NORTHEAST OHIO FOUR COUNTY REGIONAL PLANNING AND DEVELOPMENT ORGANIZATION

Nimishillen Creek Watershed - State Action Plan

FINAL REPORT

January 26, 2007

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General Policy Board Item No. 7
Resolution No. FY2006-019

RESOLUTION OF THE GENERAL POLICY BOARD OF THE NORTHEAST OHIO FOUR COUNTY REGIONAL PLANNING AND DEVELOPMENT ORGANIZATION (NEFCO) APPROVING THE NIMISHILLEN CREEK WATERSHED - STATE ACTION PLAN

WHEREAS, NEFCO is the designated water quality management planning agency for Portage, Stark, Summit, and Wayne Counties; and

WHEREAS, NEFCO has been awarded the Upper Tuscarawas River Watershed Coordinator grant from the Ohio Department of Natural Resources (ODNR); and

WHEREAS, the Upper Tuscarawas River Watershed Coordinator grant work program calls for the completion of a watershed action plan for the Nimishillen Creek Watershed; and

WHEREAS, the action plan will be used to guide water quality improvement and protection efforts; and

WHEREAS, the action plan follows watershed planning guidelines set forth by the ODNR and the Ohio Environmental Protection Agency (Ohio EPA) making the watershed more competitive in attracting outside funding for watershed projects; and

WHEREAS, the plan has been reviewed by watershed stakeholders; and

WHEREAS, the NEFCO Environmental Resources Technical Advisory Committee (ERTAC) performed a technical review of this report and recommended approval,

NOW, THEREFORE, BE IT RESOLVED that the NEFCO General Policy Board approves the Nimishillen Creek Watershed - State Action Plan. Furthermore, the Board directs staff transmit this to the ODNR for endorsement.

Certified as action taken by the NEFCO General Policy Board at its regular meeting held on June 21, 2006

Warren Woolford

Warren Woolford, Secretary
NEFCO General Policy Board

Table of Contents

List of Tables . . . . . **ix**
List of Figures . . . . . **xii**

I. Introduction **1**
Purpose 1
Fundamental Water Quality Goals 1
Watershed Issues Overview 1
Updates and Revisions 1
Nimishillen Creek Watershed Partners 3
Development of the Action Plan 3
Education, Marketing Strategies, and Outreach Goals 4

II. Watershed Inventory **5**
Introduction 5
Watershed Information and Map 5
Physical Description 5
Administrative Boundaries 6
Districts
Park 6
Schools 9
Colleges and Universities 11
Sewer 11
Soil and Water 11
Resource Conservation and Development (RC&D) Program 13
Muskingum Watershed Conservancy District 13
Geology
Topography, Land Form, and Slope 14
Glacial History 14
Bedrock Geology 17
Mineral Resources 17
Soils 20
Fitchville-Sebring Soil Association 20
Chili-Wheeling Association 20
Ravenna-Canfield Association 21
Canfield-Wooster Association 21
Carlisle-Willette-Linwood Association 21
Wadsworth-Rittman Association 22
Loudonville-Wooster Association 22
Latham-Keene Association 22
Muskingum-Gilpin-Dekalb Association 22
Biological Features
Rare, Threatened, and Endangered Plant Species 23
Invasive, Non-Native Species 23
Wildlife 24

Table of Contents (continued)

Page

Water Resources
- Climate and Precipitation 25
- Surface Water 25
- Flow Regime 26
- USGS Gauging Stations 26
- Floodplain Areas 28
- Water Quality Improvement Efforts 30
- Storm Water
  - NPDES Storm Water Phase 2 Communities 30
  - Stark County Drainage Task Force 31
- Wetlands 32
- Ground Water
  - Water Suppliers 34
  - Ground Water Pollution Potential 34
  - SWAP Program 36

Land Use 36
- Land Cover 38
- Status and Trends 40
- Impervious Surfaces 41
- Protected Lands 42
- Agriculture 43
  - Crop Type 44
  - Tillage 44
  - Rotations 45
  - Irrigation 45
  - Livestock Inventory and Grazing 46
  - Agriculture and Economy 47

Socioeconomics
- Demographics 47
- Economics 48

Physical Attributes
- Riparian Corridor Study 48
- Ohio EPA's Habitat Restorability Rating 50
- Riparian Miles with Permanent Protection 53
- Dams 53
- Gradient 53
- Channelization and Other Modifications 54
- Eroded Banks 55
- Floodplain Connectivity 56
- Riparian Levees 56
- Entrenched Miles, Bankfull Discharge, and Stream Power 56

Recreation 60

Cultural Resources
- Historical Information 61

Table of Contents (continued)

Page

Historical Sites 62
Nimishillen and Sandy Canal 62

III. Water Resource Quality 63
Designated Uses for Ohio Surface Water Resources 63
Aquatic Life Use Designations 63
Non-Aquatic Life Use Designation - Water Supply 65
Non-Aquatic Life Use Designation - Recreation 66
Non- Aquatic Life Use Designation - State Resource Waters 67
Biological Criteria 67
IBI - Index of Biological Integrity 67
ICI - Invertebrate Community Index 68
MIwb - Modified Index of Well Being 68
Aquatic Life Use Attainment Status of Nimishillen Creek 68
QHEI - Qualitative Habitat Evaluation Index 72
Other Water Quality Studies 73

IV. Water Quality Issues 76
Overview of Water Quality Impairments 76
Point Source Pollution 76
Nonpoint Source Pollution 78
Potential Contamination Sources 79
Spills 79
General Watershed Issues 82
Erosions and Sedimentation 84
Urbanization/Suburbanization 85
Improperly Treated Wastewater 85
Riparian Corridor Segmentation and Incursion 86
Channel Modification 87
Flooding 88
Acid Mine Drainage 89

V. Load Reduction 91

VI. Home Sewage Treatment System Plan 92
Purpose of the HSTS Plan 92
Key Features Affecting HSTSs in the Nimishillen Creek Watershed
Topography and Geology 94
Soils 94
Water Supply 97
Land Uses 97
Demographics, Socioeconomic, and the 2000 U.S. Census 98
Home Sewage Treatment System Problem Definition 100
Sewered and Unsewered Areas 100

Table of Contents (continued)

Page

Characterization of Existing Home Sewage Systems 101
Known Impacts on Specific Stream Segments 101
Critical Areas
HSTS Inspections 101
Priority Area 1 103
Priority Area 2 103
Priority Area 3 103
Priority Area 4 103
Financial Assistance 104
Proposed Corrective Action Plan
Current Actions 104
Proposed Actions 104
Tracking and Documenting Success 105

VII. Subwatershed Action Plans
East Branch Subwatershed Action Plan 106
Inventory
Physical Description 106
Land Use 106
Point Source Discharges 109
Water Quality Data and Impairments
Ohio EPA's Water Quality Results 111
Impairments
Aquatic Life Use 111
Recreation 111
Fish Consumption 111
Ohio EPA's Causes and Sources of Impairments 111
Other Water Quality Information 112
East Branch Subwatershed Issues and Actions 113
Issue #1 - Storm Water Runoff and Flooding 113
Issue #2 - Riparian Corridor Protection and Restoration 116
Issue #3 - Failing Home Sewage Treatment Systems 119
Issue #4 - Illegal Dumping 121
Issue #5 - Agricultural Runoff 123

Middle Branch Subwatershed Action Plan 126
Inventory
Physical Description 126
Land Use 126
Point Source Discharges 128
Water Quality Data and Impairments
Ohio EPA's Water Quality Results - 2001 131
Impairments
Aquatic Life Use 132

Table of Contents (continued)

