnows and aquatic insects were observed. In addition scum and sheen was present during wet weather that was not observed during dry weather. At the visited location, the drain has less than a 10-foot vegetative buffer width that provides very little canopy. Maintained lawns and impervious surfaces are adjacent to the drain.

The Clee Drain. Inset-turbidity and scum in the Clee Drain following a rain event – Van Horn between I-75 and Allen Road

3.2.2.3. Detroit River South

Thoroughfare Canal

The northern waterway on Grosse Ile, referred to as the Thoroughfare Canal, starts at the Detroit River on the north side of the island and discharges into the Trenton Channel on the west side of the island. Observations were made at three separate locations along the drain. In general, the drain is relatively wide ranging from 35-50 feet at the observed locations. The water in the canal was observed to be murky greenish-gray in color. The banks of parts of the canal have been modified with a retaining wall and features boats and docks. In these areas, the grass is cut up to the streambanks, leaving no vegetative buffer or canopy. Other parts of the canal, however, are more natural and contain overhanging vegetation and woody debris, and aquatic plants. The width of this vegetation is generally small (10 feet or less) but did widen to 50-100 feet at one location. Erosion in the canal was only slight.

Retaining walls and boat docks in the Thoroughfare Canal - Horsemill Road near Meridian in Grosse Ile

Frenchman Creek

The Frenchman Creek originates towards the center of Grosse Ile and flows south where it outlets into the Detroit River. The creek was observed at three separate locations. The creek was less than 10 feet wide at all the observed locations and was dry at the time of observations. In general, the creek had good streamside cover that provided an adequate canopy as well as overhanging vegetation and woody debris. The width of the vegetative buffer varied from site to site from virtually no buffer to a 50-100 foot buffer. Adjacent land uses include wetlands, forest, maintained lawns, and impervious surfaces. No erosion was observed in the creek and there was no indication of flashiness.

Frenchman Creek - Bellevue & Eight Street in Grosse Ile

Unnamed - Grosse Ile East

This unnamed drain begins just east of the origin of the Frenchman Creek and flows south. One site visit was made along this drain. At the time of observation, there was no water in the drain and the drain appeared to be about 5 feet wide. Streamside cover of trees and shrubs provided a good canopy, overhanging vegetation, and woody debris. However, the width of this vegetation was small and averaged about 15 feet. Erosion was slight to none. Maintained lawns and impervious surfaces surrounded the drain.

Unnamed Drain - Manchester Street in Grosse Ile

Unnamed Drain – Elizabeth Park

Elizabeth Park is located along the Trenton Channel in the City of Trenton. An unnamed waterway flows through the park and originates from the Trenton Channel on the north side of the park and flows south before discharging into the Trenton Channel further south of the park. One site along the waterway was visited. The width of the waterway was between 25-50 feet. The water was clear with a greenish tint. Maintained lawns abut the waterway at the location of observation. Scattered trees and shrubs constitute the streamside land cover but is not enough to provide an adequate vegetative buffer or canopy. However, overhanging vegetation and woody debris was observed and appeared to provide shelter for ducks that were in the waterway. Filamentous algae and trash were also observed at the site.

Unnamed waterway - Elizabeth Park, off Jefferson south of West Rd in Trenton

3.2.2.4. Areas of Concern

Frank & Poet

Observations also were made at locations that were reported as "areas of concern" by the Combined Downriver Watershed communities. As described previously, the Frank & Poet Drain has an inadequate vegetative buffer along much of its length. The drain crossing at Allen Road north of Pennsylvania (shown below) is typical of this condition. This site exhibits highly exposed streambanks and tree roots with maintained lawns extending to the edge of the bank. In addition at this particular site (west of the Allen Road), the land adjacent to the drain appears to be used for dogs to roam.

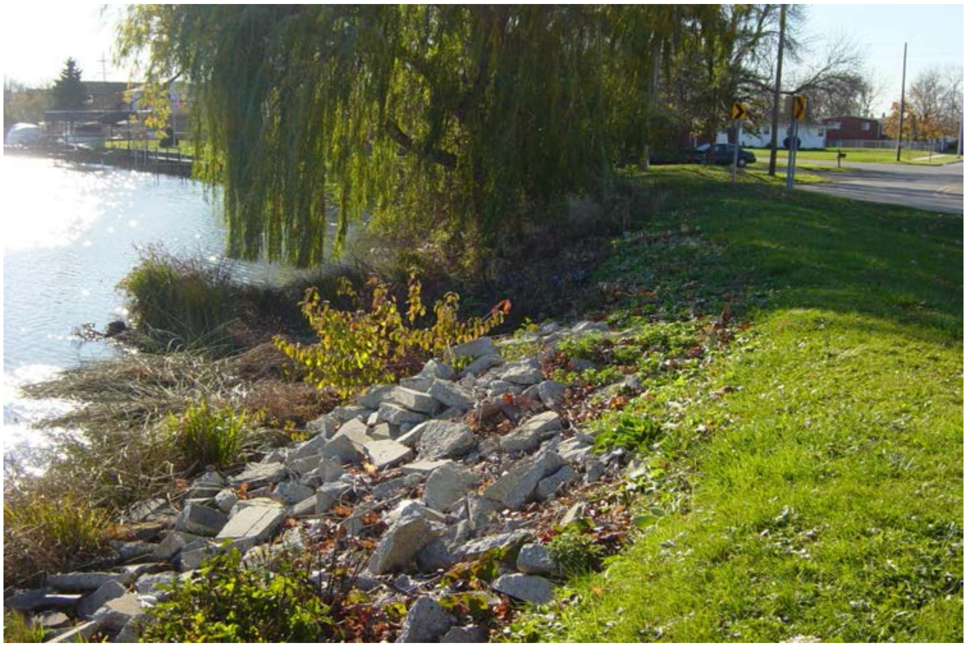
Bank Erosion and lack of vegetative buffer along Frank & Poet Drain – Allen Road (west side) north of Pennsylvania

Sediment deposition also was observed throughout the Frank & Poet Drain. In some instances, as seen between Vreeland and Gibraltar Roads, sediment and debris deposition has caused blockages in the drain. This blockage has potential to contribute to flooding upstream. Immediately upstream of the blockage, the effects can be seen, as the drain is slightly wider in this area.

Debris and sediment deposition along Frank & Poet Drain – under railroad spur between Vreeland and Gibraltar Roads

Unnamed Channel – City of Gibraltar

The City of Gibraltar identified an area of concern due to erosion, located near South Gibraltar and Navarre Roads. A seawall lines most of the waterway but erosion is evident at a break in the seawall. Part of a streamside tree had already fallen into the waterway and the integrity of the remaining tree was threatened by erosion. It appeared that broken concrete was placed on the streambank for stabilization. In addition, part of an outfall pipe had broken off into the river. It was not known if the broken pipe was a result of the erosion. The Army Corps of Engineers has proposed an emergency shoreline-protection project at this site and suggests using riprap stone for protection.[69]



Unnamed waterway - South Gibraltar & Navarre Roads in Gibraltar

[69] "Army Corps Proposes Shore-Protection Projects", News Herald, May 26, 2004.

The Army Corps of Engineers also has proposed an emergency shore-protection project at the Horse Island Bridge and suggests using riprap stone protection to help extend the life of the bridge and its immediate area.[70]

Horse Island Bridge – City of Gibraltar

[70] "Army Corps Proposes Shore-Protection Projects", News Herald, May 26, 2004.

4. Challenges and Goals

Blakely Drain at Merriman

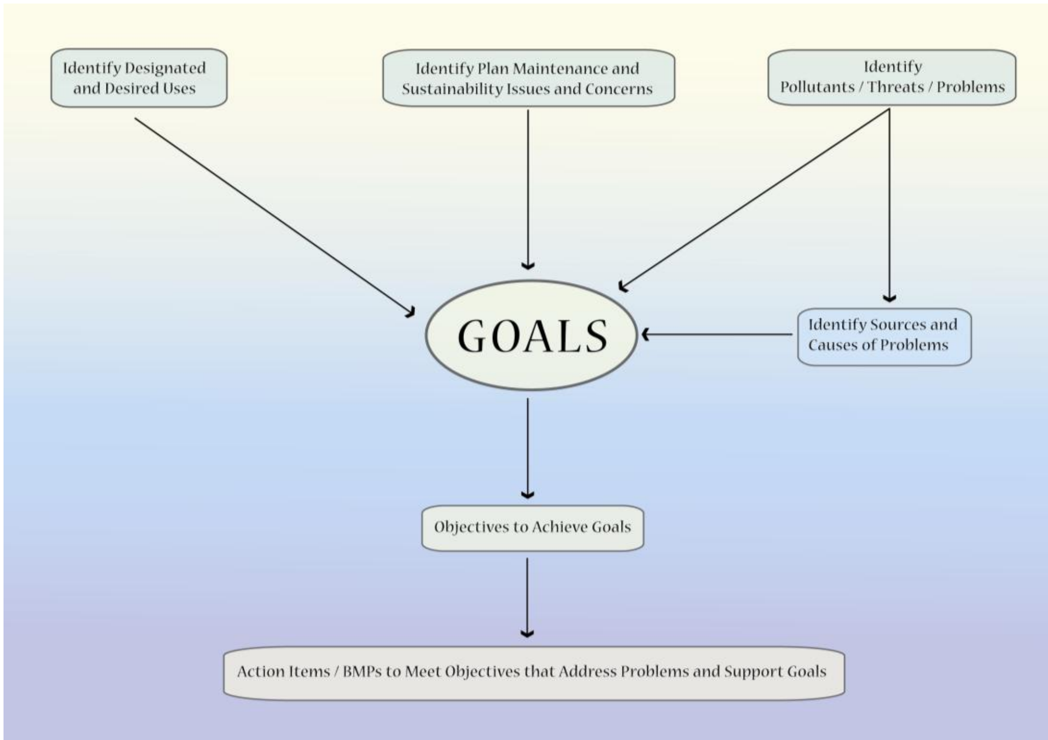
Chapter Contents

Designated Uses
Desired Uses
Pollutants and Threats
    Pollutants
    Sources and Causes
Goals and Objectives

Through the review of existing data and supplemental field inventory results, the watershed committee developed an understanding of the characteristics and condition of the watershed. With this understanding and knowledge, the CDWIC reviewed and developed designated and desired uses for the watershed. After identifying the applicable designated and desired uses for the watershed, the known and suspected causes of impairment and/or threats to these uses were identified. The CDWIC then developed goals and objectives for the watershed that are based on restoring and protecting the designated and desired uses and address the priority pollutants, sources, and causes.

Figure 4-1 shows the steps involved in developing goals and gives a preview of the next steps.

Figure 4-1. Goals Development Diagram



4.1 DESIGNATED USES IN THE COMBINED DOWNRIVER WATERSHED

Per the Michigan Department of Environmental Quality, water quality is primarily measured by whether the water body meets the designated uses as defined by the State of Michigan. In Michigan, the goal is to have all waters of the state meet the designated uses that apply to that body of water.

Designated uses are recognized uses of water established by state and federal water quality programs.

All surface waters of the State of Michigan are designated for and shall be protected for all of the following uses. Those that apply to the Combined Downriver (CDR) Watershed are in boldface:

1. **Agriculture**
2. **Industrial water supply**
3. Public water supply
4. **Navigation**
5. **Warmwater fishery**
6. **Other indigenous aquatic life and wildlife**
7. **Partial body contact recreation**
8. **Total body contact recreation between May 1 and October 31**
9. Coldwater fishery

The following definitions[1] apply:

1. Agriculture - a use of water for agricultural purposes, including livestock watering, irrigation, and crop spraying.
2. Industrial water supply - a water source intended for use in commercial or industrial applications or for noncontact food processing.
3. Public water supply - a surface raw water source that, after conventional treatment, provides a source of safe water for various uses, including human consumption, food processing, cooking, and as a liquid ingredient in foods and beverages.
4. Navigation – a water source suitable for navigation
5. Warmwater fishery - a waterbody that contains fish species which thrive in relatively warm water.
6. Other indigenous aquatic life and wildlife - the use of the surface waters of the state by fish, other aquatic life, and wildlife for any life history stage or activity and the protection of fish for human consumption.
7. Partial body contact recreation - any activities normally involving direct contact of some part of the body with water, but not normally involving immersion of the head or ingesting water, including fishing, wading, hunting, and dry boating.
8. Total body contact recreation between May 1 and October 31 - any activities normally involving direct contact with water to the point of complete submergence, particularly immersion of the head, with considerable risk of ingesting water, including swimming.
9. Coldwater fishery - waterbodies that contain fish species which thrive in relatively cold water.

[1]Administrative Rules Part 4 Water Quality Standards, MDEQ http://www.deq.state.mi.us/documents/ deq-swq-part31-part4.doc

Public water supply is not applicable since communities in the Combined Downriver Watershed do not use local surface water as a source for drinking water. Coldwater fishery is not applicable in the Combined Downriver Watershed and streams within the watershed are not designated as a Michigan trout streams (Designated Trout Streams of Michigan-FO 210). Throughout most of the watershed, waterways are used for navigation and the State considers this use "Fully Supporting". Navigation is not considered impacted in the watershed; however, sedimentation can limit waterway capacity.

State and local monitoring of the condition of the watershed have determined that some uses are potentially impacted or impaired. Impaired uses are those uses that are not being met, while potentially impacted uses are those that currently meet water quality standards, but might not in the future. Table 4-1 summarizes the designated uses as impaired, potentially impacted, or not applicable. Indigenous aquatic life and wildlife is impaired within the watershed, while warmwater fishery, partial body contact recreation and total body contact recreation uses are potentially impacted.

The Watershed is also listed on the Michigan 303(d) list (non-attainment list) for poor macroinvertebrate community (Blakely Drain, Frank & Poet Drain and Brownstown Creek). These are addressed in the 2007 TMDLs. Therefore, other Indigenous Aquatic Life and Wildlife are listed as impaired. Full and Partial Body Contact are listed as potentially impacted in these subwatersheds. The 2008 TMDL for the Detroit River states that the watershed is not meeting designated uses for partial and full body contact as required. Although there is no direct data available for the rest of the Combined Downriver Watershed that indicates pathogens exceed water quality standards, the similarities between the Combined Downriver Watershed and the adjacent Ecorse Creek Watershed where pathogen data is available lead to the expectation that, at a minimum, both of these uses are potentially impacted in the CDR Watershed. The warmwater fishery use is potentially impacted due to flashy hydrology, lack of habitat, high suspended solids and sediment deposition. Flashy hydrology and sediment loads potentially impact agriculture and industrial water uses as well.

Table 4-1 Designated Uses

Priority	Designated Use	State Status	Local Status	Notes
1	Partial Body Contact Recreation	Not Supporting		* A TMDL for e. coli exists for the Detroit River. *There is no available data for the Frank and Poet, Brownstown and Blakely, however, data from adjacent watersheds indicates this use may be potentially impacted.
2	Other Indigenous Aquatic Life and Wildlife	Not Supporting		Biota TMDL (Frank and Poet, Brownstown Creek, and Blakely Drain)
3	Warmwater Fishery	Not Assessed	Potentially Impacted	Recommend a fishery assessment be completed.
4	Total Body Contact Recreation (between May and Oct)	Not Supporting	*	* A TMDL for e. coli exists for the Detroit River. *There is no available data for the Frank and Poet, Brownstown and Blakely, however, data from adjacent watersheds indicates this use may be impacted.
5	Agriculture	Fully Supporting		
6	Industrial Water Supply	Fully Supporting		
7	Navigation	Fully Supporting	Potentially Impacted	Detroit River and nearby canals are navigable, although sedimentation is an issue in areas
8	Public Water Supply at Point of Intake	Not Applicable		
9	Coldwater Fishery	Not Assessed		

**Note, Recreational Uses are impaired in the Detroit River subwatershed and endangered in the remainder of the Combined Downriver Watershed.*

4.2 DESIRED USES IN THE COMBINED DOWNRIVER WATERSHED

Desired uses are how communities may want to use the watershed or want it to look. The CDWIC members identified desired uses of the watershed based on factors important to the watershed community. Desired uses include restoring and/or protecting all of the applicable designated uses. The desired uses presented below are in addition to the designated uses, and may include current or potential natural resource concerns, such as loss of farmland and open space, or preserving unique habitat for wildlife. Many desired uses may not have a direct impact on water quality, but are still included in the watershed planning process.

A **desired use is** how you might want to use your watershed or how you might want it to look.

CDWIC members were asked to complete a survey identifying their community's desired uses of the watershed. These survey results were then compiled into a preliminary list and categorized as either Fully Met, Partially Met, and Not Met.. Uses were determined to be impaired or potentially impacted based on studies previously published by the Michigan Departments of Natural Resources and Environmental Quality or other agencies[2,3,4,5,6] and upon measurements and observations made by ASTI, OHM, and/or Wade-Trim during their 2004 field investigations. Where no information was available, desired use was categorized as unknown. Once compiled, the desired uses were brought before the CDWIC members for discussion, finalization, and prioritization. Table 4-2 summarizes the desired uses identified and lists them in order of priority.

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[2] Goodwin, K. 2002. Biological Assessment of the Detroit River Tributaries, Including the Ecorse River, Frank and Poet Drain, and Brownstown Creek Watersheds, Wayne County, Michigan. July-September 2001 Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-02/020, January 2002.

[3] Jones, R. 1991. A Biological Survey of County Drains in the Vicinity of Detroit Metropolitan Airport, Wayne County, Michigan, July 12-13, 1990. Michigan Department of Natural Resources, MDEQ Report #MI/DNR/SWQ-91/059.

[4] Jones, R.J. 1992. A Biological Survey of Frank and Poet Drain, Wayne County, Michigan, August 13-14, 1991. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DNR/SWQ-92/205, March 1992.

[5] Mulcrone, M. 1995. Frank and Poet Drain Diurnal Dissolved Oxygen Study March 1995. Michigan Department of Environmental Quality, Surface Water Quality Division Staff Report MI/DEQ/SWQ-95/076, March 1992.

[6] WCDOE (Wayne County Department of Environment). 2000/2001. Water Quality Results for Natural Bathing/Recreational Areas. *E. coli* sampling results for Ecorse Creek, June through August 2000 & 2001 spreadsheets. Wayne County Department of Environment, Division of Environmental Health.

Table 4-2 Locally Desired Uses

Priority	Desired Use	Not Met	Partially Met	Unknown
1	Flood Control	●	●	
2	Natural Features		●	
3	Native Vegetation/Unique Habitat/Natural Buffers		●	
4	Recreational Areas	●	●*	
5	Open Space		●	
6	Greenways		●	
7	Wetlands		●	
8	Agricultural Land		●	
9	Well Water Supply			●

**Note, Recreational Areas are not met in the Detroit River subwatershed and partially met in the remainder of the Combined Downriver Watershed.*

Flood Control

Flooding is a concern of the communities in the watershed. There is limited hydraulic capacity within the drains, and flooding occurs when large rain events (and sometimes snow melts) occur. This use was listed as both impaired and potentially impacted because only certain areas of the watershed are prone to flooding (see Chapter 2). All other areas are considered potentially impacted relative to flooding.

Natural Features Preservation

Natural features such as riparian corridors, streams, lakes, wetlands, soils and vegetation are extremely important to the hydrologic cycle. Changes to natural features disrupt the hydrologic cycle that naturally exists. These changes cause adverse impacts, including increased storm water runoff rates and volumes, increased pollution (less filtration by vegetation), habitat destruction, and reduction in infiltration. Natural features can be preserved through careful planning.

Native Vegetation/Unique Habitat/Natural Buffers

Providing unique habitats can improve stream health, and invite wildlife not normally seen in an urban environment. Natural buffers allow for storm water infiltration as well as enhanced pollution removal by vegetation from storm water runoff. Natural buffers also slow down storm water runoff velocities, which is important in preventing stream bank erosion.

Native vegetation and naturalization of urban areas help to prevent pollution from reaching the streams. Native vegetation generally has deeper root systems than non-native species, which allows for greater filtration of pollutants and enhances the amount of storm water that is infiltrated. Native vegetation is beneficial both at the stream corridor and throughout the watershed. Native plants also can improve the aesthetic quality. Invasive species can quickly establish themselves replacing native plants. Environmental and economic problems caused by the dense growth of invasive species include the impairment of water-based recreation and navigation, and the degradation of water quality and fish and wildlife habitat.

Recreational Areas

Currently, there are limited recreation areas in the watershed. The CDWIC would like to see parks and trails along the stream corridor for recreational uses, as well as to maintain property values. There is potential opportunity for recreation on some of the streams as well, through activities like kayaking and fishing. Bringing people closer to the streams will also raise the level of awareness and concern for watershed issues.

Open Space Preservation

Currently, approximately 41% of the watershed consists of open space and/or active agricultural areas. However, based on SEMCOG Future Land Use projections, by 2030 it is predicted there will be only 5% open space left. Open space is important for a variety of reasons, including habitat, increased potential for storm water infiltration, pollution prevention, aesthetics, and recreational opportunities. Impervious development is one of the greatest threats to the watershed. Preserving existing open space could be a critical factor in the health of the watershed in the future.

Greenway Preservation

Greenways can be described as connections between people and places to protect and enhance natural resources while providing opportunities for non-motorized recreation and a greater quality of life. Greenways protect open space that is vital to the health of the watershed and also provide habitat corridors for wildlife. Greenways often involve cooperative agreements among neighboring communities, which could lead to a better working relationship among communities within the watershed. Greenways can enhance property values

The Downriver Linked Greenways Initiative is already underway to connect the Downriver communities through a network of trails and greenways. Implementing and expanding this initiative in the Combined Downriver Watershed is desired by the CDWIC.

Wetland Preservation

Wetlands provide habitat for wildlife, absorption of pollutants, and flood control. As communities develop, wetland areas generally are removed or reduced. Mitigated wetlands often fail. The increase of urban runoff often overburdens remaining wetlands and greatly degrades the quality of the wetland. Preserving wetlands will help to maintain the existing benefits wetlands provide, such as enhancing water quality by filtering pollutants and flood control. The MDEQ has developed a Landscape Level Wetland Functional Assessment for the Alliance of Downriver Watersheds. This GIS based tool should be referenced in order to ensure protection and preservation of remaining wetland areas.

Agricultural Land

Development pressure in the CDR communities is intensifying and areas are becoming increasingly vulnerable to conversion from agricultural and natural landscapes to residential and/or commercial land uses. The CDWIC desires to preserve current agricultural uses in the watershed. Agricultural lands provide open spaces and can conserve riparian areas, wetlands, and wildlife habitat.

Well Water Supply

There are residents within the Combined Downriver Watershed whose water supply is from groundwater. Because groundwater and surface water are hydraulically connected, the CDWIC is concerned with how storm water and surface waters may impact the quality of groundwater that will be used for public use.

4.3 POLLUTANTS AND THREATS TO WATERSHED HEALTH, AND THEIR SOURCES AND CAUSES

After identifying the applicable designated and the desired uses for the watershed, the known and suspected causes of impairment and/or threats to these uses were identified.

4.3.1. Pollutants

Pollutants are defined as any substance of such character in such quantities that when it reaches a body of water, soil, or air, it contributes to the degradation or impairment of their usefulness or renders them offensive. Pollutants not only include the traditional types of pollutants - like sediment and nutrients – but also include such things as increased temperature and increased hydrologic flow[7]. Pollutants/issues were identified for each impaired or potentially impacted use. At a regular CDWIC meeting, the committee discussed and prioritized the pollutants for each use. Table 4-3 summarizes the designated and desired uses (both State and local) that are impaired or potentially impacted in the Combined Downriver Watershed, and the associated pollutants/issues that are known (k)or suspected (s).

Table 4-3 Combined Downriver Watershed Uses and Pollutants/Issues

Impaired Uses	**Known and Suspected Pollutants/Issues** (in order of priority for each use)
Other indigenous aquatic life/wildlife	Lack of stable flow (K) Sedimentation (K) Lack of habitat (K) Low dissolved oxygen (K) Nutrients (S)
Total and Partial Body Contact Recreation (Detroit River) (State)	E. coli and other pathogens (K) Lack of stable flow (K)
Potentially Impacted Uses	**Known and Suspected Pollutants/Issues** (in order of priority for each use)
Total and Partial Body Contact Recreation (State)	E. coli and other pathogens (K) Lack of stable flow (K)
Open space preservation Natural features preservation Wetland preservation Greenway preservation Agricultural land Native Vegetation/Unique habitat/Natural buffers	Inadequate protective measures (K)
Warm Water Fishery	Lack of stable flow (K) Sedimentation (K) Lack of habitat (K) Low dissolved oxygen (K) Nutrients (S)
Flood Control (local)	Lack of stable flow/ excessive surface runoff (K) Sedimentation (K) Inadequate protective measures (K)

Note: K refers to known pollutants and S refers to suspected pollutants

[7] Developing a Watershed Management Plan for Water Quality, MDEQ

4.3.1.1. Known and Suspected Pollutants

The urbanizing landscape of the Combined Downriver Watershed provides many challenges to improving the health of the waterways and watershed. The following is a list of known pollutants and causes of the problems within the Watershed.

Lack of stable flow

Natural base flow (dry weather base flow) in streams is fed mostly by groundwater. After a storm event, rainwater should infiltrate to the groundwater table, which in turn provides constant flow to the streams. Once urbanization occurs, "urban runoff" results as rainwater infiltration is impeded by impervious surfaces. Urban runoff is able to quickly travel to streams, resulting in higher (flashy) peak flows after storm events. In addition, the lack of infiltration results in lower groundwater recharge, with resulting lower stream base flows during dry weather as less groundwater is available to provide a constant source of flow. Higher peak flows after a rain event or snow melt can cause stream bank erosion and flooding while lower dry weather flows make it difficult for some aquatic species to survive.

Excessive surface runoff

As described above, the large increase in impervious surface and loss of open space or "green" space within the watershed has greatly reduced the amount of rainwater that is able to infiltrate to the groundwater table. Instead, this water becomes surface runoff and quickly travels to the stream. This results in both higher peak flows and a greater volume of runoff. Excessive surface runoff can cause stream bank erosion, flooding, and an increase in pollutants to the stream.

Sediment

Excessive peak flows can result in stream bank erosion, which in turn results in suspended solids and sediment deposition. Sediment in streams may also be a result of sediment being carried to the stream via urban runoff. As storm water travels across impervious surfaces, it is able to carry pollutants, including sediment. In addition, disturbed soils near impervious surfaces due to activities such as construction can contribute to the problem.

Suspended solids can result in turbidity, which is harmful to aquatic life. Waters can become warmer as suspended solids absorb heat from sunlight. Less dissolved oxygen can be retained by the warmer waters, which causes oxygen levels to fall. Photosynthesis decreases because less light penetrates the water. Since photosynthesis produces oxygen as a byproduct, this sediment induced drop in photosynthesis also can contribute to lower oxygen levels. Sediment also can clog the gills of fish. The sediment also can settle and deposit in areas necessary for aquatic insects and fish spawning.

Sediment deposition also changes the natural shape of the channel and can reduce the hydraulic capacity of the stream. This can contribute to flooding problems.

Lack of habitat

A lack of habitat results in a poor diversity of aquatic species. Poor habitat can be caused by sediment as it is deposited on substrate necessary for aquatic insects. The absence or downsizing of riparian buffer zones is the biggest cause of lack of habitat. Riparian buffer zones provide shade necessary for preventing heating of stream water. Riparian vegetation also results in woody debris that creates protection for aquatic life. In addition, urban runoff results in a loss of the pool and riffle structure normally found in natural streams. Pools are areas of relatively deep, slow moving water and are important in providing deeper areas for aquatic species. Riffles are relatively shallow areas of fast moving water and are important for aerating the water. A lack of stable hydrology also plays a major role in the degradation of habitat.

Low dissolved oxygen
Sufficient dissolved oxygen levels are necessary for the survival of aquatic species. As the levels of dissolved oxygen decrease, the diversity of aquatic life also decreases, as sensitive species are no longer able to survive. Oxygen in the water is used as microorganisms break down organic and/or chemical pollutants (biological oxygen demand) and/or through chemical oxidation (chemical oxygen demand), resulting in less oxygen available for aquatic life. These biological pollutants typically include natural sources (leaf debris, grass, animal wastes) and algae blooms. As noted above, excess suspended solids can absorb heat from sunlight and reduce photosynthesis, which also causes oxygen levels to decrease. Urban runoff, which may become heated as it travels across impervious surfaces, also may contribute to thermal pollution (warming) of the streams, resulting in decreased dissolved oxygen levels.

Nutrients
Nutrients are considered a suspected pollutant because it is highly likely that nutrients are discharged to receiving waters based on similar watersheds. However, the severity of nutrients as a pollutant is unknown as there is insufficient data to prove or disprove that nutrients are problematic in the Combined Downriver Watershed. Nutrients can come from several sources within the watershed. Excess fertilizer runoff, animal wastes, failing septic systems, and even permitted discharges can contribute to excessive nutrients in the streams. Fertilizer used by residents, businesses, and agriculture can be carried to the streams by storm water runoff, both in terms of soluble nutrients and attached to sediment (as suspended solids) in the runoff. Animal wastes also contribute to nutrient loading. Excessive geese populations along impoundments that are mowed to the banks can contribute significant loadings. Septic systems that are not maintained or inspected regularly and properly can result in the migration of human wastes that contains nutrients. Permitted discharges, such as those discharges from domestic and/or industrial wastewater treatment plants, can also be a source for nutrients. High nutrient levels, especially phosphorous, result in excessive growth of aquatic plants (often nuisance plants) and algae. Nuisance plants are able to out compete plants that may be more valuable for habitat. Excessive plant and algae growth also results in lower dissolved oxygen levels when they die and are degraded, which adversely affect aquatic life.

Inadequate Protective Measures
Development and land-use projections indicate that the majority of open space in the CDR watershed will be lost to development. Protection by local regulations can help reduce the amount of open space, natural features, wetlands, greenways, agricultural land, and natural stream buffers that is lost to development.

4.3.1.2. Suspected Pollutants

Because of a lack of available data, E. coli and other pathogens are considered suspected pollutants in the Watershed.

E. coli, other pathogens

E. coli contamination can harm wildlife as well as impair the use of the creeks for total and partial body contact uses. Sources of E. coli can include urban storm water, illicit connections, human waste from failing septic systems, and animal wastes. Urban storm water can collect pathogens from sources such as animal waste as it travels across impervious surfaces. Failing septic systems can leach contaminated water that may find its way to streams, contributing E. coli and other pathogens. Illicit connections in which sanitary sewers carrying human waste are improperly discharged to the storm water system can also be a source for E. coli and pathogen contamination.

4.3.2. Sources and Causes of Pollutants

In order to determine how best to reduce the identified pollutants, the sources contributing those pollutants must be identified. Sources are simply where the pollutants originate. The next step was to identify possible causes for the source of pollutants. The cause is the condition that is creating the source of the pollutant. For example, if sediment (pollutant) is resulting from stream bank erosion (source), the cause of the stream bank erosion may be unrestricted livestock access[8].

> **Sources** are where the pollutants originate.
>
> **Causes** are the conditions that are creating the source of the pollutant.

Sources were determined using a variety of methods including a literature review, field observations, and input from the CDWIC. Sources were prioritized for each pollutant and causes were prioritized for each source. The committee discussed and prioritized sources and causes at a regular CDWIC meeting based on committee's experience and knowledge of the watershed.

