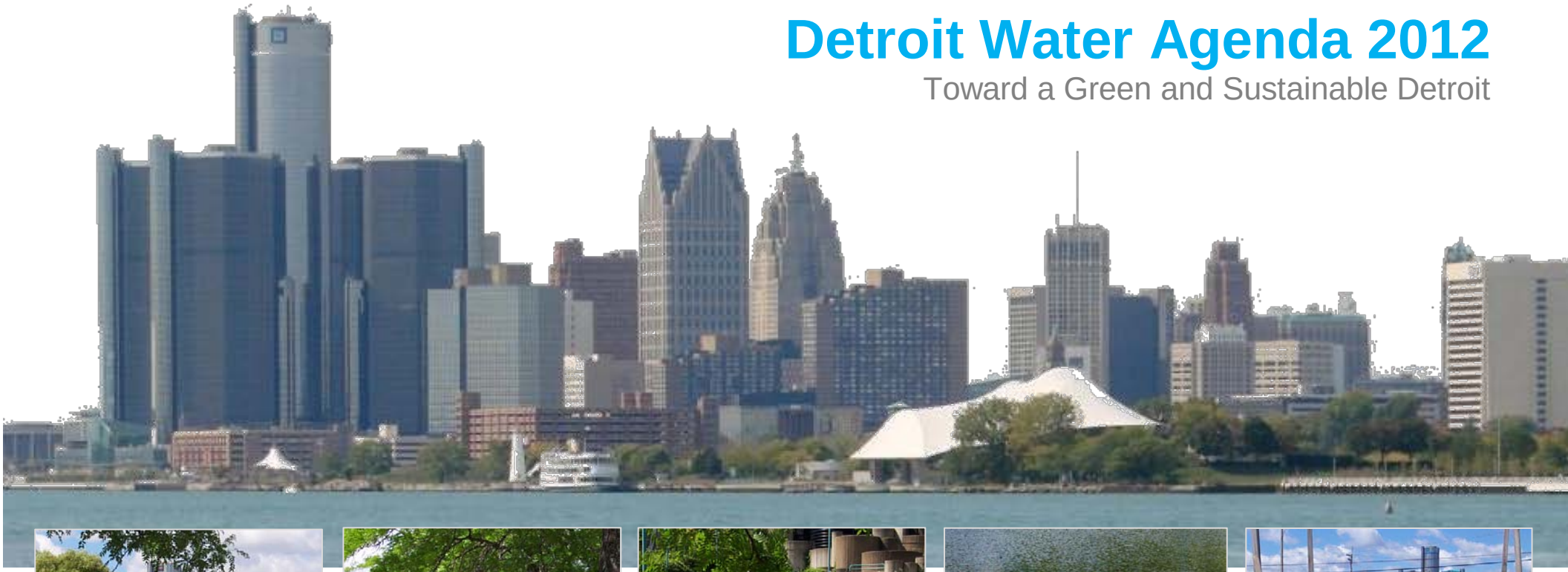
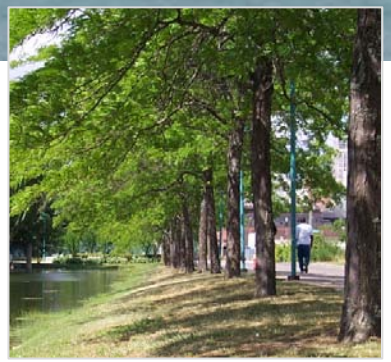
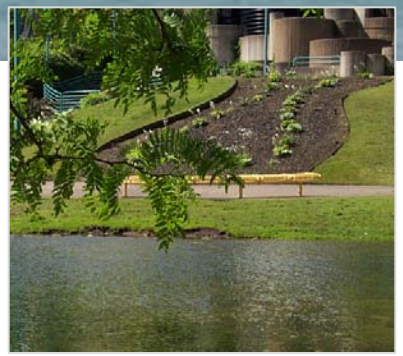
A reference for creating sustainable development policies for Detroit

Detroit Water Agenda 2012

Toward a Green and Sustainable Detroit







City of Detroit
Council Member Kenneth V. Cockrel, Jr.
Detroit City Council Green Task Force Water Subcommittee

Acknowledgements

The Detroit Water Agenda 2012 document would not have been possible without the leadership of Detroit City Council Member Kenneth V. Cockrel, Jr., and the many Detroit residents and community groups who gave their valuable time and efforts. The Green Task Force Water Subcommittee is also grateful for the participation and contributions of the following:

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Waste Management

Cover – Detroit Riverfront
Photo Sources: Urban Design Unit/Pⅅ Sierra Club

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Detroit residents
Photo: Sierra Club

A Note from
Kenneth V. Cockrel, Jr.

Greetings!

You hold in your hands a document that is of important historical significance.

The pages that follow comprise Detroit's first ever Water Agenda. This community driven document is the result of months of discussion and input from a broad array of Detroit residents, stakeholders and community groups. These discussions were focused on creating a framework for the future protection and management of one of the city's most precious resources – our water.

The Detroit Water Agenda 2012 includes recommendations on water assistance, environmental justice, water resource conservation and stormwater management. As the founder and Chair of the Detroit City Council Green Task Force, I am pleased to offer my support of this important document.

I hope that it can be seen not only as a framework for action today but as a pathway towards a brighter, cleaner tomorrow. Thank you.

Sincerely,

Kenneth V. Cockrel, Jr.
Detroit City Council Member

Source: http://epa.gov/greatlakes/index.html

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."

~John Muir

Introduction

Climate change, rapid development, urbanization and increasing demand for water have been a driving force for many cities and towns to adopt sustainability plans, green agendas and climate action plans. According to the U.S. Government Accountability Office (GAO) report, "…current trends indicate that demands on the nation's [water] supplies are growing. In particular, the nation's capacity for storing surface-water is limited and ground-water is being depleted. At the same time, growing population and pressures to keep water instream for fisheries and the environment place new demands on the freshwater supply. The potential effects of climate change also create uncertainty about future water availability and use."[1]

Increasing demand for water resources and the effects of climate change are interconnected. The way we live, build and consume and dispose have put a tremendous strain on the natural environment, natural resources and existing infrastructure. Increased carbon dioxide in the atmosphere has been linked to increases in drought and flooding, extreme temperatures, changes in sea level and melting polar ice.[2] Rising water demand and potential shortages caused by drought and population growth pressures have the potential to cause environmental degradation, economic hardship and public health issues for individuals and communities, particularly the underprivileged.[3] These consequences make it imperative to find sustainable ways to live, build, develop and grow.

As part of the City's effort to formulate sustainable development policies, the Green Task Force (GTF), established in 2007 under the leadership of Detroit City Council Member Kenneth V. Cockrel, Jr., is heading a municipal effort to address the challenges of climate change and develop a framework for a green and sustainable Detroit. Several GTF working groups made up of City staff, Detroit citizens, non-profit groups, academic institutions and businesses were established to provide guidance on sustainability in the areas of land use, transportation, green building, water and green jobs.

The Water Subcommittee (WSC) is the GTF advisory group looking specifically at water resource conservation and reuse, stormwater management, water pollution prevention and

[1]GAO-03-514 Report, July 2003
[2]Intergovernmental Panel on Climate Change (IPCC)

[3]United Nations Development Programme - Human Development Report Office (http://hdr.undp.org/en/reports/global/hdr2011/download/)

community outreach and education at the local level. Its focus is water issues beyond the building site to the local and regional level, and the promotion of best practices that correspond to established national, state, and regional strategies.

This Detroit Water Agenda 2012 is a compilation of information gleaned from meetings of the WSC during the past year. It is a working document that covers eight focus topics and provides recommendations and strategies relevant to Detroit and the region on these topics. It brings together different stakeholders to begin a conversation and build consensus on adopting policies related to water sustainability for Detroit. The recommendations provided here do not represent an official City policy or an endorsement by any City agency. Rather, they reflect community-based input on local and regional water issues, and are intended to be used as a reference for moving forward with sustainable development practices in Detroit.

Three Components of Sustainable Development
The Ideal Balance

Sustainable development is the center merging point of all three components
Source: http://cmsdata.iucn.org/downloads/iucn_future_of_sustanability.pdf

What is Sustainable Development?

Sustainable development has become a familiar term since it was first used in *Our Common Future (*also known as the Brundtland Report), published by the United Nations World Commission on Environment and Development in 1987. Sustainable development is broadly understood to mean "intergenerational equity". In the context of developing sustainability policies for Detroit, the definition set forth in *Our Common Future* provides a clear vision statement; and its meaning and applicability to us as part of a global community grows ever more important: Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This is accomplished through the balance of its three interdependent components: environmental protection, economic growth and social justice.[4] It is the ideal balance of these components of sustainable development that we seek to achieve.

