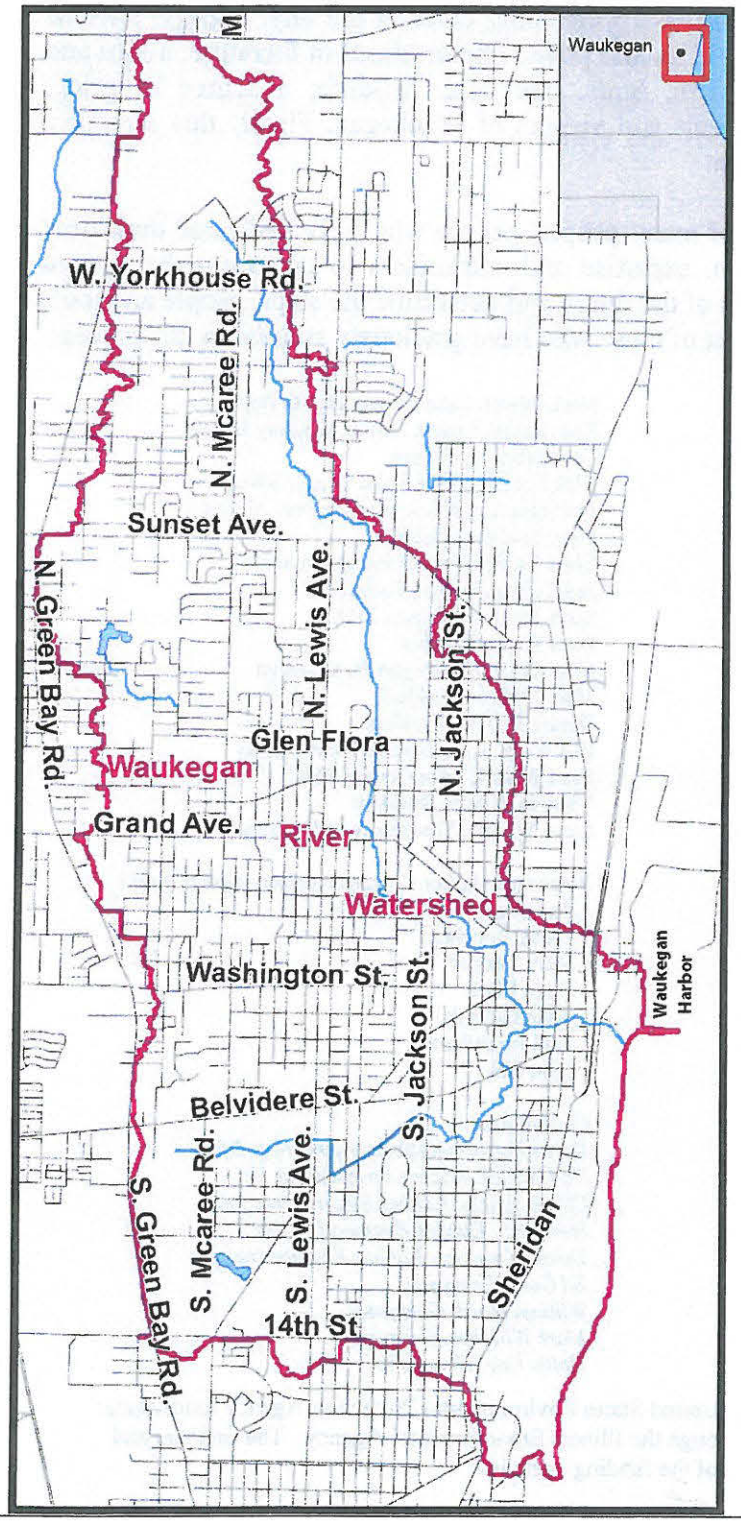
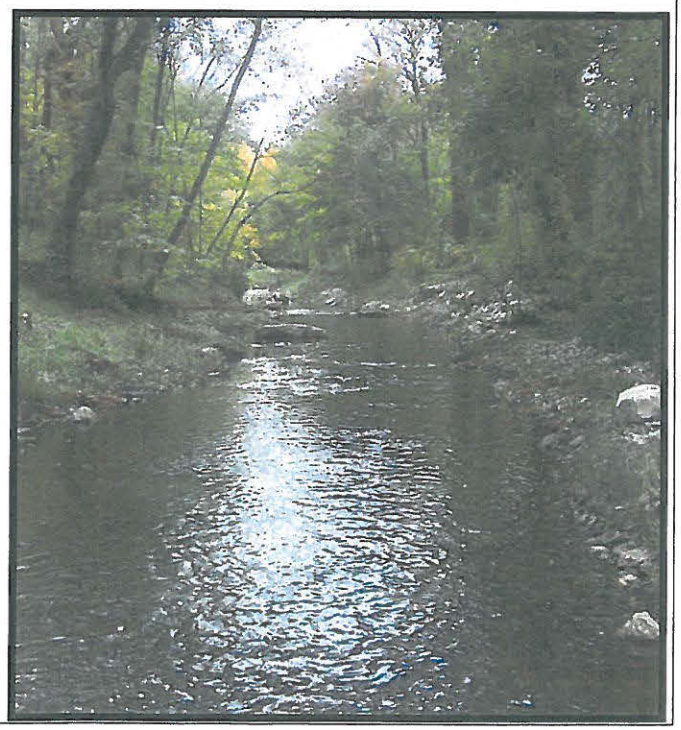
Waukegan River Watershed Plan

At a Glance





Waukegan River Watershed

This summary of the Waukegan Watershed Plan gives an overview of the creation and implementation of a watershed-based plan to address the various concerns of communities in the Waukegan River Watershed. It includes facts and figures on the current state of the watershed. It also contains the vision by a group of residents, local officials and other interested individuals and organizations to return the Waukegan River to a welcoming oasis in the city; a green wooded corridor along a meandering waterway of riffles and pools; immortalized in literature; a safe and inviting place of nature, teeming with fish, birds, and other wildlife; a source of pride, wonderment and exploration for the residents and visitors of Waukegan. Finally this summary contains a roadmap to reach this destination.

This work is the result of the assistance of many people; people who have dedicated their time and resources, have provided information, expertise and enthusiasm to document the current conditions of the river, see the possibilities of the future and determine the steps, people and tools needed to achieve the future. Below is a list of those who have graciously assisted in this process.

Tom Anton, Field Museum Herpetologist
Marvin Bariyani, Resident
Tom Barlow, Resident
John Beardsley, Illinois State Water Survey
Lawrence Blacik, Resident
Sharon Blacik, Resident
Mea Blauer, Lake County Soil & Water
Tom Chefalo, Lake County, Planning Building and Development
Barbara Chervin, Resident
Mary R. Cunningham, Lake County Board
Sam Cunningham, 1st Ward Alderman
David Dallison, TOWN
Tom Dilley, USDA
Tony Figueroa, 4th Ward Alderman
Nada Finn, TOWN
Newton Finn, TOWN
Scott Hickman, Avian Biologist
John Jurkovac, Waukegan Bldg Commissioner
Paul Kakuris, Citizen
Kathleen Kilkelly Thompson
Sandy Kubillus, Integrated Lakes Mgmt.
Ron Laubach, City of Waukegan
John Lesnak, Illinois EPA
Don Lloyd, Lake County Soil & Water Conservation District
Lee Luu, TOWN
Tammy Mitchell, Illinois EPA
Kent Moon, Harbor Place, LLC
John Moore, City of Waukegan
Debra Nelson, Illinois DNR
Bob Newport, United States EPA
Audrey Nixon, Lake County Board
Adrienne Orr, Lake County Health Dept.
Diane Ower, Resident
Doug Ower, Sierra Club
Mark Pfister, Lake County Health Dept.
Rosa Reyes-Prosen, Latino Advisory Board
Gary Schinler, Citizen
Nick Spittlemeister, Lake County SWCD
Jim Stanczak, Waukegan Regional Airport
Mary Stickers, Resident
Chris Tanner, Tanner Environmental
Jeff Terwin, United States EPA
Scott Tomkins, Illinois EPA
Peter Toyra, Resident
Mike Trigg, Waukegan Park District
Mary Walker, Resident
Denise Waters, Resident
Bill White, Illinois State Water Survey
Sean Wiedel, Lake County SMC
Victoria Wiedel, Resident
Steve Wikner, Waukegan Park District

Waukegan Harbor Citizens Advisory Group Board
Susie Schreiber
Penny Bouchard
Mary Connor
Hugh Flack
Mike Galayda
Paul Geiselhart
John Ohl

Consultants
Karen Kabbes, Kabbes Engineering, Inc.
Dan Hirsch, Kabbes Engineering, Inc
Chuck Sparks, Kabbes Engineering, Inc
Steve Luu, Kabbes Engineering, Inc
Teresa Kraegler, Kabbes Engineering, Inc
Ed Goss, Geosyntec
William Ward, Geosyntec
Mark Willobee, Geosyntec
Hollis Ude, Geosyntec

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FUN FACTS

How much land drains into the Waukegan River?

11.6 square miles.

How long is the Waukegan River System?

12.5 miles.

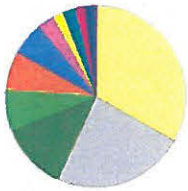
What is the highest point in the watershed?

730 feet above sea level.

What is the lowest point?

580 feet above sea level.