Table 4-4 summarizes the sources and causes of the pollution and issues in the watershed. The table provides more specific information to help explain the factors that face the communities in the watershed. Due to the limited specific supporting data (monitoring results, etc) for the CDR, the sources and causes have been categorized as known or suspected through engineering judgment based on information from similar adjacent watersheds (Ecorse Creek and/or Lower Huron River Watersheds)

[8] Ibid

Table 4-4 Combined Downriver Watershed Pollutants/Issues, Sources and Causes

Known and Suspected Pollutants/ Issues	**Known and Suspected Sources** (in order of priority for each pollutant)	**Known and Suspected Causes** (in order of priority for each source)	**Affected Designated and Desired Use(s)**
Lack of stable flow/excessive surface runoff (K)	Urban storm water (K)	Impervious surfaces (K) Development pre-dating storm water mgt requirements (K) Loss of wetlands (K) Inadequate storm water mgt (K) Loss of floodplain (K)	Flood Control Warm Water Fishery Other Indigenous Aquatic Life/ Wildlife
	Reduced base flow/ groundwater recharge (K)	Impervious surfaces (K) Development pre-dating storm water mgt requirements (K) Loss of wetlands (K) Inadequate storm water mgt (K) Loss of floodplain (K)	
Lack of habitat (K)	Sedimentation (K) Erosion (K)	Unstable hydrology/excessive runoff (K) Removal of streambank vegetation (K) Inadequate erosion/ sedimentation controls (K)	Warm Water Fishery Other Indigenous Aquatic Life/ Wildlife Native Vegetation/ Unique Habitat/ Natural Buffers
	Reduced base flow/ groundwater recharge (K)	Impervious surfaces (K) Development pre-dating storm water mgt requirements (K) Loss of wetlands (K) Inadequate storm water mgt (K) Loss of floodplain (K)	
	Limited woody debris (K)	Removal of forested riparian buffer (K) Inadequate protective ordinances (S)	
Low dissolved oxygen (K)	Natural sources (leaves, grass, animal wastes) (S)	Inadequate storm water mgt (K)	Warm Water Fishery Other Indigenous Aquatic Life/ Wildlife Native Vegetation/ Unique Habitat/ Natural Buffers
	Sediment oxygen demand (S)	Unstable hydrology/excessive runoff (K) Removal of streambank vegetation (K) Inadequate erosion/ sedimentation controls (K)	
	Elevated water temperature (K)	Impervious surfaces (K) Limited riparian cover (K) Detention basins (S)	

Table 4-4 continued

Known and Suspected Pollutants/ Issues	Known and Suspected Sources (in order of priority for each pollutant)	Known and Suspected Causes (in order of priority for each source)	Affected Designated and Desired Use(s)
Nutrients (S)	Fertilizer use (S)	Improper usage of fertilizers (S)	Other Indigenous Aquatic Life/ Wildlife
	Illicit connections (K)	Aging development sanitary sewer infrastructure (K) Insufficient sanitary sewer infrastructure maintenance (S)	
	Animal waste (S)	Improper mgt of animal waste (S) Excessive geese, improper mgt (S)	
	Permitted discharges (current NPDES permits) (K)	---	
	Failing septic systems (S)	Insufficient septic system maintenance (S) Poor soils (K) Cost to correct (S) Inadequate ordinance enforcement (S)	
Sediment (K)	Streambank erosion (K)	Removal of streambank vegetation (K) Inadequate erosion/ sedimentation controls (K)	Flood Control Warm Water Fishery
	Urban runoff (K)	Impervious surfaces (K) Development pre-dating storm water mgt requirements (K) Loss of wetlands (K) Inadequate storm water mgt (K) Loss of floodplains (K)	
Inadequate protective measures (K)	Development and land use projections (S)	Inadequate natural features protections in local regulations (S) Inadequate historical public understanding and knowledge (K) Insufficient funding for land acquisition and protection (S)	Open space Preservation Wetland Preservation Greenway Preservation Native Vegetation/ Unique Habitat/ Natural Buffers Agricultural Land
E. coli, other pathogens (S)	Animal wastes (S)	Improper mgt of animal waste (S) Excessive geese, improper mgt (S)	Total Body Contact Recreation Partial Body Contact Recreation
	Illicit connections (K)	Aging development sanitary sewer infrastructure (K) Insufficient sanitary sewer infrastructure maintenance (S)	
	Urban storm water (K)	Impervious surfaces (K) Development pre-dating storm water mgt requirements (K) Loss of wetlands (K) Inadequate storm water mgt (K) Loss of floodplain (K)	
	Failing septic systems (S)	Insufficient septic system maintenance (S) Poor soils (K) Inadequate ordinances (S)	

Combined Downriver Watershed
OURS TO PROTECT
Inter-Municipality Committee

4.4 GOALS AND OBJECTIVES

The designated and desired uses identified by the CDWIC were the basis for the goals developed. Once the committee came to a consensus on the designated and desired uses of the watershed, they developed goals to help restore, enhance, and/or protect these uses. Goals are a qualitative description of a desired future condition, purpose or end stated in general terms without criteria of achievement. Prioritization of the goals was done by the CDWIC at a committee meeting. The committee discussed each goal and prioritized them based off of the committees' experiences in the Watershed. The prioritization of the goals was finalized once the committee was in agreement.

Goals of CDWIC

- ✓ Reduce Stream Flow Variability
- ✓ Reduce Flooding
- ✓ Increase Public Education, Understanding, and Participation Regarding Watershed Issues
- ✓ Improve Water Quality
- ✓ Protect Public Health
- ✓ Preserve, Increase and Enhance Recreational Opportunities
- ✓ Protect, Enhance, and Restore Riparian and Instream Habitat
- ✓ Watershed Management Sustainability
- ✓ Preserve & Protect Critical Areas

In contrast to goals, objectives outline how the goal will be reached. In terms of the Watershed Management Planning process, an objective is how you will reduce pollution from a source to protect or restore a designated or desired use.

It should be noted that the overarching goals of the CDWIC are to restore and/or protect the designated and desired uses of the Watershed. Therefore, the uses addressed by each goal are included. The collective goals, objectives, and associated uses are presented on the following pages. The goals are listed in order of priority; however, it is generally understood and recommended that multiple actions will be occurring simultaneously throughout the implementation of the plan. For example, it is essential that efforts to increase public understanding and participation regarding watershed issues occur on an on-going basis during the life of this plan. Many of the identified goals and long-term (greater than 5 years), and short-term (less than 5 years) objectives must be addressed in concert with one another to accomplish the end result of improved water quality in the Combined Downriver Watershed.

The long-term goal is identified, under which short- and long-term (or both) objectives have been identified. The objectives address many of the designated and desired uses of the watershed.

1. Reduce Stream Flow Variability

Both Short- and Long-Term Objectives	Use(s) Addressed
• Reduce runoff volume/rate • Preserve & enhance native vegetation /naturalization	• Flood Control • Warmwater Fishery • Other Indigenous Aquatic Life & Wildlife • Wetland Preservation • Natural Vegetation/Unique Habitat/Natural Buffers • Partial Body Contact Recreation • Total Body Contact Recreation
Long-Term Objectives	
• Preserve and restore wetlands & open space	

2. Reduce Flooding

Long-Term Objectives	Use(s) Addressed
• Reduce sedimentation • Preserve and restore wetlands & open space • Reduce runoff volume/rate • Improve understanding of streamflow volumes & distribution	• Flood Control • Open Space Preservation • Wetland Preservation

3. Increase Public Education, Understanding, and Participation Regarding Watershed Issues

Short-Term Objectives	Use(s) Addressed
• Improve media coverage • Create partnerships with institutions, schools, and the private sector • Foster relationships with the County and neighboring communities	• All
Both Short- and Long-Term Objectives	
• Improve education and awareness of watershed successes and failures	

4. Improve Water Quality

Short-Term Objectives	Use(s) Addressed
• Eliminate/reduce illicit discharges	• Warmwater Fishery • Other Indigenous Aquatic Life and Wildlife • Partial Body Contact Recreation • Total Body Contact Recreation • Open Space Preservation • Wetland Preservation • Natural Vegetation/Unique Habitat/Natural Buffers
Both Short- and Long-Term Objectives	
• Protect, expand, and restore the riparian corridor • Improve erosion and sedimentation controls • Preserve and restore wetlands & open space	
Long-Term Objective	
• Reduce directly connected storm water discharges to sanitary systems • Meet Biota TMDL mandated adequate macroinvertebrate community and habitat based on P-51 Scores.	

5. Protect Public Health

Both Short- and Long-Term Objectives	Use(s) Addressed
• Reduce secondary health concerns related to flooding	• Total Body Contact Recreation • Partial Body Contact Recreation
Long-Term Objectives	
• Meet partial body contact requirements • Meet total body contact requirements	

6. Preserve, Increase and Enhance Recreational Opportunities

Both Short- and Long-Term Objectives	Use(s) Addressed
• Protect & improve riparian corridor aesthetics	• Recreational Areas • Open Space Preservation • Wetland Preservation • Greenway Preservation • Natural Vegetation/Unique Habitat/Natural Buffers • Partial Body Contact Recreation
Long-Term Objectives	
• Obtain land for wetlands and passive parks • Meet partial body contact requirements • Increase public access to stream corridors • Encourage recreation & open space planning in land use approval process	

7. Protect, Enhance, and Restore Riparian and Instream Habitat

Objectives	Use(s) Addressed
Short-Term Objectives • Integrate storm water management in planning and land use approval process **Long-Term Objectives** • Enhance warmwater fishery • Restore diverse aquatic community	• Warmwater Fishery • Other Indigenous Aquatic Life and Wildlife • Natural Vegetation/Unique Habitat/Natural Buffers

8. Watershed Management Sustainability

Objectives	Use(s) Addressed
Short-Term Objectives • Establish institutional relationships to ensure plan implementation **Long-Term Objectives** • Develop long-term funding methodologies	• All

9. Preserve & protect Critical Areas

Long-Term Objectives	Use(s) Addressed
• Integrate critical areas preservation goals into land-use policy	• All

5. Management Alternatives

Frank and Poet Drain at Pelham

Chapter Contents

Overview of Process (Methods)
- CDWIC Meetings & Workshops
- Individual Community/Entity Interviews
- Public Meetings

Analysis of Existing Policies & Programs
- Minimizing Impervious Land Area
- Preserving Open Land
- Treating Runoff

Description of Best Management Practices (BMPs)
- Structural
- Vegetative
- Managerial
- Desired Projects

Identification of Critical Areas
- Critical Priority Areas Identified by the Committee
- Critical Areas for Preservation & Conservation
- Critical Areas based upon Estimated Pollutant Loads

Estimated Pollutant Load Reductions

Comparison to Anticipated Pollutant Reduction Target(s)

Information was gathered from the various entities in the watershed to understand current practices and policies and to develop focused recommendations. This chapter details the variety of Best Management Practices (BMPs) and potential improvement projects that were discussed during the development of this Watershed Management Plan. BMPs will need to be applied as systems of practices because one practice rarely solves all water quality problems at a site, and the same practice will not work for all the sources and causes of a pollutant. Critical areas within the watershed are also identified and described in this chapter to provide additional focus for implementing BMPs and preservation and conservation efforts.

5.1 OVERVIEW OF PROCESS (METHODS)

5.1.1 CDWIC Meetings & Workshops

The Combined Downriver Watershed Inter-municipality Committee met throughout the course of developing the Watershed Management Plan. In total, 15 meetings were held, several of which were held jointly with the Ecorse Creek Inter-municipality Committee (ECIC). A schedule of these meetings can be found in Appendix C. All meetings were open to the public and the schedule was provided on the project webpage. Committee meetings were used to conduct regular business of the committee, solicit information necessary for the completion of the WMP from committee members, provide updates and discuss the progress of the WMP, and provide information regarding on-going watershed activities.

In addition to regularly scheduled CDWIC meetings, two workshops also were held. These workshops were held jointly with both the ECIC and Lower Huron River Watershed Inter-municipality Committee. The purpose of these workshops was to both provide general background information to the committees and to solicit input necessary for the development of the WMP. The first workshop, held on November 9, 2004, focused on finalizing the desired uses and goals of the watershed. The first portion of this workshop provided a characterization of each of the three watersheds and pointed out differences and similarities between the three. With this information in hand, representatives from the watershed came to a consensus on the designated and desired uses as well as goals for the watershed. The second workshop, held on February 9, 2005, focused on Management Alternatives. The desired outcomes of this workshop were to gain an understanding of the relationship between goals, objectives, and management alternatives; and to identify objectives and management alternatives to address problems and support the goals of the watershed. The first portion of this workshop focused on explaining the relationship between goals, objectives, and management alternatives and also provided an overview of different types of management alternatives. The watershed groups then divided and brainstormed short-term objectives to support the long-term goals for the watershed. In addition, the CDWIC representatives reviewed a list of possible management alternatives and discussed and revised the list so it could be used for future selection of management alternatives.

5.1.2 Individual Community/Entity Interviews

Individual meetings were held (March and April 2005) with each community or entity that chose to participate. Communities and entities that participated included: Brownstown Township, City of Gibraltar, Grosse Ile Township, Huron Township, City of Romulus, City of Southgate, City of Taylor, Wayne County, Wayne County Airport Authority, City of Woodhaven, and the City of Wyandotte. Attendees at these meetings varied but included mayors, supervisors, directors, planners, engineers, and/or field staff. The purpose of these meetings was to review each community's individual Management Alternatives Selection Sheet, review the Codes and Ordinances Worksheet (COW), and identify problem areas within the community or entity's jurisdiction and identify possible areas for future improvements. Priority areas included locations of flooding, streambank erosion, sedimentation, algae growth, debris buildup, etc., and are discussed further in Section 5.4.

5.1.2.1 Management Alternatives Selection Sheet

Before the individual meetings occurred, each community/entity was asked to complete a Management Alternatives Selection Sheet. This sheet was developed as a tool for communities to consider implementing different types of management alternatives. The Selection Sheet was not meant to be an exhaustive list of management alternatives and communities were given the opportunity to add any management alternatives to the sheet. The management alternatives were organized by categories of structural, vegetative, and managerial best management practices (BMPs). Communities and entities were asked to identify management alternatives that are currently being done, those to be implemented in less than 5 years, and those to be implemented in 5 to 25 years. Not all management alternatives were applicable or feasible for every community or entity in the watershed. In these cases, communities/entities indicated that they were not interested in a particular management alternative. The Management Alternatives Selection Sheet was discussed at the individual community interviews. A summary of the Management Alternatives Selection Sheet can be found in Appendix D.

5.1.2.2 Codes and Ordinances Worksheet (COW)

Management Alternatives include policies and programs. In order to identify what policies and programs could be initiated to improve water quality, an assessment of current policies and programs was needed. This was accomplished by using the Codes and Ordinance Worksheet (COW) that was developed by the Center for Watershed Protection (CWP) in Maryland[1]. The worksheet was slightly altered for this Watershed Management Planning effort and a copy can be found in Appendix D. The COW is a simple worksheet used to see how the local development policies, ordinances, and codes compare to model development principles (from a water quality standpoint). It has been utilized in Michigan for planning purposes within the neighboring Huron River Watershed. The COW was distributed to all entities in the CDWIC and results were discussed at individual meetings with committee members.

[1] Schueler, Thomas. Better Site Design: A Handbook for Changing Development Rules in Your Community. Center for Watershed Protection, Ellicott City, MD

5.1.3 Public Meetings

As is described in greater detail in Chapter 9 (Public Involvement), the development of this plan included several formal and informal public involvement sessions. These were in addition to the meetings and workshops held with the Inter-Municipality Committee and in addition to individual community and entity meetings held throughout the planning process. The results of the public information meetings were utilized as another tool in understanding the issues and priorities in the watershed and in developing the action plan(s). Public involvement opportunities included:

- **Public Information Meeting #1 January 20, 2005**
  The purpose of the meeting was to provide an overview of the watershed management plan process, present an overview of the watershed including general findings to date, and to discuss the next steps in the project and how to stay involved. General input and comments were gathered from those in attendance. Example goals for the watershed were also presented and participants were asked to indicate their priorities.

- **Public Information Meeting #2 June 1, 2005**
  The purpose of the meeting was to present an overview of WMP process, the designated and desired uses, major goals of the watershed, the draft recommended action plan for the watershed, and methods to measure progress. The meeting was also held to gather additional input and ensure continued awareness and involvement in the development of the plan.

- **Public Information Meeting #3 September 22, 2005**
  The purpose of the meeting was to present the final draft of the Watershed Management Plan and to gather any final comments and input prior to the plan being approved by the MDEQ. The purpose of the meeting was to present the final draft of the Watershed Management Plan and to gather any final comments and input prior to the plan being approved by the MDEQ. The meeting was held in conjunction with the Friends of the Detroit River Annual Meeting and approximately 52 people were in attendance.

In addition to the three formal public information meetings that were held during the development of the watershed management plan, *informal* input was gathered and participation encouraged. As was detailed in the MDEQ approved Public Participation Plan (PPP), the communities and entities that make up the watershed committee utilized several methods to ensure awareness and participation in the development of the management plan. For example: A project website (www.combineddownriver.com) was developed and maintained. This website included information on the project, announced meeting schedules, and allowed the public to email comments to various project participants, and/or request to be added to an email list for project announcements; An email distribution list of committee representatives and interested public, that grew over time, was developed and used to provide continuous communication; and, phone calls and individual meetings with various stakeholders took place. These and other informal means of communication and input proved to be imperative in the development of the watershed management plan.

5.1.4 2012 Update

As part of the 2012 update, information was gathered from each community regarding their housekeeping activities and what types of BMP practices they were interested in implementing over the next 5 years. Individual meetings were scheduled with each community throughout the summer and early autumn of 2010 to detail the types of BMP projects desired, their location, and desired year of implementation. Attendees at these meetings varied but included managers, directors, planners, engineers, and/or field staff.

A worksheet was developed to solicit this information from each community via meetings and emails. This information was then added to the Watershed Treatment Model (WTM) to develop the existing pollutant loads as well as the reductions due to BMP project implementation. This information was also utilized to generate the updated Action Plan. The following summarizes the topics of discussion at meetings related to the development of the 2012 WMP updates.

- **Full ADW Meeting** **April 15, 2010**
  The agenda included discussing the proposed schedule for the WMP updates and how new land cover data was going to be used to help determine opportunity for BMPs. Meetings with individual communities/stakeholders were also announced. Also discussed new TMDLs released since the last WMP.

- **Full ADW Meeting** **July 15, 2010**
  A PowerPoint presentation of critical area maps were reviewed and discussed with the group, as well as potential improvement projects. Sign up sheets for individual community meetings was distributed. An email was sent with instructions on developing wishlist projects and a brainstorming checklist. Communities were to complete the worksheet/checklist prior to the individual meetings.

- **Individual meetings with Stakeholders** **July – October 2010**

- **Full ADW Meeting** **October 14, 2010**
  A summary of the individual meetings was provided. The Watershed Treatment Model was also presented and the results were discussed. Watershed Advisory Group meetings were scheduled for November.

- **Individual WAG Meetings** **November 30, 2010**
  Existing conditions for TSS, Nitrogen, Phosphorus, Fecal and Runoff were reviewed. We also reviewed future conditions based on community commitments and model input. The WAGs were also given the opportunity to identify any additional critical areas and projects.

- **Full ADW Meeting** **January 18, 2011**
  Wayne County and the US Army Corp of Engineers gave a presentation on the North Branch Ecorse Creek Flood Risk Management Study. The recommendations from this study were added to the WTM as future projects. Draft WMPs were posted to the ADW website in March 2011 .

- **Full ADW Meeting.** **March 3, 2011**
  The ADW members were asked to review and comment on the draft WMPs prior to submittal to MDEQ. Drafts were submitted to MDEQ in March 2011.

- **Team Meeting with MDEQ** **December 20, 2011**
  The purpose of the meeting was to meet with MDEQ discus their comments on the draft WMPs and how edits would be made to the documents.

- **Full ADW Meeting** **January 12, 2012**
  The results of the meeting with MDEQ were shared with the ADW members. Announced that revised WMPs would be submitted to DEQ in February.

5.2. ANALYSIS OF EXISTING POLICIES & PROGRAMS

As described in Section 5.1.2.2., policies and programs were assessed through the completion of a Codes and Ordinances Worksheet by each community/entity. The COW focused on policies to minimize impervious land area, preserve open land, and treat runoff. More specifically, the following categories of policies and programs were reviewed in the COW: street width, right-of-way width, vegetated open channels, parking ratios, parking codes, parking lots, structured parking, parking lot and other runoff, open space design, sidewalks, driveways, open space management, rooftop runoff, buffer systems, buffer maintenance, clearing and grading, tree conservation, land conservation incentives, storm water outfalls, land runoff, and farmland preservation. Additional miscellaneous questions also were addressed.

Listed below are select results from the completed COWs and the recommendations for these various codes and ordinances from the Center for Watershed Protection. A summary of the completed COWs can be found in Appendix D.

5.2.1 Minimizing Impervious Land Area

The COW included specific questions regarding impervious land area caused by streets, parking, sidewalks, driveways, and rooftops that contribute to significant storm water runoff. To reduce the amount of runoff, minimizing the amount of impervious surface area is a focal point of this Watershed Management Plan. Recommendations were made for the following:

- Street width
- Parking ratios
- Parking codes
- Parking lots
- Sidewalks
- Driveways
- Rooftop runoff

As shown in Table 5-1, community development policies within the Combined Downriver Watershed overlap slightly with street width, parking ratios and parking lot stall dimension recommendations from the Center for Watershed Protection, but generally allow for, or require, more paved surface than recommended. It is recommended that Combined Downriver communities review their policies for these parking and residential street development standards and revise these standards, as appropriate, to reduce the amount of impervious surface required in new and re-development settings.

Table 5-1, Comparison of Combined Downriver Communities' Policies and Recommended Standards Governing Paved Surfaces.

Code or Ordinance	Typical Code or Ordinance	Recommended Code or Ordinance[2]
Allowable street width (ft)	22-41	18-22
Parking ratios		
Office (per 1000 ft^2)	3-6	3
Shopping Center (per 1000 ft^2)	4-7	4.5
Homes (each)	1-2	2
Parking lots		
Stall width (ft)	8.5-10	9
Stall length (ft)	18.5-20	18
Driveways width (ft)	8-10	9

In particular, communities are urged to review and revise policies governing parking ratios for commercial and multi-family residential uses. Studies conducted by the Center for Watershed Protection and the City of Olympia, Washington found that not only were parking ratios generally higher than required, based upon average use, but that developers generally exceeded required parking minimums; leading to significant unused space and exceedingly high impervious surface use. They recommend policies that not only reduce the minimum amount of parking required but that also establish ceilings for parking lot ratios.[3,4]

As stated previously, impervious surface coverage in the CDR is high and expected to increase as additional lands are developed. The amount of paved surface within the watershed is a driving factor behind both water quality concerns and the flooding problems experienced in the watershed. Policies governing the amount of paved surface should be carefully scrutinized and revised as needed. A local study, conducted by the Washtenaw County Drain Commissioner's Office for three townships neighboring the City of Ann Arbor, found that reducing parking and street width requirements, along with cluster or open-space development designs, could reduce impervious surface coverage in future development by fourteen percent (14%).[5] The Olympia, Washington study predicted that aggressive policy changes could yield a 20% reduction in the amount of expected imperviousness at build-out.[6]

In addition to the items identified in Table 5-1, another way to reduce storm water runoff is to allow for shared parking between businesses. Currently about 2/3 of communities/entities within the watershed allow for reduced parking ratios if shared parking arrangements are in place. This is an excellent way for communities to continue

[2] Center for Watershed Protection, Better Site Design, Codes & Ordinances Worksheet http://www.cwp.org/COW_worksheet.htm
[3] Wells, Cedar. 1995. Impervious Surface reduction Study: Final Report. City of Olympia, Washington, Public Works Department, Water Resources Program.
[4] Schueler, Thomas R. 1998. Better Site Design: A Handbook for Changing Development Rules in Your Community. Center for Watershed protection. Ellicott City, Maryland.
[5] Sheehan, H. and J. Bobrin. 1999. Imperviousness Reduction and Mitigation in Tributaries of the Huron River: A Stormwater Management Study of Ann Arbor, Scio and Superior Townships. A project of the Washtenaw County drain Commissioner, funded by the Michigan Department of Environmental Quality, Great Lakes protection Fund. 88 pp.
[6] Wells, Cedar. 1995. Impervious Surface reduction Study: Final Report. City of Olympia, Washington, Public Works Department, Water Resources Program.

to minimize impervious surfaces within the watershed and it is recommended these practices be adopted watershed-wide.

Currently very few communities, if any, allow pervious materials to be used for spillover parking lots or require 30% of parking areas sized for compact cars. Communities may be reluctant to change these policies until case studies have been constructed and documented in the area. Allowing for these policy changes will minimize impervious land area throughout the watershed, and it is recommended that communities/entities investigate this possibility.

Especially in urban communities, sidewalks play an important role in allowing pedestrians to access shopping, recreation areas, and in promoting general health and recreation. A recommended way to reduce the impact of sidewalks is to slope sidewalks to drain to front yards instead of directly to streets or create pedestrian walkways through common areas rather than along roads. This allows for runoff to be infiltrated to the ground, thereby reducing directly connected impervious surfaces.

Rooftops in an urban area are also a significant source of storm water runoff. Directing rooftop runoff to yard areas or allowing temporary ponding of rooftop runoff on yards is a recommended method from the Center for Watershed Protection for reducing directly connected impervious surfaces. Most communities in the watershed allow for rooftop runoff to be discharged to yard areas but many do not allow for ponding on yards. It is recommended all communities allow rooftop runoff to be discharged to yard areas and for the communities to evaluate whether temporary ponding of storm water on yards is feasible for their individual locations.

5.2.2 Preserving Open Land

Paralleling closely with practices minimizing impervious land area, preserving open land practices and ordinances help protect valuable open space that allows storm water runoff to be filtered and infiltrated before reaching open water courses. The following types of policies were reviewed and have recommendations for improvement:

- Open space design and management
- Tree conservation
- Land conservation
- incentives

The Center for Watershed Protection recommends allowing for cluster-development designs that promote open space preservation in a community. The CWP notes that providing flexibility in standards, such as lot sizes, set backs, road widths, and/or other incentives, may help encourage developers to promote such designs. The results of the COW indicate that nearly every community/entity within the CDR Watershed allow for cluster-type development in their respective community to preserve open space and are willing to work with developers on a case-by-case basis to provide needed flexibility in the design. The results of the COW in this category are very promising and 100% adoption of this philosophy is recommended.

The Center for Watershed Protection recommends that communities have enforceable requirements to establish associations that can effectively manage open space and that open space areas are consolidated into larger areas with greenway corridors between them. The purpose of having larger open space areas and connecting greenway corridors is to promote wildlife habitat and access, as well as reducing directly connected impervious surface areas. The results of the COW indicate that approximately 2/3 of the communities/entities in the CDR Watershed have associations that manage open space, while most do not require open space areas to be consolidated or require greenway corridors. It is recommended that the communities within the CDR Watershed revisit land use plans to determine where open space consolidation is desired and feasible and where greenway corridors can be established.

Preserving natural resources such as trees, wetlands, native vegetation and other open space areas are important to the watershed. The COW indicates that most communities have policies in place to protect trees and native vegetation during development. While most communities are flexible in working with developers to conserve non-regulated open space, they do not typically provide land conservation incentives to do so. The Center for Watershed Protection recommends that communities work with developers on a case-by-case basis to provide needed flexibility and incentives, such as transfer-of-development rights, in order to promote land conservation. It is recommended that communities/entities review their policies regarding land conservation incentives and determine whether it is applicable to their community to allow for these flexibilities and incentives.

5.2.3 Treating Runoff

Runoff can be treated by numerous methods. Runoff can be directed through vegetated channels or bioretention islands so that it is filtered before entering an open watercourse. Vegetated buffers also provide similar protection. Wet detention basins can allow sediment to settle before being discharged. In addition to treatment, pollutants in runoff can be prevented through clearing and grading and land runoff policies. Specifically, recommendations are made for the following policies:

- Vegetated open channels
- Parking lot & other runoff
- Buffer systems
- Buffer maintenance
- Clearing and grading
- Storm water outfalls
- Land runoff

Buffer systems along open drainage courses and around wetlands are important features for filtering pollutants, including sediment. Most communities/entities have adopted the Wayne County Storm Water Ordinance, which requires a 25-foot buffer around open drains and wetlands. Communities in the watershed should consider adopting the recommendations of the Center for Watershed Protection of maintaining a 75-foot buffer around streams and wetlands to further promote filtering and a reduction in streambank erosion.

Another way of treating storm water runoff is by creating vegetative swales and bioretention islands. Both methods use vegetation to enhance infiltration of storm water runoff and to filter pollutants. Vegetative swales also assist in reducing runoff velocities. The results of the COW indicate that most communities have established design criteria for grassed swales, but that less than half allow the use of bioretention islands. Having example projects for communities to see, and having a better understanding of the operation and management of bioretention islands may help promote bioretention islands throughout the watershed. Most communities within the watershed require a minimum percentage of parking lots to be landscaped and bioretention islands could fulfill these requirements.

It is recognized that curb and gutter systems effectively and rapidly convey storm water off site, which contributes to high stream flows and streambank erosion. Many established communities, such as those in the CDR Watershed, require curb and gutter in their respective residential areas. It is recommended that the communities evaluate this policy to determine if there are areas within their community where it is feasible to have grassed swales instead of curb and gutter systems.

5.3 DESCRIPTION OF BEST MANAGEMENT PRACTICES (BMPS)

A number of Best Management Practices (BMPs) or management alternatives were considered by the CDWIC. These are actions that are being done or may be done in the future by some or all of the entities in the Watershed. The following are brief descriptions of these BMPs, categorized as Structural, Vegetative, or Managerial. Managerial BMPs are further described as Ordinances and Policies, Managerial Practices, Studies and Inventories, Public Education, Illicit Discharge Elimination, or Coordination and Funding. How these BMPs will be implemented is described in Chapter 6, the Watershed Action Plan.

> A **Best Management Practice** (BMP) is a land management practice that is implemented to control sources or causes of pollution. There are three primary types of BMPs that treat, prevent, or reduce water pollution.
>
> - <u>Structural BMPs</u>: "bricks and mortar" practices that require construction activities to install, such as storm water basins, grade stabilization structures, and rock rip-rap
> - <u>Vegetative BMPs</u>: "green infrastructure" that uses plants, including grasses, trees and shrubs, to stabilize eroding areas
> - <u>Managerial BMPs</u>: that involve changing the operating procedures at a site
>
> BMPs are typically applied as a system of practices because one practice rarely solves all water quality problems at a site, and the same practice will not work for all the sources and causes of a pollutant. All three types of BMPs may be needed to address a source of pollutants.
>
> MDEQ Developing a Watershed Management Plan for Water Quality, Feb 2000.

Construct Detention/Retention ponds – Addresses Goals 1, 2, 4

Detention/retention ponds should be designed and constructed to meet or exceed the Wayne County Storm Water Ordinance. Retention ponds do not have an outlet, meaning that runoff only leaves the basin through evaporation or infiltration. Detention ponds capture and retain storm water runoff and release the runoff at a regulated rate, thus reducing peak flows to downstream waterways. Detention ponds may be designed as wet or dry basins depending on whether or not a permanent pool of water is present. A wet pond utilizes a permanent pool of water that contributes to nutrient removal and the settling of solids. The outlet of a dry pond is designed to gradually release storm water, which allows for some settling of sediment and other pollutants, but may not be as effective in removing pollutants as a wet pond. An advantage to dry ponds is that storm water is generally heated to a lesser degree since a permanent pool is not present.

Install Porous Pavement at appropriate sites – Addresses Goals 1, 2, 4

Porous pavement helps reduce the amount of impervious land area within the watershed, which is critical to infiltrating storm water runoff, therefore improving water quality and reducing stream flow variability. Porous pavement, including gravel, can especially be utilized in overflow parking areas that are not used regularly. Porous pavement is an infiltration technique that combines stormwater infiltration, storage, and structural pavement consisting of a permeable surface underlain by a storage reservoir. Porous pavement is well suited for parking lots, walking paths, sidewalks, playgrounds, plazas, tennis courts, and other similar issues.

Streambank Stabilization – Addresses Goals 4, 6, 7
Eroding streambanks are present throughout the watershed due to high velocity peak stream flows and runoff. Measures to control high peak flows will ultimately prevent further erosion. Actions that harden stream banks are not advisable since this will transfer energy downstream and add to erosion. Eroding streambanks are of concern due to the sediment loads and loss of aquatic habitat that can result. It is difficult for vegetation to survive in areas of erosion. Public safety at severely eroded streambanks also may be an issue. Bank stabilization is the process by which stream banks are stabilized by various techniques to prevent damage done by erosion. Stream banks can be protected and stabilized using techniques such as building a flood plain bench to provide additional storage during higher flow events, adding native vegetation and bioengineering techniques throughout the critical area, cutting back the banks, and restoring the stream bank with a wide variety of structural and vegetative measures.

Install catch basin inserts at strategic locations – Addresses Goals 4, (5), 7
Catch basins are often the entry points into a storm drain system, and therefore are an ideal place to filter storm water before it enters the system. Catch basin inserts can collect sediment, trash, and debris. Filters in the inserts can also remove oil, nutrients, and certain metals.

Increase Floodplain – Addresses Goals 4, 7
In order to help meet anticipated TMDL requirements for biota, off-line areas could be created specifically for the purpose of providing conditions suitable for biota. These off-line areas would be located adjacent to streams and floodplains. A floodplain, or flood plain, is flat or nearly flat land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. A vegetated riparian buffer can be designed in these areas. The buffer protects the adjacent stream by filtering pollutants through both the vegetation and underlying soil. In addition, the vegetation slows runoff velocities reaching the stream, thus reducing stream bank erosion. Vegetation also helps stabilize stream banks.

Replace undersized bridges and culverts – Addresses Goals 2
During the field inventory and during individual community/entity interviews, several bridges and culverts were identified as not being able to convey flow either because of being undersized, having heavy sedimentation or debris build-up, or being misaligned. Undersized bridges and culverts should be properly sized to convey the appropriate flow. Heavy sedimentation and debris that is obstructing flow through bridges and culverts should be removed and misaligned bridges and culverts should be realigned or replaced.

Install Green Roofs at strategic locations – Addresses Goals 1, 2, and 4
Green roofs reduce the amount of runoff from impervious rooftops. Green roofs are conventional rooftops that include a thin covering of vegetation allowing the roof to function more like a vegetated surface. The overall thickness of the vegetated roof may range from 2 to 6 inches, typically containing multiple layers consisting of waterproofing, synthetic insulation, non-soil engineered growth media, fabrics, synthetic components, and foliage. Green roofs would reduce impervious area, peak flows and stream flow variability.

Hydrodynamic Separation – Addresses Goals 4, 5, and 7
Hydrodynamic separators (HDS) are storm water management devices used to control water pollution. They are designed as flow-through structures with a settling or separation unit to remove sediment and other pollutants. HDS are considered structural Best Management Practiced (BMPs), and are used to treat and pre-treat storm water runoff.

Water Harvesting – Addresses Goals 1, 2, 3, 4, and 7
Water Harvesting can be broken down into rainwater harvesting and storm water harvesting. Rainwater harvesting is the accumulating and storing, of rainwater. It has been used to provide drinking water, water for livestock, water for irrigation or to refill aquifers in a process called groundwater recharge. Water collected from the ground, sometimes from areas which are especially prepared for this purpose, is called stormwater harvesting. Rainwater harvesting is typically accomplished by use of cisterns and/or rain barrels and reduces the amount of roof runoff and peak flows.

Green Street – Addresses Goals 1, 2, 3, 4, and 7
A green street is a street that is designed to integrate a system of "green infrastructure" to manage storm water runoff within its right of way and reduce the amount of directly connected impervious runoff. Green streets reduce the amount of water that is piped directly to streams and rivers, add to the aesthetics of the community, and make the best use of the street tree canopy for storm water interception as well as temperature mitigation and air quality improvement. SEMCOG has estimated that urban runoff from roads is the largest uncontrolled contributor of nonpoint source pollution in Southeast Michigan with over 100 billion gallons of storm water runoff, 30 million pounds of sediment, and 200,000 pounds of nutrients generated from roads.