[4]W. M. Adams, IUCN-The World Conservation Union, The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century, *Report of the IUCN Renowned Thinkers Meeting, 29-31 January 2006* (www.iucn.org)

Objectives of the Detroit Water Agenda 2012

- State a commitment to water conservation, water efficiency and stormwater management and support measures for water resource efficiency and conservation
- Inform and guide consumers about water issues and challenges in light of sustainable development and growth, access and affordability
- Encourage public and private sector initiatives in water efficiency, resource conservation and reducing the negative impact of urban runoff and water pollution on the natural environment
- Promote educational and outreach programs and information sources about water
- Call on the City to 'Lead by Example'

- Propose and implement water management and conservation strategies that will promote protection from and mitigation of the worst effects of climate change on community, agriculture, health and quality of life
- Become a component of an integrated sustainability and climate action plan to be included in the City's Master Plan
- Ensure that sites and buildings are designed and constructed according to green building principles and strategies
- Encourage the development community to incorporate sustainable building practices and strategies in the building design, construction and demolition, maintenance of existing facilities
- Convey federal and state information related to regulations, guidelines and policies for water resources, water conservation, water resources protection and water pollution prevention
- Realize the value of water based recreational activities and their economic development impact on the region as they relate to tourism and quality of life
- Ensure that recreational opportunities as they relate to water use are accessible to all and are environmentally friendly[5]

Kayaks on the Detroit River- Heritage Water Trail
Photo: Absolute Michigan & Metropolitan Affairs Coalition

Detroit Riverfront Promenade
Photo: Sierra Club

[5]As an example, a kayaking permit/registration policy effort is currently being discussed.

Seventh Generation

"In every deliberation we must consider the impact on the seventh generation… even if it requires having skin as thick as the bark of a pine."

~Great Law of the Iroquois

01

Story of Our Place

The "Story of Our Place" is the story of our water. No other state in the Great Lakes region can make the claim as broadly as Michigan: water is our greatest natural resource. As residents of this beautiful eco-region surrounded by its vast freshwater lakes and rivers, we often take our water for granted. We see water as abundant and limitless; its health and existence assured. But as with all earth's water, the water of the Great Lakes region is finite and is vulnerable to degradation.

The Great Lakes Basin holds 90% of the fresh surface water in the U.S. and more than 20% of the world's supply. These lakes were formed an estimated 10,000 years ago when a large ice sheet receded, leaving behind water which filled up the basins that the glaciers had carved, now known as our Great Lakes.

The Detroit River, located within the Basin, is 28 miles long and runs south from Lake St. Clair to Lake Erie. It provides a boundary between the United States and Canada, and has served an important role in the history of Detroit. Detroit's place, economy, and culture were established by Detroit's early settlers along the Detroit River because of the availability of the water resource. When Detroit was founded in 1701, the Detroit River provided an unlimited supply of clean water to its residents. Early settlers collected water from the river in leather buckets, and carried them back to their homes for use.[6] The Detroit ribbon farms, the manmade canals and the industries that evolved in the early days of Detroit are all a testament to the value of the water of the Detroit River.

Detroit's water resource is made up of much more than just our local Detroit River; it is the Clinton and St. Clair Rivers flowing into Lake St. Clair, along with the Rouge River feeding into the Detroit River. All are interconnected to each other and to the greater lakes above: Lake Huron, Lake Michigan and Lake Superior and below, Lake Erie, Lake Ontario and the St. Lawrence Seaway. The health of one part of this watershed eco-region system impacts all others.

Before the arrival of Europeans, the indigenous, tribal peoples inhabited this uniquely rich place, and travelled the river using canoes. They thrived on its water, fish, and other related animal and plant life, and established a record of a way of life that has

[6]Detroit Water and Sewerage Department (www.dwsd.org)

become a model for environmental stewardship and conservation. From the mid 1600's the European settlers, travelling by canoe, began using the Detroit River as a shipping route for the fur trade. Later, the river was central to Detroit's transition from the fur trade into a major industrial city, since the Detroit River was the only way a ship could travel out of the Great Lakes system. The Erie Canal, completed in 1817, opened up an easier way to Lake Erie from the east coast, and the Detroit River became a main route for settlers traveling to Michigan from the East. As a result of this new route, Detroit experienced a major increase in population, and by the early 1900's, with its growing population and workforce, Detroit rapidly transformed into an industrial city.

As still one of the busiest and most important waterways in the world, the Detroit River continues to be a vital transportation route connecting Lake Michigan, Huron, and Superior to the St. Lawrence Seaway and Erie Canal.[7]

The Detroit River and its shore incurred tremendous damage from Detroit's industrial pollution during the first half of the 20th century. Fish populations, historically an early indicator of the condition of the Lakes[8], were dying off and unable to inhabit the waters. Yet, there was insufficient political motivation at that time to clean up the river or to create regulations on industry because of the enormous costs and the feared impacts on the local economy. As a result of the massive industrial pollution being dumped into the waters, Lake Erie became so toxic that it was unable to support aquatic life; it was considered "dead".[9] In 1970, all fishing activities were officially halted and declared unsafe in the Detroit and St. Clair Rivers as well as Lake Erie and Lake St. Clair because of the high levels of mercury found in the water. It was this event that set into motion the major efforts to clean and restore the Detroit River.

Today, the Detroit River continues to provide a drinking water supply to metropolitan areas including Detroit and the city of Windsor, Ontario.[10] Detroit is highly urbanized and much of the previously industrialized land along the River has been transformed or is in the process of transformation into green open space, recreational, residential and mixed uses. In addition, the Detroit River was honored with the designation of an American Heritage River in 1998 and a Canadian Heritage River in 2001.

This story of our local and region's water ecosystem is intended to remind us that we all play an important role in preserving, conserving and protecting water - our greatest natural resource. Our history helps us gain an appreciation of our water resource; to understand its vital importance and the need to use our water in sustainable ways. As climate change increasingly affects our access to clean water, it is critical to require resource management and ensure environmental justice.

St. Lawrence River and Great Lakes Watershed
Source: http://en.wikipedia.org/wiki/Saint_Lawrence_River

Detroit River
Photo: http://sitemaker.umich.edu/ipe2006/home

[7, 9]Jenny Nolan, "How the Detroit River shaped lives and history", *The Detroit News* (11 Feb 1997) http://apps.detnews.com/apps/history/index.php?id=186; Detroit River (24 March 2012). In *Wikipedia*, Retrieved 2 March 2012 from http://en.wikipedia.org/w/index.php?title=Detroit_River&oldid=483751001
[8]Great Lakes, (2 March 2011). In *Wikipedia*, Retrieved 2 March 2012 from http://en.wikipedia.org/w/index.php?title=Great_lakes&oldid=416703740

[10]U.S. Geological Survey (http://mi.water.usgs.gov/pubs/OF/OF02-1/OF02-1LW.php)

02

Environmental Justice

Jarrad Henderson, AP

Water Justice is the ability of all communities to access safe, affordable water for drinking, fishing, recreational and cultural uses.

~Environmental Justice Coalition for Water
www.ejcw.org

As climate change increasingly damages the planet and threatens our ability to access clean water and to prevent water pollution, those who are impacted most are largely in low-income communities. These negative effects are increasing and are threatening the ability of these communities to survive and thrive. To protect low-income communities, it is vital that we seek the principle of water justice.

Environmental justice is the right for every person to live, work and play in a safe, healthy and sustainable environment. Detroit is a community that is struggling to maintain and create these environmental rights for all its residents.

For example, water quality from the banks of the Detroit River near Zug Island to the beaches of Belle Isle has historically been compromised by heavy polluters as well as runoff from the ordinary daily activities of an industrialized, urban community.

Zug Island

Zug Island and the communities along the southwestern shores of the Detroit River are heavily burdened with industry. According to the EPA, there have been over 100 small oil spills and one large oil spill over 100,000 gallons in the Detroit River since 2000.[11] Among the sources of industrial pollution in the area is DTE's coal-fired power plant. It releases mercury through precipitation and direct deposition, and sits adjacent to Bellanger Park Fishing area, an area actively used by Detroit anglers. In fact, many areas along the Detroit River are used by fishermen for subsistence fishing during the summer. Mercury is one contaminant known to cause severe developmental damage to unborn children; and is linked to the developmental disorders cerebral palsy and autism spectrum disorder in children.

Photos: Zug Island, Ren Farley, November 2009 (www.2000Detroit1701.org)

Photo: Belle Isle, Mike Russell, April 2008 (www.en.wikipedia.org)

[11]U.S. Environmental Protection Agency (http://www.epa.gov/med/grosseile_site/indicators/oiltable.html)

Belle Isle

Belle Isle, the jewel of Detroit, is the primary beach used by Detroit residents during the summertime. Historically, the beach has shown intermittent high levels of E. coli after rain events based on limited sampling by the state and supplemental community testing. The beach is located downstream from several Combined Sewer Overflows (CSO) located on the Detroit River that release raw and partially treated sewage during heavy rain events and snowmelts. These discharges have been identified as the source of multiple pollutants including disease-causing microorganisms called pathogens; nutrients, heavy metals, and other toxins. When pathogens are present at recreational beaches, they cause beach closures due to the high risk of illness from the water including diarrhea, vomiting, dysentery, respiratory and other infections. Sewage pollution is not only a threat to human health, it also can adversely affect aquatic life, aquatic habitats, contribute to algae blooms and decrease property values. While the strong river current effectively limits the migration of pollutants from Detroit's CSO discharges across the river to the Belle Isle bathing beach by pushing the CSO effluent plume along the city shoreline, the beach still remains vulnerable to intermittent E. coli contamination from these and other water pollutants including waste from geese, ducks and other waterfowl which reside in the area adjoining the bathing beach.

RECOMMENDATIONS

1. Adopt and implement the Environmental Justice principles[12] in the planning, design and management of water resources in Detroit.

2. Support community organizations working to improve their neighborhoods (i.e. 48217, Inc, Belle Isle Conservancy, Sierra Club Environmental Justice Program, Detroiters Working for Environmental Justice).

