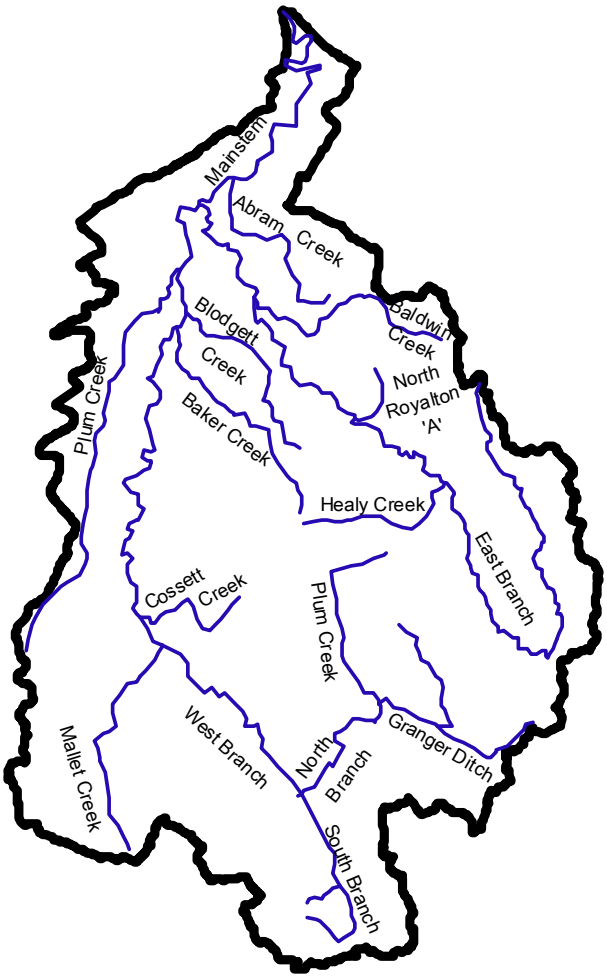
Rocky River Watershed
Action Plan



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Rocky River Watershed
Action Plan

Abstract

This report summarizes the strategic actions of the Rocky River Watershed Action Plan. It includes a discussion of the goals and objectives of the Action Plan, the timeline for implementing recommended actions, and a statement of priorities and best management practice targets listed on a subbasin basis. The Action Plan also presents plans for implementing educational outreach, for marketing the Action Plan, and for evaluating the progress made.

This Action Plan is supported by a series of appendices prepared for the Rocky River Watershed Action Plan through an Ohio 319 Grant 01(h) EPA-09. These appendices are referenced in the Action Plan. The appendices can be viewed on the Rocky River Watershed Council's website at http: //www.myrockyriver.org.

The Action Plan was prepared with the assistance of the Rocky River Watershed Council under the direction of its Board of Trustees. The Board of Trustees includes the following members:

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Rocky River Watershed Action Plan
List of Acronyms

AMATS: Akron Metropolitan Area Transportation Study
BMP: Best Management Practices
BOD: Biochemical Oxygen Demand
CCBH: Cuyahoga County Board of Health
CSO: Combined Sewer Overflow
DEFA: Division of Environmental and Financial Assistance
FEMA: Federal Emergency Management Agency
GIS: Geographic Information System
HSTS: Home Sewage Treatment System
HUC: Hydrologic Unit Code
NASA: National Aeronautics and Space Administration
NEFCO: Northeast Ohio Four County Regional Planning and Development Organization
NEO PIPE: Northeast Ohio Public Involvement and Public Education Committee
NEORSD: Northeast Ohio Regional Sewer District
NLCD: National Land Cover Dataset
NMCP: Nine Minimum Control Plans (related to Combined Sewer Overflows)
NOACA: Northeast Ohio Areawide Coordinating Agency
NPDES: National Pollutant Discharge Elimination System
ODNR: Ohio Department of Natural Resources
Ohio EPA: Ohio Environmental Protection Agency
OSU: The Ohio State University
OWI: Ohio Wetlands Inventory
PIPE: Public Involvement/Public Education
QHEI: Qualitative Habitat Evaluation Index
SD: Sewer District
SSO: Separate Sewer Outfall
STP: Sewage Treatment Plant
SWAP: Source Water Assessment Plan
SWCD: Soil and Water Conservation District
TMDL: Total Maximum Daily Load
USEPA: United States Environmental Protection Agency
WWTP: Wastewater Treatment Plant

Introduction

The attached document contains the core elements of the Rocky River Watershed Action Plan. Section I is the declaration of the goals and objectives for the Action Plan that were presented for Rocky River Watershed Council review at its April 29, 2004 meeting. The actions identified include a series of programmatic recommendations that are intended to provide increased protection of the water resources within the watershed. The actions also include a number of objectives that contain short-term targets for remediation actions. These targets have been selected based on an appraisal of what might reasonably be implemented in the watershed during the three-year cycle of the existing 319 Implementation Grant and a five-year period for activities that are outside the scope of the 319 Implementation Grant.

Section II of the Action Plan is a presentation of the timeline that will guide the implementation of the activities that make up the Action Plan. The timeline identifies the resources that are needed to implement each activity. This information was presented for to the Board of Trustees of the Watershed Council review at their June 24, 2004 meeting

Section III contains the priority action needs for the subbasins within the Rocky River Watershed. Targeted action needs are also presented for each subbasin. The specific subbasin load reduction targets associated with nitrogen loads are included.

The individual elements of the Strategic Action Plan are those that watershed stakeholders selected as priority actions during a series of public meetings held in Spring 2003. During these meetings, stakeholders reviewed the results of a two-year process that inventoried the state of the water resources and the water quality of the Rocky River and derived a series of possible solutions to documented problems. The body of work that supports the development of the Rocky River Watershed Action Plan is identified in Attachment A. All of the reports identified in the attachment constitute the appendices of the Action Plan. They are available for review on Rocky River's website (www.myrockyriver.org).

Section IV presents the education/marketing/evaluation plan along with a funding strategy.

For more information contact Andy Vidra of NOACA at avidra@mpo.noaca.org

Section I: Rocky River Watershed Action Plan
Goals and Objectives

Goal Statement for the Rocky River Watershed Action Plan

In the following discussion, a "critical area" is an area that:

- Has been identified in the Total Maximum Daily Load (TMDL) report as being a major contributor to the impairment of designated uses in the watershed; or,
- Has been identified for specific remediation efforts in the 319 Implementation Grant; or,
- Has been identified as high growth area that could threaten existing water quality.

A "priority area" is one where a given pollution source or a cause of water quality degradation has been determined to have a major impact on water resources.

An" area of concern" exists where a given pollution source or a cause of water quality degradation has been determined to have a moderate impact on water resources.

Goal 1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams.

Maintenance of functioning riparian corridors along the streams of the Rocky River is the single most important action that can be taken to maintain water quality in the stream and to minimize problems from future development.

It has been estimated that approximately 10 miles of riparian corridor are in a highly disturbed state in the Rocky River Watershed. Disturbed areas occur more commonly in urbanized areas, although agricultural areas are also affected. The goal is to replant or otherwise restore one half of the disturbed area in the watershed through voluntary efforts. The Watershed Council Board of Trustees Restoration sites will select restoration sites dependent on funding availability and local interest. Interested watershed volunteers will restore some portion of the targeted miles as part of voluntary replanting projects. In other cases, project sites will be selected in concert with funding that becomes available from parties that seek to mitigate future disturbances or from grants/donations secured for this purpose.

Substantial development pressure exists in the southern half of the watershed. Unless this development is better managed than in the past, additional riparian disturbance will result. While it is not practical to estimate the potential for future disturbance, the goal is to prevent any additional loss wherever possible and to provide for remediation of any future disturbances that are considered to be necessary.

Goal 2: Reduce instream bacterial levels to meet state water quality standards and reduce nutrient loadings to meet TMDL load reduction targets.

Fecal bacteria: The bacteria of concern in the Rocky River and its tributaries come from the intestinal tracts of mammals and are indicators of contamination by animal and/or human waste. Ohio EPA has documented that 24 of the 27 sites that they use to monitor bacteria levels in the Rocky River fail to meet their designated recreational use requirements.

Generally speaking, bacteria contamination comes from three sources: humans, domestic animals, and wildlife. Human contamination comes predominantly from failing home sewage treatment systems (HSTSs). Domestic animals include pets and livestock. The primary sources of wildlife wastes based on size and numbers are deer and geese.

Wildlife sources are virtually uncontrollable by any means other than population control measures. Therefore in the Rocky River Watershed, wildlife contamination should be considered a fixed quantity.

Pets, particularly dogs and cats, exist everywhere in the watershed and usually in concentrations that generally are insufficient to cause a problem by themselves. Good housekeeping on the part of pet owners is the measure that is warranted as part of a stewardship approach to water quality management.

Livestock in the Rocky River include the normal array of agricultural livestock including cattle, dairy cows, pigs, sheep, goats, llamas, and alpacas. It also includes hundreds of recreational horses located in concentration in the Upper West Branch and along the riding trails of the Cleveland Metroparks along the East Branch. Large herds are managed through existing Department of Agriculture programs, but smaller herds are managed largely through a voluntary approach. Voluntary compliance with sound waste management needs to be better encouraged in the watershed.

Human contamination is recognized as the most pronounced source of fecal contamination in the Rocky River Watershed. It is estimated that 4,000 of the 16,000 home sewage treatment systems in the watershed are in a state of failure. As existing systems continue to age, this rate of failure is expected to increase.

It is not possible to quantify how many failing HSTSs or animal waste sites have to be repaired or replaced in order to attain recreational use designations in the watershed. An interim target of a 50% reduction in the number of failing systems and a 50% increase in the number of controlled animal sites has been established as the target for bacteria load reductions.

Nutrient Loadings: The Rocky River Total Maximum Daily Load (TMDL) Report has established the need to reduce nitrogen loading in the watershed by 934,980 pounds per year and phosphorus loadings by 24,730 pounds per year. Both of these targets need to be met largely through nonpoint source controls. To work towards these targets, best

management practices will need to be implemented in agricultural operations, in lawn care fertilizer applications, and in the management of home sewage disposal systems. To achieve these target levels will take a multifaceted approach with solid participation from each Soil and Water Conservation District and each county health department in the watershed. Specific funding and enforcement strategies will need to be developed and implemented. Each Soil and Water Conservation District and Health Department is responsible for prioritizing sites in their county according to funding availability and landowner interest. The objective of load reductions needed from these sources is to reduce the flowing load of nitrogen and bacteria in the watershed, so no single location is more or less important than any other.

Goal 3: Increase public awareness and involvement in stewardship of the Rocky River.

Nonpoint sources of pollution can best be controlled by voluntary action on the part of all landowners in the watershed. The personal investment in Good Housekeeping by watershed stakeholders can best be obtained through an integrated and comprehensive education program that reaches all stakeholders. Programming that reinforces what a tremendous resource the Rocky River is will be instrumental in helping to achieve this end.

Rocky River Watershed Action Plan Statements of Objectives

1. Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams.
   - Permanently protect targeted areas.
     a. Critical areas determined to be the mainstem of the East Branch below Hinckley Lake and the West Branch along its entire length.
     b. Priority areas exist in the rapidly developing areas along or draining to the East and West Branches.
   - Protect all existing vegetated areas through setback requirements.
     a. The priority area encompasses the entire watershed.
   - Restore disturbed areas.
     a. Critical areas include Abram Creek and Baldwin Creek.
     b. The priority area encompasses the remainder of the watershed.
   - Protect existing aquatic habitat.
     a. The critical areas include the rapidly developing areas in Strongsville, North Royalton, and Medina County along the West Branch.
     b. Priority areas include developing areas of the remainder of the watershed.
2. Reduce instream bacterial levels to meet state water quality standards and reduce nutrient loadings to meet TMDL load reduction targets.
   - Reduce failing HSTSs by 50% in targeted stream segments.
     a. Critical areas include the East and West Branches below the Medina County line.
     b. Priority areas include Plum Creek at Olmsted Falls.
     c. Areas of concern include Abram Creek, Mallet Creek, the North Branch, and Granger Ditch.
   - Implement sixty waste management plans at horse farms and other livestock facilities.
     a. Critical areas include the lower East and West Branches in Cuyahoga County and the upper East Branch in Medina County.
   - Pass and implement pet waste control programs in all watershed communities.
3. Increase public awareness and involvement in stewardship of the Rocky River.
   - Implement a watershed-wide Public Involvement/Public Education (PIPE) effort.
   - Develop a public official outreach effort.

Goal and Objective Statements with
Programmatic and Environmental Indicators

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams (Page 1 of 2).			
Objective(s)	Action(s)	Programmatic Indicator(s)	Environmental Indicator(s)
1) Increase area of riparian corridors that are permanently protected. (Every acre of riparian corridor that is maintained in its natural state will reduce nitrogen loadings by 2 pound/year and will preserve streamside habitat features.)	Local land trusts and other land conservation organizations solicit conservation easements from property owners along watershed streams with a goal of protecting an additional 100 acres.	Number of acres secured by conservation easements.	Maintenance of QHEI, IBI, Miwb, and ICI scores along impacted stream reaches as measured as part of the State's five year monitoring cycle.
	City and county park districts purchase land along five additional miles of streams in the Rocky River Watershed.	Miles of streams purchased or donated to local parks.	
2) Protect existing vegetated riparian corridors.	All 32 Watershed communities pass township regulations or municipal ordinances that meet the setback requirements specified in the Regional Storm Water Task Force's model ordinance.	Number of resolutions and ordinances passed.	Maintenance of QHEI, IBI, Miwb, and ICI scores along impacted stream reaches as measured as part of the State's five year monitoring cycle.

Goal and Objective Statements with
Programmatic and Environmental Indicators

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams (Page 2 of 2).			
Objective(s)	Action(s)	Programmatic Indicator(s)	Environmental Indicator(s)
3) Restore riparian corridors in targeted areas.	Rocky River Watershed Council sponsors 'willow post' type projects at five highly eroded sites representing an estimated 500 feet of stream and resulting in a decrease of 500 pounds of Nitrogen per year.	Number of projects completed and number of feet of stream channel treated.	Improvement in QHEI, IBI, Miwb, and ICI scores along impacted stream reaches as measured as part of the State's five year monitoring cycle.
	Install grass filter strips in 100 acres of agriculture or other disturbed areas to reduce nitrogen loadings by 800 pounds/year.	Number of acres treated with grass filter strips.	
	Replant 1000 feet of stream channels with woody vegetation to reduce nitrogen loads by 500 pounds/year.	Number of channel feet revegetated.	
4) Protect the aquatic habitat in the Rocky River Watershed by managing increased storm water runoff rates and quantities from new development.	All 32 watershed communities pass the Regional Storm Water Task Force's Model Storm Water Ordinance to reduce the impacts of runoff from new development on stream channel stability.	Number of resolutions and ordinances passed. Number of retention/detention and water quality basins added in the watershed.	Improvement in QHEI, IBI, Miwb, and ICI scores along impacted stream reaches as measured as part of the State's five year monitoring cycle.

Goal and Objective Statements with
Programmatic and Environmental Indicators

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets (Page 1 of 2).			
Objective(s)	Action(s)	Programmatic Indicator(s)	Environmental Indicator(s)
1) Reduce home sewage treatment system pollutants reaching the Rocky River.	County Health Departments initiate an expanded homeowner education program emphasizing the proper care and maintenance of HSTSs.	Distribution of 1,000 pamphlets to targeted HSTS owners in the critical areas of the watershed.	Fecal coliform/ E. coli levels throughout the watershed after 2 years of education efforts and 1 year after implementing 50 system replacements. Reduction in the number of contact advisories issued for primary and secondary recreation. Nitrogen levels in TMDL segments measured as part of the State's five-year monitoring plan. Attainment of chemical water quality standards and fish and macroinvertebrate community use attainment as measured by the State's five-year monitoring strategy.
	Initiate a cost-share program to replace 50 failing HSTSs with on-lot discharging systems in targeted areas of the East and West Branches to reduce nitrogen loads by 1,250 pounds/year.	Installation of 50 on-lot HSTSs in critical areas of the watershed.	
	Qualify all owners of failing HSTSs for low interest loans through DEFA.	All four county health departments have approved HSTS management plans.	
	Encourage Ohio EPA to work with the Ohio Department of Health to upgrade HSTS management requirements and to develop a NPDES permit for off-lot systems.	Passage of upgraded HSTS regulations and the issuance of a general permit for off-lot discharging systems.	
	Encourage the acceleration of sanitary sewer line extensions to provide for the elimination of failing HSTSs in areas where sanitary service can feasibly be made available. Target the removal of 500 systems resulting in a decrease in nitrogen loads by 12,500 pounds/year	Completion of planning and eventual construction of up to six sewer line extension projects in those communities that have HSTS related water quality problems that can viably be eliminated by sanitary sewer line extensions..	

Goal and Objective Statements with
Programmatic and Environmental Indicators

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets (Page 2 of 2).			
Objective(s)	Action(s)	Programmatic Indicator(s)	Environmental Indicator(s)
2) Reduce animal waste related pollutants reaching the Rocky River	Soil and Water Conservation Districts produce and distribute 50 information packets to assist recreational horse owners manage animal waste runoff in critical areas of the watershed.	Distribution of 50 information packets to horse owners in the watershed.	Fecal coliform/ E. coli levels throughout the watershed after two years of education efforts and one year after implementing six animal waste management systems. Reduction in the number of contact advisories issued for primary and secondary recreation. Nitrogen levels in TMDL segments measured as part of the State's five-year monitoring strategy. Maintenance of attainment of chemical water quality standards and the performance of fish and macroinvertebrate communities as measured by the State's five-year monitoring strategy.
	Using EQIP cost-share funds, implement animal waste management programs to control recreational horse waste runoff at six sites in critical areas in the watershed reducing nitrogen loadings by 300 pounds/year.	Installation of six horse waste control projects in critical areas of the watershed.	
	Implement and enforce pet waste management programs in all 32 communities in the Rocky River Watershed.	Number of ordinances or regulations in place in the watershed.	

Goal and Objective Statements with
Programmatic and Environmental Indicators

Goal #3: Increase public awareness and involvement in stewardship of the Rocky River. (Page 1 of 1).			
Objective(s)	Action(s)	Programmatic Indicator(s)	Environmental Indicator(s)
1) Implement a watershed-wide Public Involvement/Public Education (PIPE) effort.	Encourage Phase II Storm Water Communities to participate in a watershed PIPE effort.	Number of communities that participate.	Estimates of volume of trash collected.
	Initiate a riparian protection education program.	Number of landowner contacts made.	
	Act as a distributor/supporter of health department outreach efforts on the management of HSTSs.	Number of homeowner contacts made.	
	Sponsor and coordinate annual stream clean-ups.	Number of clean-ups held. Number of participants. Estimates of volume of trash collected.	
	Initiate an educational outreach effort for owners of farm animals and pet owners.	Number of animal owner contacts made.	
2) Develop a public official outreach effort.	Develop a communication tool to regularly update local officials about watershed issues.	Number of public official contacts made. Number of newspaper articles written about public involvement.	

Section II: Rocky River Watershed Action Plan Timeline

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams (Page 1 of 2).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
1) Increase area of riparian corridors that are permanently protected.	Local land trusts and other land conservation organizations solicit conservation easements from property owners along watershed streams.	Staff time donated by watershed stakeholders to meet with land conservation organizations to solicit their cooperation (estimated to be 150 hours/year.)	Land conservation organization agreements to participate by December 2004. Outreach to landowners: On-going activity.
	City and county park districts purchase land along five additional miles of streams in the Rocky River Watershed.	$10,000,000 for land purchase assuming an average corridor width of 1,000 feet and a purchase price of $10,000/acre using funds from existing park budgets, the Clean Ohio Program, and other sources.	January 2005 to December 2009.
2) Protect existing vegetated riparian corridors.	Watershed communities pass township regulations or municipal ordinances that meet the setback requirements specified in the Regional Storm Water Task Force's model ordinance.	Commitment from each watershed community for staff time to review model ordinances and to draft the legislation to be submitted to Council or Township Trustees (estimated to require 40 hours/community.)	Introduction of ordinances by December 2004. Implementation of ordinances by December 2005.

Rocky River Action Plan Timeline

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams (Page 2 of 2).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
3) Restore riparian corridors in targeted areas.	Rocky River Watershed Council sponsors 'willow post' type projects at five highly eroding sites	Donations from watershed stakeholders of $5,000 for materials. Volunteer time (estimated 400 hours) for planning and implementing projects.	January 2005 to December 2009.
	Install grass filter strips in 100 acres of agriculture or other disturbed areas.	Donated SWCD time to solicit landowner cooperation, to design and inspect practice application. $100,000 in cost-share funds.	January 2005 to December 2009.
	Replant 1000 feet of stream channels with woody vegetation.	Donations from watershed stakeholders of $10,000 for plant materials. Volunteer time for planning and implementing projects (estimated 400 hours).	January 2005 to December 2009.
4) Protect the aquatic habitat in the Rocky River Watershed.	Pass the Regional Storm Water Task Force's Model Storm Water Ordinance to reduce the impacts of new development on stream channel stability.	Community staff time to review model ordinances and to draft the legislation to be submitted to Council or Township Trustees (estimated 20 hours/community).	Introduction of ordinances by December 2004. Implementation of ordinances by December 2005.

Rocky River Action Plan Timeline

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets (Page 1 of 3).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
1) Reduce home sewage treatment system pollutants reaching the Rocky River.	County Health Departments initiate an expanded homeowner education program emphasizing the proper care and maintenance of HSTSs.	Grant funding for $2,000 for distribution of 1,000 pamphlets to HSTS owners in the critical areas of the watershed. Donated Health Department staff time to conduct outreach activities.	Distribute pamphlets by December 2005; Continued education programming will be on on-going activity.
	Initiate a cost-share program to replace 50 failing HSTSs with on-lot discharging systems in targeted areas of the East and West Branches.	$35,000 for cost-share for the installation of 50 on-lot HSTSs in critical areas of the watershed as part of the Section 319 implementation project under the direction of the Cuyahoga County Board of Health.	January 2004 through December 2006.
	Qualify all owners of failing HSTSs for low interest loans through DEFA.	Donated Staff time for all four county health departments to develop approved HSTS management plans.	December 2004.

Rocky River Action Plan Timeline

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets (Page 2 of 3).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
1) Reduce home sewage treatment system pollutants reaching the Rocky River (continued).	Encourage Ohio EPA to work with the Ohio Department of Health to upgrade HSTS management requirements and to develop a NPDES permit for off-lot systems.	Volunteer time from watershed stakeholders to support interaction with Ohio EPA.	December 2004.
	Encourage the acceleration of sanitary sewer line extensions to provide for the elimination of failing HSTSs in areas where sanitary service can feasibly be made available. All communities that have HSTS related water quality problems are being encouraged to examine whether sewer extensions are a viable alternative to HSTS replacements.	Donated staff time from communities operating a wastewater treatment system to plan and construct six sewer line extension projects.	January 2004 to December 2006.

Rocky River Action Plan Timeline

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets (Page 3 of 3).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
2) Reduce animal waste related pollutants reaching the Rocky River	Soil and Water Conservation Districts (SWCD) produce and distribute 50 information packets to assist recreational horse owners manage animal waste runoff in critical areas of the watershed.	Donated SWCD staff time for the distribution of 50 information packets to horse owners in the watershed.	December 2004
	Using EQIP cost-share funds, implement animal waste management programs to control recreational horse waste runoff at sites in critical areas in the watershed.	EQIP funding for the installation of six horse waste control projects in critical areas of the watershed. Donated SWCD staff time to design and inspect constructed facilities. Donated SWCD staff time to develop on-going animal owner education programs.	December 2005
	Implement and enforce pet waste management programs in all communities in the Rocky River Watershed.	Community efforts to pass and implement ordinances.	December 2005

Rocky River Action Plan Timeline

Goal #3: Increase public awareness and involvement in stewardship of the Rocky River. (Page 1 of 1).			
Task Description (Objective)	Action(s) (How)	Resources Needed	Time Frame
1) Implement a watershed-wide Public Involvement/Public Education (PIPE) effort.	Encourage Phase II Storm Water Communities to participate in a watershed PIPE effort.	Donated staff time from watershed stakeholders to recruit community participation. Donated community personnel time redirected to watershed PIPE planning.	December 2004
	Initiate a riparian protection education program.	Donated staff time from watershed stakeholders to implement program.	December 2005
	Act as a distributor/supporter of health department outreach efforts on the management of HSTSs.	Donated staff time from watershed stakeholders to implement program.	Initial outreach by December 2004; continued outreach to be on going.
	Sponsor and coordinate annual stream clean-ups.	Donated staff time from watershed stakeholders to organize cleanups; volunteer time to participate in clean-ups.	May 2004 and then on going.
	Initiate an educational outreach effort for owners of farm animals and pet owners.	Donated staff time from watershed stakeholders to implement program.	December 2005
2) Develop a public official outreach effort.	Develop a communication tool to regularly update local officials about watershed issues.	Donated staff time to develop outreach strategy and to implement it on an on going basis.	Initiate by December 2004 and continue on an on going basis.

Section III: Rocky River Watershed Action Plan
Priorities and Targets

Priority Action Needs Within the Subbasins of the Rocky River Watershed

Water Quality Issue Area	Mainstem	Abram Creek	East Branch	Baldwin Creek	Royalton "A"	Healey Creek	West Branch	Plum (Olmsted)	Baker Creek	Mallet Creek	North Branch	Granger Ditch	Plum (Brunswick)
Protect and Restore Riparian Corridors													
Permanently protect targeted areas	Not an Issue	Low Priority	Critical Concern	Low Priority	Priority Concern	Priority Concern	Critical Concern	Low Priority	Priority Concern	Low Priority	Low Priority	Low Priority	Priority Concern
Protect existing vegetated areas through use of setbacks	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern
Restore disturbed riparian areas	Priority Concern	Critical Concern	Priority Concern	Critical Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern
Control storm water runoff from new development	Priority Concern	Priority Concern	Critical Concern	Priority Concern	Critical Concern	Critical Concern	Critical Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Critical Concern
Reduce Instream Bacterial Levels and Nutrient Loadings													
Reduce failing home sewage treatment system	Not an Issue	Area of Concern	Critical Concern	Critical Concern	Low Priority	Low Priority	Critical Concern	Priority Concern	Low Priority	Area of Concern	Area of Concern	Area of Concern	Low Priority
Implement waste management systems at horse farms	Not an Issue	Not an Issue	Critical Concern	Not an Issue	Not an Issue	Not an Issue	Critical Concern	Nat an Issue	Not an Issue	Low Priority	Not an Issue	Not an Issue	Not an Issue
Pass and implement pet waste control programs	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern
Increase Public Awareness and Involvement													
Implement watershed-wide Public Involvement/ Public Education programs	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern
Develop public official outreach efforts	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern	Priority Concern

Targeted Action Needs Within the Subbasins of the Rocky River Watershed

Action Plan Priority Water Quality Action	Mainstem	Abram Creek	East Branch	Baldwin Creek	Royalton "A"	Healey Creek	West Branch	Plum (Olmsted)	Baker Creek	Mallet Creek	North Branch	Granger Ditch	Plum (Brunswick)
Restore disturbed riparian areas		0.5 miles	2.0 mile	1.0 mile			4.0 mile	0.5 miles		1.0 mile			1.0 mile
Control storm water runoff from new development			Critical Concern		Critical Concern	Critical Concern	Critical Concern						Critical Concern
Reduce failing home sewage treatment system		200 Systems	640 Systems	110 Systems			600 Systems	73 Systems					
Implement waste management systems at horse farms			40 Operations				20 Operations			6 Operations			
Action Plan Supplemental Water Quality Action	**Mainstem**	**Abram Creek**	**East Branch**	**Baldwin Creek**	**Royalton "A"**	**Healey Creek**	**West Branch**	**Plum (Olmsted)**	**Baker Creek**	**Mallet Creek**	**North Branch**	**Granger Ditch**	**Plum (Brunswick)**
Long-term Reduction in Impervious Area	From 39% to 15%	From 45% to 15%		From 27% to 15%									
Annual Load Reductions from Land Based Nitrogen Control (pounds/year)	18,547	15,546	71,258	9,453	N/A	N/A	195,834 plus 48,224 from the South Branch	53,235	N/A	60,486	18,733	34,682	21,165

Section IV: Rocky River Watershed Action Plan
The Education, Marketing, and Evaluation Plan of the Rocky River Watershed Action Plan

Implementation of a Watershed-Wide Public Involvement/Public Education (PIPE) Effort

Within the Rocky River Watershed there are numerous educational opportunities already in place. What is needed is a mechanism to coordinate these opportunities so as to focus on watershed protection and stewardship. Existing educational opportunities include the following:

- All four counties and the 16 cities or villages in the watershed are Phase II Storm Water communities that are required to develop public involvement and public education (PIPE) programs related to storm water management and watershed protection.
- The Soil and Water Conservation Districts in the watershed have existing educational programs related to water resource management and protection.
- The county health departments in the watershed operate public education programs related to HSTS management, instream bacteria monitoring, and other environmental issues applicable to the watershed.
- The Cleveland Metroparks, Lorain Metroparks, and Medina Metroparks all conduct public involvement and education activities at the parks that they manage in the watershed.
- NASA conducts a variety of educational programs on topical issues related to the environment.
- The Firelands Land Conservancy, the Medina Summit Land Conservancy, the Isaac Walton League and numerous other groups sponsor land protection outreach programs.
- The NEO-PIPE Committee provides regional assistance to all communities or groups interested in promoting storm water management programming.
- The Boy Scouts and the Girl Scouts, 4-H Programs, and other groups encourage troop members to be involved in environmental education and involvement activities.
- Baldwin Wallace College and Cuyahoga Community College are both located in the Rocky River watershed and provide their students with opportunities to take part in the examination of watershed conditions; involved students also provide a resource for helping educate other watershed stakeholders.
- K-12 school groups including science classes and environmental clubs are actively involving students in learning experiences throughout the watershed.

- Citizen driven efforts, such as the Coe Lake Initiative, are actively involving watershed residents in programming designed to improve the Rocky River.

The Phase II Storm Water Communities are responsible for developing PIPE programs as a means of encouraging the public to become more involved in storm water management. The NOACA Regional Storm Water Task Force recommended that communities pool their PIPE efforts to make them more efficient and to generate a common message. The Task Force further recommended that a watershed approach be adopted as the vehicle for implementing the storm water PIPE effort. These recommendations are beginning to be implemented. The Medina County Commissioners have opted to use the Medina County Soil and Water Conservation District (SWCD) as the PIPE coordinator for the Medina County portion of the watershed. The Summit SWCD has been selected by the regulated communities in Summit County to perform the same function. The Cuyahoga County SWCD has arrangements to provide PIPE coordination for about one-half of the communities in the Cuyahoga County portion of the Rocky River Watershed and continues to recruit additional community participation. The Lorain Department of Community Development is working towards providing a similar service for Lorain County communities. All four county agencies participate on the NEO PIPE Committee that was established to coordinate Phase II PIPE activities across Northeast Ohio. The Rocky River Watershed Council will work to broaden the participation of Phase II communities in watershed PIPE planning and to insure that the Rocky River Watershed efforts continue to be coordinated with the NEO PIPE Committee.

An immediate need that has been identified is to initiate a riparian protection education program. The loss of riparian areas to advancing development in the watershed has been identified as a serious threat to the future water quality in the watershed. In addition, all Phase II communities in the watershed must take action to preserve and protect existing sensitive areas including riparian areas. A riparian education initiative will assist the public officials in the watershed as they review, pass, and implement riparian setback ordinances in their communities in accordance with their Phase II Storm Water Management Plans. This is important as a means to help landowners understand and accept the concept of removing themselves from the dangers of developing in the riparian zone while also protecting that area for the good of the water resources of the Rocky River. The Rocky River Watershed Council will request the assistance of watershed partners in the development of such an educational program.

Home sewage treatment systems (HSTSs) have been identified as a significant source of bacteria and nutrients in the Rocky River watershed. The Health Departments in Cuyahoga, Lorain, and Medina, the three counties where HSTSs have the most pronounced effects in the watershed, are already cooperating with one another in HSTS outreach efforts. The 319 Implementation Grant from Ohio EPA assists this cooperation. The Rocky River Watershed Council will work to support homeowner participation in HSTS maintenance training and in accepting system replacement when such becomes necessary. The Council will include HSTS information as a regular feature on its

website, in any newsletters produced, in informational displays at public events in which it participates, and in other ways as is found useful.

One of the objectives of the Rocky River Watershed Action Plan is to reduce bacteria loadings from improperly handled wastes associated with farm animals and pets. The Watershed Council will join other ongoing efforts to educate pet owners of the need to properly dispose of their pets' wastes. The educational outreach will emphasize the need to clean up after pets in ones yard, in ones neighborhood, and particularly in streamside parks.

Farm animal waste management from large livestock operations is already well managed in the watershed. The Rocky River Watershed Council needs to concentrate on owners of small numbers of farm animals. A particular emphasis needs to be given to the owners of one or more recreational horses. The Natural Resources Conservation Service is prepared to provide training to such owners. The Council will promote attendance of watershed animal owners at training programs that are presented in the area.

Stream cleanup events provide a popular opportunity for watershed stakeholders to get involved with helping to maintain the Rocky River. The Rocky River Watershed Council has incorporated educational elements into the cleanups that it has sponsored in the past. The Council will continue to support the efforts of stakeholder groups to organize future cleanups and will provide educational materials/speakers as appropriate.

The Rocky River Watershed Action Plan has established the key elements that need to be emphasized in the effort to protect or improve the quality of the water resources of the Rocky River. The Watershed Council has created an educational agenda for its own programming. Stakeholder groups that are involved in educational programming of their own within the watershed, particularly those identified above, need to be recruited to participate with the Watershed Council to present a unified message to watershed residents. Possible coordination mechanisms include, individually or in combination, the following:

- An annual Rocky River Watershed Educational Congress held to showcase successful educational activities and to share opportunities for collaborative work in the future.
- The formation of a Rocky River Watershed Educational Forum that communicates with educational resources via regularly scheduled meetings, website exchanges, and/or newsletters.
- The sharing of newsletter articles about the Rocky River and activities to improve it.
- An exchange of speakers, programming, and publicity in order to maximize the opportunity of watershed residents to take part in any given activity while minimizing the workload of generating activities.

Development of a Public Official Outreach Effort

The Rocky River Watershed Action Plan has established an objective to develop a communication tool that can be used to regularly update local officials about watershed issues. The Watershed Council will initiate this effort through two actions. First, it will broaden its contact list to insure that all appropriate locally elected and appointed officials receive all communications regarding events and programming sponsored by the Watershed Council. Second, the Watershed Council will charge its Public Education Work Group to develop a Rocky River Local Officials Day Program that can efficiently and effectively inform local officials of their role in promoting the protection of the Rocky River. One outcome of this event will be the development of a strategy to maintain contact with local officials in a way that they find most useful.

Marketing of the Rocky River Watershed Action Plan

The Rocky River Watershed Council relies on several mechanisms to involve stakeholders in the effort to preserve and protect the Rocky River. New approaches are being developed to broaden stakeholder involvement. While stakeholders that are involved with the Action Plan are an important resource for recruiting more participants, the Watershed Council also uses other measures as well. The following discussion highlights the various marketing measures of the Council.

The Rocky River Watershed Council Meetings: The Rocky River Watershed Council meets quarterly at locations throughout the watershed. The Annual Meeting is held in January and is the forum for electing the Chairperson and Board of Directors. Each meeting of the Council has an agenda that allows for a review of the status of the Action Plan, informs the stakeholders of upcoming events, provides notice of on-going planning activities, and presents an educational element. The Council will regularly recruit speakers on topics of interest and importance to stakeholders to share their experiences with meeting attendees. Every meeting provides all stakeholders with the opportunity to ask questions of the Council and to make comments regarding happenings in the watershed. The meetings are open to all stakeholders in the watershed and are advertised through website postings, e-mail notifications, mailings to those individuals who do not have Internet access, and notices in a variety of stakeholder and newspaper publications.

Annual Rocky River Watershed Day: The Rocky River Watershed Day provides an opportunity for all stakeholder groups to sponsor or participate in a variety of events held throughout the watershed. There typically is a late afternoon or early evening rap-up event open to all participants as a means of sharing experiences and impressions. Events in the past have included stream cleanups, vegetative plantings, nature walks, park tours, volunteer monitoring demonstrations, and the like. The park systems are always active partners in River Day events and provide a sizable client base from which to draw participants. River Day events tend to draw hundreds of people to activities that broaden their knowledge while providing an opportunity to get personally involved with helping the River.

The Rocky River Watershed Council Website: NOACA was the host to the Council website during the plan development process. The Cuyahoga Soil and Water Conservation District now maintains the site with input from stakeholders. (The website address is: www.myrockyriver.org.) The website address is displayed on printed materials produced by the Council and is provided as a link on many stakeholder websites.

The Rocky River Watershed Interactive Virtual Tour: An effort is underway to develop a Virtual Tour of the Rocky River Watershed. This tour can be taken either through access from the Council's website or through a computer CD that is being prepared. The idea behind the virtual tour is to acquaint interested parties to the resources and sights of the Rocky River while informing them of the issues affecting its water quality. It is designed to promote the Watershed Action Plan in a medium that is user friendly and interesting. The tour will introduce stakeholders to the ways that they can get involved and provide them with contacts to help them make it happen.

The Rocky River PowerPoint Presentation: A PowerPoint presentation is being prepared that will allow any individual to tailor a presentation on the Rocky River Watershed Action Plan to small groups. The PowerPoint presentation will be converted into a slide show so that persons or groups that do not have access to PowerPoint compatible equipment can use it. There are scores of small groups that could act to help improve or protect the River, but there are not enough people that are fully conversant on the major aspects of the Action Plan to meet with all of the groups that need to be reached. By preparing a presentation that covers the major elements of the Plan in a prepackaged format, each interested group can experience the importance of the River and the ways that they can get involved in taking care of it. Individual group members that have a need for more information will be directed to the Council's website and to a list of contacts that can further help them.

Rocky River Watershed Brochure: The Council is preparing a watershed brochure that helps to inform readers about what the Rocky River watershed is and what are the problems that it faces. The brochure will visually orient readers to the stream and its tributaries and identify needed actions in each subwatershed. The key elements of the Rocky River Watershed Action Plan will be presented. The brochure will be available to be used as a handout to reach audiences that are not reached by other educational venues.

Funding Strategy

The Rocky River Watershed Council is a stakeholder driven process. Many agencies and individuals have an interest in working to preserve and protect the watershed. The Rocky River Watershed Action Plan provides a mechanism to coordinate the productive activities that are already underway in the watershed and to enhance future activities through cooperative programming and funding. Funding of watershed activities will come from the following sources.

Stakeholder Participation: Stakeholders already involved on the Rocky River Watershed Council provide substantial support for implementing the Watershed Action Plan. Local communities, environmental agencies, watershed businesses, and involved residents are the primary resource available to protect the river. Stakeholders provide volunteer time, meeting locations and support, monetary donations and supplies, and other resources as needed. Enlightened landowners exercise good stewardship in their daily lives to the betterment of the watershed. Much of the work that is to be accomplished in the Rocky River Watershed will directly result from continued stakeholder participation. Stakeholders also offer a resource to assist in the development of programming by other stakeholder groups and the preparation of grant applications to further that work.

Section 319 Implementation Grants: Currently the Watershed Council is managing a Section 319 Implementation Grant provided through the Ohio EPA. This grant provides support for Watershed Council initiatives through 2006. The grant is partially supporting the education and marketing activities discussed above. It is also proving cost-share funds to help demonstrate the use of home sewage treatment systems that utilize new technology to treat septic wastes on-site. The current grant is helping local land conservancies protect targeted lands through the use of conservation easements.

The Rocky River Watershed Council will be eligible to apply for future Section 319 Implementation Grants once Ohio EPA endorses the Watershed's Action Plan. Numerous activities have been identified in the Action Plan that would benefit from the assistance provided by this grant program. Permanent protection of critical areas through outright purchase or through the granting of conservation easements is one activity. Funding support is needed for bioremediation projects along impacted stream channels, the replanting of disturbed streamside vegetation, and the planting of grass filter strips along agricultural fields. Low-income homeowners that have failing home sewage treatment systems can benefit from assistance available through the Implementation Grant Program. Continuing education needs can also be assisted.

Public and Private Grants and Donations: While the Watershed Council will pursue grant opportunities as they arise, the primary way that grants will be secured to further activities that protect the Rocky River will be through applications developed by individual stakeholders in the watershed. The Action Plan identifies a series of activities that need to be implemented to achieve this end. Stakeholders are encouraged to apply for any of the numerous grants that are available to assist in this work. The Watershed Council will help stakeholders target their activities to areas most in need and will support applications that meet identified needs. The Council will also help to identify partners that can assist in carrying out the projects that secure funding.

Many entities are willing to support watershed protection efforts. Local businesses often look for ways to help. This help can come in the form of donations of refreshments for watershed activities, for equipment needed at clean-up or planting events, and a variety of other forms. The Watershed Council is well situated to facilitate the linking of corporate

sponsors with action group needs. The Council is capable of accepting donations and allocating them to meet priority needs.

Evaluating the Progress of the Rocky River Watershed Action Plan

The following tables were constructed from information contained in the Rocky River Watershed Strategic Action Plan. These tables contain a summary of how the success of the Watershed Action Plan will be evaluated. The ultimate success of the Action Plan will be the restoration of impaired stretches of the Rocky River and the continued maintenances of high water quality in those segments currently attaining their designated uses. Demonstration of use attainment is a time-intensive undertaking that will take years to document. However, the implementation of actions that are expected to help reach and maintain full use attainment can be evaluated as they are implemented. The tools to be used by the Rocky River Watershed Council to evaluate the progress towards achieving each of the goals and objectives of the Action Plan are identified below:

The Watershed Council will track progress made through the preparation of an Annual Watershed Report. The Board of Directors of the Watershed Council will oversee the preparation of this report. Individual stakeholders will be the entities that need to report on the progress that they or their organization has made during the course of the year. The Annual Report will do more than highlight successes accomplished. It will identify where new approaches are needed and recommend ways to implement those approaches. The report will also establish priorities for the coming year. The Board of Directors will also be responsible for reporting on the resource needs to implement the Action Plan in the coming year and to identify plans to meet those needs.

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams.				
Task 1) Increase area of riparian corridors that are permanently protected.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Local land trusts and other land conservation organizations solicit conservation easements from property owners along watershed streams.	• Medina Summit Land Conservancy • Firelands Land Conservancy • Cleveland Metroparks • Cuyahoga SWCD	Number of acres protected by new conservation easements in the watershed including an estimate of the number of riparian and wetland acres protected.	Annual Stakeholder Reports to the Rocky River Watershed Council.	Goal is to protect an additional 100 acres of riparian corridor by December 2009.
City and county park districts purchase land along five additional miles of streams in the Rocky River Watershed.	• Metropark Agencies serving Cuyahoga, Lorain, Medina, and Summit Counties. • Watershed cities, villages, and townships.	Miles of streams purchased or donated to local parks.	Annual Stakeholder Reports to the Rocky River Watershed Council.	January 2005 to December 2009 pending receipt of $10,000,000 of funding assistance from the Clean Ohio Program.
Task 2) Protect existing vegetated riparian corridors.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Communities pass township regulations or municipal ordinances that meet the setback requirements specified in the Regional Storm Water Task Force's model ordinance.	All 32 Watershed communities. Ohio EPA	Number of resolutions and ordinances passed. Maintenance of QHEI scores measured as part of Ohio EPA's monitoring strategy.	Annual Stakeholder Reports to the Rocky River Watershed Council. Publication of Ohio EPA's Technical Support Document for the Rocky River.	Implementation of ordinances by all watershed communities by December 2005. The next survey of the Rocky River is scheduled for 2007.

Goal #1: Protect and restore the riparian corridor along the Rocky River, its tributaries, and headwater streams.				
Task 3) Restore riparian corridors in targeted areas.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Sponsor 'willow post' type projects at five highly eroded sites representing an estimated 500 feet of stream	Rocky River Watershed Council working with volunteers.	Number of projects completed and number of feet of stream channel treated. Increase in QHEI scores along impacted stream reaches as part of the State's five year monitoring cycle.	Rocky River Watershed Council Annual Report Publication of Ohio EPA's Technical Support Document for the Rocky River.	January 2005 to December 2009. The next survey of the Rocky River is scheduled for 2007.
Install grass filter strips on 100 acres of agriculture or other disturbed areas.	Landowners working with watershed SWCD's.	Number of acres treated with grass filter strips.	Annual Stakeholder Reports to the Rocky River Watershed Council.	January 2005 to December 2009 pending receipt of $100,000 of funding assistance from the 319 Implementation Grant Program.
Replant 1000 feet of stream channels with woody vegetation.	Rocky River Watershed Council working with volunteers.	Number of channel feet revegetated.	Rocky River Watershed Council Annual Report	January 2005 to December 2009.
Task 4) Protect the aquatic habitat in the Rocky River Watershed by managing increased storm water runoff rates and quantities from new development.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Communities pass the Regional Storm Water Task Force's Model Storm Water Ordinance to reduce the impacts of runoff from new development on stream channel stability.	All 32 Watershed communities. Ohio EPA	Number of resolutions and ordinances passed. Maintenance of QHEI scores measured as part of Ohio EPA's monitoring strategy.	Annual Stakeholder Reports to the Rocky River Watershed Council. Publication of Ohio EPA's Technical Support Document for the Rocky River.	Implementation of ordinances by all watershed communities by December 2005. The next survey of the Rocky River is scheduled for 2007.

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets.				
Task 1) Reduce home sewage treatment system pollutants reaching the Rocky River.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Initiate an expanded homeowner education program emphasizing the proper care and maintenance of HSTSs.	County Health Departments in the watershed.	Distribution of 1,000 pamphlets to HSTS owners in the watershed. Fecal coliform/ E. coli levels throughout the watershed after 2 years of education efforts.	Annual Stakeholder Reports to the Rocky River Watershed Council. Watershed Health Departments working in concert with Ohio EPA.	Distribute pamphlets by December 2005. December 2007.
Initiate a cost-share program to replace 50 failing HSTSs with on-lot discharging systems in targeted areas of the East and West Branches.	County Health Departments in the watershed working with homeowners.	Installation of 50 on-lot HSTSs in critical areas of the watershed. Fecal coliform/ E. coli in critical areas 1 year after implementing 50 system replacements.	Annual Stakeholder Reports to the Rocky River Watershed Council. Watershed Health Departments working in concert with Ohio EPA.	January 2005 to December 2006. December 2007.
Qualify owners of failing HSTSs for low interest loans available through DEFA to repair or replace on-site treatment systems.	County Health Departments in the watershed.	Each of the four county health departments receives Ohio EPA's endorsement of their HSTS management plan.	Annual Stakeholder Reports to the Rocky River Watershed Council.	December 2004
Encourage the acceleration of sanitary sewer line extensions to provide for the elimination of failing HSTSs.	Sewer Planning agencies in the watershed.	Completion of planning and eventual construction of up to six sewer line extension projects.	Annual Stakeholder Reports to the Rocky River Watershed Council.	December 2006

Goal #2: Reduce instream bacterial levels to meet state water quality standards and nitrogen loadings to meet TMDL reduction targets.				
Task 2) Reduce animal waste related pollutants reaching the Rocky River.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Produce and distribute 50 information packets to assist recreational horse owners manage animal waste runoff in critical areas of the watershed.	The Cuyahoga, and Medina Soil and Water Conservation Districts.	Distribution of 50 information packets to horse owners in the watershed.	Annual Stakeholder Reports to the Rocky River Watershed Council.	December 2005
Using EQIP cost-share funds, implement animal waste management programs to control recreational horse waste runoff at six sites in critical areas in the watershed.	The Cuyahoga, and Medina Soil and Water Conservation Districts.	Installation of six horse waste control projects in critical areas of the watershed.	Annual Stakeholder Reports to the Rocky River Watershed Council.	December 2005
Implement and enforce pet waste management programs in all 32 communities in the Rocky River Watershed.	All 32 Watershed communities.	Community efforts to pass and implement ordinances.	Annual Stakeholder Reports to the Rocky River Watershed Council.	December 2005

Goal #3: Increase public awareness and involvement in stewardship of the Rocky River.				
Task 1) Implement a watershed-wide Public Involvement/Public Education (PIPE) effort.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Encourage Phase II Storm Water Communities to participate in a watershed PIPE effort.	Phase II Communities in the watershed.	Number of communities that participate.	Rocky River Watershed Council Annual Report.	December 2004
Initiate a riparian protection education program.	Rocky River Watershed Council working with volunteers.	Number of landowner contacts made.	Rocky River Watershed Council Annual Report.	December 2005
Act as a distributor/supporter of health department outreach efforts on the management of HSTSs.	Rocky River Watershed Council working with volunteers.	Number of homeowner contacts made.	Rocky River Watershed Council Annual Report.	Initial outreach by December 2004; continued outreach to be on going.
Sponsor and coordinate annual stream clean-ups.	Rocky River Watershed Council working with volunteers.	Number of clean-ups held. Number of participants. Estimates of volume of trash collected.	Rocky River Watershed Council Annual Report.	May 2004 and then on going.
Initiate an educational outreach effort for owners of farm animals and pet owners.	Rocky River Watershed Council working with volunteers.	Number of animal owner contacts made.	Rocky River Watershed Council Annual Report.	December 2005

Task 2) Develop a public official outreach effort.				
Evaluation Activity	**Responsible Parties**	**Evaluation Measure**	**Reporting Mechanism**	**Timeframe**
Encourage Phase II Storm Water Communities to participate in a watershed PIPE effort.	Rocky River Watershed Council working with volunteers.	Develop a communication tool to regularly update local officials about watershed issues.	Rocky River Watershed Council Annual Report.	Initiate by December 2004 and continue on an on going basis.

Attachment A

Rocky River Watershed Action Plan Support Documents

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A. Watershed Inventory of the Rocky River Watershed

B. The Water Resources of the Rocky River Watershed

C. Water Resource Threats Related to Growth in the Rocky River Watershed

D. Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

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Appendix A
Watershed Inventory of the Rocky River

Abstract

This report presents an inventory of information important to the water resources in the Rocky River Watershed of Northeast Ohio. It includes background information on a series of water quality based reports that are pertinent to the Rocky River. The report summarizes the geologic and soil conditions in the watershed. It identifies rare, threatened and endangered plant and animal species and other biological information. A review of land use conditions in the watershed and its major tributaries is also presented.

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Appendix B
The Water Resources of the Rocky River

Abstract

This report summarizes the condition of water resources in the Rocky River Watershed of northeast Ohio. It includes a discussion of climatic and precipitation, surface water including wetlands, streams and lakes, and groundwater resources. Fourteen stream segments in the watershed are discussed in detail.

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  - Baker Creek
  - Cossett Creek
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Appendix C
Water Resource Threats Related to Growth in the Rocky River Watershed

Abstract

This report evaluates population projections for the Rocky River Watershed to identify growth areas and to assess water resource threats associated with this growth.

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Appendix D
Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

Abstract

This report summarizes the causes and sources of water quality problems in the Rocky River Watershed of northeast Ohio. It includes a discussion of point and nonpoint sources. Eighteen stream segments in the watershed are evaluated.

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- Healey Creek
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- West Branch of the Rocky River from Cossett Creek to Plum Creek
- West Branch of the Rocky River above Cossett Creek
- Baker Creek
- Blodgett Creek
- Plum Creek near Olmsted Falls
- Mallet Creek
- South Branch
- North Branch of the Rocky River
- Remsen Creek including Granger Ditch
- Plum Creek near Brunswick

Appendix E
Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed

Abstract

This report identifies and locates point sources of pollution to the Rocky River. It also characterizes the location and nature of nonpoint sources of pollution in the watershed. An evaluation of the relative significance of all source types is provided on a subbasin basis.

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Appendix F
A Look at the Beneficial Use Impairments of the Rocky River

Abstract

Impairment to a beneficial use means a change in the chemical, physical, or biological integrity of the river sufficient to cause a change in any one of fourteen uses identified by the Great Lakes Water Quality Agreement. Whenever these uses are impaired, there are grounds for undertaking remedial actions to restore the stream system. Understanding what the problems are is the first step towards identifying the remedial actions needed to fix them. Towards that end, a Use Impairment Statement was generated for the Rocky River.

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The Water Quality Problem Statement for the Rocky River Watershed

Abstract

This report summarizes the water quality problems that have been documented to affect the Rocky River Watershed of Northeast Ohio. It includes a discussion of fourteen individual stream segments in the watershed.

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Water Quality Problem Statements for the Rocky River
- Rocky River Mainstem
- Abram Creek
- East Branch of the Rocky River
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- Healey Creek
- West Branch of the Rocky River
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- Baker Creek
- Cossett Creek
- Mallet Creek
- North Branch of the Rocky River
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Appendix H
Load Reduction Targets
For the Rocky River Watershed

Abstract

This report summarizes the target load reductions in the Rocky River Watershed of Northeast Ohio. It includes a discussion of load reduction targets for the six segments subject to TMDL reductions. The report also identifies needed reductions in other portions of the watershed.

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- Summary of Causes and Sources

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Appendix I
Evaluation of Solutions, Actions and Best Management Practices for Identified Water Quality Problems in the Rocky River Watershed

Abstract

This report identifies and evaluates water quality solutions, actions and best management practices (BMPs) for the Rocky River Watershed Action Plan. The proposed solutions are predicated on the work described in the previous appendices and substantive stakeholder involvement.

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Appendix J
Road Map to the
Rocky River Watershed Action Plan

Abstract

This report helps the reader to navigate through the complexities of the Rocky River Watershed Action Planning process and the reports produced as a part of it. The Road Map provides basic background information about to the Rocky River Watershed that sets the setting for the Action Plan development. The report details the types of information collected during the planning process and identifies where the reader can access this information. The report also serves to document the Action Plan planning process itself.

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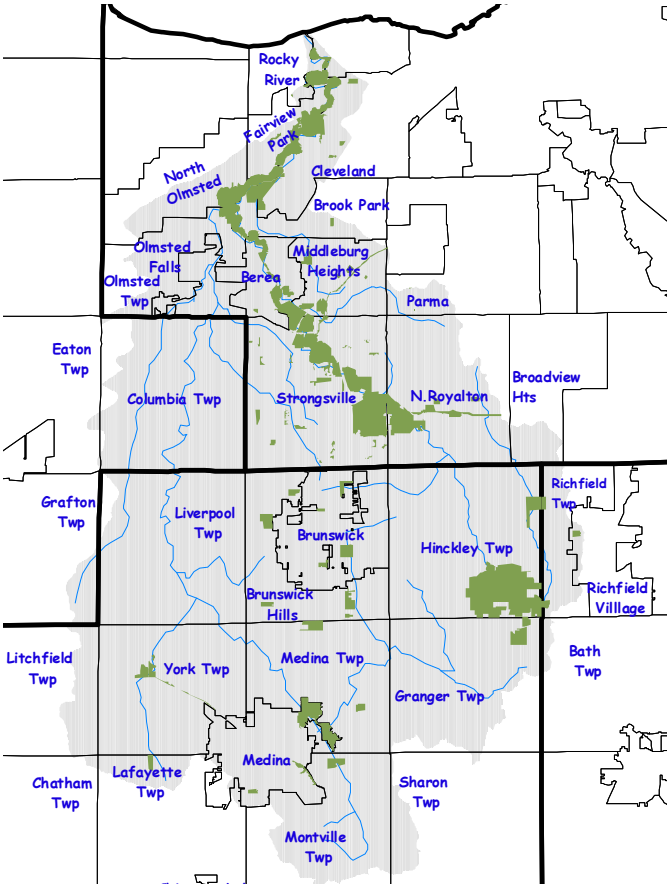
WATERSHED INVENTORY OF THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix A
July 2006



This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

Watershed Inventory of the Rocky River

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Watershed Inventory of the Rocky River

Abstract

This report presents an inventory of information important to the water resources in the Rocky River Watershed of Northeast Ohio. It includes background information on a series of water quality based reports that are pertinent to the Rocky River. The report summarizes the geologic and soil conditions in the watershed. It identifies rare, threatened and endangered plant and animal species and other biological information. A review of land use conditions in the watershed and its major tributaries is also presented. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

Data Availability for the Rocky River Watershed

There is a wealth of available data and information related to the water quality of the Rocky River. Much of this information is conveniently available on the Internet. This is important as the number and size of available reports is large. It would be time-consuming and expensive for the general public to get paper copies of all of the pertinent material. If anybody interested in the Rocky River does not have access to the Internet, it is suggested that they visit their local library where they can access the web.