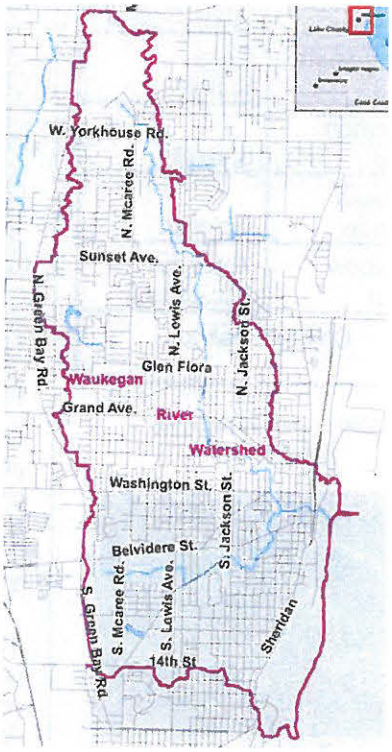
How Is The Watershed Used?



33% Single Family
24% Transportation
12% Open Space
7% Forest/Grassland
7% Retail/Commercial
6% Government
3% Industrial
2% Multi-Family Housing
2% Wetlands
2% Utilities
2% Other
100% Total

What is the Waukegan River Watershed?

The Waukegan River Watershed includes all the land area that drains into the Waukegan River, from Unincorporated Lake County and three municipalities: Beach Park, North Chicago and Waukegan.



All the water that runs off the land, including rainfall and snowmelt, water from your hose when you wash your car or water your lawn or wash down your parking area, in our watershed flows into area storm sewers and ditches to the Waukegan River and into Lake Michigan.

How we build and maintain our cities, roads, homes, businesses and parkland all determine the quality of the Waukegan River Watershed. Pollution or erosion anywhere in the watershed affects the river and the lake.

The Waukegan River Watershed is comprised of two smaller watersheds: the North Branch and the South Branch of the Waukegan River. The two branches join together at South West Street to form the Waukegan River which then drains into Lake Michigan.

Who Does The River Effect?

The Waukegan River Watershed affects the 30,000 people living and 50,000 people working in the watershed according the Northeastern Illinois Planning Commission (NIPC) estimates. By 2030, the NIPC predicts the overall population will swell to over 153,000. Water quality is an issue not only for those who enjoy the Waukegan River, but also for those who fish and swim in Lake Michigan. When the river floods, there are 90 structures that lie in the path, including 23 apartment buildings, 46 houses, and 12 commercial buildings according to analysis performed by Geosyntec.

What Fish Live In The River?

Coho	White Sucker
Largemouth Bass	Green Sunfish
Common Carp	Bluegill
Fathead Minnow	Goldfish
Rainbow Trout	Threespine Stickleback
Chinook Salmon	

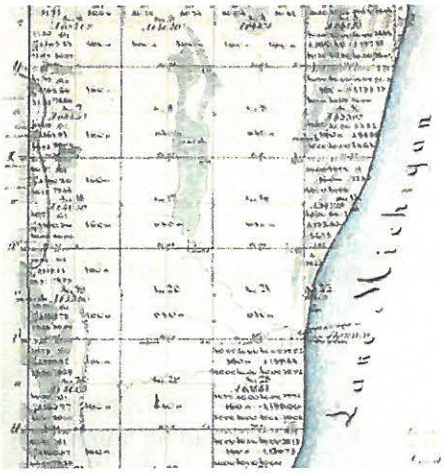
2000 to 2006 Fish Survey Data from ISWS

Threespine Stickleback

Green Sunfish

Largemouth Bass

The History of the Waukegan River



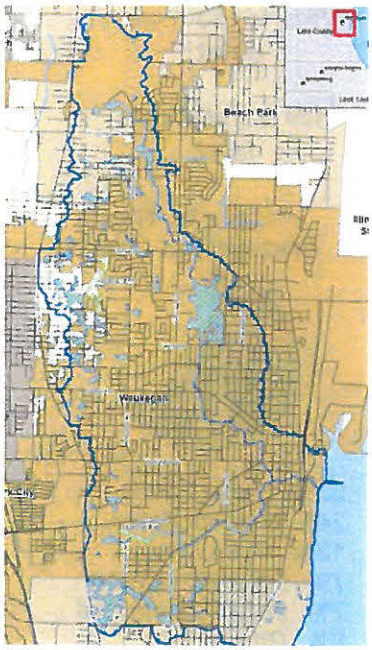
The Waukegan River system of the 1800s consisted of wetlands, channels, and ravines as depicted on this 1839 land plat map.

Historically, development altered the drainage system. Wetlands were filled and portions of the river have been buried in pipes. Waukegan eventually became a center for factories and other industrial uses. Wastes and byproducts were often buried or placed on the land or dumped into nearby water ways. Some of these pollutants can degrade and break down over time. However, other pollutants may not degrade and need to be dealt with in other ways.

The River Today

The Waukegan River we see today is no longer as pristine as the waters before the arrival of development.

In 2001, in the joint Intensive River Basin survey conducted between the Illinois Department of Natural Resources and the Illinois Environmental Protection Agency who surveyed and sampled the sediment in reaches of the river and found elevated levels of contaminants such as aldrin, DDT, PCBs and hexachlorobenzene at the surveyed sites.



Wetlands in the Waukegan River Watershed

Another problem plaguing the river is low dissolved oxygen. In order to survive, fish must obtain oxygen through water just as we do through air. The Lake County Health Department has been monitoring dissolved oxygen in the river since 2003. The most recent 2006 data shows that at some sample sites, levels of oxygen fell dangerously to 0 mg/l.

Waukegan River Pollution...Where Does it Come From?

The Waukegan River and its tributaries are listed in the Illinois EPA's 2006 list of impaired waters. The contaminants from the 2006 Illinois Integrated Water Quality Report that cause the river to be listed are noted in the adjacent box.

Contaminant	Found In	Past or Current Source
Total Dissolved Solids (TDS)	Urban Runoff	Road Salt
DDT	Contaminated Sediment	Insecticide
PCBs	Contaminated Sediment	Industry
Aldrin	Contaminated Sediment	Pesticide
Chromium	Contaminated Sediment	Industry

Many of these pollutants come from Waukegan's past as an industrial hub. The previously released toxins leach into the sediments at the bottom of the Waukegan River. Some of these contaminants take decades to break down while others remain in the soil until removed.

Pollution of the river is still occuring. Our urban lifestyles contribute pollution on a daily basis.

Repaired Illicit Drain

Oil that drips off the vehicles we drive, salt we place on our roads and sidewalks eventually can get washed into our lakes and streams

Garbage can wash down to the river where there is no one to pick them up.

When we fertilize our lawns, the excess fertilizer is washed into storm sewers and ends up in the river and eventually Lake Michigan.

Our roofs collect pollutants. If our roof downspouts drain the water to sidewalks and driveways, the water can carry pollutants to the river.

While some tree waste is a part of a healthy stream system, neighbors who place grass clippings or other waste along the river also add pollutants.

Plumbing errors or sewer leaks allow toilet and sink water to be deposited in the river leading to pollution with noticeable odors, and in some cases, immediate fish kills.

Estimated Pollution From Stormwater Runoff

Pollutant	Pounds/Year
Total Dissolved Solids (TDS)	13,486,800
Total Nitrogen	54,200
Zinc	8,700
Lead	5,900
Copper	1,200
Cadmium	49.6

Annual pollutant loads calculated from "Unit Area Pollutant Load Estimates for Lake County, Illinois Lake Michigan Watershed", SMC/NIPC 1993

What Effect Does The Pollution Have?

TDS: Impairs water quality for fish, can be toxic to aquatic life.

DDT: Toxic to aquatic life. Causes thinning of bird egg shells.

PCBs: Linked to cancer in laboratory animals. Toxic to fish, can kill fish larva in small doses.

Aldrin: A pesticide that is toxic to both humans and fish

Chromium: Heavy metal that can accumulate in aquatic life. Causes organ damage in humans.

More Information at: www.epa.gov

A Vision for the Future

Issues at Hand

Some pollutants in the Waukegan River's sediment do not degrade over time. If present, contaminants such as PCBs and heavy metals must be permanently capped or covered over.

Parking lots and other impervious surfaces which do not allow water to soak into the ground increase the pollution that washes to the river.

Places where the Waukegan River has been covered or piped cannot support wildlife or allow natural pollutant removal.

Some pollutants are very difficult or impossible to remove once they reach the water. Chloride in road salt is one example.

Vegetated river corridors can act as a buffer between the river and the development and provide habitat. Without them, pollutants wash directly into the water.

Controlling accessibility by vehicles and providing for visibility is important. Illegal dumping has plagued parts of the Waukegan River.

How do we address the problems facing the Waukegan River?

A Vision for Water Quality

- Remove debris from the river and prevent more dumping
- Address legacy pollution problems
- Reduce urban runoff pollution
- Stop illegal discharges into the river
- Enact additional regulations and policies to protect the river
- Address riverbank erosion
- Maintain and enhance existing wetlands

A Vision for Wildlife Habitat

- Remove in-stream blockages to aquatic life
- Expand and establish greenway corridors along the waterway and connect existing habitats
- Extend trails and protected park land for wildlife and the public use

A Vision for a Safer River

- Maintain the riparian corridor vegetation to increase public visibility, use and safety
- Obtain up-to-date floodplain studies for the entire stream
- Replace, remove, or flood-proof vulnerable buildings
- Reduce runoff rates and volumes to reduce flash flooding
- Re-grade and stabilize steep banks

A Vision for Measurable Progress

- Conduct annual river walks
- Maintain the river and river corridor vegetation
- Monitor the river's water, sediment and wildlife quality
- Track watershed planning projects and milestones

A Vision for an Informed Public

- Integrate the Watershed plan into school, local government and volunteer organizations programs
- Expand public and volunteer awareness programs

How Much Can We Reduce Pollution From Urban Runoff?