[12]The Principles of Environmental Justice, adopted at First National People of Color Environmental Leadership Summit, October 1991

3. Increase education of Detroit residents on water pollution. Specifically, education on beach monitoring for Belle Isle, types of pathogens possibly present in the water and education for people fishing from the Detroit River.

4. Increase signage in areas that are heavily fished and accessed by people along Detroit River. There should be warning signs to educate people on limiting or avoiding fish consumption due to contamination in the river. All park areas, especially Belle Isle, should use updated and prominently displayed signage warning of contaminants present; and prompt notification should be provided to residents located downstream from an E. coli related beach closure.

5. Limit industrial land uses and the expansion of existing ones near waterways and in disadvantaged communities already burdened, such as those in postal codes 48217 and 48210.

Temporary health warning signage
Source: http://www.mfe.govt.nz/

03

Water Assistance

In many urban communities, access to clean water is a challenge. Detroit, with its seismic shifts in industrial activity and population decline, is an unfortunate example of this challenge. In 2009, the DWSD supplied 20 percent less water than in 2003.[13] While that may be a cause for celebration of water conservation and efficiency in some cities, in Detroit it reflects the dire circumstances that the poor and unemployed are facing. It is estimated that thousands of individuals and households in the City of Detroit do not have access to drinking water for normal household use simply because they can not afford it.[14]

Paradoxically, the drop in demand for water (for these reasons as well as conservation efforts) has pushed the water rates even higher. Over the last ten years, both the water and unemployment rates in Detroit have seen significant increases. Since 2000, water rates have more than doubled, from $8 to over $16 dollars per 1,000 cubic feet (Mcf).[15] This is particularly devastating for the poor and unemployed. More than 20 percent of Detroit workers are unemployed by official estimates, but it is believed the numbers are higher. And as an aging water infrastructure system continues to require investments, many of these costs are shifted to those remaining customers, putting further financial strain on them; and the vicious cycle continues.

In response to these challenges, concerned citizens and those impacted by these financial hardships called for programs that would help to alleviate and support vulnerable low-income residents, disabled and senior citizens. This led to a locally based organization, Michigan Welfare Rights, to champion and spearhead an effort, which was approved in April 2006 by the Detroit City Council of a Water Affordability Plan.

The Water Affordability Plan proposed that low-income household users (based upon federal poverty guidelines) would be charged a monthly rate that equals 2.5% of their gross annual income. In addition to this formula, contributions from non-metered water users (apartment dwellers) and others would be solicited to contribute to the system. Customers in arrearage bills would be allowed to join a program, which would provide payment

[13,14]Brett Walton, **"**In Detroit: No Money, No Water". *Circle of Blue* (19 April 2010) http://www.circleofblue.org/waternews/2010/world/in-detroit-no-money-no-water/
[15]Detroit Water & Sewerage Department, official documents from 1999-2010

assistance. The program, intended to also include water conservation and best practices to educate consumers on water conservation and pollution control, was never fully implemented as envisioned by its advocates. Instead, the Detroit Residential Water Assistance Program was created.

Water Assistance Programs:

Detroit Residential Water Assistance Program (DRWAP)

The Detroit Water and Sewage Department created and developed an adjunct program that has been managed by the Department of Human Services since 2008. This program is referred to as the Detroit Residential Water Assistance Program (DRWAP). DRWAP is a program that provides assistance to Detroit residents whose water bills have become delinquent.

Water Access Volunteer Effort (WAVE)

WAVE was established in 2003 by a group of concerned citizens and business leaders as a 501(c)(3) non-profit organization based in Detroit. WAVE's goal is to provide assistance to low-income families by ensuring uninterrupted and safe access to drinking water and sewerage services. Detroit residents whose annual income is less than 150% of the federal poverty income level (approximately $30,000 for a family of 4) can apply for WAVE assistance.

RECOMMENDATIONS

1. Improve awareness of water assistance programs through an aggressive marketing and public information campaign.

2. Encourage all water assistance programs to release quarterly reports on program utilization and status of any and all program funds.

3. Partner with relevant non-profits, institutions and others for a water protection and conservation educational campaign with such items as home water audits and conservation incentives.

4. Continue to support, monitor and evaluate the Water Assistance Program while promoting water conservation measures and other sustainable policies.

"We never know the worth of water till the well is dry."

~Thomas Fuller, Gnomologia, 1732

04

Water Resource Conservation

Detroit is well positioned to start building sustainable neighborhoods and green communities. With a new Detroit City Charter in place supporting green initiatives, green technologies and natural resource conservation, and with more than one quarter of the city's land area vacant, Detroit has a unique opportunity to reform its thinking about land development practices and restructure its regulatory mechanism.

Transitioning Detroit toward a sustainable and green city requires a regulatory mechanism that responds to and addresses the challenges of environmental responsibility toward water resource conservation. This effort could move forward with auditing local zoning ordinances and codes to identify barriers, and draft amendments to align local regulation with national and state guidelines in promoting water conservation standards, water efficiency, stormwater management alternatives and water pollution prevention.

Council Member Kenneth Cockrel's Green Task Force has responded to multiple stakeholders that included Detroit residents, environmental community groups, academic institutions and businesses calling for the establishment of green policies and sustainability guidelines. With his sponsorship, two major resolutions relative to environmental stewardship were passed by the Detroit City Council. One resolution calls for a planning effort to establish a Detroit watershed plan, and another calls for establishing a green building policy for municipal new construction and maintenance and operation projects. As a result, a more coordinated and concerted effort is now underway to create sustainability plans for the city.

Adopting land development practices and a regulatory mechanism for new sustainable design and development models is one challenge that requires a coordinated and concerted effort at the municipal level. To incorporate water conservation, stormwater best management practices and water pollution prevention as part of the City's Master Plan, and into the zoning ordinances and code requirements, would require at least the immediate involvement of several City departments. This would include the Department of Water & Sewerage (DWSD), Planning & Development (P&DD), Public Works (DPW), Building & Safety Engineering Environmental Affair (BSEED) and the Law Department.

What is water conservation?

Despite the appearance of abundance, freshwater makes up only about 1% of the world's water resources. The Great Lakes hold about 20% of that surface freshwater. Clearly, these Lakes are a valuable natural resource and require integrated management through a comprehensive local and regional water conservation programs. Water conservation is defined as practices and measures applied to reduce water use by improving the water efficiency of a wide range of uses of water.[16] Both municipal governments and local communities have an important role to play in water resource management.

Water conservation is an essential part of water resource management. There are two types of users from the perspective of water resource management: *system users* or customers (e.g., residential, commercial, agricultural and industrial users) and *system operators* or suppliers (e.g., local utilities or regional supply plants).[17] Conservation practices can be implemented by both, and fall into two general categories: technical and behavioral practices.

Practices that focus on changes to hardware (e.g., plumbing fixtures, etc.) or supply methods fall into the technical category; and those that involve changes to water use habits are behavioral. In general, technical practices are regulatory in nature, while the behavioral are market-driven. Together, these practices are referred to as *"demand management"* measures since they affect water use and reduce waste at the source.[18] In other words, they are ways to improve water efficiency and conservation by both customers and suppliers. Measures such as waste reduction, leak detection and use of efficient appliances and technologies; and policies such as pricing at an economic rate, charging fees for pollution control practices, instituting regulations and restrictions for specific water uses and providing educational outreach to users on water conservation methods are all means to manage water resource demand.

In the U.S., it is estimated that we extract about 340 billion gallons of freshwater every day (including for residential, commercial, industrial and recreational activities, agriculture and other uses) from rivers, streams, reservoirs and wells (about 124 trillion gallons/year).[19] According to the U.S. Green Building Council, buildings alone consume over 13% of all the potable water we use (about 15 trillion gallons/year)[20]. An average shower uses 25-50 gallons (about 5-7 gallons per minute) and the average toilet in a building uses 3.5 to 7 gallons of water per flush.[21] Toilets consume the largest amount of indoor household water at 27% (Figure 4.1).

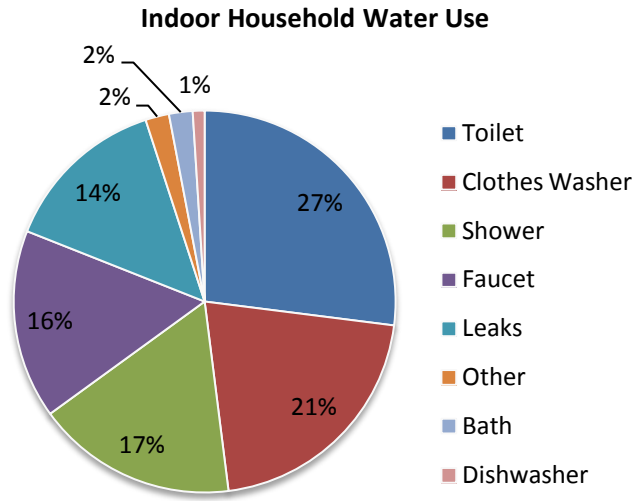


Figure 4.1 Statistics from AWWA Research Foundation

[16]Summary of Current Water Conservation Practices in the Public Water Supply Sector of the Great Lakes-St. Lawrence Region-Briefing Paper, March 31, 2004
[17,18]U.S. EPA, Cleaner Water through Conservation, Washington D.C., 1995 (Report No. EPA-841/B-95-002)

[19]U.S. Green Building Council LEED® Reference Guide - Water Efficiency
[20]U.S. Green Building Council (www.usgbc.org/ShowFile.aspx?DocumentID=5961)
[21]U.S. EPA, WaterSense (http://www.epa.gov/WaterSense/pubs/indoor.html)

What is the Great Lakes Compact?