Page

Recreation 132
Fish Consumption 132
Ohio EPA's Causes and Sources of Impairments 132
Other Water Quality Information 133
Middle Branch Subwatershed Issues and Actions 135
Issue #1 - Failing Home Sewage Treatment Systems 136
Issue #2 - Environmental Education 137
Issue #3 - Agriculture Runoff and Practices 141
Issue #4 - Riparian Corridor Restoration 144
Issue #5 - Storm Water Runoff from Urban and Suburban Areas 147

West Branch Subwatershed Action Plan 150
Inventory
Physical Description 150
Land Use 152
Point Source Discharges 152
Water Quality Data and Impairments
Ohio EPA's Water Quality Results 155
Impairments
Aquatic Life Use 155
Recreation 155
Fish Consumption 155
Ohio EPA's Causes and Sources of Impairments 155
Other Water Quality Information 156
West Branch Subwatershed Issues and Actions 153
Issue #1 - Environmental Education 158
Issue #2 - Storm Water Runoff from Urban and Suburban Areas 160
Issue #3 - Watershed Monitoring 162
Issue #4 - Abandoned Mine Drainage 164
Issue #5 - Riparian Corridor Restoration 166

Sherrick Run Subwatershed Action Plan 169
Inventory 169
Physical Description 169
Land Use 169
Point Source Discharges 169
Water Quality Data and Impairments
Ohio EPA's Water Quality Results 174
Impairments 174
Ohio EPA's Causes and Sources of Impairments 174
Other Water Quality Information 174
Sherrick Run Subwatershed Issues and Actions 176
Issue #1 - Acid Mine Drainage 176
Issue #2 - Failing Home Sewage Treatment Systems 179

Table of Contents (continued)

Page

Issue #3 - Illegal Dumping 181
Issue #4 - Environmental Education and Monitoring 183

Hurford Run Subwatershed Action Plan 186
Inventory
Physical Description 186
Land Use 186
Point Source Discharges 186
Water Quality Data and Impairments
Ohio EPA's Water Quality Results 190
Impairments
Aquatic Life Use 190
Recreation 190
Fish Consumption 190
Ohio EPA's Causes and Sources of Impairments 190
Other Water Quality Information 191
Hurford Run Subwatershed Issues and Actions 192
Issue #1 - Industrial Site Runoff 193
Issue #2 - Environmental Education 195
Issue #3 - Riparian Corridor Restoration 198
Issue #4 - Failing Home Sewage Treatment Systems 200

Mainstem Subwatershed Action Plan 203
Inventory
Physical Description 203
Land Use 203
Point Source Discharges 207
Water Quality Data and Impairments
Ohio EPA's Water Quality Results 208
Impairments
Aquatic Life Use 210
Recreation 210
Fish Consumption 210
Ohio EPA's Causes and Sources of Impairments 210
Other Water Quality Information 211
Mainstem Subwatershed Issues and Actions 211
Issue #1 - Riparian Corridor Restoration and Protection 212
Issue #2 - Soil Erosion and Sedimentation 214
Issue #3 - Acid Mine Drainage (AMD) 218
Issue #4 - Environmental Education 219
Issue #5 - Storm Water Runoff and Flooding 222

VIII. Water Quality Monitoring 225

Table of Contents (continued)

Page

IX. Evaluation and Funding 226

X. Appendices 227

Appendix A - Acronyms 227

Appendix B - Nimishillen Creek Watershed Partners' By-Laws 229

Appendix C - Stark County Trail and Greenway Mater Plan Map 233

Appendix D - 2000-2001 Ohio Natural Heritage Database for Rare Plant Species in Stark County 235

Appendix E - Lakes Greater Than Five Acres in the Nimishillen Creek Watershed 237

Appendix F - Stark County "Dedicated" Ditches 239

Appendix G - Point Source Dischargers in the Nimishillen Creek Watershed 241

Appendix H - Spills in the Nimishillen Creek Watershed Responded to by Ohio EPA Division of Emergency and Remedial Response Since 1990 247

Appendix I - Nimishillen Creek Comprehensive Watershed Management Plan - Response to Comments 253

Appendix J - References Cited 265

List of Tables

Table		Page
II-1	14-Digit Hydrologic Unit Code (HUC) Subwatershed in the Nimishillen Creek Watershed	5
II-2	Parks Adjacent to Nimishillen Creek and its Tributaries	8
II-3	School Districts Serving the Nimishillen Creek Watershed's Communities	9
II-4	Land Use/Land Cover by Subwatershed for the Nimishillen Creek Watershed	38
II-5	Future Road and Bridge Construction and Maintenance Projects in the Nimishillen Creek Watershed	42
II-6	Known Protected Land in the Nimishillen Creek Watershed	43
II-7	2003 Crop Production for Stark County, Ohio	44
II-8	Summary of Tillage Statistics in Stark County, Ohio	45
II-9	2003 Livestock Inventory for Stark County, Ohio	46
II-10	2002 Cash Receipts from Marketing of Farm Commodities in Stark County, Ohio	47
II-11	Stark County's Decennial Population Since 1860	48
II-12	Nimishillen Creek Watershed Percentage of Low, Moderate and High Quality Riparian Habitat	50
II-13	Ohio EPA Restorability Rating Factor for Aquatic Life Based on Stream Habitat Quality Index for Nimishillen Creek	52
II-14	Nimishillen Creek Watershed Average Stream Gradient and Percent of Slope	54
II-15	Named Ditches in the Nimishillen Creek Watershed	55
II-16	Estimated Bankfull Discharge for Selected Nimishillen Creek Segments	58
II-17	Estimated Unit Stream Power for Selected Nimishillen Creek Segments	59
III-1	Aquatic Life Use Designations for Nimishillen Creek and Tributaries	65

List of Tables (continued)

Table		Page
III-2	Water Supply Use Designation for Nimishillen Creek and Tributaries	66
III-3	Recreation Use Designation for Nimishillen Creek and Tributaries	67
III-4	Ecoregion Biocriteria for the Erie/Ontario Lake Plain (EOLP) and the Western Allegheny Plateau (WAP)	70
III-5	Summary of Designated Aquatic Life Uses and Attainment Status for Nimishillen Creek and Tributaries	72
III-6	Relationship between Ohio's Aquatic Life Uses and the QHEI	73
IV-1	Ranking of 25 Land Uses in the Watershed and Land Use Characterization Rating for each Subwatershed	80
IV-2	Abandoned Underground Coal Mines in the Nimishillen Creek Watershed	89
VI-1	2000 U.S. Census Information for Areas in the Nimishillen Creek Watershed Containing Poor Soils in Unsewered Areas	100
VII-1	Point Source Discharging Operations in the East Branch Watershed	109
VII-2	East Branch Nimishillen Creek Aquatic Life Use Attainment Segment Summaries	111
VII-3	Ohio EPA's Causes and Sources of Impairments for the East Branch of Nimishillen Creek	112
VII-4	Mean Cumulative Index Values* (CIV) for the East Branch of Nimishillen Creek Based on NEFCO's Macroinvertebrate Surveys	112
VII-5	Point Source Discharging Operations in the Middle Branch Subwatershed	130
VII-6	Ohio EPA 2001 Biological and Aquatic Life Use Sampling Results from the Middle Branch of Nimishillen Creek	131
VII-7	Ohio EPA's Causes and Sources of Impairments for the Middle Branch of Nimishillen Creek	132
VII-8	Mean Cumulative Index Values* (CIV) for the Middle Branch of Nimishillen Creek Based on NEFCO's Macroinvertebrate Surveys	133

List of Tables (continued)