Road Salting Practices

As part of the watershed plan a study was done to look at how pollution from runoff could be reduced by changing road salting practices or disconnecting direct stormwater discharges to the river. Salt increases Total Dissolve Solids (TDS) in the water which adversely affects the health of fish.

Jurisdiction	Lane-Miles*	Approx. Salt Application Rate (lb/lane-mile/event)	Avg. Annual Chloride Equivalent Load (tons/year)
Beach Park	14.30	300 to 400	27.33
Waukegan	371.07	400 to 800	1215.55
North Chicago	27.68	300 to 500	60.45
Lake County	9.40	200 to 400	15.40
Total	**422.45**		**1318.72**

Over 1300 tons of road salt and other chloride based de-icers are used each year in the Waukegan River watershed, much of which eventually makes it into the waterway and out to Lake Michigan. TDS pollution in the Waukegan River consists mostly of the chloride used to keep roads ice-free. This study analyzed the salt load reductions if a given jurisdiction adopted lower salt application rates used by a neighboring municipality.

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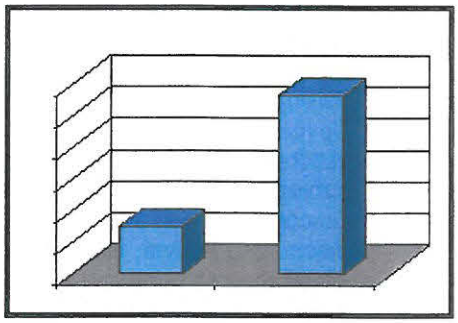
However, safety of the motoring public is always a concern. Road salt application rates may differ based on local needs. If a lower 200 to 400 lbs per lane mile per snow event application rate could be used throughout the watershed it is estimated that the chloride use, and thus chloride in runoff, could be reduced by as much as 48%. Lower salt use means less TDS pollution.

Storm Water Pollution Reduction

Another way to control pollution is to reduce the amount of stormwater discharged into the river. Reducing stormwater flow can involve implementing best management practices that reduce pollutant loads from stormwater by cutting the direct connection from runoff to the waterway. These practices can allow water to be filtered by the soil and plant life as it flows naturally over land and into the ground.

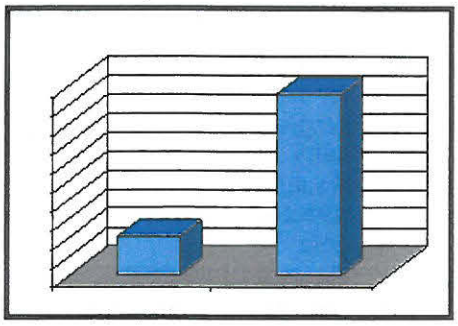
- Alternative 1: Convert 5% of storm sewered areas to non-storm sewered areas
- Alternative 2: Convert 25% of storm sewered areas to non-storm sewered areas

Total Dissolved Solids Reduction



Alternative 1: 150 tons/year
Alternative 2: 570 tons/year

Total Suspended Solids Reduction



Alternative 1: 51 tons/year
Alternative 2: 240 tons/year

Implementing the Vision

Bridging the Gap: Ideas to Action

How will the vision be implemented? As part of the plan, specific actions have been identified to be undertaken by lead organizations and supporting groups.

Below is some of the action items identified in the report.

Cleaning up the river

- Develop a citizen stream watch and monitoring network
- Conduct annual river walks to clean up debris and identify illicit discharges
- Place more garbage receptacles in public areas along river
- Acquire prioritized parcels
- Sample sediment in the river and determine course of action
- Develop easily policed trails where appropriate with lighting and camera surveillance for public safety
- Disconnect direct storm sewer discharges to river, wherever possible
- Divert direct stormwater discharge from roadways at all bridge crossings

New Policies

- Increase city code enforcement staffing and training to address dumping
- Encourage introduction of legislation for statewide deposit and refund program for glass bottles, aluminum cans, and plastic bottles
- Require developers to disconnect direct storm water discharges, where able
- Require future development or re-development along river to re-grade river banks to reconnect river channel and floodplain where needed
- Modify ordinances to allow use of permeable materials for driveways and parking lots
- Propose a city fee for impervious surfaces to use for federal and state matching funds for BMPs
- Revise ordinances to require areas of imperviousness not to be increased on site during re-development and give credit for infiltration practices
- Revise ordinance to not allow abandoned impervious areas to be maintained as impervious areas when site is re-developed.
- Revise ordinance to require in-watershed mitigation of wetlands

Public Awareness

- Educate riverfront property owners about property ownership boundaries and their impact and responsibility to the river
- Educate the public on proper pet waste, fertilizer, oil and paint, carwash runoff, pharmaceutical, and diaper disposal
- Expand storm sewer inlet stenciling program
- Educate plumbers and contractors about illicit discharges
- Develop bi-lingual watershed and water quality information
- Expand schools involvement in the Waukegan Watershed Plan.

Addressing Flood Safety

- Request a FEMA and SMC floodplain study for the entire Waukegan River system
- Acquire or relocate flood vulnerable structures
- Enhance regionally significant storage area to help reduce flashy flood peaks

Erosion Control

- Construct in-stream rock riffles to address stream down cutting issues
- Terrace stream banks to re-connect channel and flood plain terrace at 6-month to 2-year flood plain elevation
- Re-grade steep drop offs caused by stream erosion
- Do not remove sediment or re-grade earthen areas without detailed soil erosion control in place and appropriate permitting

Addressing Wildlife Habitat

- Remove obstructions to fish in the river
- Daylight enclosed portions of the river
- Remove or retrofit dams, weirs or other blockages
- Remove manmade blockages to Lake Michigan
- Repair failed outlet structures
- Create a consistent greenway along river for wildlife and to allow area for future stream dynamics
- Vegetate stream banks and stream corridors with native vegetation and maintain to allow for visibility of the stream corridor
- Implement invasive species control

Measuring Progress

- Sample river for oxygen levels, bacteria, and contaminants regularly
- Conducted a fish and wildlife survey every five years
- Monitor sediments on regular basis.

Lead and Supporting Organizations

US Environmental Protection Agency
Federal Emergency Management Agency
IL Environmental Protection Agency
IL Department of Transportation
IL Department of Natural Resources
University of Illinois Extension
City of Waukegan
Village of Beach Park
City of North Chicago
Waukegan Park District
LC Department of Transportation
LC Health Department
LC Stormwater Management Comm.
Solid Waste Agency of Lake County
Task Force on Waukegan Neighborhoods
Waukegan Main Street
School Districts
College of Lake County
Waukegan Harbor CAG

An Eye on the Future

Best Management Practices for Implementation

Rain Gardens

Rain gardens are specially designed planting areas that allow water to infiltrate into the ground. During the infiltration process, pollutants are removed and the water is cooled. Water is returned to the stream more slowly. They act as a green buffer between the roofs, driveways, parking lots, roads and the river. Neighborhood rain gardens improve property values.

Stream Riffle Installation

Artificial riffles replicate naturally occurring rock formations that can improve oxygen levels in the water and provide habitat for fish and aquatic organisms. Riffles are also used to stop stream downcutting and therefore help protect stream banks from erosion.

Porous Pavement

Parking lots consist of mostly of impervious paving material.

Replacing asphalt and concrete with pervious pavement increases ground water recharge and reduces polluted runoff to rivers and streams.

Vegetated River Corridor Protection

Removing unauthorized fill and re-grading the land to reconnecting the river and the floodplain helps reduce flooding and erosion.

Maintained corridors with native vegetation, discourage illegal dumping, provide wildlife habitat, help remove pollutants and encourage appropriate public uses.

WAUKEGAN RIVER WATERSHED PLAN
EXECUTIVE SUMMARY

This document summarizes the data, analysis and resulting action plan prepared for the Waukegan River Watershed. The Waukegan River is part of the Lake Michigan watershed, one of the four main watersheds in Lake County. The plan covers a drainage area of almost twelve square miles and includes a portion of the lakefront. The City of Waukegan, which makes up a majority of the watershed, has a population of approximately 88,000. Portions of North Chicago, Beach Park and unincorporated Lake County also drain to the watershed. The drainage area extends north to the Waukegan Airport and south to approximately 14th Street and west to Green Bay Road. The population density and history of industry make the Waukegan River watershed unique in the county.

The Illinois Environmental Protection Agency (IEPA) has listed the Waukegan River as impaired for aquatic life, due to contaminated sediments and total dissolved solids. The contaminated sediments, which contain DDT and PCB, have been attributed to past industrial uses. Contaminated sediments were found in the mid 1990s and again in 2001. Additional testing is needed to determine if the contaminants are still present or have degraded or have been washed into Lake Michigan. High levels of total dissolved solids, which have been attributed to in part winter road salting, are an ongoing concern. Low levels of dissolved oxygen in the river have now been documented though new monitoring efforts.