The Great Lakes supply freshwater to more than 40 million people.[22] As with all natural resources, the Great Lakes Basin is affected by climate change, urbanization, land development and water pollution. In order to protect this important water resource, states and communities bordering the Lakes, including portions of Canada, coordinated an effort to regulate activities and uses of water within the Great Lakes Basin (Figure 4.2). The resulting agreement, the Great Lakes Compact, provides coordination and cooperation to protect the water resources by the eight Great Lakes states: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin; and also includes the Canadian provinces of Ontario and Quebec.

The Great Lakes Compact is a regulatory mechanism and an agreement that controls the diversion and excessive withdrawals of water by commercial, industrial, and agricultural activities as well as by communities that border the Lakes and are part of the Basin. The Compact was established with a shared goal and interest in guiding the protection of the Great Lakes-St. Lawrence River Basin water from diversion outside the states that have stake in the Great Lakes. In some instances, the Compact prohibits (with limited exceptions) the diversion of the water outside the Great Lakes Basin.

In addition to its regulatory power for the states, the Great Lakes Compact establishes the ground rules for water resource management and water conservation best practices. Equally important, the Compact delegates a self-directed role to the states and empowers local communities to develop their own water conservation programs and water efficiency measures for managing the waters of the Great Lakes Basin. As part of that effort, the GTF Water Subcommittee is providing this Water Agenda as a basis to further develop Detroit's own programs and recommendations for its water resource consistent with the Compact.

[22]Great Lakes Water Resources Compact, Wildlife Policy, *National Wildlife Federation,* Accessed 2 March 2012. (www.nwf.org)

Figure 4.2 The Great Lakes Basin
Source: Great Lakes Information Network (www.great-lakes.net/)

RECOMMENDATIONS

1. Continue the work of the Water Subcommittee as a task force made up of Detroit citizens, government agencies, environmental community and businesses to formulate policies and guidelines for a water resource conservation program, water efficiency, stormwater management and water pollution prevention program.

2. Develop policies and guidelines for existing parcels and newly developed sites that promote an increased capacity for the land to absorb stormwater events, reduce urban runoff rate and volume and to prevent water pollution.

3. Develop guidebooks and brochures highlighting the savings from basic 'housekeeping' strategies for water conservation.

4. Support the Great Lakes Compact.

5. Develop water conservation guides for residential, institutional, commercial, and industrial users. Include information about the connection between water and energy (e.g. energy is required to pump, treat and convey water).

6. Advance sustainable development strategies and green building design in the city by using standards similar to those by the U.S. Green Building Council (i.e., Leadership in Energy and Environmental Design - LEED® and Sustainable Sites Initiative - SITES™).

7. Link water conservation programs with incentives and/or with permitting process (e.g., mandating water use reduction).

8. Use water efficient plumbing fixtures and fixture sensors for toilets, urinals, showers and faucets to control water flow.

9. Promote the use of captured rainwater or rainwater harvesting for irrigation and non-potable uses.

10. Promote the use of efficient landscaping practices in irrigation.

11. Encourage wastewater recycling for reuse.

12. Promote the use of drought resistant and native plants that do not require regular irrigation.

13. Establish a program for municipally treated wastewater for non potable uses such as landscaping.

14. Provide financial incentives to the development community to promote water efficient systems and technologies in new and existing buildings.

15. Promote an integrated approach to development that conserves water, manages stormwater and prevents water pollution.

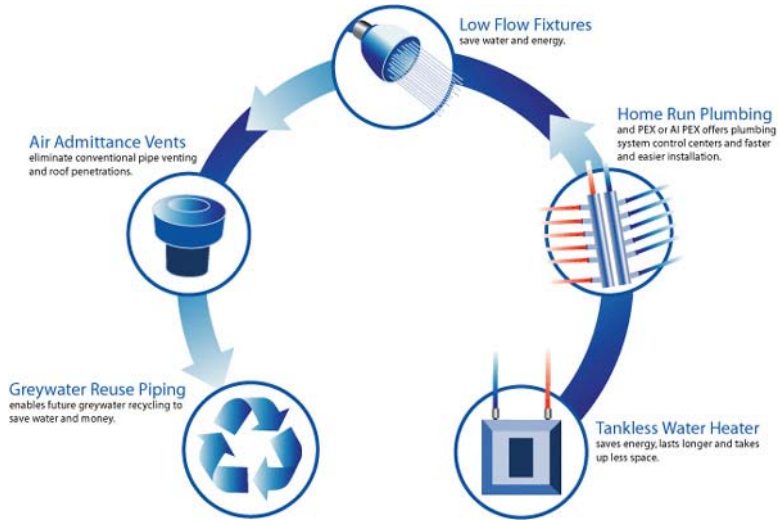


Diagram of resource-efficient plumbing system and technologies
Source: http://www.timbr.com

ADDITIONAL REFERENCES

Alex Wilson, "Water Policies: Encouraging Conservation", *Environmental Building News*, Vol.17, No. 9, Sept. 2008. (www.building green.com)

"Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our water is the principal measure of how we live on the land."

~Luna Leopold

05

Stormwater Management & Water Pollution Prevention Alternatives

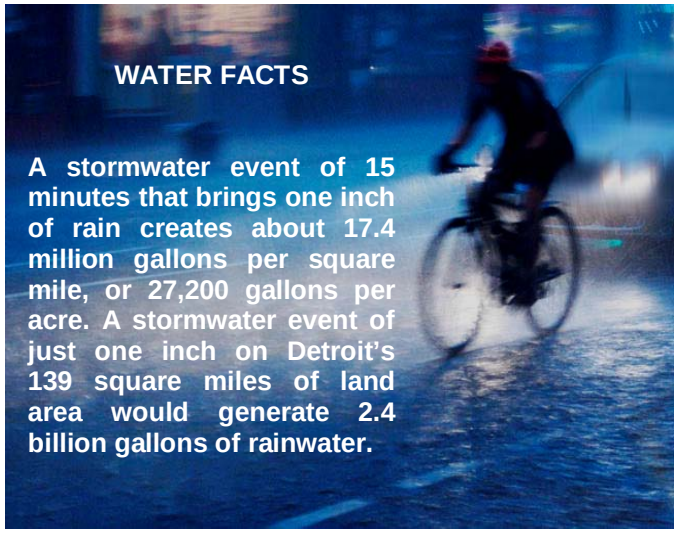


Photo: "Urban Rainstorm", Ellis Nadler, London
Source: www.imagekind.com

Urban stormwater handling and management systems in older cities like Detroit have been found to be economically and environmentally unsustainable. Rather than considering water as a resource, these systems deal with stormwater as a nuisance element that must be disposed of and diverted away from the site. These systems rely primarily on a network of impervious pavement surfaces, catch basins, drains, curbs, gutters, and pipes to collect and convey stormwater from private properties with residential and commercial buildings (e.g., from roofs, parking area, lawns) and from public lands (e.g., streets, public sidewalk, public parks) to a combined sanitary sewer (CSS) and ultimately to treatment facilities before discharge into rivers and streams.

Detroit has a combined sanitary sewer system in place to handle and manage stormwater. This system dates back to 1836 and is operated and managed by the Detroit Water and Sewerage Department (DWSD). Almost all of Detroit's rainwater and wastewater are conveyed by an approximately 3,430 miles of sewer lines.[23] This combination of stormwater and wastewater is conveyed to a network of strategically located pump stations, overflow retention areas, screening, disinfection and treatment

[23] http://www.dwsd.org/downloads_n/about_dwsd/fact_sheet/dwsd_fact_sheet.pdf

plant facilities before it is discharged in the Detroit River. While these strategies handle stormwater efficiently as designed, it is painfully clear that not only does the system require huge capital investments in maintenance, operations and improvement but that water quality issues are a major concern for communities along the Detroit River, including the city of Detroit; and those concerns have not been fully addressed (e.g., Zug Island).

Urban stormwater management practices have come under scrutiny in recent decades due to their capital intensive strategies requiring costly investments in existing centralized infrastructure (e.g., repair to sewer lines, pump stations and treatment plants) and their ineffectiveness in addressing water sustainability and water pollution prevention. The concern is that these stormwater management practices underestimate water pollution caused by the distribution of impervious surfaces (decentralized uses and activities) throughout the urban landscape.