The best way to start a search for information on the Rocky River is through the following link: http://www.epa.state.oh.us/dsw/watershed/. Click on the "Find Your Watershed" button. Navigate to the location of the Rocky River (Watershed 87) and click again. You are now at the gateway to a host of information. The best aspect of this watershed page is that it provides a summarized view of the data contained in Ohio EPA's "1993 Biological and Water Quality Survey of the Rocky River". The report itself is the primary source of water chemistry and biological sampling conducted by Ohio EPA on the Rocky River. It is the information contained in this report that is summarized on the watershed page by clicking on the 'use attainment statistics' and 'causes and sources of impairment' buttons. Ohio EPA has provided a link to the more recent Water Quality survey at the following website:

http://www.epa.state.oh.us/dsw/documents/97rocky.pdf.

The next useful source of information on the Rocky River is the "Total Maximum Daily Loads (TMDLs) for the Rocky River Basin" report prepared by Ohio EPA in October 2001. This report can be accessed through the following link: http://www.epa.state.oh.us/dsw/tmdl/RockyRiverTMDL.html. This report makes a series of recommendations related to the sources and causes of nonattainment in the Rocky River. It provides the backdrop for the development of the Rocky River Watershed Action Plan process. The TMDL Report also provides a description of the watershed in terms of geology, soils, relief, and climate.

The Northeast Ohio Areawide Coordinating Agency (NOACA) has worked with the Rocky River Watershed Council to prepare a "State of the Rocky River 2000" report. This report assembled the findings of all of the above referenced works into a user-friendly view of the Rocky River's resources, water quality problems, and remediation needs. This report is available for viewing and downloading on the NOACA website. The address is: http://www.myrockyriver.org/.

USEPA has watershed information available on their website. The link is: http://cfpub.epa.gov/surf/huc.cfm?huc_code=04110001. This link provides the opportunity for the user to visit the Envirofacts Warehouse to retrieve environmental information from EPA databases on Air, Community Water Sources, Water Dischargers, Toxic Releases, Hazardous Waste, and Superfund Sites. Geographic searches include zip code, city, EPA Region, or county.

NOACA has created a computer map base for the Rocky River. This base constitutes Geographic Information System or GIS coverage for the watershed. The files in the database are in an ESRI Shape File format. NOACA is working to make these files available for

downloading off their website. Files are available for watershed and subbasin divides, political boundaries, roads, streams, lakes, wetlands, land cover, and more. All of the files contained in the Rocky River database are compatible with the information contained in the MAGIC 2001 CD-collection distributed by NOACA and its partner agencies. Information on the MAGIC 2001 collection is available on the NOACA website (www.noaca.org.)

The Rocky River Watershed Action Plan: Appendix B: The Water Resources of the Rocky River provides information on the hydrology of the watershed. This information includes a discussion of the climate/precipitation affecting the watershed. It also includes a description of the streams, lakes and wetlands of the Rocky River. Channel conditions, floodplain locations, and a water quality use attainment assessment summary are also provided. A review of groundwater availability and pollution potential maps is presented.

Geology and Soils Information

The geology of the Rocky River Watershed and the soils that have been developed there materially affect the waterways of the Rocky River. The bedrock underlying the watershed consists of layered sedimentary rocks that represent former sands, silts, and mud deposited 300 million years ago or more in shallow marine bays, or in deltas, river beds, flood plains, swamps, and similar environments. After deposition and burial, these sediments became rock layers ranging in thickness of up to several feet each. The formations that are comprised of these individual layers were formed during the Devonian, Mississippian, and Pennsylvanian Periods. The major thickness of the rock units in the Rocky River Watershed is composed of shale and siltstone layers. Two formations are composed of coarse material. These are the Berea Sandstone and the Sharon Conglomerate. The key formations found in the watershed include the following (listed from oldest to youngest):

- The Chagrin Formation-a soft, blue-gray shale interspersed with a few thin siltstone layers. This formation is approximately 100 feet thick in the Rocky River.
- The Ohio Shale-a black shale formation, about 500 feet thick, that consists of two members: the Huron Shale below and the Cleveland Shale above. Only the Cleveland Shale is exposed in the Rocky River along its lower reaches.
- The Bedford Formation-a 100 foot thick sequence of blue-gray shale and siltstone layers.
- The Berea Sandstone-a hard sandstone of varying thickness that averages about 50 feet in thickness in the Rocky River.
- The Cuyahoga Formation-a highly variable formation that consists largely of interbedded gray shale and siltstone layers in the Rocky River. The Strongsville member is prominent in the watershed.
- Pottsville Formation-a formation dominated by the Sharon Conglomerate that caps the highest elevations in the watershed.

Much more recently, the watershed underwent another significant event in its geologic history. This was the advent of the glacial period. The repeated advances and retreats of four glacial episodes resulted in the wearing down of the pre-glacial landscape and the deposition of great thicknesses of surficial deposits across the region. These deposits consist of unconsolidated clay, sand, and gravel that range in depth from a few feet on the higher elevations of the watershed to more than 100 feet in pre-glacial valleys that are now completely buried.

The northern and westernmost portions of the watershed lie in the Lake Erie Plain Physiographic Province, while the remainder of the watershed is in the Appalachian Plateau Province. The Lake Plain area is relatively flat and underlain by massive shale bedrock. Rolling topography underlain by alternating shale and sandstone units marks the Plateau portion. As mentioned previously, the entire watershed has been glaciated with pre-glacial valleys having been filled in with glacial deposits. High clay content soils are the dominant feature throughout the watershed. Storm water runoff and soil erosion are highly affected by these factors in the watershed.

The major soil associations in the watershed include:

- Soils that formed in Glacial Till on Uplands
    1. Urban land-Mahoning Association: urban land and undulating, somewhat poorly drained soils that formed in silty and loamy glacial till; found on uplands and the higher parts of the lake plain.
    2. Mahoning-Ellsworth: nearly level to very steep, somewhat poorly drained and moderately well drained soils that formed in silty and loamy glacial till: found on the uplands and higher areas of the lake plain.
    3. Wadsworth-Rittman: nearly level to sloping, somewhat poorly drained and moderately well drained soils that formed in silty and loamy glacial tills; found on uplands.
    4. Canfield-Wooster-Ravenna: nearly level to moderately steep, moderately well drained, well drained, and somewhat poorly drained soils that formed in loam glacial till and that have a restrictive subsoil layer (fragipan).
    5. Bennington-Cardington: nearly level to gently sloping, somewhat poorly drained and moderately well drained soils that formed in silty clay loam or clay loam glacial till.
- Soils that formed Lacustrine, Alluvial, or Glacial Outwash Deposits on Terraces, Floodplains and in Glacial Outwash Areas
    1. Haskins-Caneadea-Lobdell: nearly level to gently rolling, somewhat poorly drained and moderately well drained soils that formed in loamy materials overlying clayey glacial lake-deposited sediment or in clayey sediment and stream-deposited sediment; found on terraces and floodplains.
    2. Fitchville-Chili-Bogart: nearly level to sloping, somewhat poorly drained to well drained soils that formed in silty glacial lake-deposited sediment or in loamy material overlying sand and gravel; found mainly on terraces.
    3. Carlisle-Luray-Lorain: nearly level, very poorly drained organic soils and soils on glacial lakebeds; these soils formed in thick layers of partly decomposed plants or in silty and clayey glacial lake-deposited sediment.
    4. Urban land-Mitiwanga: urban land and moderately deep, nearly level and gently sloping, somewhat poorly drained soils that formed in loamy glacial till; found on uplands and lake plains.
    5. Brecksville-Hornell: moderately deep, gently sloping to steep, well drained and somewhat poorly drained soils that formed in silty and clayey glacial till and residuum from shale; found on uplands.

6. Allis-Urban land: urban land and moderately deep, nearly level, poorly drained soils that formed in silty and clayey glacial till derived mainly from shale; found on lake plains
7. Oshtemo-Urban land-Chili: urban land and nearly level to very steep, well drained soils that formed in stratified, loamy and sandy glacial outwash; found on terraces and beach ridges.

- Deep soils that formed on floodplains and low stream terraces
    1. Chagrin-Tioga-Euclid: nearly level, well drained and somewhat poorly drained soils that formed in loamy and sandy alluvium and in silty and loamy deposits; found on floodplains and low stream terraces.

More than 90% of the watershed is covered by Hydrologic Soil Types that are classified as 'C' and 'D' soils. These are the soils that have the slowest infiltration rates and the highest runoff potential. This would seem to limit the effects of increasing impervious areas as the streams of the watershed are already sized to transport large storm flows. However, these stream channels are in a fragile state of balance in that they are capable of supporting warm water aquatic habitats but have only a limited ability to accept change without degradation.

The soils in the rolling hills area of the Appalachian Plateau are susceptible to high rates of erosion when disturbed. This most commonly occurs when the landscape is developed. Diligent soil erosion and sediment control is particularly important in these areas.

As much as 95% of the area in the watershed is underlain with soils that have severe limitations for septic systems. Therefore, alternative HSTS designs are regularly used in the watershed. Local health departments already use county soil maps to insure that appropriate system designs are used on individual lots. Soil unsuitability is so widespread that it dictates the types of systems that are approved by local health departments.

Animal waste facilities are needed in the proximity of animal operations. The limitations of whatever soil they are to be located on will have to be addressed in the design of each specific facility. The more limited the soil, the more expensive the solution. The local SWCD should be consulted for soils information to help select the best possible location for siting these facilities.

Soils information is an underutilized resource in the watershed. While local Soil and Water Conservation Districts and Health Departments regularly make use of soils information, many other entities would benefit if they were to use this resource more often. Damp basements, wet spots in yards, and cracking concrete are a few of the results of not using available soils information as a guide during development. High mortality rates or poor growth performance of plantings, whether for ornamentation or for erosion control, are often associated with selection of the wrong plant communities for the soil in which they are planted. Pond performance can be greatly compromised if the pond is located on a highly permeable soil. Storm water management practices that rely on infiltration of rainfall into the soil need to be sited on soils that are suited for that purpose. Soils information is easily accessed either through the Internet or from county Soil and Water Conservation Districts. All stakeholders in the Rocky River Watershed are encouraged to make better use of this important resource when planning or constructing anything on the land.

More information on the Geology and Soils in the Rocky River Watershed can be found in the following resources:

GUIDE TO THE GEOLOGY OF NORTHEASTERN OHIO (1970), by P. O. Banks and Rodney M. Feldman. Northern Ohio Geological Society.

This report is the definitive description of the glacial deposits and bedrock units underlying all of Northeast Ohio including the Rocky River Watershed. The book is out of print but can be found at the main libraries in the watershed.

SOIL SURVEY OF CUYAHOGA COUNTY (1980).
SOIL SURVEY OF LORAIN COUNTY (1976).
SOIL SURVEY OF MEDINA COUNTY (1986).
SOIL SURVEY OF SUMMIT COUNTY (1990). United States Department of Agriculture, Soil Conservation Service (now Natural Resource Conservation Service) in cooperation with the Ohio Department of Natural Resources, Division of Lands and Soils and the Ohio Agricultural Research and Development Center. These reports contain descriptions of the soils covering the watershed and a series of tables that rate the soils suitability for a large assortment of uses. Soil maps superimposed on aerial photographs are also included. Digital soils information is available for download at the following website: http://soildatamart.nrcs.usda.gov/

The MAGIC 2001 CD Information Collection has computer map files for the soils of the watershed. It also contains groundwater availability maps and groundwater pollution potential maps.

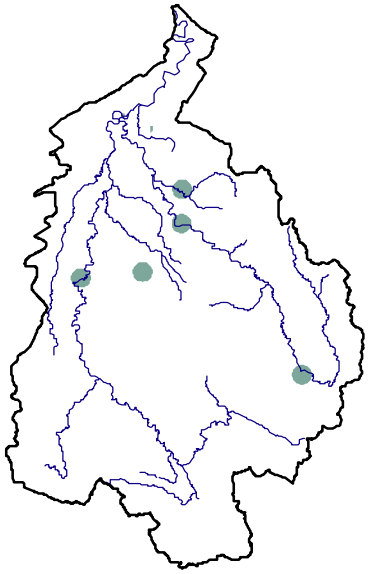
Biological Features

Rare, Threatened, and Endangered Species: The Ohio Department of Natural Resources' Division of Natural Areas and Preserves maintains the Natural Heritage Database for Ohio. This database contains information on the location of rare, threatened and endangered plant and animal populations, as well as the location of natural areas. NOACA arranged for the Division to extract all information relative to the Rocky River Watershed. This information was supplied in the form of ArcView shapefiles. NOACA integrated these files into the Rocky River database and extracted the pertinent information regarding the plant and animal communities of the Rocky River. The following table identifies the sensitive species that have been documented to reside in the watershed. The attached maps indicate the generalized locations where these species occur.

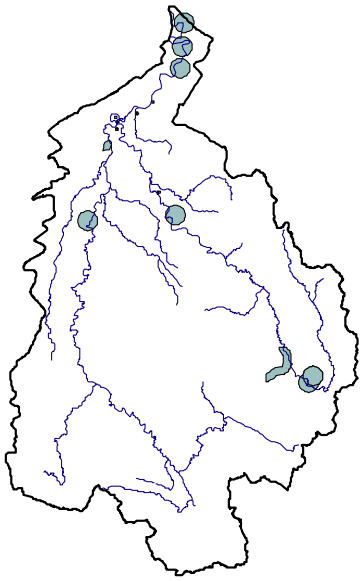
Sensitive Plant and Animal Species in the Rocky River Watershed		
TYPE	COMMON NAME	STATUS
FISH	BIGMOUTH SHINER	THREATENED
	MUSKELLUNGE	SPECIES OF CONCERN
MUSSELS	NONE LISTED	

INVERTEBRATES	NONE LISTED	
MAMMALS	NONE LISTED	
BIRDS	BEWICK'S WREN	ENDANGERED
	MAGNOLIA WARBLER	SPECIAL INTERES
	UPLAND SANDPIPER	THREATENED
	YELLOW-CROWNED NIGHT-HERON	THREATENED
REPTILES AND AMPHIBIANS	FOUR-TOED SALAMANDER	SPECIES OF CONCERN
PLANTS	BOTTOMLAND ASTER	ENDANGERED
	GROUND JUNIPER	ENDANGERED
	LOUISIANA SEDGE	ENDANGERED
	THIN-LEAVED SEDGE	ENDANGERED
	AMERICAN CHESTNUT	POTENTIALLY THREATENED
	CANADA BUFFALO-BERRY	POTENTIALLY THREATENED
	NODDING RATTLESNAKE-ROOT	POTENTIALLY THREATENED
	PALE SEDGE	POTENTIALLY THREATENED
	PIGEON GRAPE	POTENTIALLY THREATENED
	PRAIRIE FALSE INDIGO	POTENTIALLY THREATENED
	RICHARDSON'S PONDWEED	POTENTIALLY THREATENED
	ROUND-LEAVED DOGWOOD	POTENTIALLY THREATENED
	TURK'S-CAP LILY	POTENTIALLY THREATENED
	DEER'S-TONGUE ARROWHEAD	THREATENED

Sensitive Animal Locations in the Rocky River Watershed



Sensitive Plant Locations in the Rocky River Watershed



Invasive Species: Invasive plant species pose a significant threat in the Rocky River Watershed. The Ohio Department of Natural Resources list about 60 invasive plant species that are considered to be a problem in Ohio. Of these species, the ones with the most prominence in the Rocky River Watershed are garlic mustard, purple loosestrife, multiflora rose, and Japanese knotweed. All four of the Metroparks in the watershed conduct educational programming and provide volunteer removal opportunities as part of their invasive species control efforts.

Carp populations in the Rocky River are thriving. Zebra mussels are present in the lower course of the river. Dams along the mainstem control sea lamprey populations. These statements indicate that invasive aquatic animal populations are putting pressure on the watershed's system, and the ability of the river to cope with that pressure is variable. The carp populations have been dominant for such a long time that they have become accepted. There is little call for controlling their populations as a result. The zebra mussels and sea lampreys have yet to seriously affect watershed stakeholders. Therefore, this type of effort also garners a low priority in the watershed.

Wildlife Notes: The Rocky River has large, perhaps too large, populations of whitetail deer and Canada geese. These animals enthrall park goers and bedevil property owners.

Wildlife in the watershed is considered to be one of the stronger assets of the Rocky River. The river supports an active and productive fishery. Migrating waterfowl are plentiful. The diversity of small mammals is high and regular sightings are the rule. Songbird populations are very good within the confines of the large-scale pressures on these populations due to the destruction of their rainforest wintering grounds in Central and South America. Turkey vultures have a local festival named after them. Turkey populations are expanding at a near explosive rate. Blue herons abound. All of these considerations lead to a high awareness of wildlife in the watershed and a greater interest in seeing these populations preserved and protected.

Information on the wildlife and plant communities in the watershed is available from a variety of sources. A few of these resources are listed below.

Medina County Natural Resource Mapping Project Summary Report. September 2002. Prepared for the Medina County Park District by the Davey Resource Group. Data and maps have been compiled to assist with effective planning in the County. Information includes watersheds and streams of Medina County, floodplain areas, flood-prone areas, land cover, significant natural resources, historic and pre-historic resources, utility transmission corridors, and railroad corridors.

The Cleveland Metroparks has natural resource information available in internal databases that has not been published in external reports. They are willing to make this information available to interested parties if suitable arrangements can be made.

- Vegetation cover map.
- Water quality data on the Rocky River (East branch, West Branch just upstream of the confluence, and the main stem) that includes basic chemical, biological and stream morphological data. - 1982-1990.

- Salamander and wood frog surveys from the early 1990's.
- Turtle surveys. - 2001-2002
- Ongoing park wide vegetation studies using quadrant-sampling methodology throughout forested areas of the Park. (In conjunction with Cleveland State University.)
- Coyote "howl" surveys - 2001-2002.
- Aerial infrared and spot light surveys of deer densities - 1999-2003.
- Study on bird use of utility corridors during spring and fall migration in cooperation with First Energy Corporation. (Several of the study sites are in the Rocky River Watershed.) (2002 and ongoing).

Pfingsten, Ralph A., Distribution of Amphibians and Reptiles in the Rocky River Watershed. Unpublished manuscript, 1987.

White, Andrew, "Fish Collections in the Rocky River, 1970-1974." John Carroll University.

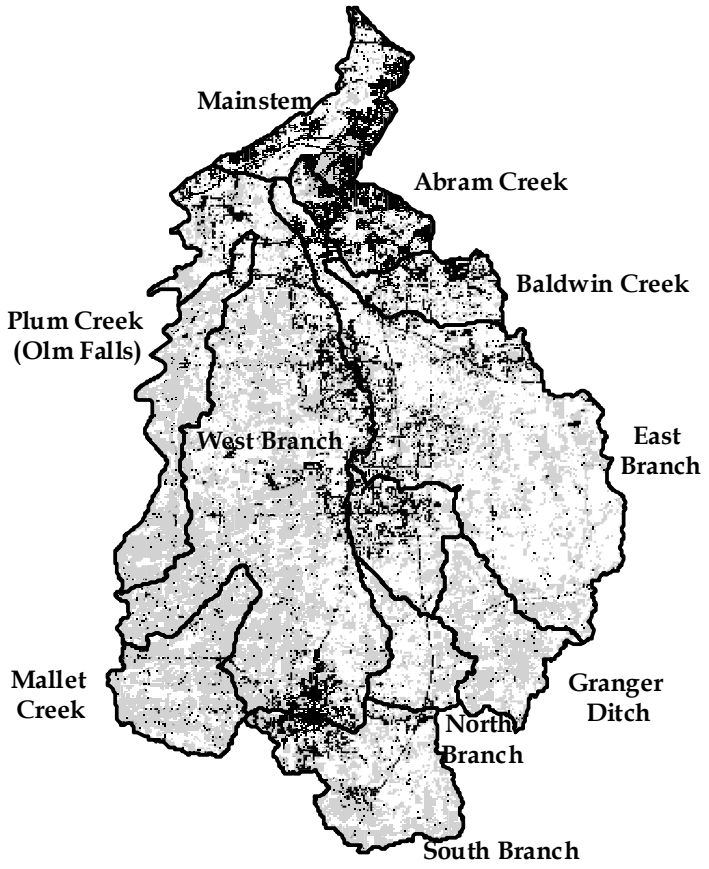
Phil Hillman, Ohio Department of Natural Resources, District #**3,** has identified that his department has done research in the Rocky River watershed. The following reports are on file at ODNR District #3 in Akron, Ohio.

- Brook trout reintroduction - 2000-2002
- Creel surveys - 1982-88, in cooperation with Cleveland Metroparks.
- Contaminant surveys - 2002, Steelhead studies.

Land Use

Land use in the Rocky River Watershed is extracted from satellite generated land cover analyses based on the most recent data from 1994. This data was complied for the watershed as a whole and for each of its main subbasins. The following tables summarize this data for both the entire watershed and for the subbasins that have been delineated by ODNR in their computerized data files

Generalized Land Use in the Rocky River Watershed



Generalized Land Use

- Agriculture/Open Urban Areas
- Urbanized
- Open Space

Rocky River Watershed	
Land Cover	**Per Cent**
Agriculture	40.45
Barren land	0.14
Non-forested Wetlands	1.12
Open Water	0.26
Shrub/scrub	1.95
Urban	13.89
Wooded	42.18

Mainstem Watershed	
Land Cover	**Per Cent**
Agriculture	15.15
Barren land	0.12
Non-forested Wetlands	1.59
Open Water	0.02
Shrub/scrub	1.33
Urban	39.45
Wooded	42.32

Abram Creek Watershed	
Land Cover	**Per Cent**
Agriculture	20.22
Barren land	0.29
Non-forested Wetlands	2.65
Open Water	0.02
Shrub/scrub	2.04
Urban	45.29
Wooded	29.49

East Branch Watershed	
Land Cover	**Per Cent**
Agriculture	28.02
Barren land	0.04
Non-forested Wetlands	1.32
Open Water	0.28
Shrub/scrub	3.98
Urban	10.78
Wooded	55.58

Baldwin Creek Watershed	
Land Cover	Per Cent
Agriculture	17.49
Barren land	0.11
Non-forested Wetlands	0.74
Open Water	0.26
Shrub/scrub	4.08
Urban	26.75
Wooded	50.55

West Branch Watershed	
Land Cover	Per Cent
Agriculture	46.59
Barren land	0.09
Non-forested Wetlands	1.04
Open Water	0.19
Shrub/scrub	1.68
Urban	12.73
Wooded	37.67

Plum Creek at Olmsted Falls	
Land Cover	Per Cent
Agriculture	63.60
Barren land	0.08
Non-forested Wetlands	1.78
Open Water	0.14
Shrub/scrub	1.64
Urban	5.22
Wooded	27.52

Mallet Creek Watershed	
Land Cover	Per Cent
Agriculture	67.82
Barren land	0.09
Non-forested Wetlands	0.37
Open Water	0.27
Shrub/scrub	0.36
Urban	4.59
Wooded	26.51

South Branch Watershed	
Land Cover	Per Cent
Agriculture	44.59
Barren land	0.90
Non-forested Wetlands	0.76
Open Water	0.89
Shrub/scrub	0.41
Urban	13.23
Wooded	39.22

North Branch Watershed	
Land Cover	Per Cent
Agriculture	39.61
Barren land	0.00
Non-forested Wetlands	1.22.
Open Water	0.63
Shrub/scrub	0.63
Urban	4.48
Wooded	53.43

Granger Ditch Watershed	
Land Cover	Per Cent
Agriculture	51.89
Barren land	0.00
Non-forested Wetlands	0.63
Open Water	0.14
Shrub/scrub	0.77
Urban	2.16
Wooded	44.41

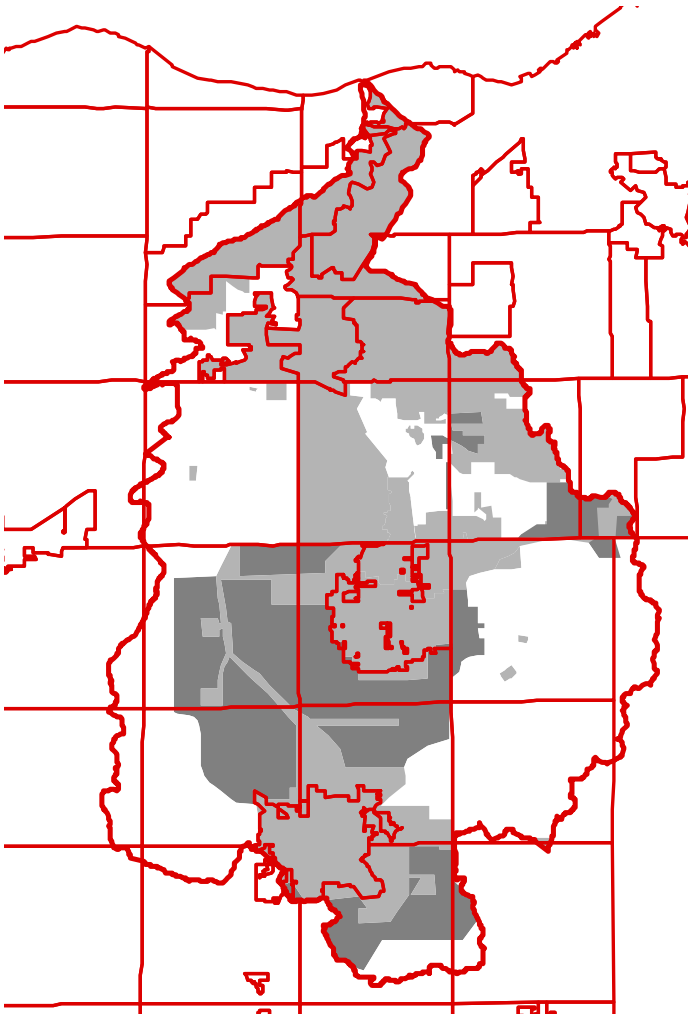
Plum Creek at Brunswick	
Land Cover	Per Cent
Agriculture	31.64
Barren land	0.00
Non-forested Wetlands	0.50
Open Water	0.12
Shrub/scrub	0.35
Urban	21.39
Wooded	46.00

Urban: The Mainstem, Abram Creek, Baldwin Creek, and the upper half of Plum Creek at Brunswick are heavily urbanized. The lower East Branch, the lower West Branch, and the Medina City portion of the South Branch have significant concentrations of urbanized areas. Since land use is defined here based on satellite images of landcover, the percent imperviousness of each subbasin is closely approximated by the percent of urban land in the watershed.

While the majority of urban lands are serviced with sanitary sewers, home sewage treatment systems remain in use in several areas. The following table summarizes the number of systems in various portions of the watershed and provides an estimate of the number of systems that have been documented to be failing. The following map identifies areas that have sanitary sewers and those that do not.

Home Sewage Treatment Systems in the Rocky River Watershed						
Subwatershed	**Total HSTS**	**Not inspected**	**Assessed**	**Failed**	**Inconclusive**	**Satisfactory**
Abram Creek	218	12	134	47	3	22
Baldwin Creek	496	34	197	196	24	45
Confluence of East and West Branch	64	1	22	24	1	16
East Branch	1683	585	485	386	39	188
Main Branch	3	3	-	-	-	-
Plum Creek at Olmsted Fall	171	81	49	15	3	23
West Branch	1421	319	721	176	3	202

Sanitary Sewer Service in the Rocky River Watershed



Sanitary Sewer Options
May Be Sewered
Sewered
To Remain Unsewered

Agriculture: The agricultural land cover category includes active cropped fields, fallow fields, pastures, and other open spaces that have only sparse vegetative cover. Vacant fields in urban areas will be classified in this category including large expanses of grass areas. Knowledge of an individual watershed is necessary to reach conclusions as to the exact nature of lands in this category. The majority of the land that is classified as agricultural in the Mainstem, Abram Creek, and Baldwin Creek is likely to be urban vacant or grassland. The upper reaches of Plum Creek at Brunswick and the lower reaches of the Plum Creek at Olmsted Falls are also likely to be dominated by urban open spaces. The same is true of the reaches of the West Branch and East Branch in Cuyahoga County.

In Cuyahoga County, field crops consist of hay for horses, corn and soybeans. The fields are mostly fall plowed (estimated 90%). The fragmentation of farm areas by urban development makes full-time farmers extinct in Cuyahoga County. All of the field crops are planted by part-time farmers or farmers coming in from out of county (mostly Lorain County).

The Rocky River watershed in Medina, Lorain, and Summit Counties still contains a substantial amount of land under cultivation or having livestock. A total of approximately 20,000 acres are devoted to agricultural production. Crop production generates 68% of the agricultural cash value and livestock production accounts for the remainder. York, Liverpool and Granger townships especially, continue to see cropland used for cash grains, primarily corn and soybeans with some wheat, as well as hay that is grown primarily for cash sales in Medina and adjacent counties. Most of this land is operated on a cash rent basis. Tillage trends are toward more conservation (mulch) tillage, but there is still conventional tillage occurring on flatter soils and on small operations. Conventional tillage represents as much as 30% of the total. Herbicide and pesticide use is typical for northern Ohio, with probable increases in "Roundup ready" crops, and is applied primarily by custom applicators. Livestock numbers (principally dairies) have declined substantially, such that only a handful remains. However, the numbers of horse stables and exotic livestock (alpacas) are increasing. There is some increase in the amount of land used for the growing of nursery stock, fruits and vegetables. Small-scale irrigation supports these higher value crops.

The Medina County Soil and Water Conservation District has recently inventoried agricultural activities in the county. A drive-by survey was completed over a period of several months in spring, 2003. The type of livestock, estimated number of animals, and address were identified for each farm. The majority of the livestock operations are situated within Liverpool, York and Granger Townships. Most of the operations are small and have limited manure storage or pasture. It was estimated that the 200 horse operations comprise 67% of the total livestock producers in the watershed. Of those, 120 horse operations (60%) have less than 4 horses, while 42 operations (21%) had greater than 10 horses. Horses make up 44% of the total animal units, most of which are for recreational use. The 68 Beef operations comprise 23% of the total livestock producers with 41 of the beef farms (60%) having at least 10 animals. The 9 dairy operations comprise 3% of the livestock producers. Every dairy operation had at least 10, but no more than 50 animals. There are 10 sheep operations comprising 3% of the livestock producers. There are 9 alpaca and 2 hog producers operations situated within the watershed.

Protected Lands: Parklands are plentiful in the Rocky River Watershed. This is one of the great attributes of the watershed. Cleveland Metroparks manages the land along much of the East Branch and almost all of the Mainstem. Lorain and Medina Metroparks are expanding their holdings. A multitude of community parks are spread out across the watershed as well. The map on the cover of this report displays the breadth of public park ownership in the Rocky River Watershed.

The Medina Summit Land Conservancy and the Cuyahoga Soil and Water Conservation District do hold conservation easements on lands in the watershed. Ten easements covering in excess of 200 acres are preserved by these organizations to date. Locations of specific privately protected properties are not released to the general public in order to protect the privacy of the landowners.

Cultural Resources

In reality, the Rocky River Watershed is so much more than just the land area that drains into the Rocky River. It contains Hinckley Lake, Wallace Lake, Baldwin Lake, Coe Lake, Lake Medina, and Wildwood Lake. It is the Rocky River Reservation, the Mill Stream Run Reservation and the Hinckley Reservation of Cleveland Metroparks. It is Plum Creek Park, Allardale Park, the Lester Rail Trail, and the Princess Ledges Nature Preserve operated by the Medina County Park District. It is the Lorain County Metroparks and the new Columbia Reservation being established along the West Branch of the river. It is numerous city parks including Coe Lake that is the showpiece of the City of Berea.

It is home to Cleveland Hopkins International Airport, the NASA Glenn Research Center, Baldwin Wallace College, and the Western Campus of Cuyahoga Community College.

The watershed is home to the Pancake Breakfast on Buzzard Day in Hinckley, to band concerts on the Square in places like Medina, to Frog Jumping contests in Valley City, to regattas in Rocky River and Lakewood.

The watershed contains many historical and cultural features including a unique collection of electric railway cars at Trolleyville USA.

Fishermen delight in the waters of the Rocky - whether they are after the steelheads in the lower river or the pan fish in the lakes and streams of the upper watershed.

Swimming is a recreational activity in the Rocky River watershed with beaches at Wildwood Lake, Hinckley Lake, and Wallace Lake.

Previous and Complimentary Water Quality Efforts

NOACA has completed a 3-year effort to update the region's areawide 208 Water Quality Management Plan. This plan, the Clean Water 2000 Plan, is the first comprehensive update to

the region's 208 water quality management plan in twenty years. The plan assesses existing and anticipated threats to the region's water resources including the Rocky River, and recommends local government water quality management policies in the areas of sanitary sewer development, home sewage disposal systems, control of nonpoint sources, protection of critical water resources and watershed planning. The plan recommended the formation of a watershed planning group for the Rocky River.

Since the passage of the Clean Water Act in 1972, considerable effort has been expended in an attempt to identify an effective means of managing urban storm water runoff. USEPA, assisting by Ohio EPA, has been actively involved in the identification of methods and incentives to bring about the control of these impacts. Recognizing that more needs to be done, USEPA initiated the Storm Water Permits Program under its National Pollution Discharge Elimination System (NPDES) Program. The Storm Water Permits have been implemented in stages. Phase II of that program went into effect in March 2003 when over 400 communities in Ohio, including 22 in the Rocky River Watershed, submitted their plans for reducing the impacts from urban runoff from their community to the maximum extent practicable. Regulated communities submitted plans that satisfy each of six minimum control measures. These measures address:

- Public Education and Public Participation
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping.

In what is likely to be the beginning of a trend in urban watersheds, the Total Maximum Daily Load (TMDL) Report on the Rocky River recently released by Ohio EPA recognizes the need for better management of urban runoff in the watershed. The TMDL looks to gains to be made as communities strive to comply with the Phase II rules as the primary mechanism to alleviate urban runoff impacts.

Physical Attributes of Streams and Floodplain Areas

The earliest settlers in the Rocky River watershed made use of its water resources. Numerous milldams were built to provide power for gristmills, lumbering operations and other industries. Sandstone quarrying operations in Berea resulted in the formation of several larger lakes and many small ponds. Baldwin Lake, Wallace Lake, and Coe Lake all owe their existence to quarrying operations. Granger Ditch was heavily channelized early in the 20th Century, an action from which it is still recovering.

Throughout most of the Rocky River the stream does have access to its floodplain. A few exceptions occur in isolated stretches of some of the more heavily urbanized tributary streams. These include Abram Creek, Baldwin Creek, Plum Creek near Brunswick, Champion Creek and Bradway Creek. The latter two streams flow to the West Branch of the Rocky River and drain portions of the City of Medina.

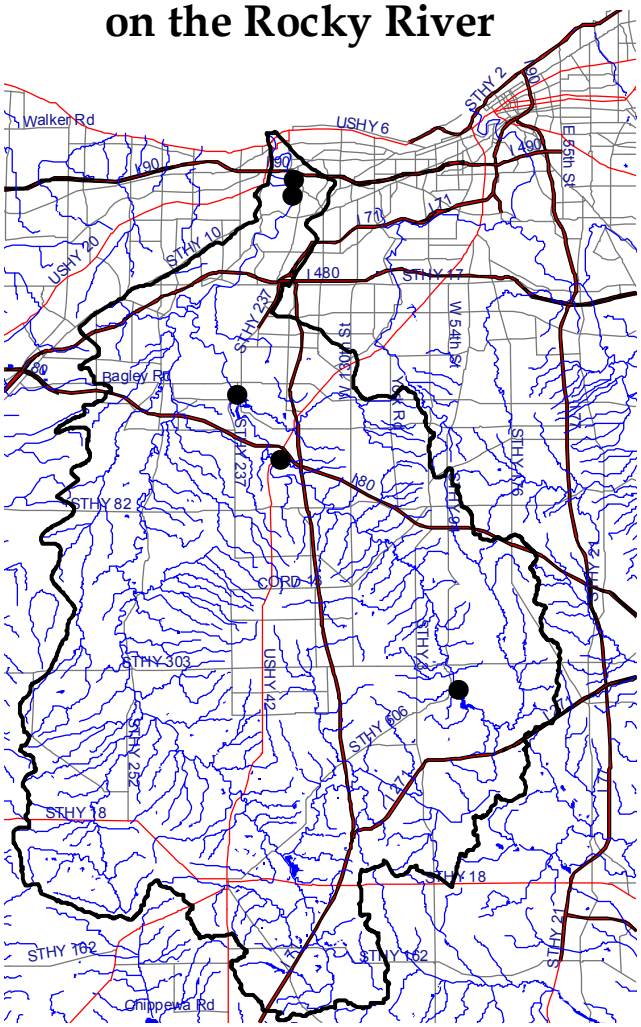
The riparian corridor of the Rocky River is maintained in a forested condition along most of its length. It is estimated that vegetation along less than 10% of watershed streams is in a highly

disturbed state. There are 163.2 miles of streams recognized in the Gazetteer of Streams for the Rocky River Watershed. This means that an estimated 146.9 miles of streams are relatively undisturbed. Priorities for restoration include Abram Creek (0.5 miles), the East Branch (2.0 miles), Baldwin Creek (1.0 miles), the West Branch (4.0 miles), Plum Creek near Olmsted (0.5 miles), Mallet Creek (1.0 miles), and Plum Creek at Brunswick (1.0 miles).

Of the 163.2 miles of recognized streams in the Rocky River Watershed, approximately 25 to 30 miles are permanently protected in public parks. The remainder of the stream network is privately owned. The majority of Baldwin Creek and Abram Creek are in an altered state due to the effects of urbanization. As much as another 10 miles of streams are locally impacted in other tributaries. Approximately 135 miles of stream remain in a near natural state or have recovered from the impacts of previous disturbances. Approximately 3 miles of Granger Ditch were heavily channelized early in the 2oth Century. The spoil material was piled high along the streambank and remains to this day. The stream within this channel is constrained by the spoil banks but has established a new state that is in equilibrium with the altered conditions to the point where it is able to support a warmwater aquatic community.

Two low head dams exist along the mainstem. These dams have only a minor effect on the mainstem affecting flow for as little as 100 yards upstream.. A dam exists immediately south of Cedar Point Road on Abram Creek. Immediately downstream, Abram Creek falls at a steep rate that diminishes the effect of the dam. A dam affects flow in the East Branch for approximately 0.5 miles near Albion Road. The remaining dams that affect the flow of the Rocky River are located at the downstream ends of Baldwin Lake and Hinckley Lake along the East Branch. Both of these dams have a significant impact on the overall flow regime of the East Branch. The Baldwin Lake dam affects flow for 1.0 mile upstream. The Hinckley Lake dam affects flows for about 1.5 miles. The general locations of the dams along the Rocky River are shown below. Recently a dam on the West Branch at Sprague Road was breached during a high flow event. This location is no longer affected by the remnants of the former dam. The general locations of the dams of the Rocky River are shown below.

Locations of Dams on the Rocky River



THE WATER RESOURCES OF THE ROCKY RIVER

Rocky River Watershed Action Plan
Appendix B
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

The Water Resources of the Rocky River

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The Water Resources of the Rocky River

Abstract

This report summarizes the condition of water resources in the Rocky River Watershed of northeast Ohio. It includes a discussion of climatic and precipitation, surface water including wetlands, streams and lakes, and groundwater resources. Fourteen stream segments in the watershed are discussed in detail. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

Climatic and Precipitation Information

Large annual, daily, and day-to-day ranges in temperature characterize the climate throughout the Rocky River Watershed. Summers are moderately warm and humid. Winters are reasonably cold and cloudy. The summer high temperatures exceed 90 degrees on the average of 10-20 days per year. The winter temperatures are below zero generally less than five days per year in the northern part of the watershed near Lake Erie. Subzero days may occur as often as 10 times a year in the southern portions of the watershed. Overall, January is typically the coldest month and July is the warmest. Temperatures are low enough in the winter that the ground freezes to a depth of one foot and more. During these periods, runoff from snowmelt or rain showers occurs at an increased rate due to the ground's limited ability to absorb water.

Precipitation in the watershed varies widely from year to year. Monthly variations in rainfall are relatively small, typically ranging from 2.5 to 3.5 inches. Of the four counties that make up the Rocky River Watershed, Medina County has the highest average rainfall with 37.22 inches. Lorain County has the lowest amount with 34.56 inches. Fall is the driest period throughout the watershed on the average.

Specific information on the climate and precipitation affecting the Rocky River Watershed is available from several sources including the following:

CLIMATE SUMMARY FOR CLEVELAND, OHIO. National Weather Service, Cleveland Ohio. Available on the Internet at:

http://www.erh.noaa.gov/er/cle/climate/cle/climatecle.html.

This site reports on the climatic conditions at Cleveland Hopkins Airport for the seven-year period of 1995 through 2001. Temperature, precipitation and snowfall data are available on an annual, monthly and daily basis.

RAINFALL FREQUENCY ATLAS OF THE EASTERN UNITED STATES FOR DURATION FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS FROM 1 TO 100 YEARS. Technical Paper No. 40. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.

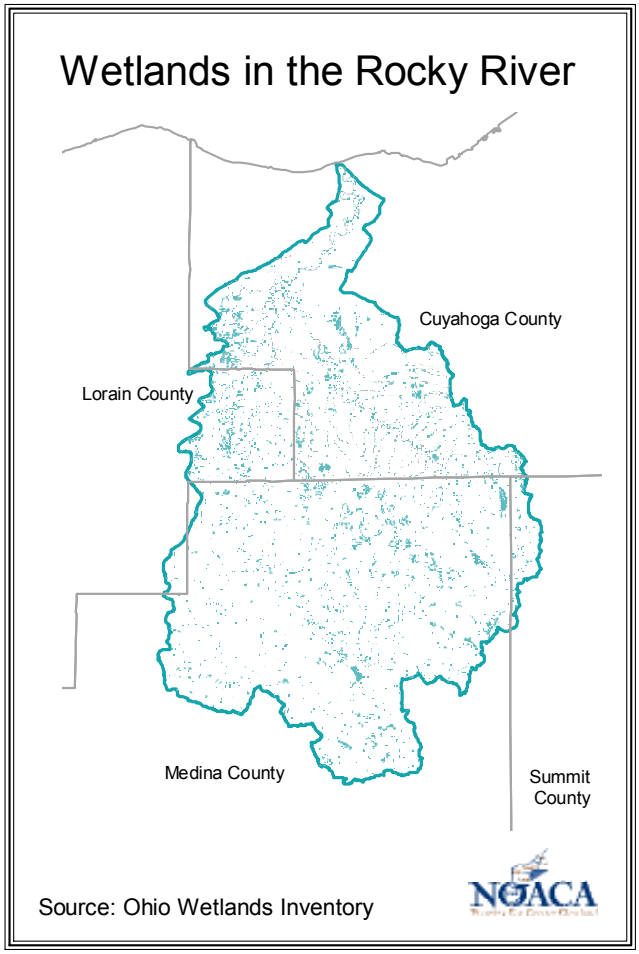
Available on the Internet at: http://tgsv5.nws.noaa.gov/er/hq/Tp40s.htm.

Hydrologic evaluations require precipitation values defined in terms of inches or inches/hour for a variety of storm conditions. This Technical Report provides the hydrologist or engineer with these values.

Surface Water

WETLANDS: The National Land Cover Dataset (NLCD) provides land use information for the Rocky River Watershed based on aerial photographs taken between 1991 and 1993. The dataset was created by a partnership of federal agencies that utilize land use information. The NLDC identifies that 1.85% 0f the Rocky River Watershed is comprised of wetland areas. Of the total of 3,462 wetland acres in the watershed, 3,118 are classified as woody wetlands and 344 are emergent herbaceous wetlands.

The Ohio Wetlands Inventory (OWI) classifies and maps known wetlands. Coverage is available for the entire Rocky River Watershed. The general distribution of wetlands in the Rocky River as identified in the OWI is shown in the attached figure. The OWI is available on the Internet at: **http://www.dnr.state.oh.us/wetlands/mapping.htm**. The OWI information is also available on the MAGIC 2001 CD collection distributed by NOACA and its partners.



The condition of the wetlands in the Rocky River Watershed is highly variable. Expanding development in the southern portions stresses wetlands located there. This is particularly true of small wetlands in headwater areas. Numerous large wetlands located within the confines of the Metropark systems in the watershed are well protected and are functioning well. A major new wetland was created within Cleveland Metroparks Mill Stream Run Reservation when the Strongsville Wetland Area was developed to offset wetlands lost with the construction of the South Park Mall. Lake Abram has a long-standing problem with discharges from failing home sewage disposal systems, but that problem is being addressed. There is no known assessment of the remaining wetlands in the basin. A case can be made that preservation of the remaining wetlands is a priority in the watershed. Restoration opportunities could be identified in order to be in a position to take advantage of remediation funds in the future, but no organized effort is currently under way to accomplish this on a watershed basis.

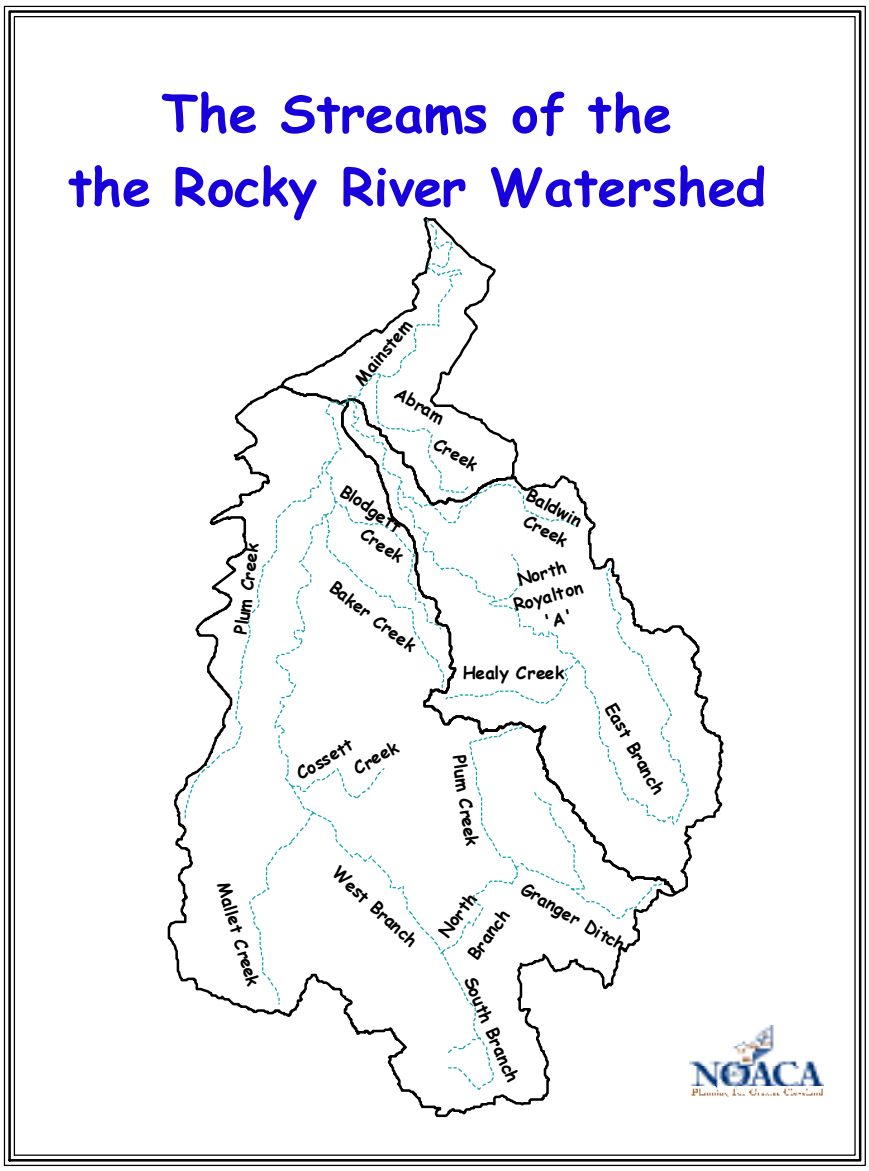
STREAMS: The Rocky River consists of the mainstem, the East Branch, the West Branch and several major tributary streams as shown in the figure below. When researching information on the Rocky River it is helpful to know to know the watershed identifiers used by federal and state agencies. The Rocky River is divided into two 11 digit Hydrologic Unit Codes (HUC11 codes) by the United States Geological Survey. The Rocky River Mainstem and the East Branch comprise the HUC11 code of 04110001 070. The West Branch is code 04110001 060.

Ohio EPA uses a watershed identification system of its own. In the Ohio EPA scheme, the Rocky River is referred to as Watershed OH87. Subbasin identifiers can be added to this code. For example, the mainstem portion of the river is code OH87 2. The subbasin identifiers for the remaining streams of the Rocky River are as follows: 3-Abram Creek; 4-East Branch below Healey Creek; 5-Baldwin Creek; 7-North Royalton "A" Tributary; 8-East Branch above Healy Creek; 9-Healey Creek; 10-West Branch below Plum Creek; 11- Plum Creek near Olmsted Falls; 12-West Branch from Cossett Creek to Plum Creek; 13-Strongsville "A" Tributary; 14-Baker Creek; 15-West Branch above Cossett Creek; 16-Cossett Creek; 17-Mallet Creek; 19-North Branch; and 20-Plum Creek near Brunswick.

There are three reports available that provide more information on the watersheds of the Rocky River. These are:

HYDROLOGIC ATLAS FOR OHIO-AVERAGE ANNUAL PRECIPITATION, TEMPERATURE, STREAMFLOW, AND WATER LOSS FOR 50-YEAR PERIOD, 1931-1980 (1991) by Leonard J. Harstine. Ohio Department of Natural Resources, Division of Water, Ground Water Resources Section. Water Inventory Report No. 28. Available on the Internet at: http://www.dnr.state.oh.us/water/pubs/hydatlas/atlasonl.htm. This report presents a series of maps of Ohio showing the average annual precipitation, average temperature, stream flow, water loss (average precipitation minus stream flow), and evaporation.

GAZETTEER OF OHIO STREAMS (1960). Ohio Department of Natural Resources, Division of Water. Report No. 12 of the Ohio Water Plan Inventory.
This report identifies the watershed area, stream length, high point elevation of the watershed divide, the elevation of the stream mouth, and the average slope of the streams of Ohio and their major tributaries.



LOW FLOW CHARACTERISTICS OF STREAMS IN OHIO THROUGH WATER YEAR 1997. U. S. Geological Survey Water Resources Investigations Report 01-4140 by David E. Straub. This report is available on the Internet at: http://www.dnr.state.oh.us/water/pubs/reports/wibaseflow.htm.

This report, prepared in cooperation with the ODNR Division of Water, presents selected low-flow and flow duration characteristics for 386 sites throughout Ohio. These sites include 195 long-term continuous-record stations with stream flow data through water year 1997 and 191 low-flow partial-record stations with measurements into water year 1999. This report is an update to U. S. Geological Survey Open-File Report 81-1195, "Low Flow Characteristics of Ohio Streams", by D. P. Johnson and K. D. Metzker. Information relative to the Rocky River contained in this report is shown in the following tables:

Rocky River near Berea, Ohio

SELECTED STREAMFLOW CHARACTERISTICS: Harmonic mean flow: 22.4 ft^3/s
Average streamflow: 284 ft^3/s (66 years)
Minimum daily streamflow: 0.2 ft^3/s

Magnitude and frequency of low flow for indicated periods

Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)					Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)				
		2	5	10	20	50			2	5	10	20	50
Apr.-Mar.	1	7.2	2.4	1.2	0.7	0.3	Dec.-Feb.	1	40	20	13	9.4	6.2
	7	8.8	3.3	1.8	1.1	.6		7	45	23	16	12	7.9
	30	15	5.8	3.2	1.9	1.0		30	108	47	29	19	12
	90	31	11	6.4	3.9	2.2		90	419	223	141	90	50
May-Nov.	1	7.2	2.4	1.2	0.7	0.3	Sep.-Nov.	1	9.2	3.1	1.6	0.9	0.4
	7	8.8	3.3	1.8	1.1	.6		7	12	4.3	2.4	1.5	.8
	30	16	5.8	3.2	1.9	1.0		30	22	7.6	4.1	2.6	1.3
	90	32	12	6.5	3.9	2.2		90	82	27	14	8.1	4.2

Duration of daily flow for indicated periods

Period	Streamflow (ft^3/s) that was equaled or exceeded for the indicated percentage of time												
	98	95	90	85	80	75	70	60	50	40	30	20	10
Apr.-Mar.	3.3	6.3	11	16	22	29	37	56	85	126	186	319	664
May-Nov.	2.3	4.3	7.1	9.6	13	17	21	31	43	60	87	145	320
Dec.-Feb.	16	21	31	44	55	65	79	111	146	197	288	450	960
Sep.-Nov.	2.3	3.7	5.9	8.1	10	14	17	25	37	51	75	127	299

East Branch Rocky River near Berea, Ohio

SELECTED STREAMFLOW CHARACTERISTICS. Minimum observed streamflow: 6.8 ft^3/s August 1982.