Table		Page
VII-9	Mean Cumulative Index Values (CIV) and Stream Segment Conditions Based on Macroinvertebrate Surveys at Reifsynder Park in Canton, Ohio	134
VII-10	Pollutant Removal Efficiencies from the Constructed Storm Water Treatment Wetland at Reifsynder Park in Canton, Ohio	135
VII-11	Point Source Discharging Operations in the West Branch Subwatershed	154
VII-12	Aquatic Life Use Attainment Segment Summaries for the West Branch of Nimishillen Creek	155
VII-13	Ohio EPA's Causes and Sources of Impairments for the West Branch of Nimishillen Creek	156
VII-14	Mean Cumulative Index Values* (CIV) for the West Branch from NEFCO's Macroinvertebrate Surveys	156
VII-15	Point Source Discharging Operations in the Sherrick Run Subwatershed	173
VII-16	Mean Cumulative Index Values* (CIV) for Sherrick Run Based on NEFCO's Macroinvertebrate Surveys	174
VII-17	Selected Water Chemistry Results from Grab Sample at the Acid Mine Drainage Discharge Point (RM 3.1) on Sherrick Run	175
VII-18	Point Source Discharging Operations in the Hurford Run Subwatershed	189
VII-19	Hurford Run Aquatic Life Use Attainment Segment Summaries	190
VII-20	Ohio EPA's Causes and Sources of Impairments for Hurford Run	191
VII-21	Mean Cumulative Index Values* (CIV) for Hurford Run Based on NEFCO's Macroinvertebrate Surveys	191
VII-22	Point Source Discharging Operations in the Nimishillen Creek Mainstem Watershed	208
VII-23	Ohio EPA 1998 Aquatic Life Use Sampling Results from Nimishillen Creek Mainstem	209

List of Tables (continued)

Table Page

VII-24 Ohio EPA's Causes and Sources of Impairments for Nimishillen Creek Mainstem 210

VII-25 Mean Cumulative Index Values* (CIV) for the Nimishillen Creek Mainstem Based on NEFCO's Macroinvertebrate Surveys 211

List of Figures

Figure		Page
I-1	Nimishillen Creek Subwatersheds	2
II-2	Government Jurisdictions	7
II-3	Creek-Side Parks	10
II-4	Sewered Areas	12
II-5	Glaciated/Unglaciated	15
II-6	Slopes >6%	16
II-7	Bedrock Geology	18
II-8	Abandoned Mines	19
II-9	USGS Stream Gauges	27
II-10	100-Year Floodplain	29
II-11	Wetlands	33
II-12	Ground Water Pollution Potential	35
II-13	Source Water Assessment and Protection (SWAP) Areas	37
II-14	Nimishillen Creek Land Cover	39
II-15	Riparian Habitat Quality	51
II-16	Creek Segments with Estimated Bankfull Discharge Calculations	57
III-1	Ohio Ecoregions	69
III-2	Attainment Status	71
IV-1	Point Source Dischargers	77
IV-2	Oil and Gas Wells	81
IV-3	Spills	83
VI-1	Nimishillen Creek Subwatersheds	93
VI-2	Slopes > 6%	95

Figure		Page
VI-3	HSTS Limiting Soils in Unsewered Areas	96
VI-4	Tracts and Unsewered Areas	99
VI-5	HSTS Priority Areas	102
VII-1	East Branch Subwatershed	107
VII-2	East Branch Riparian Habitat Quality	108
VII-3	Middle Branch Subwatershed	127
VII-4	Middle Branch Riparian Habitat Quality	129
VII-5	West Branch Subwatershed	151
VII-6	West Branch Riparian Habitat Quality	153
VII-7	Sherrick Run Subwatershed	170
VII-8	Sherrick Run Abandoned Mines	171
VII-9	Sherrick Run Riparian Habitat Quality	172
VII-10	Hurford Run Subwatershed	187
VII-11	Hurford Run Riparian Habitat Quality	188
VII-12	Mainstem Subwatershed	204
VII-13	Mainstem Riparian Habitat Quality	205
VII-14	Mainstem Abandoned Mines	206

I. Introduction

Purpose
The intent of the Nimishillen Creek Watershed Action Plan is to:

1. Develop a plan to protect and/or restore the water quality of the Nimishillen Creek and its tributaries to meet state water quality standards and ensure the health and safety of watershed residents.
2. Raise public awareness, especially among the watershed's residents, of the pollution sources and solutions in the Nimishillen Creek Watershed.
3. Consolidate existing watershed information from previous reports and studies into a single user-friendly report; as well as, create a reporting format that can easily be updated when new information becomes available.

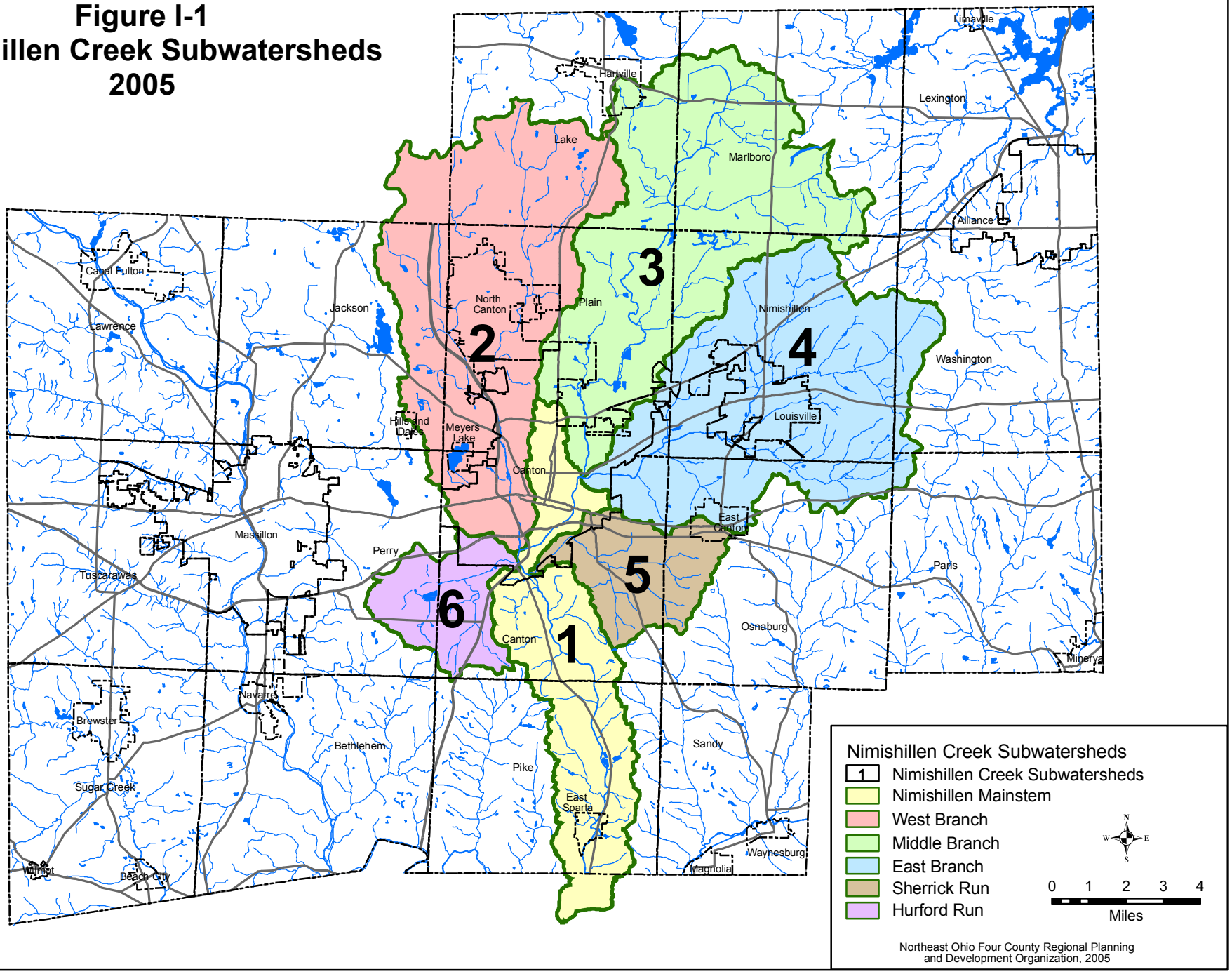
Fundamental Water Quality Goals
1. Restore to state water quality standards the Nimishillen Creek and its tributaries.
2. Restore and protect the riparian corridor.
3. Reduce water quantity (flooding) problems in the watershed.