Water Efficiency – Addresses Goals 3
Water efficiency is the long-term ethic of saving water resources through the employment of water-saving technologies and activities. Using water efficiently will help ensure supplies for future generations.

Construct Rain Gardens/Bioretention Cells, where feasible – Addresses Goals 1, 2, 4, (5)
Rain gardens/bioretention cells are shallow surface depressions planted with specially selected native vegetation to capture and treat stormwater runoff from rooftops, streets, and parking lots. Often times, these depressions are excavated and backfilled with compost and sharp sand to improve infiltration rates. Rain gardens provide on-site treatment of storm water runoff by providing vegetated areas that may be graded so that storm water runoff flows to the area. This allows the runoff to be infiltrated and filtered through the vegetation. Native vegetation is commonly used in these areas because it requires less maintenance and generally has deeper roots, which is more effective in facilitating infiltration and filtering pollutants. Rain gardens can be designed with an overflow structure and underdrain system so that during large storms, storm water runoff is able to reach the storm drain system to prevent flooding. Rain gardens can be applied in highly urbanized areas and are generally used on small sites and can be substituted for parking lot islands.

Construct Grow Zones, where feasible – Addresses Goals 1, 2, 4, (5)
A grow zone is an area that had traditionally been turf grass or other impervious cover that is converted to native grasses and/or wildflowers, trees and shrubs to minimize storm water runoff and provide on-site treatment of storm water runoff.

Implement Tree Planting Programs, Addresses Goals 1, 2, 4, and 5

Tree planting is the process of transplanting tree seedlings, generally for forestry, land reclamation, or landscaping purposes. Strategically placed, healthy trees can effectively reduce the amount of runoff and pollutant loading in receiving waters. Trees protect water quality by substantially reducing runoff during small rainfall events, which are responsible for the first flush runoff. According to the International Society of Arboriculture, a typical tree will intercept approximately 3,000 gallons of storm water per year.

Preserve/restore/expand/improve wetlands, Based on MDEQ Landscape Level Wetland Assessment – Addresses Goals 1, 2, 4, (5), and (6)

Results of the MDEQ Landscape Level Wetland Functional Assessment (2011) identified areas of existing wetlands within the ADW as well as areas with high or medium level potential for wetland restoration. The results should be utilized when seeking properties for preservation and/or wetland restoration. (See Section 5-5) The Assessment indicated a 90% loss of wetlands in the ADW as a whole (as compared to pre-settlement condition) and a 91% wetland loss in the Combined Downriver Watershed. Wetlands serve critical functions such as flood control, sedimentation areas, erosion control, water cleaners, habitat, recreation, and economy. A restored wetland is the rehabilitation of a drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to the natural conditions to the greatest extent possible. Wetland size and configuration, hydrologic sources, and vegetation selection must be considered during the design phase. Constructed wetlands provide a suspended solid removal of approximately 70 percent, while nutrient removal ranges widely due to a lack of standard design criteria, but is in the range of 40-80 percent.

Work w/ County to enforce W.C. Storm Water ordinance – Addresses Goals (all)

Many of the communities in the Combined Downriver Watershed have adopted the Wayne County Storm Water Ordinance. As local development and redevelopment plans are received, the ordinance is applied with specific design criteria required for flood control and water resources protection. The County storm water ordinance provides guidance and encourages the implementation of appropriate Best Management Practices to control the volume, rate, and minimize the potential pollutant load of storm water runoff from new development as well as redevelopment projects.

Incorporate low impact design planning[7] – Addresses Goals 1, 2, (3), 4, (5), 6, 7, 9

Land use planning and management involves a comprehensive planning process to promote Low Impact Development (LID) and control or prevent runoff from developed land uses. LID is a low cost alternative to traditional structural stormwater BMPs. It combines resource conservation and a hydrologically functional site design with pollution prevention measures to reduce development impacts to better replicate natural watershed hydrology and water quality. Through a variety of site design techniques, LID reduces the creation of runoff, volume, and frequency. Essentially, LID strives to mimic pre-development runoff conditions. This micro-management source control concept is quite different from conventional end-of-pipe treatment or conservation techniques. Less developed communities in the watershed should be especially interested in adopting LID principles. The LID planning process involves the following steps: 1) determine water quality and quantity goals with respect of human health, aquatic life and recreation; 2) identify planning area and gather pertinent hydrological, chemical and biological data; 3)

[7] Ibid

determine and prioritize the water quality needs as they relate to land use and the proposed development; 4) develop recommendations for low impact development to address the problems and needs that have been previously determined; 5) present recommendations to a political body for acceptance and 6) implement adopted recommendations.

Incorporate riparian corridor in community zoning and land-use plans – Addresses Goals 4, (5), 6, 7
As described above, the riparian corridor refers to the area adjacent to streams. A vegetated riparian buffer refers to establishing or maintaining vegetation in the riparian area. The buffer protects the adjacent stream by filtering pollutants through both the vegetation and underlying soil. In addition, the vegetation slows runoff velocities reaching the stream, thus reducing stream bank erosion. Vegetation also helps stabilize stream banks. By incorporating the riparian corridor into zoning and land-use plans, the areas adjacent to drains are identified and can more easily be protected and preserved. Opportunities for restoration of the riparian corridor are also more easily identified.

Review and revise grading and land clearing policies–Addresses Goals 1, 2, (3), 4, (5), 7
If not already in place, grading and land clearing policies will minimize clearing and grading of woodlands and native vegetation to the minimum amount needed to build lots, allow access, and provide fire protection.

Review and revise SESC policies and program practices[8] – Addresses Goals 2, (3), 4, 7
Soil erosion control is the process of stabilizing soils and slopes in an effort to prevent or reduce erosion due to storm water runoff. Source areas are construction sites where soil has been disturbed and exposed, streambanks that are eroding due to lack of vegetation and an excess of peak flows during storm events, and road crossing over streams where the integrity of the structure is compromised or where the road itself contributes gravel or dirt. Soils can be stabilized by various physical or vegetative methods, while slopes are stabilized by reshaping the ground to grades, which will improve surface drainage and reduce the amount of soil eroding from a site. In areas where development activity is underway, it is important to emphasize the Soil Erosion and Sediment Control ordinance inspection and enforcement, which often entails hiring an adequate number of field staff.

Adopt native landscaping ordinances – Addresses Goals 1, 2, (3), 4, 6, 7
A native vegetation preservation and planting ordinance gives first consideration for the use of native vegetation, includes incentives to encourage native vegetation preservation and planting, and includes provisions for protection, maintenance and replacement of native vegetation. Native vegetation assists in the infiltration and filtering of storm water runoff.

Review and revise parking requirements for new development/redevelopment – Addresses Goals 1, 2, 4
Parking lots can contribute a large percentage of impervious area on a site. Parking lots are often oversized to handle peak usage, leaving much of the parking lot empty during normal usage. To reduce the amount of impervious surface, communities can consider revising the number of spots required (with overflow). Shared parking can also be utilized in certain situations. If two adjacent sites utilize parking at different times, a single shared lot may meet the needs of both sites. Requiring compact car spaces can also reduce the size and amount of impervious surface.

[8] Ibid

Enact wetland and/or natural features protection ordinances – Addresses Goals 1, 2, (3), 4, (5), 6, 7

A natural features ordinance would call for the protection of such natural features as woodlands, grasslands, slopes, wetlands, and groundwater. The ordinance reduces the impact to natural features by limiting the proximity of disturbance. Protection of wetlands from sedimentation, destruction, and misuse is also provided.

Open space preservation in zoning and master planning – Addresses Goals 1, 2, (3), 4, (5), 6, 7, 9

Land use projections based on SEMCOG data show that a majority of open space will be depleted by the year 2030. In order to maintain the current hydrology and counteract further degradation from urbanization, as much open space as possible should be preserved. Open space can be preserved through community zoning and master planning, in which areas of open space are recognized and planned for in the future. Standards for development that require a certain percentage of open space can also help in preserving current open space.

Implement private roads ordinances (narrower streets)[9] – Addresses Goals 1, 2, 4

A private roads ordinance complements efforts to reduce directly connected impervious surfaces by permitting roads to be built that are narrower than county road standards. Narrower roads produce a smaller area of impervious surface. The ordinance can promote rural character by allowing narrow roads in certain developments in order to preserve open space.

Work w/ County to revise drain maintenance procedures to reduce the destruction of habitat and stream vegetation – Addresses Goals 4, 6, 7

Current practices may result in the destruction of stream bank vegetation from rough clearing the drain for sediment removal or channel widening. Drain maintenance should limit the destruction of stream bank vegetation that is essential in filtering pollutants and maintaining the integrity of the stream bank. Sediment disruption should also be limited, as this will only cause additional sediment deposition downstream of the maintenance site. Downstream conditions should also be investigated before drain maintenance is put in place to ensure it can handle any additional flows. In general, drain maintenance usually results in an increased flow rate downstream as surface water is generally able to better flow through the area in which maintenance has occurred.

Review & revise drain maintenance and restoration procedures, as appropriate – Addresses Goals 2

Areas where sediment deposition and streambank erosion have occurred should be considered for cleanout to restore the hydraulic capacity of the drain. As mentioned above, this should be done in a way that minimizes destruction of stream bank vegetation. Downstream conditions should also be investigated before maintenance occurs to ensure that any increased flows do not have an adverse effect downstream.

Implement pet waste collection program to supply the public with convenient disposal places for pet waste – Addresses Goals 3, 4, 5, 6

A pet waste collection program would supply the public with convenient disposal places for pet wastes in locations such as public parks and other areas that may have high pet traffic. Pet waste contributes nutrient loads and can pose a threat to partial and full body

[9] Ibid

water contact. In addition, a pet waste collection program also increases public awareness since disposal locations are visible to all those passing.

Routinely sweep public streets & public parking lots – Addresses Goals 4, (5), 7
Street sweeping on a regular basis minimizes pollutant loads to receiving waters by removing sediment, debris, and other pollutants from road and parking lot surfaces. High-efficiency street sweepers are capable of removing smaller particles than older sweepers and can result in more significant pollutant removal.

Eliminate roof drains directly connected to impervious surfaces, where possible – Addresses Goals 1, 2, 4, 7
Storm water runoff that is connected directly to impervious surfaces, such as driveways and catch basins contributes to higher peak flows and pollutant loads. If runoff is instead directed to pervious surfaces such as landscaped areas or grass swales, runoff velocities are decreased, runoff volume is decreased due to infiltration, and storm water is filtered by vegetation. Runoff can be diverted from impervious surfaces by directing runoff from roofs, driveways, parking lots, etc, to vegetated areas. This can apply to residential, commercial, and industrial developments. In older communities, downspout disconnection also can reduce directly connected impervious surfaces.

Water quality monitoring – Addresses Goals (3), 4
Water quality monitoring will help measure the success of activities being implemented. This will help communities in the watershed know the extent of whether their activities are making an impact on the health of the watershed or whether their activities should be reassessed.

Investigate opportunities for recreational areas[10] – Addresses Goals 6
In order to encourage public awareness and concern for rivers, streams and wetlands, it is important to increase opportunities for people to access these water resources. If provided with aesthetic and accessible, well-advertised recreational areas - be it a canoe livery, a fishing pier, or a trail system – the public will be able to experience the human benefits that the water offers and in turn, may want to work to protect the resource. First, the designated and desired uses must be restored so that it is safe for the public to use the resource in the manner it is intended; i.e., reduce sediment in order to promote a canoe livery. Then, the recreational amenity can be planned, built and promoted.

Flow monitoring – Addresses Goals (3), 4, 5
Flow monitoring involves an analysis of data on rainfall, streamflow, instream water quality, storm water quality, biological communities and habitat, instream bottom sediment, air deposition, and aesthetic conditions. In addition, flow monitoring includes measurement of the performance of various storm water best management practices (BMPs) including structural controls, wetlands, and nonstructural controls.

Identify areas not suitable for septic system installation (coordinate with Wayne County Health Dept) – Addresses Goals 3, 4, 5
Location requirements for on-site septic systems should be reviewed with the Wayne County Health Department.

[10] Ibid

Evaluate areas suitable for dredging to restore hydraulic capacity of drains – Addresses Goals 2, (4), (7)
Sediment buildup from runoff and erosion has decreased the hydraulic capacity of certain waterways in the Combined Downriver Watershed. Areas where flooding is a problem could be evaluated to determine if sediment buildup is the cause. Those areas then could be prioritized and dredged (with minimal disturbance to the waterway).

Identify areas suitable for septic system installation (coordinate with Wayne County Health Dept) – Addresses Goals 3, 4, 5
Location requirements for on-site septic systems should be reviewed with the Wayne County Health Department.

Inventory areas lacking storm water detention for retrofit opportunities – Addresses Goals 1, 2, (4)
Storm water detention is now required for new developments, however, older developments were not subject to this requirement. Performing an inventory would involve creating a list of these older developments and determining whether on-site conditions are suitable for retrofit opportunities, such as detention basins, bioretention islands, etc.

Initiate hydrologic and hydraulics studies to determine sources contributing to flooding[11] – Addresses Goals 1, 2, (4)
Initiating hydrologic and hydraulics studies to determine sources contributing to flooding can be used to help prioritize areas for implementing BMPs that will help reduce the volume and rate of runoff. A comprehensive study of the hydrology of the watershed would provide an understanding of the interaction of precipitation, infiltration, surface runoff, stream flow rates, water storage, and water use and diversions. A hydraulics study would yield information about stream velocity, flow depth, flood elevations, channel erosion, storm drains, culverts, bridges and dams. Information resulting from these studies would provide greater detail on the sources and causes of problems related to hydrology-induced erosion.

Compile and Annual Summary of ADW Activities – Addresses Goals 3
A comprehensive ADW summary would provide an annual report of Watershed activities and findings for the year. The report outlines ongoing activities, results from any studies, present case studies, report successes and findings, as well as goals and activities for the upcoming year. The report would serve as a summary that could be provided to both the DEQ and the general public for educational purposes. The ADW has prepared Annual Reports each year since its inception. This activity should continue.

Program to increase awareness and use of rain barrels – Addresses Goals 1, 2, 3
Residential rain barrels are used to collect rooftop runoff. Collecting this water helps reduce peak runoff flows and promotes water conservation. Also, residential rain barrels are a useful tool in creating public awareness and educating the public about watershed issues.

Establish BMP case studies – Addresses Goals (all)
Implementing BMPs requires a change from the normal accepted practices that are now in place. Because of this, there is some reluctancy in implementing BMPs that are not yet common. Several project profile sheets have been developed for grant funded projects in

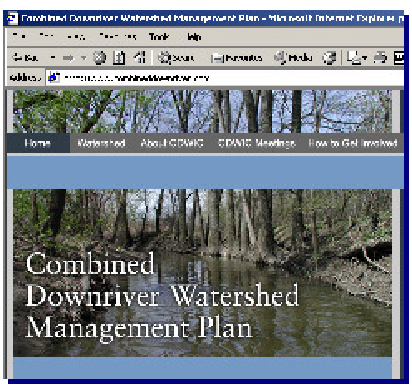
[11] Ibid

the ADW. Establishing successful BMP case studies within the watershed have been an effective means of increasing BMP awareness and acceptance.

Regular storm water-related information on cable TV – Addresses Goals 3, 8
Cable Television is one source that can be utilized by communities to reach the general public. Upcoming meetings and events, as well as educational materials, can be posted on Cable TV. Possible educational topics include: Education of the public about their responsibility and stewardship in their watershed; Education of the public on the location of residential separate storm water drainage system catch basins, the waters of the state where the system discharges, and potential impacts from pollutants from the separate storm water drainage system; Encouragement of public reporting of the presence of illicit discharges or improper disposal of materials into the separate storm water drainage system; Education of the public on the need to minimize the amount of residential or noncommercial wastes washed into nearby catch basins (this should include the preferred cleaning materials and procedures for car, pavement, or power washing; Acceptable application and disposal of pesticides and fertilizers; The effects caused by grass clippings, leaf litter, and animal wastes that get flushed into the waterway); Education of the public on the availability, location and requirements of facilities for disposal or drop-off of household hazardous wastes, travel trailer sanitary wastes, chemicals, yard wastes, and motor vehicle fluids; and, Education of the public concerning management of riparian lands to protect water quality.[12]

Send out watershed-related press releases – Addresses Goals 3, 8
Press releases that result in publicity of watershed activities and successes will result in an increase in overall awareness, understanding, and participation regarding watershed issues.

Maintain watershed webpage – Addresses Goals 3, 8



A watershed webpage provides a central and easily accessible means for citizens to learn about the watershed and its challenges and goals, and a means to provide information on activities in which citizens can participate. The ADW maintains a website, www.allianceofdownriverwatersheds.com, which serves as a repository and informational site for elected officials, staff, and interested stakeholders. A webpage was developed as part of this Watershed Management Plan and has been updated and maintained. Costs and resources used are divided among participating entities through the ADW budget.

Provide watershed education – Addresses Goals 3, (all)
The CDWIC believes that watershed education is essential to improving water quality from a non-point source standpoint. Watershed education includes a school curriculum dealing with watershed issues, organizing participation activities throughout the watershed (such as a stream cleanup day), making available flyers, education via cable TV and newsletters.

Combined Downriver Watershed
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Inter-Municipality Committee

[12] Michigan Department of Environmental Quality, Public Education Plan Guidance Document.

Trash management education to the public – Addresses Goals 2, 3, 4, 6
Trash management education to the public could be used to inform the public on the proper disposal of wastes. Specifically, information on hazardous waste disposal would be supplied. Information would include methods for the proper disposal of various common substances as well as information on the location of disposal sites. The message may be distributed via flyers, newsletter articles, cable TV, etc.

Outreach program to educate homeowners about the proper operation/maintenance of their septic systems – Addresses Goals 3, 4, 5
Failing septic systems can contribute nutrient and pathogen loads to the storm sewer system and waterways. Failing septic systems can be attributed to unsuitable soil conditions, improper design and installation, or poor maintenance. Education materials can help teach homeowners with septic systems how to identify when their septic system is failing and proper maintenance to prevent a failing system.

Pet waste management education to the public – Addresses Goals 3, 4, 5
Pet waste management information to the public would include messages that notify pet owners that pet waste has a negative impact on water quality and can contribute to both nutrient and pathogen loads. Proper and timely disposal of pet waste can help combat pollution caused by pet waste. The message may be distributed via flyers, newsletter articles, cable TV, etc.

Lawn and garden maintenance information to the public – Addresses Goals 3, 4, 7
Lawn and garden maintenance information to the public would include such messages as the proper height to mow grass and the use of environmental-friendly fertilizers. The message may be distributed via flyers, newsletter articles, cable TV, etc.

Distribute/display SE Michigan Partners for Clean Water Materials – Addresses Goals 3, 4, 5, 7, (8)
With the Phase II requirements affecting many communities that are SEMCOG members, SEMCOG established the Southeast Michigan Partners for Clean Water to coordinate storm water public education activities to help save local dollars and to send consistent messages. These messages are intended to be action-oriented with the primary goals of protecting water resources and meeting permit requirements, and would be delivered through brochures, newsletters, workshops, river crossing signage, print ads, and local media. Materials focus on the “Seven Simple Steps to Clean Water,” which are: Help keep pollution out of storm drains; Fertilize sparingly and caringly, Carefully store and dispose of household cleaners, chemicals, and oils; Clean up after your pet; Practice good car care; Choose earth friendly landscaping; and, Save water.

Watershed-related articles in Newsletter/ Magazine – Addresses Goals 3, 4, 7, (8)
Articles in community/entity newsletters or magazines focus on public education. The messages of these newsletter or magazine articles can vary and include: ultimate discharge point, lawn and garden maintenance, pet waste disposal, septic system maintenance, trash management, etc.

Post watershed-related news and/or educational materials on Entity Website – Addresses Goals 3, 4, 7, (8)
News and educational materials can be displayed on entity's websites for easy access by the general public. Upcoming activities, activity summaries, as well as educational materials that include messages on ultimate discharge point, lawn and garden maintenance, pet waste disposal, septic system maintenance, trash management, etc. can be posted.

Watershed-related informational Displays – Addresses Goals 3, 4, 7, (8)
Informational displays in public buildings or at public events is one way to educate the public on storm water issues. The messages of these displays can vary and include: ultimate discharge point, lawn and garden maintenance, pet waste disposal, septic system maintenance, trash management, etc.

River Crossing and Entering Watershed Signage – Addresses Goals 3, 4
'River crossing' signs and 'Entering the Watershed' signage serves as a method of public education as to the proximity of rivers and boundaries of the watershed. Knowing these locations helps citizens gain a sense of ownership and protectiveness for the waterways within the watershed.

Storm Drain Curb Marker Program[13] – Addresses Goals 3, (4), (5)
Many of the entities in the Watershed have been working with the Detroit Riverkeeper group and their "Storm Drain Labeling and Educational Program." The Riverkeeper program has been working closely with the Combined Downriver and Ecorse Creek Watershed groups to put together a program that involves storm drain labeling and a region wide storm water educational program. Over 12,000 labels have been produced and distributed to the participating communities in these watersheds. Installation of the curb-side storm drain labels started in 2004 and will continue, helping to bring attention to storm drain born water quality issues.

Promote reporting system for illicit discharges – Addresses Goals (3), (4), (5)
A reporting system for illicit connections can be effective in identifying illicit connections. The reporting system should be advertised through public education and be a convenient way for residents and others to report illicit connections. To make citizens aware of the reporting system, advertisements can be made via cable TV, newsletter or magazine articles, entity websites, etc.

Household Hazardous Waste Collection Site/Day[14] – Addresses Goals 3, (4), 5
Some jobs around the home may require the use of products containing hazardous components. Such products may include certain paints, cleaners, stains and varnishes, car batteries, motor oil, and pesticides. The used or leftover contents of such consumer products are known as "household hazardous waste." Household hazardous wastes are sometimes disposed of improperly by individuals pouring wastes down the drain, on the ground, into storm sewers, or putting them out with the trash. The dangers of such disposal methods may not be immediately obvious, but certain types of household

[13] Detroit Riverkeeper Program http://www.detroitriver.org/Riverkeeper_2005.htm
[14] Environmental Protection Agency http://www.epa.gov/epaoswer/non-hw/househld/hhw.htm

hazardous waste have the potential to cause physical injury to sanitation workers; contaminate septic tanks or wastewater treatment systems if poured down drains or toilets; and present hazards to children and pets if left around the house. Household hazardous waste collection sites or designated collection days allow citizens to properly dispose of household hazardous wastes.

Yard Waste Collection and/or Recycling – Addresses Goals 3, 4, (7)
When yard waste decomposes, it depletes dissolved oxygen levels and has an adverse effect on aquatic species. Excessive plant material also encourages algae growth. Yard waste collection and/or recycling enables citizens to dispose of their yard waste in the proper manner so that it does not reach downstream waterways.

Watershed-related educational brochures and published articles to the public – Addresses Goals 3, 4
Brochures and published articles focus on public education. The messages of these brochures can vary and include: ultimate discharge point, lawn and garden maintenance, pet waste disposal, septic system maintenance, trash management, etc. Brochures can be distributed via mail, or made available at public buildings or events.

Illicit Discharge Elimination Program – Addresses Goals 3, 4, 5, and 7.
The Illicit Discharge Elimination Program (IDEP) directly results in the annual removal of significant quantities of raw sewage and other pollution which pose a threat to both human and aquatic life. The ADW, in cooperation with Wayne County staff, actively identifies and eliminates potential and existing improper discharges and sanitary sewer connections to stormwater systems and open waterways. The ADW targets commercial, industrial, and institutional facilities and buildings. Illicit discharges and connections are identified by dye testing facility sanitary drainage systems, observing "housekeeping" issues, and looking for signs of illicit discharges or material handling/storage practices that may allow material to migrate to a storm drain or watercourse. Facilities found to have improper sanitary sewer connections or illicit discharges to the storm sewer system, or to an open waterway, are notified. Follow-up work with facility owner/managers and local community staff to ensure corrective actions are taken and compliance with federal, state, and local regulations is achieved.

Meet w/ County and/or MDOT to coordinate drain maintenance – Addresses Goals 2
Currently there is confusion as to who is responsible for drain maintenance in the numerous drains throughout the Watershed. The committee would like to establish responsibility for each drain, whether it is the County, MDOT, or the individual community. Once responsibility is clarified, the ADW members are committed to working cooperatively with the responsible entity to identify issues related to drain maintenance.

Create partnerships with institutions, schools, and private sector to promote a collaborative effort in watershed management – Addresses Goals 3, 8, (all)
The CDWIC recognizes that its efforts in watershed management can be far more effective with the participation of institutions, schools, and the private sector. The committee feels that public education through the schools to change everyday practices is a key component to watershed management. The private sector also plays an important role in watershed management. In addition to possible help with project implementation, the private sector also must change its practices for maximum improvement to occur throughout the watershed.

Seek alternative funding sources – Addresses Goals 8, (all)
The State of Michigan is considering new legislation to fund the development of a stormwater utility within a new grant program through the Strategic Water Quality Initiative Fund (SWQIF). This funding mechanism will enable a community to fairly assess costs based on benefits received.

Other funding programs can include low interest loans from the State Revolving Fund Program. Specific grant/loan programs that may be considered include, but are not limited to, Clean Michigan Initiative (CMI), Section 319, Great Lakes Reconstruction Initiative, National Oceanic and Atmospheric Administration (NOAA), Army Corps of Engineers, and Sustain Our Great Lakes.

Create a funding source for land acquisition and protection – Addresses Goals all
The protection or creation of open space can assist in counteracting further degradation from urbanization, allow for infiltration, increased floodplain, storm water treatment and storage, etc. while also serving as a recreational amenity to the community, watershed, and region. A variety of options should be investigated on an individual community and watershed-wide basis. These could include elements such as open space preservation millages, grants, tax initiatives, donations, conservation easements, land preservation through the development process, etc. Groups to work with in this effort could include Southeast Michigan Land Conservancy (smlcland.org) and Grosse Ile Nature and Land Conservancy (ginlc.org).

Create law to allow illicit discharge enforcement as a source of revenue – Addresses Goals (3), 5, 8
Creating such a law would involve establishing authority and a system in order to charge inspection fees and collect a fine for punishment for illegally discharging a substance into the storm sewer conveyance system (including open drainage courses). Fees and penalties would be used to fund storm water requirements including PEP and IDEP.

Work with Stream Team and others for citizen monitoring – Addresses Goals 3, 4, 5
The Stream Team is comprised of volunteers from area schools and Downriver Citizens for a Safe Environment. The Stream Team is active in clean-up days and water-quality monitoring, and in specific restoration projects. Currently, there is not an established water-quality monitoring program in the Combined Downriver Watershed. The Stream Team could provide needed monitoring of the waterways in the Combined Downriver that could be used as the backbone for measuring the progress and effectiveness of watershed activities.

5.4 IDENTIFICATION OF CRITICAL AREAS

Critical (priority) areas were identified to focus attention on, and prioritize actions within. These are areas of the watershed that exhibit known or suspected problems, that offer opportunities to prevent further degradation through the protection of remaining and significant natural features, and/or that hold potential for restoration. These areas were identified using information provided by the CDWIC, the Michigan Department of Natural Resources, the Wayne County Department of Environment, and other community or organizational representatives, and through geographical information analysis and modeling. Sites within the following four (4) categories were identified as critical areas within the Combined Downriver Watershed:

- Problem areas as identified by communities within the watershed;
- Natural areas for preservation and conservation; and
- Areas estimated to contribute the greatest amount of pollution to area watercourses
- Areas susceptible to flooding and hydrologic instability

5.4.1 Critical Priority Areas Identified by the Committee

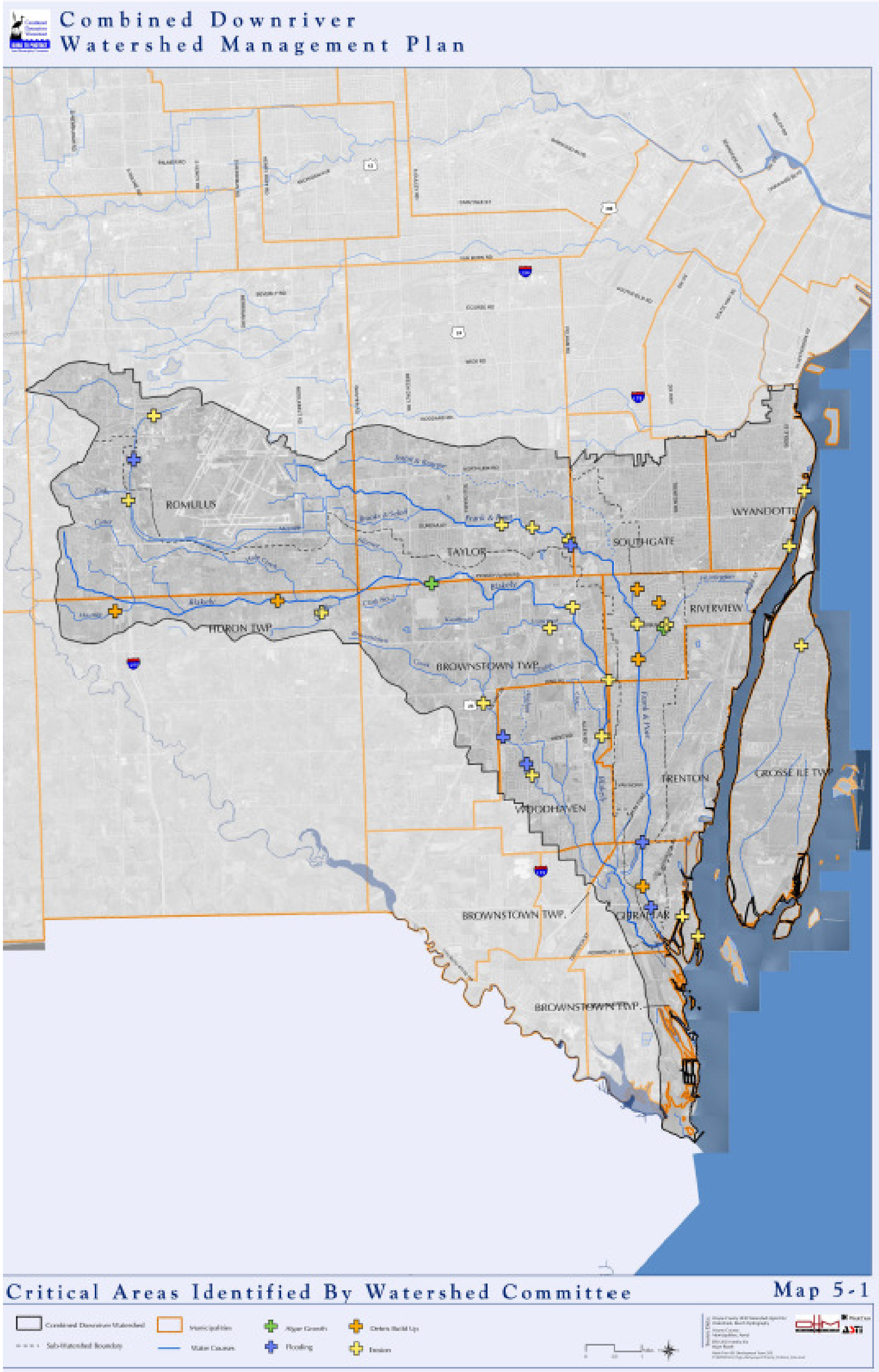
As described in Section 5.1.2, individual meetings were held with a majority of communities and entities within the watershed (March and April 2005) to further identify and discuss problem areas within their jurisdiction. These meetings were key to soliciting information directly from those who have the greatest understanding of the issues and potential for projects within the watershed. Discussions with community/entity representatives not only identified the location and nature of problems, but also focused on possible restoration or retrofit opportunities in these areas. These areas were reviewed by the watershed during the 2012 WMP update process and confirmed that they continued to be critical areas. They are listed below in order of priority.

Identified problems and critical areas in the watershed are illustrated on the following map (Map 5-1, Critical Areas Identified by Watershed Committee), and typically fell into one of four categories:

- Flooding
- Erosion
- Debris Build Up (Logjams)
- Algae Growth

This information was further used to develop elements of the Watershed Action Plan (Chapter 6) and to quantify possible potential pollutant load reductions (Section 5.5) that could result from implementation of these projects/actions.

Map 5-1


Combined Downriver
Watershed Management Plan
ROMULUS
TAYLOR
SOUTHGATE
WYANDOTTE
RIVERVIEW
HURON TWP
BROWNSTOWN TWP
WOODHAVEN
TRENTON
GROSSE ILE TWP
GIBRALTAR
BROWNSTOWN TWP.
Critical Areas Identified By Watershed Committee
Map 5-1

5.4.2 Critical Areas for Preservation and Conservation

As described previously in Chapters 2 and 3, unstable hydrology and excess sedimentation are the principal factors impacting the biotic communities within the Combined Downriver Watershed, causing non-attainment of water quality standards and designated uses. The key factor driving the exaggerated peak flows, hydrologic instability, and sedimentation in the watershed is urbanization and the resultant increase in impervious surfaces. Forested riparian buffers, wetlands, woodlands, and other areas of open space, while outside of the stream channel itself, are critical components of a healthy stream system. Their protection helps minimize impervious surfaces and maintains the natural processes of interception, infiltration, and evapotranspiration of rain and snowmelt, thereby helping to maintain a more natural hydrologic balance.