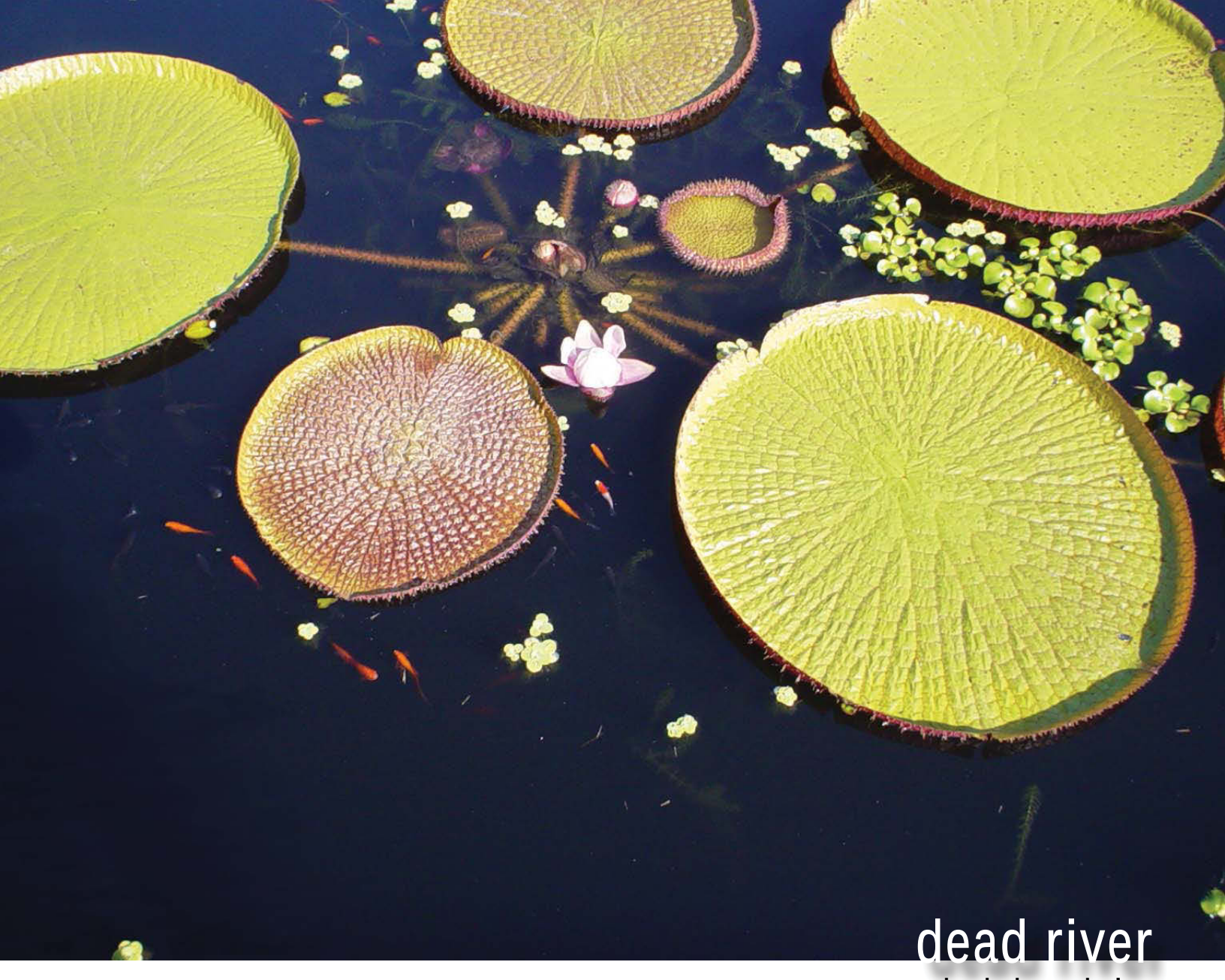
A stream inventory documents the current state of the river. Forty-one to fifty percent of the river banks were found to be experiencing high to moderate erosion. The field work found twenty-seven outlet pipes with various problems including some that were noted as possible illicit sewer drains. Twenty-four failing or problem structures were found in the streams that either need to be removed, repaired or modified. Nineteen percent of the river or approximately 8,700 feet is enclosed in pipe.

Biological sampling has found the river to be in poor condition. Based on soil maps, only eleven percent of the watershed's wetland remain today, to cleanse and store water and provide habitat. The flashiness of the river and the fact ninety structures are in the mapped floodplain were noted, however, only a small portion of the river has a mapped floodplain or flood study. Forty-eight stormwater detention basins were found and five potential regional storage sites were analyzed.

A local stakeholder group steered the development of this plan, under a grant provided to the Waukegan Harbor Citizen's Advisory Group (CAG) through the IEPA and USEPA. The participants included municipal and county elected officials and staff, community groups, residents, federal and state agency staff, representatives of local businesses and other interested individuals. Goals and objectives and a list of action items were prepared. These action items were placed under five main goals: improve water quality, improve natural habitat, reduce flood damages, educate watershed residents and users, and maintain and monitor the watershed and improvements. Public safety, illegal dumping, property ownership boundaries and corridor recreation were also addressed.

Watershed analysis indicates that changes in road salting practices could reduce the chlorides total dissolved solids to the river by 31% to 48%. Pollutant loadings to the river from urban stormwater runoff could be reduced by 24% to 37% by watershed wide adoption of stormwater infiltration structures. However, watershed open land is predicted to reduce from 21% to 14% in the future. Future development in the watershed must recognize the role of stormwater runoff from roofs and paved surfaces in nonpoint pollution. It is critical to the future of the Waukegan River that new development be built so as to not discharge stormwater pollutants to the river.

Citizen groups and local officials have already moved forward to implement some of the actions recommended in this plan. A key action item is the annual Waukegan River Watershed stakeholders meeting to review current watershed data and accomplishments and revise the action plan.



dead river

watershed - based plan

2008

foreword

The Dead River Watershed - Based Plan was developed through a cooperative effort between the Lake County Stormwater Management Commission and representatives of the watershed stakeholders. A number of different entities, ranging from homeowners to municipal governments and county agencies, consistently attended monthly meetings during the planning process. Twelve public meetings were held to solicit input from the stakeholder committee.

The Dead River Watershed Management Plan was developed to provide a "blueprint" for reducing f ood damages, improving water quality, and protecting natural resources in the watershed. The Plan is intended to assist private citizens and the local, State, and Federal units of government concerned with managing the water resources of this watershed in a cost-effective and environmentally sound manner.

The Plan contains a summary of data collected for the watershed, quantif es water resource-related problems, presents goals and objectives agreed upon by the stakeholder group, and presents a list of recommended actions for effectively managing watershed resources in concert with activities such as comprehensive planning, development standards, and transportation planning. The Plan provides a basis for inter-jurisdictional communication and coordination on water resources issues.

This Plan is an advisory document for stakeholders of the watershed, but we encourage stakeholders to endorse the Plan, utilize the document as a reference, and pursue implementation. This document does not contain subwatershed regulatory requirements, but instead provides proactive guidance on opportunities to balance the uses and demands on the watershed's resources to improve the quality of life for future generations.

Lake County Stormwater Management Commission

Michael D. Warner, P.E., CFM
Executive Director

September 2008

Our vision for the Dead River Watershed is of . . .

a network of healthy streams and ecosystems where habitat for native plants and animals, and surface and ground water quality, are protected and enhanced;

unique, vibrant communities with sustainable and healthy economies;

a dedicated system of open space is protected, enhanced and preserved.

~ THE DEAD RIVER WATERSHED PLANNING COMMITTEE

executive summary

THE DEAD RIVER WATERSHED

The Dead River watershed is the area of land where water that falls as rain or snow f ows across the landscape, enters our streams and wetlands, and ultimately drains into Lake Michigan. The 16 square mile (10,200-acre) watershed is bounded by Green Bay Road on the west, Lake Michigan on the east, Waukegan Harbor on the south, and Shiloh 25th Street on the north.

The watershed is part of the Root-Pike watershed system that includes Kellogg Creek to the north and the Root and Pike Rivers in southeastern Wisconsin. The Dead River watershed is one of the few remaining Illinois tributaries that drains to Lake Michigan, and contributes to the overall quality and health of Lake Michigan and the Great Lakes system.

The watershed includes over twelve miles of stream and more than 1700 acres of wetlands. From north to south, the major stream channels inlcude an unnamed tributary, Bull Creek, and Glen Flora Tributary. Bull Creek is made up of the 27th Street Tributary, North Branch of Bull Creek, South Branch of Bull Creek, and the Wilson Avenue Tributary, which together become the Dead River in Illinois Beach State Park. The Glen Flora Tributary, formerly known as the Little Dead River, currently f ows through the Johns Manville lagoons and discharges through a pipe to Lake Michigan.

The watershed includes part of Illinois Beach State Park, a National Natural Landmark visited by 2.8 million people annually, which contains 2000 acres of Illinois Nature Preserve, a high concentration of threatened and endangered species, and unique ecosystems found nowhere else on earth. The park also contains the last remaining undeveloped Lake Michigan shoreline and sand dune complex in Illinois.

The Dead River watershed includes areas of the City of Zion, Village of Beach Park, and City of Waukegan, as well as lands owned and managed by Lake County, the Lake County Forest Preserve District, the State of Illinois, and a number of other public and private entities.