Magnitude and frequency of low flow for indicated periods

Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)			Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)		
		2	10	20			2	10	20
Apr.-Mar.	1	3.3	0.6	0.1	Dec.-Feb.	1	16	6.1	4.3
	7	4.0	.8	.5		7	20	7.3	5.3
	30	7.0	1.5	.9		30	48	11	8.8
	90	14	2.9	1.8		90	144	63	40
May-Nov.	1	3.3	0.6	0.1	Sep.-Nov.	1	4.2	0.8	0.4
	7	4.0	.8	.5		7	5.4	1.1	.7
	30	7.1	1.5	.9		30	10	1.9	1.2
	90	14	3.0	1.8		90	36	6.4	3.7

Duration of daily flow for indicated periods

Period	Streamflow (ft^3/s) that was equaled or exceeded for the indicated percentage of time				
	98	95	90	85	80
Apr.-Mar.	1.6	2.9	5.0	7.4	10
May-Nov.	1.2	2.0	3.2	4.4	6.0
Dec.-Feb.	7.0	9.5	14	20	25
Sep.-Nov.	1.0	1.7	2.7	3.7	4.7

West Branch Rocky River at West View, Ohio

SELECTED STREAMFLOW CHARACTERISTICS: Minimum observed streamflow: 0.3 ft^3/s October 19[illegible]

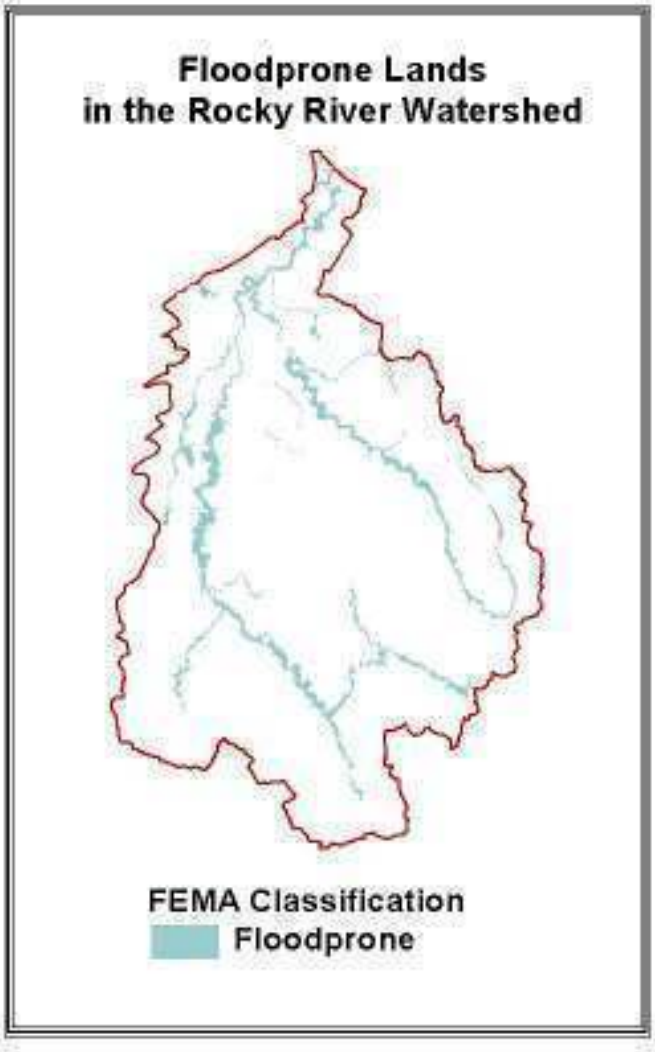
Magnitude and frequency of low flow for indicated periods

Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)			Period	Number of consecutive days	Streamflow (ft^3/s) for indicated recurrence interval (years)		
		2	10	20			2	10	20
Apr.-Mar.	1	2.2	0.5	0.1	Dec.-Feb.	1	17	4.7	3.3
	7	2.8	.4	.2		7	20	5.8	3.9
	30	5.5	.8	.6		30	58	12	7.3
	90	13	1.9	1.0		90	286	80	46
May-Nov.	1	2.2	0.5	0.1	Sep.-Nov.	1	3.9	0.4	0.2
	7	2.8	.4	.2		7	4.8	.6	.3
	30	5.6	.8	.4		30	9.7	1.3	.8
	90	13	1.9	1.1		90	41	5.6	2.6

Duration of daily flow for indicated periods

Period	Streamflow (ft^3/s) that was equaled or exceeded for the indicated percentage of time				
	98	95	90	85	80
Apr.-Mar.	0.9	1.9	3.6	6.0	8.6
May-Nov.	.6	1.2	2.2	3.1	4.5
Dec.-Feb.	3.6	8.6	13	20	25
Sep.-Nov.	.5	1.0	1.7	2.6	3.4

One other source of information is available to help characterize the streams within the Rocky River Watershed. Flood Hazard Maps are produced by the Federal Emergency Management Agency (FEMA) and are available on the Internet at: http://www.fema.gov/mit/tsd/. These maps are also available on the MAGIC 2001 CD collection available from NOACA and its partners. These maps show the extent of the 100-Year floodplain along the major waterways of the Rocky River. NOACA has created a layer specific to the Rocky River in an ESRI Shapefile format. The extent of the floodplains identified by FEMA is shown below.



RIPARIAN AREAS: Riparian corridors along the streams of the Rocky River Watershed are largely intact and support an abundance of vegetation and associated wildlife communities. Most of the Mainstem and much of the East Branch are contained in the reservations of the Cleveland Metroparks. Other parks protect additional stretches throughout the watershed. However, there are numerous areas where development has encroached on the riparian corridors. This encroachment has seriously affected the functioning of the corridor in many locations, particularly in some of the heavily urbanized subwatersheds.

Past development in many portions of the Rocky River Watershed has resulted in pronounced disturbances of the vegetation in riparian corridors. A problem that compounds the potential effects of additional development on the riparian zones in the Rocky River is the fact that this development is occurring in headwater streams to a much greater extent than in the past. Headwater streams are those feeder creeks that generally have a drainage area of less than one-half square mile. These creeks are an integral part of the aquatic ecosystem but they have heretofore received little protection in the region. These streams have regularly been graded over during the land-clearing phase of a development and are often replaced with enclosed storm drains. Continued loss of headwater capacity stress all downstream reaches and will, if allowed to proceed too far, result in the inability of a downstream stretch of stream to meet its designated water use attainment criteria.

It is difficult to estimate how many new homes will abut the riparian corridor along the streams of the Rocky River. Perhaps one in ten new homes will be along these corridors. The communities in the Rocky River Watershed that are regulated by the Phase II Storm Water Permit program have all committed to enacting riparian set back ordinances by the end of 2005. After this date, natural vegetation will be maintained along all streams in the watershed including the small streams classified as Headwater Streams by Ohio EPA. This action will potentially protect thousands of linear feet of riparian zones and associated habitat.

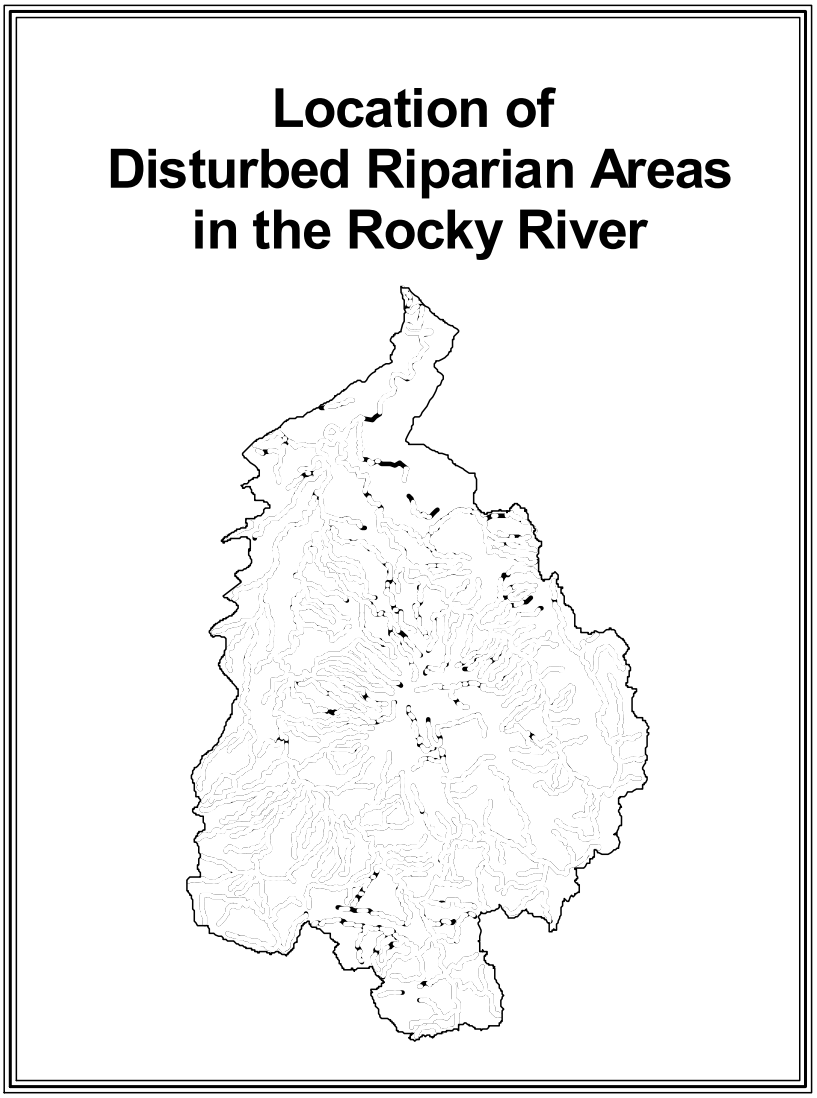
The following figure shows currently disturbed riparian zones as a result of existing development. An evaluation of this map indicates that conditions are good to very good in numerous stream segments. These include the Mainstem, the East Branch, the West Branch, the North Branch, Healey Creek, and the North Royalton 'A' Tributary.

Abram Creek has been extensively culverted removing the riparian function altogether in those locations. Where the stream is free flowing, riparian vegetation is generally good, but channel modifications continue to limit the stream. Baldwin Creek has similar conditions, in that the riparian vegetative cover is good along most of its length but channel modifications are prevalent throughout the course of the stream.

Both Plum Creeks have extensively disturbed riparian corridors in the upper reaches and have well protected corridors in their lower reaches. Plum Creek near Olmsted Falls is affected by agricultural land uses in its upper reaches. Plum Creek near Brunswick is heavily urbanized in its upper reaches.

Mallet Creek is another stream that has a significant history of agricultural impacts on its riparian corridor. The stream is recovering from past disturbances and vegetation has become reestablished along much of its course. Lingering effects do continue, but progress is noted.

Remsen Creek and Granger Ditch were heavily channelized in the past. They have remained little disturbed since and are recovering at this time. Channel vegetation has been reestablished along almost all of these streams. A well functioning riparian corridor now exists in much of the area where the remnants of past Channelization remain highly visible.



Rocky River Mainstem

Stream: Rocky River Mainstem Tributary to: Lake Erie Drainage Area: 293.8 square miles total Length: 11.8 miles, 48.0 miles including the East Branch Slope: 13.7 feet per mile Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.7 miles in Partial Attainment, and 3.37 miles in Nonattainment Recreational Use Assessment: Impaired

The Mainstem of the Rocky River begins near Cedar Point Road where the East and West Branches converge. The mainstem flows through portions of North Olmsted, Fairview Park, Cleveland Lakewood and Rocky River before it discharges to Lake Erie. The vast majority of the Mainstem flows within the confines of the Cleveland Metroparks Rocky River Reservation.

The Mainstem of the Rocky River has 8.7 miles in partial attainment of its aquatic use designation and 3.37 miles in nonattainment. The nonattainment segments are located downstream of the North Olmsted Wastewater Treatment Plant (River Mile 11.1) and near the Lorain Avenue crossing (River Mile 6.0). Recreation use impairments exist along the entire Mainstem. Bacteria samples collected at six stations along the Mainstem indicate frequent exceedances of the Primary Contact criterion.

The mainstem has access to its floodplain along its entire length. Stream bank erosion is not a significant problem along the Mainstem. A limited amount of bank armoring exists where roads are adjacent to the channel. Several low head dams exist along its course. These dams have only a limited affect on the stream. The riparian corridor is dominated by park-like conditions and it well forested. The exception is the lacustrine area at Lake Erie that is a heavily used boating area lined with boat slips and marina services.

The aquatic habitat in the Mainstem has a mean QHEI (Qualitative Habitat Evaluation Index) value of 64.5. Only a site downstream of the junction with Abram Creek (River Mile 10.0) measures below 60.0. This indicates that the Mainstem is capable of supporting a aquatic community assemblage expected under Warmwater Habitat use designation. Despite this, a relatively high proportion of modified habitat attributes characterize the instream habitat. Modified habitat attributes common to all sites were moderate to heavy siltation and fair channel development. Sediment loads and scouring stream flows from urban runoff are the principal factors acting to reduce habitat quality. These impacts are facilitated by the erodible nature of the shale bedrock over which the Mainstem flows.

Abram Creek

Stream: Abram Creek Tributary to: Mainstem of the Rocky River Drainage Area: 10.06 square miles Length: 7.4 miles Slope: 29.4 feet per mile Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.7 miles in Nonattainment Recreational Use Assessment: Impaired

Abram Creek rises in Middleburg Heights and flows northerly through Brook Park and Cleveland. It enters the Mainstem near River Mile 10. Along the way, the creek flows past the Cleveland Hopkins International Airport. Recently a section of the creek was encased in a culvert to accommodate the expansion of the major runway of the airport. The affected stretch runs between River Miles 1.9 to 0.9.

The Ohio EPA has assessed the lower 3.4 miles of the stream. The entire stretch is in nonattainment of its aquatic use designation. Recreation use impairments exist along the entire Mainstem. Bacteria samples collected at three stations along the stream indicate frequent exceedances of the Primary Contact criterion.

Abram Creek has been extensively modified above Grayton Road. The majority of the stream in this area has been channelized or culverted. Free flowing stretches tend to be entrenched with limited access to the floodplain. Below the culverted stretch below Grayton Road, the stream channel is deep and narrow. The stream in this stretch falls rapidly before merging with the Mainstem. A high dam that effectively blocks fish migration exists immediately upstream of Cedar Point Road. Riparian cover along Abram Creek is good in all areas where the stream is not culverted.

The physical habitat in Abram Creek is marginally suited to supporting biological communities due to habitat modifications and habitat degradation arising from urban runoff. The average QHEI score is 54.5. Modified attributes impacted by urban runoff were primarily embedded substrates and little instream cover.

East Branch of the Rocky River

The East Branch of the Rocky River is a u-shaped stream that rises in North Royalton. It flows in a southerly direction through a corner of Broadview Heights, and enters Hinckley Township and Richfield Township. The stream reenters Hinckley Township before turning north and reentering North Royalton. The stream then flows through Strongsville, Berea, and Olmsted Township before joining the West Branch in North Olmsted. The East Branch is impounding to create Hinckley Lake in Hinckley Township

and Baldwin Lake in Berea. The flow path passes through Cleveland Metropark's Hinckley and Mill Stream Run Reservations.

Stream: East Branch of the Rocky River Tributary to: Mainstem of the Rocky River Drainage Area: 80.4 square miles Length: 34.5 miles Slope: 16.5 feet per mile Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 30.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired

According to the results of monitoring conducted in 2001, all 30.0 assessed miles of the East Branch are attaining the designated aquatic life uses. However, the lower 11.6 miles of the stream have frequent exceedances of the Primary Recreation criterion for bacteria, causing the recreation use of this stretch to be impaired.

The East Branch of the Rocky River above Baldwin Lake in Berea is characterized as a relatively natural stream except for Hinckley Lake. The stream has access to its floodplain throughout this reach. Only localized bank disturbances occur and stream bank erosion rates are close to natural levels. The entire flow distance has very good riparian cover. Except for the Hinckley Lake Dam, there are no impoundments.

Below Baldwin Lake, the stream channel exhibits signs of urbanization. Riparian cover remains good, but accelerated flow volumes do impact the stream. Isolated stretches near Baldwin Lake have been straightened and the bank has been armored in several limited areas.

The East Branch has an average QHEI score of 66.7 that is sufficient to support a warmwater stream assemblage. The lower ten miles do have sparse instream cover owing to shale bedrock and urban runoff. Modified attributes common in this stretch include high to moderate riffle and overall embeddedness and siltation contributed by urban runoff and bank erosion.

Baldwin Creek

Baldwin Creek begins in North Royalton and flows in a westerly direction through Parma, Middleburg Heights, Strongsville, and Berea before entering the East Branch. At one time, the creek was impounded to form Coe Lake. Recently, the City of Berea redirected the flow of the Creek to bypass Coe Lake.

Ohio EPA has assessed the lower 8.0 miles of Baldwin Creek. None of these miles are attaining designated aquatic uses. The Cuyahoga County Board of Health has

documented frequent exceedances of the Primary Contact criterion for bacteria in the Creek. This would indicate that recreation uses are impaired throughout the reach.

Stream: Baldwin Creek Tributary to: East Branch of the Rocky River Drainage Area: 11.94 square miles total Length: 9.2 miles Slope: 53.8 feet per mile Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired

Baldwin Creek is impacted by urbanization. Much of the stream channel has been modified. Channel alignment and bank armoring are common. The stream is embedded in its channel and has only limited access to the floodplain. While riparian cover is good over much of the stream's path, flashy flows and high sediment loads limit conditions in the channel.

The average QHEI score is 52.75 but individual scores are highly variable ranging from 32.0 to 67.0. This score indicates that the stream is marginally suited to supporting normal warmwater stream communities. Overall, scouring flows and sedimentation degrades habitat. Conditions tend to worsen as one proceeds downstream reflecting the cumulative impact of urban drainage. Embedded substrates and riffles were observed at all sites, while channel modifications and limited instream cover characterized downstream sites.

North Royalton 'A' Tributary

Stream: North Royalton 'A' Tributary Tributary to: East Branch of the Rocky River Drainage Area: 1.72 square miles total Length: 3.3 miles Slope: N/A Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 1.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired

The North Royalton 'A' Tributary is a small stream that drains a portion of North Royalton and receives the discharge from the City's 'A' Treatment Plant.

Until recent improvements were made to the treatment plant, the stream did not attain its designate aquatic life use. However, sampling conducted in 2001 indicates that the

stream is now attaining that use. Recreation uses are impaired, however, due to elevated bacteria counts.

The stream channel in the vicinity of the treatment plant remains in a natural condition with a stable configuration. The stream does have access to its floodplain, and bank disturbances are at a minimum. The large lot residential watershed has a high QHEI score at the one site measured (with a value of 72.5 being recorded). The rather heavy forested area that dominates the lower course of the stream seems to be protecting the reach from the effects of upstream development. Impacts are beginning to be felt in the way of slightly embedded substrates and unstable riffles.

Healey Creek

Stream: Healey Creek
Tributary to: East Branch of the Rocky River
Drainage Area: 4.84 square miles total
Length: 5.75 miles
Slope: N/A feet per mile
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment
Recreational Use Assessment: Not Available

Healey Creek drains a portion of Brunswick, Brunswick Hills Township, and Hinckley Township before it enters the East Branch in North Royalton.

Healey Creek has been sparingly monitored. One site at River Mile 0.9 has been monitored and it demonstrated fair benthic and fish communities. While the QHEI score of 65.0 is good, the intermittent nature of stream flow acts to limit the aquatic communities. Bacteria sampling has resulted in no exceedances of the Primary Contact criterion so recreation uses are classified as not impaired.

The stream channel in the monitored reach remains in a natural condition. The riparian cover is good and the stream has access to its floodplain. Little modification has occurred. Continued urbanization in the headwaters remains a concern.

The West Branch of the Rocky River

The West Branch of the Rocky River commonly begins at the junction of its North and South Branches in Medina Township. The stream flows north through the City of Medina, York Township, Liverpool Township, Columbia Township, Olmsted Township, and Olmsted Falls before joining the East Branch in North Olmsted. Almost all of the West Branch flows through privately held land that remains in a largely natural state.

There are three stretches of the West Branch that are in Partial Attainment of their aquatic use designations. Fish communities that are rated only as fair are the cause of the noted departure from the biocriteria in all three of these segments. The segments include the upstream terminus of the segment near State Route 162 (river Mile 33.6), the area near Fenn Road (river Mile 27.3) and downstream from Blodgett Creek (River Mile 3.6). Bacteria exceedances have been noted at the two monitoring locations on the West Branch (at River Miles 16.4 and 33.6) resulting in this segment being listed as impaired for recreational uses.

Stream: West Branch of the Rocky River
Tributary to: Mainstem of the Rocky River
Drainage Area: 188.3 square miles
Length: 36.2 miles
Slope: 16.0 feet per mile
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 23.96 miles in Full Attainment, 10.05 miles in Partial Attainment, and 0.0 miles in Nonattainment
Recreational Use Assessment: Impaired

The West Branch is a largely naturally flowing stream along its entire length. A dam that impounded flow at Sprague Road has been breached and no longer affects the flow of the river. Throughout its length, the West Branch has access to its floodplain with little encroachment. A noted exception is a construction and demolition landfill located in the floodplain in Liverpool Township. Most of the banks of the West Branch remain in a natural state with a minimum of armoring, often located near road crossings.

The average QHEI score of 67.4 reflects habitat that is generally capable of supporting warmwater assemblages. In the upper reaches agriculture and urbanization result in modified attributes that include moderate to high substrate and riffle embeddedness and siltation.

Plum Creek near Olmsted Falls

The first of the two Plum Creeks that are tributary to the West Branch of the Rocky River occurs in the vicinity of Olmsted Falls. This stream begins in Grafton Township. It flows in a northerly direction through Liverpool Township, Columbia Township, and Olmsted Township before reaching the West Branch in Olmsted Falls.

Ohio EPA has assessed the lower 2.9 miles of Plum Creek. The entire stretch is not attaining its designated aquatic like uses. In addition, bacteria sampling indicates that the Secondary Contact Recreation criterion are frequency exceeded. The stream is therefore not meeting its recreational use designation either.

Historically, the upper reaches of Plum Creek have been extensively modified to aid in agricultural drainage. Riparian corridors continue to be disturbed in these areas. Stream

flow is very sluggish throughout the area. In the lower three miles, the stream flows in a largely natural channel that has considerably more fall than the upper portions. The average QHEI score is 70.0 in this stretch.

Stream: Plum Creek near Olmsted Falls
Tributary to: West Branch of the Rocky River
Drainage Area: 18.9 square miles
Length: 14.8 miles
Slope: 16.4 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.0 miles in Nonattainment
Recreational Use Assessment: Impaired

Baker Creek

Stream: Baker Creek
Tributary to: West Branch of the Rocky River
Drainage Area: 5.81 square miles
Length: 8.2 miles
Slope: 45.7 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report
Recreational Use Assessment: Impaired

Baker Creek rises in Brunswick and flows in a northwest direction through Strongsville and Columbia Township. Through much of its course, the stream flows in a largely natural channel that is narrow and deep. It does have access to its floodplain and riparian cover is good. Ohio EPA has not evaluated the habitat in this stream, but conditions are such that a warmwater community should be supportable.

Cossett Creek

Stream: Cossett Creek
Tributary to: West Branch of the Rocky River
Drainage Area: 4.18 square miles
Length: 8.2 miles
Slope: 59.0 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.7 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment
Recreational Use Assessment: Not Available

Cossett Creek flows in a westerly direction through Brunswick Hills Township and Liverpool Township. It is marginally attaining its designated aquatic life use and its Secondary Contact Recreation use designation based on a single monitoring location at River Mile 0.2.

In the lower reaches, the QHEI score is 59.5. This low score is thought to be partially responsible for the marginal status of the stream's aquatic life attainment. The channel is in a natural condition. Riparian cover is good and water temperatures are cool. The stream has access to its floodplains and stream banks are stable.

Mallet Creek

Mallet Creek is a largely agricultural stream that flows through Lafayette Township, York Township, and Liverpool Township. Mallet Creek does attain its aquatic life use designation and its recreational use designation.

Mallet Creek continues to recover from channel modifications undertaken more than 50 years ago to aid in agricultural drainage. Riparian corridor disturbances and excessive siltation act locally to stress the stream. However, sufficient sections of stable stream channel areas exist to allow Mallet Creek to support a warmwater community.

Stream: Mallet Creek Tributary to: West Branch of the Rocky River Drainage Area: 18.75 square miles Length: 11.4 miles Slope: 27.5 feet per mile Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report Recreational Use Assessment: Locally Impaired

North Branch of the Rocky River

The North Branch of the Rocky River is formed where Granger Ditch and Plum Creek (near Brunswick) combine near the border of Granger Township and Medina Township. It terminates in western Medina Township where it merges with the South Branch to form the West Branch.

The North Branch consistently meets it designated aquatic life use classification. There is no reason to suspect that it does not meet its recreational use designation even though bacteria sampling has not been undertaken.

The stream channel is in a natural state with very good riparian cover and stable stream banks. Ohio EPA has documented habitat conditions at one location. The QHEI score at this site was 74.5. While overall conditions are good, some impacts from agricultural

runoff could be seen in the slightly embedded riffles and moderate siltation in depositional areas.

Stream: North Branch of the Rocky River Tributary to: West Branch of the Rocky River Drainage Area: 37.55 square miles Length: 5.4 miles Slope: 22.4 feet per mile Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.79 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Not Impaired

Remsen Creek including Granger Ditch

Remsen Ditch including Granger Ditch is a stream that drains much of Granger Township and the southern portion of Hinckley Township. Locally, the entire watershed is referred to simply as Granger Ditch.

Water quality in the stream has historically been classified as good. The majority of the channel was heavily ditched early in the twentieth century, but has remained largely undisturbed since. High banks that are a carry over from the original ditching restrict the channel, but the stream has re-established a degree of sinuosity and diverse habitat characteristics. The remote location of much of the channel has resulted in a re-growth of riparian vegetation and cover conditions a generally very good.

Stream: Remsen Creek including Granger Ditch Tributary to: North Branch of the Rocky River Drainage Area: 14.62 square miles Length: 6.5 miles Slope: 30.5 feet per mile Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in the 2000 305(b) Report Recreational Use Assessment: Not Impaired

Plum Creek near Brunswick

The second of the two Plum Creeks that discharge to the West Branch of the Rocky River drains a portion of Brunswick and Brunswick Hills Township before flowing through Medina Township. Medina County Parks Plum Creek Park is a prominent feature of the watershed.

Ohio EPA has monitored one site at River Mile 2.5 just south of a densely populated area in Brunswick. This site is impacted by excessive sedimentation and nutrients. Based on this, a one-mile stretch of the stream has been determined to only be in partial attainment of its aquatic life designation. Information on bacteria levels is unavailable, so no determination of the recreational use designation can be made.

Stream: Plum Creek near Brunswick Tributary to: North Branch of the Rocky River Drainage Area: 12.79 square miles Length: 7.1 miles Slope: 21.4 feet per mile Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Not Available

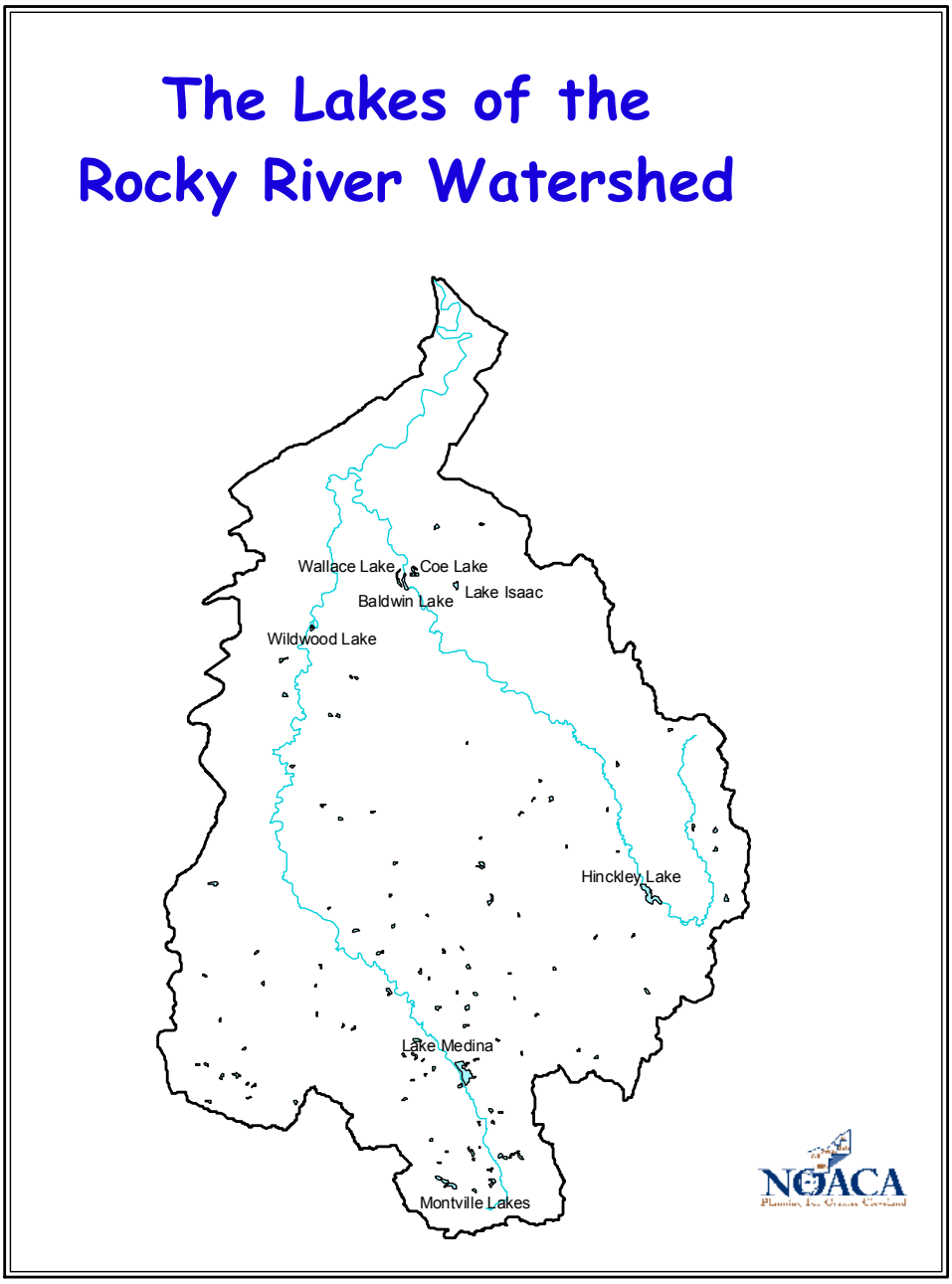
Upstream of State Route 303, Plum Creek has been heavily modified. The stream has been channelized and many headwater areas have been leveled. Downstream of Plum Creek Parkway, the channel is in a more natural state with good riparian cover and little channel disturbance. Work conducted by NOACA in the early 1980's indicated that fish communities largely recovered from the upstream disturbance by the time that Plum Creek merges with Granger Ditch.

LAKES: There are five publicly owned lakes greater than five acres in size in the Rocky River Watershed. The major lakes are identified in the following figure that also shows the locations of the larger lakes and ponds that are located throughout the watershed.

Lake Medina is the largest lake in the Rocky River Watershed with 109 surface acres. The lake is isolated from the South Branch of the Rocky River and has no appreciable area draining in to it. The volume of the lake is 40 acre-feet, the average inflow rate is 41,600 acre-feet, and the residency time is 3.85 years. This lake served as the water supply for the City of Medina until Spring 2002. The lake is now used for recreational purposes. The Medina Metroparks is administering the lake under a cooperative agreement with the City of Medina. Lake Medina is a dammed impoundment that supports good water quality. It was created by impounding a portion of the South Branch of the Rocky River near where it enters the West Branch. The South Branch was routed around the lake, a factor that helps to maintain water quality in the lake.

Hinckley Lake is the second largest lake in the Rocky River Watershed. It has 88 surface acres and was formed by impounding the waters of the East Branch in Hinckley Township. The volume of the lake is 616 acre-feet, the average inflow rate is 16,000 acre-feet, and the residency time is 14 days. The drainage area of the lake is approximately 22.5 square miles. The lake is managed by the Cleveland Metroparks for recreational uses including non-powered boating and fishing. The lake is classified as being in a eutrophic state. Hinckley Lake has been plagued with historically high

sediment loadings. A primary contributor of sediment in times past was the Cleveland Tank Testing Grounds upstream from the lake. Here military tanks assembled at the Tank Plant located on the grounds of Cleveland International Airport were field tested prior to delivery to the United State Army.



Wallace and Baldwin Lakes are sister lakes located in Berea astride the East Branch of the Rocky River. The drainage area above the lakes is approximately 63.5 square miles. Baldwin Lake has 32 acres of surface area. It serves as a portion of the City of Berea's water supply and provides recreational uses. The volume of the lake is 40 acre-feet, the average inflow rate is 41,600 acre-feet, and the residency time is 0.35 days. The damming of the East Branch in an area that used to be a stone quarry formed the lake. This is a spot where the Berea Sandstone was mined. Wallace Lake is adjacent but connected to Baldwin Lake. It too was the site of a Berea Sandstone quarry. Wallace Lake has a volume of 83 acre-feet and an unknown inflow and residency time. Cleveland Metroparks maintains a swimming beach at Wallace Lake. Fishing is also a significant activity. Both Baldwin and Wallace Lakes are classified as being eutrophic.

Coe Lake is also located in Berea near Baldwin and Wallace Lakes. Coe Lake has 23 surface acres and a volume of 15 acre-feet. It has an upstream drainage area of approximately 10.1 square miles. It was formed when Baldwin Creek was impounded. The lake serves as a backup water supply for the City of Berea as well as providing for recreational uses. Until recently, Baldwin Creek flowed through the lake. Berea has isolated the lake from the creek in order to better maintain its water quality for water supply purposes. Berea pumps water into Coe Lake during periods when the Baldwin Creek and the East Branch are free of elevated loadings of road salt and/or sediment.

Other significant lakes in the Rocky River Watershed include Lake Isaac, Wildwood Lake and the Montville Lakes. Volume, inflow, and residency time estimates are not available for these lakes. Lake Isaac is classified as a "glacial pothole" created thousands of years ago. Lake Isaac is managed by Cleveland Metroparks and is located in Middleburg Heights in an area tributary to the East Branch. The lake serves a waterfowl refuge, especially for migrant waterfowl.

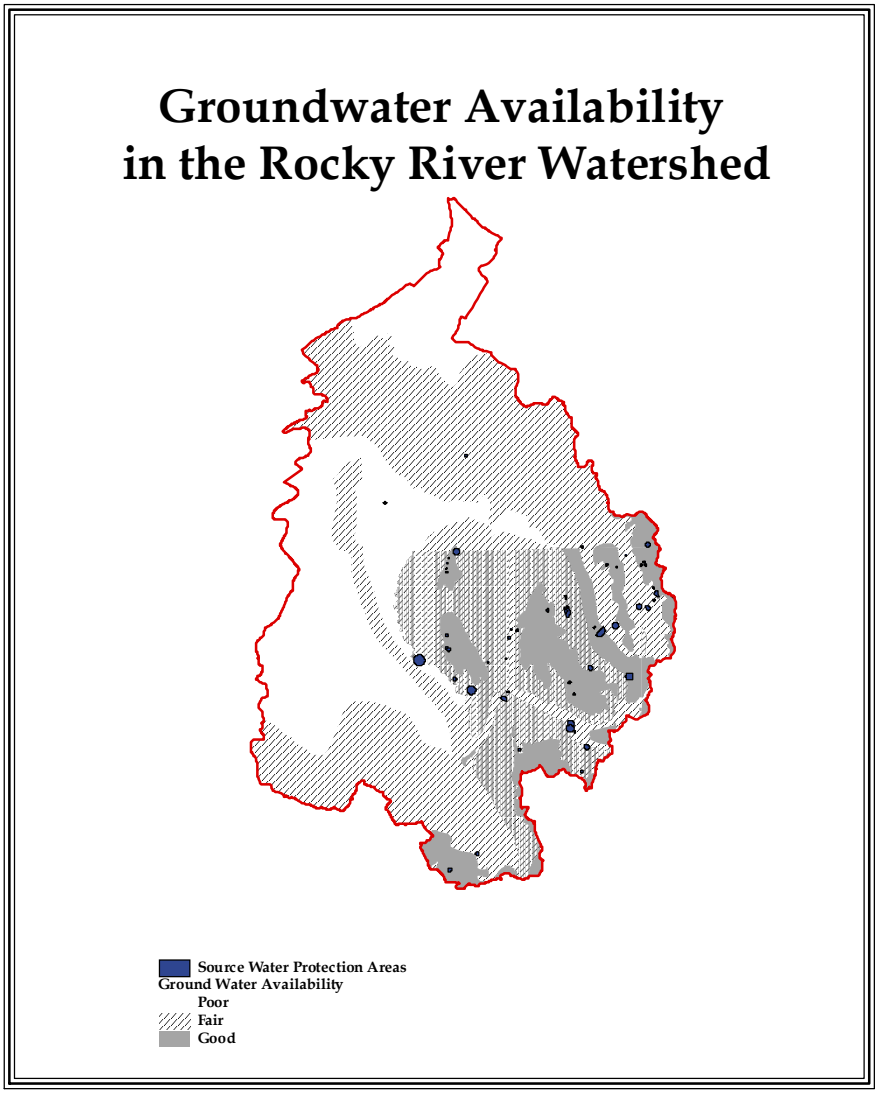
Wildwood Lake is a privately owned lake used for recreational purposes. The lake is located near the West Branch in Columbia Township. The Montville Lakes are a series of Lakes located in Montville Township in an area that is tributary to the South Branch of the West Branch. The lakes form the centerpiece of a mixed-use development of residential housing interspersed with a golf course.

Groundwater Resources

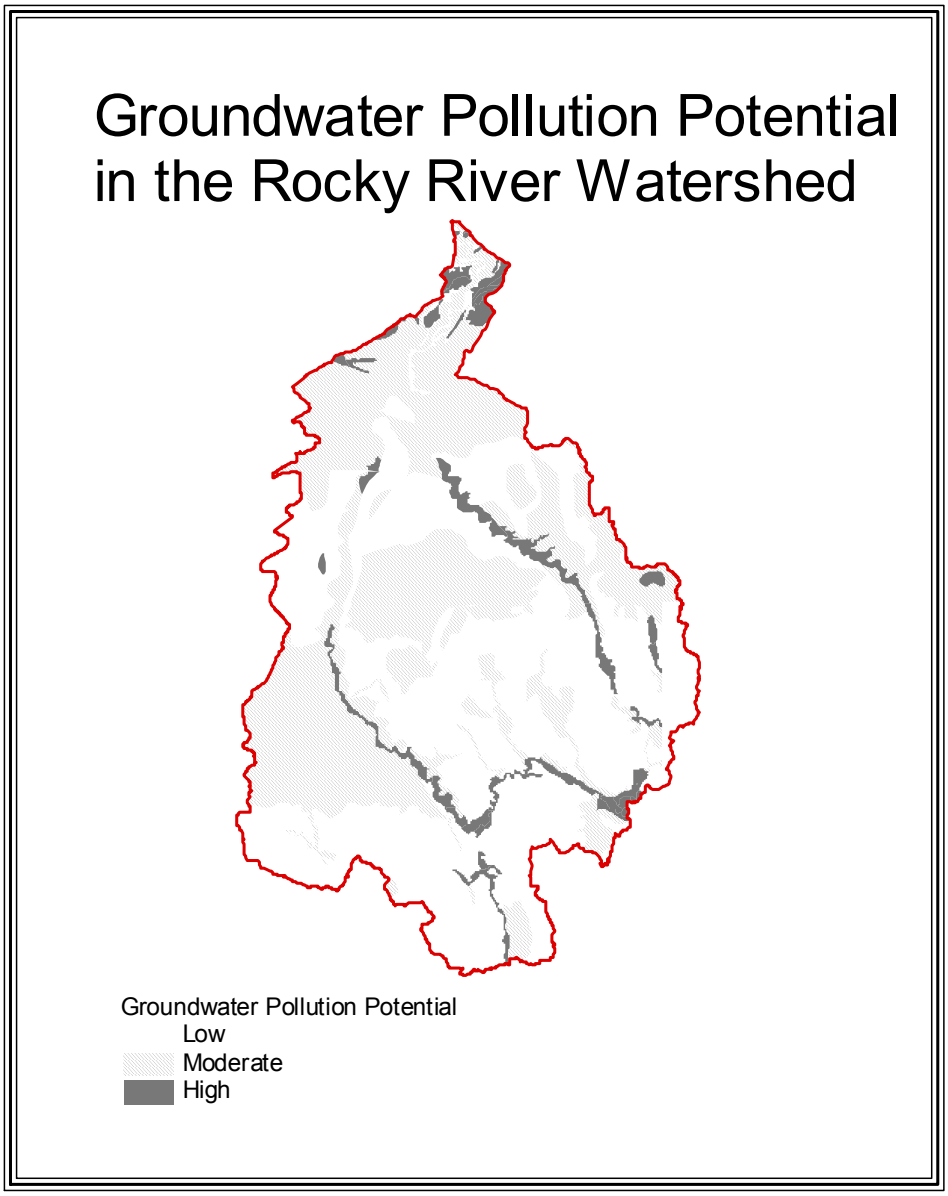
Groundwater is little used for water supply in the watershed. Limited supplies are available where the Berea Sandstone or the Sharon Conglomerate (both of which dip gently to the south) is close to the surface. Larger supplies are available from buried valleys that were filled with sand and gravel outwash when the last ice age retreated from the area. Groundwater flow in these deposits follows the preglacial topography that is generally towards the north to northwest. Large tracts of the watershed find groundwater to be a very limited resource. In response to this, and given the closeness of Lake Erie, lake water has been made available to most of the watershed. Virtually all of Cuyahoga County and the Brunswick area of Medina County are served by the City of Cleveland Water System. The Lorain Rural Water Authority, with water supplied by the City of

Avon, serves Columbia Township and most of the Medina County portion of the watershed. The City of Berea has its own surface water supply using water drawn from both the East Branch and Baldwin Creek. In addition, some groundwater limited areas in Medina County use cistern systems or small ponds for their water supply. Groundwater usage is generally limited to low density residential areas in portions of Hinckley, Granger, and Medina Townships where supplies are in the fair to good range.

The following map depicts the general availability of groundwater in the watershed. The areas marked as Source Water Protection Areas show those areas that are actively used for groundwater supplies.



The availability of groundwater is one limiting factor in the use it in the Rocky River Watershed. The other limiting factor is the potential for groundwater to become unusable due to contamination. DRASTIC maps have been prepared by ODNR working with Ohio EPA to access the pollution potential of aquifers. The following map indicates the relative rating of areas in the watershed for this important parameter. The areas of the watershed that continue to use groundwater for domestic supplies are generally in the low to moderate pollution potential range.



WATER RESOURCE THREATS RELATED TO GROWTH IN THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix C
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

Water Resource Threats Related to Growth in the Rocky River Watershed

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Water Resource Threats Related to Growth in the Rocky River Watershed

Abstract

This report evaluates population projections for the Rocky River Watershed to identify growth areas and to assess water resource threats associated with this growth. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

Water Resource Threats Related to Growth in the Rocky River Watershed

Introduction

The Rocky River Watershed is a growing watershed. Suburban development is pronounced throughout the entire southern half of the watershed. New developments, both large and small, have been commonplace for more than fifty years. Population projections indicate that this growth is expected to remain strong for at least another 20 years.

A significant feature of the growth that now is occurring in the watershed is that it is occurring in areas where water quality is at its best. Adding to the potential seriousness of this pattern is the fact that the new development is occurring in the headwater streams of the watershed. Without a concentrated effort to manage future growth, two problems could develop within the watershed. New growth that stresses headwater areas threatens to disrupt the integrity of the aquatic community resident in the growth areas. This could lead to a loss of water quality. In addition, the destruction of headwater areas will make it all that more difficult to restore the water quality in those stream segments that have already been damaged by uncontrolled runoff from previous development actions.

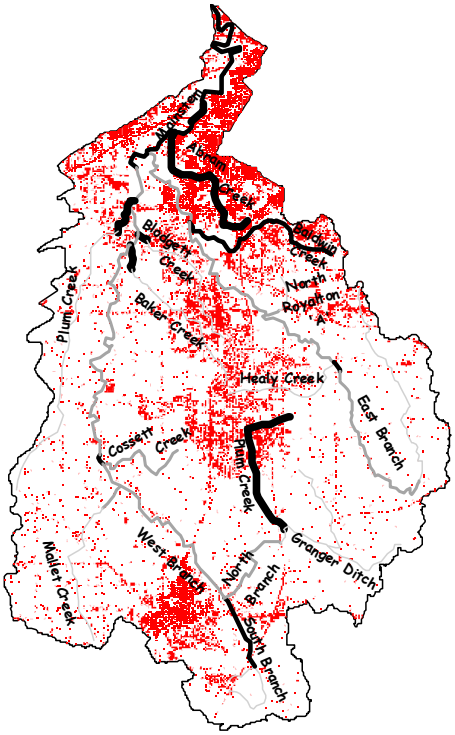
Figure 1 presents a view of the effects that development has had on the Rocky River. In this figure, all stream segments that are not attaining, or only partially attaining, designated aquatic uses are highlighted on a map base that shows developed areas. There is an obvious relationship in the Rocky River Watershed between depressed water quality and degree of development. It is clear from historical water quality trends that this is most often the case in areas where the impacts of development are not adequately addressed. The identification of those areas most threatened by advancing development in the Rocky River Watershed will help to target actions designed to minimize this degradation from future development in the watershed.

Growth Projections

The first step in defining the threat that continued growth in the Rocky River Watershed poses, is the identification of the growth areas. This has been accomplished through a two-step analysis. The first step involves the use of Areawide Population Projections developed by NOACA as part of its regional coordination role. The second step involves reviewing the 2000 Census to determine what growth has actually occurred since the 1990 Census. A composite growth statement is developed out of this process.

The NOCA Population Projections are the 'official' projections for the region. These projections are developed in concert with the State of Ohio and benefit from the input of local planning agencies and representatives. The process by which the projections are established starts with the Ohio Department of Development. This Department determines the expected population gain or loss for the State as a whole. They then

Developed Lands and Impacted Stream Segments in the Rocky River Watershed



Darkened streams are either not attaining their designated aquatic uses or are only partially attaining them.

Figure 1

allocate their projection to each of Ohio's 88 counties. In Northeast Ohio, NOACA is responsible for taking the total projection for each county and reallocating it to the minor civil divisions (cities, villages, and townships) that make up the county. As mentioned, NOACA does this with considerable input from local sources.

The last series of population projects that NOACA generated through this process was developed based on the 1990 Census data. Projections were made on a 5-year basis through the year 2020. The resulting figures are included as Table 1. Included in Table 1 are projections for the communities in Summit County that are tributary to the Rocky River. The Summit County figures were generated by AMATS, the agency responsible for transportation planning in the Greater Akron-Canton area.

The projections contained in Table 1 are depicted graphically in Figure 1 as they pertain to the Rocky River Watershed. Figure 2 displays growth areas through the use of a dot-density technique. In this technique, the amount of growth (or loss of population in some cases) is calculated for any specified projection year. Growth in Figure 1 is shown by randomly placing one dot in a community for every 30 persons of expected growth. A community with a growth projection of 3,000 people will receive 100 dots. This will produce a density pattern that is the same as a community half the size that has a projected growth of only 1,500 persons. The number of dots in any community tells the amount of growth that must be absorbed. The density of the dots indicates the potential impact of that growth: the denser the pattern, the greater the potential impact.

Population Growth in the Rocky River Watershed

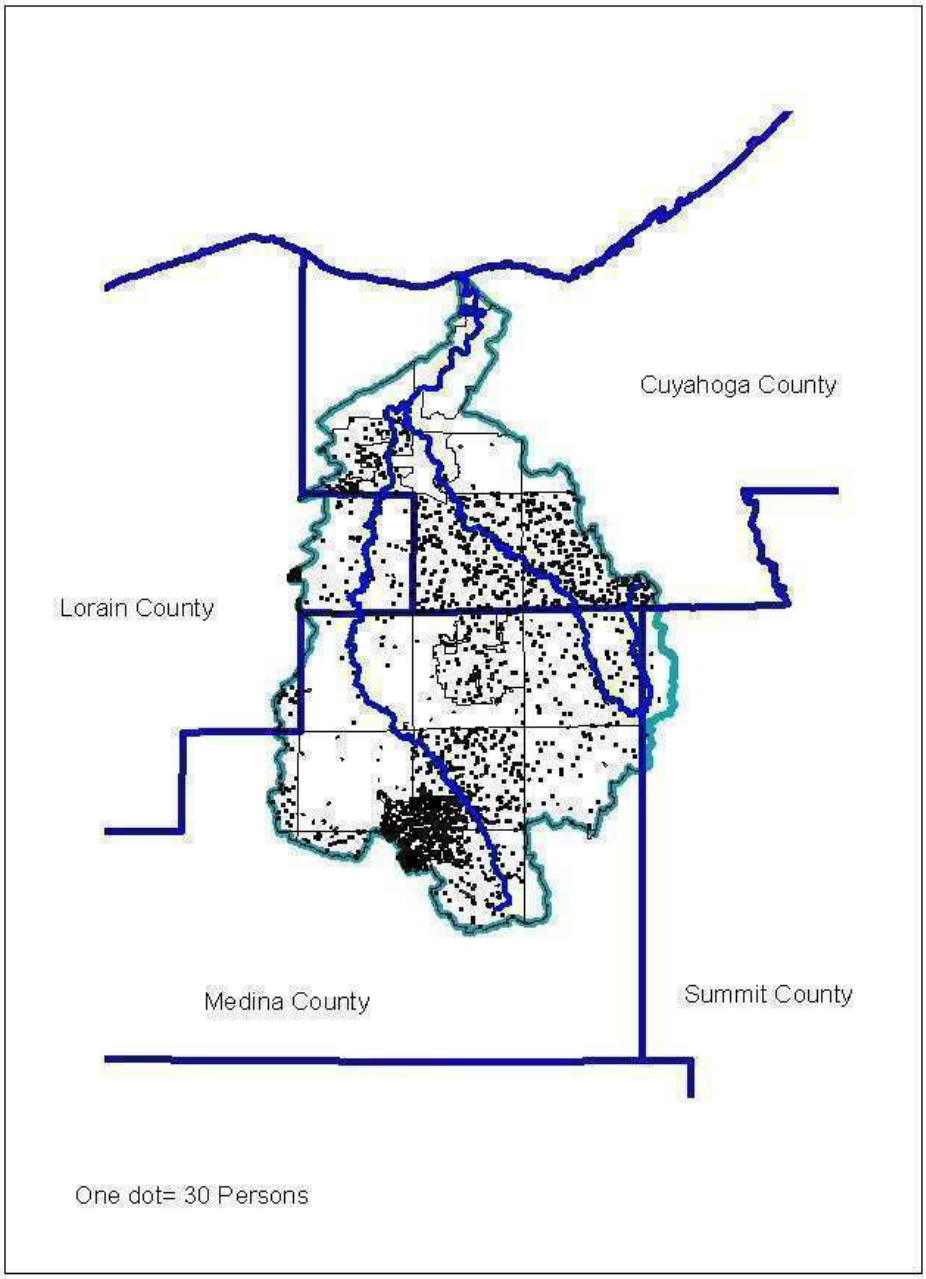


Figure 2

Table 1: Projected Population and Household Growth in the Communities of the Rocky River Watershed

Community	Population 1990	Projected Population 2000	Projected Population 2020	Households 1990	Projected Households 2000	Projected Households 2020	Population Change 2000-2020	Household Change 2000-2020
Berea	19051	19000	18700	7036	7124	7310	-300	186
Broadview Heights	12219	13600	15100	4757	5371	6223	1500	852
Brook Park	22865	20600	17900	7892	7252	6567	-2700	-685
Cleveland	505616	473200	417100	199794	190009	174393	-56100	-15616
Fairview Park	18028	17300	16300	7769	7574	7458	-1000	-116
Lakewood	59718	58900	57500	26999	27051	27005	-1400	-46
Middleburg Heights	14702	13700	12500	6106	5830	5601	-1200	-229
North Olmsted	34204	35000	34100	12657	13147	13382	-900	235
North Royalton	23197	28800	35500	8771	11101	14335	6700	3234
Olmsted Township	8380	10200	11400	3226	3980	4642	1200	662
Olmsted Falls	6741	7600	8600	2448	2797	3299	1000	502
Parma	87876	85600	82200	34685	34315	34424	-3400	109
Parma Heights	21448	20500	19200	9344	9065	8861	-1300	-204
Rocky River	20410	20200	19900	9276	9322	9591	-300	269
Strongsville	35308	42100	50000	12284	14918	18549	7900	3631
Columbia Township	6594	7200	8500	2124	2357	2911	1300	554
Eaton Township	6516	6900	7700	2037	2191	2554	800	363
Grafton Township	2013	2200	2700	622	690	885	500	195
Brunswick	28230	30000	32000	9082	9847	10967	2000	1120
Brunswick Hills	4328	6100	10000	N/A	N/A	N/A	3900	N/A
Chatham Township	1799	1900	1900	575	617	644	0	27
Granger Township	2932	3500	4600	1021	1239	1701	1100	462
Hinckley Township	5845	7200	9800	1915	2397	3410	2600	1013
Lafayette Township	3851	4200	4800	1450	1603	1910	600	307
Litchfield Township	2506	2900	3600	751	882	1144	700	262
Liverpool Township	3713	4000	4400	1156	1270	1466	400	196
Medina	19231	26300	41700	7242	10040	16589	15400	6549
Medina Township	4864	7100	12400	1570	2330	4253	5300	1923
Montville Township	3371	4100	5600	1073	1327	1895	1500	568
Sharon Township	3234	3200	2900	1140	1145	1084	-300	-61
York Township	2479	2500	2500	806	825	862	0	37

The second step in the evaluation of growth projections is to compare the actual Census count for the Year 2000 to the NOACA projections for 2000 and 2020 to determine any anomalies between actual and predicted growth patterns. The comparison numbers are shown in Table 2.

In Table 2, 20 of the 33 have a good relationship between predicted and actual growth patterns. This is defined as having an actual Year 2000 population that lies in between the actual 1990 population and the predicted 2020 population. Three Cuyahoga County communities that were predicted to be losing population actually grew by a small number of people. These communities are Middleburg Heights, Parma Heights and Rocky River, communities that are close to being built out.

Sharon Township in Medina County was predicted to lose a small amount of population, decreasing from 3,234 to 3,200 persons in 2000 and 2900 in 2020. In fact, the Township has grown to over 4,200 in population. York Township was predicted to remain constant in population has also grown dramatically, climbing from 2,479 people in 1990 to 2,912 in 2000. Seven other communities have experienced a population gain from 1990 to 2000 that exceeded the projections through 2020. Grafton and Liverpool Townships slightly exceed their 2020 projections already. Bath Township is 1,200 over its 2020 projection, while Brunswick is currently 1,300 over its 2020 projection. Eaton Township in Lorain County is almost 2,000 persons over its 2020 projection.

Evaluation of Projected Growth

One thing is very clear about population in the Rocky River Watershed. People are relocating to the southern half of the watershed in large numbers, while population remains relatively stable in the highly developed communities of the north. Much of this relocation was predicted in 1990, but those estimates appear to have been conservative.

One of the highest growth areas is in and around the City of Medina. Medina's 2000 Census population is 25,139, a gain of over 6,000 people since 1990. The four townships that surround the city grew by 7,000 people during the same period, with much of that growth being concentrated near the boundaries of the city. Growth pressure remains strong in this area. While, the City of Medina is nearly built out in its residential areas, new development continues at a strong pace in the township areas.

The other very high growth area in the Rocky River Watershed includes the cities of Strongsville and North Royalton. These two cities have grown by a combined 11,000 people since 1990. Population projections indicate that they will continue to grow and are expected to add an additional 14,000 people by 2020.

The Brunswick/Brunswick Hills area and the North Olmsted/Olmsted Falls area are also high growth areas both since 1990 and out into the future at least through 2020. Virtually every other community that drains to either the East or the West Branch is also expected to continue to develop. When updated population projections based on the 2000 Census become available in the course of the next year, one can anticipate that the growth trends predicted in Figure 2 will be maintained through 2020, but that York Township will be added to the high growth area.