Watershed Issues Overview
The Nimishillen Creek Watershed is located in a diverse portion of Northeast Ohio containing agricultural areas, suburban development, historic urban cities, and heavily industrial areas (Figure I-1). As would be expected with such a rich mix, issues affecting water quality in the watershed are equally diverse. Specific water quality issues and needed actions are discussed at length in the subwatershed plans located in Section VII; however, similar issues face many of the Nimishillen Creek basins. The primary issues to be addressed in the plan are:

- Promote Environment Education and Outreach
- Protect and Restore Riparian Corridors
- Reduce Pollution from Failing Wastewater Treatment Systems
- Ameliorate Impacts from Acid Mine Drainage
- Diminish the Impacts from Storm Water Runoff from Urban, Suburban, Agriculture, and Industrial Areas
- Protect and Restore the Floodplain

Updates and Revisions
Maintenance and revisions of the Nimishillen Creek Watershed State Action Plan will be the primary responsibility of the Northeast Ohio Four County Regional Planning and Development Organization (NEFCO). NEFCO is the designated water quality planning agency for Stark and Summit Counties and conducts regional planning on various issues, including watershed management. Updates and revisions will be made as new or updated information becomes available, as projects are completed, and/or as the plan's goals are achieved.

Figure I-1
Nimishillen Creek Subwatersheds
2005



Nimishillen Creek Watershed Partners

Originally formed in 2002, The Nimishillen Creek Watershed Partners is a voluntary group consisting of Nimishillen Creek stakeholders with the mission "to promote the restoration of the Creek's water quality to fishable, swimable standards and the protection of the Creek corridor." Stakeholders involved with the watershed partners come from various sectors, including citizens, local/elected government officials, the business and industrial community, park districts employees, farmers, teachers, and students. Membership is open to individual, family, or organization that subscribes to the purposes of the watershed partners. The Nimishillen Creek Watershed Partners' officers are listed below, but a general list of the Partners members are not listed due to privacy concerns. Contact the Watershed Partners Secretary for more membership information. The Watershed Partners is not a 501(c)3 organization and has no immediate plans to become this type of nonprofit organization.

Structure

The Nimishillen Creek Watershed Partners adopted bylaws in June, 2004 (Appendix B). Members nominate and elect a Core Committee to direct the groups activities. Up to fifteen members can be elected to the Core Committee with at least five Committee members being residents of Nimishillen Creek Watershed. They can appoint non-voting members from state, federal, or regional agencies to serve on the committee. Core Committee members are elected to a four-year term.

The Nimishillen Creek Watershed Partners also elect officers from the Core Committee members. The Chair must be a Nimishillen Creek Watershed resident, while the Vice-Chair and Secretary can be any member of the Core Committee. All officer positions are serve a two-year term. A treasury will be appointed by the Core Committee should it become necessary.

Current Officers

Chair: Michael Miller, North Canton Resident
Vice-Chair: Pam Feagler, Earth Action Partnership
Secretary: Eric Akin, NEFCO

Development of the Action Plan

The Nimishillen Creek Action Plan is the continuation of efforts started by NEFCO in the 1990s to develop the Nimishillen Creek Comprehensive Watershed Management Plan (CWMP). The CWMP was divided into four phases and included a riparian zone analysis, land use/land cover data, information on potential pollution sources, an general action plan, and a home sewage treatment system plan. The first two Phases of NEFCO's plan were completed in 2000, Phase III was finished in 2001, and the fourth Phase in 2003. The CWMP was developed with considerable input and guidance for local and statewide stakeholders.

However, an update Nimishillen Creek CWMP was needed to reflect the current watershed planning standards, new water quality programs, and information that has become available since its completion. Specifically, the action plan portion of the

CWMP (Phase III) was completed prior to the new watershed action plan endorsement standards from Ohio Environmental Protection Agency (EPA) and the Ohio Department of Natural Resources. The previous NEFCO plan was also completed prior to new regulations such as the National Pollution Discharge Elimination System (NPDES) Storm Water Program Phase II, Ohio EPA's Total Maximum Daily Load (TMDL) program, and NEFCO's water quality monitoring efforts.

This report is a stand alone plan that consolidates information from the previous phases of the Nimishillen Creek CWMP, includes new programs and regulations, and provides the most up to date information about the watershed. This Action Plan was completed with continued input and review from Nimishillen Creek stakeholders.

The Action Plan has been accepted by the NEFCO General Policy Board consisting of government officials from Stark, Summit, Portage, and Wayne Counties. Their resolution is included after the title page. The Nimishillen Creek Watershed Partners will officially endorse the plan once it has been fully endorsed by the State. The Watershed Partners and the Watershed Coordinator will then solicit endorsement from the municipalities and townships within the Nimishillen Creek Watershed.

Lastly, this report was intended to be released at the same time or after the completion of the TMDL report in order to utilize their findings to better guide implementation of water quality improvement actions. However, the TMDL sampling was delayed due to flooding in 2003 and 2004 and the final report is not due out until late 2006 or 2007. Therefore, it was decided to complete the Action Plan without the TMDL findings, but update the plan where needed once the TMDL is completed by the Ohio EPA.

Education, Marketing Strategies, and Outreach Goals

The education strategics are clearly described in the Subwatershed Plan portion (Section VII) of this plan. In general, education will be target to people who can provided the greatest benefit for stream protection and restoration. That would include such stakeholders as riparian landowners, elected officials, and educators. This will include getting stakeholders "hands-on" experience with watershed work through activities such as creek clean-ups and volunteer water quality monitoring.

A marketing strategy was not developed for inclusion in this plan. One will be developed in the future if needed.

II. Watershed Inventory

Introduction

The intent of the Nimishillen Creek Action Plan is to protect and/or restore the water quality of the Nimishillen Creek Mainstem and its associated tributaries by developing a Comprehensive Watershed Management Plan (CWMP) following endorsement guidelines established by the State of Ohio. This watershed inventory provides information needed to address water quality issues, like data on water resource, geology, socioeconomic factors, land usage, and cultural resources. Each section in the inventory was completed using the most up to date information available.

Watershed Information and Map

The Nimishillen Creek is located primarily in Stark County in Northeast Ohio. The watershed's unique Hydrologic Unit Code (HUC) number is 05040001 050. It is further divided into six 14-digit HUC subwatersheds which are listed in Table II-1

Table II-1: 14-Digit Hydrologic Unit Code (HUC) Subwatershed in the Nimishillen Creek Watershed

Subwatershed	HUC Number	Size (acres)
Middle Branch	05040001 050 010	16,135
Middle Branch	05040001 050 020	16,733
East Branch	05040001 050 030	29,722
West Branch	05040001 050 040	29,801
Mainstem	05040001 050 050	14,683
Mainstem	05040001 050 060	13,134

For this report, the two Middle Branch watersheds (HUCs 05040001 050 010 and 05040001 050 020) were combined into one subwatershed for the Middle Branch. This is the Nimishillen Creek Watershed 3 shown in Figure I-1. Similarly, the two Mainstem watershed (HUCs 05040001 050 050 and 05040001 050 060) were divided into three watershed labeled Watershed 1, 5, and 6 in Figure I-1. The 14-digit HUC watersheds for West and East Branches of Nimishillen Creek are the same as the Nimishillen Creek Watershed 2 and 4, respectively, in Figure I-1. The subwatershed listed in Table II-1 can be further divided into 30 smaller subwatershed areas if needed for planning or implementation purposes.