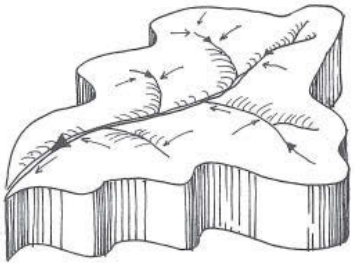
The Dead River watershed within the context of Illinois, Wisconsin, and the Great Lakes basin.

THE WATERSHED OVER TIME

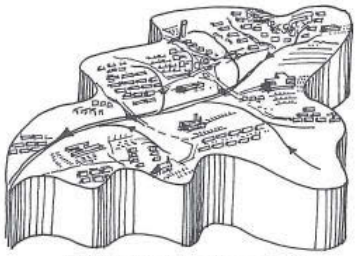
In the early 1800s, the watershed landscape consisted of scattered oak trees, prairies, and wetlands in the central and western thirds, large areas of open oak woodlands along the ridges and ravines, and a coastal 'beach ridge' along the Lake Michigan shoreline. Before settlement, the Dead River and tributary streams f owed cool and clear, and were surrounded with dense ground vegetation and scattered trees. When water reached the Lake Michigan beach plain, it spread out across the landscape creating a vast wetland and dune system and slowly seeped into the lake.

In the 1800's, the fertile soils and openness of the oak tree and prairie landscape attracted farmers, who converted these lands, including the draining of wetlands, for agriculture. In the early 1900's, urbanization of settlements began and continued with suburbanization following World War II. Today, the coastal beach ridge has been preserved as Illinois Beach State Park, and many of the ravine woodlands are intact. The rest of the watershed has been converted into downtown areas, older neighborhoods, and newer suburban development interspersed with commercial and industrial land uses.

A watershed is the geographic area of land that drains water to a particular stream, lake or wetland, and is def ned by the topography of the landscape. The watershed includes not just the surface of the land, but also the area below the surface where water that inf ltrates into the soil f ows toward the receiving stream or waterbody as underground f ow.



A WATERSHED DRAINS AN AREA OF LAND



URBANIZING WATERSHED

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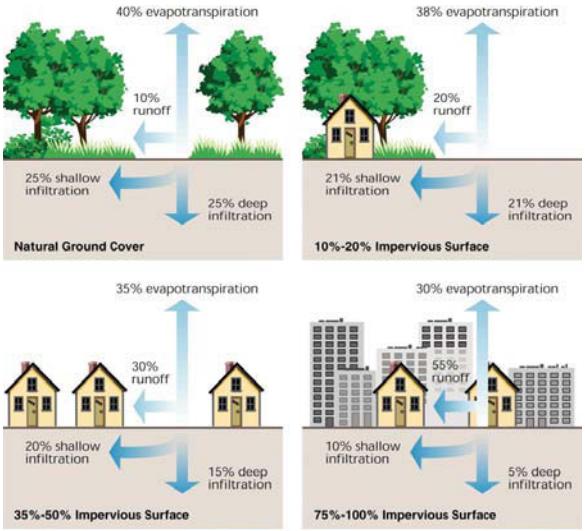
These landscapes have been restored to resemble presettlement condition similar to that found in the Dead River watershed.

THE IMPACT OF WATERSHED DEVELOPMENT

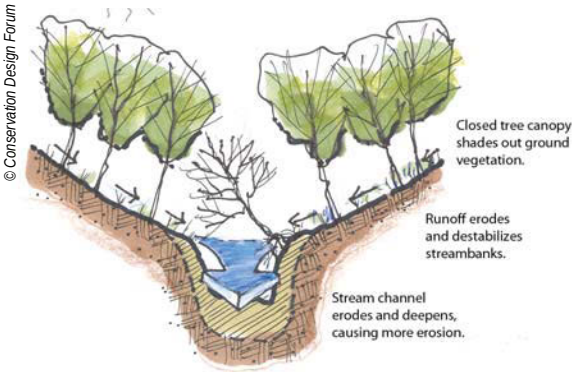
Under natural conditions, most of the water that falls on earth is used by plants, evaporates into the air, or seeps into the soil and becomes groundwater. Water that does not evaporate or inf ltrate into the ground is called runoff. As a watershed develops, natural areas are converted into lawns, rooftops, roads, and parking lots. Instead of being used by plants or seeping into the ground, water that falls on these surfaces quickly f ows to our streams directly or through the stormwater drainage and sewer system. As a result, streams and wetlands receive large pulses of water in shorter periods of time, resulting in erosion and destabilization of the stream channel and streambanks. When this happens, streambanks erode away, causing the loss of property and the pollution of our water with sediment. Where the landscape or the stormwater system is insuff cient to contain this f ush of water, f ooding can occur.

Streambanks are further destabilized by the type and density of vegetation along the streambanks. Due to the introduction of plants that are not native to Illinois, and to the lack of natural landscape processes such as f re, deep-rooted ground vegetation that used to stabilize stream edges have been replaced with non-native plants and dense woods that shade out good vegetation and do not adequately stabilize the stream banks.

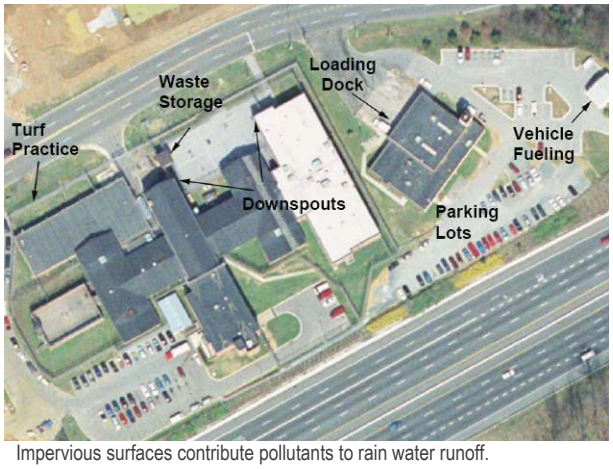
In addition to increasing the volume and rate of runoff, pollutants such as oil and grease, road salt, eroding soil and sediment, metals, bacteria from pet wastes, and excess nutrients (nitrogen and phosphorus) from fertilizers are washed from streets, buildings, parking lots, construction sites, lawns and golf courses into the streams and lake. This kind of pollution is called nonpoint source pollution. Additional pollutants include increased water temperature, altered pH, and low dissolved oxygen levels, making the river unhealthy for aquatic life.



Greater imperviousness results in a greater percentage of rainfall leaving as runoff and less inf ltrating into the ground.



High runoff can cause erosion and incision of stream channels.



Impervious surfaces contribute pollutants to rain water runoff.

The health of the Dead River system and Lake Michigan are a direct ref ection of land use activities throughout the watershed such as how we develop the watershed, and how we live in and manage our urban landscape, have a dramatic effect on the condition of watershed resources. Tthese impacts affect not only the residents and visitors of Zion, Beach Park, and Waukegan, but all of the communities that depend on Lake Michigan to provide water, recreation, food, economic well-being, or other values. Fortunately, there are proven practices for addressing these impacts, and landowners, business owners, public off cials, and all who live, work, and play within the watershed can take positive action towards improving the watershed. One of the f rst steps in the process it to understand watershed problems and make a plan for moving forward -- a watershed plan.

WATERSHED PLANNING

Healthy watersheds offer many benef ts including a healthy river with better water quality, enhanced opportunities for recreation and environmental education, opportunities for environmentally sustainable economic development, better wildlife habitat, reduced f ood damage, and a healthier Lake Michigan.

One of the f rst steps to rediscovering and enhancing these watershed benef ts is through a process called watershed planning. The purpose of the watershed planning process to better understand the condition of Dead River watershed resources, and to identify actions to prevent existing watershed problems from worsening as a result of future land use and management changes, preserve and improve water resources, reduce f ood damage, protect property and infrastructure, and improve the quality of life for watershed residents. Watershed planning has the added benef t of bringing numerous communities together to plan for the greater good and to protect and improve the land and water resources they share and impact.

The following general steps were used in developing this watershed plan.

1. Conduct monthly Watershed Planning Committee meetings with watershed stakeholders and technical team members.
2. Solicit public input on watershed issues and opportunities and formulate watershed goals and objectives.
3. Review and analyze existing studies, watershed conditions, and watershed data to identify watershed problems.
4. Identify best management practices and policies to improve watershed resources.
5. Develop detailed watershed improvement action and implementation plan and recommendations.

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Watershed planning is a participatory process with watershed stakeholders.

WATERSHED ISSUES AND GOALS

During the f rst two Watershed Planning Committee meetings, watershed stakeholders developed a list of watershed issues and opportunities and prioritized them via a voting process. Specif c areas of concern include the stream system and erosion problems, the ravines, the area north of Waukegan Harbor, and Lake Michigan and its shoreline. These and other issues were categorized into the following topic areas, with the number of votes received shown in parenthesis:

1. Stream Restoration and Management (53)
2. Floodplains (16)
3. Natural Resources (34)
4. Watershed Education & Coordination (32)
5. Stormwater Infrastructure (0)
6. Water Quality (0)

Due to the similarity and proximity of the Kellogg Creek and Dead River watersheds, these results were combined with those of the Kellogg Creek watershed as the foundation for developing the following watershed management goals, which are further detailed in Chapter 2:

Goal A: Restore the health and function of streams as part of a watershed *green infrastructure* (see description at right).