Almost all land uses and activities (e.g., residential, commercial, industrial, institutional, recreational, agricultural, public land, public rights-of-way including streets and highways) can cause water pollution. Fortunately, these sources of water pollution are regulated under the Clean Water Act (CWA). Federal regulatory and permitting classifies water pollution under two categories according to their sources; *point source* and *non-point source.*

Point source pollution is polluted runoff from separate identifiable conveyances, such as single industrial pipes or man-made ditches that discharge pollutants directly into waters. This includes discharges from municipal sewage plants and industrial facilities, as well as collected storm drainage from larger urban areas such as municipal separate storm sewer system (MS4), municipal combined sanitary sewer systems and wastewater treatment plants. One major source of point source water pollution is urban runoff resulting from an occurrence called *combined sewer overflow (CSO)* event. This occurs when the municipal CSO underground pipe is overburdened with heavy storms, and the CSO system relief points releases untreated sewage water directly into rivers and streams (Figure 5.1). Other sources include runoff

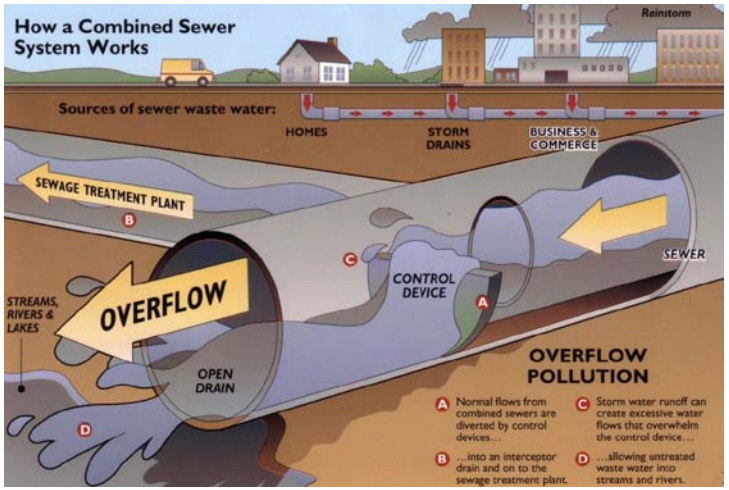


Figure 5.1 Combined Sewer System diagram
Source: Moundsville Waste Water Treatment Plant, Moundsville, WV http://www.moundsvillewwtp.com

from certain animal feedlots and fish farms, some types of ships, tank trucks, and/or offshore oil platforms.

Non-point source polluted runoff results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. Unlike point source pollution, this category of runoff comes from diffuse sources conveyed by impervious surfaces and includes construction and agricultural runoff, and runoff from everyday household or business activities. Fertilizing a yard, washing a car or leaving pet waste on the ground are examples of non-point sources of polluted runoff which flow into the sewer system.

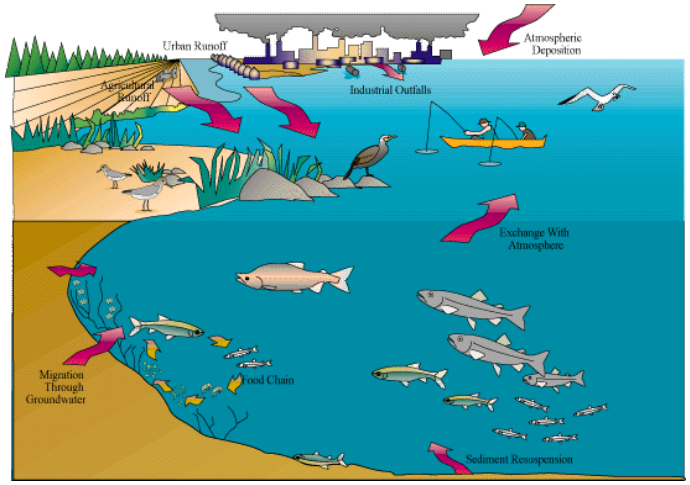
The EPA considers non-point sources a major cause of water pollution to our waterways, streams, rivers and wetlands. And since they are so diffuse, non-point sources of water pollution are a primary concern because they are difficult to identify and regulate. Addressing diffused sources of water pollution requires new strategies and integrated practices to managing stormwater.

WATER POLLUTION PREVENTION

DWSD has made significant investments and efforts in addressing water pollution prevention in recent years.[24] However, more cost effective and decentralized measures are needed to comply with federal standards and guidelines. It is time for Detroit to consider long term sustainability plans based on decentralized, onsite stormwater management strategies. It is also time for DWSD to re-examine its investments in an aging CSS system in light of the opportunities to garner the vast economic and environmental benefits of alternative and best practices in stormwater management at the parcel level.

Low impact development (LID) practices, green infrastructure[25] and Smart Growth strategies are alternatives to the traditional stormwater practices. These strategies are gaining credibility as sustainable and ecologically sound practices applied in cities around the country to meet national regulation requirements such as those of the Clean Water Act (e.g., NPDES permit requirements) and other international and intrastate guidelines (e.g., Great Lakes Compact).

Environmental responsibility and an emphasis on ecological planning have underscored the need to better manage stormwater to protect and conserve water resources. Alternative decentralized and cost effective onsite strategies are now a common practice among the engineers, architects, landscape architects, community groups, local zoning and highway officials. These strategies emulate and support the natural process of the hydrologic cycle in land development.



Sources and Pathways of Pollution
Source: http://epa.gov

National Pollutant Discharge Elimination System (NPDES)

The NPDES is a national permit program that controls water pollution by regulating point and non-point sources that discharge pollutants into waters of the United States.

[24]U.S. EPA, Detroit River-West Lake Erie Basin Indicator Project – Phosphorus Discharges from Detroit Wastewater Treatment Plant, (http://www.epa.gov/med/grosseile_site/indicators/dwwtp.html) Contaminated Sediment Remediation (http://www.epa.gov/med/grosseile_site/indicators/sediment-remediation.html) Combined Sewer Overflow Controls in Southeast Michigan (http://www.epa.gov/med/grosseile_site/indicators/cso.html)
[25]U.S. EPA, (http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm) Accessed 25 Mar 2012

ADDITIONAL REFERENCES

U.S. EPA, Polluted Runoff (Nonpoint Source Pollution). *What you can do to prevent NPS pollution*. (http://www.epa.gov/owow_keep/NPS/whatudo.html)

Land Development & The Hydrologic Cycle

In a natural setting with natural ground cover, water makes its way through the ground surface by either shallow or deep infiltration. The stormwater soaks into soil layers at a slower rate, at a normal temperature and the water that is filtered through the ground remains clean. It replenishes water bodies such as lakes, rivers, streams and reservoirs and recharges ground water, including domestic water supplies. However, in urban areas like Detroit where impervious surfaces are between 35-50% and 75-100%, approximately 30-55% of the stormwater results in urban runoff (Figure 5.3 - Note the difference when there is no development on the land).

Understanding the hydrologic cycle, the movement of water from plants, soils and water bodies and back to the atmosphere through precipitation, evaporation, transpiration, runoff and ground water movement is fundamental to understanding the importance of stormwater management (Figure 5.2). The hydrological cycle is crucial in the natural balance of all living organisms—natural habitat, wildlife and humans. Stormwater is an essential component in the water cycle and is dependent on a number of factors including: stormwater events, soil type, vegetation, slope, and type and placement of development.

Anything that is placed or built on the land affects the balance of the natural environment. Developed land—that is, covered by buildings, parking, or other impervious surfaces--alters the stormwater drainage pattern and impacts the natural water cycle. Any precipitation that reaches the surface of the ground and is prevented by impervious surfaces from being absorbed naturally by the soil, becomes *stormwater runoff*, or in more urbanized areas like Detroit*, urban runoff*.

Urban runoff is stormwater from city streets, buildings, parking, or other impervious surfaces that is not absorbed by the soil. It carries pollutants such as oils, heavy metals, toxics and solid waste including bacteria and viruses into the sewer systems and receiving waters causing contamination to waters of rivers, lakes

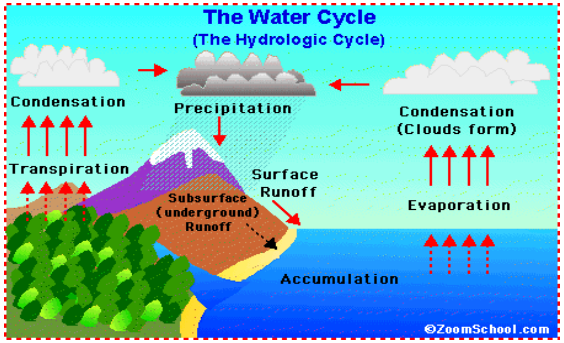


Figure 5.2 The Hydrologic Cycle
Source: Zoom School (www.enchantedlearning.com)

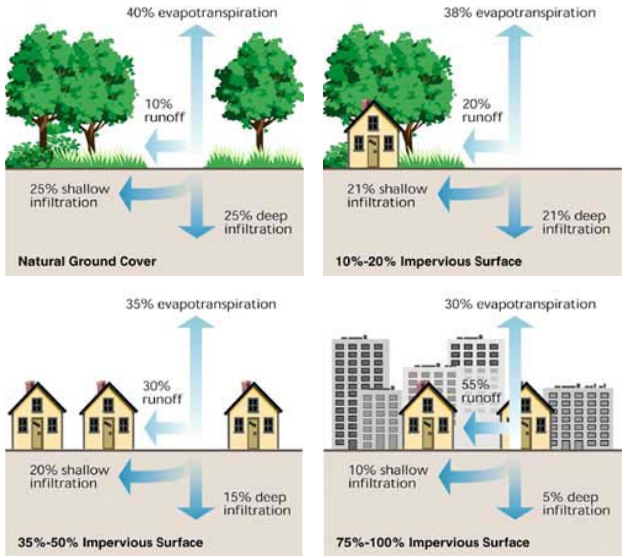


Figure 5.3: Diagram of the effect of imperviousness on surface runoff
Source: Journal of the American Planning Association, 1996; original U.S. EPA, 1993a (http:en.wikipedia.org/wiki/Stormwater)

> *"An estimated 10 trillion gallons a year of untreated stormwater runs off roofs, roads, parking lots, and other paved surfaces, often through the sewage systems, into rivers and waterways that serve as drinking water supplies and flow to our beaches, increasing health risks, degrading ecosystems, and damaging tourist economies."*
>
> National Resources Defense Council
> *Rooftops to Rivers II*
> http://www.nrdc.org/water/pollution/rooftopsII/

and streams. Urban runoff is a major contributor to non-point source water pollution. If not intercepted, slowed down and treated at the source, polluted runoff eventually adds to the overall stormwater rate and volume polluting waterways, streams and rivers and affecting both aquatic and human habitat. It should be noted that runoff from building roofs, referred to as "clean runoff", generally contains lower levels of pollutants than runoff from other impervious surfaces.[26]

Simply put, an overall reduction in impervious surfaces (e.g., roofs, pavement), use of alternate coverage surfaces (e.g. green roofs, permeable pavers) and aggressive implementation of natural stormwater management strategies is needed. We must shift our thinking to stormwater as a valuable natural resource, easily and economically harvested for reuse or recycled as treated and clean water; and an essential part of the sustainable development practices we should adopt.