Table 2: Consistency of Projected Population Growth in the Communities of the Rocky River Watershed

Community	Population 1990	Population 2000	Projected Population 2020	Consistency of Projection
Berea	19051	18970	18700	Consistent
Broadview Heights	12219	15967	15100	Underestimated Growth
Brook Park	22865	21218	17900	Consistent
Cleveland	505616	478403	417100	Consistent
Fairview Park	18028	17572	16300	Consistent
Lakewood	59718	56646	57500	Loss Higher than Estimated
Middleburg Heights	14702	15542	12500	Unexpected Growth
North Olmsted	34204	34113	34100	Consistent
North Royalton	23197	28648	35500	Consistent
Olmsted Township	8380	10575	11400	Consistent
Olmsted Falls	6741	7962	8600	Consistent
Parma	87876	85655	82200	Consistent
Parma Heights	21448	21659	19200	Unexpected Growth
Rocky River	20410	20735	19900	Unexpected Growth
Strongsville	35308	43858	50000	Consistent
Columbia Township	6594	6912	8500	Consistent
Eaton Township	6516	9675	7700	Underestimated Growth
Grafton Township	2013	2722	2700	Underestimated Growth
Brunswick	28230	33388	32000	Underestimated Growth
Brunswick Hills	4328	5469	10000	Consistent
Chatham Township	1799	2158	1900	Underestimated Growth
Granger Township	2932	3928	4600	Consistent
Hinckley Township	5845	6753	9800	Consistent
Lafayette Township	3851	5476	4800	Underestimated Growth
Litchfield Township	2506	3250	3600	Consistent
Liverpool Township	3713	4329	4400	Consistent
Medina	19231	25139	41700	Consistent
Medina Township	4864	7783	12400	Consistent
Montville Township	3371	5410	5600	Consistent
Sharon Township	3234	4244	2900	Unexpected Growth
York Township	2479	2912	2500	Underestimated Growth
Bath Township	7437	9635	8704	Underestimated Growth
Richfield V&T	5010	5424	6847	Consistent

Evaluation of the Threat Posed by Growth

Water Quality impacts associated with new development can be broadly classified into four categories: wastewater treatment impacts, storm water runoff impacts, riparian area impacts, and nonpoint source pollution impacts.

Wastewater Treatment Impacts: Wastewater impacts are perhaps the most straightforward to deal with. The watershed is served by a series of wastewater treatment plants that serve much of the high growth areas. These plants are functioning at high levels of efficiency at this time and have adequate capacity to meet the expected needs through 2020. Two Medina County Plants will serve much of the projected growth. These are the Liverpool Plant on the West Branch and the Hinckley Plant on the East Branch. Both plants have or are undergoing upgrades designed to insure that future waste loads are adequately handled. Virtually all of the growth in and around the City of Medina will be directed to the Liverpool Plant. Brunswick splits it wastewater flow between the Liverpool and Hinckley Plants. There is adequate capacity at the remaining wastewater plants in the Rocky River to accommodate growth in their service and planning areas. Strongsville and North Royalton can accommodate high-density development either at plants that they own themselves or by ties in into the Southwest Interceptor owned by the Northeast Ohio Regional Sewer District. The North Olmsted Plant can handle increased flows from development in that community and from portions of neighboring communities. In spite of this wastewater treatment capacity, it is expected that a significant portion of new homes to be built in the watershed will be serviced by home sewage treatment systems (HSTSs).

Figure 3 demonstrates where such areas are located. Reliance on HSTSs in North Royalton and Strongsville is predicated on the cost of running sewer lines into sparsely populated areas with large lot sizes. In Hinckley Township, sanitary sewer service could be provided to some areas but the community has chosen to support the maintenance of its rural character by opting to rely on HSTSs. Columbia Township is exploring ways to provide limited sanitary service to portions of the Township while maintaining low-density development in other areas. Overall, it is the valley of the East Branch that is likely to see the greatest influx of new development that is supported by HSTSs. This happens to be one of the targeted areas for addressing existing problems related to failing HSTSs. The relationship of future growth and unsewered area is shown in Figure 4.

As stated above, a significant portion of new development in the Rocky River watershed will take place in areas that are to be served by home sewage treatment systems (HSTSs). These systems, traditionally referred to as septic tanks, will encounter an increasingly rigorous set of performance standards over the course of the next few years. The soils in the Rocky River are not well suited to the use of traditional septic tanks that rely on absorption of the treated wastes by the ground. A generation of systems known as off-lot discharging systems have become commonplace in Northeast Ohio. These systems treat the wastewater prior to discharging it to a storm sewer, drainage ditch, or stream. The problem with this type of system is that, when they are not operated or maintained properly, they discharge polluted wastewater directly to the environment. USEPA is taking steps to require that all such systems in Ohio apply for and receive an NPDES permit that would regulate their operation. Homeowners will have the option to install alternative systems that avoid these regulations but at an added cost to install. Communities are likely to expand their wastewater treatment service areas to accommodate growth in some of the areas that are currently unsewered. This will result in a decreased

use of HSTSs in some areas of the watershed. One way or the other, the potential impacts to the Rocky River from soon to be installed HSTSs will be minimized by these pending actions.

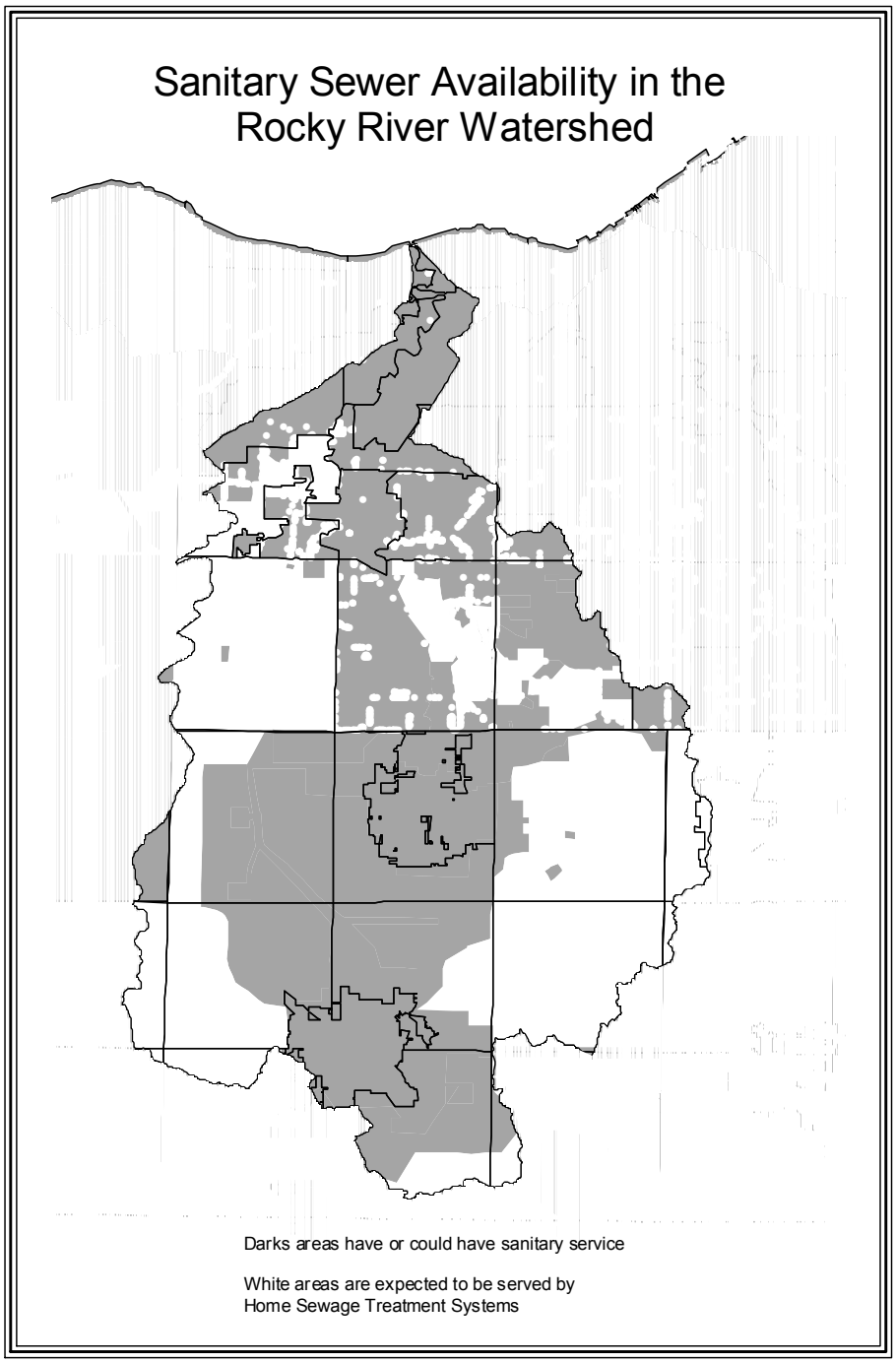


Figure 3

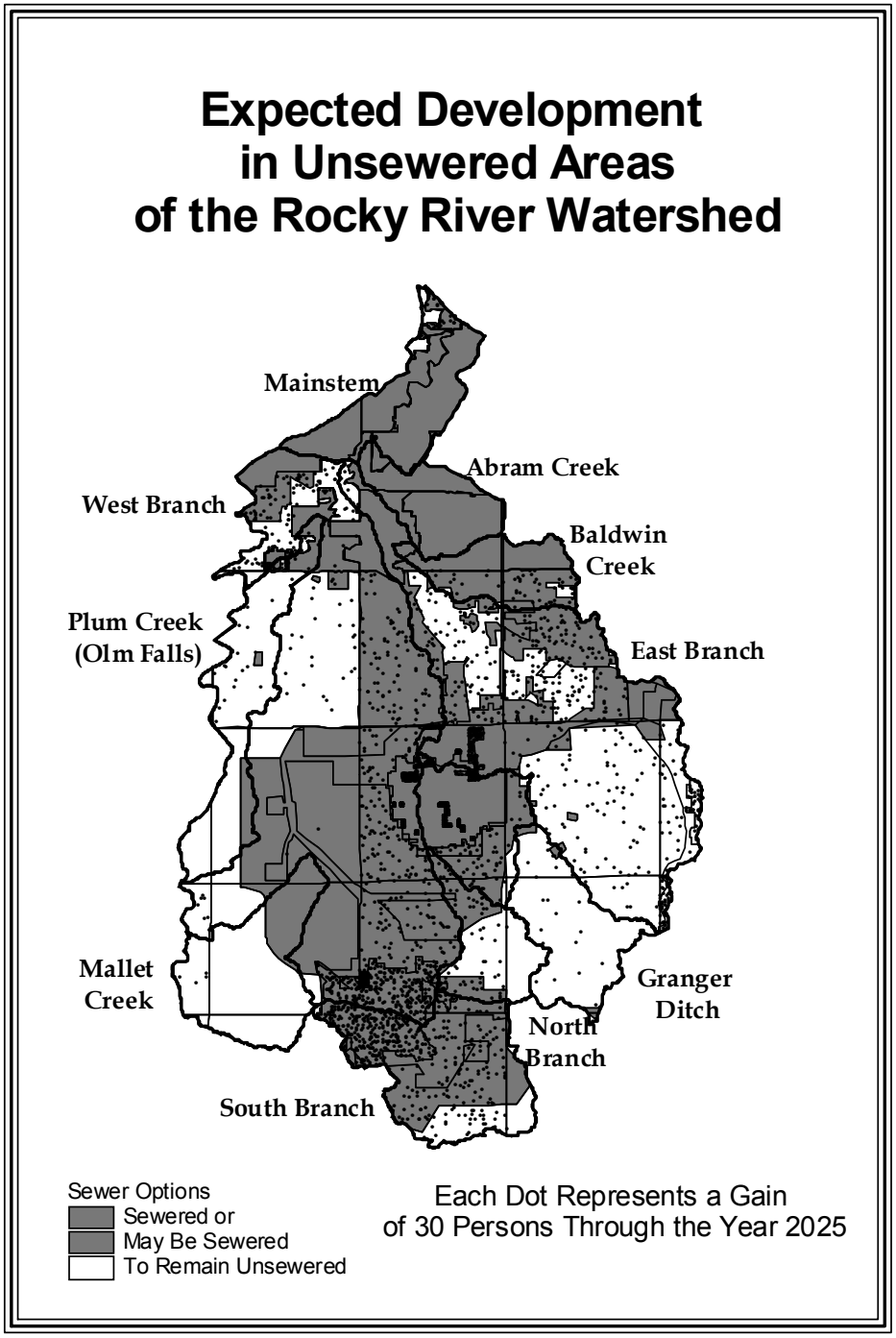

Expected Development
in Unsewered Areas
of the Rocky River Watershed
Mainstem
Abram Creek
West Branch
Baldwin
Creek
Plum Creek
(Olm Falls)
East Branch
Mallet
Creek
Granger
Ditch
North
Branch
South Branch
Sewer Options
Sewered or
May Be Sewered
To Remain Unsewered
Each Dot Represents a Gain
of 30 Persons Through the Year 2025

Figure 4

The Cuyahoga County Board of Health estimates that over the next 10 years, approximately 60 new Household Sewage Treatment Systems on newly developed lots will be installed in Cuyahoga County. During the last 4 years, the average number per year has been consistent at 5-6 HSTS on newly developed parcels. The new HSTSs are allocated to the East Branch in North Royalton and Strongsville (40-45 new systems) and to Olmsted Township (15-20 new systems) according to best professional judgment. Medina County is projected to have in excess of 100 systems installed in the next 10 years. One area where these systems will be concentrated is in the upper East Branch in Hinckley Township (an estimated 50 systems). Development in Granger Township in the Granger Ditch Watershed (10 systems) and in Medina Township in the North Branch Watershed (25 systems) will also be significant. A scattering of HSTSs is projected in Mallet Creek in Litchfield Township (5 systems) and in the upper reaches of the South Branch in Montville Township (10 systems). Plum Creek in Columbia Township is projected to receive 50 additional systems in 10 years, although future sewering plans may reduce this number. In Summit County, an additional 100 systems could potentially be installed in the East Branch Watershed. In all of the above listed projected expansions, it is anticipated that on-site discharging systems will be required to minimize future problems and associated impacts.

Storm Water Runoff Impacts: The potential impacts from storm water runoff associated with advancing development are a very real concern to the watershed. Past history has told us that it is very difficult to maintain diverse and healthy aquatic communities when urbanization results in an increase in the percent imperviousness of a watershed that exceeds 25%. This is already evidenced by the impacts seen in the mainstem, Abram Creek, Baldwin Creek and other streams of the watershed that have already been heavily urbanized. New development must act to control erosion and sedimentation during the development process and storm water runoff quantity impacts after construction is completed. The rules and regulation governing this control are being upgraded as part of the Storm Water Permit Phase II Program initiative. The scope and extent of projected development in the upper Rocky River Watershed make it mandatory these controls be conscientiously applied and rigorously enforced. If this were coupled with a more widespread reliance on low-impact development principles, the effects of the anticipated growth in the watershed should be marginal. If it is not done, than it will be very difficult to maintain use attainment compliance in most of the streams tributary to the East and West Branches.

Another potential impact of storm water management in the Rocky River Watershed has to do with development in headwater stream areas. Headwater streams are those feeder creeks that generally have a drainage area of less than one-half square mile. These creeks are an integral part of the aquatic ecosystem but they have heretofore received little protection in the region. These streams have regularly been graded over during the land-clearing phase of a development and are often replaced with enclosed storm drains. Continued loss of headwater capacity stress all downstream reaches and will, if allowed to proceed too far, result in the inability of a downstream stretch of stream to meet its designated water use attainment criteria. Model legislation is available to help communities identify and protect these critical headwater resources. It remains to get the ordinance passed in Rocky River Watershed communities.

One cannot presuppose that new development will lead to the creation of new storm water impacts or the aggravation of problems that already exist. Adequate legal authority exists to minimize impacts

from properly designed, installed, and maintained storm water control systems built into new development projects. Experience does tell us that it will take thoughtful application and aggressive enforcement for these control efforts for them to work properly. Therefore, the high growth communities must be encouraged to take an active and proactive role in insuring that this happens.

Riparian Area Impacts: Past development in many portions of the Rocky River Watershed has resulted in pronounced disturbances of the vegetation in riparian corridors. A problem that compounds the potential effects of additional development on the riparian zones in the Rocky River is the fact that this development is occurring in headwater streams to a much greater extent than in the past. It is difficult to estimate how many new homes will abut the riparian corridor along the streams of the Rocky River. Perhaps one in ten new homes will be along these corridors. The communities in the Rocky River Watershed that are regulated by the Phase II Storm Water Permit program have all committed to enacting riparian set back ordinances by the end of 2005. After this date, natural vegetation will be maintained along all streams in the watershed including the small streams classified as Headwater Streams by Ohio EPA. This action will potentially protect thousands of linear feet of riparian zones and associated habitat. The importance of this can be gauged by a review of Figure 5 that shows currently disturbed riparian zones as a result of existing development.

Nonpoint Source Pollution Impacts: The third series of water quality impacts that are associated with advancing urban development relate to nonpoint source pollution. Nonpoint pollution results from the way that we use the land and the chemicals that we spread, dump, or leak onto the ground. When rainwater, snowmelt, wind, or other agent moves these particles to the stream system, we can have nonpoint pollution problems. Examples of these are oil or gasoline that spill or leak from our cars, pesticides that we apply on our yards or farm fields, or toxic wastes that we fail to dispose of properly. Nonpoint pollution loadings tend to be fairly regular across the region. The more people you have living or working in a watershed, the more nonpoint source pollution you tend to have. It stands to reason that nonpoint loadings will increase in subbasins that are being urbanized. This describes most of the Rocky River Watershed.

There are at least three tools available to effectively limit the impacts from nonpoint source pollutant loadings in a developing watershed. The first is incorporate 'water quality' basins into each new development. These basins make use of the settling characteristics of the design and aquatic plant processing of numerous pollutants to reduce the amount of such materials moving off the development. A second tool is the use of low-impact or conservation design development practices. These practices leave much of a development site in a naturally vegetated state. This allows for less runoff to carry pollutants to the stream system and also allows for the filtering of some runoff from disturbed areas before it reaches the stream. A third technique to control nonpoint source pollution is education programming directed at residents and worker alike in the watershed. This programming would emphasize the need and methods of opportunities for each person to reduce or minimize their own contribution to nonpoint loadings.

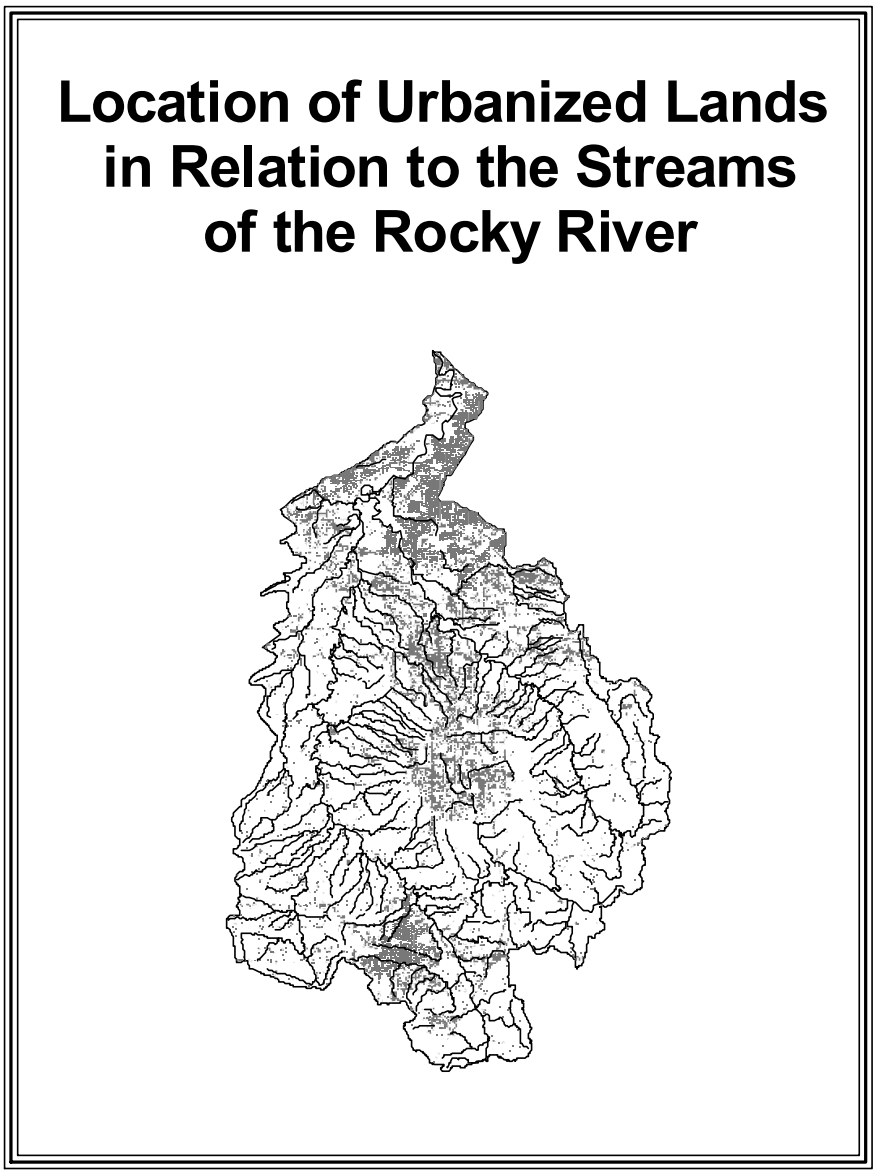


Figure 5

Growth and Its Potential Impact on Local Watersheds

Rocky River Mainstem: The communities that are drained directly by the Mainstem have either a stable population or are experiencing small declines in population. This stems from the fact that these are largely built-out communities that have little room for new residential construction. Population declines are largely driven by the regional trend that sees a continued decrease in the size of the average family occupying existing structures.

The Mainstem does receive runoff from those upstream areas that are expected to grow considerably over the course of the next 20 years. However, nature tends to buffer large streams from these

impacts. If controls are put in place to protect the receiving streams in the headwater areas, it can be reasonably expected that adverse affects in the Mainstem will be minimal.

Abram Creek is also largely built out. The on-going expansion at the Cleveland Hopkins International Airport has had a dramatic impact on Abram Creek and its channel, but that impact is largely complete.

The East Branch: The East Branch below Baldwin Lake is another section of the watershed that will see little development pressure due to the lack of available land for development. Baldwin Creek is likewise expected to experience only a small growth in population for the same reason.

Between Baldwin Lake and Hinckley Lake the situation is the reverse. Strongsville, North Royalton, Brunswick, and Hinckley Township are all projected to substantially grow in population through 2020. It is estimated that as many as 12,000 people will relocate into the area drained by the East Branch in these communities in the next 20 years. This growth is likely to affect Healey Creek and the North Royalton 'A' tributary as well as the East Branch itself. The lower reaches of Healey Creek remain sparsely developed as does the headwaters of the North Royalton 'A' tributary.

It has been stated that it is the valley of the East Branch that is likely to see the greatest influx of new development that is supported by HSTSs. Given that this happens to be one of the targeted areas for addressing existing problems related to failing HSTSs, it is imperative that that HSTS management programs receive priority in this area. Sanitary sewer expansion feasibility studies, particularly in Strongsville and North Royalton, should be undertaken to determine where this option might be feasible. New system designs and technologies should be demonstrated for use in both new construction and in upgrade installations.

The mainstem of the East Branch is protected to some degree due to the fact that the Cleveland Metroparks Mill Stream Run Reservation straddles the stream through a large part of North Royalton and most of its length in Strongsville. The Cleveland Metroparks is studying how to protect the remainder of the corridor below Hinckley Lake. Maintenance of wooded riparian areas throughout this corridor is a high priority for many of the Rocky River Watershed stakeholders. The Storm Water Permits Phase II Model Implementation Plan calls for all developing communities to institute riparian zone and wetland area setback ordinances. Implementation of the recommended setback is important not only along the mainstem of the East Branch but in its headwaters as well.

Hinckley Lake is already suffering from excessive sedimentation and nutrient enrichment. Projected development upstream of the lake occurs in southeastern North Royalton, eastern Hinckley Township, and in the Richfield/Richfield Township area of the watershed. All of this area is likely to be served by HSTSs. Discharges from these systems and from inadequately controlled runoff from construction sites could further threaten Hinckley Lake. Given the value of the lake as a recreational and waterfowl resource, care must be exercised as development of the upper watershed proceeds.

Further downstream lies Baldwin Lake that serves as a portion of the water supply for the City of Berea. This lake has already been impacted by development in the watershed over the last 25 years or more. Sediment is a continuous problem in the Lake. Elevated chloride levels in the winter resulting from road salt contaminated runoff forces Berea to rely on supplies stored in nearby Coe Lake or by

temporarily switching over to City of Cleveland water. The projected development in the watershed above Baldwin Lake has the potential to add to these problems. The overall impact on Baldwin Lake as a result of new development is lessened somewhat by the distance upstream to most of the developing areas. Furthermore, given that management of the impacts of development has markedly improved over the course of the last 25 years, it is not expected that future impacts from new development will be as pronounced as in the past.

The West Branch: Development pressures are highly variable within the drainage area of the West Branch of the Rocky River. They range from intense in and around Medina to minimal in Mallet Creek, Cossett Creek, and other areas. The Plum Creek near Olmsted Falls is likely to experience little growth in the next 20 years while the Plum Creek near Brunswick continues to grow. Two small streams drain much of the City of Medina. These streams, Champion Ditch and Bradway Creek, are already heavily impacted by urban runoff and are expected to have to absorb even more. The South Branch and the North Branch are streams in the middle of the development spectrum. Better access to road and utility infrastructure has made the Strongsville/North Royalton/ Brunswick triangle and the Medina City area more attractive to development. Pressure on the North and South Branch areas is expected to intensify as these other areas near saturation. This will probably begin to happen during the later half of the next 20-year period. Blodgett and Baker Creeks are also subject to a moderate growth pressure and are expected to develop slowly over the next 20 years as well.

Within the West Branch, most development will occur in areas that have sanitary sewer service available. The notable exceptions are substantial areas of the South and North Branches and the downstream portion of Plum Creek near Brunswick. Local officials are trying to maintain the rural character of these areas and are relying on the use of HSTSs to further that objective. A diligent HSTS management program is of a priority in these areas.

GUIDE TO THE CAUSES AND SOURCES OF WATER QUALITY PROBLEMS IN THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix D
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

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Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

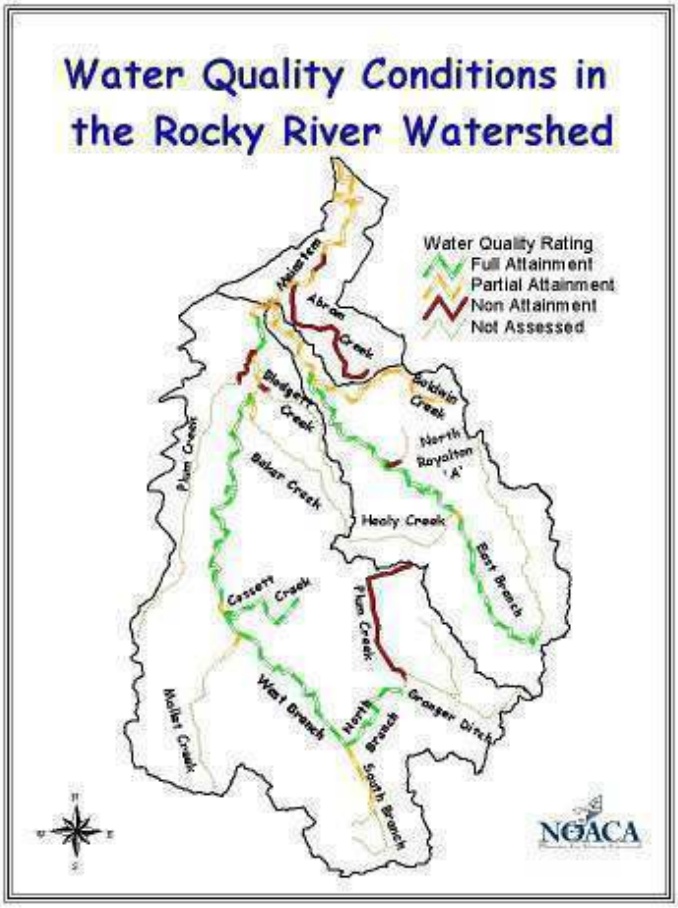
Abstract

This report summarizes the causes and sources of water quality problems in the Rocky River Watershed of northeast Ohio. It includes a discussion of point and nonpoint sources. Eighteen stream segments in the watershed are evaluated. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

Introduction

There are two analyses that can be used to define water quality problems and their distribution in the Rocky River Watershed. The first is the Ohio EPA Use Attainment Assessment.(See the figure below.) The second is the Beneficial Use Impairments Assessment conducted by the Rocky River Watershed Council's Work Group. Taken together, these assessments have identified a series of causes for the water quality problems documented within the watershed. This report explains those causes and their sources. It also gives some examples of how they combine to impact water quality of the Rocky River.



Water Quality Problem Causes

Nitrogen: Nitrogen is an essential nutrient. It is a major component of Nature's fertilizer that makes both plant and animal life possible. Like most chemicals in Nature, the problem in our lakes and streams is not nitrogen; rather it is too much nitrogen. Sometimes it is too much of a specific form.

At very high doses, nitrogen can be fatal to aquatic life. In the Rocky River, nitrogen at this level is not the problem. It probably never was, even before all of the wastewater treatment plants were upgraded beginning in the 1970's. Nitrogen exists in lower concentrations throughout the Rocky River and its tributaries. It exists at levels that are more a nuisance than a threat. Much like an overly loud neighbor, nitrogen loadings in the Rocky River are an irritant. Not enough to make aquatic organisms want to move out of most stretches of the river by itself. In some stretches of the river, the nitrogen level can be enough so that other nuisances that co-exist with it make for a less desired neighborhood. This is one where not all of the people move out, but one that is not up to previous standards. The most common co-existing nuisance is degraded habitat that has resulted from incompletely controlled urban runoff.

Elevated nitrogen levels seem to promote growth of less desirable plant forms in the river. These plant forms are not the preferred food of many of the resident fish and macroinvertebrates. This stress might just be high enough to send them looking for greener pastures in some portions of the watershed.

Ammonia-nitrogen is the problematic form of nitrogen –it can even be the killer form. We use ammonia based cleaners to clean the tough stuff. Imagine having to live in it. Ammonia levels may have been high enough at some restricted locations in the past to be fatal to fish and other aquatic life in the Rocky River. It surely was in other streams in the region. Those levels do not occur in the Rocky River today. Still, ammonia takes its toll. It can do harm at sublethal levels. When it breaks down in the stream through a naturally occurring chemical reaction, it can use up much of the available oxygen adding yet another stress on stream life. If it breaks down very rapidly, it can form high levels of nitrite-nitrogen which can be even more deadly than high ammonia levels. This is a common occurrence in some backyard water gardens, but does not happen anymore in streams like the Rocky River (we hope).

With the exception of the recently corrected problem associated with the ammonia formed from the breakdown of the urea used in deicing operations at the airport, nitrogen problems in the Rocky River stem from low-grade impacts. A little bit of control exercised in a lot of areas may be enough to reduce these levels to a point where they do not inhibit the ability of aquatic organisms to flourish. The other option is to do a whole lot of budget reducing by greatly increasing the ability of our sewage treatment plants to try to accomplish the same end.

Habitat Modification and Siltation: Habitat modifications refers to a series of actions that all have one thing in common. They degrade or destroy places for aquatic organisms

to live full and productive lives. A well functioning aquatic community is a diverse community. This is one that is in balance and one where everyone shares the resources of the stream. It has a place for everyone. Places to eat and places to sleep. Hiding places and hunting grounds. Places for the members of high society and for the working masses. Even places for the exotic immigrants. Nature provides an incredibly diverse habitat in our streams. We are incredibly good at 'undiversifying' it. We do this every time that we channelize a stream or fill in wetlands adjacent to it. We do it when we strip the stream banks bare of heavy vegetation and replace it with asphalt or grass. We do it when we dam the river up or when we plow its headwaters over. We even do it when we are sleeping through a summer's eve thunderstorm. That's because the storm water running off our roofs, drives, and roads is being blasted out of our storm sewers and is being dumped too quickly into our streams. We turn the sprinkler into a water jet and watch the soil of our stream banks wash away.

Within the watershed, local communities are working to control the rate and quantity of runoff from new construction sites in an attempt to minimize future losses of habitats. These communities need to take action to protect existing vegetation in riparian corridors. They also need to address the leveling over of small headwater streams as part of that development. The loss of riparian zone vegetation and headwater steams are considered to be the biggest threats facing the Rocky River.

Another flow alteration that affects the aquatic community in the Rocky River is the presence of numerous low head dams. These dams typically back up low flow waters to a depth of 2-3 feet. Natural fast-moving waterways are replaced with large pools where the water can grow stagnant during dry weather periods. These dams can also block the migration of a variety of aquatic organisms. This prohibits the maintenance of natural community structure and distribution.

One further way that we adversely alter habitat occurs when we dump sediment eroded from ground that we strip bare and leave uncovered into the stream. Our streams are sized by Nature to carry the amount of water and sediment that Nature decided should be in the stream. It didn't design our streams to take the abuse that we lay on them. The excess sediment, that didn't beat up the adult organisms or bury their young, fills up all of the living space in the stream. When this happens, no one can live there anymore. The only thing worse than living under a rock, is not having a rock to live under.

Thermal Modification: The aquatic communities that live in our undisturbed streams are adapted to the temperature conditions found in those streams. When humans enter the scene, two things can happen that result in the raising of stream temperatures. The discharge of wastewater raises local water temperatures. The discharge of cooling waters associated with industrial activity is the worst-case scenario, and one not very important in the Rocky River. Flow from our municipal wastewater plants may not have a large and immediate impact. However, due to the way that the Rocky River behaves during the summer, wastewater flows have a larger significance.

During the comparatively dry summer season, natural stream flow in the Rocky River is very low. This is a time that is very stressful to aquatic organisms. It is much like the effect that living in the desert has on humans. It also means that most of the water in the stream at this time is treated wastewater, and this water starts out warmer than natural flows. The end result is a river with an elevated temperature during the period when conditions are most stressful to the aquatic community to begin with.

Now consider the effect of the other impact that humans have on the stream's temperature: we enjoy being close to the water's edge. We build on the river's bank. We cut down streamside trees and shrubs and plant grass so that we can enjoy the view. We never take the time to ask, "Where did all of the shade go?" For many aquatic organisms this combination of temperature raising events is too much. Much like Eskimos set down near the equator, many aquatic organisms head north, so to speak. Better to leave a clean and posh living space than to cook in it!

Organic Enrichment and Dissolved Oxygen: Oxygen is the breath of life. This holds true for air breathing organisms as well as those that live in the water. Every living thing needs oxygen. Organisms in the water are not the only things that need oxygen. Diverse bodies of chemicals that can be found in a lake or river also use it. With oxygen in the water, it is first come, first served. Chemicals needing oxygen can wait around until a molecule or two comes by. Fish and other life need oxygen all of the time, and they are not very well equipped to just wait around for some to come by.

When too many oxygen demanding chemicals are introduced into the stream, the aquatic community begins to suffer. It's hard to chase down your dinner when you are gasping for breath. If they can't find enough oxygen, they move or die. In the Rocky River the primary type of oxygen-related problems result from what is known as organic enrichment. Elevated loadings of nitrogen compounds and/or phosphorus can result in the depletion of dissolved oxygen in the water. This happens sometimes because the oxidation of these compounds uses up some of the available oxygen. The same compounds can act as fertilizer allowing algae in the water to grow at excessive rates. Overgrown algae uses large quantities of oxygen particularly during the night. When this algae dies off, the decomposition process also uses large amounts of dissolved oxygen. The river is able to absorb some of this demand, but several sections of the Rocky River and some of its tributaries have problems dealing with it.

Toxic Chemicals: Much progress has been made at reducing or eliminating toxic chemicals from the Rocky River. Wastewater Treatment Plant discharges of these parameters are rarely a problem. Elevated levels of chlorine are suspected to cause an impact in Baldwin Lake. Low levels of these compounds are affecting the bass populations in the West Branch to the point that a fish advisory has been posted recommending that local fishermen limit the amount of these fish that they eat in a given time period. Runoff containing Road Salt provides an undefined amount of stress on the aquatic communities in the river. Levels are high enough during the winter and spring runoff periods, that Berea has taken steps to protect its water supply. Organic and Non-organic priority pollutants have been detected within Baldwin Lake.

Bacteria/Pathogens: Water Quality criteria for determining whether rivers and streams are suitable for recreational uses are established in the Ohio Water Quality Standards (Table 7-13 in the Ohio Administrative Code 3745-1-07) based upon the presence or absence of bacteria indicators in the water column. Indicator organisms used for these determinations are fecal coliform bacteria and Escherichia coli.

Fecal coliform bacteria are microscopic organisms that are present in large numbers in the feces and intestinal tracts of humans and other warm-blooded animals. E. coli typically comprises approximately 97 percent of organisms found in the fecal coliform bacteria of human feces, but there is no simple way to differentiate between human and animal sources of coliform bacteria in surface waters, although methodologies for this type of analysis are becoming more practicable. These microorganisms can enter water bodies where there is a direct discharge of human and animal wastes, or may enter water bodies along with the runoff from soils where these wastes have been deposited.

Pathogenic (disease causing) organisms are typically present in the environment in such small amounts that it is impractical to monitor them directly. Fecal coliform bacteria, including E. coli by themselves are usually nonpathogenic. However, some strains of E. coli can be toxic, causing serious illness. Although not necessarily agents of disease, fecal coliform bacteria and E. coli may indicate the potential presence of pathogenic organisms that enter the environment through the same pathways. When fecal coliform bacteria or E. coli are present in high numbers in a water sample, it invariably means that the water has received fecal matter from one source or another. Swimming or other recreational-based contact with water having a high fecal coliform or E. coli count may result in ear, nose, and throat infections, as well as stomach upsets, skin rashes, and diarrhea. Young children, the elderly, and those with depressed immune systems are most susceptible to infection.

Designations of recreational uses for water bodies in the Rocky River watershed are listed in the Ohio Administrative Code 3745-1-10. The majority of the water bodies with designated recreational uses in the Rocky River watershed are designated Primary Contact Recreation (PCR), which "…are waters that, during the recreational season, are suitable for f\full-body contact recreation such as … swimming, canoeing, and SCUBA diving with minimal threat to public health as a result of water quality (Ohio Administrative Code 3745-1-07 (B) (4) (b)). Waters within the Hinckley Reservation of the Cleveland Metroparks are designated bathing waters. Applicable water quality standards for the recreational uses supported in the Rocky River watershed are listed in the following table. Bacteriological results from environmental samples are typically reported as colony forming units (cfu) per 100 ml of water.

Bacteria are monitored at 27 locations in the Rocky River Watershed. The Recreational Use criteria are regularly exceeded at 24 of these locations as shown in the following map.

Primary Contact Recreational Use Water Quality Criteria applicable to the Rocky River Watershed (Table 7-13 of Ohio Administrative Code 3745-1-07). At least one of the two bacteriological standards (fecal coliform or E. coli) must be met.

Bathing Waters

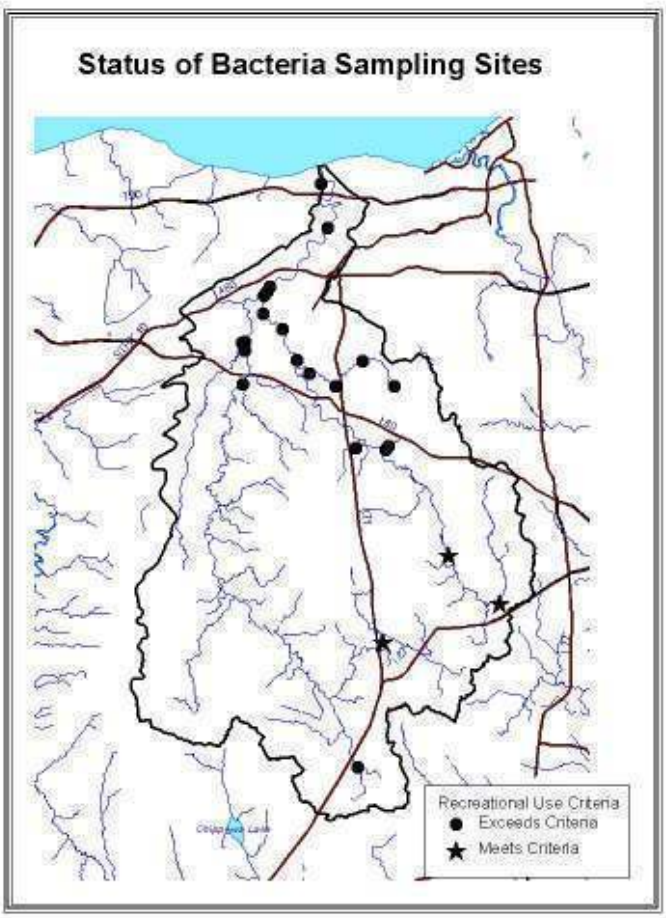
Fecal coliform-geometric mean fecal coliform content (either MPN or MF), based upon not less than five samples within a thirty day period, shall not exceed 200 per 100 ml and fecal coliform content (either MPN or MF) shall not exceed 400 per 100 ml in more than ten percent of the samples taken during any thirty day period.

E. coli-geometric mean E. coli content (either MPN or MF), based upon not less than five samples within a thirty day period, shall not exceed 126 per 100 ml and fecal coliform content (either MPN or MF) shall not exceed 235 per 100 ml in more than ten percent of the samples taken during any thirty day period.

Primary Contact

Fecal coliform-geometric mean fecal coliform content (either MPN or MF), based upon not less than five samples within a thirty day period, shall not exceed 1000 per 100 ml and fecal coliform content (either MPN or MF) shall not exceed 2000 per 100 ml in more than ten percent of the samples taken during any thirty day period.

E. coli-geometric mean E. coli content (either MPN or MF), based upon not less than five samples within a thirty day period, shall not exceed 126 per 100 ml and fecal coliform content (either MPN or MF) shall not exceed 298 per 100 ml in more than ten percent of the samples taken during any thirty day period.



Water Quality Problem Sources

Point Sources

There are ten significant point source dischargers and numerous smaller dischargers in the Rocky River Watershed. During low flow periods, the Rocky River is an effluent dominated river. All major wastewater treatment plants are operating within their permitted levels for nitrogen, ammonia, and phosphorus. Substantial improvements have been implemented at many of these plants in the past several years. These improvements are expected to result in a lessening of nutrient related problems. It is not yet known how significant these improvements will be.

Point sources are rated as a primary contributor of nutrients to the waters of the Rocky River and to many of the documented organic enrichment problems.

Urban Runoff

The lower half of the Rocky River Watershed is primarily urban and suburban. A significant part of this part of the watershed is covered with impermeable surfaces. Consequently, the runoff waters from roadways, parking lots, driveways, and roof drains are impacted by road salt, vehicle fluids, roofing materials, and litter/debris. Efficient storm water drainage systems allow runoff waters to discharge into local streams at an accelerated rate, which can intensify downstream water levels. Impermeable surfaces can also transfer heat to runoff waters that can raise the average water temperatures in the streams. Runoff can also be contaminated by residential lawn wastes and chemicals, by industrial/commercials spills, by pet wastes, and by improper use or disposal of household chemicals. The increased rate and volume of storm water runoff from highly developed areas can alter the natural flow regime that, in turn, causes a degradation of the aquatic habitat in the stream.

Urban runoff contributes substantial loadings of nutrients to the Rocky River. It is the suspected source of the toxic materials that are affecting the bass populations in the lower West Branch. It also contributes to low levels of toxic materials most of the streams in the watershed. Urban runoff is a significant source of the sediment flowing in the Rocky River but is secondary to loadings from construction sites and agricultural lands. Noted temperature rises in the watershed are partially due to the effects of urban runoff.

Farms/Nurseries/ Golf Courses

The upper reaches of the East and West Branches of the Rocky River extend into rural areas that have agricultural based activities and many golf courses. Plowing fields to the edge of waterways can cause significant soil loss into local streams. Sudden sediment loads can totally change a stream bottom habitat, which directly impacts the entire aquatic community. Allowing livestock to enter streams cam accelerate stream bank erosion and increases nutrient levels in the water. Runoff from feedlots, animal waste

piles, or improper manure applications contributes nutrients and bacteria to local streams. Over application or untimely application of pesticides on farm fields, nursery areas, or golf courses can stress or eliminate aquatic organism. Fertilizer run-off can cause aquatic plants to grow at uncontrollable rates, creating an imbalance in the ecosystem.

Agricultural sediment and nutrient loadings are most pronounced in Mallet Creek, a highly agricultural watershed. Agriculture has limited impact at other locations in the headwater areas of the West and East Branches. Its affects are limited by the rather limited scope of agricultural activity in the watershed.

Nurseries are particularly prevalent in the lower West Branch but are scattered throughout the watershed in limited numbers. They are not considered to be major contributors to known water quality problems.

Golf courses are widespread in the watershed. They are managed to the degree that no cases of pesticide contamination or gross over fertilization have been documented. As a group, they are responsible for significant disruptions of the riparian corridors in the watershed. The extent of the disruption varies from course to course. Some have large tracts of riparian corridor while others have extensive disruptions. Most could improve riparian vegetation, at least in limited locations, without affecting the quality of play.

Construction Sites/Suburbanization

Construction activities, such as individual houses, residential developments, commercial properties, and industrial sites, are occurring throughout the watershed. Improperly controlled storm water runoff can carry tons of soil into local streams, which can devastate an aquatic community. Construction sites are regulated by Ohio EPA through its Storm Water Permits Program and by local communities. Concerted enforcement of these regulations is necessary to limit potential damages.

Suburbanization has had a major impact over the years on the quality of the fish and wildlife habitat. It is responsible for considerable hydromodification and flow alterations in the watershed. Suburbanization is the leading cause of the loss of headwater habitat as very small streams are graded or culverted over.

Riparian Corridor Disturbances

Vegetation along the embankments of streams and lakes offers many benefits. These include stream bank stabilization, filtration of runoff waters, food sources, cooler water temperatures, and habitat enhancement. Conservation easements, land trusts, education, and responsible legislation are valuable tools for riparian corridor protection.

Much of the riparian corridor of the Rocky River mainstem and its major tributaries is in a protective state. Local disturbances are common and most of these stretches have opportunities for restoration. All of the 'Creeks' (Abram, Baldwin, both Plums, Champion, etc.) have heavily disturbed riparian zones.

Household Sewage Treatment Systems

Household Sewage Treatment Systems (HSTS's) provide for treatment of wastewater from homes or businesses that are not connected to a municipal wastewater treatment system. These systems need to be properly operated, maintained, and replaced when necessary in order to provide for protection of local waterways. When not properly operating, these systems discharge bacterial wastes, nutrient loading, and toxic chemicals to the stream system. Many of the systems used in the Rocky River Watershed are a type known as off-lot discharging systems. This means that when not properly operated, contaminated water is released directly into a stream or a storm sewer that flows right into one. This increases the likelihood of developing a problem. Many of the systems in use today are near or past their designed operational life and may need to be totally replaced.

HSTS's are major contributors of pathogens to the Rocky River and many of its tributaries. HSTS's are also significant contributors of the nutrient loads that result in organic enrichment problems in the watershed. The largest concentration of problems occurs in Cuyahoga County where housing density is high. Isolated problem areas occur in Columbia Township in Lorain County. There is a lack of concentration of systems in Medina County.

Summary of the Causes and Sources of Water Quality Problems in the Rocky River Watershed

The terminology of the Ohio 305(b) Report is used in this summary to identify the magnitude of the impact of various causes of water quality problems in local waterways. Causes can be a "high magnitude", "moderate magnitude", or "threatened". Gradations occur among these terms so that a degree of "best professional judgment" is often involved in the assignments. The assignments are useful in establishing cause and effect relationships top a degree that targeting of resources and actions can be undertaken.

High magnitude causes are generally identified where associated water quality standards violations are persistent. Moderate magnitude assignments are made when water quality standards violations are infrequent or of a marginal nature. The term "threatened" is used whenever water quality standards violations are rare or absent, but sources exist in sufficient numbers to result in a problem should existing controls fail to be implemented. Stream segments can also be threatened by advancing development that will result in new sources being added to the watershed.

The sources associated with any specific cause of a water quality problem are also identified using a relative scale. "Major" sources are those that have an impact sufficient to prevent the likely recovery of an impaired stream without an effective initiative to control them. A "Moderate" rating identifies an important source type that should be addressed when developing a control program, but is of secondary priority to the major sources. " Minor" sources are present but not at levels that would preclude recovery if other more dominant sources are controlled.

The assignments reflected in the following tables are based on several factors. The primary guide is the Ohio EPA 305(b) report and the 2002 Integrated Water Quality Report. These sources are supplemented with local input, particularly in the smaller subbasins.

Mainstem of the Rocky River	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.7 miles in Partial Attainment, and 3.37 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Fish Taste, Aesthetics	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-threatened Combined Sewer Overflows- major Agriculture-not an issue Urban Runoff-impacted Home Sewage Treatment Systems-minor
Habitat Modification (High Magnitude)	Agriculture-not an issue Urban Runoff-impacted
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-major Agriculture-not an issue Urban Runoff -impacted Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-major Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Moderate Magnitude)	Point Sources-not an issue Combined Sewer Overflows-major Agriculture-minor Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-moderate

Abram Creek	
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.7 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Macroinvertebrate Communities, Fish Taste, Aesthetics, Habitat	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-industrial Combined Sewer Overflows- absent Agriculture-not an issue Urban Runoff-impacted Home Sewage Treatment Systems-minor
Habitat Modification (High Magnitude)	Agriculture-not an issue Urban Runoff-impacted
Organic Enrichment/ Dissolved Oxygen (High Magnitude)	Point Sources-industrial Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff -impacted Home Sewage Treatment Systems-minor
Toxic Chemicals (High Magnitude)	Point Sources-industrial Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Moderate Magnitude)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-minor Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-moderate

East Branch below Healey Creek	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 30.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-impacted Home Sewage Treatment Systems-major
Habitat Modification (Moderate Magnitude)	Agriculture-not an issue Urban Runoff-impacted
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -impacted Home Sewage Treatment Systems-major
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-major Wildlife-moderate

East Branch above Healey Creek	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 30.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Aesthetics	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-minor Home Sewage Treatment Systems-minor
Habitat Modification (Threatened)	Agriculture-minor Urban Runoff-minor
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -minor Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-minor Urban Runoff -minor Home Sewage Treatment Systems-minor Wildlife-moderate

Baldwin Creek	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Macroinvertebrate Communities, Aesthetics, Habitat	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-absent Urban Runoff-major Home Sewage Treatment Systems-moderate
Habitat Modification (High Magnitude)	Agriculture-absent Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -major Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-absent Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Moderate Magnitude)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -minor Home Sewage Treatment Systems-moderate Wildlife-minor

North Royalton 'A' Tributary	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 1.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-not an issue Urban Runoff-moderate Home Sewage Treatment Systems-minor
Habitat Modification (Threatened)	Agriculture-absent Urban Runoff-moderate
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-absent Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-minor

Healey Creek	
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Not Available Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture-not an issue Urban Runoff-moderate Home Sewage Treatment Systems-minor
Habitat Modification (High Magnitude)	Agriculture-absent Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff -moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-minor

West Branch below Plum Creek	
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 23.96 miles in Full Attainment, 10.05 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-moderate Home Sewage Treatment Systems-moderate
Habitat Modification (Threatened)	Agriculture-absent Urban Runoff-moderate
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-moderate Wildlife-moderate

West Branch from Cossett Creek to Plum Creek	
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 23.96 miles in Full Attainment, 10.05 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-moderate Home Sewage Treatment Systems-minor
Habitat Modification (Threatened)	Agriculture-absent Urban Runoff-moderate
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-moderate Wildlife-moderate

West Branch above Cossett Creek	
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 23.96 miles in Full Attainment, 10.05 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-threatened Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-moderate Home Sewage Treatment Systems-minor
Habitat Modification (High Magnitude)	Agriculture-minor Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Moderate Magnitude)	Point Sources-not an issue Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-moderate

Baker Creek	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture-not an issue Urban Runoff-moderate Home Sewage Treatment Systems-minor
Habitat Modification (Threatened)	Agriculture-absent Urban Runoff-moderate
Organic Enrichment/ Dissolved Oxygen (High Magnitude)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff -moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (High Magnitude)	Point Sources-absent Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-minor

Blodgett Creek	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-major Combined Sewer Overflows- absent Agriculture-not an issue Urban Runoff-moderate Home Sewage Treatment Systems-moderate
Habitat Modification (Threatened)	Agriculture-absent Urban Runoff-moderate
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-major Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff -moderate Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-not an issue Urban Runoff –moderate Home Sewage Treatment Systems-moderate
Bacteria/Pathogens (Threatened)	Point Sources-major Combined Sewer Overflows-absent Agriculture-absent Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-moderate

Plum Creek near Olmsted Falls	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.0 miles in Nonattainment Recreational Use Assessment: Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-major Combined Sewer Overflows- absent Agriculture-moderate Urban Runoff-major Home Sewage Treatment Systems-moderate
Habitat Modification (High Magnitude)	Agriculture-moderate Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources-major Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -major Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources-threatened Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –moderate Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources-moderate Combined Sewer Overflows-absent Agriculture-minor Urban Runoff -minor Home Sewage Treatment Systems-moderate Wildlife-minor

Mallet Creek	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report Recreational Use Assessment: Locally Impaired Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture-major Urban Runoff-minor Home Sewage Treatment Systems-moderate
Habitat Modification (Minor)	Agriculture-moderate Urban Runoff-minor
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-major Urban Runoff -minor Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -minor Home Sewage Treatment Systems-moderate Wildlife-minor

South Branch	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report; expected to be in full attainment Recreational Use Assessment: Not Impaired Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture- moderate Urban Runoff- moderate Home Sewage Treatment Systems-minor
Habitat Modification (Moderate Magnitude)	Agriculture-moderate Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- moderate Urban Runoff - moderate Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff - moderate Home Sewage Treatment Systems-minor Wildlife-minor

North Branch	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.79 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Not Impaired Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture- moderate Urban Runoff-minor Home Sewage Treatment Systems-moderate
Habitat Modification (Threatened)	Agriculture-moderate Urban Runoff-minor
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- moderate Urban Runoff -minor Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -minor Home Sewage Treatment Systems-moderate Wildlife-minor

Granger Ditch/Remsen Creek	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in the 2000 305(b) Report Recreational Use Assessment: Not Impaired Other Impairments: Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (Threatened)	Point Sources-absent Combined Sewer Overflows- absent Agriculture- moderate Urban Runoff-minor Home Sewage Treatment Systems-moderate
Habitat Modification (Moderate Magnitude)	Agriculture-major Urban Runoff-minor
Organic Enrichment/ Dissolved Oxygen (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- moderate Urban Runoff -minor Home Sewage Treatment Systems-moderate
Toxic Chemicals (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-moderate Urban Runoff -minor Home Sewage Treatment Systems-moderate Wildlife-minor

Plum Creek near Brunswick	
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment Recreational Use Assessment: Not Available Other Impairments: Fish Communities, Aesthetics, Habitat (Threatened)	
Cause	**Source(s)**
Nitrogen Loadings (High Magnitude)	Point Sources-absent Combined Sewer Overflows- absent Agriculture- minor Urban Runoff-major Home Sewage Treatment Systems-minor
Habitat Modification (Moderate Magnitude)	Agriculture-minor Urban Runoff-major
Organic Enrichment/ Dissolved Oxygen (High Magnitude)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- minor Urban Runoff -major Home Sewage Treatment Systems-minor
Toxic Chemicals (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture- minor Urban Runoff –minor Home Sewage Treatment Systems-minor
Bacteria/Pathogens (Threatened)	Point Sources- absent Combined Sewer Overflows-absent Agriculture-minor Urban Runoff -moderate Home Sewage Treatment Systems-minor Wildlife-minor

INVENTORY OF POINT AND NONPOINT SOURCE DISCHARGERS IN THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix E
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed

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Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed

Permitted Wastewater Dischargers

Ohio EPA classifies wastewater discharges as being 'minor' or 'major'. Tables 1 and 2 below identify all NPDES permit holders in the Rocky River Watershed according to the EPA classification scheme. These dischargers are located in Figure 1 according to the map number listed in the tables. Of the 24 permitted point source dischargers in the Rocky River Watershed, six are industrial dischargers (noted by an 'I' in the second position of the permit number). Two of the six are classified as 'major'. These are Cleveland International Airport and the NASA Lewis/Glenn Research Center. The areas served by sanitary sewers are shown in Figure 2. This figure also shows the areas that are likely to have sanitary sewer service extended to them at some point in the next 20 years.