Goal B: Reduce and prevent f ood damage to protect health, safety, property and infrastructure.

Goal C: Preserve and restore a *green infrastructure* network of land and water resources.

Goal D: Provide people with watershed improvement education, resources, and opportunities.

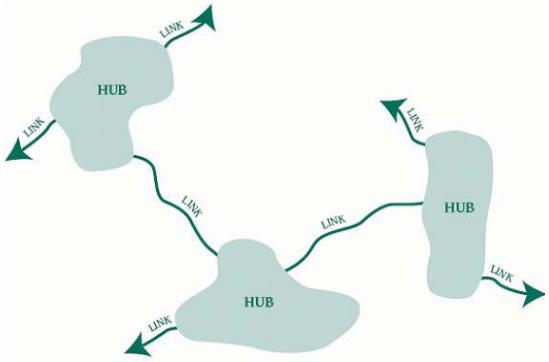
Goal E: Improve water quality by reducing the impacts of land use and development.

Goal F: Improve public, private, and non-prof t coordination and decision-making.

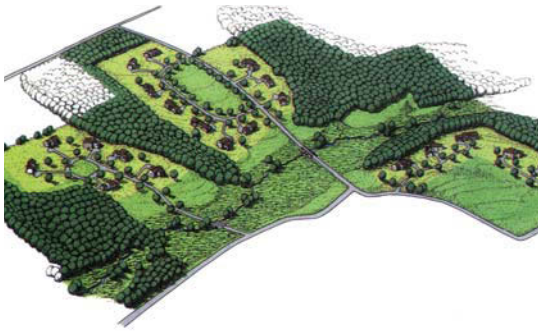
Goal G: Stabilize the stream systems by reducing surface runoff.

Green infrastructure: On the local scale, municipal or neighborhood, green infrastructure consists of site-specific best management practices (such as naturalized detention facilities, vegetated swales, porous pavements, rain gardens and green roofs) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls.

On the regional scale, green infrastructure consists of the interconnected network of open spaces and natural areas (such as forested areas, floodplains and wetlands, greenways, parks and forest preserves) that mitigate stormwater runoff, naturally recharge aquifers, improve water quality while providing recreational opportunities and wildlife habitat.



Conservation design: A county-wide method for developing land that conserves the green infrastructure elements of a site while providing for development at full density on the remainder of the site. Conservation design typically includes the use of stormwater management measures that filter and infiltrate runoff on site.



WATERSHED INVENTORY AND ASSESSMENT

Chapter 3 of this plan is an assessment of watershed conditions based on data, studies, and inventories, and the preparation of a series of watershed maps. The assessment included stream corridor conditions, stormwater infrastructure, f ooding, water quality, land use, wetlands, and other relevant data and information. This information serves as baseline data for comparison with future watershed assessments. Five important conclusions based on this watershed assessment are summarized here.

1. The Dead River system exhibits rapid increases and decreases in water f ow, level and velocity, which reduces water quality, reduces the quality of stream habitat, and destabilizes the stream channel, causing erosion of streambanks and ravines and damage to stormwater infrastructure.

2. Streambank and ravine erosion are a major concern along many reaches and require immediate attention. Stormwater discharge points are of particular concern as many of them were found to be failing or negatively impacting the stream system.

3. Water quality is impacted primarily by sediment, low dissolved oxygen levels, high phosphorous concentrations, and other typical urban watershed non- point source pollutants. The Waukegan Regional airport, other impervious surface areas, and the industrial legacy of Waukegan Harbor and areas to the north of the harbor are signif cant contributors to water runoff and pollution.

4. Preserving and restoring priority green infrastructure areas, including Illinois Beach State Park, Lyons Woods Forest Preserve, wetlands, and stream corridors, is critical for improving water quality and other watershed resources. Restoration measures include controlling invasive species, which threaten high quality natural, beach erosion in Illinois Beach State Park, and the habitat of the stream channel and the natural corridor through which the stream channel runs.

5. The municipalities, residents, businesses, landowners, and other organizations and agencies within the watershed lack the coordination and communication necessary to improve watershed resources.

WATERSHED BEST MANAGEMENT PRACTICE TOOLBOX

Chapter 4 of the watershed plan includes a description of best management practices and policies that can improve watershed resources. Included in this toolbox are actions that can be taken by residents, landowners, business owners, agencies, and municipalities to prevent conditions from worsening and to improve existing impaired conditions. Best management practices described in the toolbox include:

- Stabilize eroding streambanks using deep-rooted vegetation and other environmentally-friendly measures.
- Use conservation design principles for new development and retrof tting existing development with improved stormwater management practices.
- Install vegetated swales, raingardens, and f lter strips, to help slow, f lter, inf ltrate, cool, and cleanse stormwater before being discharged to our streams and wetlands.
- Reduce the area of impervious surfaces and using permeable paving practices that allow water to inf ltrate into the ground rather than run across the surface.
- Maintain deep-rooted, native vegetation buffers around streams, wetlands, and detention basins.
- Preserve green infrastructure including open space, stream corridors, wetlands, and natural areas.

WATERSHED ACTION PLAN

The effectiveness of the Dead River watershed plan will be largely dependent on the quality of the action plan in Chapter 5. The action plan provides the "who, what, where and when" for making watershed improvements and includes programmatic, policy, and site-specif c recommendations. The site-specif c action items are tied to a particular location in the watershed or along the stream corridor, and include details such as area, length, cost, responsibility, schedule, and priority. The eleven most important recommendations are summarized as follows:

1. Stabilize streambanks and ravine slopes to reduce erosion, protect property and infrastructure, improve water quality, and improve habitat.

2. Restore and manage stream corridors by restoring native riparian buffers, reducing the density of trees, removing excessive debris, and stabilizing the stream bed with practices that also enhance habitat.

3. Manage, retrof t, and stabilize the stormwater management system including detention basins and culverts, with focused attention on stormwater discharge points (pipes and ditches), to reduce runoff rate and volume and to improve water quality in the streams and Lake Michigan.

4. Preserve and restore priority green infrastructure areas to provide natural surface water storage areas, provide space for installing best management practices, and preserve an ecologically functioning network of open space, wetlands, streams, and natural areas as part of an interconnected system.

5. Manage and restore watershed natural areas including wetlands, former wetlands / hydric soil areas, and especially Lyons Woods Forest Preserve and Illinois Beach State Park.

6. Develop positive and creative new uses for the Zion Nuclear Power Plant and Waukegan Harbor areas, ensuring that these uses are compatible with protecting and improving watershed resources and Lake Michigan.

7. Remediate existing f ood problems and prevent future f ooding by reducing stormwater runoff and preserving areas for surface water storage and absorption such as f oodplains, depressional storage areas, and wetlands, which also provide water quality improvement benef ts.

8. Use better stormwater management, conservation design, and low impact development practices for new and existing development that slows, f lters, inf ltrates, cools, and cleanses stormwater runoff, especially in Critical Subbasins. This includes source controls and lot level best management practices such as vegetated swales, naturalized detention basins, rain gardens, stream buffers, f lter strips, and reduced use of lawn chemicals and fertilizers.

An eroding stream channel before (left) and after restoration (right).

Monitoring is an important part of improving watershed resources.

9. Modify and use planning and development standards, policies, and capital improvement plans and budgets to protect and enhance water quality.

10. Provide public education and outreach to enhance understanding and apprciation of watershed resources and problems, to provide solutions, and to provide opportunities for people to get involved in watershed improvement activities.

11. Monitor and evaluate watershed plan implementation and physical watershed conditions to guage progress towards watershed goals.

MONITORING AND EVALUATION PLAN

A monitoring and evaluation plan was developed to provide a means of measuring progress towards watershed goals and plan implementation. This plan should be used by watershed plan stakeholders and other implementers to monitor watershed resources and to track whether meaningful progress is being made towards plan goals. The monitoring plan includes details such as the frequency of monitoring, short, medium, and long term milestones, responsible party, and mode of collection.

THE FUTURE OF THE WATERSHED DEPENDS ON ALL OF US

This plan has limited usefulness without the dedication and commitment of watershed stakeholders to the improvement, restoration, management, and stewardship of watershed resources. As the primary land use, development, and infrastructure authorities in the watershed, municipal and county off cials and staff have a signif cant amount of the responsibility for plan implementation. County, state, and federal agencies also have a signif cant role in watershed plan implementation, by approving and supporting projects with funding, and by providing technical information, tools, and resources to assist local authorities and watershed organizations in their efforts. Watershed residents and landowners must also accept responsibility for managing their own land and water resources, for identifying watershed problems and opportunities, and for working with others to implement this plan.

All of these people and organizations will need to work together to successfully protect and restore the Dead River watershed, to ensure long-term watershed stewardship, and to share the responsibilities, costs, and benef ts of watershed improvements. Plan implementation will also depend on a watershed organization to oversee, guide, coordinate and monitor watershed activities on behalf of the stakeholders. This organization typically forms as an outgrowth of the Watershed Planning Committee with support coming from a variety of state and local agencies as well as local land use authorities and decision makers. This is the primary mechanism for the general public to be involved in watershed activities, to support the implementation of the watershed plan, and to voice their concerns and celebrate their successes in restoring watershed resources.