Physical Description

The Nimishillen Creek Watershed shown in Figure I-1 is located in the northeastern portion of the Muskingum River Watershed in the Ohio River drainage basin in which Nimishillen Creek is a major subwatershed. For the purpose of this plan and to remain consistent with previous NEFCO studies, the Nimishillen Creek Major Subwatershed will be referred to as the Nimishillen Creek Watershed. Additionally, NEFCO has divided the Nimishillen Creek Watershed into six (6) major subwatersheds. This will improve the accuracy of determining specific hydrologic habitat modifications and/or stream

segments within the watershed that may receive a higher priority for protection and of measuring the progress of restoration efforts in the future.

The headwaters of the Nimishillen Creek Mainstem primarily originate in three distinct areas. The headwaters of the West Branch Nimishillen Creek are located to the west of the Village of Hartville and just south of the Akron-Canton Airport. Flowing south, the West Branch of Nimishillen Creek flows through the City of North Canton and the City of Canton to its confluence with the Nimishillen Creek Mainstem near river mile (RM) 12.1. The headwaters of the Middle Branch Nimishillen Creek are located in Marlboro Township in northern Stark County. Flowing southwesterly, the Middle Branch Nimishillen Creek flows along the western portion of Plain Township, before entering the City of Canton where it combines with the East Branch to form the Nimishillen Creek Mainstem at RM 15.0.

The headwaters of the East Branch Nimishillen Creek are located to the north, east and south of the City of Louisville. Flowing southwesterly, the East Branch Nimishillen Creek flows to the City of Louisville before entering the City of Canton and joining with the Middle Branch near RM 15.0 forming the Mainstem. Continuing to flow south, the Nimishillen Creek Mainstem flows through the City of Canton and the Village of East Sparta, prior to its confluence with Sandy Creek just south of the Stark and Tuscarawas County boundaries.

Administrative Boundaries

Located within the watershed boundaries, in part or in whole, are the following government jurisdictions shown in Figure II-2:

Cities (County):
- Canton (Stark)
- Green (Summit)
- Louisville (Stark)
- North Canton (Stark)

Villages (County):
- East Canton (Stark)
- East Sparta (Stark)
- Hartville (Stark)
- Hills and Dales (Stark)
- Meyers Lake (Stark)

Townships(County):
- Canton (Stark)
- Jackson (Stark)
- Lake (Stark)
- Marlboro (Stark)
- Nimishillen (Stark)
- Osnaburg (Stark)
- Paris (Stark)
- Perry (Stark)
- Pike (Stark)
- Plain (Stark)
- Sandy (Tuscarawas)
- Washington (Stark)

Districts

Park

There are over 60 parks and public recreation areas in the Nimishillen Creek Watershed managed by five separate park districts. Watershed communities with park lands are the City of Canton, North Canton, East Sparta, and Louisville. Also, the Stark County Park District maintains four parks within the watershed. The

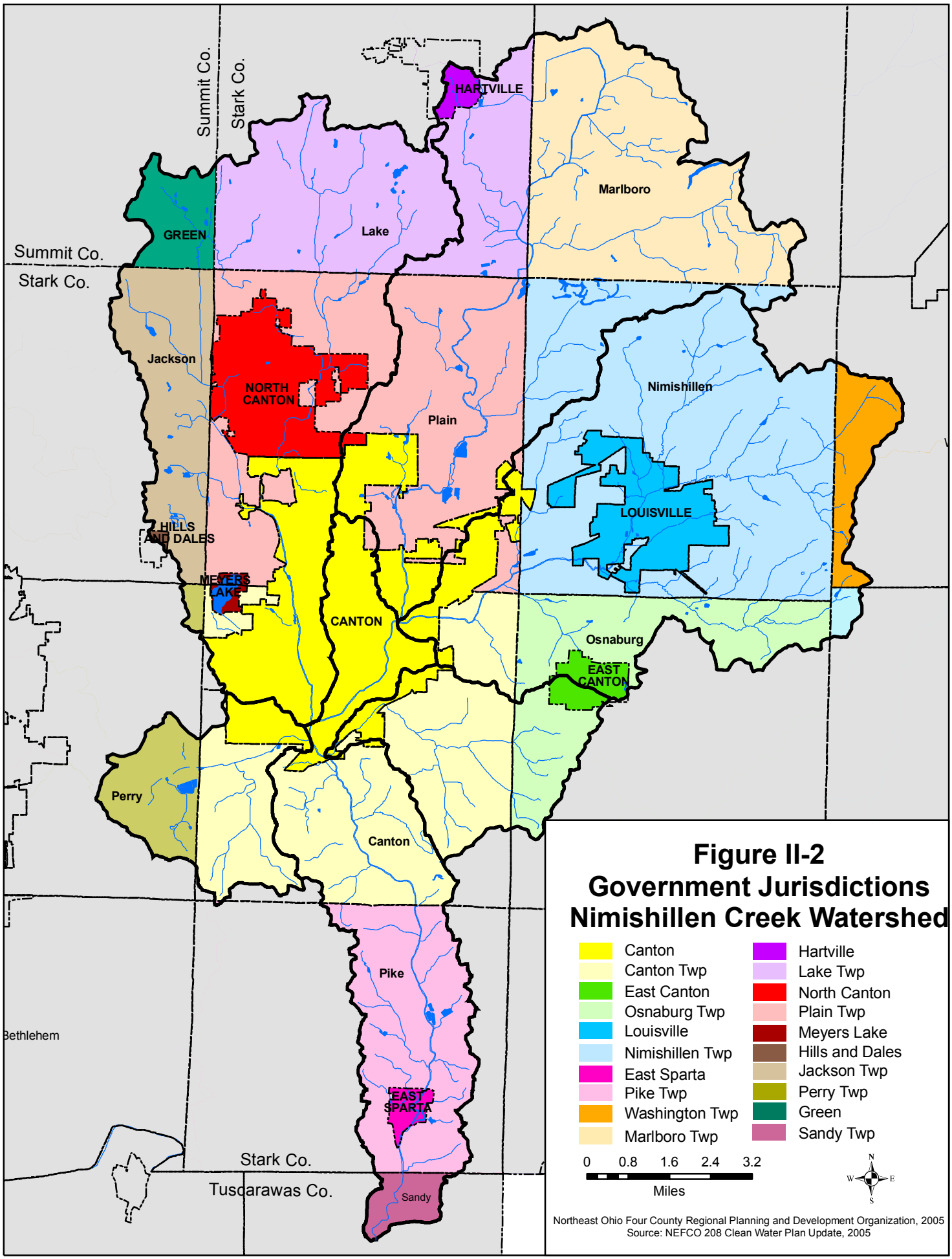


Figure II-2
Government Jurisdictions
Nimishillen Creek Watershed

Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: NEFCO 208 Clean Water Plan Update, 2005

majority of the parks are concentrated within the City of Canton with few parks in the headwater areas of Nimishillen Creek.