Table 1: Minor Dischargers in the Rocky River Watershed

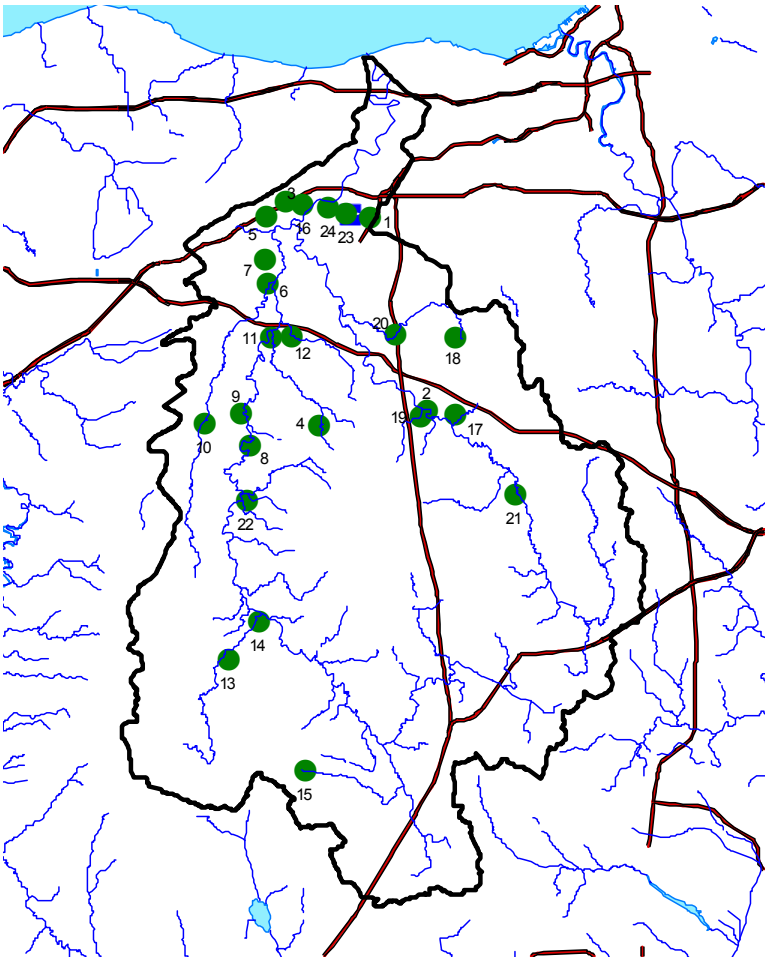
Map Number	Entity	NPDES Permit Number
1	Air BP at Cleveland Hopkins International Airport	3IN00060
2	Camp Cheerful in Strongsville	3PR00292
3	Cuyahoga Landmark in Strongsville	3IN00104
4	Forest Park Wastewater Treatment Plant in Strongsville	3PA00036
5	Moen Corporation in North Olmsted	3IN00241
6	Olmsted Falls Subdivision	3PA00022
7	Trailer Mart, Inc. in Olmsted Township	3PV00013
8	Columbia Hills Country Club in Columbia Township	3PR00227
9	Columbia Schools in Columbia Township	3PT00087
10	Plum Creek Sewage Treatment Plant (STP) in Columbia Township	3PG00052
11	Columbia West STP in Columbia Township	3PG00053
12	Westview STP in Columbia Township	3PH00022
13	Buckeye Local Schools STP	3PT00036
14	Columbia Gas Transmission Corp. in Medina	3IN00301
15	Medina Landmark in Medina	3IG00087

Table 2: Major Dischargers I n the Rocky River Watershed

ENTITY (Map Number)	NPDES PERMIT NUMBER	DESIGN FLOW TREATMENT	PROCESSES
North Olmsted (16)	3PD00016	7.00 MGD (Million Gallons per Day)	Bar Screens, Comminutors, Primary Sedimentation, Activated Sludge - Conventional, Secondary Clarification, Microstrainer-Secondary, Chlorination, Dechlorination, Discharge
N. Royalton 'A' (17)	3PD00030	3.30 MGD	Bar Screens, Grit Removal, Primary Settle, Aeration, Final Settle, Tertiary filters, UV Disinfection, Post Aeration, Discharge
N. Royalton 'B' (18)	3PC00018	1.00 MGD	Bar Screens, Aeration, Final Settle, Chlorination, Dechlorination, Discharge
Strongsville 'B' (19)	3PB00047	2.1 MGD	Comminutor, Grit Removal, Phosphorus Removal, Preaeration, Primary Settling, RBC's, Secondary Settling, Rapid Sand Filters, Chlorine Contact, Dechlorination, Discharge
Strongsville 'C' (20)	3PB00048	1.8 MGD	Comminuter, Grit Removal, Phosphorus Removal, Preaeration, Primary Settling, RBC's, Secondary Settling, Rapid Sand Filters, Chlorine Contact, Dechlorination, Discharge
Medina SD 300 (21)	3PK00003	3.25 MGD	Bar Screen, Comminuters, Secondary Clarifiers, RBC's, Tertiary Sand Filters, Chlorination, Dechlorination, Discharge
Medina SD 500 (22)	3PK00004	10.0 MGD	Manual Bar Screen, Grit Removal, Rectangular Clarifiers, Activated Sludge With Powder Activated Carbon, Tertiary Filters, Chemical Phosphorus Removal, Chlorine Chemical Disinfection, Dechlorination, Discharge
Cleveland Hopkins Airport (23)	3II00179 (Draft Form)	Storm Dependent	Oil/Water Separators
NASA (24)	3IO00001	0.545 MGD	Oil/Water Separators

Figure 1

Permitted Point Source Dischargers in the Rocky River Watershed



Numbers match discussion in text.

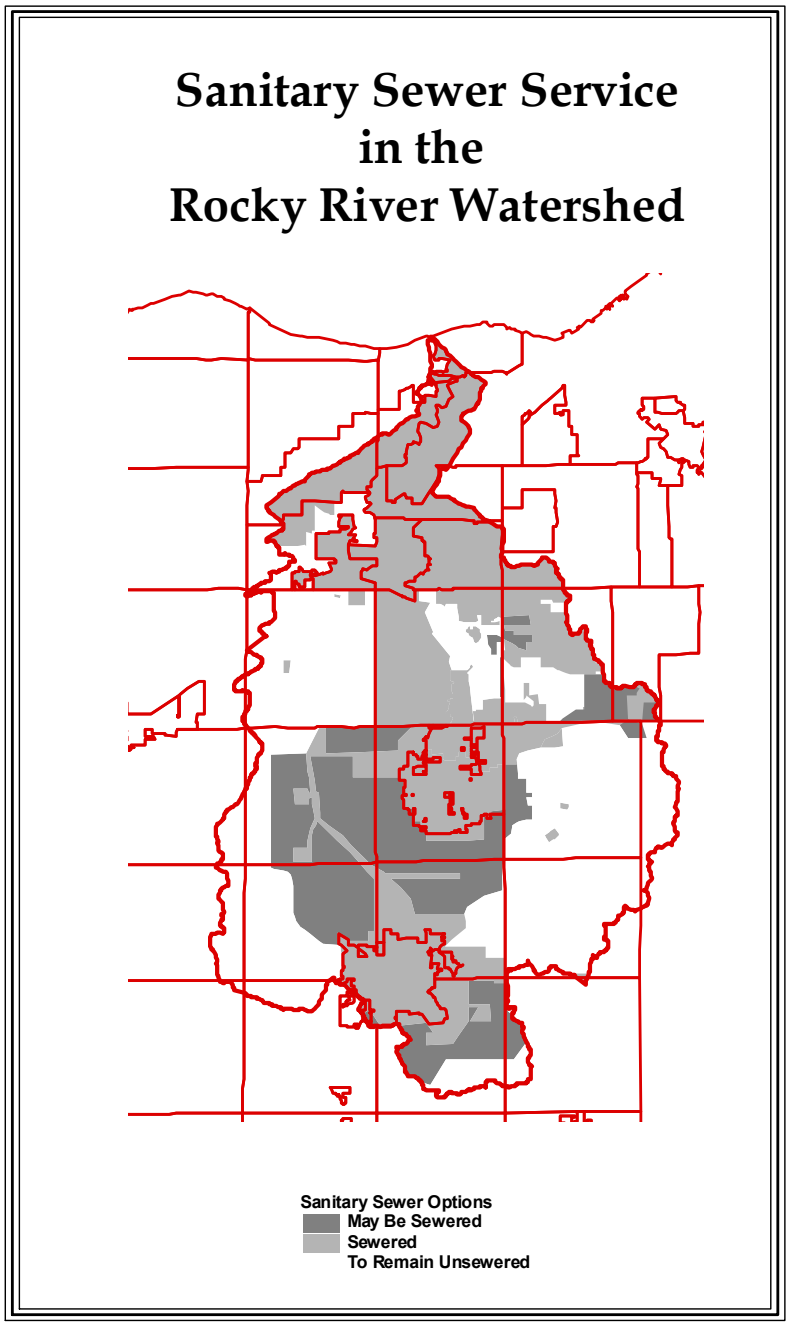
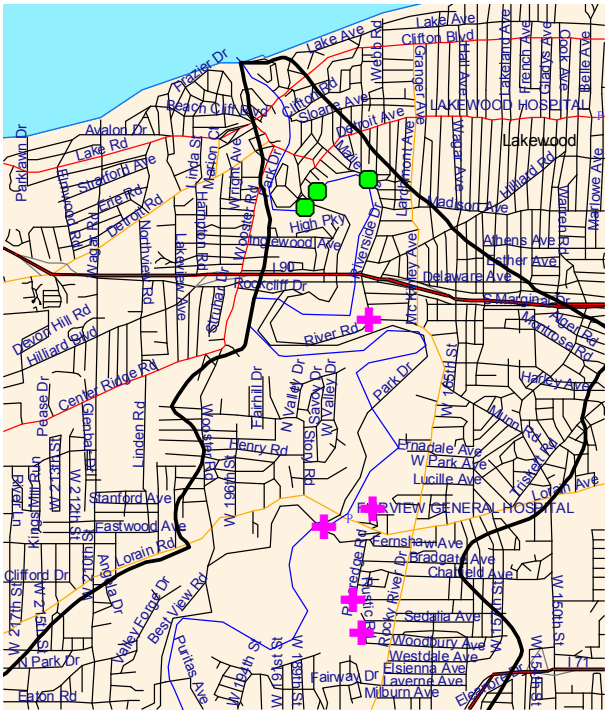


Figure 2: Sanitary Sewer Service Areas

Combined Sewer Outfalls

According to the Rocky River TMDL, there are 13 combined sewer outfalls (CSOs) that continue to discharge to the Rocky River. (See Figure 3). These outfalls are located in the lower stretch of the mainstem between river miles 7.5 and 1.5. This encompasses an area from upstream of Lorain Avenue to near Detroit Avenue. Ohio EPA summarizes the status of the CSOs in the TMDL report. The following discussion is drawn from that document.

Figure 3: Combined Sewer Outfalls in the Rocky River Watershed



The City of Lakewood currently has 8 overflows in their sewerage system that discharge in wet weather periods to either Lake Erie or the Rocky River. The City has ongoing projects that are focusing on separating storm water from sanitary sewerage, as well as increasing the efficiency and wet weather treatment capability at the Lakewood WWTP. The City of Lakewood has developed and is implementing a Nine Minimum Controls Plan (NMCP) for CSOs in their sewerage system.

In an effort to maximize the WWTP capabilities, recent modifications were made to the primary settling facilities at the WWTP to eliminate hydraulic bottlenecking which was occurring in the primary treatment portion of the WWTP. This will allow an increase in the amount of wet weather wastewater that can be treated at the WWTP that has the effect of reducing the frequency and amount of partially treated wastewater being bypassed from the WWTP during high flow periods.

The City of Lakewood currently is planning a WWTP headworks modification that will reduce the water level in the main interceptor sewer entering the plant, and will increase the system's wet weather storage capacity. Installation of new equipment will result in the maximization of wet weather storage capacity both at the WWTP and in the sewer system, will reduce CSO activity in the system, and will reduce the possibility of upstream basement flooding. The improvements to the Lakewood WWTP and the aerial sewer entering the WWTP are predicted to reduce the average number of plant bypass CSO events from approximately 84 per year, to an estimated 10 per year (an 88 % reduction).

The Northeast Ohio Regional Sewer District (NEORSD) maintains five combined sewer overflows (CSOs) which discharge to the Rocky River. The NPDES permit for the NEORSD CSOs requires the development of long-term control plans for these discharges. Water quality and modeling studies conducted in the past 3 years (Metcalf and Eddy, 1998; Metcalf and Eddy, 1999) have found that CSOs tributary to the Rocky River activate, or discharge combined sewage to surface waters tributary to the Rocky River on an average of 59 times per year, with a total discharge of combined sewage of 17.57 million gallons per year. However, water quality studies and modeling have indicated that the contributions of fecal coliform bacteria from the CSOs were roughly equivalent to loads received from upstream sources, loads for BOD were approximately one- tenth of the upstream load, and that heavy metal loadings were between 10 and one hundred times higher in the upstream flow than that found in the CSO effluent (Metcalf and Eddy, 1998). Therefore, it appears that reduction or elimination of the CSO discharges will be beneficial, but will not result in significant changes in water quality in the Rocky River.

The phase II Westerly District CSO study found that three of the five Rocky River CSOs activated (i.e. discharged combined sewage to surface waters) four or fewer times per year, and no further action is proposed for these discharges at this time (Metcalf and Eddy, 1999). For the remaining two CSOs that activate more than four times a year, modifications are proposed which will reduce or eliminate the discharges. For one of these CSOs, a minimal design change will divert more of the combined sewer flow to the collection system, which will reduce the number of activations per year. For the other CSO, a more costly improvement will be required to connect the flow to an interceptor sewer in order to reduce the number of activations per year to four or less. The total cost of the improvements for the Rocky River CSOs is estimated at $487,000, and both projects are included in the first tier of projects in the Westerly District that will enter into the design phase within 1-2 years.

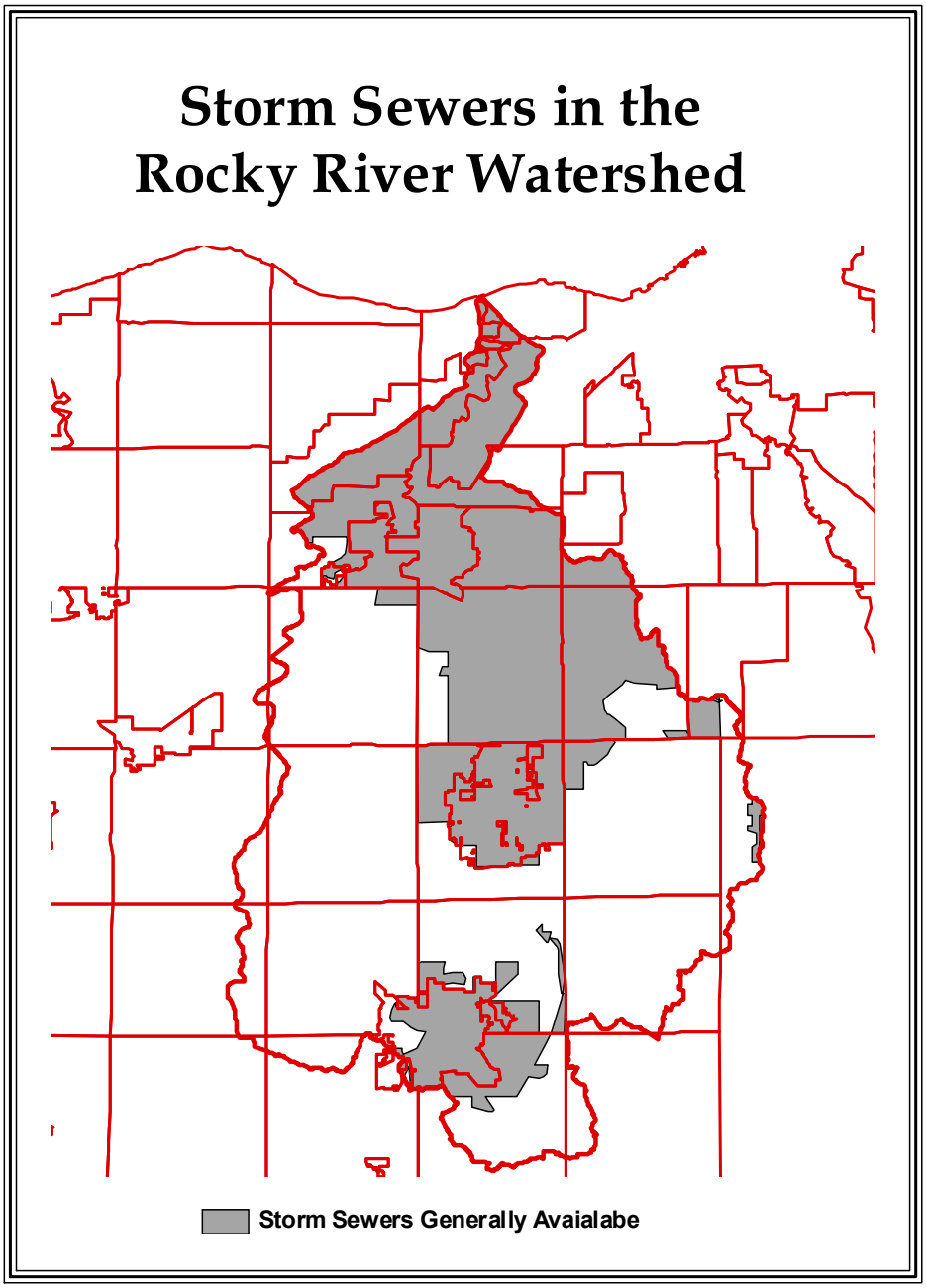
Separate Sewer Overflows

There are no permitted separate sewer overflows in the Rocky River.

Storm Sewer Service Areas

Figure 4 shows the generalized areas that are served with storm sewers in the Rocky River Watershed. Most of the area indicated is served with 'curb and gutter' systems where storm water is conveyed in underground pipes to the discharge point. A portion of the area does rely on open ditches to convey storm water to the receiving stream. In these areas, storm water is usually piped away from structures in underground pipes before discharging to the roadside ditches. Isolated pockets of storm sewers exist in some of the lesser-developed portions of the watershed but these pockets have little overall impact on local waterways.

Figure 4: Storm Sewer Service Areas



Potential Nonpoint Source Pollution Impact Areas

Agricultural Areas: Agriculture remains an important activity in the Rocky River Watershed. Crop production and livestock production are dominant operations in York and Liverpool Townships in Medina County and in Columbia Township in Lorain County. A reduced, but still substantial production occurs in Montville, Medina, and Granger Townships in Medina County. The aerial extent of agricultural activity can be discerned from Figure 5. The map in Figure 5 shows the Landsat data for "agriculture and urban open space". Since the generalized satellite images cannot differentiate between agricultural uses (particularly pasture lands) and expanses of lawn grass, another approach is needed to differentiate agricultural areas. In Figure 4, urban, sewered areas are superimposed on the Landsat data to help differentiate the agricultural lands.

Recreational horse ownership is an important activity in Hinckley Township in Medina County and the line of North Royalton, Strongsville, Middleburg Heights, Berea and Olmsted Falls in Cuyahoga County. A field Survey of horse operations in Cuyahoga County identified 58 sites that were stabling 980 horses. (See Figure 6.) Of these, 27 were smaller operations that supported an average of three horses each. The 31 public stables averaged 29 horses each. The two largest housed 146 and 70 horses. The watershed distribution of horse operations included 34 in the East Branch, 2 in Baldwin Creek, 21 in the West Branch, and 1 in the Mainstem. The significance of these operations to water quality lies in the fact that frequent exceedances of the bacteria criterion for recreational uses occur in the streams that drain these operations.

Approximately 50 livestock operations are scattered throughout the Medina-Lorain-Summit County portion of the Rocky River Watershed. The combination of generally adequate site management, remoteness, and limited scope of these operations results in little anticipated impact on the waters of the Rocky River.

In terms of watersheds, Mallet Creek is dominated by agricultural activity with upwards of three-quarters of the land area in agricultural use. Plum Creek near Olmsted Falls has a similar agricultural presence in all but its lowermost reaches. Agricultural runoff is important to drainage to the West Branch downstream from the City of Medina through Columbia Township. Approximately one-half of the land area here is in agricultural uses.

The South Branch of the Rocky River has historically been devoted to agriculture but that use is waning. Suburban development in primarily in Montville Township has infringed on agriculture to a substantial degree over the last 20 years. Only about one-third of the area remains in agriculture today.

The Granger Ditch/Remsen Creek watershed has an estimated 52% of its land area devoted to agriculture. The majority of the agricultural activity is from small operations that are scattered throughout the watershed.

The recreational horse operations are scattered along the East Branch of the Rocky River and along the lower reaches of the West Branch. These are the areas that have ready access to the multitude of horse trails maintained by the Cleveland Metroparks in the Mill Stream Run and Rocky River Reservations. Recreational horse farms do occur throughout the Medina County portion of the Rocky River Watershed particularly in Hinckley Township that also drains to the East Branch.

Figure 5: Agricultural Lands

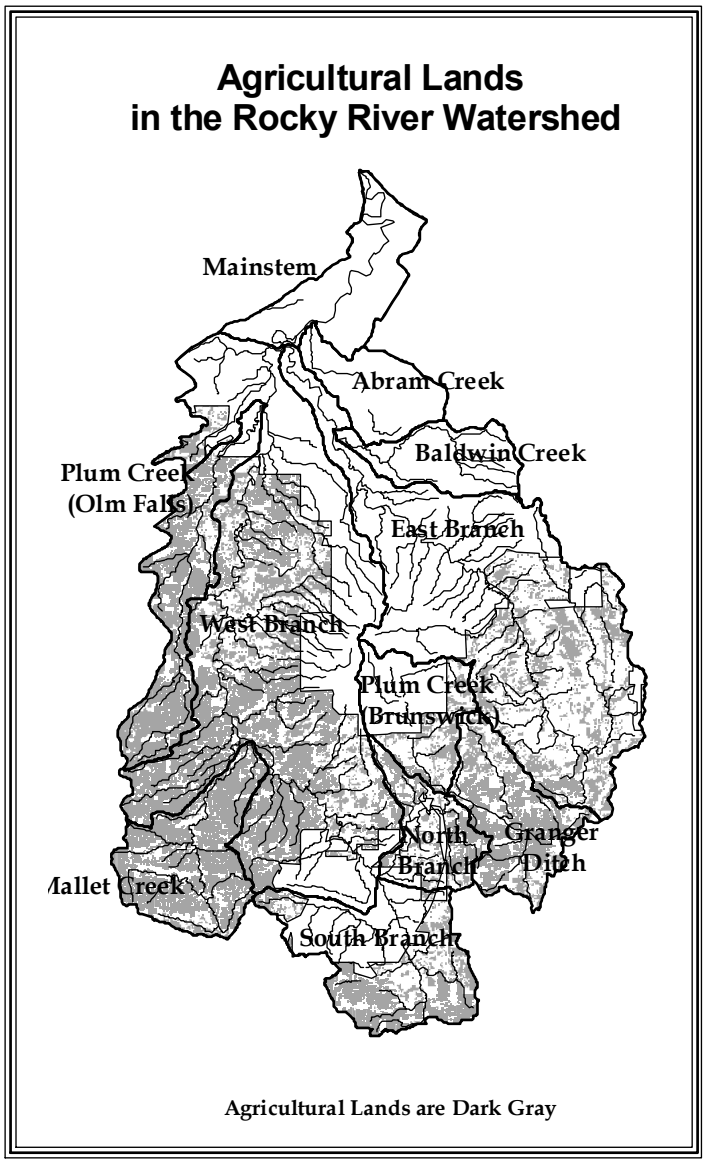
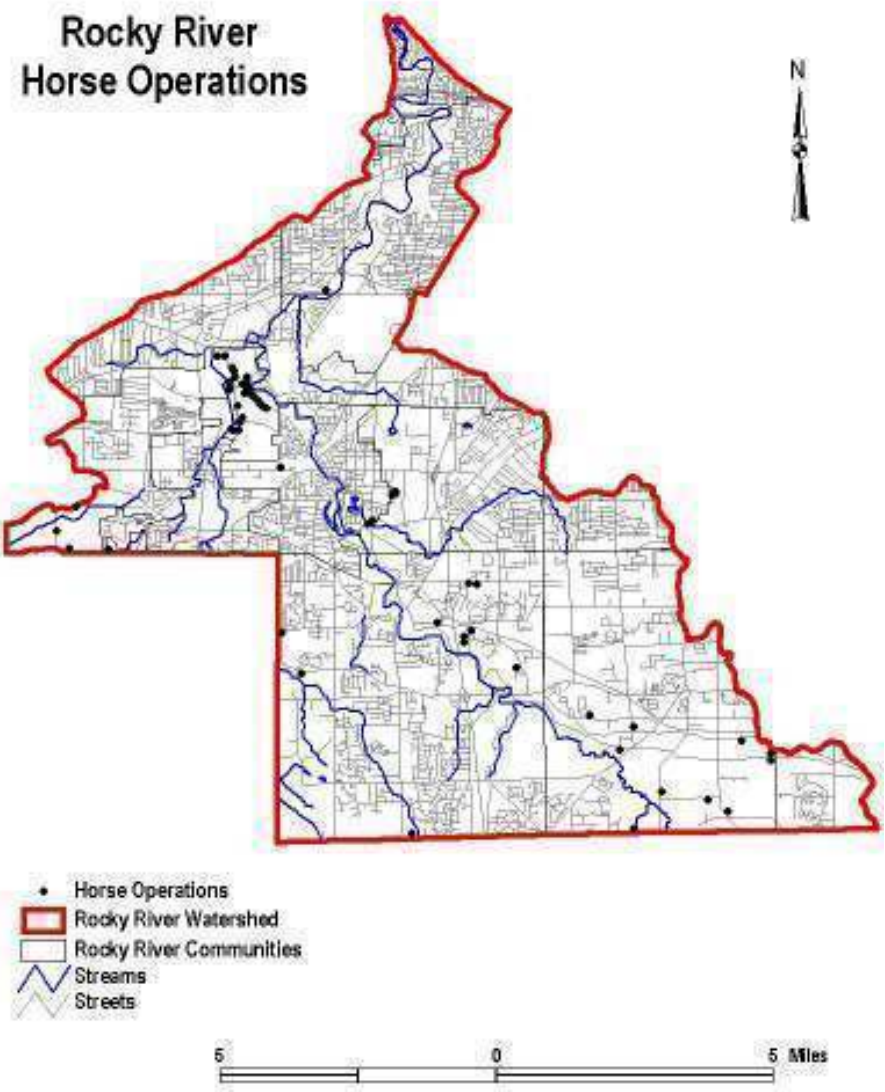
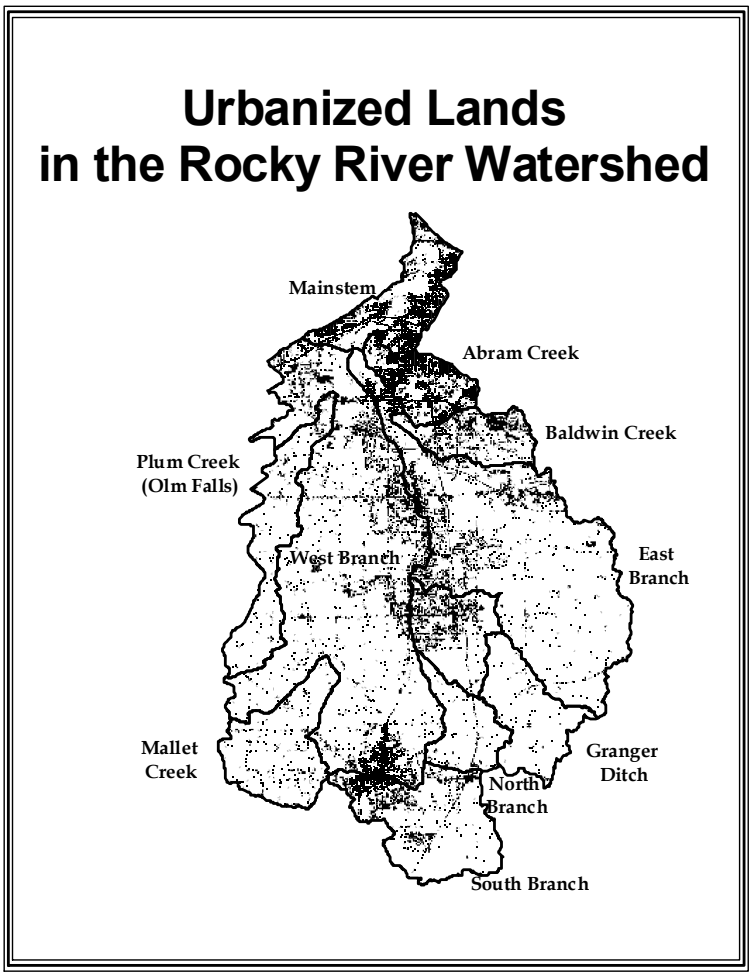


Figure 6: Horse Locations in Cuyahoga County



Urban areas: The portions of the Rocky River Watershed that are potentially affected by urban nonpoint source pollution can be discerned from Figure 7 that identifies those tracts that are largely impervious.

Figure 7: Urbanized Lands



The Mainstem of the Rocky River, Abram Creek, and Baldwin Creek are heavily urbanized throughout their drainage areas. In the East Branch, the upper portion of the watershed is largely undeveloped. This includes all of the area in Medina and Summit County. Headwater streams that are increasingly developed feed the lower portion of the East Branch. These streams include Healey Creek and the North Royalton 'A' Tributary.

Within the West Branch, there is substantial variability of potential urban runoff impacts. Granger Ditch, Mallet Creek, the North Branch, and Plum Creek near Olmsted Falls are little influenced by urban runoff. The South Branch is rural in its headwaters but subject to growing urban flows in its lower reaches including the heavily urbanized Champion Creek that drains a potion of the City of Medina.

The West Branch of the Rocky River receives the flow from the northern half of the City of Medina (including the heavily urbanized Bradway Creek). Otherwise, runoff into the West Branch includes only a limited amount of urban impacted flows until it reaches Cuyahoga County. Here the lower reach of the West Branch itself has a moderate amount of urbanized land. The tributaries that enter from the east have an increasing amount of urban land. Baker and Blodgett Creeks are particularly urbanized.

Home Sewage Treatment Systems: The Rocky River TMDL report provides a good summary of home sewage disposal systems HSTSs) in the Rocky River Watershed. The report estimates that there are approximately 16,800 HSTSs in the watershed: 4,000 in Cuyahoga County; 10,000 in Medina County; 2,400 in Lorain County; and 400 in Summit County.

In Cuyahoga County, the communities of Berea (19 HSTSs), Middleburg Heights (320 HSTSs), Olmsted Falls (620 HSTSs), and Strongsville (950 HSTSs) are located completely in the watershed. Portions of Brook Park (190 HSTSs), Fairview Park (4 HSTSs), North Olmsted (18 HSTSs), North Royalton (1100 HSTSs), Parma (1300 HSTSs), and Olmsted Township (1050 HSTSs) are located in the watershed.

Five Medina County townships and two cities are located in the Rocky River Watershed. These include: Brunswick (63 HSTSs), Brunswick Hills Township (679 HSTSs), Hinckley Township (1827 HSTSs), Liverpool Township (1102 HSTSs), Medina City (24 HSTSs), Medina Township (1144 HSTSs), and York Township (887 HSTSs). Portions of Granger Township (922 HSTSs), Lafayette Township (176 HSTSs), Litchfield Township (227 HSTSs), Montville Township (757 HSTSs), and Sharon Township (94 HSTSs) are located in the watershed. Almost all of Columbia Township is located in the Rocky River Watershed. There are currently over 2500 HSTSs in the Township. It is estimated that 200 additional HSTSs are located in the portions of Grafton Township and Eaton Township that lie in the watershed.

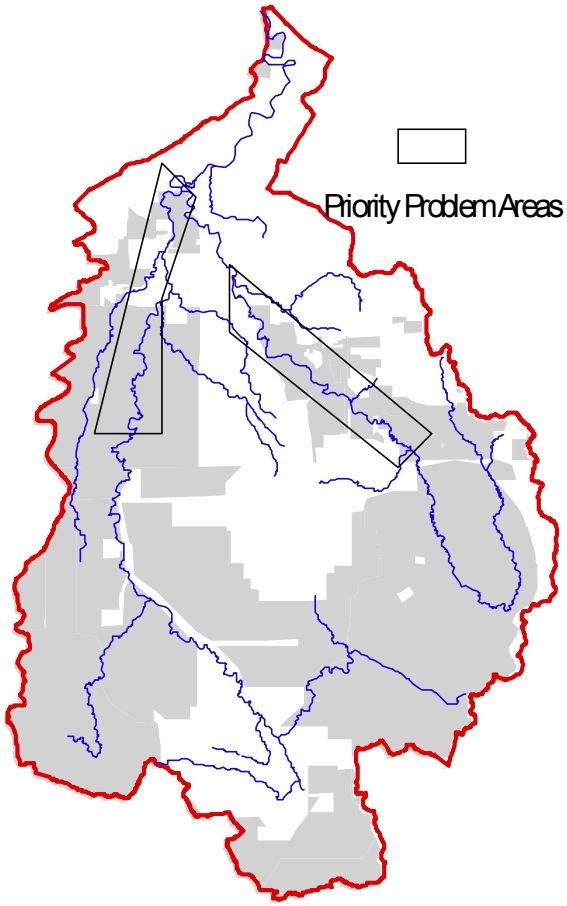
Portions of Richfield and Bath Townships are located in the Rocky River Watershed along with part of the Village of Richfield. It is estimated that 400 HSTSs are located in these areas.

Figure 2 provides an overview of the areas that are served with HSTSs in the watershed. It is the white areas in the figure that rely on on-site systems. In terms of watersheds, Granger Ditch/Remsen Creek, the North Branch, Mallet Creek, and Plum Creek near Olmsted Falls that are predominantly served by HSTSs. The Greater Medina area and the lower reaches of the West Branch are largely sewered, but the remainder of this tributary is served by HSTSs. The East Branch through Hinckley Township is largely unsewered. The middle stretch through North Royalton and Strongsville is 50 % unsewered. The lower reaches in Middleburg Heights and Berea are largely sewered.

The East Branch of the Rocky River is the most impacted by concentrations of failing HSTSs with persistent violations of the criteria for recreational uses documented from near the Cuyahoga/Medina County line to the junction with the West Branch. The West

Branch is also heavily impacted through Columbia Township to the junction with the East Branch. These areas are shown in Figure 8.

Figure 8
Home Sewage Trwatment System (HSTS)
Priority Problem Areas in the Rocky River



Shaded areas are served by HSTSs

Summary of Development Trends: The Water Resource Threats Related to Growth in the Rocky River Watershed Report details the nature of growth expected in the Rocky River Watershed. This report contains estimates of both population growth and household projections through the Year 2025 for each of the communities in the Watershed. While it is possible to predict growth in any given community, it is not possible to allocate that growth to any specific area within the community. Therefore, there are no estimates of either population growth or new households allocated to the subbasins of the Watershed. It is also not possible to allocate growth to areas served by sanitary sewers versus those that will remain on home sewage treatment systems. Qualitative evaluations of these factors are possible however based on best professional judgment.

One thing is very clear about population in the Rocky River Watershed. People are relocating to the southern half of the watershed in large numbers, while population remains relatively stable in the highly developed communities of the north.

Rocky River Mainstem: The communities that are drained directly by the Mainstem have either a stable population or are experiencing small declines in population. This stems from the fact that these are largely built-out communities that have little room for new residential construction. Population declines are largely driven by the regional trend that sees a continued decrease in the size of the average family occupying existing structures.

The Mainstem does receive runoff from those upstream areas that are expected to grow considerably over the course of the next 20 years. However, nature tends to buffer large streams from these impacts. If controls are put in place to protect the receiving streams in the headwater areas, it can be reasonably expected that adverse affects in the Mainstem will be minimal.

Abram Creek is also largely built out. The on-going expansion at the Cleveland Hopkins International Airport has had a dramatic impact on Abram Creek and its channel, but that impact is largely complete.

The East Branch: The East Branch below Baldwin Lake is another section of the watershed that will see little development pressure due to the lack of available land for development. Baldwin Creek is likewise expected to experience only a small growth in population for the same reason.

Between Baldwin Lake and Hinckley Lake the situation is the reverse. Strongsville, North Royalton, Brunswick, and Hinckley Township are all projected to substantially grow in population through 2020. It is estimated that as many as 12,000 people will relocate into the area drained by the East Branch in these communities in the next 20 years. This growth is likely to affect Healey Creek and the North Royalton ‘A’ tributary as well as the East Branch itself. The lower reaches of Healey Creek remain sparsely developed as does the headwaters of the North Royalton ‘A’ tributary.

It has been stated that it is the valley of the East Branch that is likely to see the greatest influx of new development that is supported by HSTSs. Given that this happens to be one of the targeted areas for addressing existing problems related to failing HSTSs, it is imperative that that HSTS management programs receive priority in this area. Sanitary sewer expansion feasibility studies, particularly in Strongsville and North Royalton, should be undertaken to determine where this option might be feasible. New system designs and technologies should be demonstrated for use in both new construction and in upgrade installations.

The mainstem of the East Branch is protected to some degree due to the fact that the Cleveland Metroparks Mill Stream Run Reservation straddles the stream through a large part of North Royalton and most of its length in Strongsville. The Cleveland Metroparks is studying how to protect the remainder of the corridor below Hinckley Lake. Maintenance of wooded riparian areas throughout this corridor is a high priority for many of the Rocky River Watershed stakeholders. The Storm Water Permits Phase II Model Implementation Plan calls for all developing communities to institute riparian zone and wetland area setback ordinances. Implementation of the recommended setback is important not only along the mainstem of the East Branch but in its headwaters as well.

Development pressures are highly variable within the drainage area of the West Branch of the Rocky River. They range from intense in and around Medina to minimal in Mallet Creek, Cossett Creek, and other areas. The Plum Creek near Olmsted Falls is likely to experience little growth in the next 20 years while the Plum Creek near Brunswick continues to grow. Two small streams drain much of the City of Medina. These streams, Champion Ditch and Bradway Creek, are already heavily impacted by urban runoff and are expected to have to absorb even more. The South Branch and the North Branch are streams in the middle of the development spectrum. Better access to road and utility infrastructure has made the Strongsville/North Royalton/ Brunswick triangle and the Medina City area more attractive to development. Pressure on the North and South Branch areas is expected to intensify as these other areas near saturation. This will probably begin to happen during the later half of the next 20-year period. Blodgett and Baker Creeks are also subject to a moderate growth pressure and are expected to develop slowly over the next 20 years as well.

Within the West Branch, most development will occur in areas that have sanitary sewer service available. The notable exceptions are substantial areas of the South and North Branches and the downstream portion of Plum Creek near Brunswick. Local officials are trying to maintain the rural character of these areas and are relying on the use of HSTSs to further that objective. A diligent HSTS management program is of a priority in these areas.

Subbasin Evaluation of Nonpoint Source Impacts: The following tables were generated according to the following decision rules. Agricultural impact potential is a function of several factors. First is the percentage of a subbasin that is classified as "agriculture or urban vacant. This figure must be interpreted using best professional judgment as to the degree that a particular subbasin is dominated by agricultural uses

versus urban open spaces. Next, judgment is required to differentiate large-scale crop or animal production from horticultural or other small-scale operations that pose a diminished impact potential. Lastly, the concentration of agricultural activity must be assessed to determine those areas where the combined effects of numerous operations could pose a magnified problem.

Urbanized land impacts are evaluated on the basis of the percentage of a subbasin that is classified as urban in the satellite generated land cover analysis. This classification closely resembles the percent imperviousness of a watershed. Generally speaking, watersheds that have less than 10% imperviousness are little affected by urban storm water runoff impacts (minor impact). Watersheds with between 10 and 25% imperviousness are being stressed by urban runoff and are targets for remediation programs (moderate impact). Watersheds that exceed 25% imperviousness are impacted by urban runoff to the point that restoration is not likely to be possible without substantive investment (major impact).

Aquatic habitat can be degraded by either agricultural runoff or urban runoff. Typically, agriculture affects habitat by increasing the sediment load in the stream, by eliminating riparian vegetation in an attempt to maximize tillable acres, and by Channelization of the stream to improve drainage in low-lying fields. Urban runoff from established development tends to concentrate a larger quantity of runoff volume into a shortened runoff period. This tends to make stream channels unstable which results in a loss of habitat quality and diversity. When modified habitat attributes become common in a stream channel, the impact on habitat becomes important. When QHEI scores drop below 60, habitat can become a limiting factor for aquatic life. Habitat impacts are considered to be minor if the QHEI is greater than 60 and modified attributes are not prominent. Impacts are moderate when QHEI scores exceed 60 but modified attributes are common. Impacts are rated major when QHEI scores are below 60 and modified attributes are common.

Potential HSTS impacts are assessed with the consideration of both the number of HSTSs in the watershed and an evaluation of the expected rate of failure of existing systems and their concentrations within the watershed. Such assessments are based on best professional judgment.

The assessment of nonpoint source impact potential in the subbasins in the Rocky River is presented below.

Subbasin: **Mainstem**

- Percent Agriculture/Urban Vacant: 15.15 Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: 39.58 **Impact Classification: Major**
- Average QHEI: 64.5 Modified Attributes: Common
- **Habitat Modification Classification: Moderate**
- Number of HSTSs: 3 Number of Projected Failures: 2
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **Abram Creek**

- Percent Agriculture/Urban Vacant: 20.22 Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: 45.57 **Impact Classification: Major**
- Average QHEI: 54.5 Modified Attributes: Common
- **Habitat Modification Classification: Major**
- Number of HSTSs: 218 Number of Projected Failures: 80
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **East Branch**

- Percent Agriculture/Urban Vacant: 28.02 Estimated % Agriculture: 20
- Scale of Agricultural Activity: Moderate **Impact Classification: Moderate**
- Percent Urbanized: 10.82 **Impact Classification: Moderate (concentrated)**
- Average QHEI: 66.7 Modified Attributes: Common
- **Habitat Modification Classification: Moderate**
- Number of HSTSs: 1,683 Number of Projected Failures: 640
- Concentration of HSTSs: High **Impact Classification: Major**

Subbasin: **Baldwin Creek**

- Percent Agriculture/Urban Vacant: 17.49 Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: 26.87 **Impact Classification: Major**
- Average QHEI: 52.8 Modified Attributes: Common
- **Habitat Modification Classification: Major**
- Number of HSTSs: 496 Number of Projected Failures: 110
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **North Royalton 'A' Tributary**

- Percent Agriculture/Urban Vacant: N/A Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: N/A **Impact Classification: Moderate**
- Average QHEI: 72.5 Modified Attributes: Limited
- **Habitat Modification Classification: Minor**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **Healey Creek**

- Percent Agriculture/Urban Vacant: N/A Estimated % Agriculture: <5
- Scale of Agricultural Activity: Small **Impact Classification: Minor**
- Percent Urbanized: N/A **Impact Classification: Moderate**
- Average QHEI: 65.0 Modified Attributes: Limited
- **Habitat Modification Classification: Minor**
- Number of HSTSs: N/A Number of Projected Failures: N/A

- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **West Branch**

- Percent Agriculture/Urban Vacant: 46.59 Estimated % Agriculture: 30
- Scale of Agricultural Activity: Moderate **Impact Classification: Moderate**
- Percent Urbanized: 12.82 **Impact Classification: Moderate (concentration)**
- Average QHEI: 67.4 Modified Attributes: Limited
- **Habitat Modification Classification: Moderate**
- Number of HSTSs: 1,421 Number of Projected Failures: 600
- Concentration of HSTSs: Locally High **Impact Classification: Major**

Subbasin: **Baker Creek**

- Percent Agriculture/Urban Vacant: N/A Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: N/A **Impact Classification: Moderate**
- Average QHEI: N/A Modified Attributes: N/A
- **Habitat Modification Classification: Moderate**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **Blodgett Creek**

- Percent Agriculture/Urban Vacant: N/A Estimated % Agriculture: <5
- Scale of Agricultural Activity: Low **Impact Classification: Not an Issue**
- Percent Urbanized: N/A **Impact Classification: Moderate**
- Average QHEI: 60.5 Modified Attributes: N/A
- **Habitat Modification Classification: Moderate**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Low **Impact Classification: Minor**

Subbasin: **Plum Creek at Olmsted Falls**

- Percent Agriculture/Urban Vacant: 63.60 Estimated % Agriculture: 50
- Scale of Agricultural Activity: Large **Impact Classification: Major**
- Percent Urbanized: 5.31 **Impact Classification: Minor**
- Average QHEI: 71.0 Modified Attributes: Limited
- **Habitat Modification Classification: Moderate (Channelization)**
- Number of HSTSs: 171 Number of Projected Failures: 73
- Concentration of HSTSs: Locally High **Impact Classification: Major**

Subbasin: **Mallet Creek**

- Percent Agriculture/Urban Vacant: 67.82 Estimated % Agriculture: 60
- Scale of Agricultural Activity: Large **Impact Classification: Major**
- Percent Urbanized: 4.67 **Impact Classification: Minor**
- Average QHEI: N/A Modified Attributes: Common
- **Habitat Modification Classification: Moderate**

- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Moderate **Impact Classification: Moderate**

Subbasin: **North Branch**

- Percent Agriculture/Urban Vacant: 39.61 Estimated % Agriculture: 30
- Scale of Agricultural Activity: Moderate **Impact Classification: Moderate**
- Percent Urbanized: 4.48 **Impact Classification: Minor**
- Average QHEI: 74.5 Modified Attributes: Limited
- **Habitat Modification Classification: Minor**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Moderate **Impact Classification: Moderate**

Subbasin: **South Branch**

- Percent Agriculture/Urban Vacant: 44.59 Estimated % Agriculture: 30
- Scale of Agricultural Activity: Moderate **Impact Classification: Moderate**
- Percent Urbanized: 14.13 **Impact Classification: Moderate (concentration)**
- Average QHEI: N/A Modified Attributes: N/A
- **Habitat Modification Classification: Minor**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Moderate **Impact Classification: Moderate**

Subbasin: **Granger Ditch**

- Percent Agriculture/Urban Vacant: 51.89 Estimated % Agriculture: 45
- Scale of Agricultural Activity: Major **Impact Classification: Major**
- Percent Urbanized: 2.16 **Impact Classification: Minor**
- Average QHEI: N/A Modified Attributes: N/A
- **Habitat Modification Classification: Moderate (Recovering)**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Moderate **Impact Classification: Moderate**

Subbasin: **Plum Creek at Brunswick**

- Percent Agriculture/Urban Vacant: 31.64 Estimated % Agriculture: 15
- Scale of Agricultural Activity: Small **Impact Classification: Minor**
- Percent Urbanized: 21.39 **Impact Classification: Moderate**
- Average QHEI: 74.5 Modified Attributes: Common in upstream areas
- **Habitat Modification Classification: Moderate in upstream areas**
- Number of HSTSs: N/A Number of Projected Failures: N/A
- Concentration of HSTSs: Low **Impact Classification: Minor**

Summary of Watershed Sources

Table 3 provides a summary of the relative importance of each of the actual or potential pollution sources discussed above.

Table 3: Summary of Watershed Sources in the Rocky Rive Watershed

Watershed	Point Sources	CSO/ SSOs	Agriculture	Urban Runoff	HSTSs
Mainstem	Threatened	Present	Not an issue	Impacted	Minor
Abram Creek	Impacted	Absent	Not an issue	Impacted	Minor
East Branch	Threatened	Absent	Moderate	Moderate	Major
Baldwin Creek	Threatened	Absent	Not an issue	Major	Minor
North Royalton 'A" tributary	Threatened	Absent	Not an issue	Moderate	Minor
Healey Creek	Minor	Absent	Minor	Moderate	Minor
West Branch	Threatened	Absent	Moderate	Moderate	Major
Baker Creek	Threatened	Absent	Not an issue	Moderate	Minor
Blodgett Creek	Threatened	Absent	Not an issue	Moderate	Minor
Plum Creek near Olmsted Falls	Impacted	Absent	Major	Minor	Major
Mallet Creek	Minor	Absent	Major	Minor	Moderate
South Branch	Minor	Absent	Moderate	Moderate	Moderate
North Branch	Minor	Absent	Moderate	Minor	Moderate
Granger Ditch/Remsen Creek	Minor	Absent	Major	Minor	Moderate
Plum Creek near Brunswick	Minor	Absent	Minor	Moderate	Minor

A LOOK AT THE BENEFICIAL USE IMPAIRMENTS OF THE ROCKY RIVER

Rocky River Watershed Action Plan
Appendix F
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

A Look at the Beneficial Use Impairments of the Rocky River

How healthy or polluted is the Rocky River and its tributaries? Impairment to a beneficial use means a change in the chemical, physical, or biological integrity of the river sufficient to cause a change in any one of fourteen uses identified by the Great Lakes Water Quality Agreement. Whenever these uses are impaired, there are grounds for undertaking remedial actions to restore the stream system. Understanding what the problems are is the first step towards identifying the remedial actions needed to fix them. Towards that end, a Use Impairment Statement was generated for the Rocky River. The following discussion documents how that statement was derived. A simplified version of the statement is attached.

Fish & Other Wildlife Should be Safe to Eat: Certain toxins can build up to unsafe levels in the tissues of fish and other wildlife even when very low measurements of these toxins are found in the environment. These toxins can be transferred to humans when contaminated fish, fowl, deer, or other wildlife is eaten. The Ohio Department of Health issues fish advisory statements for various waterways in the State. The most recent version can be viewed at their website (http://www.odh.state.oh.us/Alerts/fishadv.pdf). The Department of Health has issued a fish advisory for the West Branch of the Rocky River. They advise that the consumption of rock bass and smallmouth bass be limited to one meal per month. No other advisories apply to Rocky River fish. Fish consumption is therefore rated "**Slightly Impaired".**

No wildlife consumption advisories are in place in the watershed. The limited tissue studies that have been conducted in the region indicate no consumption problems. Wildlife consumption is rated "**Not Impaired"**.

Fish & Other Wildlife Should Taste Good: There are chemicals that can affect the flavor of fish, ducks, and geese when they are present in high enough quantities in the environment. Fishermen have raised concerns about the taste of Steelhead Trout caught in the mainstem of the Rocky River in the vicinity of Abram Creek. The persistence of this condition has yet to be documented. No other fish or wildlife taste problems have been identified in the watershed. Since the tainting of fish and other wildlife flavor cannot be scientifically established, local officials must rely on prevailing attitudes of consumers. Fishers and hunters are encouraged to report any concerns that they have regarding the flavor tainting issue. This use is currently rated "**Not Impaired"**.

Fish & Other Wildlife Populations Should be Diverse and Healthy: The health of fish that live in the Rocky River are directly affected by the quality of the water in the river. Ducks geese, and other animals that regularly feed or drink from the river can also be affected. The Ohio EPA uses a biological index to gauge the health and diversity of fish communities in the river. The health of the other wildlife that use the river are judged by observation. Based on the results of sampling conducted by Ohio EPA, fish communities are **impaired** at locations along the mainstem, in both the East and West Branches, and in numerous tributary streams. Abram Creek is **impaired** along most of its length. The

dominant causes of the impairments include habitat degradation, nutrient enrichment, flow alterations, and sedimentation.

Wildlife is flourishing in the Rocky River Watershed. There are no known water-based limitations on these populations. Geese and duck populations are commonplace. Blue Herons are plentiful. Deer are present in numbers that are difficult to manage. These populations are rated "**Not Impaired"**.

Fish Should Be Free of Abnormal Tumors and Other Deformities: Exposure to toxic chemicals can result in the development of tumors and other deformities in organism that live in or near the river. Cancerous tumors in fish are frequently noted in highly contaminated systems. Cross-bill deformed birds are one indicator that toxic substances exist in sufficient quantity to harm wildlife. Other deformities and reproductive problems have been noted over the years from sites around the Great Lakes. No abnormal incidences have been reported in fish caught in the watershed. Birds and other animals in the watershed also appear free of deformities or reproductive problems. No reports of any other problems have been noted. Evidence suggests that birds and other animals are reproducing prolifically throughout the watershed. The lack of large-scale industrial discharges to the River limit concerns related to toxic releases. Homeowners can help maintain this situation by the careful use of pesticides and other toxic chemicals around their properties. This use is rated "**Not Impaired**".

The Macroinvertebrate Community Populations Should be Diverse and Healthy: Macroinvertebrates are those organisms that live in the stream that have no backbones and are big enough to see without a microscope. They include a variety of aquatic insects as well as clams, crayfish, and snails. The macroinvertebrate populations are fairing well throughout most of the watershed. Local impairments are found in Abram Creek, the North Royalton 'A' tributary, Plum Creek near Olmsted Falls, Healy Creek, and Plum Creek near Brunswick. These populations are rated "**Slightly Impaired**" in the watershed. The noted limitations in the macroinvertebrate communities at isolated locations in the Rocky River are associated with a variety of causes. Habitat limitations, flow alterations, on-site wastewater treatment discharges, sediment from developing areas, and storm water runoff are all partially responsible for observed conditions.

The Amount and Quality of Sediment in River Should Keep Dredging Activities Within Normal Limits: This category evaluates whether increased sediment loadings related to erosion on agricultural fields, construction sites, or other lands require that waterways need to be dredged more often than would be expected under natural conditions. It also considers whether the sediments that are dredged in the watershed are safe for open lake disposal. Materials dredged from the mouth of the Rocky River are suitable for open lake disposal according to the Lake Erie LaMP Technical Report No. 9 (http://www.epa.gov/glnpo/lakeerie/buia/lamp9.pdf). are rated "**Not Impaired**" for Lake disposal.

Both Baldwin Lake and Hinckley Lake have sedimentation problems that are aggravated by increased sediment loadings from land use activities. Rigid enforcement of construction site runoff and sediment control rules/practices can help to minimize problems from future development. The sediments in the Rocky River are rated "**Slightly Impaired**" for Lake Dredging.