THIS PLAN IS A BLUEPRINT

The Dead River Watershed-Based Plan provides specif c guidance for addressing impacts and for preserving and enhancing the valuable resources of the watershed. It provides a source of information and recommendations for municipalities, forest preserves, developers, residents, county and state agencies, and others to effectively plan and conduct land use and other activities in a way that is appropriate for protecting watershed resources. It provides guidance for comprehensive planning, development standards, green infrastructure preservation, natural resource restoration, land management, and water quality improvement, with an overall focus on water resources. It also provides indirect guidance for capital improvement planning and budgeting.

acknowledgements

The Lake County Stormwater Management Commission secured the funding and provided project oversight and management. The dedication and support of the Dead River Watershed Planning Committee and other watershed stakeholders in the planning process made development of this plan possible. The municipalities of the watershed graciously hosted our planning committee meetings. Special acknowledgment goes to Beach Park who hosted the majority of our meetings due to their central location in the watershed. Conservation Design Forum and Montgomery Watson Harza assisted with data collection and plan preparation. Funding for the Dead River Watershed Management Plan was made available through the United States Department of Agriculture Natural Resources Conservation Service and Lake County Stormwater Management Commission.

The following people generously gave their time to speak to the Planning Committee about watershed issues: Tim Girmscheid, Liberty Prairie Conservancy; Don Wilson, Illinois Beach State Park; Deb Maurer, Lake County Forest Preserves; Joe Hughes, Bull Creek Stakeholders Association; Tony Wolff, Patty Werner, Mike Prusila, Scott Paszkiewicz, and Crissy Mehle, SMC; Jason Navota and Tom Price, CDF; and Erin Maloney, MWH.

Contributors to the watershed plan included representatives from both Kellogg Creek and the Dead River watersheds:

Mike Adam, Lake County Health Dept.
Jim Anderson, Lake County Forest Preserve
Larry Anglada, Zion Benton Township High School
Bob Asma, Resident
Jim Battista, Midwest Group/Pineview Cemetery
John Beardsley, IL State Water Survey
Emma Bialecki, Lake County Forest Preserve District
Pat Bleck, Beach Park Drainage District
Janice Bock, Resident
Richard & Jean Bogdala, Residents
LeRoy Boldt, Village of Beach Park
Robert Cade, North Shore Sanitary District
Frances Canonizado Alliance for the Great Lakes
Thomas Chefalo, Lake County Planning, Building, and Development
Bruce Cliff, Resident
Sara Creque, Illinois Natural History Survey
John M. Crombie, Resident
Leonard Dane, Lake County Health Department
Lyle DeGraff, Resident
William & Susan Fishback, Resident
Rachel Foerster, Resident
Jack Forney, Zion Industrial Park
Tim Girmscheid, Liberty Prairie Conservancy
Jeff Greenspan, Trust For Public Land
Gene Gross, Beach Park & Benton Township
S. I. Harris, Resident
Erica Heyl, Resident
Nick Huber, Lake County Forest Preserves
Joe Hughes, Resident
Paula Illich, Resident
Doug & Barb Jaeger, Residents
Paul Kakuris, Illinois Dunesland Preservation Society
Jeffrey Koziel, Land Conservancy of Lake County
Sandy Kubillus, Integrated Lakes Management
Joe Leccise, Resident
Bob Long, Resident
Judy Mackey, Resident
Larry Matson, City of Waukegan
Robert Martin, Village of Pleasant Prairie
Deb Maurer, Lake County Forest Preserves
Bruce Mihelich, City of Zion
Curtis Mitzelfelt, Resident
Ron Molinaro, Village of Winthrop Harbor
John Moore, City of Waukegan
Debra Nelson, IDNR
Ronda Nissen, Resident
Adrienne Orr, Lake County Health Dept.
Howard Parks, Resident
Chip Parrott, RHMG/ Village of Beach Park
Mary Peloza, Resident
Joe Robinson, North Shore Sanitary District
Ric Robinson, Resident
Denise Rolando, Resident
Marilyn Ross, Resident
Steve Rowan, Resident
Tom Rush, Village of Beach Park
Susie Schreiber, Waukegan CAG
Joseph Sekulich, Resident
Dan Shappert, Bull Creek Stakeholders Association
Natasha Shaw, State Rep. Eddie Washington
Glenn Smith, Resident
Jim Stanczak, Waukegan Airport
Terry Staples, Resident
Joe Synovic, Resident
Shantal Taylor, Resident
Diana Vanderheyden, Resident
Richard Vanderhoef, Resident
Ronald Weldon, Resident
Bill White, IL State Water Survey
Donald White, Lake County Public Water District
Lloyd Wickersheim, Resident
Steve Wikner, Waukegan Park District
Calvin & Lavonne Wilcox, Residents
Judith Wilkes, Resident
Don Wilson, Resident
Bill Zika, Resident

Dead River Watershed - Based Plan

PLANNING TEAM

Lake County Stormwater Management Commission

Chris Gaynes
Crissy Mehle
Scott Paszkiewicz
Mike Prusila
Rasto Vrazda
Mike Warner
Patty Werner
Tony Wolff

Conservation Design Forum

Jason Navota
Eric Otto
Tom Price
Becca Cerf
Matt Fordham
Ryan Wilson
Brent Jacobsen

Montgomery Watson Harza

Justin Bartels
Erin Maloney

North Branch Chicago River Watershed-Based Plan

EXECUTIVE SUMMARY

In Lake County, the Lake County Stormwater Management Commission (SMC) is responsible for managing Lake County's water resources. The North Branch Chicago River Watershed-Based Plan was developed to provide direction and target resources for better management and restoration of the watershed. This plan serves as a blueprint for improving water quality, reducing flood damage, and protecting natural resources in the North Branch Chicago River Watershed. Watershed plans also provide an opportunity for multiple jurisdictions with varying priorities to coordinate their efforts and accept their responsibility for the impact their actions have both up and downstream. As Lake County continues to grow, there is a need to predict and manage how land use changes will affect the North Branch Chicago River and its' watershed.

INTRODUCTION

The North Branch Chicago River Watershed encompasses over 50.4 square miles in Lake County, and 44.4 square miles in Cook County. The total watershed area is 60,658 acres, with 32,240 acres in Lake County and 28,418 acres in Cook County. Twenty-five municipalities comprise most of the watershed's area. Natural open spaces have been converted to agricultural, commercial, and residential uses. Flood damage has occurred and water quality and habitat have been degraded. The Lake County Stormwater Management Commission (SMC) hired V3 Companies to update and expand the 2000 Final Draft of the North Branch Chicago River Watershed Assessment and Management Plan for Lake County. Applicable content from the 2005 North Branch Chicago River Open Space Plan (NBOSP) was incorporated into the updated watershed-based plan. The original 2000 plan and this updated plan were both funded in part by the Illinois Environmental Protection Agency (IEPA) through Section 319 of the Clean Water Act (CWA) and by the SMC.

This watershed assessment and plan was developed with the assistance and input of a variety of watershed stakeholders. The watershed plan is one component of a larger watershed project undertaken by a partnership of watershed stakeholders with substantial funding support from the IEPA. Watershed partners came together to provide leadership for watershed communities and residents in developing a new vision for the degraded North Branch Chicago River as described in the following mission statement.

NORTH BRANCH WATERSHED PROJECT MISSION STATEMENT

Identify opportunities for North Branch Chicago River watershed communities to integrate multi-objective watershed management in land use planning and development activities. The North Branch Chicago River Project strives to improve degraded conditions in the watershed by combining water quality improvement, water quantity control, flood damage reduction and natural resource protection and enhancement objectives in watershed-based best management practice projects and programs.

How the North Branch Chicago River Project Began

The North Branch Chicago River watershed partnership originated from an ad hoc group coordinated by the non-profit river advocacy organization Friends of Chicago River (Friends) in the early 1990s. This ad hoc group co-sponsored two watershed stakeholder workshops in 1991 and 1992 at the Chicago Botanic Gardens known as Voices from the Stream. The Voices workshops were dedicated to identifying issues important to North Branch Chicago River watershed residents and providing a vision for the future of the watershed.

Following Voices from the Stream, a congressional appropriation sponsored by Congressman Sidney Yates prompted the National Park Service to initiate the ChicagoRivers Demonstration Project in 1993. A number of government agencies participated in the project along with the Friends and other volunteers from the ad hoc partnership workgroup. As part of the project, the government agencies studied and assessed the condition of the entire 156 miles of the Chicago River waterway system - including natural resources such as wetlands, fish and macroinvertebrates, water pollution and sediment contamination, and resident attitudes towards the river. The ChicagoRivers project was intended to galvanize local interest in the conservation and use of the Chicago River and to promote local stewardship.

During the same time the ChicagoRivers study was being conducted, a core group of watershed partners continued to work on improving the North Branch Chicago River through restoration projects. The North Branch Chicago River Watershed Project was born out of the continued interest and commitment demonstrated by these partners as they worked on successive projects in the North Branch Chicago River.