[26]U.S. EPA Municipal Handbook on Rainwater Harvesting Policies cited in *Capturing Rainwater from Rooftops,* Nov. 2011, National Resources Defense Council (http://www.nrdc.org/water/files/rooftoprainwatercapture.pdf)

RECOMMENDATIONS

1. Promote and encourage the adoption of best practices in stormwater management (BMP's), including low impact development (LID) strategies and green infrastructure alternatives.

2. Reduce the area of impervious pavement surfaces by incorporating rain gardens and water retention areas to slow down stormwater runoff and filter stormwater before entering the city sewer system.

3. Facilitate and maximize stormwater runoff to pervious areas from parking lots and other impervious pavement for treatment before it enters the sewer system.

4. Maximize green open space and porous surfaces on existing and new developed sites using 'green' strategies such as permeable pavement, green infiltration strips, gravel beds, berms and green roofs.

Walkway lined with permeable pavers - Detroit, MI
Photo: Sierra Club

5. Re-use stormwater by on-site strategies such as infiltration strips, bio-retention swales, curb-less green strips and green parking.

6. Develop basic guidelines for water conservation and water pollution prevention strategies to support residential household and builder education such as incorporating efficient plumbing fixtures, and downspout disconnection in new and existing buildings.

7. Utilize native planting, trees and shrubs to soften hard surfaces or pavement and to link new development to existing green spaces and greenway network.

8. Incorporate stormwater harvesting technologies such as cisterns, stormwater retention, or green roofs and gardens.

9. Enclose and cover service areas such as loading/unloading dock areas, trash areas, vehicle fueling and vehicle wash or equipment storage to avoid contact with and polluting stormwater runoff.

10. Prevent sedimentation, soil erosion and waste from construction activities and parking areas from entering the stormwater systems by implementing a soil erosion and sedimentation control plan for all construction sites to comply with the Construction General Permit of the 2003 EPA's requirements for erosion and sedimentation.

11. Implement urban stormwater runoff management strategies that would result in a 25% reduction in the volume of stormwater runoff from the two-year, 24-hour design storm.[27]

12. Incorporate design elements which reduce runoff volume and contamination of urban runoff from existing residential and redevelopment projects.[28]

Open space - Detroit, MI
Photo: Urban Design Unit, City of Detroit, P&DD

Cistern - Rainwater harvesting for landscape use
Source: LID Urban Design Tools, www.lid-stormwater.net

Green roof garden - Chicago City Hall Urban Heat Island Initiative
Source: www.roofmeadow.com

[27,28]U.S. Green Building Council, LEED® Standards

13. Incorporate design elements which reduce volume and contamination of urban runoff from existing residential and non-residential land uses and from future development and redevelopment projects.

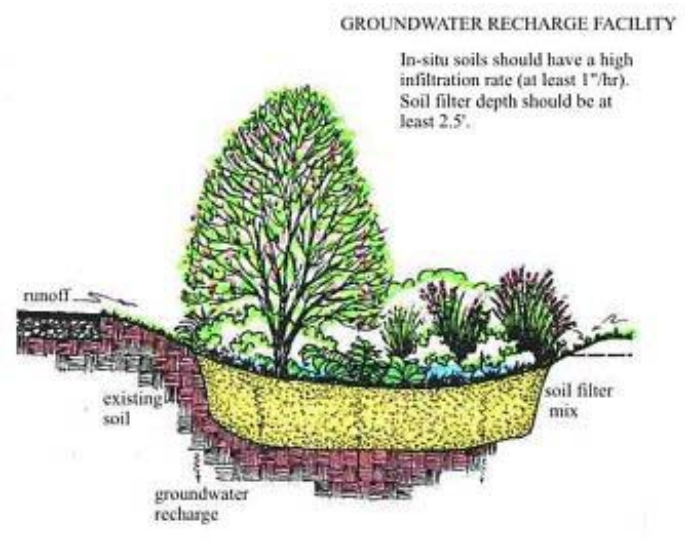
14. Maximize green open space for onsite percolation of runoff.

15. Incorporate site design elements to ensure that stormwater is contained or conveyed so as not to become contaminated by pollutants in the process of drainage or containment.

16. Adopt the following best management practices for projects under construction:

    - Contain all sediment, runoff and construction debris and waste until a proper handling is implemented.
    - Install temporary sediment control where needed in order to prevent or contain sediment or other construction debris or waste from being tracked off the site.
    - Remove any remnants of dragged sediments or other construction materials immediately.
    - Cover soil piles until used or removed.
    - Refrain from washing construction equipment or vehicles adjacent to construction sites.
    - Use drainage controls: detention ponds, infiltration pits, or sediment ponds, dikes, ditches, and vegetated filter berms.

Silt fence installed at construction site
Source: U.S. EPA. 2008. NPDES, Construction Site Stormwater Runoff Control



Bioswale section showing subsurface layers
Source: LID Urban Design Tools (http://www.lid-stormwater.net)

Parking lot bioswale, Hubble Middle School, Warrenville, IL
Source: City of Warrenville, IL (http://www.warrenville.il.us)

Green Initiatives for Stormwater Management & Water Pollution Prevention

Detroit Watershed

Develop a watershed plan covering boundaries of Detroit not currently covered by existing regional watershed plans (e.g. the Rouge River and Clinton River Watersheds).

Green Building Program

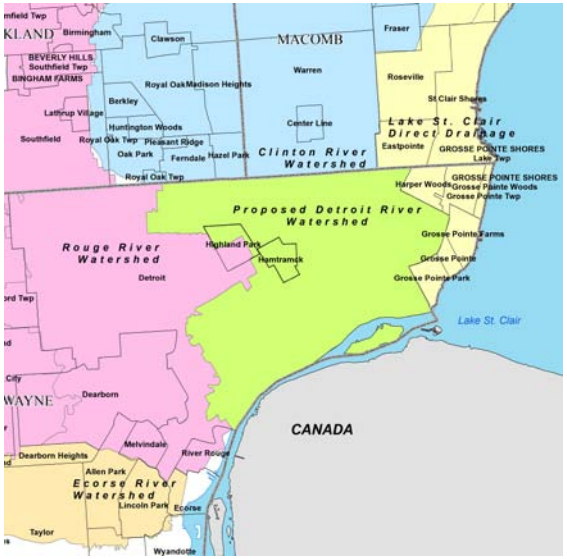
Establish a green building program for the City based on the Leadership in Energy and Environmental Design-LEED® rating system of the U. S. Green Building Council. Encourage the development community to adopt the rating system for green building practices and sustainable development strategies for new building construction, maintenance and operation of existing buildings and for sustainable neighborhoods (LEED for Neighborhood Development, LEED-ND).

Detroit Green Roof Initiative

Support the creation of a Detroit Green Roof Initiative. Currently, there is a proposed project ready to be implemented. This is a public-private sponsored demonstration project that illustrates the benefits of green roofs in stormwater management (absorbing 60-80% of the stormwater that falls on the roof). The subject of the project is greening a two-acre Old Hudson's site over the current Premier Parking Garage in Downtown Detroit (proposed and designed by the Urban Design Unit of the City of Detroit Planning & Development Department in 2009).

Zoning Ordinance Overlay District

Establish zoning ordinance designation for special purpose district such as green zone and green overlay areas to accommodate urban agriculture, local farming, and new technologies such as on-site water use and recycling or food production.



Proposed Detroit Watershed
Source: Alliance of Rouge Communities

Greening the Old Hudson's Site, Woodward Avenue, Detroit
Source: Urban Design, P&DD, City of Detroit; Google Earth

Rain Garden Planting Initiative

Initiate a rain garden program (e.g., Rain Garden Initiative). This program would include both private properties and municipal-owned lands, including rights-of-way and parking lots. Rain gardens, which are full of native plant species, collect water through shallow depressions in the front, rear or side yard. In addition to improved aesthetics, polluted runoff is reduced as the rainwater instead filters through the ground.

Downspout Disconnection Program

Support the Downspout Disconnection Program. State law requires property owners in all cities in Michigan to disconnect downspouts leading to the storm sewer system by June 30, 2012. Currently, the DWSD is partnering with the Greening of Detroit to provide workshops and free materials on how to disconnect downspouts. This program should also encourage property owners to use rain barrels and rain gardens to capture and use stormwater. This will reduce the amount of water going to the sewage treatment plants during heavy rains and will help prevent sewage overflows.

Community Initiated Green Infrastructure Projects

Support community-based green infrastructure projects such as the Lower Eastside Action Plan project (LEAP).

Rain barrel
Source: bnriverkeeper.org

Rain garden
Source: www.raingardennetwork.com

Vegetated roof surface, green roof Courtesy of LiveRoof®

Downspout disconnect modification
Source: http://www.grandbuilding.ca

"A healthy ecology
is the basis for a healthy economy."