There Should be a Lack of Eutrophication or Undesirable Algae: This impairment considers cases when there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to increased nutrient loadings to the stream. Nutrient levels in the River are well below levels of concern but loadings are elevated enough to be an issue throughout the watershed. Sources include: Sewage treatment facilities, over-fertilization of lawns, areas having improper home sewage treatment systems and from agricultural runoff. However, levels are not high enough to lead to eutrophic conditions or excessive algal populations. Homeowners can help to reduce undesirable algae by controlling their application of fertilizer, and by not dumping yard wastes into local streams. This use is rated "**Not Impaired**" in the watershed.

The River Should be Free of Drinking Water Consumption or Taste & Odor Problems: - The River has a problem if treated drinking water supplies are impacted to the extent that: 1) densities of disease- causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection). There remains only one public water supply intake in the Rocky River watershed. The City of Medina has abandoned Lake Medina as its water source and receives water from Lake Erie. The City of Berea has invested in a capital program that allows it to continue to use water from the River. The drinking water use is rate "**Not Impaired**" in the Rocky River Watershed.

The River Should be safe for Swimming and Wading: Fecal coliform and E. coli bacteria can make contact with the River unsafe when they exceed limits established by the Ohio Department of Health and Ohio EPA. Bacteria levels after storm events often exceed save levels throughout the watershed. These conditions make swimming and wading inadvisable for up to 48 hours. Bacteria loadings from problematic home sewage treatment systems affect limited areas during dry weather periods. Combined sewer overflows remain a contributor in the lower portions of the watershed. Localized sanitary discharges also contribute. Wildlife and livestock are locally important contributors. Pet owners need to pick up their animal's waste, and farm animal owners need to manage livestock waste in order to help reduce bacteria levels in the Rocky River. Owners of home sewage treatment systems also need to maintain their systems in order to reduce this problem. Overall, the recreational use of he Rocky River is rated "**Impaired**".

The River Should be Aesthetically Pleasing: The aesthetics of the River are impaired when any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum). It is also considered to be impaired when the amount of trash and floatable debris is objectionable. Much of the mainstem and the East Branch flow through parkland settings. Major stretches of the West Branch and limited sections of the East Branch flow through sparsely developed areas. In all of these sections, the stream is very aesthetically pleasing. Many tributary streams are highly developed and do suffer from impaired aesthetics. Isolated eyesores related to inappropriate development along the riparian corridor do exist. Litter and debris are not considered to be a big problem in the Rocky River. Rapid development in the watershed can change this. Watershed residents can help by properly disposing of all household wastes and by taking part in litter control programs. Support for riparian setback ordinances can also help to maintain the naturalness of the stream. The aesthetic quality of the Rocky River is rated "Locally Impaired".

Microscopic Plants and Animals (Phytoplankton & Zooplankton) Populations Should be Healthy and Diverse: Microscopic plants and animals make up a major and important part of the food chain in a river system. They must be healthy and present in sufficient numbers to support all other forms of life in the river. It is unknown if this beneficial use is impaired. No rigorous evaluation tool exists for use in the watersheds that drain to Lake Erie. It is not anticipated that the Rocky River Watershed would have an above average impairment relative to these populations. This use impairment is rated "Unknown" in the watershed.

There Should be no Added Costs to Agriculture and Industry: This use is impaired when there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including livestock watering, irrigation and crop-spraying) or industrial purposes (i.e. intended for commercial or industrial applications). There is low potential for impairment, based on the regular attainment of Water Quality Standards for agricultural water use and industrial water use in the river. This use is rated "Not Impaired".

Fish and Wildlife Habitat Should be Diverse: All of the animals that live in or along a stream need to have sufficient habitat that is of good quality. If a stream lacks quality habitat, aquatic populations can be greatly reduced even if the water quality is good. Sedimentation, channelization, streambank alterations, low level dams, and increased runoff rates effect habitat conditions for both fish and wildlife at numerous location along the Rocky River. This causes habitat to be "Impaired" at many locations in the watershed. Continuing development in the watershed regularly threatens the habitat of small headwater streams. This can be minimized in communities that pass a riparian setback ordinance.

Beneficial Use Impairment Statement for the Rocky River-Part 1

BENEFICIAL USE	What is the Concern?	ROCKY RIVER IMPAIRMENT STATUS
Fish & Other Wildlife are Safe to Eat	Certain toxins can build up to unsafe levels in the tissues of fish and other wildlife even when very low measurements of these toxins are found in the environment. These toxins can be transferred to humans when contaminated fish, fowl, deer, or other wildlife are eaten.	Slightly Impaired for Fish OK for Other Wildlife
Fish & Other Wildlife Taste Good	There are chemicals that can affect the flavor of fish, ducks, and geese when they are present in high enough quantities in the environment	OK
Fish & Other Wildlife Populations are Diverse and Healthy	The health of fish that live in the Rocky River are directly affected by the quality of the water in the Rocky River. Ducks geese, and other animals that regularly feed or drink from the river can also be affected. The Ohio EPA uses a biological index to gauge the health and diversity of fish communities in the river. The health of the other wildlife that use the river are judged by observation.	Impaired for Fish OK for Other Wildlife
Fish are Free of Abnormal Tumors & Other Deformities	Exposure to toxic chemicals can result in the development of tumors and other deformities in organism that live in the river. Cancerous tumors are frequently noted in highly contaminated systems.	OK
Bird and Other Animals are Free of Deformities or Reproductive Problems	Cross-bill deformed birds are one indicator that toxic substances exist in sufficient quantity to harm wildlife. Other deformities and reproductive problems have been noted over the years from sites around the Great Lakes.	OK
The macroinvertebrate community populations are diverse and healthy	Macroinvertebrates are those organisms that live in the stream that have no backbones and are big enough to see without a microscope. They include a variety of aquatic insects as well as clams, crayfish, and snails.	Slightly Impaired
The Amount and Quality of Sediment in River Keeps Dredging Activities Within Normal Limits	This category evaluates whether increased sediment loadings related to erosion on agricultural fields, construction sites, or other lands require that waterways need to be dredged more often than would be expected under natural conditions. It also considers whether the sediments that are dredged in the watershed are safe for open lake disposal.	OK for Lake Disposal Slightly Impaired for Lake Dredging

Beneficial Use Impairment Statement for the Rocky River-Part 2

BENEFICIAL USE	What is the Concern?	ROCKY RIVER IMPAIRMENT STATUS
There is a Lack of Eutrophication or Undesirable Algae	This impairment considers cases when there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to increased nutrient loadings to the stream.	OK
The River is free of Drinking Water Consumption or Taste & Odor Problems	- The River has a problem if treated drinking water supplies are impacted to the extent that: 1) densities of disease- causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection).	OK
The River is safe for swimming and wading	Fecal coliform and E. coli bacteria can make contact with the River unsafe when they exceed limits established by the Ohio Department of Health and Ohio EPA.	Impaired
The River is Aesthetically Pleasing	The aesthetics of the River are impaired when any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum). It is also considered to be impaired when the amount of trash and floatable debris is objectionable.	Locally Impaired
Microscopic Plants and Animals (Phytoplankton & Zooplankton) Populations are Healthy and Diverse	Microscopic plants and animals make up a major an important part of the food chain in a river system. They must be healthy and present in sufficient numbers to support all other forms of life in the river.	Unknown
There are no Added Costs to Agriculture & Industry	This use is impaired when there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including livestock watering, irrigation and crop-spraying) or industrial purposes (i.e. intended for commercial or industrial applications).	OK
Fish & Wildlife Habitat is Diverse	All of the animals that live in or along a stream need to have sufficient habitat that is of good quality. If a stream lacks quality habitat, aquatic populations can be greatly reduced even if the water quality is good.	Impaired

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

THE WATER QUALITY PROBLEM STATEMENT FOR THE ROCKY RIVER WATERSHED

Rocky River Semi-Annual Report
Appendix G
May 2006
Updated February 2010

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The Water Quality Problem Statement for the Rocky River Watershed

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The Water Quality Problem Statement for the Rocky River Watershed

Abstract

This report summarizes the water quality problems that have been documented to affect the Rocky River Watershed of Northeast Ohio. It includes a discussion of fourteen individual stream segments in the watershed. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

The Water Quality Problem Statement for the Rocky River Watershed

Introduction

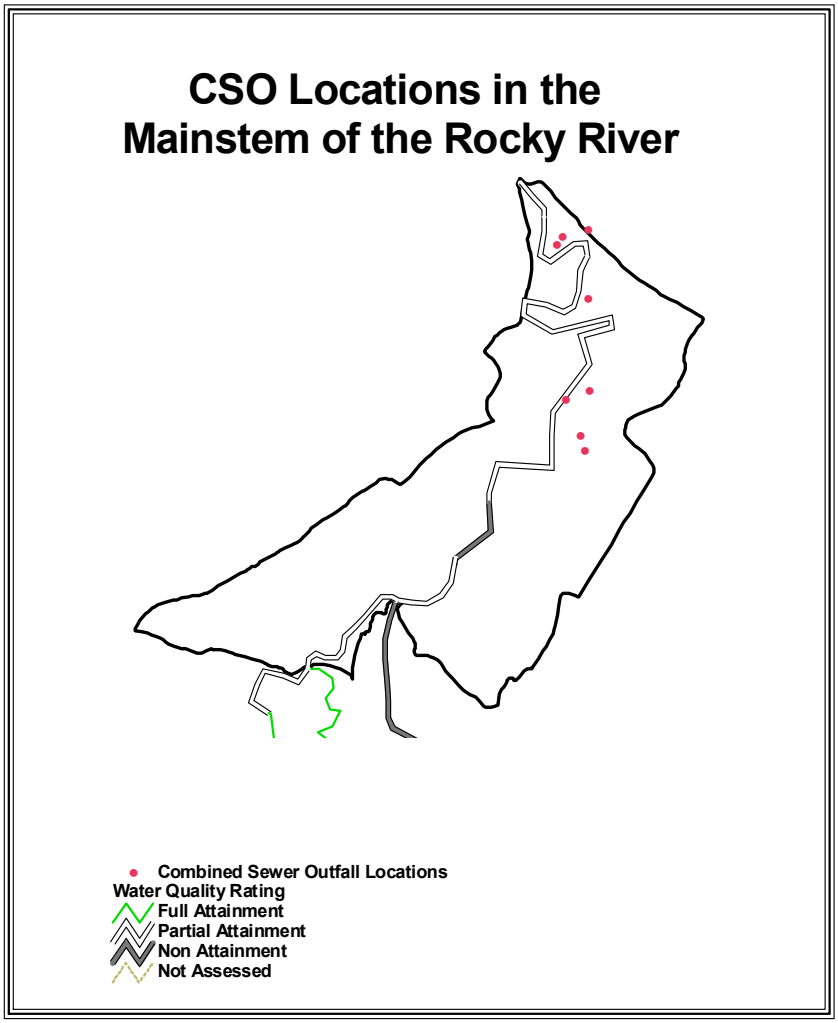
The following presentation provides a statement of the water quality problems that have been documented in the Rocky River and its tributaries. This statement is the result of a process that was undertaken by the Rocky River Watershed Council and its Work Groups. The Water Quality Problem Statement was preceded by a series of reports that collected, analyzed, and evaluated the information known about water quality in the Rocky River Watershed. These reports include:

1. "Water Resource of the Rocky River".
2. "Watershed Inventory for the Rocky River Watershed".
3. "Inventory of Point and Nonpoint Source Discharges in the Rocky River Watershed".
4. "A Look at the Beneficial Use Impairments of the Rocky River".
5. "A Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed Report".
6. "Target Load Reduction for the Rocky River Watershed Report".
7. "Water Resource Threats Related to Growth in the Rocky River Watershed".
8. "Summary Report of Source Identification Surveys".

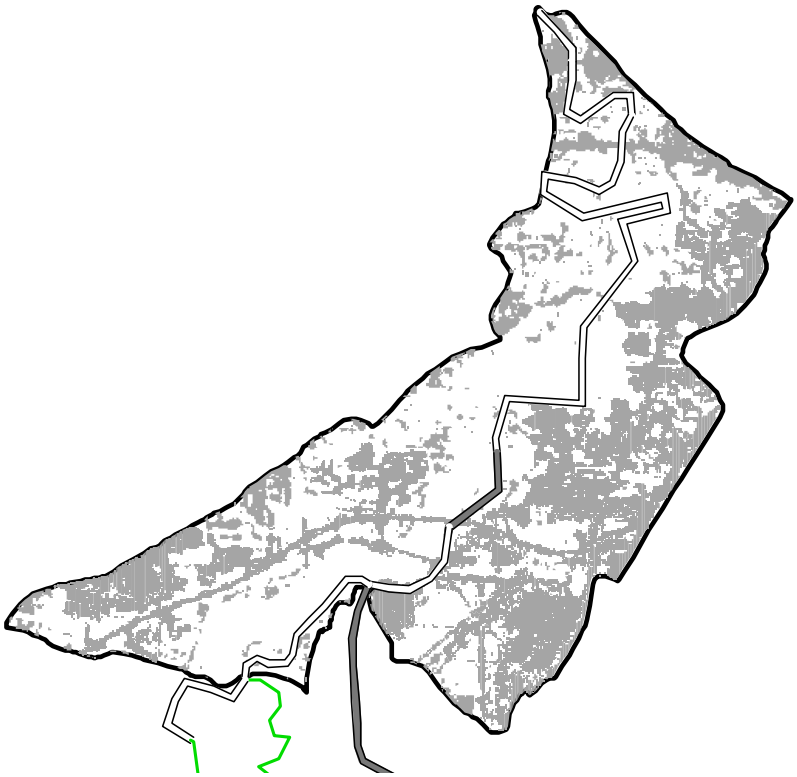
The presentation that follows contains a series of items for each of the major segments of the Rocky River. The presentation begins with a summary of the key information that describes the segment. For each segment, maps are then provided that identify the Use Attainment Assessment generated by Ohio EPA. These maps also depict the geographic extent of the major causes or sources that impact any given stream segment. The Problem Statement for each segment summarizes the beneficial use assessment that was made for the segment, the point and nonpoint sources of concern, the nature of existing water quality problems in the segment, and the result of Ohio EPA's Total Maximum Daily Load Evaluation. The segment report concludes with a statement of the problem-solving strategies that apply to the problems identified as important in that segment. These strategies quantify needed load reductions whenever possible.

Water Quality Problems in the Mainstem of the Rocky River

Stream: Rocky River Mainstem
Tributary to: Lake Erie
Drainage Area: 293.8 square miles total
Length: 11.8 miles, 48.0 miles including the East Branch Slope: 13.7 feet per mile
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.7 miles in Partial Attainment, and 3.37 miles in Nonattainment
Recreational Use Assessment: Impaired



Urbanized Lands in the Mainstem of the Rocky River



Water Quality Rating

- Full Attainment
- Partial Attainment
- Non Attainment
- Not Assessed

Problem Statement for the Mainstem of the Rocky River

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Slightly Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Impaired**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • **Present** • Absent • Threatened Agricultural Runoff. • Major • Moderate • Minor • Threatened • **Not an issue** Urban Runoff. • **Major** • Moderate • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	**Nitrogen Loadings.** **Organic Enrichment/ Dissolved Oxygen Problems.** **Habitat Modifications.** Bacteria and Pathogens. Toxic Chemicals

Bold Type indicates selection that applies to this river segment

Problem Solving Strategies for the Mainstem of the Rocky River

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of subbasin from 39.45% to 15%.
- Evaluate low head dams along Mainstem and remove those that serve as obstructions to aquatic migration.
- Reduce modified habitat attributes associated with heavy sediment loads and scouring stream flows from urban runoff wherever possible.
    - Reduce sediment loading from bank erosion by stabilizing 500 linear feet of streambank and adding riffles/grade control and/or bankfull benches along 2500 feet of an unnamed tributary to the Mainstem adjacent to Windsor Drive in North Olmsted to reduce nitrogen loading by 100 lbs/yr, phosphorus loading by 45 lbs/yr and sediment loading by 75 tons/yr, at a cost of $300,000.
    - Target residential neighborhoods upstream of the erosion sites along Windsor Drive in North Olmsted for rain garden, rain barrel, downspout disconnection, and roadside ditch retrofit outreach and deployment, with an initial goal of treating 25% of the channel protection volume (25% = 1 acre-ft or 163 cubic ft/acre).

Minimize the storm water impacts associated with new development:

- Manage the limited amount of new development likely in the subbasin and the pronounced development pressure in the upper watershed.
- Maintain high degree of riparian vegetation along stream channel.

Reduce urban runoff rates and pollutant loadings:

- Nitrogen loadings need to be reduced by 46% and phosphorus loadings by 28% to meet TMDL objectives.
- Combined sewer outfall improvements that are programmed to reduce overflows by 88% form the Lakewood system and 25% from the NEORSD system need to be completed.
- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements

No established problems exist from this source in the Mainstem's direct watershed.

Agricultural Runoff

No established problems exist from this source in the Mainstem's direct watershed.

Land Use Issues

Continuing education of golf course personnel is called for to insure minimal impact from maintenance practices.

Water Quality Problems in Abram Creek

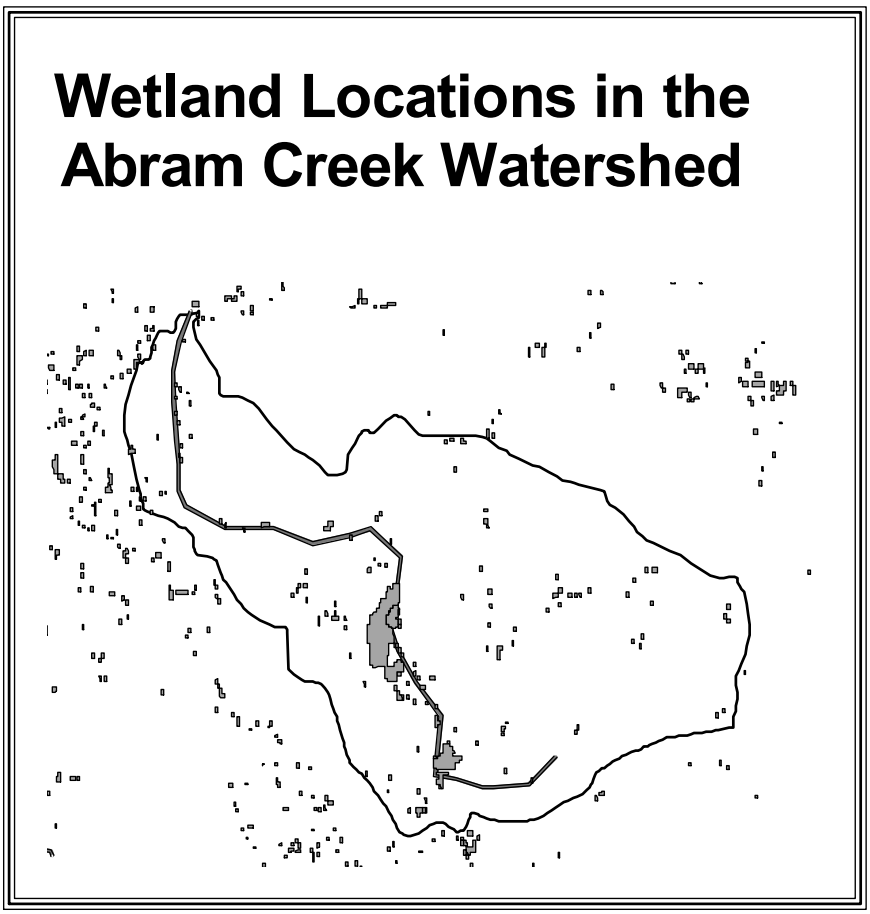
Stream: Abram Creek

Tributary to: Mainstem of the Rocky River

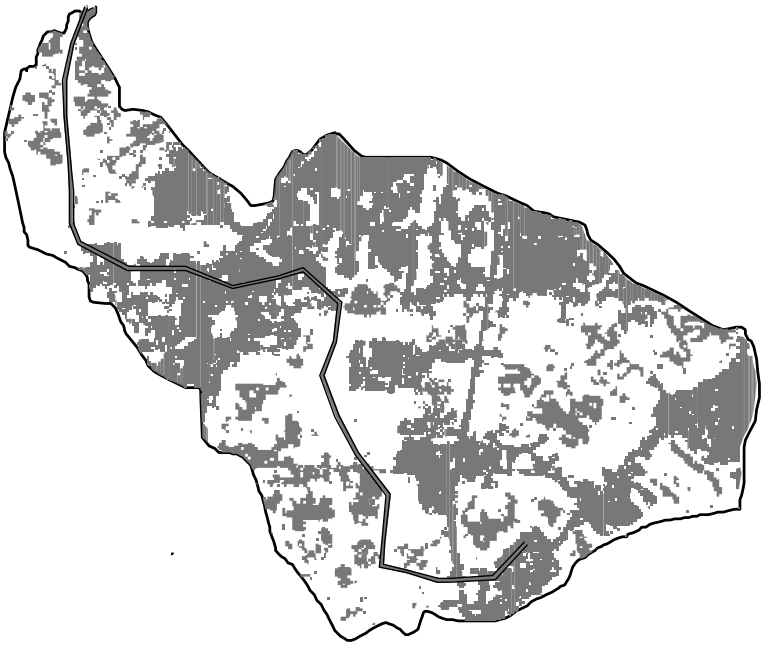
Drainage Area: 10.06 square miles Length: 7.4 miles Slope: 29.4 feet per mile

Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation

Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.7 miles in Nonattainment



Urbanized Lands in the Abram Creek Watershed



Use Attainment Status

Non Attainment

Problem Statement for Abram Creek

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Slightly Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Impaired**	Point Sources • **Impacted** • Minor • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • Minor • Threatened • **Not an issue** Urban Runoff. • **Major** • Moderate • Minor • Threatened Home Sewage Treatment System Discharges. • Major • **Moderate** • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Habitat Modifications. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Toxic Chemicals • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened	**Nitrogen Loadings.** **Organic Enrichment/ Dissolved Oxygen Problems.** Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals

Problem Solving Strategies for Abram Creek

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of subbasin from 45.29% to 15%.
- Evaluate high dams upstream of Cedar Point Road and remove if demonstrated to be an obstruction to aquatic migration.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.

Minimize the storm water impacts associated with new development:

- Manage the limited amount of new development likely in the subbasin.
- Maintain high degree of riparian vegetation along stream channel.
- Prioritize parcels for permanent protection via fee simple acquisition or the acquisition of conservation easements.

Reduce urban runoff rates and pollutant loadings:

- Ammonia loading reductions from Cleveland Hopkins International Airport need to be completed.
- Glycol discharges from the airport also need to be eliminated.
- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.
- Install storm water retrofit practices in appropriate locations to add both water quality treatment and storage capacity, with an initial goal of treating 200 acres of the subwatershed, reducing nitrogen loading by 500 lbs/yr and phosphorus loading by 64 lbs/yr, at an estimated cost of $2 million. See attachment A for a map of potential locations.
- Target residential neighborhoods in the uppermost 750-acre catchment along Big Creek Parkway in Middleburg Heights for rain garden, rain barrel and fertilizer management outreach and deployment to reduce runoff volume by 400,000 gallons/yr, nitrogen loading by 10 lbs/yr and phosphorus loading by 4 lbs/yr.

Home Sewage Treatment System Improvements

200 HSTSs exist in the watershed; at least 50 need to be upgraded.

Agricultural Runoff

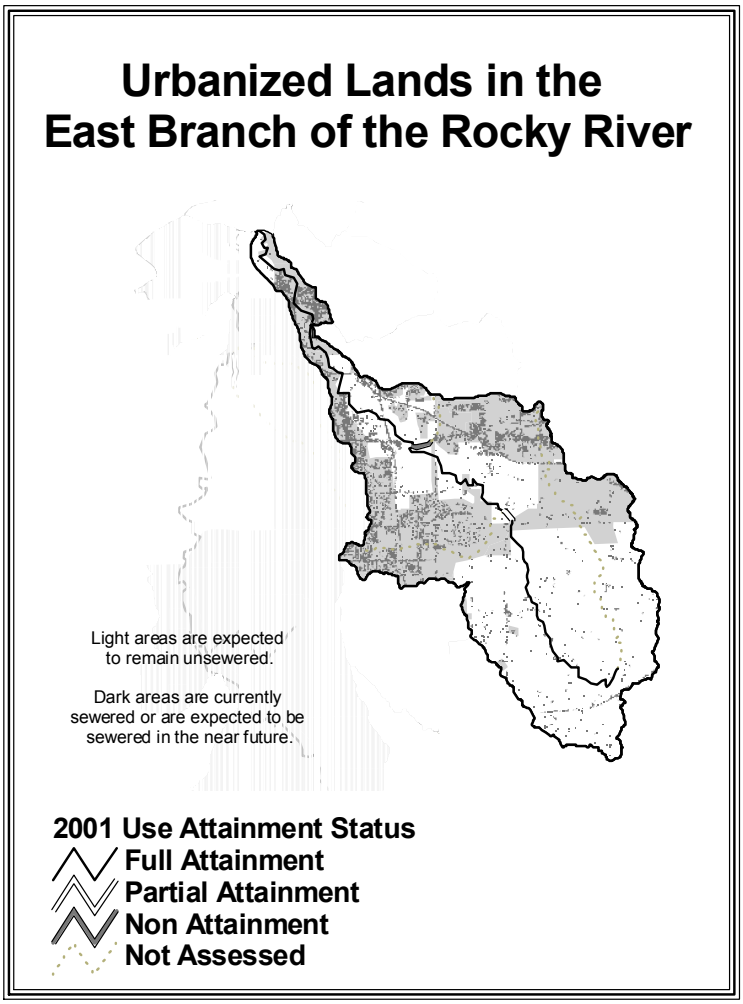
No established problems exist from this source in the Abram Creek watershed.

Land Use Issues

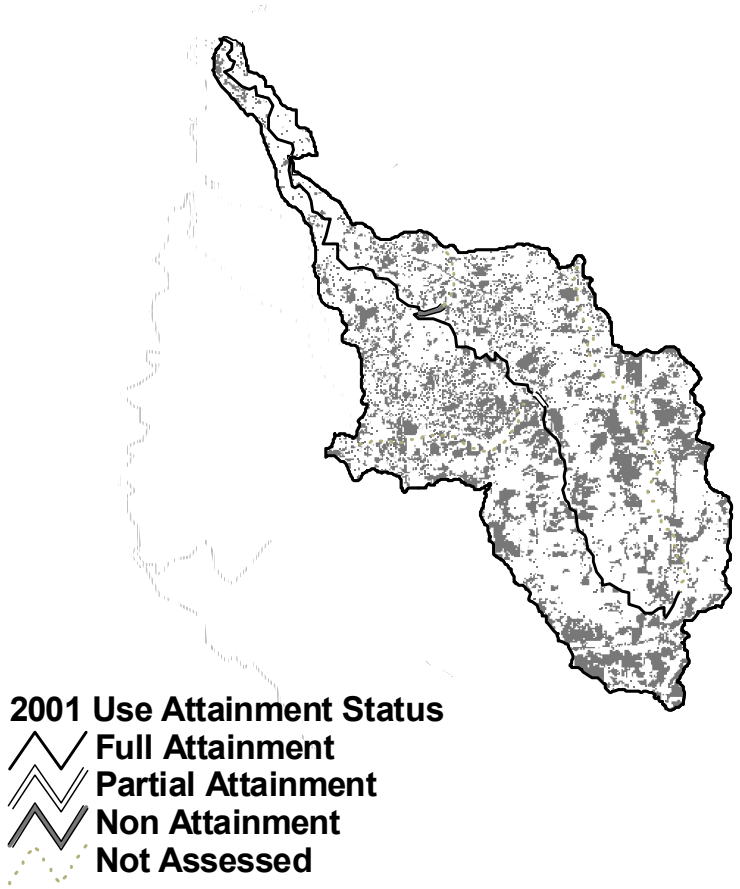
No specific issues are a priority in this watershed.

Water Quality Problems in the East Branch of the Rocky River

Stream: East Branch of the Rocky River
Tributary to: Mainstem of the Rocky River
Drainage Area: 80.4 square miles Length: 34.5 miles Slope: 16.5 feet per mile
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 25.1 miles in Full Attainment, 4.9 miles in Partial Attainment, and 0.0 miles in Nonattainment



Agricultural Lands in the East Branch of the Rocky River



Problem Statement for the East Branch of the Rocky River

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • **Moderate** • Minor • Threatened • Not an issue Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • **Major** • Moderate • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Bacteria and Pathogens. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Solving Strategies for the East Branch of the Rocky River

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of lower portions of the East Branch to 15%.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.

Minimize the storm water impacts associated with new development:

- Manage new development likely in the Strongsville, North Royalton, and Hinckley Township portions of the subbasin.
- Manage new development likely in the Richfield and Richfield Township portions of the subbasin.
- Maintain high degree of riparian vegetation along stream channel.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements

1,683 HSTSs exist in the watershed; at least 640 need to be upgraded.

Agricultural Runoff

Improperly managed horse, cattle, and other farm animal wastes produce excessive nutrient and bacteria loadings that contribute marginally to documented problems in downstream areas

- Minimize localized problems that exist from livestock operations in the upper East Branch watershed in Medina County. Target remediation resources to horse operations discharging to the East Branch in North Royalton and Berea and to the West Branch in Olmsted Township.

Minimize nutrient, fertilizer, and chemical runoff from crop production.

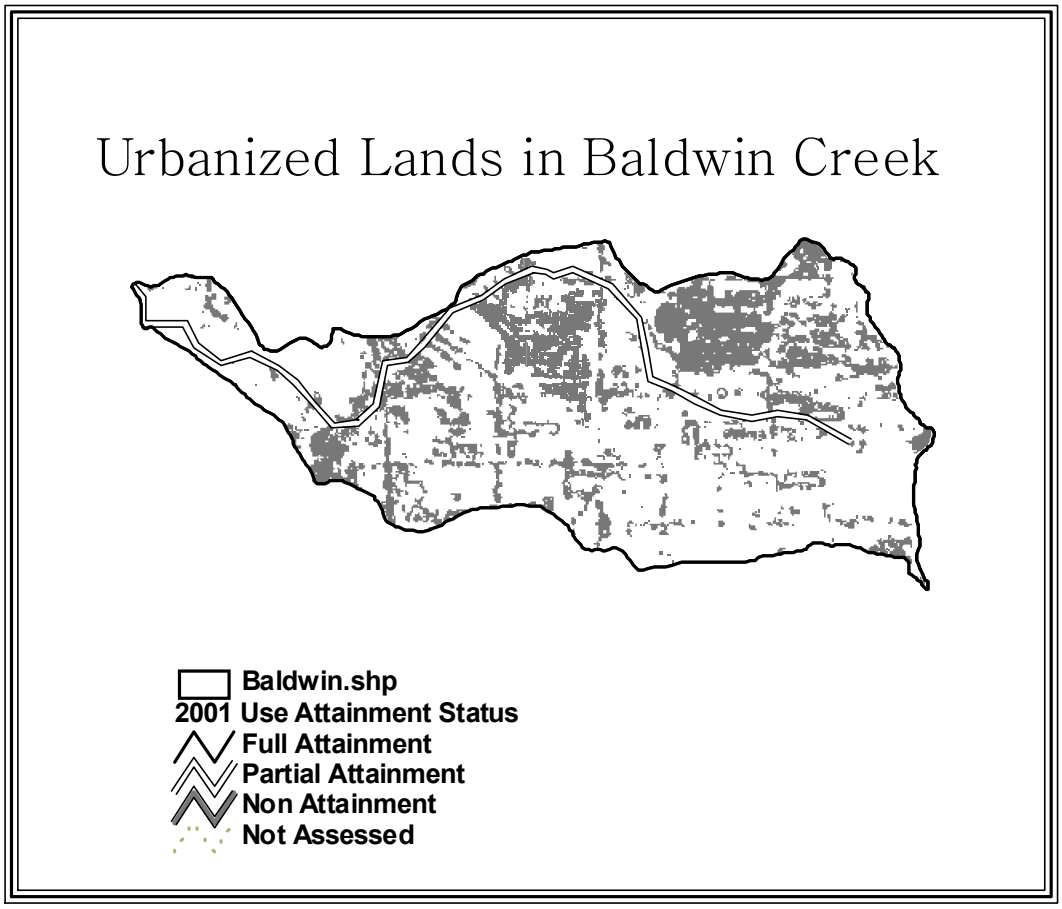
- Target cost-share resources to farms located in the Upper East Branch Watershed.

Land Use Issues

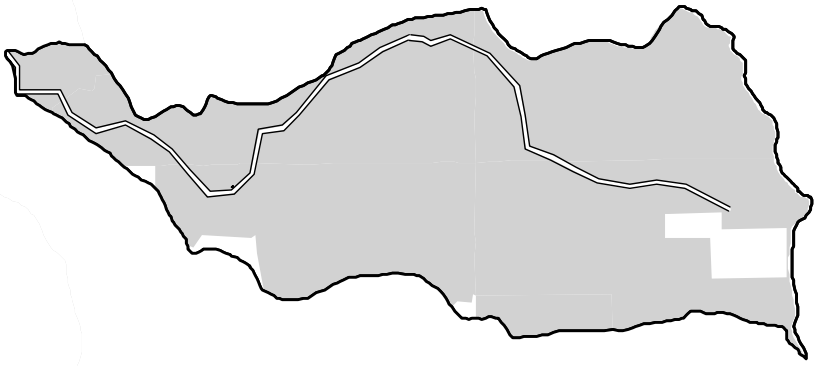
Conservation and other low impact developments need to be encouraged throughout the watershed.

Water Quality Problems in Baldwin Creek

Stream: Baldwin Creek
Tributary to: East Branch of the Rocky River
Drainage Area: 11.94 square miles Total Length: 9.2 miles Slope: 53.8 feet per mile
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.0 miles in Partial Attainment, and 0.0 miles in Nonattainment



Status of Sanitary Sewer Service in Balwin Creek



Dark Areas are currently served with sanitary sewer service.

Light areas will continue to utilize HSTSs.

Problem Statement for Baldwin Creek

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Impaired**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • Minor • Threatened • **Not an issue** Urban Runoff. • **Major** • Moderate • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	**Nitrogen Loadings.** **Organic Enrichment/ Dissolved Oxygen Problems.** **Habitat Modifications.** Bacteria and Pathogens. Toxic Chemicals None of the above

Problem Solving Strategies for Baldwin Creek

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of subbasin from 26.75% to 15%.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.
- Restore fish passage to 0.9 miles of Baldwin Creek by removing four low-head dams and enhance fish habitat sufficient to raise the average QHEI of the reach from 51.5 to 60 along the creek's lower one-mile reach in Berea, at an estimated cost of $507,000. See Attachment B for mapped locations.
- Reduce siltation and embedded substrate and enhance habitat by an average of 5 QHEI points through the installation of 2500 feet of streambank stabilization practices and 7500 feet of stream restoration practices, reducing sediment loading by 900 lbs/yr, nitrogen loading by 1450 lbs/yr and phosphorus loading by 550lbs/yr, at an estimated cost of $2,125,000. See attachment B for a map of identified erosion areas.

Minimize the storm water impacts associated with new development:

- Manage the limited amount of new development likely in the subbasin.
- Maintain the remaining riparian vegetation along stream channel.
- Prioritize parcels for permanent protection via fee simple acquisition or the acquisition of conservation easements.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.
- Install storm water retrofit practices in appropriate locations to add both water quality treatment and storage capacity, with an initial goal of treating 100 acres of the subwatershed, reducing nitrogen loading by 250 lbs/yr and phosphorus loading by 32 lbs/yr, at an estimated cost of $1 million. See attachment C for a map of potential locations.

Home Sewage Treatment System Improvements

496 HSTSs exist in the watershed; at least 110 need to be upgraded.

Agricultural Runoff

No established problems exist from this source in the Abram Creek watershed.

Land Use Issues

No specific issues are a priority in this watershed.

Water Quality Problems in the North Royalton 'A' Tributary and in Healey Creek

Stream: North Royalton 'A' Tributary
Tributary to: East Branch of the Rocky River
Drainage Area: 1.72 square miles total Length: 3.3 miles Slope: N/A
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.6 miles in Partial Attainment, and 0.4 miles in Nonattainment

Stream: Healey Creek
Tributary to: East Branch of the Rocky River
Drainage Area: 4.84 square miles total Length: 5.75 miles Slope: N/A
Ohio EPA Use Designations: State Resource Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment

The land area drained by the North Royalton 'A' Tributary and Healey Creek is included on the maps of the East Branch of the Rocky River.

Problem Statement for the North Royalton 'A' Tributary

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Not Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • Minor • Threatened • **Not an issue** Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Statement for Healey Creek

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Not Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • **Minor** • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • **Minor** • Threatened • Not an issue Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Solving Strategies for the North Royalton 'A' Tributary and Healey Creek

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat (see summary map in Attachment D):

- Restore habitat in the Upper Healey Creek subwatershed by restoring 1500 linear feet of incised channel in Venus Park in Brunswick using natural stream channel design, two-stage or self forming channel techniques, restoring QHEI to a minimum of 60, and reducing nitrogen loading by 400 lbs/yr and phosphorus loading by 150 lbs/yr, at an estimated cost of $300,000.
- Install storm water wetland on vacant 3-acre property upstream of Venus Park, where three outlet pipes meet to form Healey Creek, to reduce nitrogen loading by 400 lbs/yr, phosphorus loading by 150 lbs/yr, and sediment loading by 200 tons/yr, at an estimated cost of $200,000.
- Reconnect 1500 linear feet of floodplain along Healey Creek as it flows through North Park in Brunswick by removing levees and adding or expanding riparian wetlands and/or vernal pools to increase QHEI to a minimum of 60 and reduce sediment by 126 tons/yr, nitrogen loading by 200 lbs/yr, and phosphorus loading by 75 lbs/yr, at an estimated cost of $300,000.
- Target residential neighborhoods upstream of Venus Park and upstream of North Park Lake for rain garden, rain barrel and fertilizer management outreach and deployment.
- Retrofit approximately 3500 feet of roadside ditch to improve storage, infiltration and water quality treatment along West Drive and East Drive in Brunswick, reducing nitrogen loading by 10 lbs/yr and phosphorus loading by 4 lbs/yr at an estimated cost of $100,000.

Minimize the storm water impacts associated with new development:

- Manage the limited amount of new development likely in the subbasin.
- Maintain the remaining riparian vegetation along stream channel.
- Permanently protect 9000 linear feet of Healey Creek and its tributaries by acquiring interest in real property or conservation easements on the 25-acre Hudak property and 20-acre Custer property immediately upstream of North Park in Brunswick and the 10-acre Metro Church property, 85-acre Knight Development property, and 107-acre and 23-acre Fifth-Third Bank properties downstream of North Park in Brunswick, at an estimated cost of $2.7 million.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements

HSTS management is a minor issue in both of these subbasins.

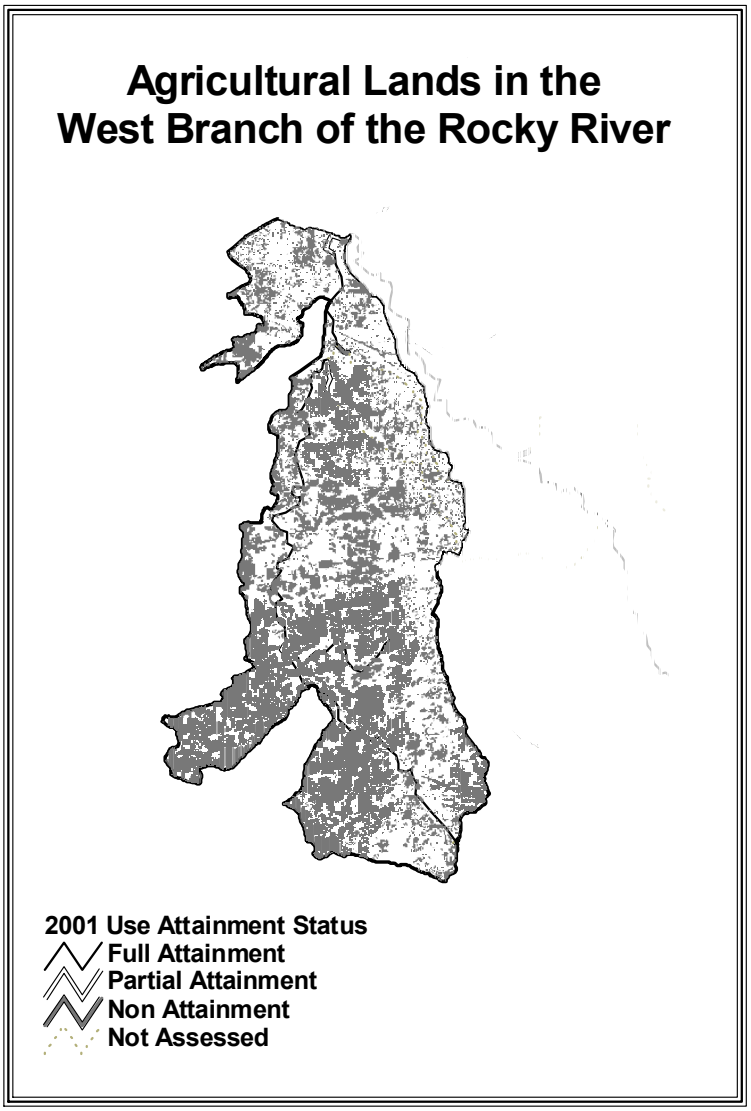
Agricultural Runoff
No established problems exist from this source in these watersheds.

Land Use Issues
Conservation and other low impact developments need to be encouraged throughout the watershed.

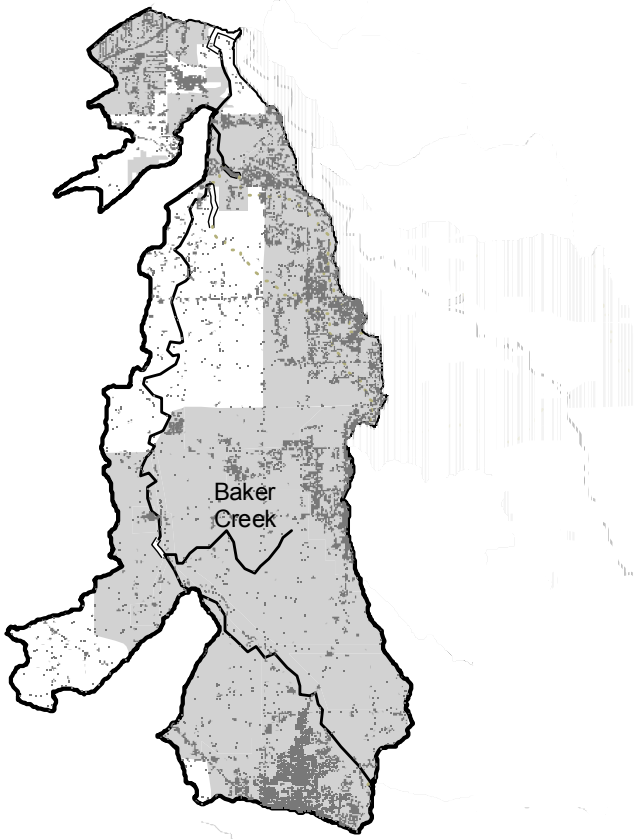
Implement the Rocky River Upper West Branch Balanced Growth Plan.

Water Quality Problems in the West Branch of the Rocky River

Stream: West Branch of the Rocky River
Tributary to: Mainstem of the Rocky River
Drainage Area: 188.3square miles Length: 36.2 miles Slope: 16.0 feet per mile
Ohio EPA Use Designations: Water; Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 23.96 miles in Full Attainment, 10.05 miles in Partial Attainment, and 0.0 miles in Nonattainment



Urbanized Lands in the West Branch of the Rocky River



2001 Use Attainment Status

- **Full Attainment**
- **Partial Attainment**
- **Non Attainment**
- **Not Assessed**

Darkened Areas are served with sanitary sewers of are likely to be sewered in the near future.

Problem Statement for the West Branch of the Rocky River

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • **Moderate** • Minor • Threatened • Not an issue Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • **Major** • Moderate • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Solving Strategies for the West Branch of the Rocky River

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of lower portions of the West Branch to 15%.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.

Minimize the storm water impacts associated with new development:

- Manage new development likely in the Strongsville and the City of Medina portions of the watershed.
- Maintain high degree of riparian vegetation along stream channel.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements

1,421 HSTSs exist in the watershed; at least 600 need to be upgraded. Target areas include Columbia Township and Olmsted Township.

Agricultural Runoff

Improperly managed horse, cattle, and other farm animal wastes produce excessive nutrient and bacteria loadings that contribute marginally to documented problems in downstream areas

- Minimize localized problems that exist from livestock operations in the upper West Branch watershed in Medina County. Target remediation resources to horse operations discharging to the West Branch in Olmsted Township.

Minimize nutrient, fertilizer, and chemical runoff from crop production.

- Target cost-share resources to farms located in the Upper West Branch Watershed.

Land Use Issues

Conservation and other low impact developments need to be encouraged throughout the watershed.

Water Quality Problems in Baker Creek

Stream: Baker Creek

Tributary to: West Branch of the Rocky River Drainage Area: 5.81 square miles Length: 8.2 miles Slope: 45.7 feet per mile Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report

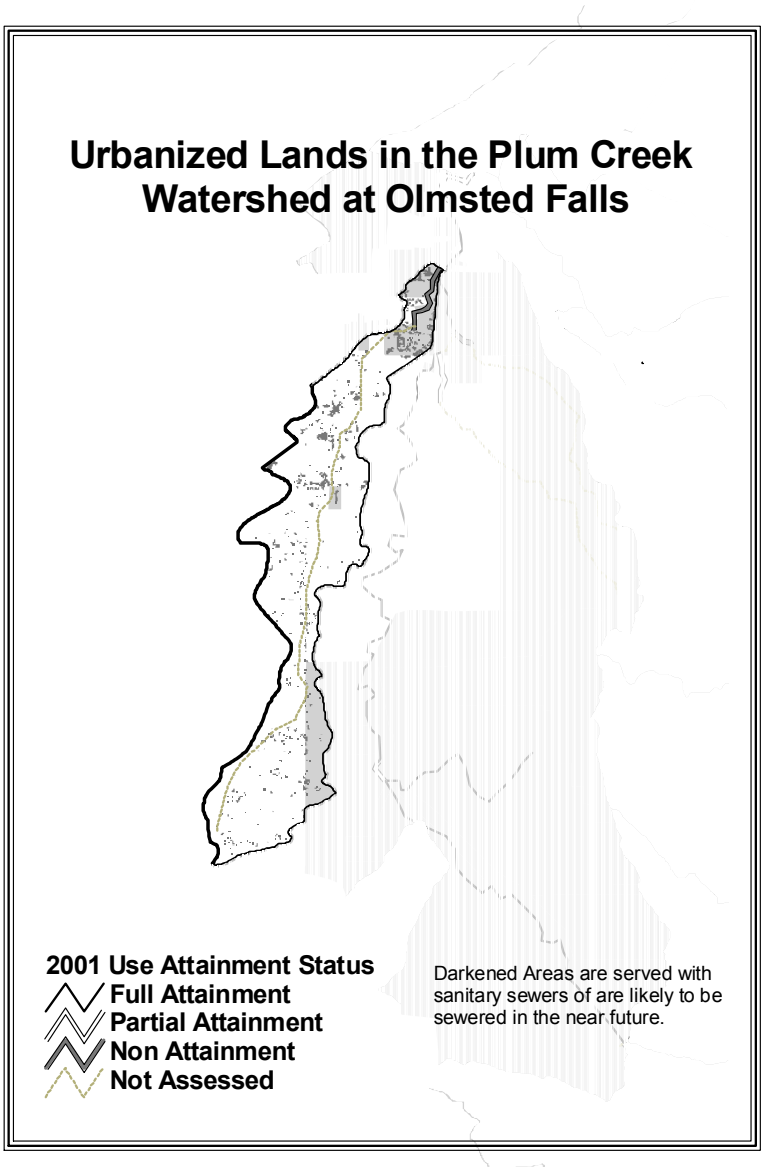
See preceding West Branch maps for general conditions in Baker Creek. Baker Creek is unlabeled on these maps but is shown. It is the most upstream tributary that enters the West Branch from the East.

Problem Statement for Baker Creek

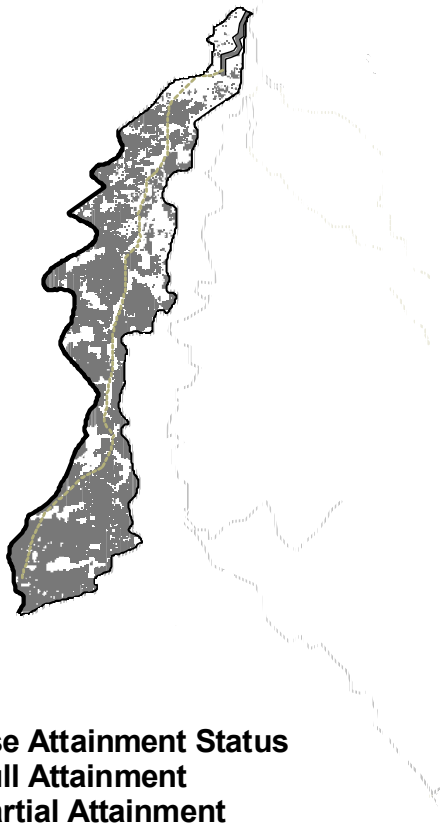
Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • Minor • **Threatened** Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • Minor • Threatened • **Not an issue** Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Habitat Modifications. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Bacteria and Pathogens. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Water Quality Problems in Plum Creek at Olmsted Falls

Stream: Plum Creek near Olmsted Falls
Tributary to: West Branch of the Rocky River
Drainage Area: 18.9 square miles Length: 14.8 miles Slope: 16.4 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 0.0 miles in Partial Attainment, and 3.0 miles in Nonattainment



Agricultural Lands in Plum Creek at Olmsted Falls



2001 Use Attainment Status

- Full Attainment
- Partial Attainment
- Non Attainment
- Not Assessed

Problem Statement for Plum Creek at Olmsted Falls

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • **Impacted** • Minor • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • **Major** • Moderate • Minor • Threatened • Not an issue Urban Runoff. • **Major** • Moderate • Minor • Threatened Home Sewage Treatment System Discharges. • **Major** • Moderate • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	**Nitrogen Loadings.** Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals None of the above

Problem Solving Strategies for Plum Creek at Olmsted Falls

Storm Water Management

Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of lower portions of Plum Creek to 15%.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.

Minimize the storm water impacts associated with new development:

- Manage new development likely in the Olmsted Township and Olmsted Falls portions of the watershed.
- Maintain the remaining of riparian vegetation along stream channel.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements

171 HSTSs exist in the watershed; at least 73 need to be upgraded. Target areas include Columbia Township and Olmsted Township.

Agricultural Runoff

Improperly managed horse, cattle, and other farm animal wastes produce excessive nutrient and bacteria loadings that contribute marginally to documented problems in downstream areas

- Minimize localized problems that exist from livestock operations in the upper portion of the watershed in Columbia Township.

Minimize nutrient, fertilizer, and chemical runoff from crop production.

- Target cost-share resources to farms located in the upper portion of the watershed.

Land Use Issues

Conservation and other low impact developments need to be encouraged throughout the watershed.

Water Quality Problems in the Upper West Branch of the Rocky River

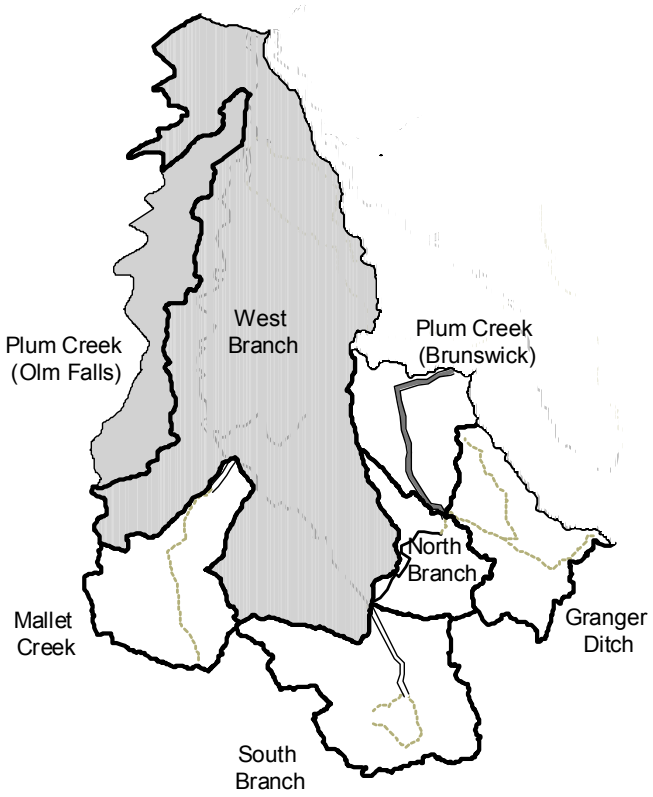
Stream: Mallet Creek
Tributary to: West Branch of the Rocky River
Drainage Area: 18.75 square miles Length: 11.4 miles Slope: 27.5 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: Not assessed in 2000 305(b) Report

Stream: North Branch of the Rocky River
Tributary to: West Branch of the Rocky River
Drainage Area: 37.55 square miles Length: 5.4 miles Slope: 22.4 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.79 miles in Full Attainment, 0.0 miles in Partial Attainment, and 0.0 miles in Nonattainment

Stream: Granger Ditch including Remsen Creek
Tributary to: North Branch of the Rocky River
Drainage Area: 14.62 square miles Length: 6.5 miles Slope: 30.5 feet per mile
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 8.7 miles in Partial Attainment, and 3.37 miles in Nonattainment
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: Not assessed in the 2000 305(b) Report

Stream: Plum Creek near Brunswick
Tributary to: North Branch of the Rocky River
Drainage Area: 12.79 square miles Length: 7.1 miles Slope: 21.4 feet per mile
Ohio EPA Use Designations: Warm Water Habitat; Agricultural and Industrial Water Supply; Primary Contact Recreation
Aquatic Life Use Attainment Status: 0.0 miles in Full Attainment, 1.0 miles in Partial Attainment, and 0.0 miles in Nonattainment

Water Quality Use Attainment in the Upper West Branch of the Rocky River



2001 Use Attainment Status

Full Attainment

Partial Attainment

Non Attainment

Not Assessed Darkened Areas are described elsewhere.