Table II-2: Parks Adjacent to Nimishillen Creek and its Tributaries			
District	**Park Name**	**Size (Acres)**	**Subwatershed**
Canton	Arboretum	41.5	West Branch
	Park Connector Strip	0.5	Mainstem
	Cook	14	East and Middle Branches
	Covered Bridge	62	West Branch
	Crenshaw	20	Sherrick Run
	Freeway	4	Mainstem
	Jackson	6	Mainstem
	Ida	8	Mainstem
	Ink	17	West Branch
	Lee	3	Mainstem
	Martindale	19	Middle Branch
	Monument	19	West Branch
	Nimisilla	23	East and Middle Branches
	Oak	16	Middle Branch
	Reifsynder	60	Middle Branch
	Riverside (not park)	9	Mainstem
	Robert E. Schreiber	20	Middle Branch
	Stadium	76	West Branch
	Thurman Munson	38	Mainstem, Sherrick Run
	Waterworks	12	West Branch
	West	43	West Branch
East Sparta	Sandy Valley	13	Mainstem
Louisville	Wildwood	26	East Branch
North Canton	Price	19	West Branch
Stark County	Cook Lagoon	5	Middle Branch
	Esmont	12	Mainstem
	Faircrest	18	Mainstem
	Petros	94	Hurford Run

All parks within the Nimishillen Creek Watershed, to some degree, provide recreational, community health, and environmental benefits to surrounding areas. However, for this plan only the parks directly adjacent to Nimishillen Creek and its tributaries will be discussed. If properly managed, parks located along the creek can provide numerous water quality benefits like stream shading, runoff filtration, soil stabilization, floodplain protection, and wildlife habitat. Conversely, a poorly managed riparian park can have significant water quality impacts.

Table II-2 lists and Figure II-3 shows all the parks directly adjacent to Nimishillen Creek and its tributaries. These creek-side parks not only can be the first areas considered for possible water quality protection or restoration project, but can also be used for educational programs, like volunteer stream monitoring, for Nimishillen Creek.

The Stark County Park District has long range plans to develop a trail and greenway corridor along the Nimishillen Creek's Mainstem, East Branch, Middle Branch, and West Branch. In 2004, Stark Parks has purchased or acquired land adjacent to Nimishillen Creek and was in negotiations to purchase another 30 riparian acres. Appendix C contains a map of Stark Parks' trail and greenways master plan.

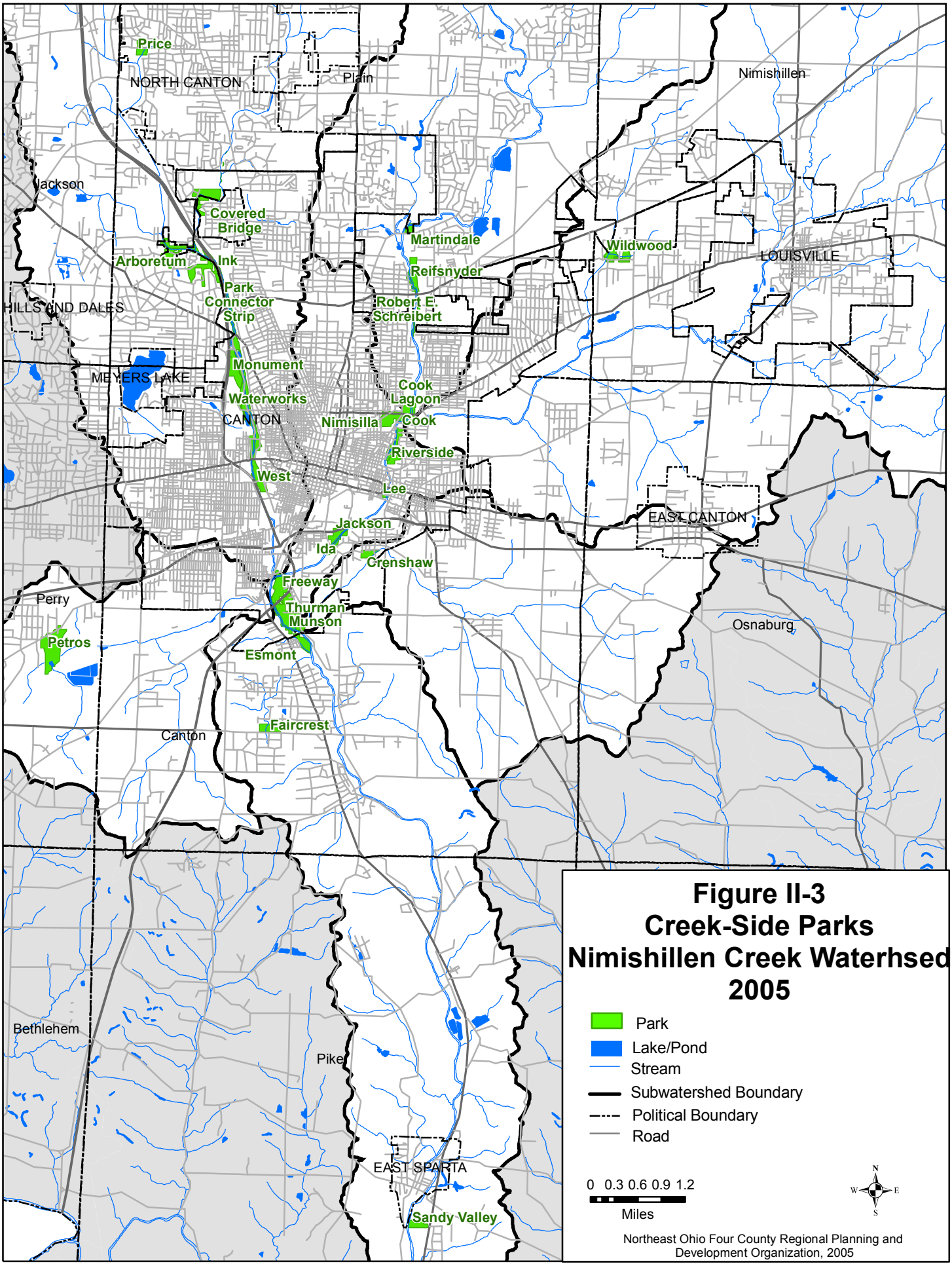
Schools

As expected from a heavily populated urbanized/suburban area, there are several school districts that serve the Nimishillen Creek Watershed communities. Table II-3 summarizes all thirteen districts including number of students and schools. Programs aimed at students and/or teachers is an important part of any education and awareness type program.

Table II-3: School Districts Serving the Nimishillen Creek Watershed Communities

School District	Watershed Communities Served	*Total Enrollment: 2003-2004	Number of Elementary Schools	Number of Middle Schools	Number of High Schools
Canton City	Canton	11,798	17	4	2
Canton Local	Canton, Canton Twp., Pike Twp.	2,538	3	1	1
Green Local	City of Green	4,165	2	2	1
Jackson Local	Jackson Twp.	5,561	4	1	1
Lake Local	Hartville and Lake Twp.	3,359	3	1	1
Louisville City	Louisville and Nimishillen Twp.	3,274	4	1	1
Marlington Local	Marlboro and Washington Townships	2,738	3	1	1
Minerva Local	Paris Township	2,202	2	1	1
North Canton City	North Canton, Plain Twp., and Lake Twp.	4,924	4	1	1
Osnaburg Local	East Canton and Osnaburg Twp.	953	1	1	1
Perry Local	Perry Twp.	4,854	6	2	1
Plain Local	Canton, North Canton, and Plain Twp.	6,122	6	2	1
Sandy Valley	East Sparta and Pike Twp.	1,568	2	1	1
	Totals =	**54,056**	**57**	**19**	**15**

Source: Ohio Department of Education, 2004


Price
NORTH CANTON
Plain
Nimishillen
Jackson
Covered Bridge
Arboretum
Ink
Park Connector Strip
HILLS AND DALES
Martindale
Reifsnyder
Robert E. Schreibert
Wildwood
LOUISVILLE
MEYERS LAKE
Monument
Waterworks
CANTON
Cook Lagoon
Nimisilla
Cook
Riverside
West
Lee
EAST CANTON
Jackson
Ida
Crenshaw
Freeway
Perry
Thurman Munson
Petros
Esmont
Osnaburg
Faircrest
Canton
Bethlehem
Pike
EAST SPARTA
Sandy Valley
Figure II-3
Creek-Side Parks
Nimishillen Creek Waterhsed
2005
Park
Lake/Pond
Stream
Subwatershed Boundary
Political Boundary
Road
0 0.3 0.6 0.9 1.2
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005

Colleges and Universities
Several higher education institutions reside either within or near the Nimishillen Creek Watershed. Schools within the watershed boundaries include Walsh College, Kent State University - Stark Campus, Malone College, and Stark State College of Technology. Colleges or Universities within 25 miles of the watershed are Mount Union College, University of Akron, Kent State University, and the College of Wooster.