The North Branch Chicago River Watershed-Based Plan

Based on their active involvement in watershed projects throughout this time period, Friends received an IEPA section 319 Grant in 1996 to develop a more formal watershed partnership, and a strategy for restoring and managing a 94 square mile area of the North Branch Chicago River watershed. The watershed strategy would be embodied in a watershed management plan that identified solutions for water pollution, flood reduction, and protection and restoration of natural resources. Friends contracted with Kirk Gregory, a professor at Northeastern Illinois University (NEIU), to complete a watershed assessment and plan for the Cook County portion of the North Branch Chicago River. NEIU students would conduct the watershed assessment under the guidance of Professor Gregory, and NEIU would become a watershed partner in future projects to study and monitor the condition of the river. At the same time, Friends entered into a cooperative agreement with SMC to assess the watershed condition and develop a management plan for the Lake County portion of the watershed. SMC had long been involved in restoration initiatives in the North Branch Chicago River. SMC was a member of the team that planned the Voices workshops in the early 90's, and participated with the Friends and other partners in a number of watershed projects and events in the following years.

SMC and NEIU worked together to select a methodology for the stream assessment, a nonpoint source pollutant loading model, and to identify sources of data for other components of the watershed assessment. A watershed assessment for the Cook County North Branch Chicago River was completed in 1998, but insufficient funding and the lack of a designated planning authority precluded the completion of a more detailed watershed assessment and full watershed management plan for Cook County. Although there is considerable difference in the level of detail, the North Branch Planning Committee decided to combine the Cook County and Lake County watershed assessments in this plan document (Chapter 3) to provide a more complete view of the entire watershed project area. As a result, while the watershed assessment in Chapter 3 reflects the most up-to-date information for the entire study area, there are some discontinuities between the Cook and Lake County portions of the watershed assessment due to differences in informational detail and mapping.

The ultimate goal of the North Branch Chicago River Watershed Project is to develop a watershed action plan for the entire North Branch Chicago River project area including both Lake and Cook Counties. While SMC was the logical partner to undertake the planning effort for Lake County, there was no comparable agency in

Cook County to develop the Cook County plan. (SMC has no planning authority or funding support to develop a management plan for the Cook County project area.) Therefore, the watershed management plan (Chapter 5 Action Plan) is for the northern half of the watershed in Lake County only. The Metropolitan Water Reclamation District of Greater Chicago (MWRD) is initiating a watershed management plan for the North Branch Chicago River in Cook County.

The first draft of the Lake County watershed assessment and plan was completed in February 1999. Following revisions based on comments from IEPA, SMC staff and Friends, a second draft of the plan was completed and mailed out for a 60-day public review in August 1999. A public hearing was held in September of 1999. Comments from the public, peer agency and municipal review received through mid-November 1999 were compiled for the North Branch Planning Committee. Over 300 individual comments were incorporated into a comment/response summary. The North Branch Planning Committee discussed comment responses that would result in substantive changes to the plan at meetings in December 1999 and January 2000. Technical guidance for responding to comments related to the water quality and hydrology and hydraulics sections of the plan was provided by the Water Quality Work Group and SMC technical staff respectively at meetings in December 1999. The resulting revisions were incorporated into the Final Draft which was adopted by the Lake County board in fall 2000.

In 2007, the update and expansion of the North Branch Chicago River Watershed Plan was completed. Updated information was gathered from municipalities, local, state, and regional agencies and other interested parties. This plan provides conclusions about current conditions and recommendations for improvements. This plan also incorporates the United States Environmental Protection Agency (USEPA) nine elements of a Watershed-Based Plan (WBP).

USEPA Watershed-Based Plan Upgrades

In October 2003, the USEPA released watershed protection guidance entitled "Nonpoint Source Program and Grant Guidelines for States and Territories". The document was created to ensure that Section 319 funded projects make progress towards restoring waters impaired by nonpoint source pollution. Under the guidance, nine elements are required in order for a plan to be considered a WBP. As described below, the updated and expanded North Branch Chicago River Watershed Plan addresses all nine elements of a WBP. The nine elements are as follows:

1. *Identification of the causes of impairment and pollutant sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan.*

   A summary of the causes of water quality impairment and pollutant sources can be found in Chapter 3.13. A review of point and non-point pollutant sources, detention basin data, the location of landfills and Superfund sites, and a compilation of data from biological and chemical monitoring, river sediment sampling data, and previous water quality reports were reviewed.

2. *An estimate of the load reductions expected from management measures.*

   The projected load reductions through site specific project implementation have been provided in Chapter 3.13. The water quality best management section within Chapter 4 (4.1.1.2), contains information on the effectiveness of Best Management Practices (BMP) to reduce water quality impacts. See tables 4-1, 4-2, and 4-3. Appendix F gives a detailed explanation of pollutant loading and reduction methodology.

3. *A description of the nonpoint source management measures that will need to be implemented to achieve load reductions identified above, and a description of the critical areas in which those measures will needed to implement this plan.*

Nonpoint source pollution originating from within the stormsewersheds are ranked with respect to the frequency of being one of the most significant contributors of contaminant loading within the watershed. The most significant stormsewershed contributors are listed as potential significant areas and are shown on Figure 3-43. The discussion of management measures that can achieve load reductions are discussed in Chapter 3.13 and 4.1.

4. *Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.*

   The action plan tables, found in Chapter 5, contain information related to technical and financial needs for each programmatic and site specific recommendation. Technical and financial assistance needs were determined based on the complexity of implementing the recommended actions. Lead and supporting agencies that should be consulted are also listed. Cost and funding sources for each recommendation vary but are based on the best available information.

5. *An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.*

   Existing and proposed education programs were evaluated to determine how well these programs address the goals and objectives of the WBP. Based on this evaluation, additional programs and educational action items were recommended to address goals and objectives that existing programs fail to address. The Chapter 5 programmatic action plan and Chapter 6 milestones and measurable goals for Goal 4 (Develop a public information and education program within the watershed communities), include these recommendations with implementation schedules, lead agencies/owners responsible, technical/financial assistance information, and measurable goals.

6. *Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.*

   Each programmatic and site specific recommendation in the action plan tables (Chapter 5) was assigned an implementation schedule based primarily on priority, cost, and technical/financial needs. Implementation schedules were based on immediate needs (0-5 years), medium term needs (5-10 years), and long term needs (10-20) years. High priority areas are generally recommended for 0-5 year implementation unless costs or available technical assistance prevent this. Other recommendation items were recommended for medium and long term implementation when funding and assistance are available.

7. *A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.*

   Milestones determine if management measures are being implemented and how effective they are at achieving plan goals and objectives over time. Milestones are evaluated using measurable indicators related to watershed characteristics such as physical, chemical, biological, and social components. In the Chapter 6 tables, milestones and measurable goals were developed for each goal and objective. These measurable goals and milestones will be evaluated for plan performance, using the scorecards found in Chapter 6.

8. *A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.*

The Chapter 2 Building Blocks Worksheet for goals and objectives identifies means for evaluation watershed improvements. Nonpoint source pollutant loads are identified in Chapter 3.13. The set of criteria that can be used to determine improvements in water quality through load reductions and the progress towards attaining water quality standards is also provided within this section. An overall assessment plan (scorecards) to determine achievement in loading reductions is outlined in Chapter 6.2 and Table 6.1.

9. *A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established above.*

   The set of criteria that can be used to determine the effectiveness of the implementation efforts over time is outlined in Chapter 6.2 and Table 6.1. Appendix K includes maintenance, management, and monitoring plans for the recommended BMPs in order to facilitate the continued water quality benefits of installed BMPs over time.

Using this Document

Watershed, River, Project & Plan

The information provided within this section includes an overview of the North Branch Chicago River watershed, the North Branch Partnership, the North Branch Chicago River Project, the North Branch Chicago River Watershed Plan, and the overall vision for the North Branch Chicago River. The North Branch Chicago River Project subsection summarizes public outreach and education programs, demonstration projects, and the watershed handbook. The North Branch Chicago River plan summarizes the establishment of goals and objectives, assessing the watershed condition, a "toolbox" for BMPs, and developing an action plan for the North Branch Chicago River.

Plan, Goals & Objectives

The Plan, Goals & Objectives section describes the overall goals and objectives (G&O's) as established at the stakeholders and partner forums. The G&O's for the North Branch Chicago River Watershed Management Plan follow the format from the December 2003 USEPA publication titled "Getting In Step, A Guide for Conducting Watershed Outreach Campaigns". During the North Branch Planning Committee meetings, participants discussed and completed the G&O from the Building Blocks Worksheets.

Watershed Resource Inventory & Assessment

The purpose of this section was to provide detailed information on existing conditions in the watershed. This information serves as baseline data for comparison with future watershed assessments. While the Cook County assessment is included in this chapter to describe the overall watershed picture, it is less detailed than the Lake county assessment and the action plan recommendations in Chapter 5 are directed to Lake County only.

Watershed Restoration and Management Techniques

The watershed restoration and management techniques described in Chapter 4, when applied to the North Branch Chicago River, can achieve the watershed goals and objectives identified in Chapter 2. The watershed techniques presented are broadly organized to reflect the plan goals of flood damage reduction, water quality improvement, natural resources protection and increased watershed coordination. Within each of the Goals Sections, the watershed measures are then categorized as being either Preventative or Remedial in nature.

Action Plan

The Action Plan chapter attempts to answer the questions, "who, what, where and when" regarding watershed improvements. This chapter is divided into three parts. The first section includes a description of the roles and responsibilities of the affiliated partners or "stakeholders" in North Branch Chicago River watershed management. The second and third sections of the Action Plan include the action recommendations.

From Plan to Performance

The Plan to Performance section provides guidance for the implementation of the watershed plan. It discusses both the coordination and cooperation efforts made by project leaders and watershed stakeholders. In addition, sources of funding, evaluating the performance plan, and updating the plan are also discussed.