Although these open space elements are deemed critical to preventing further degradation, SEMCOG land use projections indicate that the majority (52%) of existing open space will be depleted by the year 2030.[15] In order to counteract further degradation of the stream system from urbanization, it is recommended that as much open space as possible be preserved.

Areas of natural land cover were identified using current (2000) SEMCOG land use and aerial photography data.[16] Three categories of natural features information were mapped:

1. Areas of intact riparian buffer (i.e., wetland, forest, shrub/scrub adjacent to streams within the Combined Downriver Watershed);
2. Contiguous blocks of wetland, forest, shrub/scrub land equal to or greater than five (5) acres in size; and
3. Additional areas, identified by the Michigan Natural Features Inventory (MNFI) as areas with recorded observations of federal or state-listed threatened, endangered, or otherwise significant species, natural plant communities, or natural features.

Maps 5-2 and 5-3 show those critical areas targeted for preservation and conservation. Map 5-2 shows areas within the Combined Downriver Watershed where a natural riparian buffer is yet intact. Areas of wetland, forest, or shrub and agricultural lands within 300-feet in either direction from the center of the stream are shown. The relative width of the band shown indicates the width (up to 300-feet) of the existing buffer. Conversely, the absence of a mapped band along sections of the stream indicate areas where a riparian buffer is lacking. The amount of intact buffer within different land use/land cover categories is summarized in Table 5-2. Areas designated as agricultural lands may include pasture, orchard, row crops or other agricultural practices and should be inspected in the field to determine whether a true buffer or filter strip may exist along the stream at those locations.

15 SEMCOG (Southeast Michigan Council of Governments). Digital future (2030) land use projections derived from municipal master plans

16 SEMCOG (Southeast Michigan Council of Governments). 2000. Digital land use data.

Table 5-2 Critical Areas Within 300-Foot Riparian Corridor

Critical Land Use	Acres
Active Agriculture	664
Cultural, Outdoor Recreation, and Cemetery	591
Grassland and Shrub	1,392
Woodland and Wetland	2,137
Extractive and Barren	220
Water	342

An intact forested riparian corridor provides a variety of critical functions, including:

- Protecting fish and wildlife by providing food, cover, shade, and linear connections between habitats;
- Maintaining cool water temperatures, and thereby protecting dissolved oxygen concentrations, by shading the stream;
- Preventing overland runoff from contributing pollutants from upland areas through the filtration, trapping, and conversion of sediments, nutrients, and other chemicals;
- Floodwater storage and energy dissipation;
- Maintaining streambank stability and channel capacity, and
- Maintaining balanced hydrology and hydraulics within the stream channel.

Areas where the buffer is still intact should be protected through the use of overlay zones, protective ordinances, conservation easements and/or incentive programs. Areas with minimal or no riparian buffer should be reviewed and targeted for possible restoration.

The width of buffer to be maintained or restored varies according to the desired function of the buffer as well as site specific considerations such as the size (width/order) of the stream, the slope of the land adjacent to the stream, soils, vegetation and vegetative structure, and the intensity of adjacent land uses (Table 5-3). In general, water quality goals such as protecting the stream from overland runoff and providing shade to the stream require less buffer width than other benefits such as flood storage or wildlife habitat. Even if these buffer functions are secondary to water quality benefits, efforts should be made to protect wider buffers where they currently exist, and as opportunities allow, particularly in the headwaters region.

Table 5-3 Minimum Recommended Buffer Widths[17]

Desired Function/Benefit	Recommended Range (Min.)
Bank Stabilization and Aquatic Food Web	25 to 35 feet
Water Temperature Moderation	25 to 50 feet
Nitrogen/Phosphorus (Nutrient) Removal	40 to 125 feet
Sediment Removal	55 to 150 feet
Flood Mitigation	65 to 210 feet
Wildlife Habitat	60 to 260 feet

[17] USDA Forest Service. 1998. Chesapeake Bay Riparian Handbook: A guide for establishing and maintaining riparian forest buffers. USDA Forest Service, Northeastern Area – State and Private Forestry, NA-TP-02-97.

Contiguous, remaining blocks of wetlands, forest, shrub or grasslands, agricultural land, areas of extractive use or barren lands, and parks, greater than five-acres in size, within the Combined Downriver watersheds are shown in Map 5-3. The amount of these areas within different land use/land cover categories is summarized in Table 5-4. These lands represent areas of low impervious cover and areas maintaining the natural hydrologic processes of interception, infiltration, and evapotranspiration of rain and snowfall and flood water storage.

Table 5-4 Critical Areas 5 Acres or Larger (Entire Watershed)

Critical Land Use	Acres
Active Agriculture	3,019
Cultural, Outdoor Recreation, and Cemetery	2,341
Grassland and Shrub	5,292
Woodland and Wetland	9,095
Extractive and Barren	986
Water	545

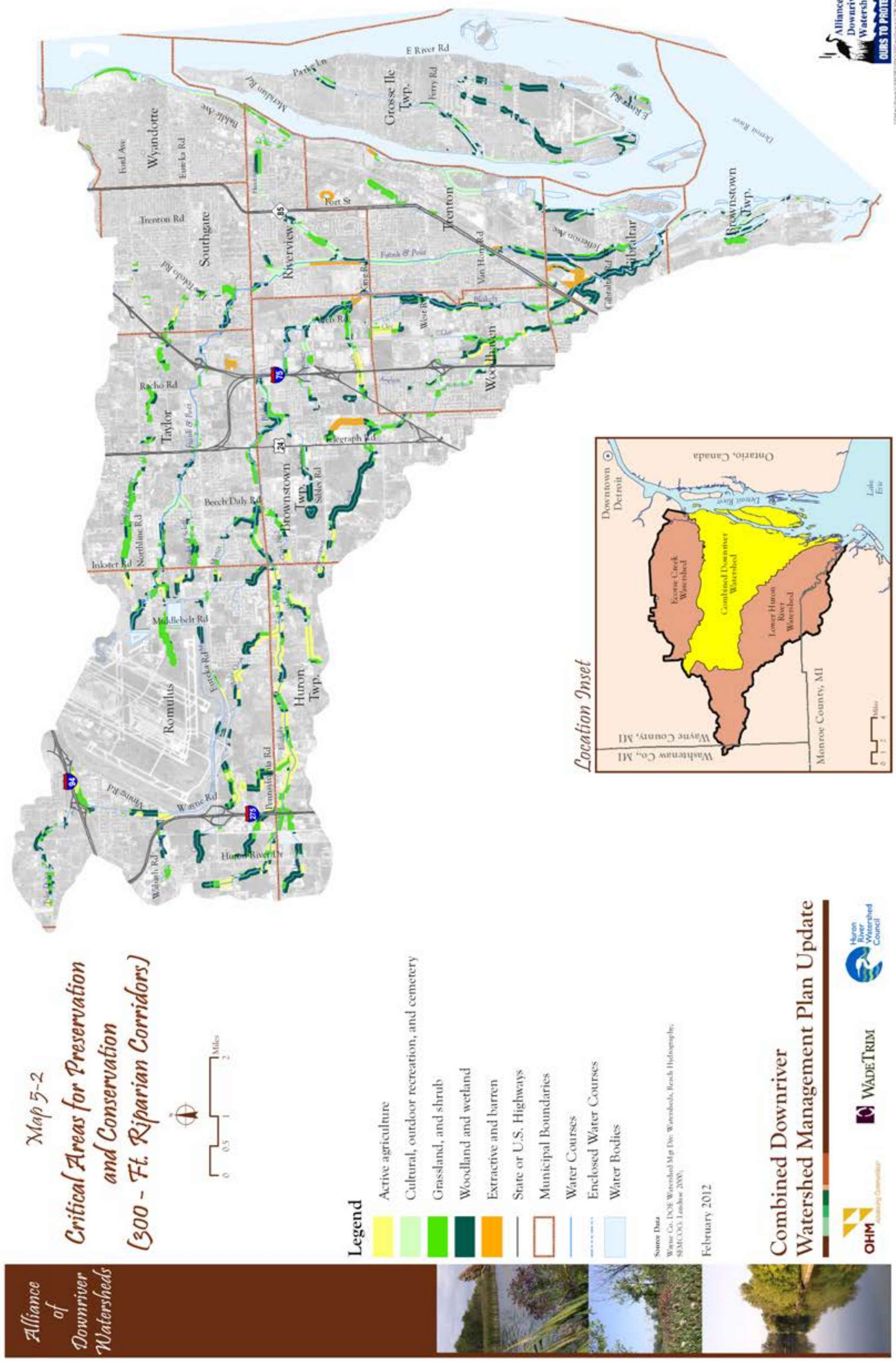
Review of Map 5-3 (and 5-2) readily shows differences between the headwaters region of the watershed at the left (west) of the maps and downstream regions to the right (east).

In general, there is a direct correlation between the preservation (or loss) of open space in a watershed and the physical, chemical, and biological integrity of the system. Remaining open space within the river system must be conserved if there is to be hope of reducing flood damage and re-attaining water quality standards and designated uses.

Map 5-4 shows generalized locations of threatened, endangered, and special concern species or unique and rare plant communities or natural features, based upon observations recorded in a database maintained by the MDNR Michigan Natural Features Inventory (MNFI). The points shown indicate the locations (1/4-1/4 Section) of occurrences of these unique elements since 1970. The color coding for these points indicates the biodiversity score assigned by the MNFI. The biodiversity scoring is designed to help prioritize areas for conservation according to their contribution to biodiversity. Factors considered in calculating the biodiversity value of each occurrence include the species' global status, state status, the quality rank assigned to each occurrence, the presence of potential habitat within the known spatial extent of the occurrences, and the last date observed at that location (a measure of the probability that it is still present).[18]

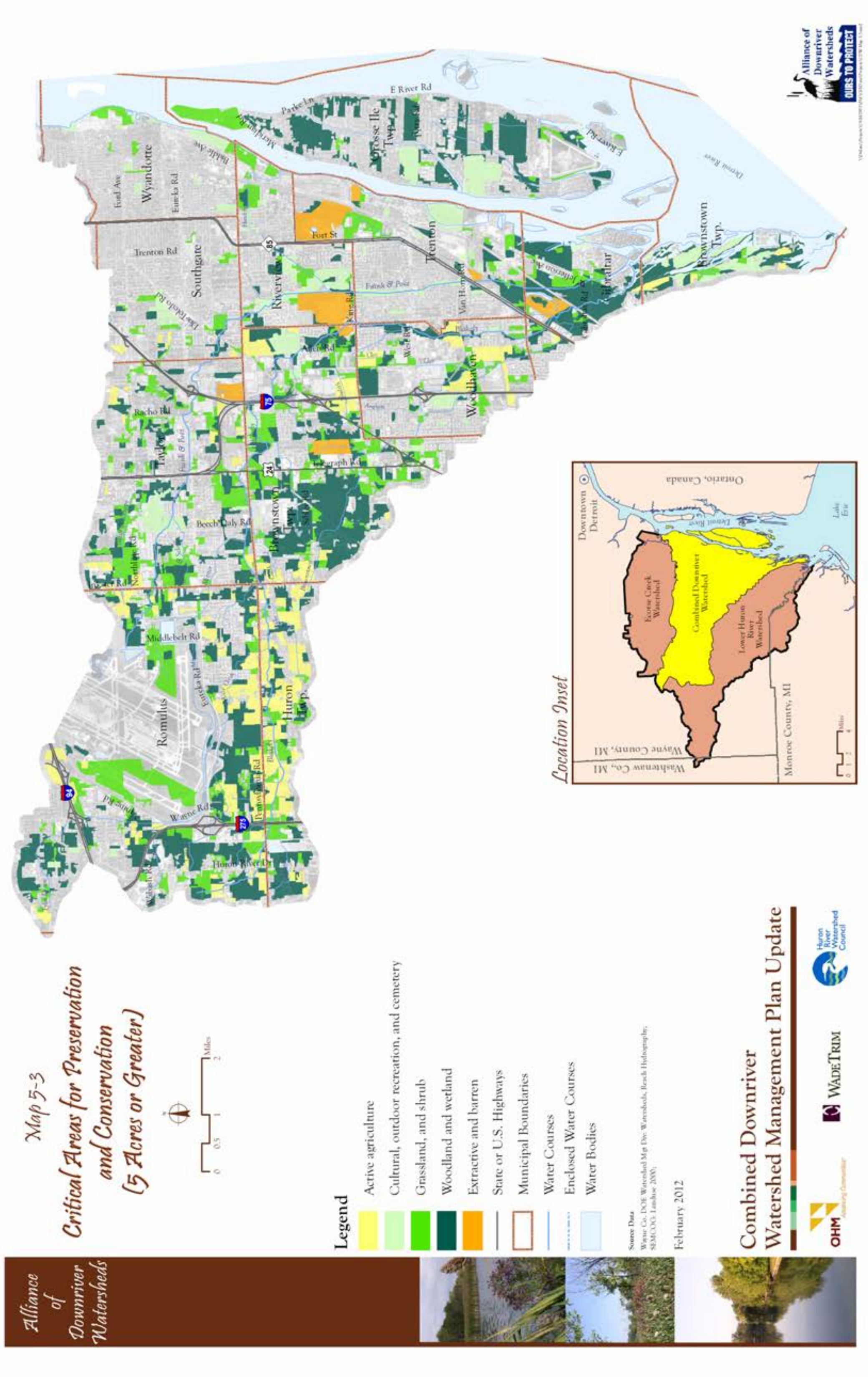
[18] Schools, E., Enander, H., and J. Paskus. Using Geographic Information Systems to Prepare Sensitive Species Information for Land Use Master Planning. Michigan Natural Features Inventory/Michigan State University Extension. Lansing, Michigan. 27 pp..

Map 5-2

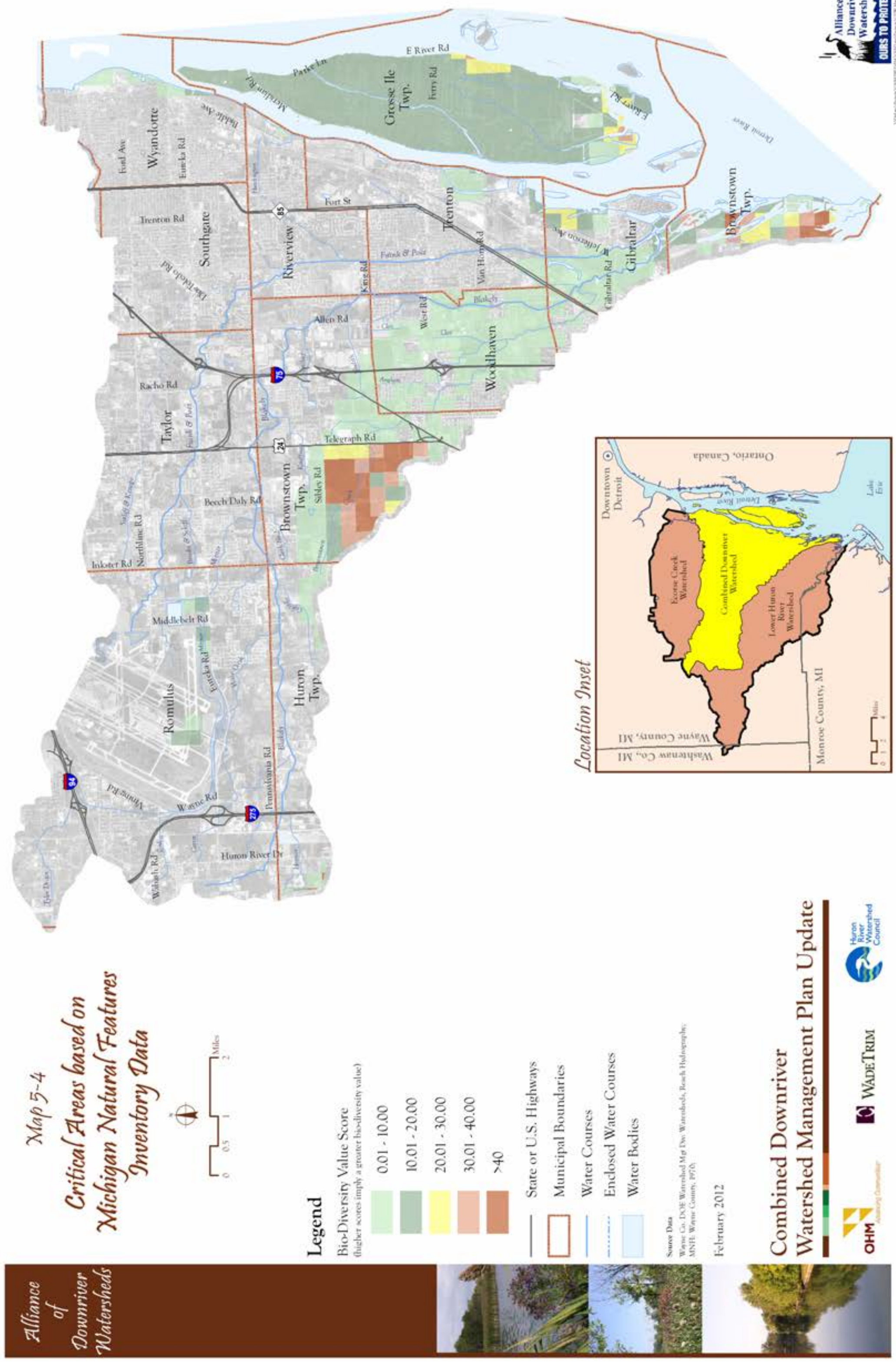


Alliance of Downriver Watersheds
Map 5-2
Critical Areas for Preservation and Conservation (300 - Ft. Riparian Corridors)
Legend
Active agriculture
Cultural, outdoor recreation, and cemetery
Grassland, and shrub
Woodland and wetland
Extractive and barren
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver Watershed Management Plan Update
Location Inset
Ontario, Canada
Downtown Detroit
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Wyandotte
Southgate
Riverview
Trenton
Grosse Ile Twp.
Gibraltar
Brownstown Twp.
Woodhaven
Taylor
Romulus
Huron Twp.
Detroit River

Map 5-3


Alliance of Downriver Watersheds
Map 5-3
Critical Areas for Preservation and Conservation (5 Acres or Greater)
Legend
Active agriculture
Cultural, outdoor recreation, and cemetery
Grassland, and shrub
Woodland and wetland
Extractive and barren
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver Watershed Management Plan Update
Location Inset
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Downtown Detroit
Ontario, Canada
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Romulus
Huron Twp.
Taylor
Brownstown Twp.
Woodhaven
Southgate
Wyandotte
Riverview
Trenton
Gibraltar
Grosse Ile Twp.
Brownstown Twp.
Detroit River

Map 5-4



Alliance of Downriver Watersheds
Map 5-4
Critical Areas based on Michigan Natural Features Inventory Data
Legend
Bio-Diversity Value Score
0.01 - 10.00
10.01 - 20.00
20.01 - 30.00
30.01 - 40.00
>40
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver Watershed Management Plan Update
Location Inset
Wyandotte
Southgate
Riverview
Trenton
Grosse Ile Twp.
Gibraltar
Brownstown Twp.
Woodhaven
Taylor
Romulus
Huron Twp.
Ontario, Canada
Wayne County, MI
Monroe County, MI

5.4.3 Critical Areas Based on MDEQ Landscape Level Wetland Functional Assessment

The Michigan Department of Environmental Quality completed a Landscape Level Wetland Functional Assessment (LLWFA) for the Alliance of Downriver Watersheds area. The LLWFA is a GIS based tool that can be used to identify and prioritize existing wetlands for protection or enhancement based on the ecological or water quality functions they provide. Similarly, the tool can be used to prioritize historic wetland areas for restoration based on the functions they would then provide.

The LLWFA uses pre-European settlement data, a 2005 update of the original National Wetlands Inventory data, soils data and 2005 high resolution aerial photography to identify existing wetlands and areas with potential for wetland restoration (areas identified as pre-settlement wetland and/or hydric soils). The database associated with the mapping provides hydro-geomorphic information for each wetland area such as: landscape position, landform, water flow direction, and pond classification. This information is then interpreted to derive the specific wetland functions (i.e. flood water storage, fish habitat, nutrient transformation, groundwater influence, etc.) of each wetland area. The status and trends of wetlands in the area are summarized in Table 5-5 and the current status of wetland areas is shown in Map 5-5.

Table 5-5. Wetland Resources and Trends

Alliance of Downriver Watersheds	Pre-Settlement	2005 Condition	Total Loss	Percent Loss
Acres of Wetland	48,733	5,230	43,503	90%
Average Size (acres)	49	8.5		
Combined Downriver Watershed				
Acres of Wetland	20,471	2,044	18,427	91%
Average Size	49	9		

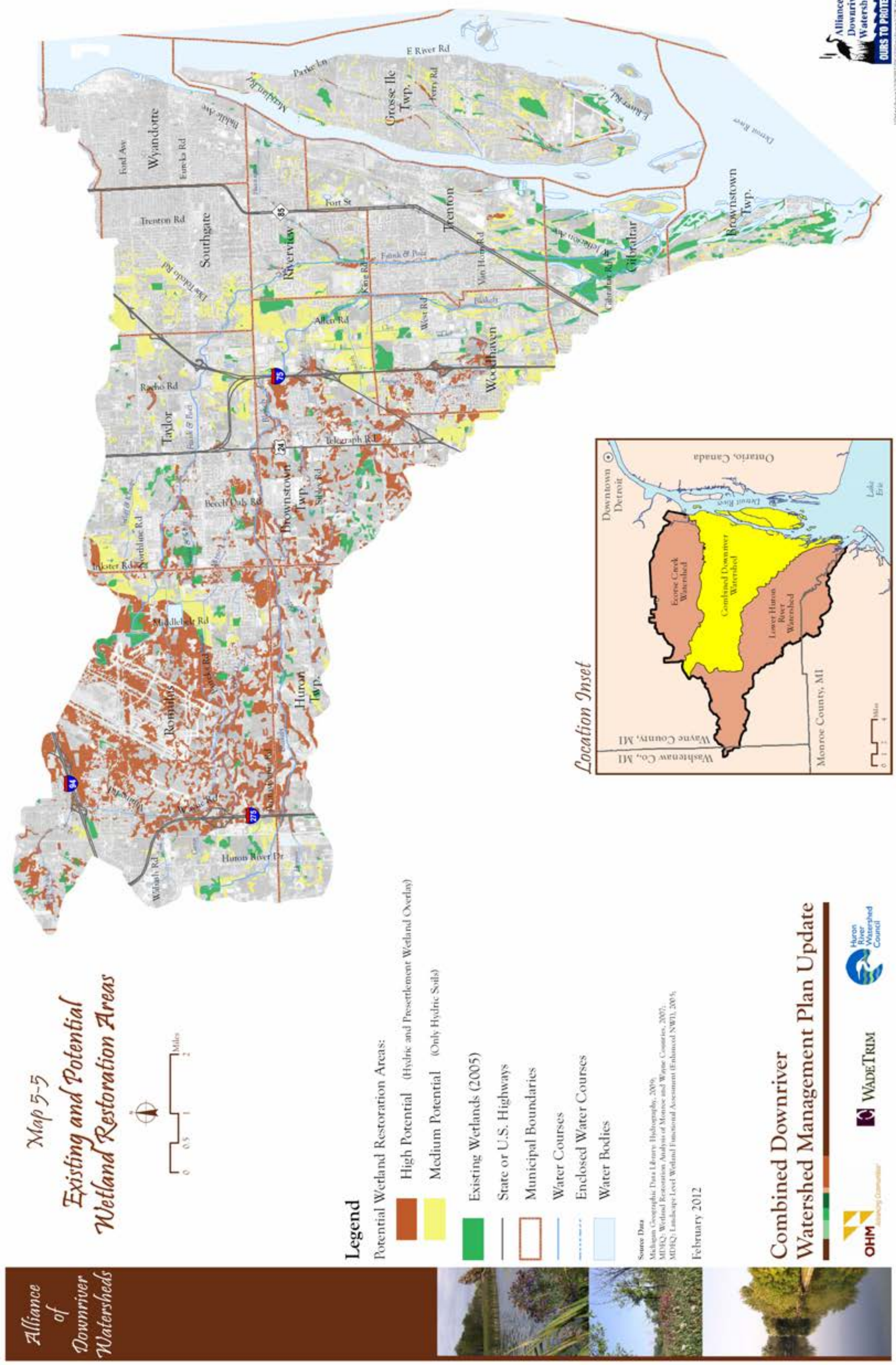
Due to the high ecological importance of wetland areas as well as the exceptionally high rate of wetland loss in the watershed all opportunities for restoration and protection of wetlands should be pursued as they arise regardless of their location in the watershed. However, the CDR Watershed Group will selectively pursue the restoration and protection of wetlands using the following process:

Critical areas and sites will be identified using the LLWFA and other criteria for each appropriate goal. An example might be:

For the Flow Stability and Flood Control Goals:

- Upstream of a flood prone or "flashy" area
- High performing for "Floodwater Storage"
- Wetland area 20 acres or more in size

Map 5-5


Alliance of Downriver Watersheds
Map 5-5
Existing and Potential Wetland Restoration Areas
Legend
Potential Wetland Restoration Areas:
High Potential (Hydric and Presettlement Wetland Overlay)
Medium Potential (Only Hydric Soils)
Existing Wetlands (2005)
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver Watershed Management Plan Update
Location Inset

5.4.4 Critical Areas Based Upon Estimated Pollutant Loads

During the development of the 2006 plan, average annual pollutant loads to streams within the watershed were estimated using the U.S. EPA's PLOAD model. As part of the 2012 update, the Watershed Treatment Model (WTM), developed by the Center for Watershed Protection, was employed in order to benefit from a different approach that incorporated a tracking tool for pollutants to estimate loading and effectiveness of implementation efforts.

Pollutant load export from the watershed was estimated for both existing and future land use conditions in order to identify priority areas within the Combined Downriver Watershed, to predict how changes in proposed land use may change pollutant loads, and to determine how various BMPs may, in turn, reduce pollutant loads to the creeks. Average annual pollutant loads to streams within the Combined Downriver Watershed were estimated using the Watershed Treatment Model (WTM) and along with the assumptions outlined in Appendix E.

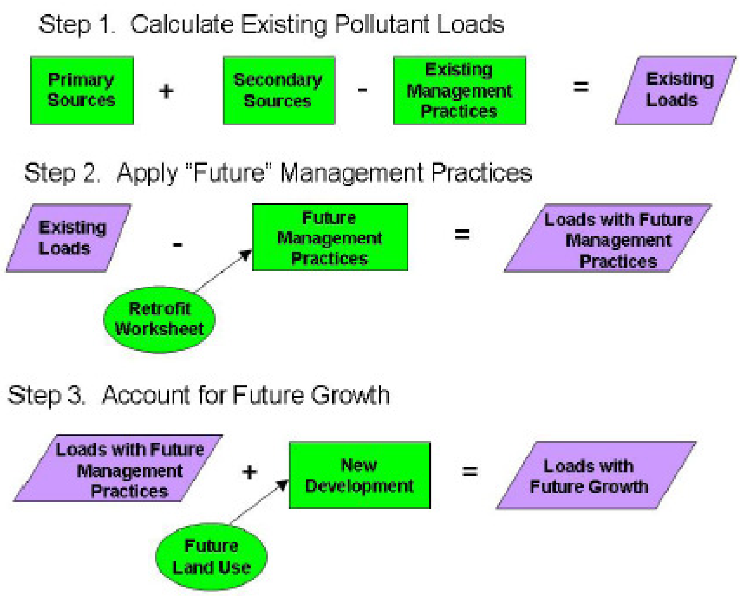
The WTM is a spreadsheet-based, decision-making and pollutant-accounting tool that calculates annual runoff volumes and pollutant loads (including total suspended solids, total nitrogen, bacteria -- fecal coliform, and total phosphorus) in small watersheds. The WTM is a simple modeling tool that is not physically based and calculates on an annual basis. WTM can serve as a tracking tool for pollutants to estimate loading and effectiveness of implementation efforts. The WTM can be populated with data from an initial monitoring effort, such as pollutant loads and practice efficiencies, then use the WTM to track practice implementation over time. Since the WTM is a spreadsheet, local government staff can maintain it and update it over time without hiring an outside consultant.

The WTM is structured to answer three questions (figure showing model structure):

1. What is the current pollutant load and runoff volume in the watershed?
2. What is the load or volume with future (i.e., proposed) management practices?
3. What is the load or volume after growth occurs in the watershed?

Each component of the figure represents one Excel worksheet that calculates the total load or load reduction.

Figure 5-1. Model Structure of the WTM. Purple boxes refer to loads, including pollutant loads and runoff volumes. Ovals are "support" worksheets that provide input to another calculation sheet.



The major inputs to the WTM include primary pollutant sources, secondary pollutant sources, and management practices (current and future). Primary sources include any pollutant source that can be determined by land use alone, while secondary sources require additional data (Table 5.6). Many of the secondary sources are individual point sources (such as the NPDES dischargers), but others are more diffuse, and include sources such as illicit discharges or septic systems.

Table 5.6. WTM Pollutant Sources.

Primary Sources	
Residential Land (various densities) Commercial Land Industrial Land Roadway	Open Water Active Construction Rural Land (includes cropland and pasture) Other Land Uses (user-defined)
Secondary Sources	
Septic Systems SSOs CSOs Illicit Connections Channel Erosion	Livestock Marinas Road Sanding (didn't apply for ADW) NPDES Discharges

The WTM accounts for the benefits of management practices in both the "current" and "future" conditions. The WTM is unique in both the range of practices it characterizes and the techniques it uses to estimate their effectiveness. The wide range of practices encompasses nonstructural as well as structural practices, including programmatic measures such as lawn care education (Table 5.7).

Since literature value load reductions can rarely be achieved with any management practice, the WTM accounts for those deficiencies using a series of discount factors to reflect practice implementation. For structural practices, these factors reflect a lack of space or poor maintenance and can hamper practice effectiveness over time. For programmatic practices, they reflect incomplete adoption of the practice by watershed residents. In both of these cases, specific design features (in the case of the structural practices), or outreach techniques (in the case of an education program) can make the practice more or less effective.

Table 5.7. Management Practices in the WTM.

Structural Practices	
Stormwater Treatment Practices (e.g., ponds and infiltration)	Stormwater Retrofits Channel Protection
Nonstructural and Programmatic Practices	
Lawn Care practices Street sweeping Riparian buffers Catch basin cleanouts	Marina Pumpouts Illicit connection removal CSO repair Septic system inspection/repair
Erosion and Sediment Control Lawn Care Education Pet Waste Education	Septic System Education Land Conversion Redevelopment with Improvements

The WTM account for the effects of future growth on pollutant loads, using future land use data (derived from a zoning map) and applying programs that will be in place to control runoff from new development. The resulting load from new development is then added to the "load with future management practices" to calculate the load including growth.

The updates to the WTM 2010 beta edition include the incorporation of runoff reduction, a description of the influence of turf and septic systems in more detail, and the addition of a "retrofit worksheet" that allows model users to describe individual stormwater retrofit practices. Account for runoff reduction is a critical modification to the WTM because it brings to light the advantages of many low-impact development practices, which would otherwise receive very little credit. Assumptions for calculating runoff reduction were taken from Hirschman et al.[19]

The methods employed in modeling and in pollutant load reduction calculations are described in greater detail in Appendix E.

Modeled annual Load estimates for total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), fecal coliform, and runoff volume for the Combined Downriver Watershed are presented in Table 5-8. Studies have shown that models that include all areas within a watershed tend to overestimate surface runoff and resultant pollutant loads. The higher values can be attributed to enhanced resolution of the stormwater load

[19] Hirschman, D., K. Collins, and T. Schueler. 2008. Technical memorandum: the runoff reduction method. Prepared for the U.S. EPA Region V and the Office of Wetlands, Oceans and Watersheds. Ellicott City, MD: Center for Water Protection.

and non-stormwater load in the WTM that includes factoring in contributions from channel erosion.