High education institutions can be utilized for various education, monitoring, and implementation programs. Students and faculty from Mount Union College have previously been active in the Nimishillen Creek Watershed Partners. A nutrient load reduction monitoring study at a constructed storm water wetland along the Middle Branch was completed in 2005 by Jim Eynon, a graduate student from Youngstown State University. Continued and even heightened involvement from these types of stakeholders will be encouraged, and additional opportunities in research, monitoring, and education will be explored.

Sewer
Figure II-4 shows the extent of sewers in the Nimishillen Creek Watershed. Generally, sewered areas are limited to the Cities of Canton, North Canton, and Louisville, plus the Villages of Hartville, East Canton, and East Sparta. Over half of the watershed area remains dependent on some type of home sewage treatment system (HSTS).

A facilities planning area (FPA) is a delineated area for sewer-related planning that clearly designates areas with sewers, areas where sewers can be extended, and areas that will not have sewer access. There are three FPAs in the Watershed: Canton-Nimishillen, Hartville, and East Sparta. In general, municipalities are the lead agencies for all sewer planning within their corporate limits, while the Stark County Sanitary Engineers Office is the lead agency for sewer projects in all unincorporated area. However for the portion of the watershed in Summit County, called the Stark-Summit Service Area, the Stark County Sanitary Engineers Office and Summit County Department of Environmental Services jointly serve as the lead agency (NEFCO, 2004).

Soil and Water
The Stark Soil and Water Conservation District (SWCD) covers nearly the entire watershed. They offer a variety of services and programs to all Nimishillen Creek residents in Stark County. Programs include reviewing Storm Water Pollution Prevention Plans (SWP3), inspecting construction site for sediment control, and developing Resource Management Systems for farmers.

Summit SWCD serves the small portion of the watershed located in Summit County. They also conduct review on SWP3s and inspect construction sites for erosion control. Summit SWCD also has an Urban Streams Program to help protect

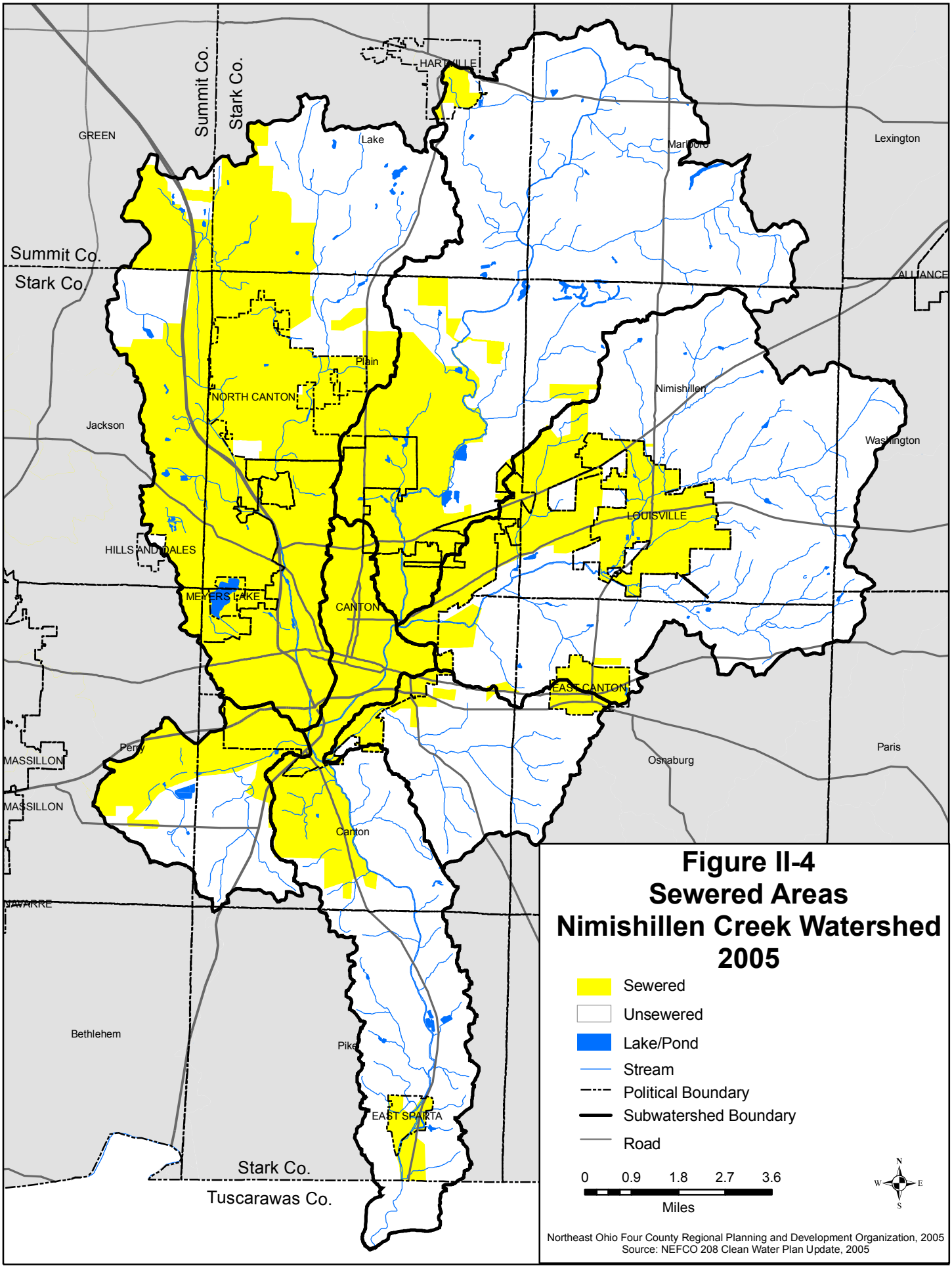


Figure II-4
Sewered Areas
Nimishillen Creek Watershed
2005

streams from problems associated with development and urbanization like increased water volume and streambank erosion.

Resource Conservation and Development (RC&D) Program
The Resource Conservation and Development (RC&D) program was established by Congress in 1962 to expand opportunities for conservation districts, county governments, and individuals to improve their communities in multi-county areas through the formation of regional non-profit organizations. Local people create and organize each RC&D and provide a way for residents to join together to address environmental, economic, and community issues. The United States Department of Agriculture provides technical and financial assistance to the program.

There are two RC&D programs with jurisdiction in the Nimishillen Creek Watershed: Crossroads and Western Reserve RC&Ds. Crossroads RC&D covers the portion of the watershed in Stark and Tuscarawas Counties, while the Western Reserve RC&D has jurisdiction in the Summit County section of the basin. Both programs have a history of supporting watershed improvement and education projects, however neither currently have active projects in the Nimishillen Creek Watershed. Inclusion of these RC&Ds will be sought, when appropriate.