~Claudine Schneider,
The Green Lifestyle Handbook

06

Water Innovation, New Technologies, Systems & Wastewater Management

Detroit River
Source: http://www.water-technology.net

The Detroit Water and Sewerage Department (DWSD) owns and operates a vast water and wastewater treatment and distribution network. DWSD directly serves residents and businesses within Detroit and numerous municipalities throughout the Southeast Michigan region. Detroit Waste Water Treatment Plant (DWWTP) treats wastewater of 77 communities, including Detroit – that is one-third of Michigan's population. The DWSD sewer system has the capacity to provide full secondary treatment as mandated by the Federal Clean Water for up to 930 million gallons per day ("mgd"), with additional capacity to provide primary treatment of peak wet weather flows up to 1.7 billion gallons per day ("bgd"). This capacity far exceeds the typical dry weather flow rates observed at the wastewater plant which are on the order of 650 mgd. Since the Service Area for the System is not projected to grow substantially over the near future, this means that there is more than enough treatment capacity to fully serve the needs of Southeast Michigan. However, there is a real need to optimize the system so that the ongoing costs meet the region's ability and willingness to pay for the critical commodity of water and adequate treatment of wastewater. In addition, with awareness of water

sustainability, there is a possibility that water use and need for wastewater treatment could decline. This is due to end users (e.g., households, businesses, industries) focusing on minimizing water use and pursuing innovative approaches for water reuse and alternative storm water management practices and strategies that do not require treatment through costly infrastructure and waste water treatment facilities. Consequently, there is an urgent need for Detroit to take a hard look at the current system and technologies in use and consider alternative system approaches with technologies and innovations that will deliver long term availability of water and wastewater treatment that are economically and environmentally sustainable, and ensure equity in terms of access, pricing, and quality of service.

PRINICPLES TO APPLY

Rationalizing the water and wastewater system for long-term sustainability may be accomplished by starting with the following three simple principles:

- **Minimize**
- **Optimize**
- **Apply Best Technologies**

System Elements to Consider:

In order to fully address system challenges and opportunities, each element of the system should be reviewed, and, to the degree possible, the system as a whole should be reviewed to identify possible "competing" impacts of optimizing single system elements. For the purposes of this document, recommendations are provided for the following elements of the system:

A. Water Intake and Treatment for Potable Water
B. Water Distribution and Pumping
C. Wastewater Collection, Treatment and Disposal

RECOMMENDATIONS

A. Water Intake and Treatment for Potable Water

- **Minimize**: Adopt water conservation policies and guidelines for new construction, and in maintenance and operation of existing facilities.
- **Optimize**: Institute best practices for intake assessment to characterize incoming water and treatment requirements based on current water quality versus average or worst case water quality.
- **Best technologies**: Use ultra-violet (UV) and other energy-based disinfection technologies to minimize the use of chemicals for disinfection.

Leib Screening and Disinfection Facility, Detroit, MI
Source: Detroit Water & Sewerage Department

B. Water Distribution and Pumping

- **Minimize**: Use of leak detection technologies and metering systems to find and minimize losses through leaks.

- **Optimize**: Use advanced pumping system and hydrology or hydraulics models to:
  - Identify appropriate points for leak improvement.
  - Develop real time pumping operation configurations to minimize pumping requirements and energy used.
  - Reduce operating costs, capital investment and debt by phasing out plants that have a high cost per gallon, are inefficient or need significant revamp. Focus capital investment on strategic facilities needed for the base load to meet demand expected in the region.
  - Develop alternative scenarios that create separate pumping regions and/or local pumping districts.

    Alternative Scenario Examples

    High Ground Storage*:* Regional topography is relatively flat so that all the water has to be pumped using electrical energy from the low lands to the furthest reaches of the system. With the current system configuration, water is pumped when there is demand. An alternative approach is to use high ground storage. The uphill pumping to storage basins at the far reaches of the system would occur during the off peak hours (at lower electrical rates) and then the system could use gravity based pressure feed from the higher elevations to the customer communities. This would not help the low-lying communities (e.g., Grosse Pointe and Downriver) but could reduce energy use for the system as a whole.

    Local Water Districts: For neighborhoods where demand is low and too costly to maintain their antiquated infrastructure, consider alternative decentralized water and wastewater treatment systems that are essentially "off grid". For example, where new system construction is the only other option for ensuring reliability, the cost and effectiveness of small packaged units for water treatment (e.g., mobile reverse osmosis technologies) may be more competitive in these areas.

- **Best technologies:**
  - Use metering, leak detection and pumping system modeling to support the ideas described in the Minimize and Optimize sections above.
  - Use energy efficient pumping technologies, appropriate preventive maintenance and energy management operating techniques to minimize energy used for pumping.
  - Explore using waste heat from existing pumping stations and water plant pumping systems as a useable commodity for economic development (manufacturing or agricultural processing that requires heat) and/ or local district heating.

Detroit Water & Sewerage Department - Capital Improvement Program
Source: http://www.pmaconsultants.com

C. Wastewater Collection, Treatment and Disposal

Wastewater treatment uses a significant amount of energy and has the potential for effluents (liquid waste) to negatively impact the environment if not treated properly. In addition, treatment and ultimate disposal of biosolids use a significant amount of energy (for pumping, de-watering, heating, incineration) and require solid waste disposal. Systematic review of wastewater and biosolids treatment provides an opportunity for innovation and reducing costs, a significant concern for the City of Detroit.

- **Minimize**: Alternative approaches to stormwater management and end user incentives, as described above, are the best ways to minimize wastewater collection and treatment requirements.
- **Optimize**: The overall opportunity is to optimize the energy requirements for moving (e.g., pumping and transport), treating and disposing of wastewater and the biosolids associated with wastewater treatment, with the potential energy and organic content recovery benefits if alternative approaches and technologies were to be utilized.
- **Best technologies**: There are many examples of converting biosolids to biogas using the methane in a cogeneration plant for electricity and district heating using hot water (much more efficient than steam). The plants in Europe are highly efficient and eliminate most of the landfill and odor issues. Biosolids conversion to biochar through pyrolysis is another method of using wastewater for agricultural soil enhancement and/or replacement for coal in power plants with a reduction in carbon footprint.

Detroit's Wastewater Treatment Plant (WWTP)
Source: http://www.water-technology.net/projects/detroit_waste2/

Biosolid *· residual, semi-solid material left from industrial wastewater or sewage treatment processes; treated human waste; sludge*	***Pyrolysis*** *· a thermo-chemical decomposition of organic material at elevated temperatures without the participation of oxygen; process by which biomass is converted to biochar*	***Biochar*** *· a name for charcoal when it is used for purposes such as a soil amendment; can endure in soil for thousands of years; has potential to mitigate climate change*

Source: Wikipedia, The Free Encyclopedia (http://en.wikipedia.org/)
Accessed 26 March 2012

"To halt the decline of an ecosystem, it is necessary to think like an ecosystem."

~Douglas P. Wheeler, EPA Journal, September-October 1990

07

Commercial Agriculture & Food Processing

Urban farming - City Farm, Chicago
Photo: Linda, 2008, Urban Agriculture. Wikipedia
http://en.wikipedia.org/wiki/Urban_agriculture

Detroit is taking a hard look at commercial farming and food processing as viable urban land uses. Recognizing that agriculture is a huge consumer of water, representing 80% of U.S. freshwater resources and 70% worldwide,[29] the City is taking the lead in developing policies that will promote conservation, use/re-use strategies and sound growing practices centered on our most precious resource – water.

Along with the increasing interest in community gardens and local food production, there are great opportunities for business establishment and expansion into this burgeoning sector. However, taking community gardens to a commercial scale for substantial job creation requires rules that address proper water conservation, use and reuse. And as more opportunities arise to establish enterprises such as small aquaculture industry--including the possibility of converting unused buildings to fisheries--the City of Detroit can adopt cutting edge policies to control water in an environmentally friendly manner.

[29] Pimentel, D., B. Berger, et al. (2004-10). "Water Resources: Agricultural and Environmental Issues". *BioScience* 54 (10): 909–918. doi:10.1641/0006-3568(2004)054[0909:WRAAEI]2.0.CO;2. (Retrieved 7 March 2012) http://ecommons.cornell.edu/bitstream/1813/352/1/pimentel_report_04-1.pdf

Background Information and Challenges

Since Detroit has a combined sewer system and the desire is there to promote sewer separation, the City of Detroit should consider the opportunity that commercial agriculture and food processing provides to work with DWSD to transform large areas of open space into a platform for food system induction and growth. While the technical side of this separation is engineering based, other considerations require thought as the process moves forward:

- Use of pesticides and herbicides
- Use of petroleum based and other man made fertilizers
- Food processing byproducts including waste
- Livestock byproducts including waste
- Water run-off from any type of commercial farming venture that could potentially add strain to the current sewer system

As the City of Detroit moves to permit commercial agriculture uses, caution should be taken and deference given to projects that utilize sound environmental practices.[30] The regulatory mechanism should require all commercial agriculture projects to address:

- How they meet guidelines set for water conservation
- How project plans promote storm sewer separation
- How their practices translate into educational and economic opportunities for citizens to grow and prosper, including the potential for exporting Detroit-based commercial farming and food processing manufacturing systems to other cities in the US and overseas

Urban agriculture
Photo: The Greening of Detroit
http://detroitagriculture.net/

[30] Alex Wilson, "Growing Food Locally: Integrating Agriculture into the Built Environment", *Environmental Building News*, Vol.18, No.2, Feb. 2009

RECOMMENDATIONS

1. Encourage locally adapted small-scale irrigation and plant production methods and schemes to conserve water. Examples include:

   - Use low cost water-saving technologies such as underground and drip irrigation that increase water efficiency and allow safe use of low quality water resources.