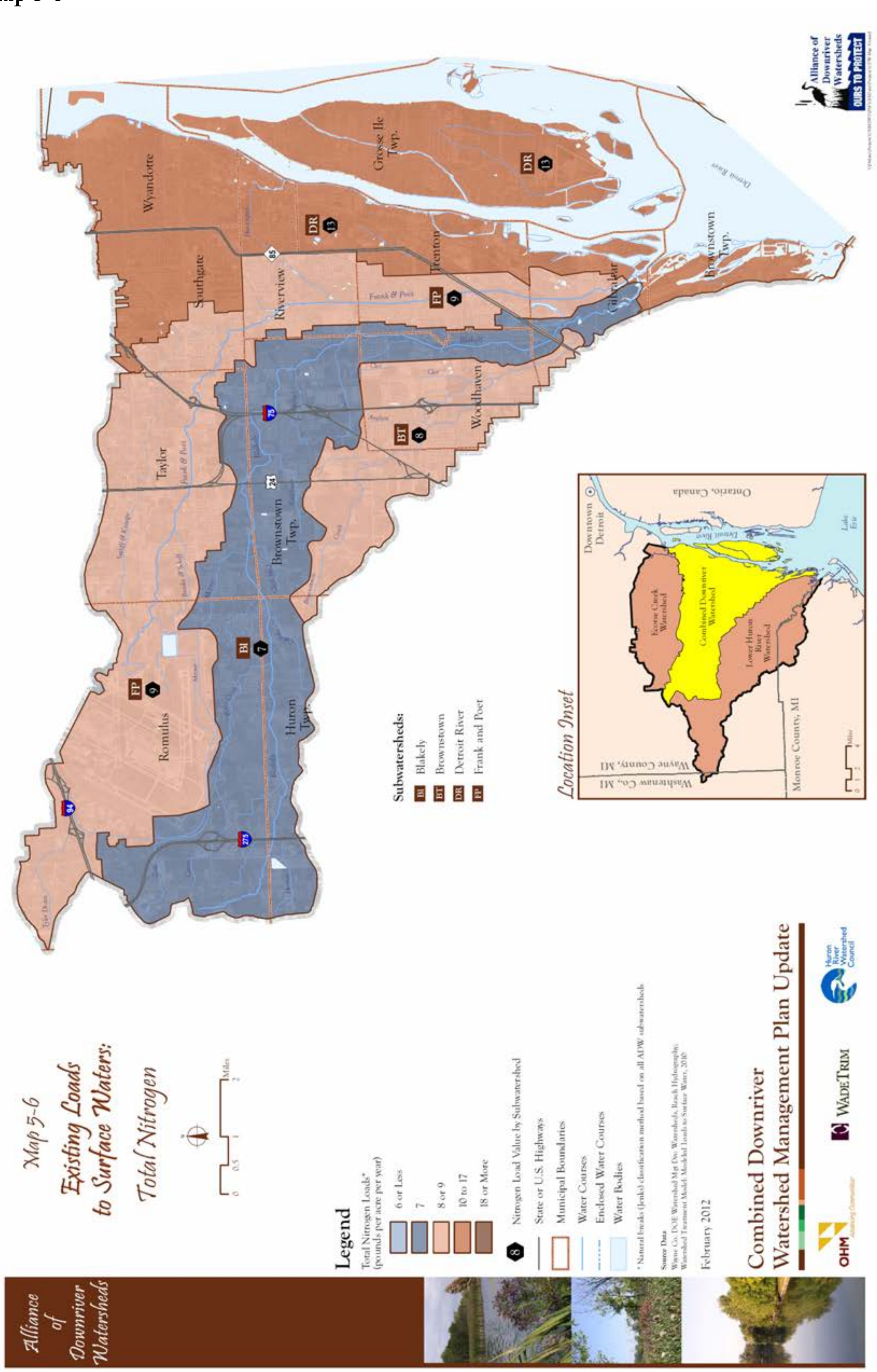
Table 5-8. Estimated Annual Pollutant Load Estimates for the Combined Downriver Watershed, Total Impervious Area (TIA) (lb./acre/year)

Existing Loads to Surface Waters

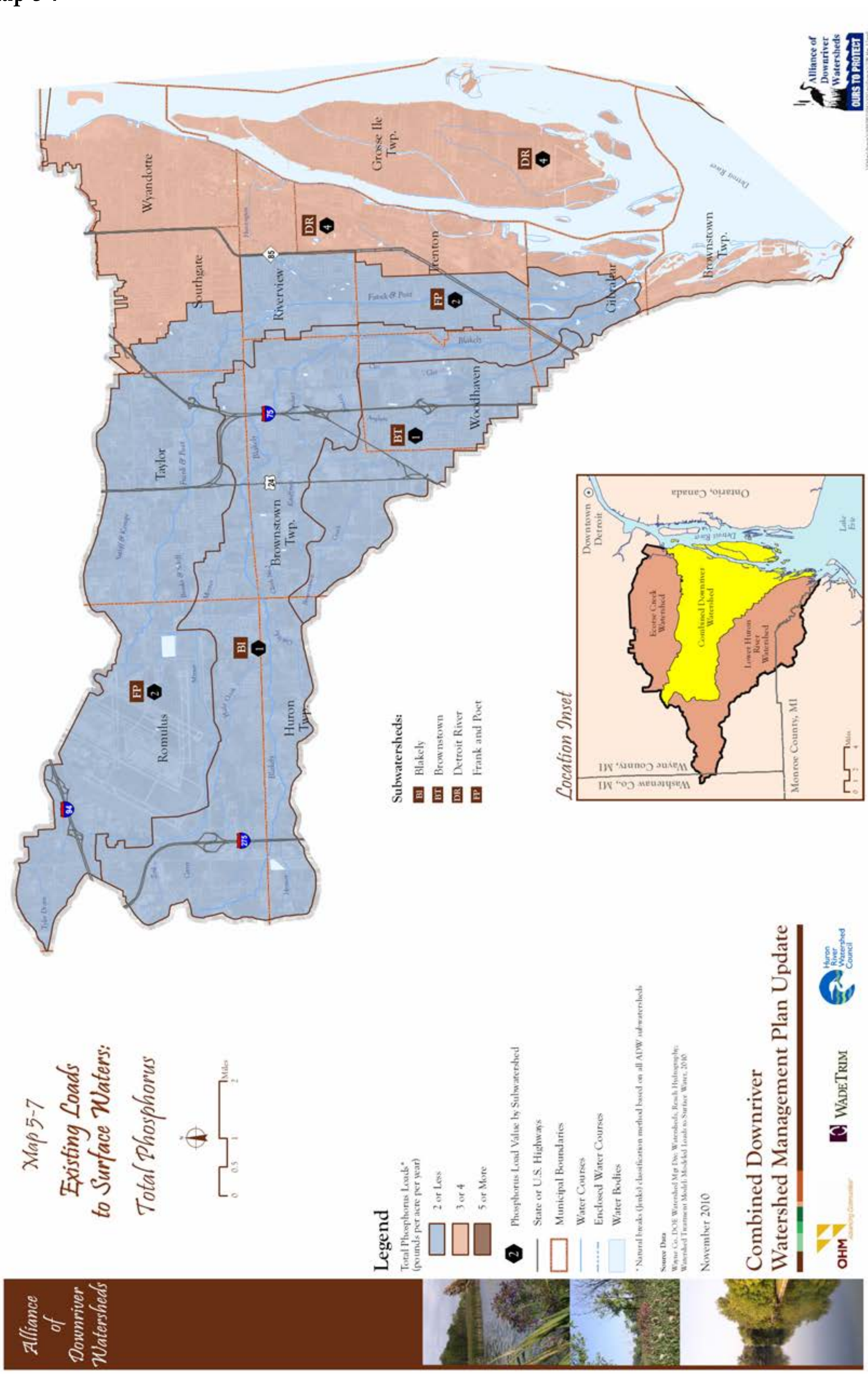
Total Load to Surface Waters	TN lb/acre/ year	TP lb/acre/ year	TSS lb/acre/ year	Fecal Coliform billion/acre/ year	Runoff Volume (acre-feet/ year)
Combined Downriver					
Blakely	7	1	538	1,761	9,917
Brownstown	8	1	595	2,295	4,000
Detroit River	13	4	585	5,927	15,974
Frank and Poet	9	2	699	2,729	16,813

Daily pollutant loads being contributed by the studied subwatersheds were calculated in order to determine baseline conditions and prioritize critical subwatersheds. Critical areas based upon pollutant loads are shown in the following figures. Analysis of the maps indicates a higher pollutant loading in the more urbanized areas of the Combined Downriver Watershed.

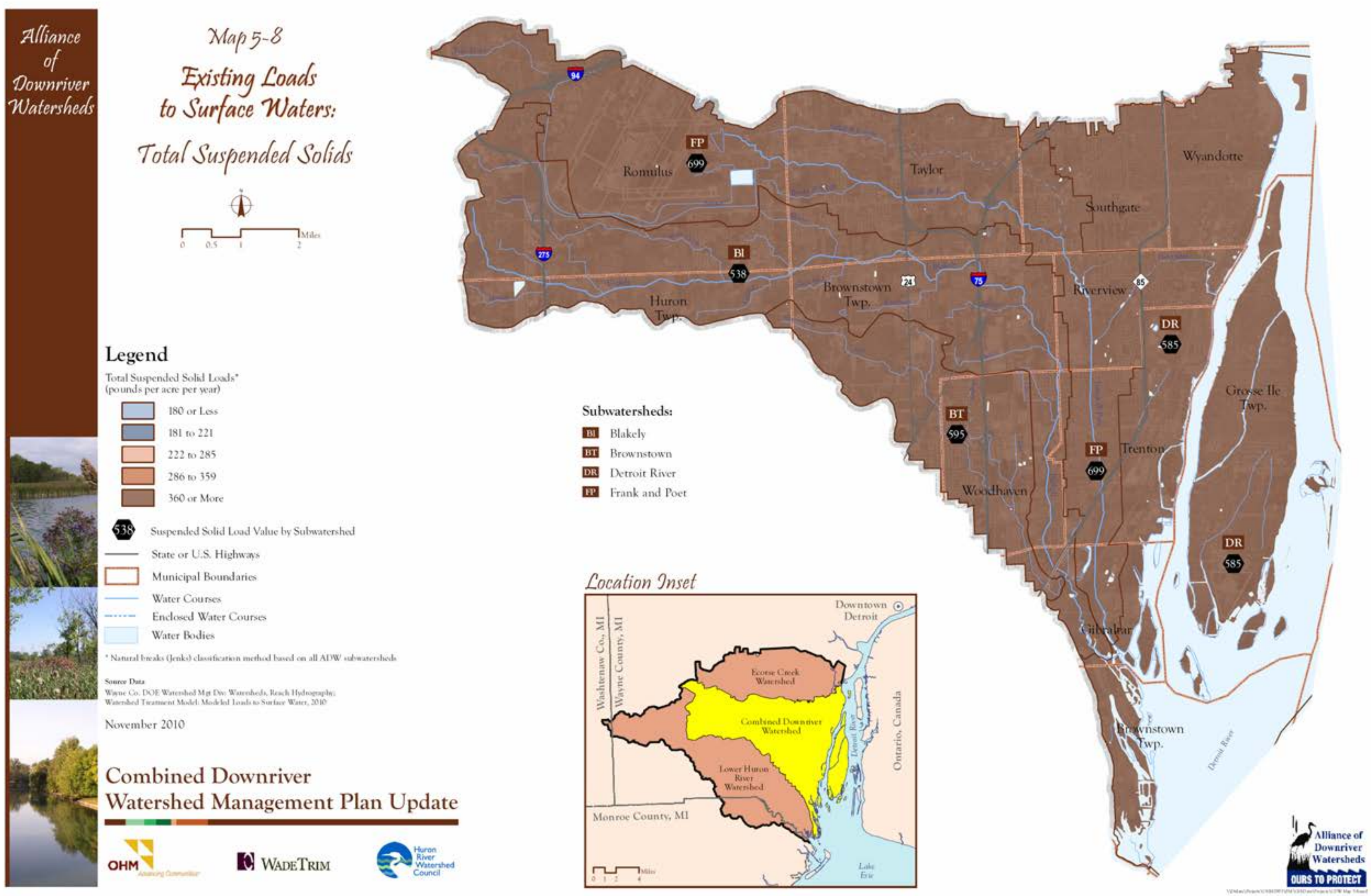
Map 5-6


Alliance of Downriver Watersheds
Map 5-6
Existing Loads to Surface Waters:
Total Nitrogen
Legend
Total Nitrogen Loads*
(pounds per acre per year)
6 or Less
7
8 or 9
10 to 17
18 or More
Nitrogen Load Value by Subwatershed
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver
Watershed Management Plan Update
Subwatersheds:
BL Blakely
BT Brownstown
DR Detroit River
FP Frank and Poet
Location Inset
Romulus
Taylor
Southgate
Wyandotte
Riverview
Trenton
Grosse Ile Twp.
Brownstown Twp.
Huron Twp.
Woodhaven
Ontario, Canada
Wayne County, MI
Monroe County, MI

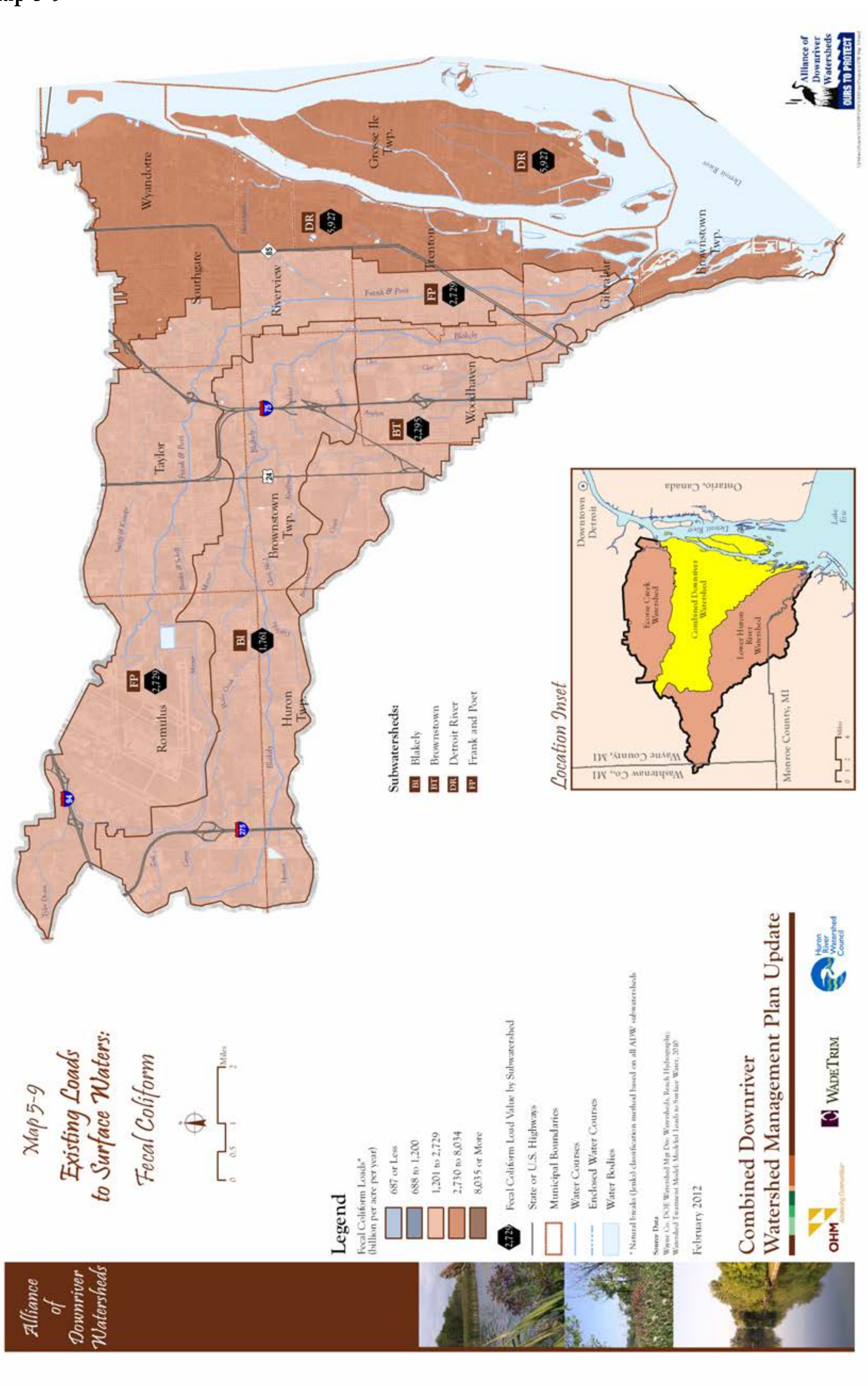
Map 5-7


Alliance of Downriver Watersheds
Map 5-7
Existing Loads to Surface Waters: Total Phosphorus
Legend
Total Phosphorus Loads* (pounds per acre per year)
2 or Less
3 or 4
5 or More
Phosphorus Load Value by Subwatershed
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
November 2010
Combined Downriver Watershed Management Plan Update
OHM
WADETRIM
Huron River Watershed Council
Subwatersheds:
BI Blakely
BT Brownstown
DR Detroit River
FP Frank and Poet
Location Inset
Downtown Detroit
Ontario, Canada
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Lake Erie
Romulus
Taylor
Huron Twp.
Brownstown Twp.
Woodhaven
Riverview
Southgate
Wyandotte
Trenton
Gibraltar
Grosse Ile Twp.
Alliance of Downriver Watersheds
OURS TO PROTECT

Map 5-8


Alliance of Downriver Watersheds
Map 5-8
Existing Loads to Surface Waters:
Total Suspended Solids
Miles
0 0.5 1 2
Legend
Total Suspended Solid Loads*
(pounds per acre per year)
180 or Less
181 to 221
222 to 285
286 to 359
360 or More
538 Suspended Solid Load Value by Subwatershed
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
* Natural breaks (Jenks) classification method based on all ADW subwatersheds
Source Data
Wayne Co. DOE Watershed Mgt Div. Watersheds, Reach Hydrography;
Watershed Treatment Model: Modeled Loads to Surface Water, 2010
November 2010
Combined Downriver
Watershed Management Plan Update
OHM
WADETRIM
Huron River Watershed Council
Subwatersheds:
BL Blakely
BT Brownstown
DR Detroit River
FP Frank and Poet
Romulus
Taylor
Southgate
Wyandotte
Huron Twp.
Brownstown Twp.
Riverview
Grosse Ile Twp.
Trenton
Woodhaven
Gibraltar
Detroit River
FP 699
BL 538
BT 595
DR 585
FP 699
DR 585
94
275
24
75
85
Location Inset
Downtown Detroit
Washtenaw Co., MI
Wayne County, MI
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Ontario, Canada
Monroe County, MI
Lake Erie
Alliance of Downriver Watersheds
OURS TO PROTECT

Map 5-9


Alliance of Downriver Watersheds
Map 5-9
Existing Loads to Surface Waters: Fecal Coliform
Legend
Fecal Coliform Loads* (billion per acre per year)
687 or Less
688 to 1,200
1,201 to 2,729
2,730 to 8,034
8,035 or More
Fecal Coliform Load Value by Subwatershed
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
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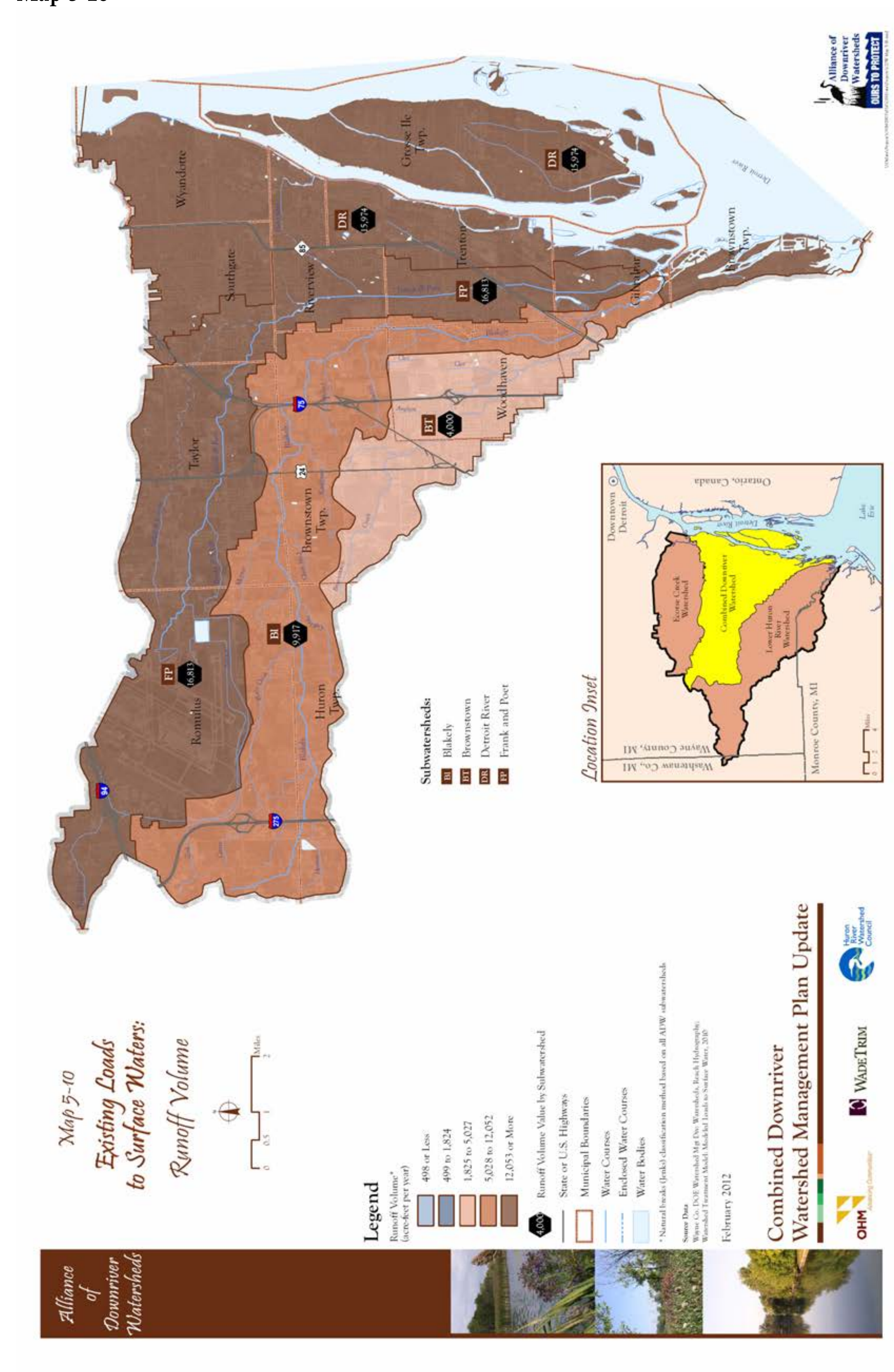
OHM
WADETRIM
Huron River Watershed Council
Subwatersheds:
Bl Blakely
BT Brownstown
DR Detroit River
FP Frank and Poet
Location Inset
Romulus
Taylor
Southgate
Wyandotte
Riverview
Trenton
Grosse Ile Twp.
Brownstown Twp.
Huron Twp.
Woodhaven
Gibraltar
FP 2,729
Bl 1,761
BT 2,295
DR 5,927
Ontario, Canada
Downtown Detroit
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Alliance of Downriver Watersheds
OURS TO PROTECT

Map 5-10


Alliance of Downriver Watersheds
Map 5-10
Existing Loads to Surface Waters: Runoff Volume
Legend
Runoff Volume* (acre-feet per year)
498 or Less
499 to 1,824
1,825 to 5,027
5,028 to 12,052
12,053 or More
Runoff Volume Value by Subwatershed
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
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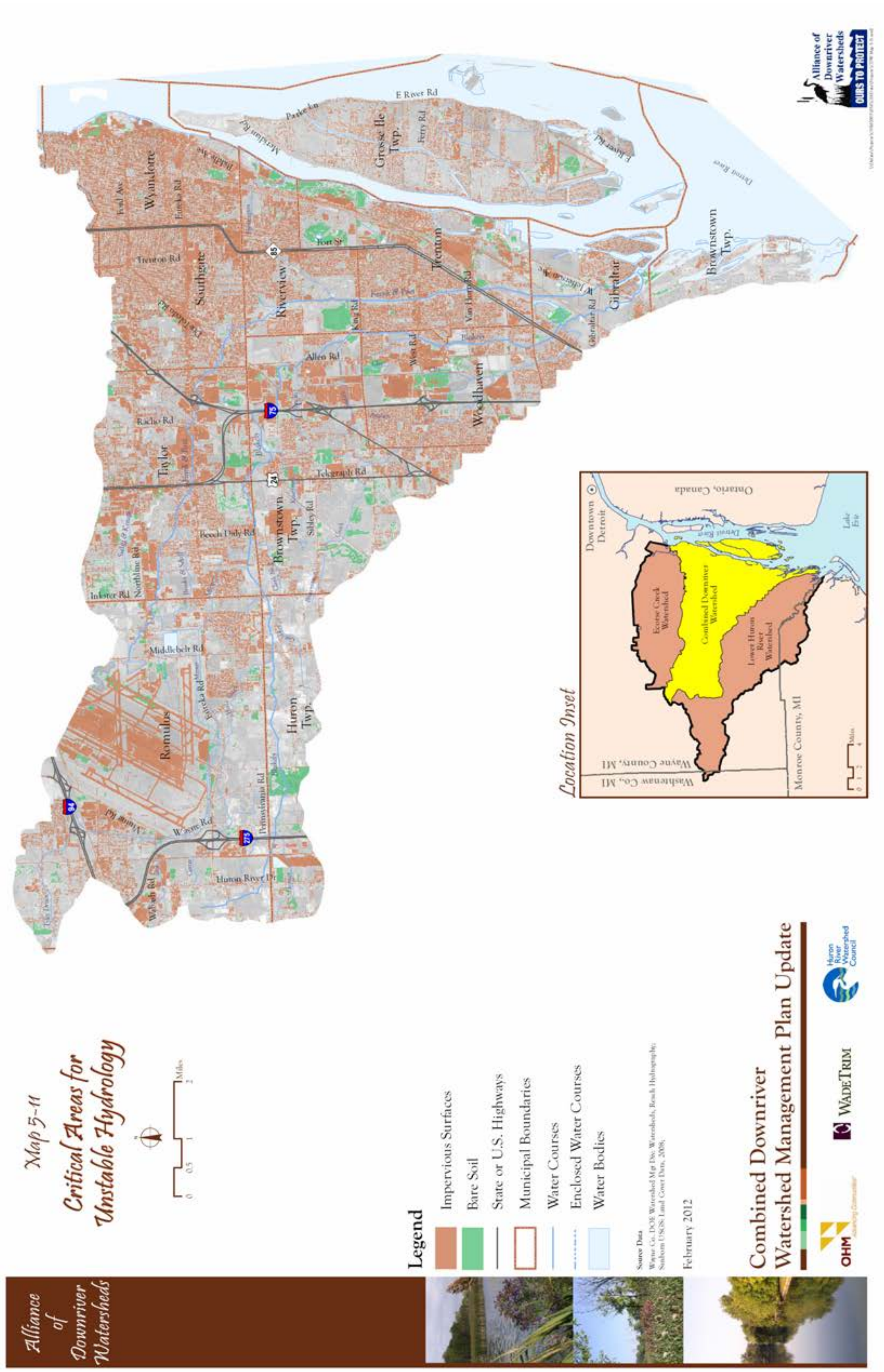
Subwatersheds:
Blakely
Brownstown
Detroit River
Frank and Poet
Location Inset
Romulus
Taylor
Southgate
Wyandotte
Riverview
Trenton
Gibraltar
Woodhaven
Brownstown Twp.
Huron Twp.
Grosse Ile Twp.
Ontario, Canada
Wayne County, MI
Monroe County, MI

5.4.5 Critical Areas for Flooding and Hydrologic Instability

Many of the watershed's water quality problems, the poor quality of in-stream habitat, and flooding problems are driven by the high amount of impervious surfaces within the watershed. Estimated categories of impervious cover were presented previously in Chapter 3. Map 5-7 illustrates impervious surfaces and bare soil within the Combined Downriver Watershed. This map was generated based upon the results of the Green Infrastructure Assessment the ADW completed in 2008. The Assessment was conducted using 2008 land cover data interpreted from USGS aerial photography. Land cover data was assessed to estimate stormwater storage capacity, air pollution removal and carbon sequestration of the existing green infrastructure in the ADW. Eventually this data will be used to estimate/track the increase in green infrastructure created by storm water/watershed restoration activities implemented by or facilitated through efforts of the ADW.

The Combined Downriver Watershed is approximately 36% impervious surface (urban, urban bare) and approximately 64% green infrastructure (woody vegetation, open space). As discussed previously, Schueler classifies streams exhibiting greater than 25% imperviousness as unlikely to support designated uses.

Map 5-11


Alliance of Downriver Watersheds
Map 5-11
Critical Areas for Unstable Hydrology
Legend
Impervious Surfaces
Bare Soil
State or U.S. Highways
Municipal Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
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Huron River Watershed Council
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Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Ontario, Canada
Downtown Detroit
Lake Erie
Romulus
Taylor
Southgate
Wyandotte
Riverview
Trenton
Woodhaven
Gibraltar
Brownstown Twp.
Huron Twp.
Grosse Ile Twp.
Allen Rd
Telegraph Rd
Inkster Rd
Middlebelt Rd
Beech Daly Rd
Wayne Rd
Huron River Dr
Fort St
Trenton Rd
Eureka Rd
E River Rd

5.5 ESTIMATED POLLUTANT LOAD REDUCTIONS

Potential reductions in annual loads stemming from the implementation of select actions and practices were estimated using information provided by the members of the ADW, published reports, and geographical information analysis and modeling using the Watershed Treatment Model.

The management practices for which there is sufficient quantitative information to allow modeling and estimation of pollutant reductions are a small subset of all available best management practices. Other, less quantifiable, but equally important actions should also be implemented, and some of these (e.g. public education) are required elements of the NPDES Phase II Stormwater permits held by the communities and entities.

Chapter 6 presents the management practices and potential BMP projects selected by the communities. These activities were added to the Watershed Treatment Model and estimated pollutant reductions are shown in Table 5-9.

It should be noted that BMPs for which there is sufficient quantitative information to allow modeling and estimation of pollutant reductions are a small subset of all available best management practices. Other, less quantifiable, but equally important actions should also be implemented, and some of these (e.g., public education) are required elements of the Combined Downriver communities' Phase II Storm Water permits.

The modeled BMPs and the resultant pollutant load reduction estimates were separated into two categories: those that, if implemented, would reduce/remove both existing and future pollutant loads and sources, and those that will apply to future loading estimates only. These are presented in Tables 5-9 and 5-10, respectively. Additional description of the methods employed to arrive at these estimates for each of the seven BMPs modeled is provided in Appendix E.

Table 5-9. Estimated Load Reductions from Existing Annual Pollutant Loads in the Combined Downriver Watershed for Select BMPs (lb./acre/yr)

Reduction in Loads to Surface Waters w/ Future Practices

Total Load to Surface Waters	TN lb/acre/ year	TP lb/acre/ year	TSS lb/acre/ year	Fecal Coliform billion/ year	Runoff Volume (acre-feet/ year)
Combined Downriver					
Blakely	0.0015	0.0003	0.0923	0.0576	2
Brownstown	0.0008	0.0002	6.7169	0.0121	0
Detroit River	0.0030	0.0011	2.4643	0.1250	5
Frank and Poet	0.0040	0.0011	3.5758	0.2141	6

5.6 COMPARISON TO ANTICIPATED POLLUTANT REDUCTION TARGET(S)

The Blakely/Brownstown and Frank & Poet Creek TMDLs require increases in the macroinvertebrate and habitat scores using P-51. A reduction in TSS loads is used as a secondary measure. TSS load reductions were calculated using available data and modeled BMPs and action items. It should be noted that TSS reductions could theoretically be met without increasing P-51 scores. The estimate for existing TSS load (Table 5-8) equals 33,322,904 lb./year. The total estimated pollutant removal attributed to implementation of BMPs at locations identified by CDWIC members as well as estimated BMP implementation at private locations** equals 5,959,317 lb./year; approximately a 18% reduction from existing loads. These estimated pollutant load reductions are based off of a 15-year timeline (2012-2026). As is detailed in Chapter 6, watershed communities identified specific projects that they desire to implement over the next 5 years (2012-2016). The acreage, number of installations, miles, etc. of the projects desired within the first 5 years was extrapolated an additional 10 years under the assumption that implementation projects would continue to occur at the same rate. In addition to BMPs on public properties, it has been assumed that BMPs on privately owned properties will take place at the same rate. Although these BMPs do not achieve the full reduction targets, they are a step in the right direction and demonstrate a commitment of the ADW members to working toward achieving the goals of the TMDLs.

Table 5-10. Estimated Reduction in Loads to Surface Waters with Future Practices (at both Public and Private Locations)

Reduction in Loads to Surface Waters w/ Future Practices (Private Development)

Total Load to Surface Waters	TN lb/year	TP lb/year	TSS lb/year	Fecal Coliform billion/ year	Runoff Volume (acre-feet/ year)
Combined Downriver					
Blakely	2,314	491	141,083	88,015	248
Brownstown	305	59	2,565,801	4,611	19
Detroit River	2,230	866	1,858,125	94,244	236
Frank and Poet	1,573	424	1,394,308	83,481	129

** Implementation of BMPs at privately owned locations were estimated to be directly proportional to the amount of area of those done at publicly owned locations. As a factor of safety, it was further assumed that only 10% of these private BMPs would be implemented.

Again, the BMPs modeled should not be considered the only best management practices that will assist communities in progress toward water quality goals. Public education, policy review and implementation of new or revised ordinances, demonstration of porous parking and paver materials, retro-fitting storm water treatment controls in areas of re-development, watershed wide tree planting programs, and other BMPs are underway and will lead to further reductions. The combined implementation of many management practices will contribute to pollutant reductions. The ADW will continue to

Combined Downriver Watershed
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Inter-Municipality Committee

evaluate progress of the Watershed Management Plans through a variety of means as is further described in Chapter 6.

6. Watershed Action Plan


Blakely Drain at Jefferson

Chapter Contents

IDEP Plan
Public Education Plan
Progress Evaluation Monitoring Plan
Planning and Reporting
Other Activities by Community
Related Efforts and Initiatives

After gathering information and input from the various entities within the watershed, and reviewing current policies and programs that are in place, a variety of management alternatives were discussed to address the priority pollutants and causes and to work toward achieving the goals of the Watershed Management Plan. The following chapter highlights the ADW's plan for the next 5 years related to IDEP, Public Education, Monitoring, Planning and Reporting, as well as other storm water management activities. This chapter also summarizes a variety of related initiatives and efforts occurring in the area or region that have a direct effect on improving water quality and the quality of life in the region. The ADW, including the Combined Downriver Watershed communities have been working over the years to implement requirements, and document and measure progress. As is detailed in the ADW budget and financing plan, the ADW has organized its planned activities into one of five categories:

- Illicit Connection/Discharge Elimination Plan (IDEP)
- Public Education
- Progress Evaluation Monitoring
- Planning and Reporting
- Other Storm Water Management Activities

Each of these categories, and a discussion of the plan for the next 5 years is on the following pages.