Problem Statement for Mallet Creek

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • **Minor** • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • **Major** • Moderate • Minor • Threatened • Not an issue Urban Runoff. • Major • Moderate • **Minor** • Threatened Home Sewage Treatment System Discharges. • Major • **Moderate** • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • Moderate Magnitude • **Low Magnitude** • Threatened Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Statement for the North Branch of the Rocky River

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Not Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • **Minor** • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • **Moderate** • Minor • Threatened • Not an issue Urban Runoff. • Major • Moderate • **Minor** • Threatened Home Sewage Treatment System Discharges. • Major • **Moderate** • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Statement for Remsen Creek including Granger Ditch

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Not Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • **Minor** • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • **Moderate** • Minor • Threatened • Not an issue Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • Major • **Moderate** • Minor Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Statement for Plum Creek at Brunswick

Water Resource Use Impairments	Point/Nonpoint Sources Present	Water Quality Problem Causes	TMDL Causes of Concern
Fish and other wildlife should taste good. **Not Impaired** Fish should be free of abnormal tumors and other deformities. **Not Impaired** Fish and other wildlife populations should be diverse and healthy. **Impaired** Macroinvertebrate community populations should be diverse and healthy. **Not Impaired** There should be a lack of eutrophication or undesirable algae. **Not Impaired** The river should be free of drinking water consumption or taste and odor problems. **Not Impaired** The river should be safe for swimming and wading. **Impaired** The river should be aesthetically pleasing. **Locally Impaired** The amount and quality of sediment in the river should keep dredging activities within normal limits. **Not Impaired** There should be no added costs to agriculture **Not Impaired** Microscopic plants and animal populations should be healthy and diverse. **Unknown** Fish and wildlife habitat should be diverse. **Threatened**	Point Sources • Impacted • **Minor** • Threatened Combined sewer overflows or sanitary sewer outfalls. • Present • **Absent** • Threatened Agricultural Runoff. • Major • Moderate • **Minor** • Threatened • Not an issue Urban Runoff. • Major • **Moderate** • Minor • Threatened Home Sewage Treatment System Discharges. • Major • Moderate • **Minor** Wildlife wastes. • **Present** • Absent • Threatened	Nitrogen Loadings. • **High Magnitude** • Moderate Magnitude • Low Magnitude • Threatened Organic Enrichment/ Dissolved Oxygen Problems. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Habitat Modifications. • High Magnitude • **Moderate Magnitude** • Low Magnitude • Threatened Bacteria and Pathogens. • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened** Toxic Chemicals • High Magnitude • Moderate Magnitude • Low Magnitude • **Threatened**	Nitrogen Loadings. Organic Enrichment/ Dissolved Oxygen Problems. Habitat Modifications. Bacteria and Pathogens. Toxic Chemicals **None of the above**

Problem Solving Strategies for the Upper West Branch of the Rocky River

Storm Water Management
Begin the process of recovering urban impacted streams and their aquatic habitat:

- Reduce effective imperviousness of lower portions of the South Branch and in Plum Creek at Brunswick to 15%.
- Reduce modified habitat attributes and habitat degradation associated with urban runoff wherever possible.
- Restore habitat and reduce streambank erosion through the restoration of 3000 linear feet of Champion Creek in the City of Medina, using soft engineering and natural stream channel design techniques to reduce nitrogen loading by 100 lbs/yr, at a cost of $500,000.

Minimize the storm water impacts associated with new development:

- Manage new development likely in and around the City of Medina and throughout Medina Township.
- Maintain high degree of riparian vegetation along stream channel.

Reduce urban runoff rates and pollutant loadings:

- Human and animal bacteria loadings associated with storm water need to be reduced wherever possible.

Home Sewage Treatment System Improvements
An estimated 500 HSTSs exist in the watershed; at and as many as 150 may need to be upgraded.

Agricultural Runoff
Improperly managed horse, cattle, and other farm animal wastes produce excessive nutrient and bacteria loadings that contribute marginally to documented problems in downstream areas

- Minimize localized problems that exist from livestock operations in Mallet Creek and in the North Branch watershed in Medina County.

Minimize nutrient, fertilizer, and chemical runoff from crop production.

- Target cost-share resources to farms located in the Mallet Creek and North Branch Watersheds.

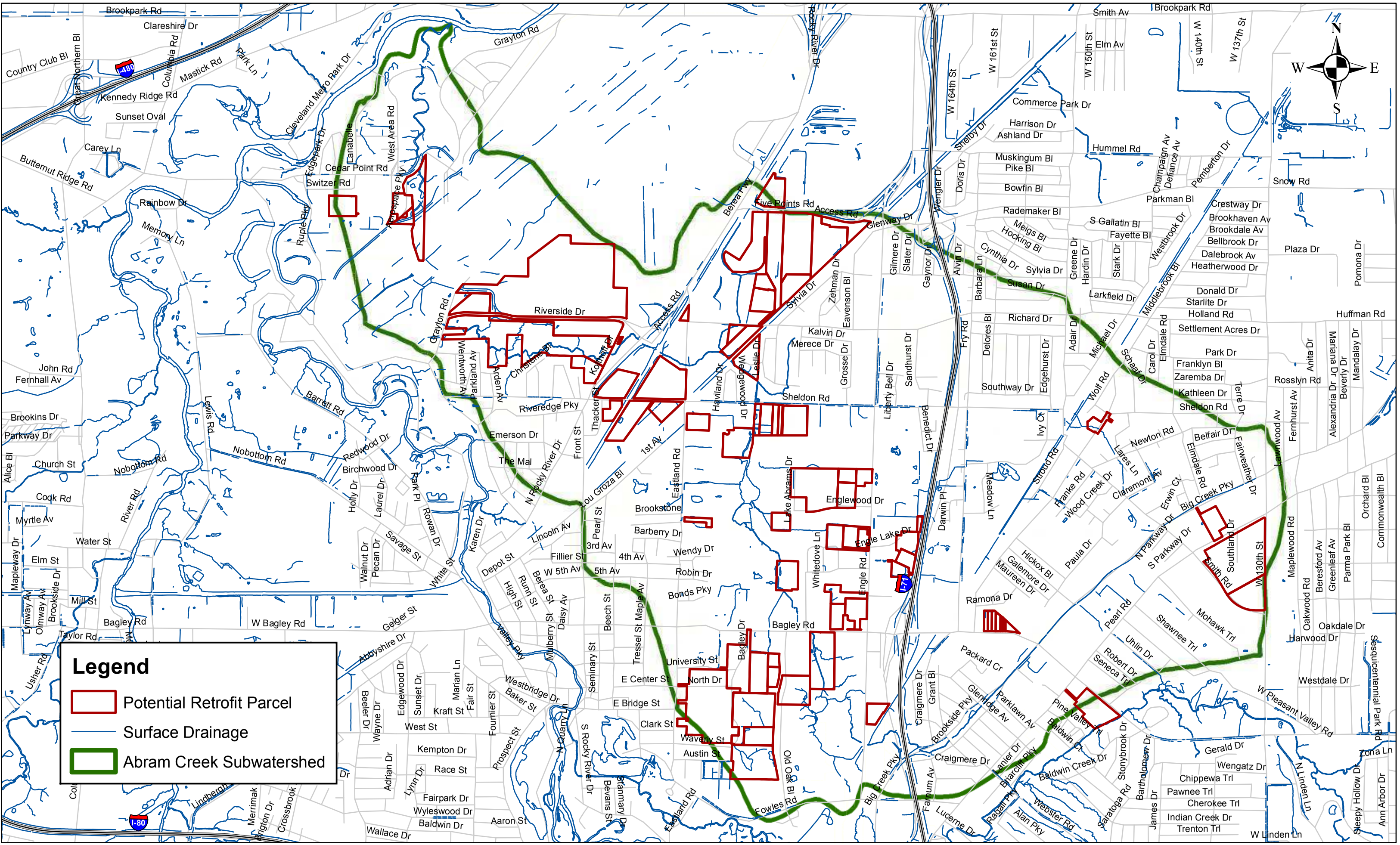
Land Use Issues
Conservation and other low impact developments need to be encouraged throughout the watershed.

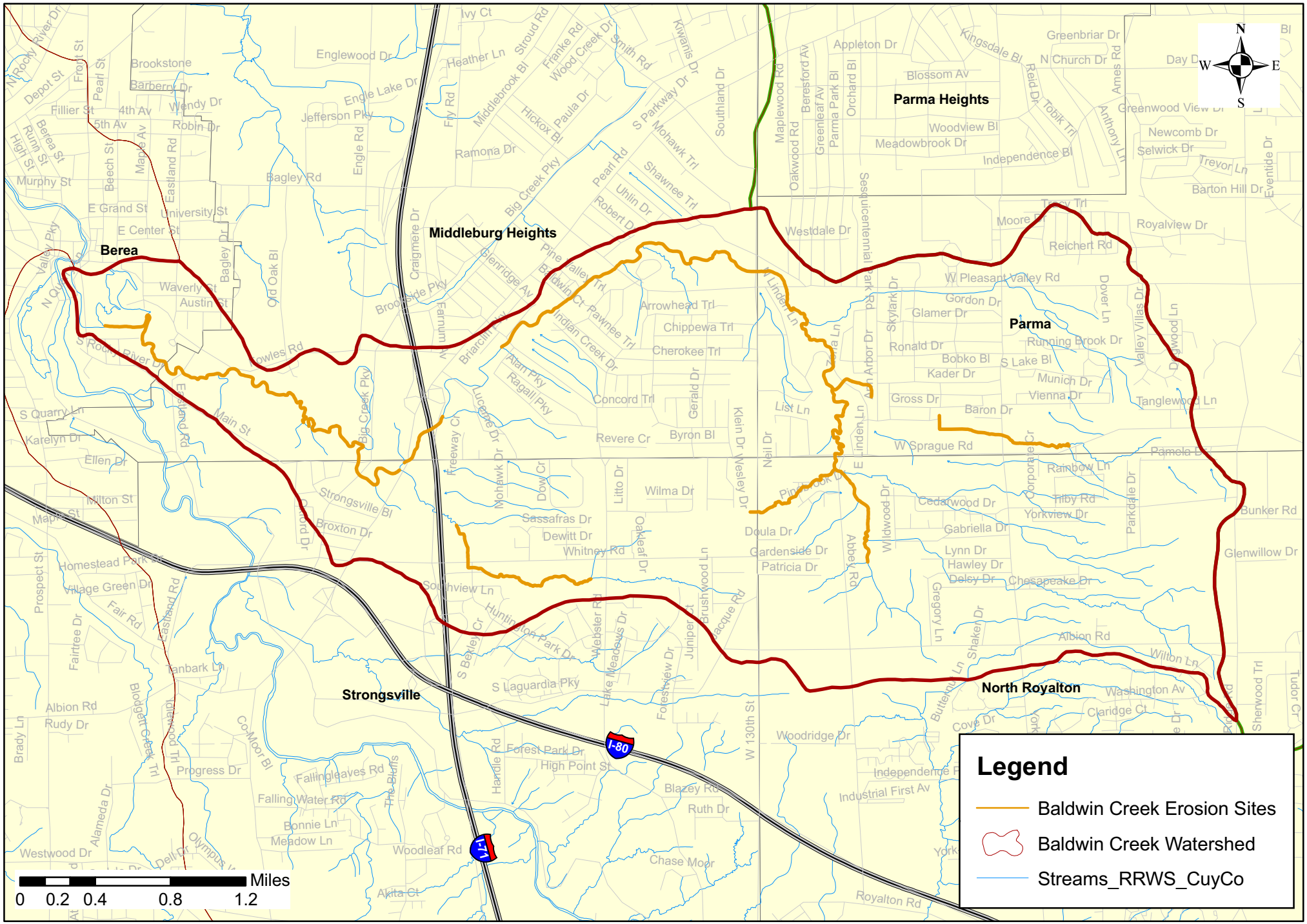
Implement the Rocky River Upper West Branch Balanced Growth Plan.

Abram Creek Potential Storm Water Retrofit Locations

0 0.5 1 Miles

RRWAP Attachment A to Appendix G

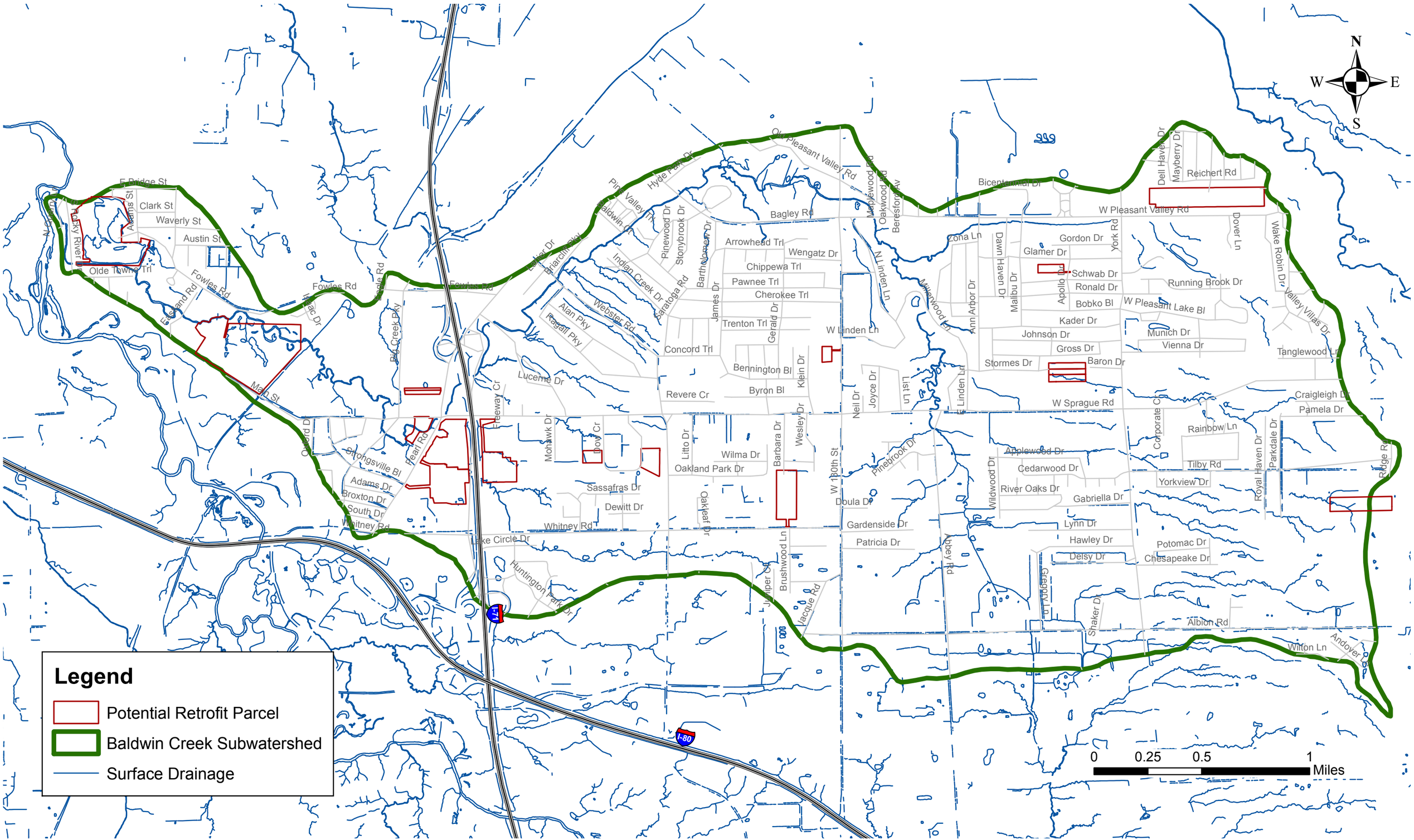


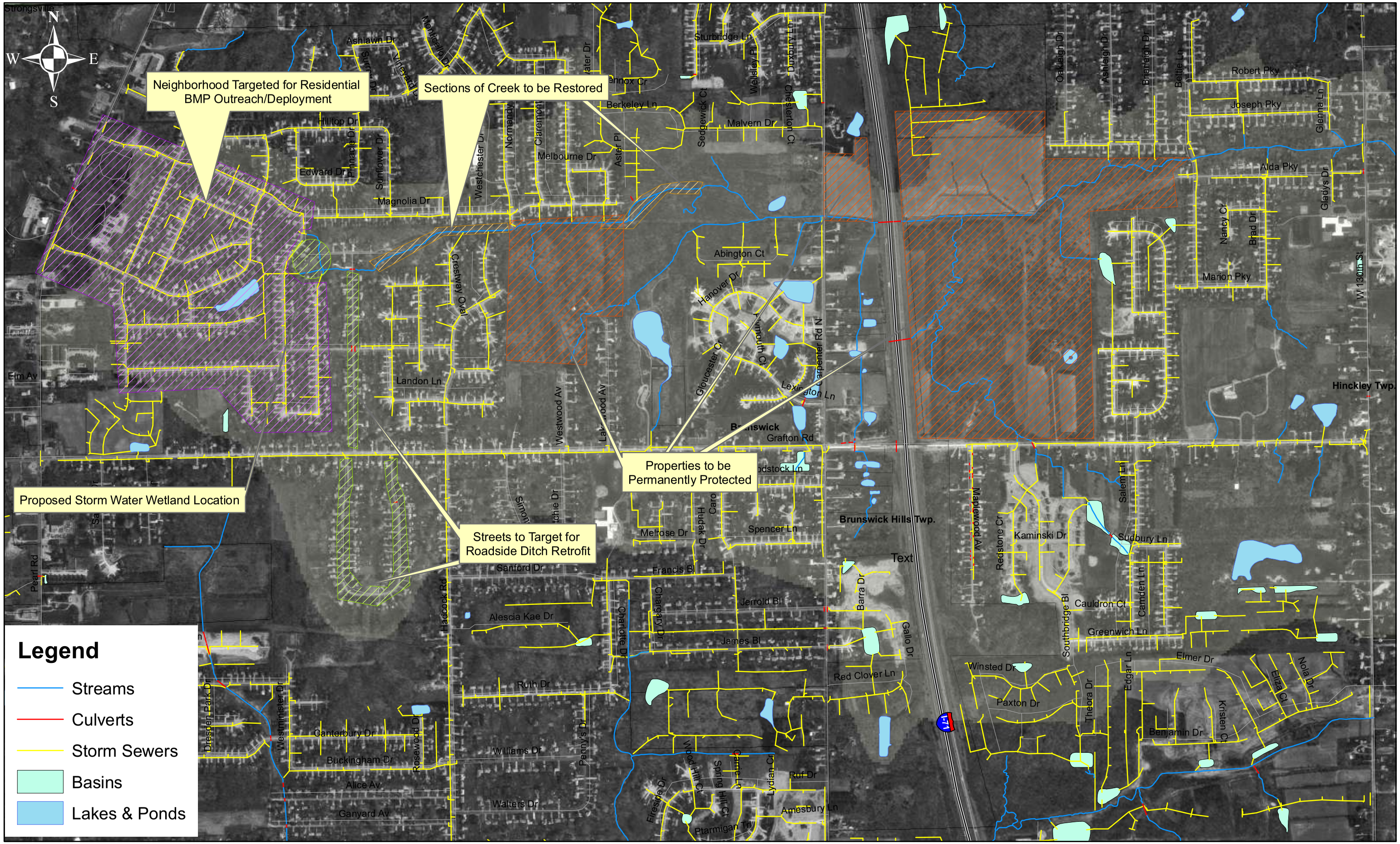


Baldwin Creek Erosion Sites

Baldwin Creek Potential Storm Water Retrofit Locations

RRWAP Attachment C to Appendix G





0.4 0.2 0 0.4 Miles

Healey Creek Summary of Recommendations

LOAD REDUCTION TARGETS FOR THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix H
May 2006
Updated February 2010

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act.

RRWLAh

Load Reduction Targets
For the Rocky River Watershed

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Load Reduction Targets
For the Rocky River Watershed

Abstract

This report summarizes the target load reductions in the Rocky River Watershed of Northeast Ohio. It includes a discussion of load reduction targets for the six segments subject to TMDL reductions. The report also identifies needed reductions in other portions of the watershed. This report is one of a series of analyses prepared for the Rocky River Watershed Action Plan through and Ohio 319 Grant 01(h) EPA-09.

Load Reduction Targets
For the Rocky River Watershed

Total Maximum Daily Load Recommendations

Summary of Causes and Sources: Six segments of the Rocky River are affected by the Total Maximum Daily Load (TMDL) allocations. These segments include the mainstem, Abram Creek, Baldwin Creek, and the Plum Creek near Olmsted Falls. The segments also include Baldwin Lake and Hinckley Lake. The following table reports the causes and sources of the water quality problems as identified in the TMDL report for each stream segment that is not meeting, or is only partially meeting, its aquatic use designations:

Segment	**Causes**	**Sources**
Mainstem (0.0 miles in full Attainment, 8.7 miles in Partial attainment and 3.37 miles in Nonattainment)	Nutrients Organic Enrichment Flow Alteration	Municipal Point Sources Marinas Combined Sewer Overflows Urban Runoff Hydromodification
Abram Creek (0.0 miles in full Attainment, 0.0 miles in Partial attainment and 3.7 miles in Nonattainment)	Ammonia Organic Enrichment	Municipal Point Sources Channelization Urban Runoff Hydromodification
Baldwin Creek (0.0 miles in full Attainment, 8.0 miles in Partial attainment and 0.0miles in Nonattainment)	Organic Enrichment Nutrients Habitat Alteration	Municipal Point Sources Urban Runoff Channelization Hydromodification Suburbanization Construction
Plum Creek at Olmsted Falls (0.0 miles in full Attainment, 0.0 miles in Partial attainment and 3.0 miles in Nonattainment)	Nutrients	Municipal Point Sources Urban Runoff Suburbanization

Segment	Causes	Sources
Baldwin Lake	Priority Organics Non-priority Organics Ammonia Chlorine Siltation Organic Enrichment/ Dissolved Oxygen	Municipal Point Sources Agriculture Urban Runoff Silviculture Non-industrial Permitted Sources
Hinckley Lake	Siltation Organic Enrichment/ Dissolved Oxygen Thermal Modification	Construction Urban Runoff Natural Sediment Loads

Ohio EPA has attempted to estimate the load reductions that are necessary to reclaim the stream segments identified in the TMDL Report as being in partial or nonattainment. They were able to provide quantitative estimates only for nutrient loadings. They were not able to quantify storm water runoff reductions or bacterial loadings. Accepted methodologies and detailed inputs are not readily available to accomplish this. This is particularly true when many source areas are pervasive throughout a watershed, such as urban lands and malfunctioning home sewage treatment systems. Where meaningful estimates of load reductions are possible, these are presented. In some cases where this information is not available, an alternative estimate of the level of reduction can be made. In other cases, it is necessary to simply begin initiating control efforts without clearly stated reduction targets.

In addition to the causes and sources identified in the TMDL and summarized in the table above, the Rocky River has a pronounced problem with elevated bacteria counts at sites throughout the watershed. The Ohio EPA 2002 Integrated Assessment Report states that 24 out of the 27 bacteria monitoring sites in their network on the Rocky River have a bacteria count that exceeds designated use criteria. The Rocky River and it primary tributaries are rated as “impaired” for recreational uses. As can be expected when bacteria violations are so widespread, a variety of source types contribute to the problems found in the Rocky River.

The Combined Sewer Overflows (CSOs) discharge mixed storm water/sanitary wastes when storm water inflow causes the capacity of the sewer to be exceeded. These discharges generally have very high bacteria counts associated with them with counts in the million range being not uncommon. Fortunately in the Rocky River, CSOs are confined to the lowest reaches of the River.

On the larger geographic scale, home sewage treatment systems (HSTSs) pose a more pronounced threat. The TMDL Report estimates that there are 16,500 HSTSs in the Rocky River Watershed. Estimates of failure rates for these systems vary widely, but rates ranging between 35 and 60% are typical. Failing systems do have a pronounced bacteria loading potential. System upgrades and replacements do occur in the watershed. On an average annual basis, an estimated 50 system replacements occur throughout the watershed. This translates into a 3,650pounds of BOD and 6,200 pounds of suspended solids if the replaced systems were in total failure. These gains are offset by the fact that as many as 5% of all systems in the watershed are expected to outlive their useful lives every year.

Non-human animals are also significant contributors to the bacterial loading in the watershed. These animals include household pets, livestock, and wild animals all of which are numerous in the watershed.

Ohio EPA points out in the TMDL report they rely on an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data, biological response signatures to describe the cause and sources associated with observed impairments in local waterways. Thus the initial assignment of principal causes and sources of impairments identified in the TMDL do not represent a true "cause and effect" analysis, but rather represent links with known stressor and exposure indicators. The "Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed" highlights some of the issues that experience tells us are operable in the Rocky River Watershed. The following discussion identifies the water quality problems that will be addressed through the Total Maximum Daily Load (TMDL) Process and established load reduction targets where appropriate. It also makes recommendations for water quality improvement strategies where target load reductions cannot be identified.

TMDL Required Reductions and Recommended Actions

Mainstem of the Rocky River

Nutrients: According to the TMDL Analysis for the Rocky River, Nitrogen loads need to be reduced by 46% in this segment. The load reduction needed (424,100 kg/yr) is larger than either the point or nonpoint inputs. Therefore, reductions are required from both components. Ohio EPA anticipates that nitrogen loads will be reduced in this segment over the next few years as a result of recent or planned activity by point source dischargers, though they do not have data to quantify the expected reductions.

The abandonment of eight treatment plants and the improvement of several of the remaining plants have resulted in a 30% reduction in loadings from 1992 to 1997. The City of Lakewood and the Northeast Ohio Regional Sewer District (NEORSD) are involved in projects to reduce the number and volume of combined sewer overflows to the lower river. The City of Lakewood is making improvements to its Wastewater

treatment Plant and its sanitary sewer system that are predicted to reduce the average number of plant bypass events from 84 per year to an estimated 10 (an 88% reduction). NEORSD is undertaking improvements that may reduce overflows from its CSOs by up to 25% over the next several years. Additional reductions are anticipated from nonpoint source initiatives in the watershed.

The phosphorus target applicable to the mainstem was being met in 1992. Phosphorus loadings had increased in 1997 to the point that a 28% reduction is now required. Ohio EPA has assigned this reduction to nonpoint source control programs as the point sources discharging to the segment already meet their limits and no improvements are planned or warranted at this time. The needed load reduction from nonpoint sources is 11,217 kg/yr.

Organic Enrichment/Dissolved Oxygen: Ohio EPA does not have enough information to establish a TMDL for this pollutant at this time. It appears that the cumulative effects of a high proportion of treated wastewater from multiple sources in the basin and the impacts associated with urban runoff and combined sewer overflows continue to limit full attainment in this segment. Ohio EPA is expecting that attainment goals will be met following the implementation of Phase II of the Storm Water Permits Program throughout the basin, implementation of the NPDES Permit for Cleveland Hopkins International Airport, implementation of combined sewer overflow controls by Lakewood and the Regional Sewer District, and other improvements in the upper watershed.

Flow Alteration: Ohio EPA recognizes that projects that control storm water quantity and quality will greatly benefit the mainstem. Phase II of the Storm Water Permits Program offers one tool to accomplish this. The development of a strategy to create storm water retention and detention basins in the urban areas is another. Floodplain and stream corridor protection legislation can also help. Public education as to the need to mange storm water runoff and to protect the river corridor area also needed.

Bacteria: Ohio EPA has not established a target load reduction for this parameter. However, HSTSs have been identified by Ohio EPA in the 1999 Technical Support Document as a significant pollution source within the mainstem of the Rocky River. These loadings are largely generated in upstream segments. This segment is also affected by the CSO discharges from the systems of the Northeast Ohio Regional Sewer District and the City of Lakewood. The combination of tributary areas being heavily urbanized and an intense recreational use of the park system along the River by pet owners provide for a large potential of impacts from pet wastes. Wildlife teems in and around the Rocky River Reservation where there is a large population of deer and other animals. Horseback riding is another potential source of bacterial loading. All of these sources are in addition to loading from upstream areas.

CSO control improvements are programmed and will result in a reduction in the bacteria loadings to the Rocky River. All of the communities tributary to the mainstem are included in the Phase II Storm Water Permits Program. These communities will be required to increase their illicit discharge detection and elimination efforts and seek to minimize pollutant discharges in their storm water runoff. These control efforts, coupled

with a limited number of HSTSs that discharge directly to the mainstem, make further bacteria reduction initiatives in this segment a lower priority than upstream segments.

Abram Creek

Current estimated Total Nitrogen Load from nonpoint sources: 31,507 lbs/yr
Target nonpoint source Total Nitrogen Load: 25,853 lbs/yr
Recommended Total Nitrogen Load Reduction from nonpoint sources: 5654 lbs/yr

Current estimated Total Phosphorus Load from nonpoint sources: 5248 lbs/yr
Target nonpoint source Total Phosphorus Load: 3778 lbs/yr
Recommended Total Phosphorus Load Reduction from nonpoint sources: 1470 lbs/yr

Abram Creek is the most degraded tributary to the Rocky River. Habitat modifications, urban storm water impacts, septic system discharges, and point source discharge of pollutants have combined to seriously degrade the biological communities in the stream. Despite the abandonment of two wastewater treatment plants in the upper watershed in 1993, little recovery has been noted in the upper watershed where habitat is seriously degraded. The downstream portions of Abram Creek are severely impacted by discharges of storm water containing ammonia-nitrogen and glycols resulting from de-icing operations at the Cleveland Hopkins International Airport.

Urbanization of the watershed and the construction of the airport have resulted in the loss or reduction in size of the wetland complexes in the upper basin as well as channelization and re-routing of significant portions of the Creek. Many stretches are highly affected by fill material, particularly foundry sand. Portions have been culverted and a one mile stretch is about to be culverted to allow extension of the main runway at the airport. De-forestation of the watershed and the cumulative impacts of impervious surfaces have changed the hydrology of the stream significantly, resulting in lower base flows and higher peak flows associated with storm events. A dam spans the Creek just upstream from Cedar Point Road. All of these factors significantly limit the restoration potential of the stream in the upper watershed. They present a formidable challenge to restoration in the lower course, but there is a chance for restoration of this reach.

Ammonia: Ammonia-nitrogen loadings from the de-icing operations at the airport are being addressed under a consent agreement between the airport and Ohio EPA. A TMDL for ammonia will be developed following monitoring of the effects of the implementation of this agreement.

Organic Enrichment/Dissolved Oxygen: The glycols discharged from the airport have been the most significant cause of the organic enrichment noted in the lower portions of Abram Creek. The airport is implementing a glycol control program under an agreement with Ohio EPA. A TMDL for this parameter will be deferred until the results of this work have been determined.

Bacteria: There are approximately 200 home sewage treatment systems in the watershed. The Cuyahoga County Board of Health is currently working to eliminate

polluted discharges from these systems. This parameter can be de-listed when this effort is completed.

Baldwin Lake

Baldwin Lake needs to be sampled during the next scheduled watershed survey. Portions of the Lake are now being managed as a wetlands. Existing data on the Lake are outdated and incomplete. No target pollutant load reductions have been prepared for the Lake.

Hinckley Lake

Based on previous sampling, Ohio EPA has determined that the designated aquatic life and recreational uses for Hinckley lake were impaired due to an unbalanced fishery, high turbidity (low water clarity), and sedimentation. Ohio EPA further determined that the turbidity of the water limits the productivity of algae in the water column. Based on this determination, the nutrient concentrations in the Lake are not excessive, nor are they a cause of non-attainment of the water quality goals of the Lake.

No target load reductions for any parameters are available at this time. Hinckley Lake needs a comprehensive management plan that will be protective of the Lake's designated uses. Ohio EPA recommends an inventory and assessment of the sediment and nutrient loadings to the Lake.

Baldwin Creek
Current estimated Total Nitrogen Load: 114,197 lbs/yr
Target Total Nitrogen Load: 25,596 lbs/yr
Recommended Total Nitrogen Load Reduction: 88,601 lbs/yr

Current estimated Total Phosphorus Load: 4922 lbs/yr
Target Total Phosphorus Load: 3741 lbs/yr
Recommended Total Phosphorus Load Reduction: 1181 lbs/yr

Nutrients: Ohio EPA is of the opinion that it will be difficult to meet the nitrogen target in Baldwin Creek based on the last water chemistry sampling collection in 1992. Both of the treatment plants that discharge to the stream are meeting their current limits and have no planned upgrades scheduled. The recommended strategy is to reduce the nonpoint source contributions to the maximum extent feasible and to implement a variety of activities that will improve habitat conditions in the stream. Phosphorus load reductions will likewise have to come from nonpoint source reductions as the plants are also discharging below their permitted levels. Remediation of failing home sewage treatment systems in the watershed are called for.

Organic Enrichment/Dissolved Oxygen: More data is required to determine whether an organic enrichment problem continues to exist in Baldwin Creek. No action is

recommended at this time. Remediation of failing home sewage treatment systems in the watershed are called for.

Habitat alteration: The evaluation of the Qualitative Habitat Evaluation Index (QHEI) information collected by Ohio EPA and the Cuyahoga County Board of Health indicate that there is potential for habitat restoration in the stream. These actions are given a high priority.

Plum Creek near Olmsted Falls

Nutrients: The TMDL calls for a 32% loading reduction for nitrogen in Plum Creek. Two, small wastewater plants have been removed from the stream. The Lorain County Plum Creek plant is scheduled for improvements. Further reductions, if needed, will have to come from nonpoint source reductions.

Phosphorous loadings need to be reduced by 14%. The removal of the two wastewater treatment plants and the improvements at the Plum Creek Plant may be sufficient to meet this target. If not, nonpoint source loadings need to be addressed.

Reductions and Recommended Actions Beyond the TMDL

Ohio EPA has not established load reduction goals for those segments that are in attainment of their designated biological uses. However, recreational use impairments do exist in segments of the Rocky River that are not affected by the TMDL load reduction program. These segments include the East Branch, the West Branch, and the upper reaches of Plum Creek near Olmsted Falls. In addition, nonpoint source loadings of other parameters do potentially stress the system in these segments. With the advancing urbanization of these areas, it is prudent to address nonpoint source controls in these areas so as to help insure that the system does not become overstressed in the future. The following recommendations are provided as a means of addressing these impairments.

East Branch

Bacteria: Failing HSTSs in the lower East Branch Watershed in Cuyahoga County are a recognized contributor to the bacteria violations noted in the stream. The Cuyahoga County Health Department has prioritized the remediation of failing systems in areas of North Royalton where sanitary sewers are not expected in the foreseeable future. The lower East Branch is potentially affected by a series of recreational horse sites spread out along its course through North Royalton, Strongsville, Middleburg Heights and Berea.

Nutrients: the Medina Soil and Water Conservation District has targeted nutrient loadings to the upper East Branch in Granger and Hinckley Townships stemming from livestock waste washoff for loading reductions. Agricultural lands in Granger Township have also been identified as a priority for improved management.

Healey Creek:
Current estimated Total Nitrogen Load from nonpoint sources: 16,678 lbs/yr
Target nonpoint source Total Nitrogen Load: 12,593 lbs/yr
Recommended Total Nitrogen Load Reduction from nonpoint sources: 4085 lbs/yr

Current estimated Total Phosphorus Load from nonpoint sources: 2872 lbs/yr
Target nonpoint source Total Phosphorus Load: 1841 lbs/yr
Recommended Total Phosphorus Load Reduction from nonpoint sources: 1031 lbs/yr

West Branch

Bacteria: The West Branch of the Rocky River has similar bacteria problems to those in the East Branch. The most pronounced problems occur in the lower courses Columbia Township, Olmsted Township, Olmsted Falls and North Olmsted. Failing HSTSs in Columbia Township, Olmsted Township, and North Olmsted are the priority for remediation. The concentration of recreational horse sites in the Olmsted Falls area makes this area a priority for encouraging increased animal waste management practices.

Nutrients: the Medina Soil and Water Conservation District has targeted nutrient loadings to the upper West Branch in Medina, York, and Liverpool Townships stemming from livestock waste washoff for loading reductions. Agricultural lands in York and Liverpool Townships have also been identified as a priority for improved management.

Upper West Branch
Current estimated Total Nitrogen Load: 25,931 lbs/yr
Target nonpoint source Total Nitrogen Load: 20,681lbs/yr
Recommended Total Nitrogen Load Reduction: 5250 lbs/yr

Plum Creek near Olmsted Falls

Bacteria: The upper reaches of Plum Creek in Columbia Township have numerous older HSTSs that are in need of repair or replacement. The Lorain County General Health District has identified this area as a priority action area.

Load Reductions from Phase II of the Storm Water Permits Program Activities Affecting the Rocky River Watershed

Urbanized communities in the Rocky River Watershed are initiating enhanced storm water management programs as the result of the Phase II storm Water Permits Program. These activities have been designed to reduce pollutant loadings and storm water runoff impacts associated with municipal operations to the maximum extent practicable. While the maximum extent practicable criterion is not a quantitative measure of expected load reductions, qualitative statements can be useful in determining the potential impact that the Phase II program may have on the watershed.

A major initiative that watershed communities have committed to is the implementation of regulations designed to minimize the impacts of new development on local streams. This applies to sediment and other contaminant releases during the construction phase. It also applies to the quality and quantity of water running over the completed development. While these activities will not decrease impacts from existing development in the watershed, it will minimize any new impacts.

The Phase II initiative will result in improvements on many urbanized lands as they become redeveloped in future years. The control of urban runoff impacts from redeveloped lands is often not as effective as controls on newly developing lands due to space and cost considerations. However, a target has been set to reduce redevelopment impacts by 50% in the long run.

Communities will be implementing improved good housekeeping and pollution minimization practices for all municipal operations that have the potential to generate storm water runoff impacts. For programs such as road salt spreading, sewer system maintenance, landscaping operations, and vehicle maintenance activities, communities will engage in accelerated training of their employees in proper and safe procedures designed to minimize impacts from these activities. In those communities that already excel at pollution prevention, there will be little reduction in pollutant loadings to the Rocky River. In those communities where such practices as not as advanced, one can expect a slight improvement. An estimate of an overall reduction of 10% has been suggested as an objective from this initiative. This value appears low but it is indicative of the fact that most communities recognize that the discharge of pollutants resulting from their operations costs them in wasted materials. Many pollution prevention activities are also undertaken as a result of efforts to safely handle hazardous materials for the protection of the employees.

Communities will be surveying their storm water outfalls on a regular basis under the Phase II Program. The primary objective is to identify and eliminate any illicit discharges from their system. These discharges can include cross-connections between sanitary and storm sewers, illegal dumps or spills, and failing HSTS effluent. Communities are already involved in the elimination of illicit discharges whenever such problems are encountered. The Phase II initiative will increase the frequency that they look for problems with the expectation that more illicit discharges will be identified and removed. In most cases, the illicit discharges that do occur are transitory in nature, otherwise they would have been identified and would have been addressed already. Therefore, increased surveillance can be expected to result in further decreases in these discharges. Older, more heavily urbanized areas will probably benefit more than newly developed areas with tighter systems and installation regulations. Arriving at an estimate of the total amount of loading reductions that will accrue due to the Phase II initiative is speculative, but a 5-10% reduction is certainly in the realm of possibility.

The Rocky River Work Group arrived at an estimate that up to 10% of all developing lands may abut a riparian corridor. A large percentage of these lands would be expected to materially affect riparian vegetation. This expectation is partially due to observed

behavior on existing developments. It is also affected by the fact that many more headwater areas are going to be developed in the Rocky River Watershed in the future. The lower courses of the watershed have been extensively developed in the past. Avoidance of large streams and rivers because of flood risks was common in this watershed. Now that development has shifted to headwater areas where flooding has a very low risk, more infringement might be predicted. Rocky River communities have embraced the NOACA Regional Storm Water Task Force's recommended storm water management program that includes an initiative to provide for mandatory riparian setbacks from all streams including headwater streams. If one assumes that 20% of the buildable land in the Rocky River Watershed will be developed in the next 20 years, and that 10% of this land affects riparian areas, 2% of the riparian corridor along the streams of the watershed will be preserved. This figure may not sound like much, but there is easily 1,000 stream miles in the entire watershed when headwater streams that meet Ohio EPA criteria are accounted for.

Potential Nutrient Load Reductions from an Intensive Land Treatment Program

The Rocky River Total Maximum Daily Load (TMDL) Project has established the need to reduce nitrogen loading in the watershed by 934,980 pounds per year and phosphorus loadings by 24,730 pounds per year. Both of these targets need to be met largely through nonpoint source controls. Nutrient loadings from agricultural operations are generally much higher on an acre-by-acre basis than all other land use types. However, agricultural lands are far removed from the segments of the Rocky River that have a documented nutrient-loading problem. Land based controls, when applied over the entire watershed, can account for a load reduction of 549,926 pounds per year of nitrogen (See below for details.) This is would account for almost 60% of the needed load reduction. However, these controls would cost an estimated $1,000 per acre treated, or $100 million when applied to all non-open space lands in the watershed. This level of treatment would also materially reduce the phosphorus loading by some undetermined amount. Improvements in the performance of HSTSs would result in additional nutrient load reductions.

Several states in USEPA's Region V have pooled their resources to create a series of tools that allow the estimation of pollutant load reduction estimates for a wide variety of nonpoint source controls. These tools have been converted into Excel spreadsheets that are available on the Ohio Department of Natural Resources (ODNR) website at:

http://www.dnr.state.oh.us/soilandwater/docs/loadreduction/Ohio_v1.2.xls

A companion document is available that provides guidance for the use of many of the load reduction estimation tools. This document is available at:

http://www.dnr.state.oh.us/soilandwater/docs/loadreduction/MI_poll_man.pdf

NOACA used the spreadsheets to evaluate potential total nitrogen load reductions from a series of land uses. Table 2 shows the estimated load reductions for all of the nonpoint

source controls that have a reduction estimation tool that quantifies total nitrogen loadings. Each entry in the table represents the annual load reduction in pounds from one acre of treated land.

As noted in Table 2, practices that rely on infiltration of storm water into the ground have a limited applicability in Northeast Ohio. The clayey soils absorb water very slowly. Infiltration devices tend to become overloaded too quickly and too often. Unfortunately, infiltration practices do possess some of the best loading reduction numbers of all BMPs where they can be suitably employed.

In order to translate the potential load reductions shown in Table 1 into estimates of what might be obtained from an aggressive nonpoint source program in the Rocky River, some simplifying assumptions have to be made. Not all BMPs are equally applicable on all land areas, even areas dedicated to the same land use. A "typical" load reduction was assigned to each land use in Table 1 to account for the variation in BMP selection likely to be encountered. Commercial areas were assigned a reduction rate of 6 pounds/acre/year. Industrial and Transportation lands were given a rate of 4 pounds/acre/year. Institutional lands and Multi-family were assigned a rate of 3 pounds/acre/year respectively. Residential lands have a 2 pounds/acre/year rate. Agricultural loading reductions were generated with the use of grass filter strips on all land in production. This represents a rate of 10 pounds/acre/year. Multiplying the typical rate for each land use by the number of corresponding acres in the watershed gives a picture of the results to be gained by treating all developed lands in the watershed with one BMP. These results are shown in Table 3 first for the entire watershed and then for select subbasin areas.

Table 2

Urban Runoff BMPs

Total Nitrogen Load Reductions in lbs/acre treated/year

Land Use	Vegetated Filter Strips	Grass Swales	Wetland Detention	Dry Detention	WQ Inlets	Infiltration Basin*	Infiltration Trench*	Porous Pavement*	Concrete Grid Pavement*	Sand Filter/Infiltration basin	WQ Inlet/Sand Filter	Oil/Grit Seperator	Wet Pond
Commercial	8	2	4	6	4	13	12	18	19	7	7	1	7
Industrial	6	1	3	4	3	8	8	12	13	5	5	1	5
Institutional	4	1	2	3	2	7	6	9	10	4	4	1	4
Transportation	5	1	3	4	3	8	7	11	12	5	5	1	5
Multi-family	4	1	2	3	2	7	6	9	10	4	4	1	4
Residential	2	1	1	2	1	4	3	5	5	2	2	0	2
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0
Vacant	0	0	0	0	0	1	1	1	1	0	0	0	0
Open Space	0	0	0	0	0	1	1	1	1	0	0	0	0

Nitrogen load reduction estimates are not available for the following urban BMPs: Extended wet detention Settling basins Sand filters Weekly street sweeping

* These BMPs have a very limited applicability in Northeast Ohio due to climatic and soil limitations.

Table 3. Individual watershed Load Reduction Values

Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	7.91	30,374
Industrial	4	3.76	9,626
Institutional	3	4.18	8,026
Transportation	4	4.22	10,803
Residential	2	77.32	98,970
Agriculture	10	61.27	392,128
Open Space	0	134.04	0
Total	N/A	292.70	549,926

Mainstem Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.93	3,571
Industrial	4	0.04	102
Institutional	3	1.74	3,341
Transportation	4	0.75	1,920
Residential	2	7.06	9,037
Agriculture	10	0.09	576
Open Space	0	4.39	0
Total	N/A	15.00	18,547

Table 3 (continued)

Abram Creek Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	1.43	5,491
Industrial	4	1.06	2,714
Institutional	3	0.47	902
Transportation	4	0.32	819
Residential	2	3.69	4,723
Agriculture	10	0.14	896
Open Space	0	3.00	0
Total	N/A	10.11	15,546

East Branch Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	1.10	4,224
Industrial	4	0.41	1,050
Institutional	3	0.54	1,037
Transportation	4	1.22	3,123
Residential	2	17.65	22,592
Agriculture	10	6.13	39,232
Open Space	0	39.62	0
Total	N/A	66.67	71,258

Baldwin Creek Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.41	1,574
Industrial	4	0.03	77
Institutional	3	0.03	58
Transportation	4	0.22	563
Residential	2	4.96	6,349
Agriculture	10	0.13	832
Open Space	0	4.15	0
Total	N/A	9.93	9,453

West Branch Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	2.15	8,256
Industrial	4	1.49	3,814
Institutional	3	0.59	1,133
Transportation	4	0.38	973
Residential	2	23.67	30,298
Agriculture	10	23.65	151,360
Open Space	0	41.77	0
Total	N/A	93.70	195,834

Table 3 (continued)

Plum Creek at Olmsted Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.24	922
Industrial	4	0.04	102
Institutional	3	0.12	230
Transportation	4	0.08	205
Residential	2	3.55	4,544
Agriculture	10	7.38	47,232
Open Space	0	6.23	0
Total	N/A	17.64	53,235

Mallet Creek Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.13	499
Industrial	4	0.00	0
Institutional	3	0.09	173
Transportation	4	0.00	0
Residential	2	2.38	3,046
Agriculture	10	8.87	56,768
Open Space	0	6.60	0
Total	N/A	18.07	60,486

South Branch Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.96	3,686
Industrial	4	0.22	563
Institutional	3	0.21	403
Transportation	4	0.36	922
Residential	2	5.27	6,746
Agriculture	10	5.61	35,904
Open Space	0	10.16	0
Total	N/A	22.79	48,224

North Branch Rocky River Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.12	461
Industrial	4	0.00	0
Institutional	3	0.03	58
Transportation	4	0.32	819
Residential	2	1.84	2,355
Agriculture	10	2.35	15,040
Open Space	0	5.24	0
Total	N/A	9.90	18,733

Table 3 (continued)

Granger Ditch Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.07	269
Industrial	4	0.05	128
Institutional	3	0.07	134
Transportation	4	0.22	563
Residential	2	2.79	3,571
Agriculture	10	4.69	30,016
Open Space	0	7.23	0
Total	N/A	15.12	34,682

Plum Creek at Brunswick Watershed
Total Nitrogen Load Reductions
From Intensive Land Treatment

Land Use	Typical Reduction (lbs/acre/year)	Sq. Mi.	Load Reduction (lbs/year)
Commercial	6	0.32	1,229
Industrial	4	0.42	1,075
Institutional	3	0.29	557
Transportation	4	0.35	896
Residential	2	4.20	5,376
Agriculture	10	1.88	12,032
Open Space	0	5.36	0
Total	N/A	12.82	21,165

EVALUATION OF SOLUTIONS, ACTIONS AND BEST MANAGEMENT PRACTICES FOR IDENTIFIED WATER QUALITY PROBLEMS IN THE ROCKY RIVER WATERSHED

Rocky River Watershed Action Plan
Appendix I
May 2006

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Evaluation of Solutions, Actions and Best Management Practices for Identified Water Quality Problems in the Rocky River Watershed

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Evaluation of Solutions, Actions and Best Management Practices for Identified Water Quality Problems in the Rocky River Watershed

Introduction

This report identifies and evaluates water quality solutions, actions and best management practices (BMPs) for the Rocky River Watershed Action Plan. This work is predicated on work described in several companion documents including "Guide to Sources and Causes…," "Inventory of Point and Nonpoint Sources," "Supplemental Source Identifications…," "Water Quality Problem Statement," and the stakeholder involvement process described below.

Stakeholder Involvement in Evaluation of Solutions

In an effort to ensure public and stakeholder involvement in the identification of water quality solutions, actions and best management practices (BMPs), the Rocky River Plan Work Group agreed on the following process. First, the Watershed Council was asked to break up into tributary watershed groups and identify local causes and sources of water quality issues. These discussion resulted in the identification of the following six watershedwide issues including: storm water management; home sewage treatment systems; agricultural land use; general land use; fish, wildlife & recreation; and public involvement & public education. The Watershed Council was then asked to identify potential solutions, actions and BMPs to address these problem issues.

The Plan Work Group then undertook a analysis process that included identifying what kind of beneficial impact the solutions would have, whether they would improve water chemistry, adjacent habitat or eliminate pathogens. The Work Group also assessed the suggested solutions to determine the following: the party responsible for implementation, the potentially targeted audiences, whether the action was voluntary or regulatory, an estimation of costs and potential funding sources. These issue assessments were then presented to the watershed community at two Watershed Council meetings where attendees were asked to identify their personal priorities.

The priority responses have been included in the attached Technical Assessment of Solutions/Actions/Best Management Practices (BMPs) Table.

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Storm Water Management

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Minimize the storm water impacts associated with new development	Implement the Regional Model Ordinance to control erosion and sediment on construction sites.	P	P		Local Governments	Developers and Builders		✓	No Direct Cost	N/A		
	Implement the Regional Model Ordinance to control the quantity of storm water from post-construction sites.		P		Local Governments	Developers		✓	No Direct Cost	N/A	1	
	Implement the Regional Model Ordinance to control the quality of storm water runoff from post-construction sites.	P		P	Local Governments	Developers and Builders		✓	No Direct Cost	N/A	1	
	Implement the Regional Model Ordinance to provide for riparian and wetland setbacks.	P	P		Local Governments	Property Owners Developers and Builders		✓	No Direct Cost	N/A	1	

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Storm Water Management

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Begin the process of recovering urban impacted streams and their aquatic habitat	Implement the Regional Model Ordinance to control the quantity of storm water runoff from redevelopment sites.		R		Local Governments	Developers and Builders		✓	No Direct Cost or $	N/A		Implement the Regional Model Ordinance to control the quantity of storm water runoff from redevelopment sites by December 2003.
Reduce urban runoff rates	Implement Good Housekeeping Practices for Municipal Operations.	P	P		Local Governments	Local Governments		✓	N/A	N/A	6	
	Implement Good Housekeeping Practices for Business Operations.	P			Rocky River Watershed Council	Local Business Owners	✓		Education and $	USEPA Grants		
	Implement better water quality based design for parking.	P			Local Governments	Parking Lot Owners		✓	$			
	Retrofit existing parking lots.	R			Rocky River Watershed Council	Parking Lot Owners	✓		$$$			
	Retrofit existing storm water control basins.	R	R		Rocky River Watershed Council		✓		$$$			

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Home Sewage Treatment Systems (HSTS)

Problem Statement	Solutions/ Actions/ BMPs	Chemical	Habitat	Pathogens	Responsible Party	Audience	Voluntary	Regulatory	Cost to homeowner or to agency	Potential Funding Source	Recommendation Priorities	Comments
HSTS can impact the Rocky River Watershed by introducing excessive nutrients such as, Bacteria, and Pathogens. Knowledge of the homeowner is essential for the proper maintenance that is required for HSTS.	System owner educational seminars	E		E	Health Departments	HSTS Homeowners	✓		$400 per seminar Perform around 20 seminars per year throughout the watershed Agency Cost	O&M Program Grants (OEEF)	1	Part of O&M Program. Cost can be included into annual permit fee to homeowner.
	Educational Materials	E		E	Health Departments	HSTS Homeowners	✓		**Comments $1.10 each (RKF) $5.00 each (V) $.05 each (FS) $1.50 each (GB) Agency Cost	O&M Program Grants (OEEF)	1	Materials include: Record Keeper Folders Videos Fact Sheets HSTS Guide Book

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Home Sewage Treatment Systems (HSTS)

Problem Statement	Solutions/ Actions/ BMPs	Chemical	Habitat	Pathogens	Responsible Party	Audience	Voluntary	Regulatory	Cost to homeowner or to agency	Potential Funding Source	Recommendation Priorities	Comments
Continued from prior page	Mailing for educational materials	E		E	Health Departments	HSTS Homeowners	✓		$00.37 per letter $00.75 per guide book and record keeper folders Total: $3,500 per year throughout the watershed Agency Cost	O&M Program Grants (OEEF)		Mailings can be including as part of an O&M Program. Educational materials can be provided during inspections and seminars with HSTS homeowners.
	Develop and implement school educational presentations	E		E	Health Departments Watershed Speakers Bureau	School aged children	x		Staff Time Agency Cost	O&M Program Grants(OEEF)		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Home Sewage Treatment Systems (HSTS)

Problem Statement	Solutions/ Actions/ BMPs	Chemical	Habitat	Pathogens	Responsible Party	Audience	Voluntary	Regulatory	Cost to homeowner or to agency	Potential Funding Source	Recommendation Priorities	Comments
Continued from previous page	Regular system inspections as part of an Operation & Maintenance (O&M) Program	P		P	Health Departments or Approved Service Provider	HSTS Homeowners	x	x	$40.00 per year for permit Inspections, on average, cost $200 Homeowner Cost	O&M Program	4	In Cuyahoga County an O&M permit is $40.00 annually. This provides for one inspection every five years
	Replace failing HSTS	R		R	Health Departments	HSTS Homeowners		x	In Cuyahoga County $6,000 to $20,000. Homeowner Cost	Loans OEPA Linked Deposit low interest loan program Grants	4	$6,000 is average cost for off-lot HSTS $20,000 is as high an on-lot HSTS can cost

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Home Sewage Treatment Systems (HSTS)

Costs for HSTS are expensive and many homeowners require assistance for the replacement of failing HSTS.	Locate and establish cost share programs for system replacements (grant money, linked deposit low interest rate loans)	R		R	Health Departments Watershed Council	HSTS Homeowners	✓		Agency Cost	Loans OEPA Linked Deposit low interest loan program Grants	1	Cost depends on time for researching and developing documentation for specific grant / program.
Health Department programs concerning HSTS must have the support of community officials and other governmental agencies.	Inter-governmental support for O & M programs	E		E	Health Departments Watershed Council	Local, county and state officials	✓		Staff Time Agency Cost			Build support from all units of government for HSTS inspections, replacements, and sanitary sewer installations.