   - Encourage drip irrigation infrastructure that can be manufactured from existing local products, such as using porous ceramic containers or pipes with holes in which water is dripped onto the soil above the root zone only. Drip irrigation practices offer the opportunity of spot irrigating and fertilizing when using wastewater, often utilizing a third of the water used in conventional irrigation practices. Drip irrigation also offers the added benefit of minimizing the contact of the wastewater and the crop, decreasing the likelihood of contamination.

   - Salt-tolerant crops: brackish water can be used in localized irrigation schemes.

   - Use rainwater harvesting methods that hold great potential for urban agriculture, but remain underused practices. Harvesting methods include rain barrels, retention ponds, rain gardening techniques and swales.

2. Encourage sustainable landscape practices. For example, good agriculture and forestry practices can contribute to sound watershed management, safeguarding water catchments and reducing runoff and flooding. Forestry also provides a source of natural soil remediation and a source for creating jobs.

3. Promote non-till strategies to protect against erosion and water runoff.

4. Make use of closed loop systems (i.e. aquaponics) that connect aquaculture with hydroponics. For example, reusing the nutrient-rich water that plants need to thrive on, and returning it back to the fish totally re-oxygenated.

5. Utilize treatment systems that remove water from organic matter as part of the waste treatment process which its byproducts include heat and energy. The water is pure enough to be reused on farming operations or returned to the existing sewer system for treatment.

6. Make use of urban horticulture and micro-gardens such as simple hydroponics (SH) to add economic and nutritional benefits by securing year-round supply of fresh produce to Detroit's populations.

7. SH promotes water savings in recycling and decontamination of water and will facilitate plant growth in areas with marginal conditions for crop production, such as adverse climate, unproductive soil, space limitations, water scarcity and pest occurrences.

8. SH generates local markets in supply food chains. SH can be considered an effective alternative to be integrated with programs for food security and nutrition for poor populations living under poverty conditions.

9. Promote organic and natural farming techniques that protect the natural watershed.

10. Implement restrictions in the size of the agriculture sites – this is one method to limit the run-off most associated with farms that are larger than 100 acres.

Drip irrigation
Source: http://ga.water.usgs.gov/edu/irdrip.html

Urban farming in Detroit, SEED Wayne
Source: http://www.celsias.com/article/urban-agriculture-career-path/

ADDITIONAL REFERENCES

Nina Mukherji, Alfonso Morales, "Zoning for Urban Agriculture", American Planning Association, *Zoning Practice,* (March 2010) http://www.planning.org/zoningpractice/2010/pdf/mar.pdf

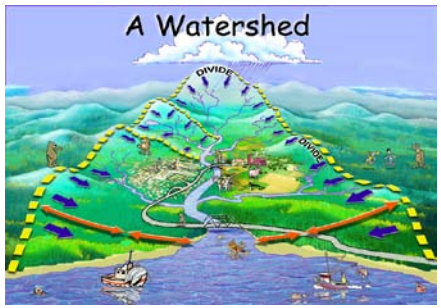
Joël Thibert, "Making Local Planning Work for Urban Agriculture in the North American Context: A View from the Ground", *Journal of Planning Education and Research,* (19 Jan. 2012) doi: 10.1177/0739456X11431692

08

Education Programs & Community Outreach

Community outreach is an integral component of the Detroit Water Agenda 2012. Educational programs that increase public awareness and encourage conservation empower citizens to become active environmental stewards.

There are numerous web-based programs and valuable information about water-related issues online. This document offers some of these resources as a starting point to educate and engage citizens, and increase the community's overall awareness of water conservation and water pollution prevention.



Children's "A Watershed" Illustration
Source: Zoom School (www.enchantedlearning.com)

RECOMMENDATIONS

1. Provide direct education to communities on water issues such as conservation, efficiency, pollution prevention and the hydrologic cycle.

2. Establish a website link on the City home page that is user friendly and educational, with an interesting and engaging video presentation link.

3. Establish a manual or brochure with City water guidelines readily available in City offices, online and with partner organizations.

4. Offer free or low cost household water efficiency audits to senior citizens and others to advise on improving household water efficiency.

5. Partner with schools to provide project workshops that could be coordinated with Earth Day events.

6. Partner with non-profit organizations to provide educational outreach and design/technical assistance to communities such as workshops on how to build a rain garden, roof garden, native species planting and sustainable landscaping.

7. Provide educational presentation events at public libraries; provide water resource conservation informational flyers and tabletop displays and exhibits.

8. Make available rain barrels at a reduced cost to residents to purchase and install as part of the Downspout Disconnection Program.

9. Organize a broad and aggressive media campaign to increase public awareness of water conservation using public service announcements (PSA), print advertising, transit advertising (DOT/SMART buses and People Mover), billboards and radio and television media spots.

Transit advertising for water conservation, Sacramento, CA
Source: CA Water Awareness Campaign

Valerie and Bruce Burris stand next to their newly planted rain garden designed by Friends of the Rouge
Photo: Sierra Club

Rain Barrel Workshop: Residents from the Northend Christian Community Development Corp. make a rain barrel from an old pepper barrel
Photo: Sierra Club

Urban farming in Detroit
Photo: Greening of Detroit (http://inhabitat.com/wp-content/blogs.dir/1/files/2012/01/greening-detroit-22.jpg)

Resources

- Alliance for the Great Lakes
  http://www.greatlakes.org/home
- Alliance of Rouge Communities
  http://www.allianceofrougecommunities.com/
- American Water Works Association
  http://www.awwa.org/index.cfm
  http://drinktap.org/consumerdnn/Home/tabid/53/Default.aspx
- California Coastal Commission
  General Nonpoint Source/Urban Runoff Information
  http://www.coastal.ca.gov/la/docs/bmp.pdf
- Chicago Water Agenda 2003
  http://cis.uchicago.edu/outreach/summerinstitute/2008/documents/wateragenda.pdf
- City of Chicago
  http://www.cityofchicago.org/city/en/depts/water/supp_info/conservation.html
- Detroit Black Community Food Security Network and
  D-Town Farm
  http://detroitblackfoodsecurity.org/index.html
- Detroit Water & Sewerage Department (DWSD)
  http://www.dwsd.org/
- Downriver Linked Green Initiative
  http://www.downrivergreenways.org/home
  http://www.downrivergreenways.org/home/reports-and-products
- Earthworks Urban Farm
  http://cskdetroit.org
- ECO-Adapt
  http://www.ecoadapt.org/about
- Encyclopedia of Earth
  http://www.eoearth.org/article/Surface_runoff
- Environmental Protection Agency – Water/Great Lakes
  http://water.epa.gov/
  http://www.epa.gov/glnpo/
  http://www.epa.gov/watersense/
- Friends of the Detroit River
  http://www.detroitriver.org/
- Friends of the Rouge River
  http://www.therouge.org/
- Great Lakes Commission
  http://www.glc.org/
  http://www.glc.org/about/glbc.html
- Great Lakes Echo
  http://greatlakesecho.org/
- Great Lakes Information Network
  http://www.great-lakes.net/lakes/ref/lakefact.html
- International Biochar Initiative
  http://www.biochar-international.org/biochar
- Lower Eastside Action Plan (LEAP)
  https://sites.google.com/site/leapdetroit/

Resources

- Metropolitan Affairs Coalition – Heritage Water Trail
  Greater Detroit American Heritage River Initiative
  http://www.mac-web.org/Projects/HeritageWaterTrail.htm
  http://www.mac-web.org/Projects/GDAHR/
- Michigan Citizens for Water Conservation
  http://www.savemiwater.org/
- Michigan Green School Initiative
  http://michigangreenschools.us/
- Michigan Sea Grant
  http://www.miseagrant.umich.edu/about/index.html
- Michigan Water Environment Association
  http://www.mi-wea.org/
- National Association of Clean Water Agencies
  http://www.nacwa.org/
- National Association of Conservation Districts
  http://nacdnet.org/about/index.phtml
  http://nacdnet.org/education/resources/water/
- Natural Resources Defense Council
  www.nrdc.org/
  http://www.nrdc.org/water/default.asp
- People's Water Board Coalition
  http://peopleswaterboard.blogspot.com/
- Prince George's County, Maryland, LID Design Strategies
  http://www.lowimpactdevelopment.org/pubs/LID_National_Manual.pdf
- SEED Wayne
  http://www.clas.wayne.edu/seedwayne/
- Sierra Club
  www.sierraclub.org
- Southeast Michigan Council of Governments (SEMCOG)
  http://www.semcog.org/
- Southwest Detroit Environmental Vision
  http://sdevweb.org/
- State of Michigan – Department of Environmental Quality
  http://www.michigan.gov/deq/0,4561,7-135-3313---,00.html
- The Culver Company
  http://www.jea.com/community/education/efficiency/wisely/index.html
- The Greening of Detroit
  http://detroitagriculture.net/
- United Nations Development Programme – Human Development Report Office
  http://hdr.undp.org/en/reports/global/hdr2011/download/
- Urban Farming
  http://www.urbanfarming.org/welcome.html
- U.S. Geological Survey
  http://www.usgs.gov/
- West Michigan Environmental Action Council
  https://www.raingardens.org/