Combined Downriver Watershed
OURS TO PROTECT
Inter-Municipality Committee

6.1 Illicit Connection/Discharge Elimination Plan (IDEP)

A major focus of the Alliance of Downriver Watersheds (ADW) is the elimination of illegal discharges to surface waters from illicit connections, illegal dumping, and lack of awareness. The Illicit Discharge Elimination Program (IDEP) directly results in the annual removal of significant quantities of raw sewage and other pollution which pose a threat to both human and aquatic life.

The Federal Clean Water Act was amended in 1987 to include municipal and other urban storm water discharges on the list of regulated sources of water pollution. In November 1999, the U.S. Environmental Protection Agency (EPA) promulgated Phase II of the National Pollutant Discharge Elimination System (NPDES) storm water regulations, which affects virtually all communities in southeast Michigan. One of the requirements of the federal Phase II NPDES storm water regulations and the MDEQ General Permit is to develop, implement, and enforce a program to eliminate improper connections to the storm sewer system and other improper discharges to surface waters. Within a given geographic area, multiple agencies (e.g., county, local unit of government, transportation agencies, etc.) typically have obligations and authority to manage storm water. An effective storm water management program, and particularly illicit discharge elimination efforts, requires a partnership between the County, local government, and other agencies that own, operate, or control storm water discharges within a given geographic area. The over 25 communities and agencies in the ADW have received coverage under the MDEQ storm water General Permit and have initiated the illicit discharge elimination program requirements of the permit.

The ADW, in collaboration with Wayne County staff, actively identifies and eliminates potential and existing improper discharges and sanitary sewer connections to storm water systems and open waterways. The Collaborative IDEP consists of 4 primary activities:

1. Coordinated Complaint Response
2. Staff Training
3. Visual Inspection During Routine Field Operations (to address seepage from sanitary sewers, on-site sewage disposal systems failures and illegal dumping)
4. County-Based Advanced investigations

Coordinated Complaint Response

The ADW members promote the use of the Wayne County Department of Public Services (WCDPS) telephone "hot line" (888-223-2363) to log and coordinate response to environmental complaints and concerns of all types. This effort is planned to continue.

Staff Training

The ADW also provides IDEP training for its members through the Wayne County IDEP Training Workshop. These workshops are typically held annually and provide technical information including identification and reporting of suspicious discharges observed during routine field operations, advanced investigation case studies, a “hands on” problem solving exercise, an examination, and a certificate of successful completion. Training will continue to be offered on an annual basis.

Advanced Investigations

County-based Advanced Investigations techniques include dry weather screening and mapping of points of storm water discharge to waters of the State as well as commercial, industrial and institutional facility dye-testing. These activities are focused in areas that have previously been identified as problem areas through in-stream IDEP investigative monitoring. Illicit discharges and connections are identified by dye testing facility sanitary sewer fixtures, observing "housekeeping" issues, and looking for signs of illicit discharges or material handling/storage practices that may allow material to migrate to a storm drain or watercourse. Facilities found to have improper sanitary sewer connections or illicit discharges to the storm sewer system, or to an open waterway, are notified. Follow-up work with facility owner/managers and local community staff to ensure corrective actions are taken and compliance with federal, state, and local regulations is achieved. Part of this effort includes education and technical assistance to businesses and facility staff regarding storm water pollution prevention. The ADW has been doing a significant amount of this work (through Wayne County) due to grant funding received. These advanced investigations are planned to continue based on funding availability over the next 5 years.

Finally, all onsite sewage disposal systems (OSDS) in Wayne County are subject to regular inspection via the Onsite Sewage Disposal System Management Ordinance. This ordinance requires inspection of systems at the time of property transfer. The ordinance also requires a septic tank evaluation report at each clean out that identifies the condition of the tank, quantity of sewage pumped out and disposal site.

6.2 Public Education

The ADW Public Education strategy for the ADW as a whole (outside of communities' individual commitments as documented in their SWPPIs) is categorized into 3 primary activities:

- Distribute Pollution Prevention Literature
- System Labeling and Signage
- Volunteer Efforts

Each year, the ADW sets aside a portion of their dues for public education efforts and each year, the ADW Public Education Committee develops a plan based on the dollars available. Over the next 5 years it is anticipated that the ADW will continue these efforts as outlined below:

Distribute Pollution Prevention Literature

Continue to provide funds for pollution prevention literature (i.e. 7 simple steps, pet waste tip card, earth friendly stickers, 24-hour hotline card) to be distributed to the ADW members. Literature is printed and distributed by Wayne County to the ADW member communities for further distribution. In addition, the ADW is working to specifically target elementary and/or middle schools in the watershed for pollution prevention literature distribution.

System Labeling and Signage

Several years ago, with the assistance of the Detroit Riverkeeper, the ADW focused on a labeling campaign of storm water inlets with "No Dumping" stickers. Thousands were placed throughout the ADW. In 2010, the ADW switched the focus to the installation of "Entering Watershed" and "Creek Crossing" signs. ADW funds were used to coordinate a sign ordering program as well as coordination by Wayne County to get ordered signs made and installed. It's anticipated that the signage program will continue for the next several years.

Volunteer Efforts
The Alliance of Downriver Watersheds partners with several agencies to assist with a variety of volunteer efforts. This includes significant volunteer coordination efforts by Wayne County. Wayne County and the ADW continue to recruit and support the involvement of the *Downriver Citizens for a Safe Environment - Stream Team* teachers and schools in the benthic macroinvertebrate monitoring efforts as well as in watershed restoration activities including riparian corridor management and grow zones projects. Wayne County is also administering the Michigan Green Schools Program within the ADW. In 2010, fourteen schools within the ADW were recognized by Wayne County as Green Schools based on their voluntary efforts to be "Green". Volunteer efforts and opportunities are also coordinated with the Detroit Riverkeeper, Friends of the Detroit River, and the Dearborn Heights Watershed Stewards. The Huron River Watershed Council is also heavily involved with the ADW. The HRWC organizes and facilitates a number of volunteer efforts throughout the watershed with a particular focus in the Lower Huron River Watershed and Friends of the Woods Creek. These partnerships and volunteer efforts are anticipated to continue over the next 5 years and beyond.

6.3 Progress Evaluation Monitoring

The Alliance of Downriver Watersheds (ADW) has been engaged in environmental monitoring since its inception in 2006. At that time, the initial monitoring program was developed based on strategies developed in the original Watershed Management Plans (2007). The ADW monitoring has continued to operate on this basis, with specific details established by the ADW's Technical Committee. Some of this monitoring has been in response to grant projects, but much has been collected using ADW budget funds. The following monitoring strategy has been developed with details to be refined by the ADW Technical Committee each year.

The monitoring strategy includes the monitoring and analysis of the following elements:

- Precipitation
- Stream Discharge/Flow
- Water Temperature
- Stream Channel Geomorphology
- Macroinvertebrate Monitoring
- Land Cover/Green Infrastructure
- MDEQ Fish, Macroinvertebrates, Habitat and Water Quality
- Water Quality

Each of the elements is detailed on the following pages and summarized in the Five-year Monitoring Plan Table 6-1.

Precipitation
Currently, five weather stations are operated in or near ADW watersheds. The station with the longest and most consistent record is located at the Detroit-Wayne Airport. Other stations are operated independently in Flat Rock, Woodhaven, Southgate, and Taylor. These stations provide critical precipitation data on a sub-hour basis that is useful for relating to other collected data. The data needs to be downloaded and processed for use, but this activity comes at little overall cost to the ADW and should continue.

Stream Discharge/Flow
Stream discharge data, coupled with water quality data can be used in pollutant modeling and pollutant loading calculations to determine areas where storm water

pollution remediation efforts need to be undertaken. Discharge also impacts stream habitat for aquatic organisms, and can scour banks and stream bottoms. Much of the efforts and projects the ADW will engage in over time are designed to store or infiltrate storm water and reduce large flow peaks. Therefore, discharge monitoring should continue in each watershed until the established targets are met and until stable aquatic life communities are established and maintained.

Seven stream gages are currently operated continuously in the watershed. One is operated by USGS (North Branch of Ecorse Creek) all year, and six others are operated by Wayne County and the Huron River Watershed Council (HRWC), roughly April through October. Theses gages are installed at the beginning of each monitoring season and removed prior to freeze over. The gages can be relocated relatively easily. Six of the gages have been in operation for three seasons following the 2010 season. It is recommended that these gages be moved to new streams that have not yet been monitored, and operated there for another three years. Gages should be returned to original sites sometime after major projects or within 5-6 years to determine change in flow statistics. The operation and maintenance of the USGS gages is done at no direct cost to the ADW. The other six stations require staff support to install, download data, calibrate, and maintain. Minimal extra equipment cost is required. Alternatively, the ADW could choose to remove or reduce the extra stations (to save cost) and return to original sites at a later time.

Water Temperature

Water temperature data, tracked over the summer, provides information about the habitat suitability for different fish and other aquatic wildlife. It is measured at the six flow gages operated by the ADW at little additional cost.

Stream Channel Geomorphology

Stream bank erosion has been identified as a major problem within ADW watersheds, but it is a difficult problem to measure. Using stream channel geomorphology field measurement techniques (as instructed by Joe Rathbun, MDEQ), and the Tractive Force calculations, Wayne County has assessed stream channel stability at 14 sites across the watershed through the 2010 season. This resulted in stream channel profiles and measurements of stream slope and substrate composition. These measures are used to estimate the stream stability as degrading (eroding), stable or aggrading (filling with sediment).

Geomorphology measurements require several hours of trained staff support, using already purchased equipment, and an amount of data entry and analytic time. It is recommended that the current level of effort (7 sites per year) continue until all (or most) macroinvertebrate sites are evaluated. This will require four – five years total. Then, return measures should be made on a 5-year return basis. This will provide channel stability measurements across the watershed, as well as, stabilizing or destabilizing trends over time. Wayne County will work with Stream Teams and others to encourage the participation and involvement of students and other volunteers in these efforts to further promote awareness and stewardship in the watershed. In 2011, the 7 sites completed in 2010 will be revisited to ensure results and determine the usefulness of the data.

Macroinvertebrate Monitoring

Macroinvertebrate density and diversity data are used as indicators for stream habitat and water quality. Data collection efforts have historically occurred three times a year (spring and fall for macroinvertebrates and winter for stoneflies) by Wayne County staff and Stream Team volunteers, who are organized by Wayne County and HRWC. This sampling currently occurs at 28 sites. Although much of the data is collected by volunteers, data is collected under a quality assurance plan. This data collection not only provides historical water and habitat quality conditions based on the presence of certain aquatic organisms, but also provides opportunities for public involvement. The use of volunteers is cost effective and provides a broad, long-term, general assessment of conditions. Therefore, it is suggested that macroinvertebrate sampling continue in the watershed to provide stakeholders an overall assessment of conditions at multiple locations within each watershed and to promote stewardship within the watershed.

Land Cover/Green Infrastructure

Land cover mapping allows for an analysis of aerial photography to determine the extent of pervious (green) and impervious (gray) land cover across the watershed. A complete land cover fly over was completed and classified in 2008-09. A Green Infrastructure analysis was conducted at that time as well to measure the performance and value of green infrastructure in providing storm water benefits. This data can also be used on a project-level basis to estimate water quality and storm water benefits. Looking forward, this data will provide the ADW with a method to evaluate the impact of future development using traditional engineering methods verses more "green" engineering methods. The ADW will assess whether or not additional land cover data collection is needed in five years (to conduct a change analysis), or 2014. This will be dependent on how much change has occurred in the watershed. No further investment is anticipated until that time.

MDEQ Fish, Macroinvertebrates, Habitat and Water Quality

MDEQ has established a five-year rotational watershed monitoring schedule, in which MDEQ field staff focus on selected watersheds in a given year and select sites for measurement of macroinvertebrates, habitat assessments and limited water quality parameters. Ecorse Creek and Downriver watersheds were last sampled in this way in 2006 and are scheduled again for 2011. The Lower Huron was monitored in 2007 and is scheduled again for 2012. ADW should provide input to MDEQ to suggest selection of sites consistent with ADW sites to provide a basis of comparison of methods and statewide trends. Fish assessments are done on a less predictable basis. This monitoring comes at no cost to the ADW.

Water Quality

Over 30 sites were sampled for a range of water chemistry parameters in 2007, as part of a grant project. These sites were sampled during dry weather (low flow) conditions with the focus of detecting illicit discharges. Parameters included ammonia, detergent, conductivity, total phosphorus, TSS, and E. coli. Each site was sampled five times at irregular intervals. No assessment of loading or subwatershed assessments were conducted at that time. Additionally, the MDEQ contracted the collection of E. coli data across Ecorse and Combined Downriver sites to develop TMDLs for those watersheds in 2008. The lack of chemistry data presents a significant gap in monitoring coverage. The ADW should consider adding a program to select a subset of sites to conduct regular dry and wet-weather sampling and supplement with wet weather event sampling and investigation of storm water hot spots, based on the existing water quality data set.

Table 6-1 summarizes the 5-year Monitoring Plan for the ADW (2010 – 2014).

Evaluation

The monitoring strategy will be evaluated each year following data analysis and reporting. Each year the ADW Technical Committee will meet prior to the Spring/Summer monitoring season to evaluate the success of previous years and the long-term monitoring strategy. At that time, each of the monitoring parameters (described above) will be considered for the value of the information they provide to evaluating two overarching measures:

1. The degree to which the parameter informs the ADW about the status and trends of overall watershed health as compared to standard state and national benchmarks; and/or
2. The ability of the parameter to evaluate the success or failure of implementation projects and other watershed management efforts.

In addition to the parameters measured, additional aspects of the monitoring program will be evaluated including monitoring sites, measurement protocols and frequencies, analytical processes and the reporting framework. Monitoring sites will be re-evaluated for accessibility and measurability and overall representativeness of general watershed conditions. Protocols will be reviewed for improvement of implementation and compared to any new developments in monitoring procedures nationally. In this way, the monitoring program will be adaptive to the data and information needs of the ADW and other stakeholders, field conditions and new innovations and developments.

6.4 Planning and Reporting

Planning and reporting activities for the ADW consists of 4 primary items:

- ADW operations
- Website
- Annual Report
- Grant Writing

Regularly scheduled ADW meetings, including sub-committee meetings, to provide information to ADW members and to take action on budgets, direction, grant applications, etc. will continue. The ADW as a whole typically meets on a quarterly basis and are anticipated to continue to do so.

This category also includes the regular maintenance of the ADW website which is anticipated to be a continued effort over the next 5 years. (www.allianceofdownriverwatersheds.com)

The ADW plans to continue to develop an annual report each October to summarize the efforts of the ADW. The ADW Annual Report is typically included as an attachment to each entities annual report that is submitted to the MDNR.

Grant writing tasks are budgeted for and will continue over the next 5 year period. The ADW has been successful in obtaining grant funds over the past several years, leveraging the pooled ADW funds together. The ADW will continue to seek outside funding sources to assist in implementing the Storm Water and Watershed Management activities identified in this Watershed Management Plan.

Table 6-1

Five Year Monitoring Plan Summary (2011-2015)
Ecorse Creek, Combined Downriver, and Lower Huron River Watersheds

Monitoring Activity	Proposed Responsible Party	Sites/Frequency/Season	Year Performed 2011	2012	2013	2014	2015
Planning & Reporting							
ADW develops/refines monitoring plan	ADW Facilitator	Not applicable	X	X	X	X	X
Data Handling, Data Management & Analysis	WCD/HRWC	Not applicable	X	X	X	X	X
Prepare Monitoring Report/Brochure/Press Release	ADW	Not applicable				X	
Physical Monitoring							
Precipitation	Communities	April - Oct at 5 sites	X	X	X	X	X
Flow	HRWC/WCD/USGS	April - Oct at 7 sites	X	X	X	X	X
Temperature	HRWC/WQD	April - Oct at 6 sites	X	X	X	X	X
Geomorphology/stream classification	HRWC/Stream Team/WQD	28 sites, 5-year returns	X	X		X	X
Biological Monitoring							
Macroinvertebrates	HRWC/Stream Team/WQD	3x per year at 28 sites	X	X	X	X	X
Green Infrastructure Monitoring	WCD	Across ADW					X
Fish, Macroinvertebrates, Habitat	MDEQ/DNR	As selected by MDEQ/DNR	X	X	?	?	?
Water Quality							
Dissolved Oxygen (DO)	ADW	April - September at 10 sites 2x per month		X	X	X	X
E. Coli	MDEQ	April - September at 10 sites 1x per week; wet event sampling		X	X	X	X
Total Phosphorus (TP)	ADW	April - September at 10 sites 2x per month; wet event sampling		X	X	X	X
Embeddedness	ADW	April - September at 10 sites 2x per month; wet event sampling		X	X	X	X
Public Education/Involvement							
Public Survey	SEMCOG	Not applicable		?	?		
Summary of Volunteer Restoration Efforts	HRWC/Stream Team/WCD	Not applicable	X	X	X	X	X
Pollution Prevention							
Illicit Discharges Identified & Eliminated	WCD/Communities	Not applicable	X	X	X	X	X

HRWC = Huron River Watershed Council
WQD = Wayne County Department of Public Works, Water Quality Division
USGS = United States Geological Survey
MDEQ = Michigan Department of Environmental Quality
DNR = Michigan Department of Natural Resources
SEMCOG = Southeast Michigan Council of Governments

Alliance of Downriver Watersheds — June 2012

6.5 Other Storm Water Management Activities

As part of the 2012 WMP Update, each community within the watershed identified a number of projects that they would like to implement if funding is available (outside of permit requirements). This information was collected through a series of meetings with the individual communities. Storm Water Management Activities and best management practices were categorized into one of 16 categories:

- Green Roof
- Green Street
- Porous Pavement Installation
- Grow Zones/Native Plantings/Rain Gardens
- Bank Stabilization/Restoration of Bank or Riparian Features
- Culvert/Bridge Replacement
- Storm Water Detention/Retention
- Increase Floodplain
- Public Education/Stewardship
- Hydrodynamic Separators (Vortechnics/Stormceptor)
- Land Acquisition or Conservation Easements
- Water Efficiency
- Comprehensive Street Tree Planting Program
- Water Harvesting/Reuse
- Downspout Disconnection Program
- Other

The best management practices identified above are described in further detail in Chapter 5.

Table 6-2 identifies which communities within the Watershed are proposing to implement BMPs and what year they would like to do so (if funding is available). It's anticipated that this table and the identified projects will be utilized for developing grant applications in the coming years. Map 6-1 geographically illustrates this information.

Table 6-2

	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-15
Best Management Practice	**2012**	**2013**	**2014**	**2015**	**2016**	**2017-2026**
Green Roof			1.7 acres			
Romulus Athletic Center	X					3.4 acres
Romulus Proposed Fire Station			X			
Southgate DPW Building		X				
Wayne Co Downriver WW Treatment Facility			X			
Woodhaven Brownstown School Buildings	X	X	X	X	X	
Green Street			**1.5 acres**			
Southgate – High School/Nature Center				X	X	3 acres
Porous Pavement			**12 acres**			
Rockwood Municipal Parking Lot			X			24 acres
Romulus City Hall/Library/Court Parking Lots	X					
Southgate City Complex				X	X	
Taylor Meadows Parking Lot		X	X			
Taylor Conservatory		X				
Taylor Wick Road		X	X	X	X	
Wayne Co Central Maintenance Yard					X	
Wayne Co Goddard Yard			X			
Wayne Co Sibley Yard			X			
Wayne Co Elizabeth Park			X			
Wayne Co New Boston Yard			X			
Wayne Co Downriver WW Treatment Facility			X			
Wyandotte School Track	X					
Grow Zones/Rain Garden			**9.8 acres**			
Gibraltar Middle Gibraltar/Jefferson SE Corner	X	X	X			20 acres
Grosse Ile Twp West River Rd and Parkway			X			
Riverview Frank & Poet Drain	X	X	X	X	X	
Romulus Animal Shelter	X					
Romulus Proposed Fire Station			X			
Southgate "The Gate" Golf Course		X	X	X		
Southgate City Complex		X	X	X		
Taylor Lakes of Taylor/Taylor Meadows (2)		X	X	X		
Taylor Conservatory			X			
Taylor Midtown Walkway		X	X			
Taylor Wick Road		X	X	X	X	
Wayne Co Inkster Rd at I-94	X					
Wayne Co Ecorse Rd at I-94	X					
Wayne Co Misc Road ROWs		X				
Wayne Co Elizabeth Park		X				
Wayne Co Central Maintenance Yard		X				
Wayne Co Goddard Yard		X				
Wayne Co Sibley Yard		X				
Wayne Co Downriver WW Treatment Facility		X				
Woodhaven Park Improvements	NA					
Woodhaven Brownstown School Buildings	X	X	X	X	X	
Wyandotte Extend Grow Zone at School		X				

Combined Downriver Watershed
OURS TO PROTECT
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Table 6-2 continued

Best Management Practice	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016	Years 6-15 2017-2026
Bank Stabilization			0.8 miles			
Brownstown - Brownstown Creek (Twp Hall)	X	X				1.6 miles
Brownstown - Brownstown Creek (Telegraph to Twp Limits)			X	X	X	
Riverview Reflection Pond N of Sibley at Huntington	X	X	X	X	X	
Romulus Elementary				X		
Romulus Black Creek Restoration				X		
Southgate Frank and Poet at Former State Reg Ctr	X	X				
Southgate Frank and Poet West of Dix-Toledo	X	X				
Taylor Midtown Walkway		X	X			
Taylor Sexton Kilfoil - Beech Daly to Pelham		X	X	X	X	
Taylor Frank and Poet at Gibraltar Trade Ctr			X	X	X	
Taylor Frank and Poet at Southland Mall		X	X	X		
Wayne Co - Drain ROWs Petitioned by LUGs		X				
Wayne Co Elizabeth Park Shoreline Protection		X				
Woodhaven Two Creek Locations	NA					
Wyandotte Detroit River at Bishop Park and Golf Course			X	X	X	
Wyandotte S. Branch near Goddard and 12th St.			X	X	X	
Culvert/Bridge Replacement			8 locations			
Brownstown Campus Project	X	X				16 locations
Gibraltar Vreeland Rd - E of Fort, W of Jefferson (Frank & Poet)		X				
Romulus McBride Drain at Huron River Dr		X				
Taylor Katherine/Williams/Jackson			X	X	X	
Taylor Blakely Drain at Beech Daly		X	X	X		
Taylor Frank and Poet between Seaway & I-75		X	X	X		
Wayne Co Road ROWs Petitioned by LUGs		X				
Wyandotte Harrison St Border btwn Wyandotte/Lincoln Park		X	X	X		
Detention/Retention			10 acres			
Brownstown Retrofit Existing Twp Properties				X		20 acres
Brownstown Parks				X		
Romulus Smith/Middlebelt Regional Detention; NB EC				X		
Southgate E of I-75, N of Northline	X	X				
Southgate Former Reg. Center N of Pennsylvania			X	X		
Taylor Meadows		X	X			
Taylor I-94/Beverly Brownfield			X	X	X	
Taylor Jolly Rogers Site - S of Van Born, N of I-94			X	X	X	
Wayne Co Drain ROWs Petitioned by LUGs		X				

Table 6-2 continued

Best Management Practice	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016	Years 6-15 2017-2026
Increase Floodplain			**5 acres**			
Brownstown Creek - Chatham Park			X	X	X	10 acres
Southgate Nature Center			X	X		
Taylor Laing Park - Recreational Camping		X	X	X		
Taylor Lakes of Taylor		X	X	X		
Wayne Co Drain ROWs Petitioned by LUGs		X				
Woodhaven 10-acre Park Area	NA					
Public Education						
Ecorse Coordinating with School District	X	X				Continue program
Lincoln Park Ecorse Creek Cleanup	X					
Wayne Co Green School Grow Zones and Tree Plantings		X				
Wayne Co Home Owner Outreach - Grow Zones		X				
Wayne Co Stream Team Bug Hunts		X				
Wayne Co Green Projects Virtual Tour		X				
Wayne Co Studt/Vol Geo/Flow Monitoring		X				
Wayne Co LI-LID Advertisements		X				
Wayne Co Green Schools - Bugs in a Bucket		X				
Wayne Co River Bend Outreach		X				
Hydrodynamic Separators			**1 installation**			
Romulus Proposed Police Station					X	2 installations
Land Acquisition			**6 acres**			
Brownstown Twp Campus Project	X	X				12 acres
Grosse Ile Open Space Preservation/Funding Source	X	X	X	X	X	
Romulus Eureka/Huron River Dr W of I-75					X	
Taylor Eureka Drain by Taylor Lanes			X			
Van Buren Twp Promote Private Land Protection/Easements			X	X	X	
Wyandotte S of Golf Course/Extend Golf Course			X	X	X	
Water Efficiency			**5 locations**			
Romulus City-wide Ratio-Read Water Meters	X	X	X			10 locations
Romulus Low-Flow Fixtures for Proposed Fire and Police Bldgs			X	X	X	
Southgate City Complex/Ice Arena			X	X		
Taylor Golf Courses - Sprinklers			X	X		
Woodhaven Brownstown Schools - Waterless Urinals	X	X	X	X	X	
Tree Planting			**500 trees**			
Brownstown Twp Campus Project	X	X				1,000 trees
Gibraltar City-wide	X	X	X	X	X	
Huron Twp Twp-wide	X	X	X	X	X	
Riverview City-wide	X	X	X	X	X	
Romulus City-wide	X	X	X	X	X	
Southgate City-wide	X	X	X	X	X	
Taylor City-wide	X	X	X	X	X	
Wayne Co Inkster Rd at I-94	X					
Wayne Co Ecorse Rd at I-94	X					
Wayne Co Misc Road ROWs		X				

Combined Downriver Watershed
OURS TO PROTECT
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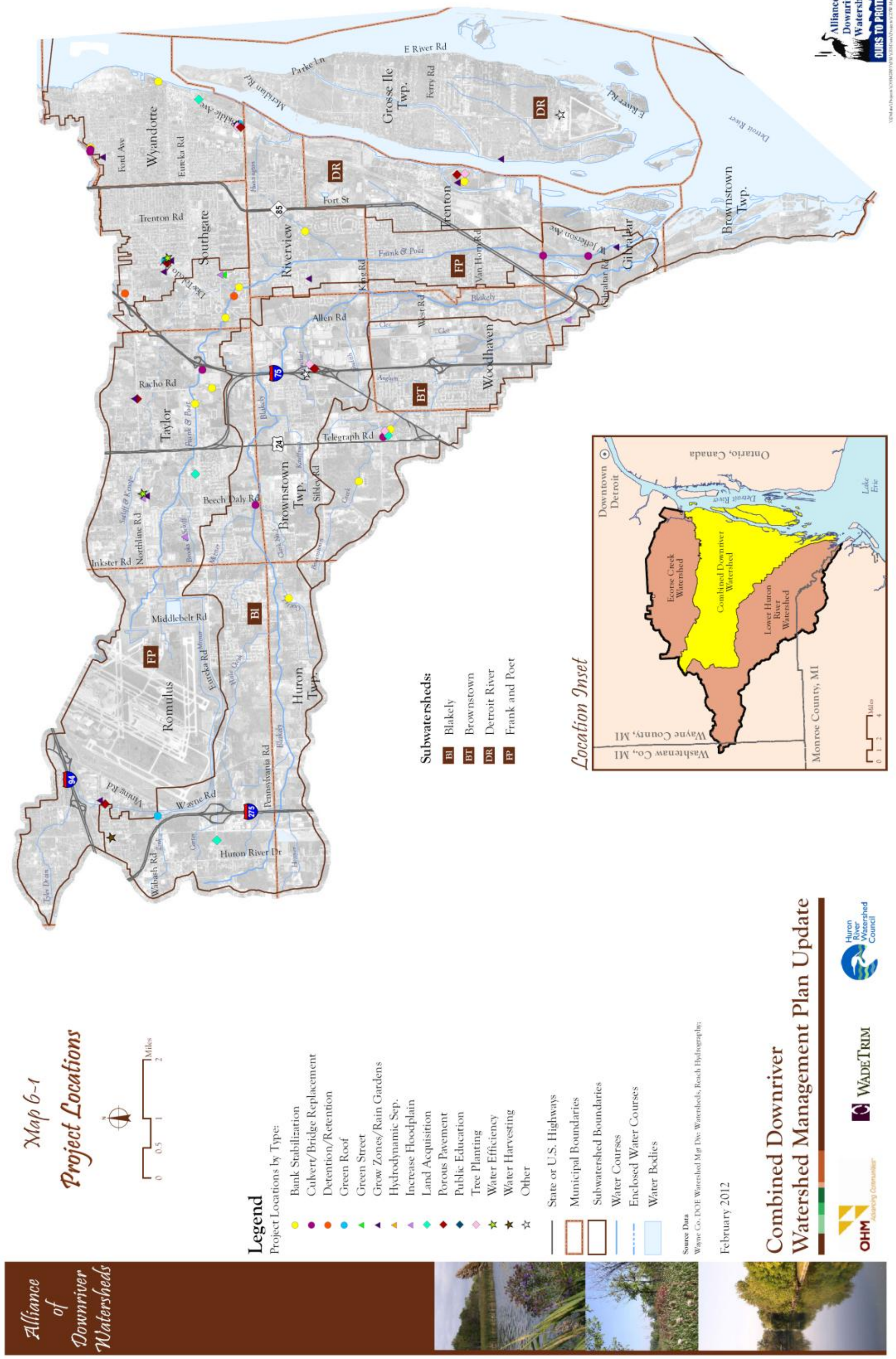
Table 6-2 continued

Best Management Practice	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016	Years 6-15 2017-2026
Tree Planting (continued)						
Wayne Co Elizabeth Park		X				
Wayne Co Central Maintenance Yard		X				
Wayne Co Goddard Yard		X				
Wayne Co Sibley Yard		X				
Wayne Co New Boston Yard		X				
Wayne Co Downriver WW Treatment Facility		X				
Woodhaven Brownstown Schools District-wide	X	X	X	X	X	
Wyandotte City-wide	X	X	X	X	X	
Water Harvesting			**2.3 acres**			
Brownstown Twp Twp-wide	X	X	X	X	X	
Gibraltar City-wide	X	X	X	X	X	
Grosse Ile Twp Twp-wide	X	X	X	X	X	
Huron Twp Twp-wide	X	X	X	X	X	
Riverview City-wide	X	X	X	X	X	
Romulus City-wide	X	X	X	X	X	4.6 acres
Romulus Senior Center at Community Gardens		X				
Southgate City-wide	X	X	X	X	X	
Taylor City-wide	X	X	X	X	X	
Wyandotte City-wide	X	X	X	X	X	
Other						
Brownstown Twp Hydraulic Capacity - VanCleef Drain (2 miles)				X	X	
Gibraltar Update Storm Grates - Flec-Storm CB Inserts	X	X	X	X	X	
Grosse Ile Twp Wetland Mapping					X	
Huron Township Downriver Linked Greenways	X	X	X	X	X	
Huron Township Ordinance Development	X	X	X	X	X	
Huron Township Wetland Delineation				X	X	
Romulus Downriver Linked Greenways	X	X	X	X	X	
Taylor Downriver Linked Greenways	X	X	X	X	X	
Wayne Co Pump Station GI/LID Retrofit Projects					X	
Wayne Co Flow Monitoring		X				
Wayne Co Benthic Monitoring		X				
Wayne Co Geomorphology Monitoring		X				
Wayne Co International Wildlife Refuge (Habitat/Naturalist Program)		X				
Woodhaven Treatment/Disposal of Street Sweepings		X	X	X		
Wyandotte Transient Marina - Clean-up/Recreation	X	X	X			
Wyandotte Low RR Crossing W of Biddle					X	
Wyandotte Water Trail Signage/Markers	X	X	X	X	X	
Wyandotte Downriver Linked Greenways	X	X	X	X	X	

Map 6-1


Alliance of Downriver Watersheds
Map 6-1
Project Locations
Miles
0 0.5 1 2
Legend
Project Locations by Type:
Bank Stabilization
Culvert/Bridge Replacement
Detention/Retention
Green Roof
Green Street
Grow Zones/Rain Gardens
Hydrodynamic Sep.
Increase Floodplain
Land Acquisition
Porous Pavement
Public Education
Tree Planting
Water Efficiency
Water Harvesting
Other
State or U.S. Highways
Municipal Boundaries
Subwatershed Boundaries
Water Courses
Enclosed Water Courses
Water Bodies
February 2012
Combined Downriver
Watershed Management Plan Update
OHM
WADETRIM
Huron River Watershed Council
Subwatersheds:
Bl Blakely
BT Brownstown
DR Detroit River
FP Frank and Poet
Location Inset
Downtown Detroit
Ontario, Canada
Ecorse Creek Watershed
Combined Downriver Watershed
Lower Huron River Watershed
Wayne County, MI
Washtenaw Co., MI
Monroe County, MI
Lake Erie
Wyandotte
Southgate
Riverview
Trenton
Gibraltar
Grosse Ile Twp.
Brownstown Twp.
Woodhaven
Taylor
Romulus
Huron Twp.
Trenton Rd
Eureka Rd
Ford Ave
Fort St
Allen Rd
Telegraph Rd
Racho Rd
Beech Daly Rd
Inkster Rd
Middlebelt Rd
Wayne Rd
Huron River Dr
Pennsylvania Rd
E River Rd
Parke Ln
Ferry Rd
Meridian Rd
Detroit River
Alliance of Downriver Watersheds
OURS TO PROTECT

The management activities identified in Table 6-2 are further defined in Table 6-3 in order to assist the ADW and other interested parties in developing project proposals and tracking implementation of this Watershed Management Plan. In addition, the US EPA expresses the need for this information in its Nine Minimum Control Measures for Watershed Management Plans seeking eligibility for Section 319 funding.