Since failing HSTS can impact the Rocky River, water quality should be regularly monitored.	Water Quality sampling on storm sewers, ditches and creeks to prioritize project areas for HSTS inspections.	E R		E R	Health Departments	Health Departments	✓		In Cuyahoga County cost include $800 in lab fees;$1,000.00 in staff time$17.50 per fecal coliform lab test. Employee time to take one sample and transport to lab is $50.00.	O&M Program	4	Sample for fecal coliform
	Perform water quality sampling and set up permanent monitoring stations for baseline water quality data.	E		E	Health Departments	Health Departments	✓		In Cuyahoga County the costs include $6,500 lab testing per year in Rocky River Watershed; $10,000 in staff costs; and $17.50 per fecal coliform lab test. Employee time to take one sample and transport to lab is $50.00.	O&M Program	1	Cuyahoga County has established 53 permanent monitoring stations. Monitoring is performed five times per year during dry weather for fecal coliform, flow, pH. Conductivity, DO, suspended solids and phosphorus

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Agricultural Land Use

Problem Statement	Solutions/Actions/BMPs	Chemical*	Habitat*	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Improperly managed horse, cattle and other farm animal wastes contribute nutrients and disease causing organisms to both surface water and groundwater.	Waste Storage Facility – Animal, Stables	P R		P R	SWCDs & NRCS	Animal Owners	✓	✓	$$$	NRCS Cost Share, Landowner, Grants		
	Waste Storage Facility – Animal, Structure – 1 to 5 Horses	P R		P R	SWCDs & NRCS	Animal Owners	✓	✓	$$$	NRCS Cost Share, Landowner, Grants		
	Waste Storage Facility – Containerization (horse/cattle)	P R		P R	SWCDs & NRCS	Animal Owners	✓	✓	$$$	NRCS Cost Share, Landowner, Grants	2	
	Heavy Use Pads (to set manure dumpsters on)	P R		P R	SWCDs & NRCS	Animal Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Roof - Over Animal Waste Facility	P R			SWCDs & NRCS	Animal Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Removal Of Historical Manure Piles	P			SWCDs & NRCS	Animal Owners	✓		$$$	NRCS Cost Share, Landowner, Grants	1	
	Educational Seminars (Leap Training)	E		E	SWCDs & NRCS	Animal Owners	✓	✓	$	NRCS Cost Share, Landowner, Grants		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Agricultural Land Use

Problem Statement	Solutions/Actions/BMPs	Chemical*	Habitat*	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Continued from previous page	Fencing - livestock exclusion	P	P	P	SWCDs & NRCS	Animal Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Livestock Use Area Protection (pads)	P		P	SWCDs & NRCS	Animal Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Animal Crossing (Stream)	P	P	P	SWCDs & NRCS	Animal Owners	✓		$$	NRCS Cost Share, Landowner, Grants		
	Trough or Tank (Water)	P	P	P	SWCDs & NRCS	Animal Owners	✓		$$	NRCS Cost Share, Landowner, Grants		
The protection and restoration of riparian buffers (streamside vegetation)	Buffer Strips (streamside vegetation)	P R		P R	SWCDs & NRCS	Agricultural Landowners Owners	✓		$$	NRCS Cost Share, Landowner, Grants		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Agricultural Land Use

Problem Statement	Solutions/Actions/BMPs	Chemical*	Habitat*	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Continued from previous page Vegetation is very important to fish and wildlife habitat and acts as a natural "filter" for runoff containing soil, nutrients, fertilizers and chemicals.	Buffer Strips (streamside vegetation)	P R		P R	SWCDs & NRCS	Agricultural Landowners Owners	✓		$$	NRCS Cost Share, Landowner, Grants	2	
	Riparian Setback Ordinances in agricultural areas	P R	P R		Local Governments with SWCDs, NRCS Assistance	Agricultural Landowners Owners		✓	No Direct Cost	NRCS Cost Share, Landowner, Grants	1	
	Conservation Easements	P R	P R		SWCDs, NRCS, State & Communities	Agricultural Landowners Owners	✓		No Direct Cost	NRCS Cost Share, Landowner, Grants	1	
	Agricultural Easements	P R			OSU Extension, SWCDs, NRCS & RCD	Agricultural Landowners Owners	✓		No Direct Cost	NRCS Cost Share, Landowner, Grants		
	Purchase of Development Rights (PDRs)	P R	P R		SWCDs, State & Communities	Agricultural Landowners Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Wetland Setback Ordinance	P R	P R		Local Governments with SWCDs, NRCS Assistance	Agricultural Landowners Owners	✓		No Direct Cost	NRCS Cost Share, Landowner, Grants	1	

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Agricultural Land Use

Problem Statement	Solutions/Actions/BMPs	Chemical*	Habitat*	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Generally accepted agricultural land use practices negatively impact water quality – nutrient, fertilizer and chemical runoff.	Wetland Reserve Program (Easements)	P	P		NRCS, SWCDs & RCD	Agricultural Landowners Owners	✓		$$	NRCS Cost Share, Landowner, Grants		
	Grassed Waterways (w/ associated subsurface drainage)	P	P		SWCDs & NRCS	Agricultural Landowners Owners	✓		$$	NRCS Cost Share, Landowner, Grants		
	Grade-stabilization structures	P	P		SWCDs & NRCS	Agricultural Landowners Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Water and Sediment Control Basins (WASCOBS)	P	P		SWCDs & NRCS	Agricultural Landowners Owners	✓		$$$	NRCS Cost Share, Landowner, Grants		
	Proper application of fertilizers/pesticides on cropland.	P			OSU Extension, SWCDs & NRCS	Agricultural Landowners Owners	✓		$	NRCS Cost Share, Landowner, Grants		
	Landowners should develop a Resource Management System Plan in cooperation with the local SWCD. Any needed BMPs should be installed.				SWCDs & NRCS	Owners	✓		$	NRCS Cost Share, Landowner, Grants		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Agricultural Land Use

Problem Statement	Solutions/Actions/BMPs	Chemical*	Habitat*	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
	Woodland lot landowners should develop a Resource Management System Plan in cooperation with the local SWCD. Any needed BMPs should be installed.	P			SWCDs & NRCS	Owners	✓		$	NRCS Cost Share, Landowner, Grants		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Land Use Issues

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Land use choices threaten critical and sensitive areas along streambanks and wetlands.	Conservation Easements for headwater protection		P		SWCD Land trusts Park districts Cities Nonprofit groups	Property owners	✓	✓	$$	Clean Ohio Grants	5	Identify key parcels Define program Implement
	Purchase of Development Rights (PDRs)		P R		State & Local Governments Nonprofit groups	Property owners	✓		$$$	GRF Grants		Develop a program Finance the program Market the program
Public access is limited in some areas of the Rocky River Watershed; whereas, access is abundant within park districts.	Public land acquisition	P	P		Local governments Park systems	Property owners	✓		$$$	Grants Donations Land swaps GRF		Inventory critical areas Develop a program Seek financing
Golf courses also utilize and improper apply lawn care chemicals that result in water quality impacts from nutrient and chemical runoff.	Golf Course-Organic Certification	E P			Watershed Group Local Audubon	Golf courses	✓		Staff	Self funded		Develop a program of alternative applications

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Fish, Wildlife and Recreation

Problem Statement	Solutions/Actions/BMPs	Chemical	Habitat	Pathogens	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Riparian (streamside buffer) vegetation is very important to fish and wildlife habitat. There is a lack of awareness about the importance of riparian buffers and their functions.	Establish, maintain, and restore good riparian corridor vegetation through education	R	R		SWCD Property owners	Cities Park districts Property owners	✓		$+	Grants	**4**	Life at Water's Edge Fact sheets Ordinances Zoning
	Establish, maintain, and restore good riparian corridor vegetation through a No Mow Program	R	R		SWCD Property owners	Cities Park districts Property Owners	✓		$+	Grants GRF		Institute a No Mow Program for property owners
Dams within the watershed impair the ability of fish to migrate.	Evaluate the impact that existing dams have on local fish communities; remove nonessential dams	R	R		ACOE ODNR	Dam owner Cities Park systems	✓		$$$			Inventory dams and assess which dams could come down. Develop a program. Find financing.
There is a general lack of awareness about the effects of pollution on wildlife and aquatic animals	Volunteer monitoring & assessment	E	E	E	CCBH SWCD OLMS Park Districts	Schools "Friends Groups" Scouts	✓		$ Staff Time	Grants		Inventory sites What type data Protocol/training Data input Ideally, a committed group of volunteers is needed

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Fish, Wildlife and Recreation

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens *	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Continued from previous page	Voluntary monitoring & assessment by agencies	P		P	Waste water treatment plants NEORSD		✓		Staff			These agencies already collect data and may be willing to target problem areas
	Riverside Clean-ups	E	R		Watershed Groups Cities Agencies	Schools, Families Churches, Scouts Volunteers	✓		$	Corporate, agency or municipal sponsors	2	Inventory problem areas. Establish program Promote.
	Organic gardening	E P	E P		Entrepreneurs for sustainability OSU Ext.	Property owners	✓		$	Self Funded		Establish program Promote
Land use choices threaten critical and sensitive areas along streambanks, wetlands and riparian areas.	Conservation Easements for headwater protection		P		SWCD Land trusts Park districts Cities Nonprofit groups	Property owners	✓	✓	$$	Clean Ohio Grants	**9**	Identify key parcels. Define program. Implement.
	Purchase of Development Rights (PDRs)		P R		State & Local Governments Nonprofit groups	Property owners	✓		$$$	GRF Grants		Develop a program. Finance the program. Market the program.

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Fish, Wildlife and Recreation

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Public access is limited in some areas of the Rocky River Watershed; whereas, access is abundant within park districts.	Public acquisition of streamside land.	P	P		Local governments Park systems	Property owners	✓		$$$	Grants Donations Land swaps GRF	**2**	Inventory critical areas. Develop a program. Seek financing.
Excessive nutrients Proper application of fertilizers/pesticides—Lawn Care	Organic gardening	E P			Watershed Groups OSU Ext.	Homeowners Cities	✓		$			Develop information on alternatives. Fact Sheets. Develop a program.
Recreational land uses, such as golf, courses, contribute to water quality problems via polluted runoff.	Golf Course-Organic Certification	E P			Watershed Group	Golf courses	✓		Staff	Self funded		Develop a program of alternative applications Promote program.
Invasive species (lamprey, purple loosestrife, etc.) threaten the survival of native fish, fauna and wildlife communities.	Invasive Species Removal		R E		Watershed Groups Park Districts Volunteers	Property Owners Parks	✓		$	Self Funded		Identify target species Identify areas Create program Seek assistance

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Public Involvement and Public Education (PIPE)

Problem Statement	Solutions/Actions/BMPs	Chemical	Habitat	Pathogens	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
There is a general lack of awareness of watershed knowledge	Road signs at stream crossings and watershed boundaries				Council/ Staff	General Public	✓		$150/sign	Grants OEEF USEPA		
	Hand deliver Press Releases/Newspaper articles for local paper				Council/Staff	Reporters/Media Contacts	✓		Volunteer/Staff Time	ODNR Watershed Coordinator		
Successful watershed planning includes the recruitment & retainment of Rocky River Watershed Council participants	Identify existing groups; fishers, paddlers, nature clubs, agencies and officials				Council/Staff	Potential Watershed Council Members	✓		Lots of Volunteer/Staff Time	ODNR Watershed Coordinator		
	Attend identified group meetings to educate and recruit				Council/Staff	Civic Groups "Friends Groups"	✓		Lots of Volunteer/Staff Time	ODNR Watershed Coordinator		
	Identify key individuals to recruit				Council/Staff		✓		Lots of Staff/Volunteer Time	ODNR Watershed Coordinator		

Rocky River Watershed Action Plan
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs)
Public Involvement and Public Education (PIPE)

Problem Statement	Solutions/Actions/BMPs	Chemical *	Habitat *	Pathogens*	Responsible Party	Audience	Voluntary	Regulatory	Cost	Potential Funding Source	Priority	Comments
Education for public and elected officials	Use regular meetings of public officials to inform, educate and recruit				Council/Staff	City Councils Township Trustees	✓		Lots of Staff/Volunteer Time	ODNR Watershed Coordinator		
	Offer technical assistance to storm water management planning efforts.				Council/Staff	Phase II City Councils Township Trustees	✓		Lots of Staff/Volunteer Time	ODNR Watershed Coordinator Fee Funded		
Malfunctioning and failing Home Sewage Treatment Systems negatively impact water quality	Act as a distributor/supporter of local health departments educational outreach materials/efforts				Council/Staff	Property/System Owners	✓		$			
Over the next five years, communities will be implementing Storm Water Management Plans	Coordinate PIPE opportunities				Council/Staff	Phase II Cities/Townships	✓		Volunteer/Staff Time	ODNR Watershed Coordinator Fee Funded		

Trash and illegal dumping is a frequent problem.	Sponsor and coordinate annual stream clean-ups.				Council/Staff	Phase II Cities/ Townships	✓		Volunteer/Staff Time	ODNR Watershed Coordinator		
	Sponsor Adopt-A-Mile of Stream	E P			Watershed Groups/Civic Organizations/Scout Groups/Golf Courses	Watershed Groups/Civic Organizations/Scout Groups/Golf Courses	✓			Self funded		
Animal Waste is a source of pathogens	Develop an inventory of hobby farms throughout the watershed				Council/Staff	Council/Staff	✓			319 Funds		
	Hold Seminars on the proper storage of animal waste				SWCDs	Farm & Pet Owners	✓			Staff Time	OEEF 319	

Road Map to the
Rocky River Watershed Action Plan

Rocky River Watershed Action Plan
Appendix J
May 2006

This publication was prepared by the Northeast Ohio Areawide Coordinating Agency on behalf of the Rocky River Watershed Council. This publication was financed in part through a grant from the Ohio Environmental Protection Agency and the United States Environmental Protection Agency, under the provisions of Section 319(h) of the Clean Water Act

RRWAPj

Road Map to the
Rocky River Watershed Action Plan

Abstract

This report helps the reader to navigate through the complexities of the Rocky River Watershed Action Planning process and the reports produced as a part of it. The Road Map provides basic background information about to the Rocky River Watershed that sets the setting for the Action Plan development. The report details the types of information collected during the planning process and identifies where the reader can access this information. The report also serves to document the Action Plan planning process itself.

Road Map to the
Rocky River Watershed Action Plan

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V. Implementation

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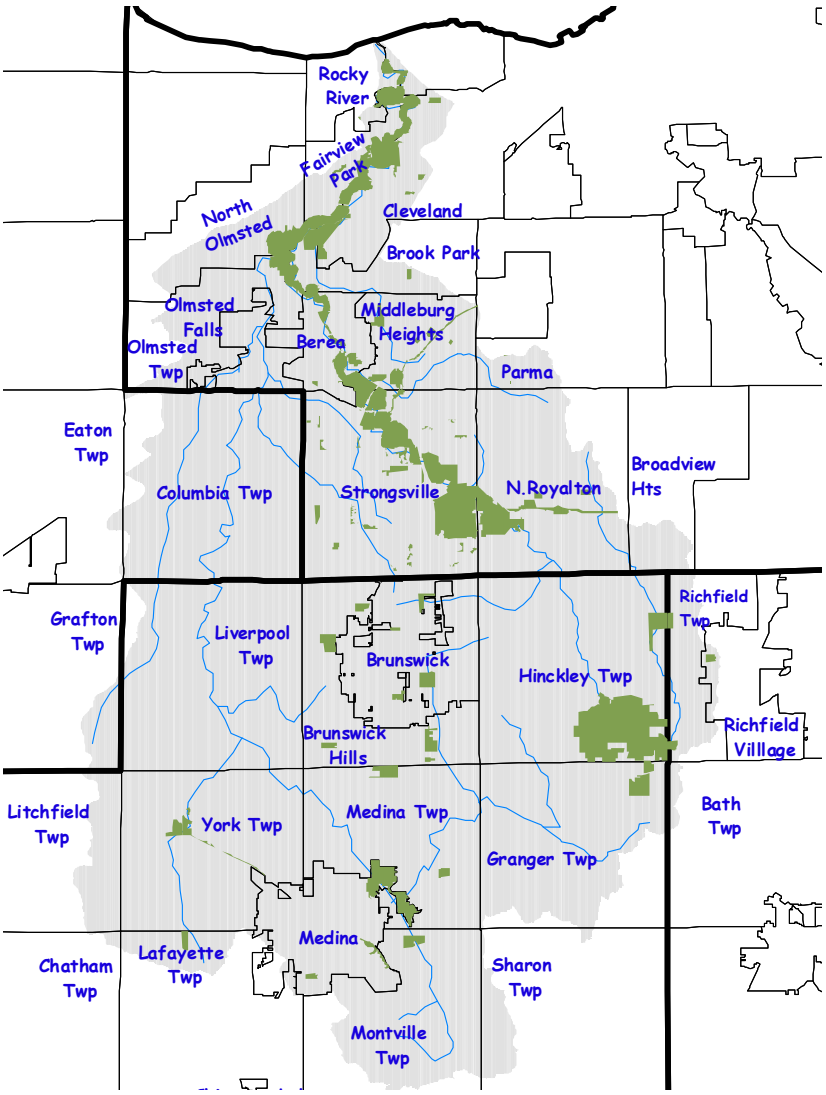
Sanitary Sewer Service Planning Areas in the Rocky River

I. Defining the Watershed

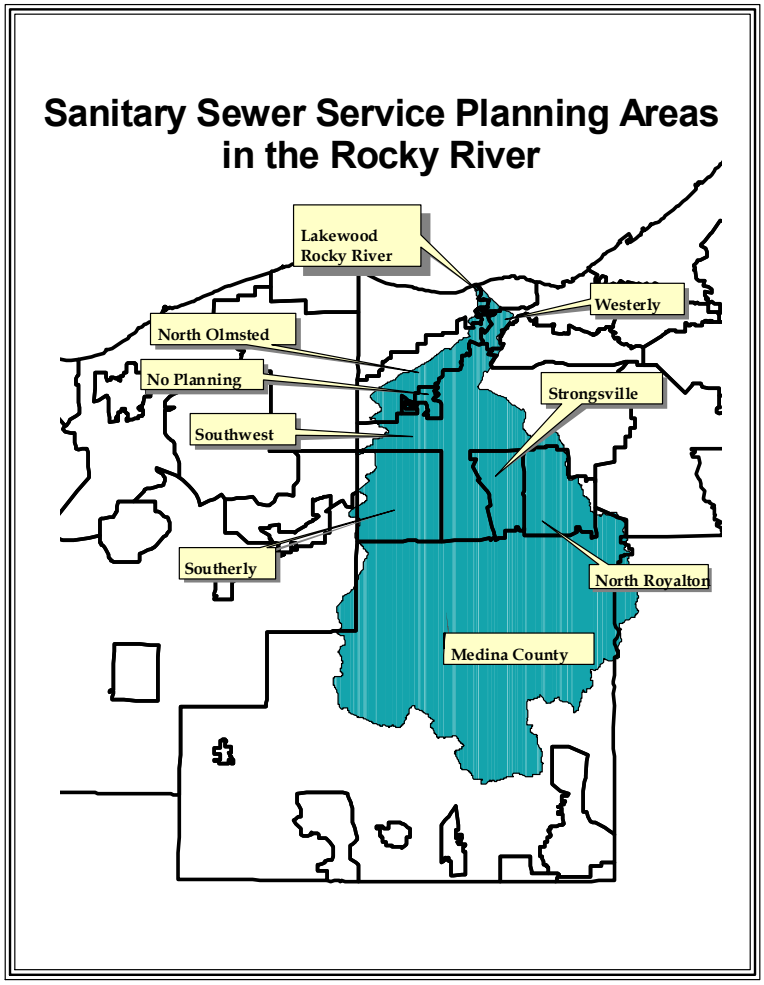
A. General Information Regarding the Watershed:

The incorporated/unincorporated areas of the Rocky River Watershed are shown below. They include four counties (Cuyahoga Lorain, Medina, and Summit), 16 cities or villages, and 16 townships.



There are four park districts that have holdings in the watershed. Cleveland Metroparks has extensive holdings along the Mainstem and the East Branch of the Rocky River including the Hinckley Reservation in Medina County. The Lorain County Metroparks, Medina County Metroparks, and the Metroparks Serving Summit County are the remaining three.

Every community in Cuyahoga County is served by its own school district. (Broadview Heights, which is in the watershed, shares a district with Brecksville, which is not in the watershed.) Two local conservancy groups serve areas within the Rocky River. They are the Medina Summit Land Conservancy and the Firelands Land Conservancy. Numerous regional groups serve broad areas of the State of Ohio including the Rocky River Watershed area. The Northeast Ohio Regional Sewer District is the sole sewer district in the watershed, although numerous other county/municipal sanitary sewer systems serve the watershed as shown below.



All four watershed counties are served by a Soil and Water Conservation District. Each county is served by a County Extension Agent and each has a local farm bureau. The Northeast Ohio Regional Coordinating Agency (NOACA) is the regional planning agency for Cuyahoga, Lorain, and Medina Counties. The Northeast Ohio Four County Regional Planning and Development Organization (NEFCO) serves the same role in Summit County.

While the Rocky River is not recognized as either a National or State Wild or Scenic River, several segments are classified as State Resource Waters. These segments include the mainstem, the East Branch, and the West Branch.

All four counties, the sixteen cities and villages, and ten of the sixteen townships are designated Phase II Storm Water Communities. Only Chatham, Lafayette, Liverpool, Medina, Montville, and York Townships are not part of the Phase II Program.

B. Demographics

Demographic information has been collected for communities that are completely or partially in the Rocky River Watershed. A summary of the highlights of this information follows:

Total Population: 957,112

Age of Population

- Population Under Age 25: 34%
- Population Over Age 24 and Under 50: 37%
- Population Over Age 49 and Under 65: 15%
- Population Over Age 64: 14%

School Age Population: 245,659

- K-12 Population: 194,982
- College Population: 50,677

Highest Attained Educational Levels of Population Over Age 25:

- Did Not Finish High School: 133,725 (20%)
- High School Graduates: 211,496 (32%)
- Some College: 174,912 (27%)
- College Graduate: (90376 (14%)
- Advanced Degree: 43,917 (7%)

Annual Household Incomes (396,334 Households)

- Under $25,000: 131,829 (33%)
- $25,000 to $50,000: 116,749 (29%)
- $50,000 to $75,000: 73,544 (19%)
- $75,000 to $100,000: 116,749 (14%)
- Over $100,000: 116,749 (5%)

One thing is very clear about population in the Rocky River Watershed. People are relocating to the southern half of the watershed in large numbers, while population remains relatively stable in the highly developed communities of the north. Much of this relocation was predicted in 1990, but those estimates appear to have been conservative.

One of the highest growth areas is in and around the City of Medina. Medina's 2000 Census population is 25,139, a gain of over 6,000 people since 1990. The four townships that surround the city grew by 7,000 people during the same period, with much of that growth being concentrated near the boundaries of the city. Growth pressure remains strong in this area. While, the City of Medina is nearly built out in its residential areas, new development continues at a strong pace in the township areas.

The other very high growth area in the Rocky River Watershed includes the cities of Strongsville and North Royalton. These two cities have grown by a combined 11,000 people since 1990. Population projections indicate that they will continue to grow and are expected to add an additional 14,000 people by 2020.

The Brunswick/Brunswick Hills area and the North Olmsted/Olmsted Falls area are also high growth areas both since 1990 and out into the future at least through 2020. Virtually every other community that drains to either the East or the West Branch is also expected to continue to develop.

Economic patterns in the Rocky River Watershed largely follow the population patterns. Manufacturing is not the major employer in the Rocky River Watershed as it is in the adjoining Black and Cuyahoga River Watersheds. It is not anticipated that this will change in the future. Service industry jobs are stable in the watershed. They are expected to grow in the developing areas as population is redistributed in the watershed over the next 20 years. Agriculture is a major economic factor in the watershed at present. Much of the agricultural land has been, and is continuing to be, lost to development pressures. However, the Rocky River will continue to have a major agricultural presence for the foreseeable future.

C. Geographic Locators

The Rocky River consists of the mainstem, the East Branch, the West Branch and several major tributary streams as shown in the figure below. The Rocky River is divided into two 11 digit Hydrologic Unit Codes (HUC11 codes) by the United States Geological Survey. The Rocky River Mainstem and the East Branch comprise the HUC11 code of 04110001 070. The West Branch is code 04110001 060.

Ohio EPA uses a watershed identification system of its own. In the Ohio EPA scheme, the Rocky River is referred to as Watershed OH87. Subbasin identifiers can be added to this code. For example, the mainstem portion of the river is code OH87 2. The subbasin identifiers for the remaining streams of the Rocky River are as follows: 3-Abram Creek; 4-East Branch below Healey Creek; 5-Baldwin Creek; 7-North Royalton "A" Tributary; 8-East Branch above Healy Creek; 9-Healey Creek; 10-West Branch below Plum Creek; 11- Plum Creek near Olmsted Falls; 12-West Branch from Cossett Creek to Plum Creek; 13-Strongsville "A" Tributary; 14-Baker Creek; 15-West Branch above Cossett Creek; 16-Cossett Creek; 17-Mallet Creek; 19-North Branch; and 20-Plum Creek near Brunswick.

In terms of geographic location, the Rocky River is contained in an area that lies between the following latitude/longitude points:

- Northwest: -82.0 East, 41.5 North
- Northeast: -81.65 East, 41.5 North
- Southeast: -81.65 East, 41.1 North
- Southwest: -82.0 East, 41.1 North

D. **General Watershed Information**

NOACA and NEFCO collaborated on the development of strategic initiatives that were included into the update of both agencies Regional Water Quality Plans. The initial plans were developed in the late '70s in response to the dictates of Section 208 of the Clean Water Act. NOACA produced its Clean Water 2000 Report in 2000 as its update to its Water Quality Management Plan. NEFCO prepared its Clean Water Plan for the Lake Erie Basin in 2003. These plans guide how wastewater treatment planning in Northeast Ohio and make a series of recommendations regarding the management of nonpoint sources of pollution. The wastewater management elements of both plans are binding. The nonpoint source recommendations are voluntary.

Under the auspices of the Rocky River Watershed Council, a Section 319 Implementation Grant is supporting nonpoint source pollution reduction efforts in the watershed. The Cuyahoga County Board of Health is administering this grant. The grant is providing for the reduction of nonpoint pollution through activities such as the upgrade of failing sewage treatment systems and is also providing for an increased public outreach effort on behalf of the Watershed Council.

II. Watershed Plan Development

A. Watershed Partners

The breadth of the involvement of watershed partners is demonstrated by the fact that over 350 person or entities are included in the mailing list of the Rocky River Watershed Council. The names on this list have been added at the request of the partner. Over 200 people on the list have identified themselves as watershed residents or landowners. Business interests include the Chamber of Commerce from seven local communities; Camp, Dresser, & McKee (a consulting firm); Knight Development Corporation and Smythe Kramer Real Estate; and the Medina Home Builders Association.

Local governments have been well represented with all of the counties, cities, and villages in the watershed having been involved during the plan development period. Watershed townships have been well represented as well. Ohio EPA, ODNR (Division of Wildlife and Division of Soil and Water Conservation), and OSU Extension have represented State perspectives. The USEPA, Cleveland Office has been a valuable resource.

The Ohio Environmental Council, EcoCity Cleveland, the Audubon, the Berea Town Form, the Berea Kiwanis, the Keelhaulers Club, and the Ohio Central Basin Steelheaders are some of the nongovernmental partners. The Medina Summit Land Conservancy and the Firelands Land Conservancy are others.

Baldwin Wallace College, Cleveland State University, and Berea High School are educational entities that have actively contributed to the development of the watershed plan.

B. The Mission Statement of the Rocky River Watershed Council

The mission statement of the Rocky River Watershed Council is improve the water resource quality and function of the Rocky River by developing a comprehensive watershed management plan that emphasizes the formation of partnerships to solve clearly identified problems.

C. Structure, Organization, and Administration of the Watershed Council

Membership

Any stakeholder of the Rocky River Watershed may become a member of the non-profit Rocky River Watershed Council by completing an application for membership.

A stakeholder is defined as any resident, landowner, local government, business, institution or other person or organization that supports the purpose of the Rocky River Watershed Council.

Organization

The Rocky River Watershed Council shall elect a Chair that also serves as a voting member and the chair of the Rocky River Board of Trustees.

The Rocky River Board of Trustees shall be elected as the administrative committee of the Rocky River Watershed Council and shall consist of fifteen (15) elected members. Membership shall be reflective of the general public, local governments, the business community, the academic community, and other watershed stakeholders. Officers and Duties of the Board of Trustees shall be as stipulated within By-Laws duly ratified by a majority vote of the Rocky River Watershed Council.

The responsibilities of the Board of Trustees include the following:

1. Administering policy and direction as established by the Rocky River Watershed Council;
2. Convening Annual meetings of the Rocky River Watershed Council;
3. Supporting planning and implementation efforts that help to protect and restore the environmental quality of the Rocky River;

4. Facilitating public education, community outreach and research;
5. Foster the formation of sub-tributary watershed groups;
6. Fundraising to support the activities of the Rocky River Watershed Council

On January 28, 2004 the Rocky River Watershed Council elected Medina County Commissioner Steve Hambley as the chair, along with fourteen watershed stakeholders to the Board of Trustees. The Trustees are:

Robert Blomquist, Mayor of Olmsted Falls.
David Cass, Assistant Service Director, City of Middleburg Heights.
Michael Durkalec, environmental scientist.
Elva Edger, Chair of the League of Women Voters Cleveland Environmental Committee.
Jackie Evvard, "Volunteer of the Year" for the Medina Soil and Water Conservation District.
Ivan Hack, Volunteer Chairman of the Cuyahoga County Agricultural Ecology Committee of the Farm Bureau in Cuyahoga County.
Christopher Hartman, District Manager of the Medina Soil and Water Conservation District.
Keith Kessler, Park Manager of the Rocky River Reservation of the Cleveland Metroparks.
Mark Kolesar, active volunteer in the Medina County area for green spaces and watersheds including the Lake Medina Campaign.
John Miller, Ph.D., Professor emeritus in biology from Baldwin-Wallace College and seasonal naturalist for the Cleveland Metroparks.
Janine Rybka, District Administrator of the Cuyahoga Soil and Water Conservation District.
Mark Sunyak, Strongsville City Engineer.
Mel Tolsma, active in environmentalist and farmer.
George Remias, registered professional Civil Engineer.

Role of the Rocky River Watershed Council & Board of Trustees

Role: Assist in building public support to encourage the implementation of the Watershed Action Plan through public education and involvement.

Action: Support the work of the RRWC Public Involvement Public Education (PIPE) Subcommittee.
Action: Continue to sponsor the Rocky River Watershed Day and clean-ups.

Role: Assist in developing funding strategies to encourage implementation of the Watershed Action Plan.

Action: Identify priority projects and potential grant funding sources.

Role: Act in an advisory capacity to the Cuyahoga County Board of Health (CCBH) as part of the 319 Implementation Grant.

Action: Participate in monthly Work Group meetings.
Action: Entertain progress reports on grant activities at quarterly meetings of the Rocky River Watershed Council meetings.

Role: Support the work of the RRWC Public Involvement Public Education (PIPE) Subcommittee.

Action: Assist CCBH in building public support to encourage participation in the Home Sewage Treatment System replacement program of the 319 Planning Grant through public education and involvement.
Action: Co-sponsor educational workshops and the development of fact sheets.

Operational Bylaws

The Rocky River Watershed Council adopted formal bylaws at its meeting on April 29, 2004.

Contact information

Stephen Hambley	George Remias	Andy Vidra
Chairperson	Secretary	Technical Support
330-722-9208	440-409-0019	216-241-2414, ext. 254

D. General Plan Contents

Rocky River Watershed Action Plan Outline

The outline of the Rocky River Watershed Action Plan and its appendices is included as Attachment A to this document.

III. Watershed Inventory

A. Description of the Watershed

The general **topography, geological features, soils, and glacial history** of the Rocky River are described in the report "Watershed Inventory of the Rocky River Watershed" that is Appendix A of the Rocky River Watershed Action Plan.

The **rare, threatened, and endangered species** of plants and animals along with **invasive species** are described in the report "Watershed Inventory of the Rocky River Watershed" that is Appendix A of the Rocky River Watershed Action Plan.

The climatic and precipitation information pertinent to the Rocky River are included in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan.

Surface water resources including wetlands information of the Rocky River is included in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan. Tributary lengths and watershed size are included. Available stream flow information is very limited in the Rocky River. The Hydrologic Atlas for Ohio indicates that the range of Average Annual stream flow in the Rocky River is 11 to 13 inches per year with an average of 12. The USGS has analyzed flow statistics at the mouth of the East and West Branches and in the mainstem as shown in Appendix B. FEMA floodplain maps are also shown in Appendix B. There have been no studies of stream sinuosity or entrenchment ratios made on the Rocky River.

Tributary descriptions and use designation information are included in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan.

Ground water aquifers, flow regimes, and pollution potential information is included in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan. There are no Source Water Assessment Plans that have been prepared in the Rocky River Watershed.

A **general land use** map of the Rocky River Watershed and summary statistics of individual subbasins are described in the report "Watershed Inventory of the Rocky River Watershed" that is Appendix A of the Rocky River Watershed Action Plan. This same report identifies areas

served by sanitary sewers as opposed to areas served with **home sewage treatment systems**. **Agricultural activity** is summarized and **protected lands** are identified in Appendix A as well.

Land use trends in the watershed are reviewed in the report "Water Resource Threats Related to Growth in the Rocky River Watershed" that is Appendix C of the Rocky River Watershed Action Plan.

B. Cultural Resources

Sites of historical, cultural, or recreational significance are described in the report "Watershed Inventory of the Rocky River Watershed" that is Appendix A of the Rocky River Watershed Action Plan.

C. Previous and Complimentary Efforts

Previous water quality efforts and current efforts that are occurring in the watershed are described in the report "Watershed Inventory of the Rocky River Watershed" that is Appendix A of the Rocky River Watershed Action Plan.

D. Physical Attributes of Streams and Floodplain Areas

The discussion of **presettlement conditions**, **channel and floodplain conditions, the status of forested riparian area, the miles of forested natural riparian buffer, the miles of stream with permanent protection, the miles of natural streams, the miles of modified channels, the location of dams and channelized streams, and the extent of floodprone areas** is included in the report "Watershed Inventory of the Rocky River" that is Appendix A of the Rocky River Watershed Action Plan and are revisited in "The Water Resources of the Rocky River Watershed" that is Appendix B of the Action Plan.

There are no **streams with unrestricted livestock access** in the Rocky River Watershed. While naturally occurring **bank erosion** occurs on every stream within the watershed, excessive bank erosion is limited. The urbanized watersheds of Abram Creek, Baldwin Creek, both of the Plum Creeks, and local drainage in the City of Medina are locations where bank erosion occurs at a rate that exceeds normally expected levels. The volume of sediment generated by excess bank erosion is not considered to represent a significant problem in the watershed. Floodplain connectivity is discussed in each of the subbasin sections in "The Water Resources of the Rocky River Watershed" that is Appendix B of the Action Plan. There are no **riparian levees** in the watershed. There exists no inventory of **entrenched stream miles** in the watershed. Isolated areas of entrenchment do occur along small feeder streams in urban areas throughout the watershed.

The **status and trends of expected residential/commercial development** is reviewed in the report "Water Resource Threats Related to Growth in the Rocky River Watershed" that is Appendix C of the Rocky River Watershed Action Plan. No new **major roadway projects** are expected in the Rocky River in the foreseeable future. Maintenance activities will continue. Small roads associated with new subdivision will be built but Ohio EPA's Storm Water Permits

Program that will reduce potential impacts from this construction to the maximum extent practicable.

E. Water Resource Quality

Locationally referenced use designation/use attainment information is included in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan. A map of use attainment status is included in the report "Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed" that is Appendix D of the Rocky River Watershed Action Plan. An evaluation of **beneficial use impairments** is presented in the report "A Look at the Beneficial Use Impairments of the Rocky River" that is Appendix F of the Rocky River Watershed Action Plan.

The quality of wetlands, lake, and groundwater is reviewed in the report "The Water Resources of the Rocky River Watershed" that is Appendix B of the Rocky River Watershed Action Plan.

The causes and sources of use impairment in the Rocky River Watershed are presented in the report "Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed" that is Appendix D of the Rocky River Watershed Action Plan. Specific causes identified include **Nitrogen loadings, habitat modification, thermal modification, organic enrichment, toxic chemicals, and bacteria pathogens**. Specific source identified include **point sources (permitted discharges, combined sewer overflows, and storm sewer outfalls), urban runoff, agricultural runoff, failing home sewage treatment systems, construction site runoff, and riparian disturbances**. These sources are discussed in Appendix D and are located and evaluated in Appendix E (Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed.) The areas that are threatened by the impacts associated with growth are identified in the report "Water Resource Threats Related to Growth in the Rocky River Watershed" that is Appendix C of the Rocky River Watershed Action Plan. **Spills and illicit discharges** have not been identified as a contributor to any use impairment in the Rocky River Watershed.

Agriculture has not been directly identified as a contributor to any of the impaired use designations in the watershed. Agricultural activity does occasionally have a local impact on water quality. Such impacts are dealt with on a case-by-case basis and are not part of the Watershed Action Plan priorities. Programs involving **Highly Eroding Lands** are in this category. (Highly Erodible Lands comprise about 3,400 of the 20,000 acres of agricultural land in the watershed and generate an estimated 10,200 tons of sediment annually.) The reduction of nitrogen loadings from agriculture areas has the same priority as nitrogen loadings from all other land areas in the watershed.

The majority of the livestock operations in the watershed are situated within Liverpool, York and Granger Townships. Most of the operations are small and have limited manure storage or pasture. It was estimated that the 200 horse operations comprise 67% of the total livestock producers in the watershed. Of those, 120 horse operations (60%) have less than 4 horses, while 42 operations (21%) had greater than 10 horses. Horses make up 44% of the total animal units,

most of which are for recreational use. The 68 Beef operations comprise 23% of the total livestock producers with 41 of the beef farms (60%) having at least 10 animals. The 9 dairy operations comprise 3% of the livestock producers. Every dairy operation had at least 10, but no more than 50 animals. There are 10 sheep operations comprising 3% of the livestock producers. There are 9 alpaca and 2 hog producers operations situated within the watershed.

As addressed earlier, none of the Rocky River streams are **levied**. Most streams have some **human impacts** due either to agriculture in the more headwater streams or urbanization/suburbanization in the lower courses. **Effluent volumes** from point sources are presented in Appendix E (Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed.) There exist no known information regarding effluent volumes associated with nonpoint sources. **Dam locations** are presented in the report "Watershed Inventory of the Rocky River" that is Appendix A of the Rocky River Watershed Action Plan. There are no known **petition ditches** in the watershed. The **status and trends** of expected residential/commercial development is reviewed in the report "Water Resource Threats Related to Growth in the Rocky River Watershed" that is Appendix C of the Rocky River Watershed Action Plan.

IV. Watershed Impairments

A. Pollutant Loadings

Pollutant loading information is presented in several locations. The first is the report "Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed" that is Appendix E of the Rocky River Watershed Action Plan. The second is the report "Load Reduction Targets for the Rocky River Watershed" that is Appendix H of the Rocky River Watershed Action Plan.

Habitat conditions have been evaluated using existing information. The Action Plan has called for the implementation of riparian setback ordinances as a means to reduce any additional loss of riparian areas. This same initiative calls for the upgrading of storm water runoff ordinances to better control the effects of runoff from new development or major redevelopment actions. Additionally, the Action Plan targets 10 miles of watershed streams for restoration of existing riparian disturbances. Targeted watersheds include Abram Creek (0.5 miles), the East Branch (2.0 miles), Baldwin Creek (1.0 miles), the West Branch (4.0 miles), Plum Creek at Olmsted Falls (0.5 miles), Mallet Creek (1.0 miles), and Plum Creek at Brunswick (1.0 miles).

The **problem statement** that links causes and sources of impairments and estimates needed load reductions is included in the report "Load Reduction Targets for the Rocky River Watershed" that is Appendix H of the Rocky River Watershed Action Plan.

V. Watershed Restoration and Protection Goals

The **goals and objectives** of the Rocky River Action Plan are presented directly in the "Rocky River Watershed Action Plan".

VI. Implementation

Prioritized objectives are included in the "Rocky River Watershed Action Plan". This report provides a listing of **tasks, solutions, resources, methods, performance indicators, and a timeframe** for all prioritized actions.

The **education, marketing, evaluation and funding strategies** are included in the "Rocky River Watershed Action Plan".

Watershed plans within the Lake Erie Watershed must describe how the **Ohio Coastal Nonpoint Pollution Control Program management measures** of the Ohio Coastal Nonpoint Pollution Control Program will be implemented within a specific watershed where the watershed inventory or sources and causes of impairment indicate applicability. The Ohio Lake Erie Watershed includes portions of 35 counties and covers an area of 11,649 square miles. The major sub-watersheds, or streams within the Lake Erie Watershed include the Maumee, Portage, Sandusky, Huron, Vermillion, Black, Rocky, Cuyahoga, Chagrin, Grand, and Ashtabula Rivers.

In recognition of the intense pressures facing our nation's coastal regions, Congress enacted the Coastal Zone Management Act (CZMA) that was signed into law on October 27, 1972. To address more specifically the impacts of nonpoint pollution on coastal water quality, Congress enacted section 6127 of the Coastal Zone Act in November 1990. Section 6127 requires that each state with an approved coastal zone management program develop and submit for approval a Coastal Nonpoint Pollution Control Program (CNPCP) to the USEPA and the National Oceanic and Atmospheric Administration (NOAA). The purpose of the program "shall be to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters, working in close cooperation with other State and local authorities."

Specific **Ohio Coastal Nonpoint Pollution Control Program Management Measures** are addressed in the Rocky River Watershed Action Plan as follows:

<u>Agriculture</u>

(3.3.7) Irrigation Water Management: Irrigation water management has not been identified as a source or a cause of any water quality impairment in any portion of the Rocky River Watershed. However, ODNR has identified that Northeast Ohio has a significant number of nurseries and other irrigation water users. These would typically be nurseries, orchards, vegetable or other producers of 10 acres or more that use irrigation water. These producers have a potential for significant impact on local streams and water quality. The ODNR, Division of Soil and Water Conservation and the Ohio Farm Bureau are developing a program to address this management measure in the Lake Erie Watershed. Local SWCDs will be responsible for proposing any needed updates to the Rocky River Watershed Action Plan should this program develop measures that need to be implemented in the Rocky River.

<u>Urban</u>

(5.3.1) New Development: This management measure is intended to accomplish the following: (1) decrease the erosive potential of increased runoff volumes and velocities associated with development-induced changes in hydrology; (2) remove suspended solids and associated pollutants entrained in runoff that result from activities occurring during and after

development; (3) retain hydrological conditions to closely resemble those of the predisturbance condition; and (4) preserve natural systems including in-stream habitat.

Goal #1, Objective 4 addresses this management measure. The model ordinance base developed by the Northeast Ohio Regional Storm Water Task Force requires that postdevelopment peak runoff rate and average volume be based on the on the 1-year/24 hour storm that is more stringent than the Coastal NPS measure calls for. This is in recognition that the Rocky River is already impacted by increased storm water flows and that added steps are necessary to help protect the river from future disturbances. The model ordinance base also requires the use of storm water quality ponds or comparable practices that are designed to trap sediment and associated pollutants in the storm water draining from new developments. The riparian and wetland setbacks included in the model ordinances base combine with the storm water management issues just discussed to minimize hydrological condition changes and habitat features. The Rocky River Watershed Action Plan calls for all watershed communities to pass and implement the model ordinance base regardless of whether they are a Storm Water Phase II Community or not.

(5.3.2) Watershed Protection: The objectives of this measure call for the development of a watershed protection program to:

1. Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;
2. Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and
3. Site development, including roads, highways, and bridges, to protect to the extent practicable the natural integrity of waterbodies and natural drainage.

The Rocky River Watershed Action Plan addresses these through a combination of action items. Goal #1, Objective 1 supports the objective of preserving sensitive areas by public acquisition or by protection through the use of conservation easements. Goal #1, Objective 2 uses setback ordinances to protect existing vegetated riparian corridors and wetlands. It also encourages the use of conservation development concepts to minimize disturbance of natural areas and limits stream crossings by roads and utility lines. Goal #1, Objective 4 provides the mechanism to control runoff from development sites so as to minimize erosion/sedimentation and to maintain runoff flow rates that do not degrade aquatic habitat. There is a requirement that all management practices use to accomplish this objective meet the requirements of the ”Rainwater and Land Development Manual.” In addition, developers are required to tightly control erosion/sedimentation during construction and to maintain post-construction sediment loads at or below pre-development rates. This requirement encourages developers to avoid high erosion areas due to the cost of erosion/sediment controls in such locations.

Medina County is involved in a Balanced Growth Initiative Project that is seeking ways to further these protections, beginning with an area in the Upper West Branch that is experiencing heavy growth pressure. The results of the pilot project will be used across the watershed.

(5.3.3) Site Development: The recommendation to protect areas that provide important water quality benefits is addressed through Goal #1, Objective #1 and Objective #2. Objective

#1 seeks to protect and restore the Riparian Corridor along the Rocky River. Objective #1 of this goal provides for an initiative to permanently protect riparian corridors through the solicitation of conservation easements or the outright purchase of riparian lands for inclusion into public parks. Objective #2 provides for the protection of existing riparian vegetation through the use of riparian setback ordinances to be implemented by all 32 communities throughout the watershed.

The limitation of impervious areas is addressed in Goal #1, Objective 4. Developers are required to protect the aquatic habitat in the streams of the Rocky River by meeting post-construction runoff requirements that are designed to maintain channel stability. This means that developers must design storm water runoff controls in a manner that not only minimizes increases in flooding, but also minimizes changes to runoff velocities. There is a recommendation that developers utilize low impact site designs in order to limit the size retention/detention facilities, but the choice remains in the developer's hands. However, whatever plan is developed to meet the runoff requirements, it will result in a minimization of any increase in the effective imperviousness of the watershed.

The limitation of land disturbance activities is realized by the model construction site ordinance that watershed communities are expected to implement as part of Goal #1, Objective #4 discussed above.

Disturbances of natural drainage features and vegetation are accomplished through the implementation of the Riparian Setback ordinance discussed above. This ordinance requires stream crossings by roadways and utility lines to be minimized and for all riparian vegetation to be maintained or restored where crossings are made.

(5.5.1) Existing Development: The existing urban development in the Rocky River Watershed is largely confined to areas that are subject to the Phase II Storm Water Program requirements. This program requires local governments to seek and eliminate illicit discharges of pollutants to the receiving waterways. This will work to remove unpermitted pollutant loadings. Each Phase II community is responsible for scheduling and implementing any controls that are necessary to accomplish this. The riparian and wetland setback ordinances recommended in Goal #1 apply to redevelopment projects as well as new development. The ordinance package limits any further destruction of natural conveyance systems and works to reestablish disturbed vegetative corridors. Goal #1, Objective 3 provides for the restoration of riparian corridors, further bolstering the revegetation effort.

(5.6.1) New On-Site Disposal Systems: All health departments operating in the watershed already meet State requirements for permitting on-site sewage disposal systems. Sanitarians work with system owners to minimize impacts on the environment as a matter of course. Properly maintained on-site systems have not been identified as a source or cause of any water use impairment in the watershed.

(5.6.2) Operating On-Site Disposal Systems: Failing on-site systems have been identified as a priority problem. Goal 2, Objective #1 addresses this issue. Goal #2, Objective #1 deals with reducing instream bacterial levels and nitrogen loadings by reducing on-site system pollutant loadings reaching the river.

(5.8.1) Planning, Siting, and Developing Local Roads and Highways: Both the riparian setback ordinance and the construction site ordinance that are part of the recommendations associated with Goal #1 of the Watershed Action Plan contain provisions to minimize the disturbance of road crossings over the streams of the watershed and to minimize soil erosion/sedimentation associated with road construction.

(5.8.2) Local Bridges: Both the riparian setback ordinance and the construction site ordinance that are part of the recommendations associated with Goal #1 of the Watershed Action Plan contain provisions to minimize the disturbance of road crossings over the streams of the watershed and to minimize soil erosion/sedimentation associated with bridge construction.

Hydrologic Modification

(7.4.1) Channelization and Channel Modification-Physical and Chemical Characteristics of Surface Waters: The Riparian Setback Ordinance recommended as part of Goal #1 of the Action Plan prohibits channel disturbing activities. The only channel modifications that can be made in the watershed will be those permitted by Ohio EPA and these must meet all of Ohio EPA's requirements.

(7.4.2) Channelization and Channel Modification-Instream and Riparian Habitat Restoration: The Riparian Setback Ordinance recommended as part of Goal #1 of the Action Plan prohibits channel disturbing activities. The only channel modifications that can be made in the watershed will be those permitted by Ohio EPA and these must meet all of Ohio EPA's requirements.

(7.5.3) Dams-Instream and Riparian Habitat Restoration: It is not anticipated that any dams will be constructed in the watershed that will not under the jurisdiction of NPDES. Therefore, this measure is not applicable in the Rocky River Watershed.

(7.6.1) Eroding Streambanks and Shorelines: Goal #1, Objective #3 provides for the restoration of streambanks with the use of woody vegetation. The use of bioengineering solutions is the preferred method of controlling streambank erosion within the Action Plan.

VII Evaluation

The set of evaluation criteria is identified in the "Evaluating the Progress of the Rocky River Watershed Action Plan" portion of Section IV of the Action Plan.

Attachment A

Outline of the Rocky River Watershed Action Plan

Rocky River Watershed Action Plan

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I. Evaluation of Solutions, Actions and Best Management Practices for Identified Problems in the Rocky River Watershed
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Appendix A
Watershed Inventory of the Rocky River

Abstract

This report presents an inventory of information important to the water resources in the Rocky River Watershed of Northeast Ohio. It includes background information on a series of water quality based reports that are pertinent to the Rocky River. The report summarizes the geologic and soil conditions in the watershed. It identifies rare, threatened and endangered plant and animal species and other biological information. A review of land use conditions in the watershed and its major tributaries is also presented.

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Appendix B
The Water Resources of the Rocky River

Abstract

This report summarizes the condition of water resources in the Rocky River Watershed of northeast Ohio. It includes a discussion of climatic and precipitation, surface water including wetlands, streams and lakes, and groundwater resources. Fourteen stream segments in the watershed are discussed in detail.

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Appendix C
Water Resource Threats Related to Growth in the Rocky River Watershed

Abstract

This report evaluates population projections for the Rocky River Watershed to identify growth areas and to assess water resource threats associated with this growth.

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Appendix D
Guide to the Causes and Sources of Water Quality Problems in the Rocky River Watershed

Abstract

This report summarizes the causes and sources of water quality problems in the Rocky River Watershed of northeast Ohio. It includes a discussion of point and nonpoint sources. Eighteen stream segments in the watershed are evaluated.

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Introduction
Water Quality Problem Causes
- Nitrogen
- Habitat Modification and Sedimentation
- Thermal Modification
- Organic Enrichment and Dissolved Oxygen
- Toxic Chemicals
- Bacteria Pathogens

Water Quality Problem Sources
- Point Sources
- Urban Runoff
- Farms/Nurseries/Golf Courses
- Construction Sites/Suburbanization
- Riparian Corridor Disturbances
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Summary of the Causes and Sources of Water Quality Problems in the Rocky River

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- East Branch of the Rocky River below Healey Creek
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- Healey Creek
- West Branch of the Rocky River below Plum Creek
- West Branch of the Rocky River from Cossett Creek to Plum Creek
- West Branch of the Rocky River above Cossett Creek
- Baker Creek
- Blodgett Creek
- Plum Creek near Olmsted Falls
- Mallet Creek
- South Branch
- North Branch of the Rocky River
- Remsen Creek including Granger Ditch
- Plum Creek near Brunswick

Appendix E
Inventory of Point and Nonpoint Source Dischargers in the Rocky River Watershed

Abstract

C. This report identifies and locates point sources of pollution to the Rocky River. It also characterizes the location and nature of nonpoint sources of pollution in the watershed. An evaluation of the relative significance of all source types is provided on a subbasin basis.

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Permitted Wastewater Dischargers
Combined Sewer Outfalls
Separate Sewer Overflows
Storm Sewer Service Areas
Potential Nonpoint Source Pollution Impacts
- Agricultural Areas
- Urban Areas
- Home Sewage Treatment Systems
- Summary of Development Trends
- Subbasin Evaluation of Nonpoint Source Impacts

Summary of Watershed Sources

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2. Sanitary Sewer Service in the Rocky River Watershed
3. Combined Sewer Outfalls in the Rocky River Watershed
4. Storm Sewers in the Rocky River Watershed
5. Agricultural Lands in the Rocky River Watershed
6. Urbanized Lands in the Rocky River Watershed

Appendix F
A Look at the Beneficial Use Impairments of the Rocky River

Abstract

Impairment to a beneficial use means a change in the chemical, physical, or biological integrity of the river sufficient to cause a change in any one of fourteen uses identified by the Great Lakes Water Quality Agreement. Whenever these uses are impaired, there are grounds for undertaking remedial actions to restore the stream system. Understanding what the problems are is the first step towards identifying the remedial actions needed to fix them. Towards that end, a Use Impairment Statement was generated for the Rocky River.

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- Fish & Other Wildlife Should be Safe to Eat
- Fish & Other Wildlife Should Taste Good
- Fish & Other Wildlife Populations Should be Diverse and Healthy
- Fish Should Be Free of Abnormal Tumors and Other Deformities
- The Macroinvertebrate Community Populations Should be Diverse and Healthy
- The Amount and Quality of Sediment in River Should Keep Dredging Activities Within Normal Limits
- There Should be a Lack of Eutrophication or Undesirable Algae
- The River Should be Free of Drinking Water Consumption or Taste & Odor Problems
- The River Should be safe for Swimming and Wading
- The River Should be Aesthetically
- Microscopic Plants and Animals (Phytoplankton & Zooplankton) Populations Should be Healthy and Diverse
- There Should be no Added Costs to Agriculture and Industry
- Fish and Wildlife Habitat Should be Diverse

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Beneficial Use Impairment Statement for the Rocky River

Appendix G
The Water Quality Problem Statement for the Rocky River Watershed

Abstract

This report summarizes the water quality problems that have been documented to affect the Rocky River Watershed of Northeast Ohio. It includes a discussion of fourteen individual stream segments in the watershed.

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Water Quality Problem Statements for the Rocky River
- Rocky River Mainstem
- Abram Creek
- East Branch of the Rocky River
- Baldwin Creek
- North Royalton "A" Tributary
- Healey Creek
- West Branch of the Rocky River
- Plum Creek near Olmsted Falls
- Baker Creek
- Cossett Creek
- Mallet Creek
- North Branch of the Rocky River
- Granger Ditch including Remsen Creek
- Plum Creek near Brunswick

Appendix H
Load Reduction Targets
For the Rocky River Watershed

Abstract

This report summarizes the target load reductions in the Rocky River Watershed of Northeast Ohio. It includes a discussion of load reduction targets for the six segments subject to TMDL reductions. The report also identifies needed reductions in other portions of the watershed.

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Total Maximum Daily Load Recommendations
- Summary of Causes and Sources

TMDL Required Reductions and Recommended Actions
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  - Organic Enrichment/Dissolved Oxygen
  - Flow Alteration
  - Bacteria
- Abram Creek
  - Ammonia
  - Organic Enrichment/Dissolved Oxygen
  - Bacteria
- Baldwin Lake
- Hinckley Lake
- Baldwin Creek
  - Nutrients
  - Organic Enrichment/Dissolved Oxygen
  - Habitat Alteration
- Plum Creek near Olmsted Falls
  - Nutrients

Reductions and Recommended Actions Beyond the TMDL
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3. Individual watershed Load Reduction Values

Appendix I
Evaluation of Solutions, Actions, and Best Management Practices for Identified Water Quality Problems in the Rocky River Watershed

Abstract

This report identifies and evaluates water quality solutions, actions and best management practices (BMPs) for the Rocky River Watershed Action Plan. The proposed solutions are predicated on the work described in the previous appendices and substantive stakeholder involvement.

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Introduction
Stakeholder Involvement in Evaluation of Solutions
Technical Assessment of Solutions/Actions/Best Management Practices (BMPs) Table

Appendix J
Road Map to the
Rocky River Watershed Action Plan

Abstract

This report helps the reader to navigate through the complexities of the Rocky River Watershed Action Planning process and the reports produced as a part of it. The Road Map provides basic background information about to the Rocky River Watershed that sets the setting for the Action Plan development. The report details the types of information collected during the planning process and identifies where the reader can access this information. The report also serves to document the Action Plan planning process itself.

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VII. Watershed Plan Development
VIII. Watershed Inventory
IX. Watershed Impairments
X. Implementation

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