Table 6-3
Management Activities for the Ecorse Creek Watershed

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
1	Continue Coordinated Monitoring System	ADW, HRWC, Wayne County, WQD, MDNR, MDEQ	Detailed plan in place for 2012 – 2016. ADW assumes monitoring will continue after 2016, but no plan in place at this time.	Aquatic Macroinvertebrates, Stream Habitat, Fish, Stream Flow, Geomorphology, Temperature, Sediment, Embeddedness, DO, TP, E. coli	See Five Year Monitoring Plan Summary	Public will be involved in surveys and restoration efforts. Trained volunteers participate in stream monitoring. Presentation of results to ADW and other interested parties.	EPA-certified laboratory to process water quality samples. Coordination with volunteer stream monitoring programs. Approved QAPP. Permits obtained to install stream gages, transducers. Review of new sites.	$37,500-$75,000 per year. $187,500 to $375,000 for 5 year period.
2	Green Roofs	ADW	Implement and monitor: 2012 – 2016	ADW member(s) receive funding for installation; and installation complete by 2016 for sites identified in Table 6-2. (1.7 acres) Infiltration and pollutant reductions measured. Number of green roofs installed.	ADW and partnership with Lawrence Tech University	ADW member will notify residents, building users. Web postings and news articles. Inclusion in ADW virtual green infrastructure tool.	Funding through grants and loans; engineering services	Variable depending on application; Estimated between $100K and $500K per site; 1.7 acres are proposed with an estimate of $200K - $1M.

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
3	Porous Pavement	ADW	Implement and monitor: 2012 – 2016	ADW Ecorse Creek members receive funding for installation by 2016 for sites identified in Table 6-2. (12 acres) Acres of porous pavement installed. Infiltration and pollutant reductions measured.	ADW	Public education materials regarding benefits of porous pavement; interpretive signs at sites, web site postings, news articles. Inclusion in ADW virtual green infrastructure tool.	Funding through grants and loans; engineering services	Variable depending on application ; $8 to $12/sq ft. 12 acres proposed with an estimate of $4.18M to $6.27M.
4	Rain Gardens/Grow Zones	ADW	Implement and monitor: 2012 – 2016	Sites identified in Table 6-2 (9.8 acres) receive funding and installation complete by 2016. Infiltration and pollutant reductions measured. Acres of Grow Zones planted.	ADW	Public involved in planting and restoration efforts. Trained volunteers participate in monitoring. Presentation of results to ADW and other interested parties. Inclusion in ADW virtual green infrastructure tool.	Funding through grants and loans; engineering services	$12/sq ft. 9.8 acres are proposed with an estimate of $5.12 million.

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
5	Green Streets	ADW	Implement and Monitor: 2012 – 2016	Sites identified in Table 6-2 (1.5 acres) receive funding and installation complete by 2016. Infiltration and pollutant reductions measured.	ADW	Public education materials regarding benefits of green street elements; interpretive signs at/along street; web site postings, public meetings during design and news articles. Inclusion in ADW virtual green infrastructure tool.	Funding through grants and loans; engineering services	Varies depending on location and mix of practices; Cost estimate of $35/sq ft. 1.5 acres are proposed with an estimate of $2.92 million.
6	Bank Stabilization/ Vegetated Stream Buffers	ADW	Implement and Monitor 2012 – 2016	Sites identified in Table 6-2 (0.8 miles – estimated 20 ft wide) receive funding and installation complete by 2016. Number of feet of bank stabilized and number of acres planted as buffers.	ADW	Public education materials regarding benefits of vegetated stream buffers; interpretive signs at sites, use of volunteer labor for installation; web site postings, news articles. Inclusion in ADW virtual green infrastructure tool.	Funding through grants and loans; engineering services	$20,000 - $60,000 More details at www.semcog.org/LowImpactDevelopment.aspx

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
7	Culvert/Bridge Replacement / Retrofit	ADW	Implement and Monitor 2012 – 2016	Sites identified in Table 6-2 (8 locations) receive funding and construction complete by 2016. Number of sites improved. Pollutant reductions measured and miles of stream passable by fish.	ADW	Public outreach to notify about project and public education on retrofit benefits for stream and habitat.	Funding through grants and loans; engineering services	Varies greatly depending on location and application. For estimating purposes, \$400 - \$2,000/lf. assuming 80′ replace or \$256,000 - \$1.3M.
8	Detention/ Retention	ADW	Implement and Monitor 2012 – 2016	Sites identified in Table 6-2 (10 acres) receive funding and construction complete by 2016. Acre/feet of storage. Infiltration and pollutant reductions measured.	ADW	Public education through presentation of results to ADW and other interested parties	Funding through grants and loans; engineering services	Cost estimate from \$300,000 - \$585,000.
9	Increase Floodplain	ADW	Implement and Monitor 2012-2016	Sites identified in Table 6-2 (5 acres) receive funding and installation by 2015. Acres of floodplain added. Infiltration and pollutant reductions measured.	ADW	Mailings to residents in project area.	Funding through grants and loans; engineering services	Varies depending on location and design.

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
10	Public Information and Education	ADW, Wayne County, HRWC and SEMCOG	Implement 2012 – 2016	Measuring / tracking homeowner behavior change as education process unfolds. Update public survey by SEMCOG and compare results to previous SEMCOG survey.	Behavior change measure-ment, participant involvement, household pollution reduced, volume of HH waste dropped off, etc. ADW, Wayne County and HRWC	Public involvement in homeowner behavior change process.	Grant funding through 319 NPS program and others	$75,000 for two years program or $187,000 for 5 year program.
11	Land Acquisition / Conservation	ADW, Southeast Michigan Land Conservancy, International Wildlife Refuge, Grosse Ile Nature and Land Conservancy	Implement and Monitor 2012 – 2016	Sites identified in Table 6-2 receive funding and purchased by 2016. Number of finalized land protection agreements; number of acres protected through easements.	Enrollment outreach and monitoring SE Michigan Land Conservancy , Int'l Wildlife Refuge, Grosse Ile Nature and Land Conservancy	Mailings to high-priority parcel owners. Meetings with individual landowners to identify interest in conservation easements, purchase of development rights, and/or sale/donation of property to appropriate management organization	Funding to purchase properties or obtain easements	Purchase prices and/or easements vary depending on location and value of property.

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
12	Water Efficiency	ADW	Implement and Monitor 2012-2016	Sites identified in Table 6-2 (5 locations) receive funding and completed by 2016. Number of water efficiency projects completed and number of gallons of water conserved.	ADW	Public education materials developed on the benefits of water efficient projects, announcements about planned and completed projects via mailings, web page postings and news articles.	Funding through grants and loans	Varies based on project.
13	Tree Planting	ADW	Implement and Monitor 2012 - 2016	Sites identified in Table 6-2 (500 trees) receive funding and installation of plantings by 2016. Many programs are proposed city-wide. Number of trees planted and increase in tree canopy.	ADW	Education materials to residents	Funding through grants and loans	$250 - $400 per tree for balled and burlap installation; $100,000 to $200,000 for installation of 500 trees.
14	Water Harvesting	ADW	Implement and Monitor 2012-2016	Sites identified in Table 6-2 receive funding and completed by 2016. Many city-wide programs. Assume 150 rain barrels per 10 communities.	ADW	Education materials to residents for rain barrel distribution and proper use and maintenance. News articles and web page postings	Funding through grants and loans	$75-$100 per rain barrel; 1500 rain barrels proposed for an estimate of $150,000.

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimate
15	Collaborative IDEP	ADW and Wayne County	Implement and Monitor 2012 – 2016	As described in IDEP Plan in Chapter 6 of this document including coordinated complaint response, staff training and advanced investigations. Number of illicit connections found, number of connections corrected and estimated pollutant reductions.	Wayne County and ADW members	Education piece to raise awareness of complaint hotline posted to web pages, flyers distributed to ADW members, articles in newspapers and newsletters.	Grants for investigations and monitoring	$500,000
16	Collaborative GI Education Campaign	ADW and Wayne County	Implement and Monitor 2012 – 2016		Wayne County and ADW members	Education piece to raise awareness of the benefits of green infrastructure posted to web pages, flyers distributed to ADW members, articles in newspapers and newsletters.	Grants to assist in campaign development and distribution	$300,000

#	Implementation Activities	Entity Responsible for Meeting Management Objective	Schedule Short-Term0-3 yrs; Long-Term 3-10 yrs	Measurable Indicators / Performance Measures	Monitoring and Party Responsible for Monitoring	Public Involvement, Outreach or Education Component	Technical, Financial and Regulatory Assistance Needed	Cost Estimat
17	Wetlands Restoration and/or Preservation	County Conservation Districts, USDA Natural Resources Conservation Service, ADW	30 acres of wetlands preserved and/or restored by 2016 including at least 15 acres of high performing for stream flow maintenance Plan: 2011 – 2012 using DEQ LLWA Implement and monitor: 2012-2016	Number of acres preserved and/or restored. Pounds of nutrients and sediment reduced. Projects initiated in the Combined Downriver Watershed.	Tracking of preserved and/or restored wetland acres – ADW members and Conservatio n District. Pre- and post- water sampling for nutrients and sediment – ADW.	Target Conservation District outreach effort/enrollment initiative. Presentation of results to ADW.	Grand funding through S. 319 NPS Program, GLBP for Soil Erosion and Sediment Control, GLRI. Supplemental budget requests to State legislature.	Restoration installation: $2,000/ac+ staff. If 15 acres restore and 15 acres preserved, estimated to cost $50,000 plus cost of acquisition.

6.6 Related Initiatives and Efforts

There are several initiatives and efforts active in the area that are related to the work of the ADW. Coordination and awareness between the watershed management planning efforts and the initiatives described below is paramount for improved water quality, the success of the area and the overall quality of life in the region. The related activities include:

- Detroit River Area of Concern
- International Wildlife Refuge
- Downriver Linked Greenways Initiative
- Greater Detroit Heritage Water Trails
- Grosse Ile Nature Conservancy
- Downriver Stream Team
- Se Michigan Partners for Clean Water's Ours to Protect Campaign
- Friends of the Detroit River / Riverkeeper Program

Detroit River Area of Concern[1]

The Combined Downriver Watershed ultimately drains to the Detroit River. Actions and improvements within the watershed can assist in improving the Detroit River and work toward delisting the River as an Area of Concern. The Detroit River is a 32-mile, international connecting channel linking Lake St. Clair and the upper Great Lakes to Lake Erie. The Detroit River Area of Concern (AOC) includes the areas that drain directly to the river and the drainage area of its tributaries in Michigan and Ontario, as well as the City of Detroit "sewershed" area. Eleven of the 14 beneficial use impairments were identified in the Detroit River. The known causes of impairments included urban and industrial development in the watershed, bacteria, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, and oils and greases. Combined sewer overflows (CSOs) and municipal and industrial discharges were major sources of contaminants within the AOC. Storm water runoff and tributaries in Michigan were also identified as major sources of contaminants. Additional environmental concerns include exotic species, changes in the fish community structure, and reductions in wildlife populations. Detroit River priorities include control of combined sewer overflows (CSOs), control of sanitary sewer overflows (SSOs), point/nonpoint source pollution controls, remediation of contaminated sediments, habitat restoration, and pollution prevention. In 2005, the Friends of the Detroit River became the lead local organization for the Detroit River AOC. In 2008, the RAP for the Detroit River AOC was updated.

International Wildlife Refuge[2]

The Detroit River International Wildlife Refuge is located along the lower Detroit River and western shoreline of Lake Erie. It was established in 2001 as the first International Wildlife Refuge in North America. The authorized refuge boundary includes islands, coastal wetlands, marshes, shoals, and waterfront lands along 48 miles of shoreline. Its location is unique – situated in a major metropolitan area.

The Refuge will facilitate and promote hunting, fishing, wildlife observation, wildlife photography, environmental education, and wildlife interpretation. These are the priority wildlife-dependent public uses for the National Wildlife Refuge System.

[1] Detroit River Area of Concern. www.epa.gov/glnpo/aco/detroit.html
[2] Detroit River International Wildlife Refuge http://www.fws.gov/detroitriver/art/pfd/brochureAug23.pdf

The U.S. Fish and Wildlife Service has developed a Comprehensive Conservation Plan to guide management of the Refuge for the next 15 years. The preferred management alternative is to focus on cooperative management – where the Refuge would grow primarily through management agreements with industries, government agencies, and other organizations.

The Humbug Marsh and adjacent uplands are one of the region's most ecologically significant sites due to its position and rarity within the Lower Great Lakes and connecting channels. As the last remaining mile of Great Lakes coastal marsh on the Michigan side of the Detroit River, the Humbug Marsh provides key habitat linkages between the nutrient poor upper Great Lakes, the St. Clair River delta, and nutrient rich Lake Erie, and provides key spawning and nursery habitat along the migration route of over 100 species of fish that live in the Great Lakes. Located at the junction of the Mississippi and Atlantic Flyways, two of North America's major migration routes, the Humbug Marsh is also important to a variety of bird species. Over 90 species of waterfowl, raptors, loons, neotropical songbirds, herons, egrets, cranes, and other land and shore birds use the Humbug Marsh area for stopover, feeding, and nesting sites.

Surrounded by industry, commercial enterprises, and residential land use; in close proximity to over 5 million people in the greater Detroit metropolitan area; and as the largest piece of undeveloped coastal property on the U.S. side of the Detroit River, the 400+-acre DRIWR has tremendous potential to provide recreational benefits in the forms of hunting, fishing, bird watching, hiking, canoeing and kayaking.

Map 6-2

Combined Downriver Watershed
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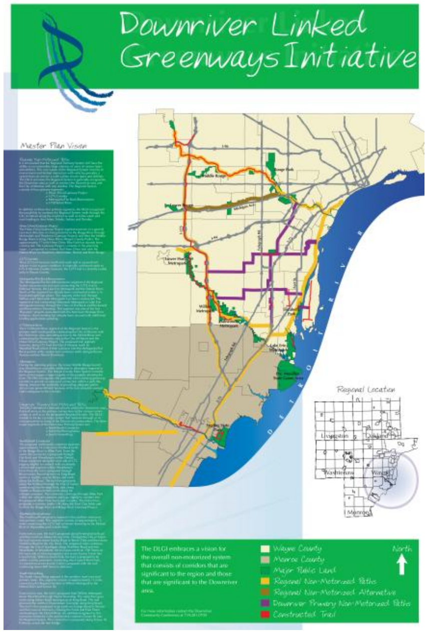
Downriver Linked Greenways Initiative



The Downriver Linked Greenways Initiative (DLGI), which began in 1999, is a culmination of many community, institutional and individual efforts. The purpose is to coordinate the Downriver communities' non-motorized transportation development efforts. Rather than planning, designing and constructing non-motorized facilities to benefit only individual communities, the DLGI has the foresight and vision to embrace a plan that benefits the greater good. The DLGI is working to improve the quality of life of residents and employees by connecting their communities to one another and to the larger Southeast Michigan Region. Several of the existing and/or planned non-motorized routes are along or near watercourses in the Combined Downriver Watershed.

The DLGI has been successful in obtaining past grants and anticipates continuing to make federal, state and local grant applications to implement the plan recommendations and create a trail system consistent with the Southeast Michigan Greenways Initiative and the American Heritage River Greenways vision.

Heritage Water Trail for Greater Detroit[3]

The Metropolitan Affairs Coalition (MAC), in partnership with community stakeholders, which include the Downriver Linked Greenways Initiative, DTE Energy, and the Michigan Department of Environmental Quality, have made the development of a Heritage Water Trail one its priority projects. The Heritage Water Trail is envisioned to be a river version of a greenway trail. The Heritage Water Trail is conceived as a network of recreational trails on the Lower Huron, Detroit, and Rouge Rivers for canoeing, kayaking, and small boat paddling that would encourage residents and visitors to recreate, exercise, and experience the area's wildlife and natural resources. Besides providing navigational, historical, and ecological information, the Water Trail is being planned and designed to promote a broad range of uses, activities, and programs to accommodate the interests of the diverse population that lives, works, and plays in the region.

Planning for the overall regional system, as well as detailed implementation for Phase I of the Water Trail was completed in 2006. The ability to have a successful and enjoyable water trail system is directly associated to the water quality of the creeks, drains, rivers, and lakes within the watershed.

Grosse Ile Nature Conservancy[4]

The Conservancy is an independent 501(c)(3) that works to achieve the goal of protecting land through land acquisition, conservation easements and educational projects. Through gift or purchase, the Conservancy secures ownership of natural land needed to protect beautiful and fragile habitats. The Conservancy also seeks grants for

[3] Metropolitan Affairs Coalition RFP for Professional Services, February 2005.
[4] Grosse Ile Nature Conservancy. www.ginlc.org

conservation easements from private landowners. The Conservancy works to provide environmental knowledge, to all ages, that is necessary to understand the complex ecosystems and how intimately the human welfare is related to the health of the ecosystems. A recent project included the reconstruction (including planting of native species) of approximately 280 feet of shoreline on the southwest side of the Grosse Ile Nature Area.

Downriver Stream Team[5]

The Downriver Stream Team is lead by teachers at Southgate Anderson High School and has evolved over the past fifteen eighteen years to include over 5,700 individuals and nearly 60 organizations to conduct water quality testing, exotic species control, education, stream bank stabilization and habitat creation. Since the first event, the Stream Team has cleaned up and restored 61 sites during 39 events.

The Stream Team has conducted several spot benthic organism monitoring programs in the downriver area over the past few years. The Stream Team also works with Wayne County to standardize testing procedures to align monitoring protocols with MICORPS sampling and reporting techniques

In addition, to benthic monitoring, the Stream Team has indicated it has the ability to assess several other water quality parameters, including: pH, DO, temperature, turbidity, total dissolved solids (TDS), chloride, nitrates, phosphorus, total coliforms, and some water born (not sediment based) heavy metals (e.g. iron, copper, zinc, nickel, lead, and some others) using electronic CBL2 Texas Instruments/probes (pH, DO, temp., turbidity, TDS), Hach titration kit (Cl-), Hach Spectrophotometer (nitrates, phosphorus, heavy metals), or Filter Funnel Manifold and appropriate Hach sterile media (total coliforms).

The Stream Team has been involved as a Partner (e.g. non-voting member) of the ADW for many years, and along with Wayne County, is seeking additional funds to formalize the Stream Team's future monitoring efforts. Concurrently, the Watershed is looking at the option of utilizing the Stream Team's efforts to assist in measuring the effectiveness of the various improvement projects and action items highlighted in this plan. Of course, the scope and quality of this expanded Stream Team monitoring program will be determined by availability of adequate funding to insure all Stream Team monitoring participants/schools are outfitted with technologies to assess the parameters needed.

Ours to Protect Campaign[6]

With the Phase II requirements affecting many communities that are SEMCOG members, SEMCOG established the Southeast Michigan Partners for Clean Water to coordinate storm water public education activities to help save local dollars and to send consistent messages. These messages are intended to be action-oriented with the primary goals of protecting water resources and meeting permit requirements. The Southeast Michigan Partners for Clean Water includes representatives from various counties, communities, watershed councils, the private sector, and water quality professionals in Southeast Michigan. The Southeast Michigan Partners for Clean Water also decided that delivery of the messages

[5] Downriver Citizens For a Safe Environment. www.dcseweb.org

[6] SEMCOG – Ours to Protect http://www.semcog.org/OursToProtect/OurstoProtect.htm

would be most effective using a two-pronged approach. Region-wide public education is one level of distribution of the messages. This effort is most effective for dealing with broader distribution mechanisms, such as regional media outlets, and can be used to develop materials that would be utilized at both the regional and local level. The second part of the delivery system is done locally. The messages are delivered through brochures, newsletters, workshops, river crossing signage, print ads, and local media. This allows the overall key messages to be tailored to an individual community's issues and concerns.

Friends of the Detroit River / Riverkeeper Program

The Friends of the Detroit River envisions an ever improving quality of life for people, plants and animals in southeast Michigan and southwest Ontario through development of a balance of grass roots advocacy and staffed programs forming an environmental group that watches and protects the Detroit River, including creation of a highly visible resource center focusing on Detroit River issues, programs, research, policies and partnerships.

The mission of Friends of the Detroit River, Inc. is to enhance the environmental, educational, economic, cultural and recreational opportunities associated with the Detroit River watershed, through citizen involvement and community action. The Friends of the Detroit River are involved in numerous projects and efforts. They were instrumental in achieving the designation of the Detroit River as an American Heritage River and preservation of the Humbug Marsh, Humbug Island and Humbug Bay.

Many of the entities in the worked with the Detroit Riverkeeper group on their "Storm Drain Labeling and Educational Program." The Riverkeeper program has been working closely with the Combined Downriver and Ecorse Creek Watershed groups to put together a program that involved storm drain labeling and a region wide storm water educational program. Over 12,000 labels were produced and distributed to the participating communities in these watersheds. Installation of the curbside storm drain labels, which started in the spring of 2004 and will continue through 2005 and beyond, helps to bring attention to storm drain born water quality issues.

7. Methods/ Milestones to Measure Progress

Frank and Poet Drain, Racho north of Eureka

Chapter Contents

Qualitative Evaluation Techniques
Quantitative Evaluation Techniques
Numeric Targets Anticipated in a Future CDR TMDL
Other Numeric Targets Established by State Statute
Additional Quantitative Measures
Watershed Plan Review and Revision

In order to evaluate the effectiveness of this Watershed Management Plan and its implementation, methods to measure progress are described here. These methods are important in determining whether the activities being performed are sufficient in reaching the goals of the plan. If the activities in the plan are found not to be sufficient, the plan can be revised to make it more effective. Not only will measuring progress assist in finding deficiencies in the plan, but it will also help demonstrate which activities are successful. Measuring progress will be done by both qualitative and quantitative techniques.

7.1 QUALITATIVE EVALUATION TECHNIQUES

Qualitative measurements are important in determining changes in behavior and visible changes in the Watershed. Surveys, participation records, and meeting/workshop evaluations can all be used to gauge whether activities aimed at public education and outreach are effective. Better survey results, an increase in participation, and favorable meeting/workshop evaluations can all be an indication of a greater understanding by the public on watershed-related issues. Results that don't yield improvements will signal that current activities and/or publicity methods should be improved. One of the main foci of evaluating changes in public understanding and behavior will be the use of the 2004 Regional Water Quality Survey that was performed by SEMCOG and the Southeast Michigan Partners for Clean Water. The purposes of the survey were to provide a benchmark to gauge the effectiveness of regional and local public outreach campaigns, leverage resources, and provide the opportunity to compare results from different areas of the SEMCOG region. A four-page survey and cover letter were mailed to a stratified random sample of 10,800 households in the SEMCOG planning area, which includes the City of Detroit along with Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties[1]. Results were given specifically for the Downriver Wayne County area. A comparable future survey will help gauge any changes that result as part of the actions of this Watershed Management Plan.

Visible changes in the watershed can also be used as an indication of progress in the Watershed. Stream surveys can identify riparian and aquatic improvements and help identify recreational opportunities. BMP implementation can also be documented visibly, with the number and location of BMPs recorded.

Table 7-1 summarizes the qualitative methods to measure progress that will be used.

[1] ETC Institute, SEMCOG Regional Water Quality Survey Findings Report, September 2004.

Table 7-1. Summary of Qualitative Methods to Measure Progress

Evaluation Method	Program/Project	What is Measured and/or Goals Addressed	Measurable Goals	Implementation
Public Surveys	Public education or involvement	Awareness; Knowledge; Behaviors; Attitudes; Concerns	Increase in the number of completed surveys showing greater awareness, more concerns, increase in knowledge	Pre- and post-survey recommended (SEMCOG survey utilized as pre-survey). Repetition on regular basis to show trends.
Ordinance Adoption	Adoption of such ordinances as wetland protection, open space preservation, natural features, tree conservation, etc.	Number of ordinances passed	Increase in the passage of stormwater related ordinances	Track ordinance adoptions through the watershed advisory group. Also report positive and negative aspects.
Stream Surveys	Identify riparian and aquatic improvements, identify recreational opportunities	Habitat; Flow; Erosion; Recreation;	Increase in habitat; decrease in erosion; increase in recreation	Identify parameters to evaluate. Record observations. Summarize findings to identify sites needing observation. Use of specific criteria would make surveys also quantitative.
Written Evaluations	Public meeting or group education or involvement project	Awareness; Knowledge	Increase in number of written evaluations with positive comments	Post-event participants complete brief evaluations that ask what was learned, what was missing, what could be done better. Evaluations completed on site.
Visual Documentation	Structural and vegetative BMP installations, retrofits	Aesthetics. Pre-and post-conditions	Increase in number of structural and vegetative BMPs & retrofits	Provides visual evidence. Photographs can be used in public communication materials
Phone call/ complaint records	Education efforts, advertising of contact number for complaints/ concerns	Number and types of concerns. Location of problem areas (including flooding occurrences, debris in streams, drain blockages)	Increase in number of calls and complaints to show an increase in awareness & concern	Track calls and complaints and responses.
Participation tracking	Public involvement and education projects	Number of people participating. Geographic distribution of participants.	Increase in participation at events	Track participation by attendance.

Table adapted from Lower One Rouge Watershed SWAG, 2001

7.2 QUANTITATIVE EVALUATION TECHNIQUES

In addition to qualitative measures of program implementation and success, quantitative measures will also be required to assess progress toward, and attainment of, water quality targets for the Combined Downriver Watershed. As described previously, portions of the CDR are identified as failing to meet Michigan water quality standards (WQS) for E. coli and for the protection of warm water aquatic life. The MDEQ has developed a Total Maximum Daily Load (TMDL) allocation, water quality targets and quantifiable pollutant load reductions, to protect aquatic biota and recreational uses within the watershed. Quantitative measures to monitor success are set forth in the TMDL. Sources and causes of the current conditions summarized in Table 7-2 are detailed in Chapter 4 (Table 4-4) of this document.

7.2.1. Numeric Targets Required in the Combined Downriver TMDLs

Aquatic Life (Biota)

The Frank and Poet, Blakely and Brownstown Creek TMDLs establishes habitat assessment scores and scores rating the community composition and diversity of benthic macroinvertebrates as the primary measures of water quality improvements in the watershed. The health of macroinvertebrate communities within the Combined Downriver drainage area will be assessed by the Michigan Department of Environmental Quality (MDEQ) using Procedure 51 assessment and scoring.[2,3]

The TMDLs establish reproducible ratings of "acceptable" scores throughout the watershed. An acceptable score correlates to a cumulative score of -4 or greater for the macroinvertebrate multimetric index. Achievement of the water quality standard for the protection of warm water aquatic life will be determined by reproducible acceptable scores in two consecutive years of monitoring. Habitat quality of the stream will also be assessed using Procedure 51 protocols. A habitat score of 65 has been established as the minimum target for in-stream habitat conditions.

Suspended Solids

TMDLs for the Frank and Poet Drain, Blakely Drain and Brownstown Creek established a numeric target for mean, annual, in-stream TSS concentrations of less than or equal to 80 mg/l during wet weather and snowmelt events, as a secondary measure of documenting the re-attainment of designated uses.

In addition, embeddedness is a more appropriate measurement of sediment for water quality in natural waters. Embeddedness measures the degree to which boulders, rubble, and debris in a sampling area are covered in fine sediments (clay, sand, or silt). Baseline data would need to be collected in order to compare to future data and show improvement in the watershed. The method for measuring embeddedness is outlined in the Manual of Fisheries Survey Methods II by the Surface Water Quality Devision, MDEQ.

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[2] MDEQ. 2002. Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers. P51. MDEQ, Surface Water Quality Division, Lansing, Michigan. Revised May, 28, 2002.

[3] MDEQ. May 1996 Revision. Update of P51. Metric Scoring and Interpretation. MDEQ Report #MI/DEQ/SWQ-96/068

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E. coli

The targets for this TMDL are 300 *E. coli* per 100 ml expressed as a daily maximum load and concentration from May 1 to October 31 (i.e., daily target) and 130 *E. coli* per 100 ml as a 30-day geometric mean, expressed as a concentration (i.e., monthly target). An additional target is the partial body contact standard of 1,000 *E. coli* per 100 ml as a daily maximum concentration year-round. Achievement of the total body contact daily maximum target is expected to result in attainment of the partial body contact standard.

7.2.2 Other Numeric Targets Established by State Statute

Pathogens/Bacteria

Rule 62 of the Michigan Water Quality Standards (Part 4 of Act 451)[4] limits the concentration of microorganisms in surface waters of the state and surface water discharges. Waters of the state which are protected for total body contact recreation must meet limits of 130 *E. coli* per 100 milliliters (ml) water as a 30-day average and 300 *E. coli* per 100 ml water at any time. These limits apply to the season during which most body-contact activities would take place; May 1 through October 31.

Although unknown at this time, it is suspected that the Frank and Poet and Brownstown Creek subwatersheds, like the Detroit River subwatershed and other southeastern Michigan urban waterways, also exhibits elevated concentrations of *E. coli* bacteria. The TMDL established for the Detroit River sets the state WQS 30-day geometric mean of 130 *E. coli*/100 mL as the maximum allowable value. It is reasonable to anticipate that *E. coli* limits in the portions of the CDR outside the Detroit River subwatershed will be similar if it is found that the watershed violates water quality standards for bacteria.

Dissolved Oxygen (DO)

Rule 64 of the Michigan Water Quality Standards (Part 4 of Act 451)[5] states that surface waters protected for warm water fish and aquatic life must meet a minimum dissolved oxygen standard of 5 mg/l. As described previously (Chapter 3) field work in 2004 indicated that the warm water minimum of 5 mg/L DO was violated at several locations monitored.

Although failure to meet the protection of aquatic life designated use has largely been attributed to flashy hydrology and high sediment yield, low oxygen concentrations may also be limiting both fish and macroinvertebrate populations. DO concentrations should be measured as part of the other MDEQ monitoring activities to ensure this standard is met throughout the watershed.

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[4] http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=

[5] http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=

7.2.3. Additional Quantitative Measures

Flow Stability

As described in Chapter 3, the comparison of mean monthly high flows to mean monthly low flows can be used as an index of flow stability.[6] There are no established U.S. Geological Survey (USGS) stream gages within the Combined Downriver Watershed. The CDWIC recommends that one or more gages be established, maintained, and monitored by the USGS and that periodic analysis of stream gage data for the Combined Downriver Watershed be used to determine a baseline utilizing the Richard-Baker flashiness index. Year-to-year calculation of this value should be conducted to determine if watershed plan implementation results in an improvement (reduction) in this ratio value.

[6] Hay-Chmielewski, E.M., P.W. Seelbach, G.E. Whelan, and D.B. Jester, Jr. 1995. Huron River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report Number 16. Ann Arbor, Michigan.

Method and Frequency of Monitoring Activities

MDEQ water quality sampling and Procedure 51 assessment, conducted as part of MDEQ's standard rotating, 5-year cycle of basin monitoring will be the primary means of determining attainment of TMDL target endpoints. However, MDEQ resources are limited and municipalities within the Combined Downriver Watershed are encouraged to expand upon the frequency and geographic coverage of the MDEQ's monitoring through support of the Downriver Stream Team, Wayne County, and/or other entities. Stream Team, Wayne County and/or other entity results should be provided to the MDEQ to help inform and prioritize the selection of 5-year cycle sampling locations for that agency. Evaluation of stream flow dynamics should be conducted by the ADW, in coordination with the USGS, on a periodic basis. The next MDEQ monitoring is scheduled for 2016.

Table 7-2 summarizes the quantitative methods that will be used to measure progress.

Table 7-2. Summary of Quantitative Methods to Measure Progress of Locally Prioritized Watershed Goals

Watershed Plan Goal (locally prioritized)		Parameter Measured	Current Condition	Measurable Goal/Target	Evaluation Method	Implementation
1.	**Reduce Stream Flow Variability**	Stream Discharge, Flow Variability, Benthics, Tractive Force Ratio	Unstable hydrology assumed given imperviousness, Mean Monthly High: Mean Monthly Low Flow Ratio unknown Biota TMDLs	Stable R-B index	Analysis of stream gage records Geomorphology tractive force ratio	Trends as indication of reduced stream flow variability
2.	**Reduce Flooding**	Stream Discharge, Flow Variability	Frequent flooding due to high rate of imperviousness	Reduced flooding frequency and monetary damages	Review of flood damage claims filed with FEMA,	Review FEMA flood claims in 4th year of each permit cycle and 5-year review/ revision cycle for watershed plan
3.	**Increase Public Education, Understanding, and Participation Regarding Watershed Issues**	Public education or involvement	Unknown Awareness; Knowledge; Behaviors; Attitudes; Concerns	Increase in the number of completed surveys showing greater awareness, more concerns, increase in knowledge		Pre- and post-survey recommended (SEMCOG survey utilized as pre-survey). Repetition on regular basis to show trends.
4.	**Improve Water Quality**	Macro-invertebrate Community Composition	Poor TMDL for Biota	"Acceptable" macroinvertebrate scores > -4 in two or more consecutive years of monitoring	MDEQ Procedure 51	MDEQ rotating, 5-year watershed monitoring cycle and annual MDEQ sampling per Biota TMDL
						Coordinate with Stream Team to augment MDEQ data collection and sampling network
		Embeddedness	Highly turbid even in dry weather (visual observations 2004), TMDL for Biota	Attain Rating of "Good" or "Excellent"	MDEQ rotating, 5-year watershed monitoring cycle sampling, IDEP monitoring and WCDOE sampling, Stream Team monitoring	Coordinate with WCDOE to expand Illicit Discharge Identification and Elimination Program (IDEP) to the CDR Watershed and to expand monitoring to include embeddedness
7.	**Protect, Enhance, and Restore In-Stream Habitat**		Wet weather concentrations as high as 220 mg/L, TMDL for Biota			Coordinate with Stream Team to augment data collection and sampling network, including wet weather embeddedness monitoring

Watershed Plan Goal (locally prioritized)		Parameter Measured	Current Condition	Measurable Goal/Target	Evaluation Method	Implementation
4.	**Improve Water Quality**	Dissolved Oxygen (DO)	Localized violations of Michigan Water Quality Standard Measured DO concentrations as low as 1.73 mg/L	> 5 mg/L	MDEQ rotating, 5-year watershed monitoring cycle sampling, IDEP monitoring and WCDOE sampling, Stream Team monitoring	MDEQ rotating, 5-year watershed monitoring cycle
7.	**Protect, Enhance, and Restore In-Stream Habitat**	Phosphorous (P)	Measured Total P concentrations from 0.07-0.194 mg/L	$\leq$ 0.1 mg/L		Coordinate with Stream Team to augment MDEQ data collection and sampling network
5.	**Protect Public Health**	*E. coli* bacteria	Unknown (lack of data) E. Coli TMDL	< 130 *E. coli*/100 mL (30-day geometric mean), <300 *E. coli* cfu/100 mL any individual sample	MDEQ rotating, 5-year watershed monitoring cycle sampling, WCDOE sampling, Stream Team monitoring	MDEQ to conduct sampling in 2006 for future TMDL, Coordinate with Stream Team and WCDOE to expand sampling and sampling network in the CDR Watershed (5 to 10 year cycle)
6.	**Preserve, Increase, and Enhance Recreational Opportunities**	Open Space Acquisition/ Protection	2,445 acres of "Cultural, Outdoor Recreation, and Cemetery" (4.5%)	Increase over Current Conditions	GIS analysis, Report acres of Open Space/Parks Protected	Work with SEMCOG to analyze changes as municipal master plans and regional GIS coverage are updated
7.	**Protect, Enhance, and Restore In-Stream Habitat**	In-Stream Habitat	Fair to Poor: unstable hydrology, sedimentation and high embeddedness,	"Marginal" habitat scores $\geq$ 96	MDEQ Procedure 51	MDEQ rotating, 5-year watershed monitoring cycle and annual MDEQ sampling per Biota TMDL
			general lack of in-stream habitat			Coordinate with Stream Team to augment MDEQ data collection and sampling network
8.	**Watershed Management Sustainability**	Institutional Relationships, Dollars Committed to Watershed Management	Alliance of Downriver Watersheds is in place and active.	$\geq$80% participation of watershed communities	Annual reports of ADW activities and budget contributions	Continued coordination by ADW members will serve as an institutional mechanism for watershed-wide cooperation and mutual support to achieve the goals of the Watershed Management Plan.
9.	**Preserve & Protect Critical Areas**	Acres of Wetland, Woodland, Riparian Buffer or Other Open Space Protected or Restored	Current projections show a majority of open space (52%) lost by 2030	Increase acreage of riparian buffer; Slow rate of loss of open space to more intensive land uses	GIS analysis, number of new programs/ conservation easements, report acres of farmland protected	Work with SEMCOG to analyze changes as municipal master plans and regional GIS coverage are updated

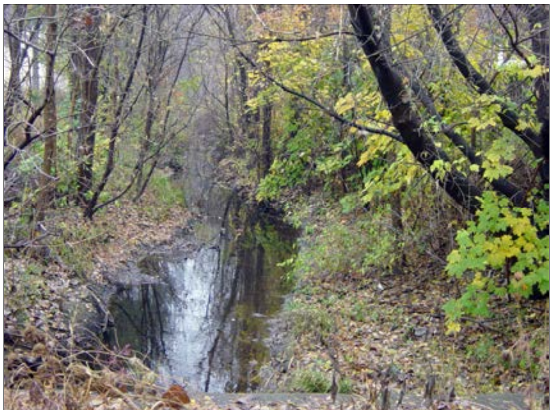
7.3 WATERSHED PLAN REVIEW AND REVISION

These measures are intended to track progress toward the attainment of designated and desired uses, water quality standards, and other watershed management plan goals. As noted previously, pollutant reduction estimates from the modeled best management practices do not achieve a 50% reduction in total suspended solids; the expected target to be established in a TMDL for the Combined Downriver Watershed. Other best management practices and communities' programs are expected to add to these water quality improvements. Likewise, the actual metrics anticipated in the scheduled TMDL are in-stream measures of habitat quality, macroinvertebrate diversity and abundance, and wet weather water quality concentrations (including E. coli); not the actual quantification of suspended solids removed.

Periodic assessment and review will therefore be required to determine whether implementation is on-track and whether the plan is having the desired efficacy. The CDR communities' Phase II Storm Water Certificate of Coverage and the 5-year permit cycle provide a natural mechanism for framing these periodic reviews. Activities and successful completion of scheduled tasks will need to be reviewed and reported annually, but the Watershed Plan itself should be reviewed, in the final year of each 5-year permit cycle, and revised if deemed necessary by that review.

Watershed Plan revisions may be triggered by the completion of major projects; the availability of new water quality, flow, inventories, or other information; by major natural events such as significant flooding in the watershed; because of changes in laws or regulations; by changes in the drainage area; or other significant events. It is anticipated that periodic reviews would be the responsibility of the Alliance of Downriver Watersheds as discussed in Chapter 8.

8. SUSTAINABILITY



Hale Creek at Brandt

Chapter Contents

Background
- Combined Downriver WAG
- CDWIC
- Watershed Management Plan Initiation
- Alliance of Downriver Watersheds

Sustainability

All or portions of the communities/entities within the Combined Downriver Watershed have been identified by the Environmental Protection Agency (EPA) and/or the Michigan Department of Environmental Quality (MDEQ) as being in urbanized areas requiring a National Pollutant Discharge Elimination System (NPDES) storm water discharge permit. A requirement of the permit is for these communities /entities to work together to develop a single watershed- based management plan (WMP) to pursue compliance. The WMP serves as a guide for the entities to understand the water quality and quantity concerns and actions needed to meet the goals of the watershed.

8.1 BACKGROUND

The Phase II Storm Water regulations provide for the entities to begin implementation of the WMP as enforceable compliance standards in their individual required Storm Water Pollution Prevention Initiative (SWPPI). The SWPPI's are to be designed to reduce the discharge of pollutants to the maximum extent practicable with guidance from the goals and objectives set forth in the WMP. The Combined Downriver Watershed entities created a formal watershed organization to cooperate on the development of the Combined Downriver Watershed Management Plan. Documentation of the history of the formation of the Alliance of Downriver Watersheds (ADW) and its continuation to facilitate implementation of the Plan is the focus of this Chapter.

8.1.1 Combined Downriver WAG

In the fall of 2002, through the facilitation of Wayne County, a planning meeting was set up for the communities in the Frank & Poet Drain watershed, the Blakely Drain watershed and the Downriver portion of the Detroit River watershed. The initial meeting of the group was held on September 10, 2002. The purpose of the meeting was to begin dialog with the communities regarding the upcoming (March 10, 2003) deadline for filing of Phase II Storm Water Permit Coverage, and to begin discussions of working together on a watershed based permit approach. The group continued to meet approximately monthly, determined they would individually apply as a single watershed under the Michigan Watershed Based General Permit Storm Water Permit (MIG619000), and also decided to identify the three watersheds as "subwatersheds" of the "Combined Downriver Watershed".

Each of the Communities submitted their applications for coverage to the Michigan Department of Environmental Quality (MDEQ) by March 10, 2003.

On April 28, 2003, the Combined Downriver Watershed Advisory Group (CDRWAG) was officially formed, with voting membership consisting of: the Cities of Gibraltar, Riverview, Romulus, Southgate, Taylor, Woodhaven and Wyandotte; the townships of Brownstown, Grosse Ile and Huron; and Wayne County and the Wayne County Airport Authority. Operational Procedures for the CDRWAG were adopted, along with a mission statement and identification of responsibilities of the CDRWAG. The mission statement adopted by the CDRWAG was:

> "A Combined Downriver Watershed and riparian corridor system that is aesthetically pleasant, clean, healthy and safe so that watershed residents and visitors can enjoy an improved quality of life, with reduced risk of flooding and better coordination of storm water management throughout the region."[1]

The identified responsibilities of the CDRWAG were defined as:

- Coordinate actions between members to facilitate compliance with the watershed-based Michigan Department of Environmental Quality Storm Water Discharge Permit (MIG619000) including preparation and implementation of a joint watershed management plan for the Combined Downriver Watershed.
- Coordinate efforts to obtain funding for watershed management projects (e.g. Clean Michigan Initiative and other state and federal sources).

[1] Operational Procedures for the Combined Downriver Watershed Advisory Group (CDRWAG) – approved by the Combined Downriver Watershed Advisory Group on April 28, 2003.

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- Provide a forum to discuss common needs and share information among members, and to explore potential mechanisms to reduce the cost and time needed to implement the requirements of the General Permit and other watershed initiatives.
- Help build consensus among communities, public agencies, and the general public on the goals, objectives and priority actions required to improve and maintain the Frank and Poet Drain, the Blakely Drain and the Detroit River water resources as an asset to the residents within the Combined Downriver Watershed.
- Assist members in meeting the requirements of state and federal water quality laws and regulations.
- Provide watershed representation and/or input into regional water quality and flood control issues.

8.1.2 Combined Downriver Inter-Municipality Committee

Throughout 2003, the CDRWAG communities continued to meet regularly (every 4-8 weeks). During this time, discussions occurred regarding how to coordinate and fund the development of the Watershed Management Plan that would be required. Discussion included investigation of the idea of forming a Drainage District under Chapter 20 or 21 of the Michigan Drain Code, as well as other options. The CDRWAG concluded that formation of a committee of the Combined Downriver communities/entities, pursuant to the Inter-Municipality Committee Act (PA 200, 1957; MCL 123.631, et seq.), was the preferable and recommended approach. Included among the reasons was that:[2,3]

- It is easy to form the inter-municipality committee; only a resolution is required.
- The committee's activities are limited to "studying of area governmental problems of mutual interest and concern, including such matters as facility studies on sewers and sewage disposal, water, drains … and to formulate recommendations for and actions thereon."
- The "committee may employ personnel to coordinate and conduct all types of surveys and studies relating to the mutual problems of its member municipalities."
- As to funding the activities of the committee, "the member governing bodies, by resolution, may authorize the allocation of municipal funds for such purpose: The proportion of the total amount of funds to be provided by each member municipality shall be based on the recommendation of the inter-municipality committee … which shall have been approved by the member governing bodies."
- A member's financial contribution may be of in kind services and the committee is authorized to accept gifts and grants in furtherance of the objectives for which the committee is established.

A draft Memorandum of Agreement (MOA) and individual community/entity resolutions to officially form the Combined Downriver Watershed Inter-Municipality Committee (CDWIC) were developed and the individual communities/entities began the process of adopting them. On March 30, 2004, following adoption of the December 16, 2003 version of the MOA by a majority of the CDR communities, the CDWIC was officially formed. Huron Township was elected as the Chair, the City of Taylor as the

[2] April 14, 2003 Memo to Kelly Cave from Patrick B. McCauley summarizing a meeting of Legal Counsel from several of the ECWAG member communities.

[3] Note: Information provided to Wayne County and Ecorse Creek Communities was shared by Wayne County with the CDRWAG. Also, several of the CDRWAG communities also are in the Ecorse Creek and were aware of the information.

Vice-Chair and the Brownstown Township as the Secretary. The Woodhaven-Brownstown School District agreed to act as the fiduciary for the CDWIC.

8.1.3 Watershed Management Plan Initiation

The CDWIC then set about the process of creating an RFP and soliciting a Consultant or Consultant Team to assist the CDWIC in development of the Combined Downriver Watershed Management Plan. On May 11, 2004 the CDWIC selected a Consultant, and on June 29, 2004 an agreement was signed between the CDWIC (through the Chair) and the Consultant, and work on development of the first Watershed Management Plan officially began. The Watershed Management Plan was subsequently approved by the MDEQ in 2007.

8.2 Alliance of Downriver Watersheds

The Inter-Municipality Committees for the Ecorse Creek, Combined Downriver and Lower Huron River Watersheds successfully worked as independent groups for several years. In October 2005 and January 2006, at a joint meeting was held between the Committee's, options for institutional arrangements for continuing collaboration on storm water permit compliance and watershed management issues. There was broad interest in forming a permanent watershed organization under the new Watershed Alliance legislation (PA 517 of 2004). A subcommittee composed of members of the ECIC, CDWIC, and LHRWIC was formed to draft bylaws as required under the statute. The LHRWIC formally recommended that the Bylaws be presented to the respective governing bodies for adoption in May 2006, the CDWIC and ECIC followed with the same recommendation in June 2006. The ADW was officially formed when the bylaws were adopted by the governing bodies of 51% of the entities within the ADW boundaries. The ADW was formed in January 2007 and has 24 members.

The Alliance of Downriver Watershed (ADW) members have been formally and informally working together for several years to manage the area's water resources on a watershed basis and to comply with federal regulations regarding the discharge of storm water. The ADW is a permanent watershed organization formed under Public Act 517 of the Public Laws of 2004. The ADW was formed in January 2007 and consists of 24 public agencies in the Ecorse Creek, Combined Downriver, and Lower Huron River Watersheds in southeast Michigan. The agencies and communities that comprise the ADW believe there are substantial benefits that can be derived by joining together and cooperatively managing the rivers, lakes, and streams within the watersheds and in providing mutual assistance in meeting state water discharge permit requirements of the members. The ADW is relatively urban in nature with more open and rural lands as you move south within the watershed boundaries. Based on 2010 Census data, approximately 453,436 people reside within the watershed boundaries.

ADW members (and NPDES permit holders) include:

- City of Allen Park
- City of Belleville
- Brownstown Township
- City of Dearborn Heights
- City of Ecorse
- City of Flat Rock
- City of Gibraltar
- Grosse Ile Township
- Huron Township
- City of Lincoln Park
- City of Melvindale
- City of Riverview
- City of Rockwood
- City of Romulus
- City of Southgate
- South Rockwood
- Sumpter Township
- City of Taylor
- Van Buren Township
- Wayne County
- City of Westland
- City of Woodhaven
- Woodhaven-Brownstown School District
- City of Wyandotte

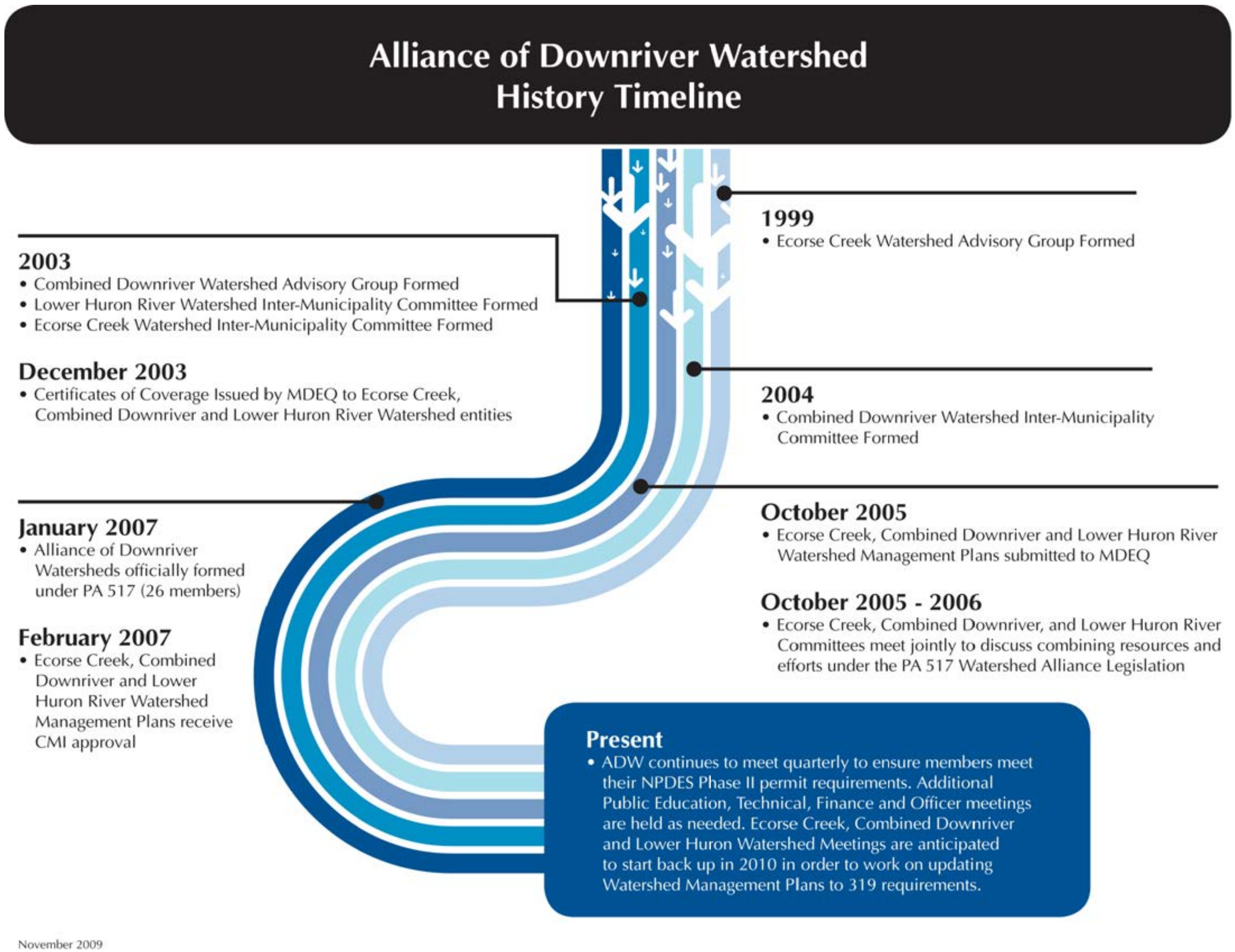
In addition to the 26 permitted agencies that are official, financially contributing members of the ADW, the ADW has formal partnerships with several agencies that are also seeking to assist in the overall management and improvement of the watershed. These include:

- Friends of Detroit River/Detroit Riverkeeper
- Downriver Stream Team
- Huron River Watershed Council

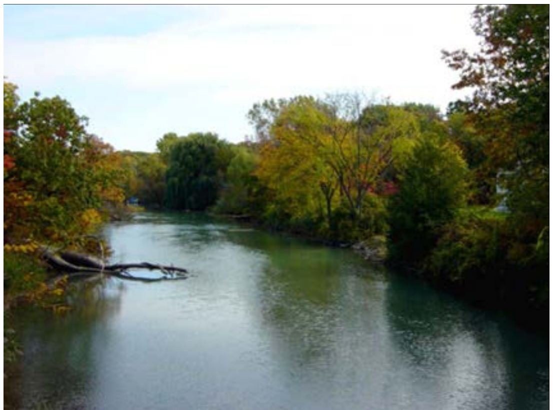
8.3 Sustainability

It is the intention of the Alliance of Downriver Watersheds members to continue to operate as they have since forming in 2007. The ADW Bylaws (Article III) details the assessment of cost to members methodology. The members of the ADW developed a cost allocation methodology based on each member's total area (acres) in all 3 watersheds and total population in all 3 watersheds. As of this writing, the ADW has sustained a bi-annual budget of approximately $300,000 - $350,000. Among other things, the annual membership dues provided by each member have been successful in serving as local match and leveraging several hundred thousand dollars in grant funds. The ADW will continue to look for opportunities to leverage their collective funds to continue making progress toward meeting the goals and actions outlined in this Watershed Management Plan. The ADW also anticipates seeking outside funding sources and grants in order to implement the more costly best management practices.

Figure 8-1


Alliance of Downriver Watershed History Timeline
1999
• Ecorse Creek Watershed Advisory Group Formed
2003
• Combined Downriver Watershed Advisory Group Formed
• Lower Huron River Watershed Inter-Municipality Committee Formed
• Ecorse Creek Watershed Inter-Municipality Committee Formed
December 2003
• Certificates of Coverage Issued by MDEQ to Ecorse Creek, Combined Downriver and Lower Huron River Watershed entities
2004
• Combined Downriver Watershed Inter-Municipality Committee Formed
October 2005
• Ecorse Creek, Combined Downriver and Lower Huron River Watershed Management Plans submitted to MDEQ
October 2005 - 2006
• Ecorse Creek, Combined Downriver, and Lower Huron River Committees meet jointly to discuss combining resources and efforts under the PA 517 Watershed Alliance Legislation
January 2007
• Alliance of Downriver Watersheds officially formed under PA 517 (26 members)
February 2007
• Ecorse Creek, Combined Downriver and Lower Huron River Watershed Management Plans receive CMI approval
Present
• ADW continues to meet quarterly to ensure members meet their NPDES Phase II permit requirements. Additional Public Education, Technical, Finance and Officer meetings are held as needed. Ecorse Creek, Combined Downriver and Lower Huron Watershed Meetings are anticipated to start back up in 2010 in order to work on updating Watershed Management Plans to 319 requirements.
November 2009

9. Public Involvement



Thoroughfare Canal in Grosse Ile

Chapter Contents

Inter-Municipality Committee Meetings and Workshops
Public Participation Process
Project Website
Individual Community / Entity Meetings
Public Information Meetings
Presentations to Councils / Boards
Public Survey (SEMCOG)
Public Education Plan

The development of this Watershed Management Plan (WMP) included and encompassed a wide range of efforts for public involvement opportunities, coordination between communities and entities within the watershed, and general awareness of the purpose of the project. A detailed meeting listing can be found in Chapter 5.

9.1 INTER-MUNICIPALITY COMMITTEE MEETINGS AND WORKSHOPS

The Combined Downriver Watershed Inter-Municipality Committee (CDWIC) met throughout the course of developing the original 2007 Watershed Management Plan. From June 2004 through November 2005, 14 meetings were held, several of which were held jointly with the Ecorse Creek Watershed Inter-municipality Committee (ECIC). Subsequent to the February 16, 2006 MDEQ comments on the Watershed Management Plan as submitted October 31, 2005, two additional meetings were held in preparation for resubmittal of the plan. All meetings were open to the public and the schedule was provided on the project webpage. Committee meetings were used to conduct regular business of the committee, solicit information necessary for the completion of the WMP from committee members, provide updates and discuss the progress of the WMP, and provide information regarding on-going local and regional watershed activities.

CDWIC Meetings
June '04 – November '05

2004
June 29th
July 29th
September 8th
October 13th
November 9th (Workshop)

2005
January 12th
February 9th (Workshop)
March 15th
April 13th
April 28th
May 18th
June 15th
July 27th
October 18th

2006
March 26th
April 27th

In addition to regularly scheduled CDWIC meetings, two workshops were also held. These workshops were held jointly with both the ECIC and Lower Huron River Watershed Inter-Municipality Committee. The purpose of these workshops was to provide general background information to the committees and to solicit input necessary for the development of the WMP.

- The first workshop, held on November 9, 2004, focused on finalizing the desired uses and goals of the watershed. The first portion of this workshop provided a characterization of each of the three watersheds and pointed out differences and similarities between the three. With this information in hand, representatives from the watershed came to a consensus on the designated and desired uses as well as goals for the watershed.

- The second workshop, held on February 9, 2005, focused on Management Alternatives. The desired outcomes of this workshop were to gain an understanding of the relationship between goals, objectives, and management alternatives; and to identify objectives and management alternatives to address problems and support the goals of the watershed. The first portion of this workshop focused on explaining the relationship between goals, objectives, and management alternatives and also provided an overview of different types of management alternatives. The watershed groups then divided and brainstormed short-term objectives to support the long-term goals for the watershed. In addition, the CDWIC representatives reviewed a list of possible management alternatives and discussed and revised the list so it could be used for future selection.

9.2 PUBLIC PARTICIPATION PROCESS (PPP)

Early in the project schedule, the committee developed a Public Participation Process (PPP), which was subsequently approved by the MDEQ in October 2004 (Appendix H). The PPP was required by the MDEQ under the General Storm Water Discharge Permit (MIG619000). The purpose of the PPP was to facilitate the involvement of watershed jurisdictions, agencies, organizations, and the general public in the development of the original 2007 Combined Downriver Watershed Management Plan. Special efforts were made by each of the entities to involve those with the authority, ability, and desire to bring about necessary change by developing and implementing the Watershed Management Plan. The PPP was posted on the project website and regular reminders were given at committee meetings that each individual community or agency was responsible for maintaining communication and encouraging participation regarding the development of the WMP. The PPP included the development of a project website (www.combineddownriver.com), an email distribution list that people could be added to as the project continued, press releases during development of the WMP, updates at local meetings, public information meetings (3), cable television announcements, etc.

9.3 PROJECT WEBSITE

A website was developed (www.combineddownriver.com) as part of the Public Participation Process requirements, and to serve as a repository for information on the project including the location of the watershed, the CDWIC structure and purpose, meeting schedule, agendas, summaries, and general happenings in the area including river clean up days, upcoming conferences, workshops, training opportunities, etc. The majority of those entities that have their own websites provided a link to the watershed webpage as well. Press releases (Appendix J) and informational pieces included the website address to try and raise awareness and use of the resource. Once a draft WMP was developed, it was posted on the project website for all to access, review and comment.

The Alliance of Downriver Watersheds created a website to share information and make announcements. The website continues to be regularly maintained and updated and includes postings such as meeting announcements, agendas, summaries, ADW bylaws and the ADW Annual Report. In 2009, the website address was renewed for another 3-year period. The website link/address is: www.allianceofdownriverwatersheds.com

9.4 INDIVIDUAL COMMUNITY/ENTITY MEETINGS

Meetings with the individual Combined Downriver communities were held during the development of the 2007 WMP in order to gain input on current practices, action items and potential improvement projects (March & April 2005). In order to develop the update for the Watershed Management Plan, another series of meetings and data gathering with the individual entities was necessary. These meetings proved to be invaluable in gaining a better understanding of the issues each community/entity is facing, as well as to brainstorm potential project ideas and locations (See Chapter 6). A worksheet was developed and emailed to the members in advance of the individual meetings. The brainstorming worksheet was developed to get ADW members thinking about potential wish list projects or action items over the next 5 years (20121-2016) (other than those required by permit). Throughout the summer and early Fall of 2010, representatives met with the majority of ADW members to review the worksheet and identify projects that they would like to pursue if funding should com available. These meetings resulted in the tables found in Chapter 6 that summarize the action items (by BMP) that are priorities over the next five years.

9.5 PUBLIC INFORMATION MEETINGS

In addition to the efforts described above, 3 formal public information sessions were held during the development of the original 2007 Watershed Management Plan (See agendas in Appendix I). The results of the public information meetings were utilized as another tool in understanding the issues and priorities in the watershed and in developing the action plan(s). Formal public involvement opportunities included:

Public Information Meeting #1
January 20, 2005
Hosted by City of Taylor at City Hall

Approximately 40 people attended the first public meeting. The purpose of the meeting was to provide an overview of the watershed management plan process, present an overview of the watershed including general findings to date, and to discuss the next steps in the project and how to stay involved. The overview of the watershed included discussion regarding the percent of population within the watersheds by community, population density, land area within the watershed by community, the primary watercourses, topography, pre-settlement vegetation, existing land use, future land use, wetlands, flood prone areas, and general issues and concerns. Example goals for the watershed were also presented and participants were asked to indicate their priorities. All those in attendance were made aware of the project website address and how they can stay involved in the project. General input and comments were gathered from those in attendance. Comments and questions were received regarding partnering with schools and volunteers to assist in water quality monitoring, educating the public and youth regarding watershed protection, balancing the need to improve flows with the need to maintain habitat, the desire to develop and enforce tree ordinances, etc.

Public Information Meeting #2
June 1, 2005
Hosted by Brownstown Township at the Community Center

Approximately 14 people attended the second public information meeting that was held during the development of this Watershed Management Plan. The purpose of the meeting was to present an overview of WMP process, the designated and desired uses, major goals of the watershed, the draft recommended action plan for the watershed, and methods to measure progress. The meeting was also held to gather additional input and ensure

continued awareness and involvement in the development of the plan. The goal development process was reviewed as were the priority pollutants and issues within the watershed. An overview of the actions and best management practices was given and a discussion took place regarding the number of actions being done or that will be done within the watersheds as part of the Phase II permit (short-term) as well as the numerous potential projects (long-term) that have been identified by the watershed committee. All those in attendance were made aware of the next steps in the planning process as well as the variety of methods to continue to provide input and review the draft plan including emailing or calling the watershed committee chair, the local watershed representatives, or project team members. The project website was also discussed as a means of staying up to date and aware of meetings, revised drafts, etc. Discussion also took place regarding how the watershed committee will move forward once the plan is completed to ensure its sustainability and implementation.

Public Information Meeting #3
September 22, 2005
Hosted by Friends of the Detroit River at the Westfield Center in Trenton

The purpose of the meeting was to present the final draft of the Watershed Management Plan and to gather any final comments and input prior to the plan being approved by the MDEQ. The purpose of the meeting was to present the final draft of the Watershed Management Plan and to gather any final comments and input prior to the plan being approved by the MDEQ. The meeting was held in conjunction with the Friends of the Detroit River Annual Meeting and approximately 52 people were in attendance. The components and process of developing the Watershed Management Plan were reviewed. An overview presentation was given regarding the designated and desired uses, priority pollutants and issues, goals, action items, related initiatives, how progress will be measured, and how the plan will be updated. Attendees were made aware that the draft plan is up on the project website and that the committee planned to submit the final plan to the MDEQ by November 1, 2005. Discussion took place about how the public participation meetings were published and advertised, what provisions are in place for implementation, specifics about the Drain Code, as well as questions regarding the field work methodology.

9.6 PRESENTATIONS TO COUNCILS/BOARDS

After the CDWIC reviewed a complete draft of the Watershed Management Plan at their May 18, 2005 meeting, comments and edits were received and made. Presentations were then scheduled with 7 of the participating watershed members to provide an overview of the process and the recommendations of the draft plan. These meetings also served to further the awareness and education regarding watersheds, things that affect water quality, and what can be done, or is currently being done to improve water quality in the area and region. Presentations were made in June, July, and August 2005 to the following:

- City of Gibraltar
- Grosse Ile Township
- City of Riverview
- City of Southgate
- City of Wyandotte
- Huron Township
- Wayne County

9.7 PUBLIC SURVEY (SEMCOG)

The Southeast Michigan Council of Governments and the Southeast Michigan Partners for Clean Water conducted a water quality survey during the summer of 2004. The purpose of the survey was to provide a benchmark to gauge the effectiveness of regional and local public outreach campaigns, leverage resources, and provide the opportunity to compare results from different areas of the SEMCOG region.[1] Results specific for the Downriver area can be found in Appendix K. Example findings include the following:

- Forty-five percent of those surveyed indicated that they "didn't know" where storm water goes after it enters a storm drain or roadside ditch.
- Only 15% of those surveyed knew that they lived in a watershed.
- More than three-fourths (78%) of those surveyed agreed with the statement that the quality of local streams where they live affects the Great Lakes and Lake St. Clair.
- Sixty-six (66%) percent of those surveyed indicated that their household uses a community collection site to dispose of household hazardous waste, such as old oil, fluids from vehicles, batteries, and pesticides.
- The top four ways residents preferred to receive information about what they can do to protect lakes and streams were from community newspaper (45%), television news (43%), major newspapers (40%), and municipal newsletter (28%).

It's anticipated that a similar survey will be conducted again in the future and compared to the results of this initial survey to illustrate changes in public perception and knowledge over time.

9.8 PUBLIC EDUCATION PLAN (PEP)

As required under the State of Michigan Phase II Watershed Based Storm Water General Permit (MIG619000), and individual communities/entities Certificate of Coverage, the members of the CDWIC individually prepared Public Education Plans (PEPs) that were submitted to the MDEQ under separate cover (most by November 1, 2004). The PEPs were prepared to instill within the residents, commercial and industrial businesses, developers, visitors, officials and employees, a heightened awareness of the connection between individual actions and the health of the watershed and water resources. The objective of the PEPs is to promote, publicize, and facilitate watershed education for the purpose of encouraging the public to reduce the discharge of pollutants in storm water. Each of the individual PEPs address public education requirements of the MDEQ that fall under one of the six required categories:

- Personal Watershed Stewardship
- Ultimate Storm Water Discharge Locations and Potential Impacts
- Reporting of Illicit Discharges
- Personal Actions that can Impact the Watershed
- Waste Disposal
- Riparian Land Management

The PEPs are separate documents submitted to the MDEQ outside of this Watershed Management Plan. However, it is a goal of this WMP to raise the level of awareness and educate the community in regard to watersheds, what is being done to improve water quality, what an individual can do to help, etc.

To further this effort, and to continue to raise awareness, a board illustrating the location of the Combined Downriver Watershed as well as a handout describing the watershed management plan process and project website were put on display and made available at a Friends of the Detroit River reception. The program was held at U of M Dearborn on June 16, 2005 with approximately 150 people in attendance. The primary purpose of the program was to update attendees about the plans for the International Wildlife Refuge Visitor Center. It's estimated that approximately 110 copies of the Combined Downriver Watershed handout were picked up by program attendees.

9.9 Watershed Advisory Committee Meetings

During the process of updating the WMPs, a meeting was scheduled with each of the Watershed Advisory Committees (WAGs). The 3 WAG meetings were held in November 2010 with the Ecorse Creek WAG, the Combined Downriver WAG, and the Lower Huron River WAG. The primary purpose of the WAG meetings was to update the members on the status of the update, present results of the Watershed Treatment Model, and solidify the projects and BMPs that were identified by the individual watershed entities.

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[1] SEMCOG Regional Water Quality Survey Findings Report. ETC Institute, Olathe, Kansas, September 2004.