Muskingum Watershed Conservancy District
The Muskingum Watershed Conservancy District (MWCD) was created in 1933 for flood control and conservation. It is the largest conservancy district in Ohio covering all or part of eighteen counties. The District is controlled by the Conservation Court consisting of common pleas court judges from each of the 18 counties with the MWCD's administrative boundary. The Conservation Court appoints a five person Board of Directors which oversees the District's operations. The MWCD is based in New Philadelphia and is considered a local agency of government and not a state or federal entity.

The District has thirteen earthen and one concrete dams for flood control. The U.S. Army Corps of Engineers was given responsibility of the dams and flood control in 1939, an agreement that continues to this day. In addition to assisting the Corps of Engineers in flood protection, the MWCD is responsible for the conservation and recreation on its lands and reservoirs.

Since its inception, the MWCD has been a self-sustaining district funded through visitors' fees, land leases, contract services, and grants. The District has been the only one in Ohio not to assess a maintenance fee to property owners within its administrative boundary. However, the MWCD is in the process of establishing such an assessment for nearly all property owners within their administrative boundary, including properties in Stark and Summit Counties. Money generated by the assessment will be used throughout the watershed to upgrade and repair the aging flood control system, sediment removal, shoreline protection, water quality improvements, and reservoir management. The assessment must be approved by

the Conservation Court. The MWCD goal is to start collecting the assessment in 2008.

The Nimishillen Creek Watershed is located in the headwaters of the Muskingum River basin. So flood control, sediment reduction, and watershed improvement projects for Nimishillen Creek could be funded through the MWCD assessment. However, the MWCD administrative boundaries were drawn based on political boundaries and not watershed boundaries, so the portions of the Nimishillen Creek Watershed located in Lake, Marlboro, and Washington Townships are not technically in the MWCD. If the MWCD assessment is approved, property owners in these townships will not be assessed, but these areas would still be eligible for MWCD funded projects.

Geology

Topography, Land Form, and Slope

The Nimishillen Creek Watershed, like the rest of Stark County, lies in two subdivisions of the Appalachian Plateau province. The northern two-thirds of the watershed resides in the glaciated section of the Appalachian Plateau, and the southern one third in the unglaciated section (Figure II-5). The headwaters in the northern and central portions of the county have moderate relief and gentle slopes due to glacial actions and depositions. However, in the unglaciated southern portion of the watershed, Nimishillen Creek Mainstem has cut a narrow gorge through highlands resulting in steep sloping upland areas and broad flat expanses in the flood plains. As a result of glaciation, Nimishillen Creek currently flows southwardly and drains a major portion (32 percent) of Stark County (NEFCO, 2003).

Figure II-6 shows the areas in the watershed where slopes are greater than 6 percent, with the steepest slopes predominately occurring in the southern portion of the watershed. The townships of Canton, Osnaburg, and Pike in the southern unglaciated section of the watershed have the most area affected by steep slopes. Consequently, the southern portion of the watershed has slower rates of development and urbanization in part due to poor conditions for home sewage treatment systems (HSTS).

Glacial History

Prior to glaciation, the topography of the entire watershed was similar to what is found in the southern portion today: steep sloped uplands with broad flat expanses in the lower lying areas. However, a succession of glaciers overran the area, and all but the southern portion of the land comprising the Nimishillen Creek Watershed was shaped and molded by glacial erosion and deposition.

The watershed area had several glaciers come and go during the Illinoian and the Wisconsin age glaciers. The Wisconsin glacier, which began its advance nearly 20,000 years ago, swept away or buried most of the drift laid down by the earlier Illinoian glaciers, before receding nearly 12,000 year ago.

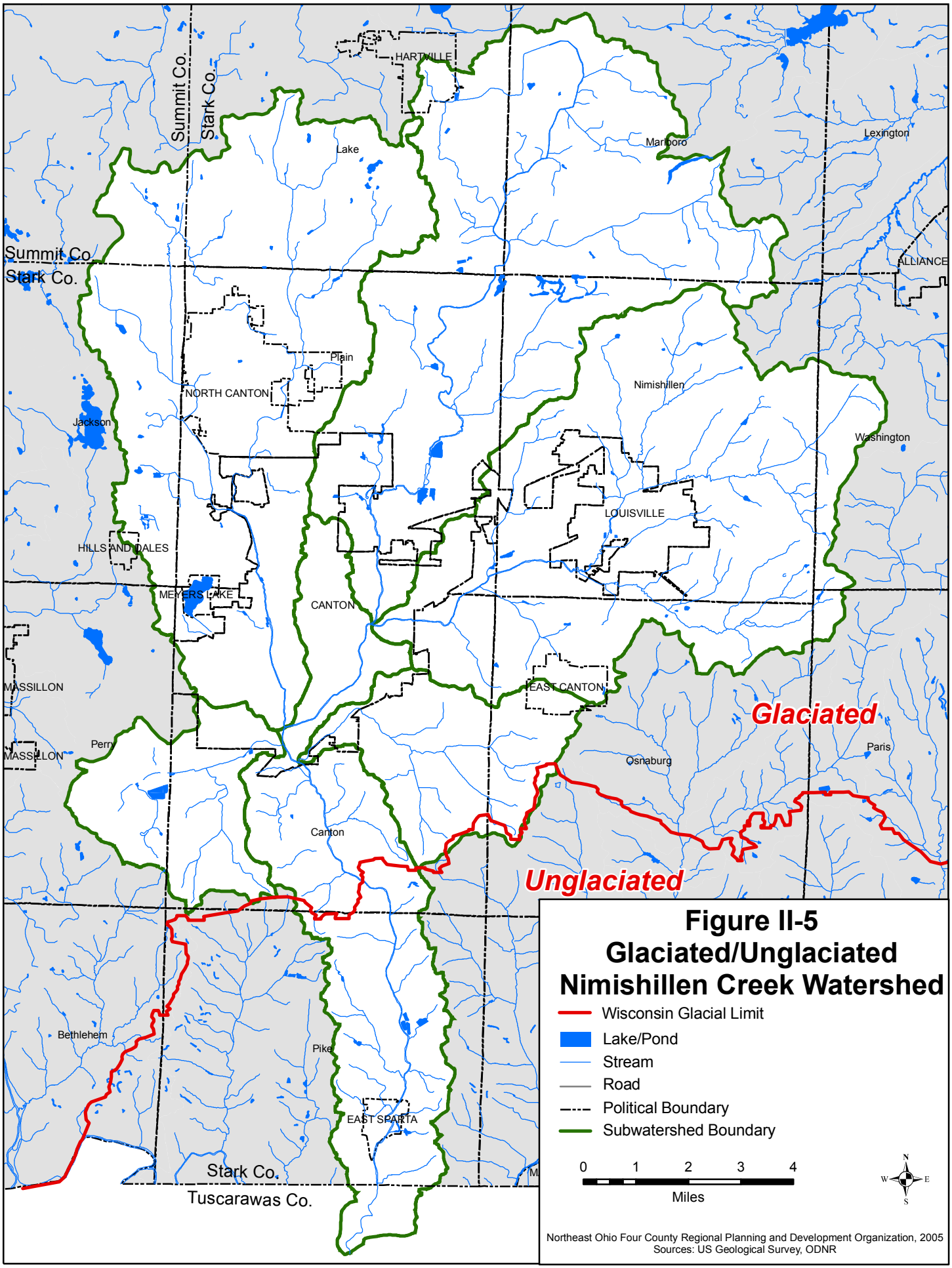


Figure II-5
Glaciated/Unglaciated
Nimishillen Creek Watershed

Wisconsin Glacial Limit
Lake/Pond
Stream
Road
Political Boundary
Subwatershed Boundary

Northeast Ohio Four County Regional Planning and Development Organization, 2005
Sources: US Geological Survey, ODNR

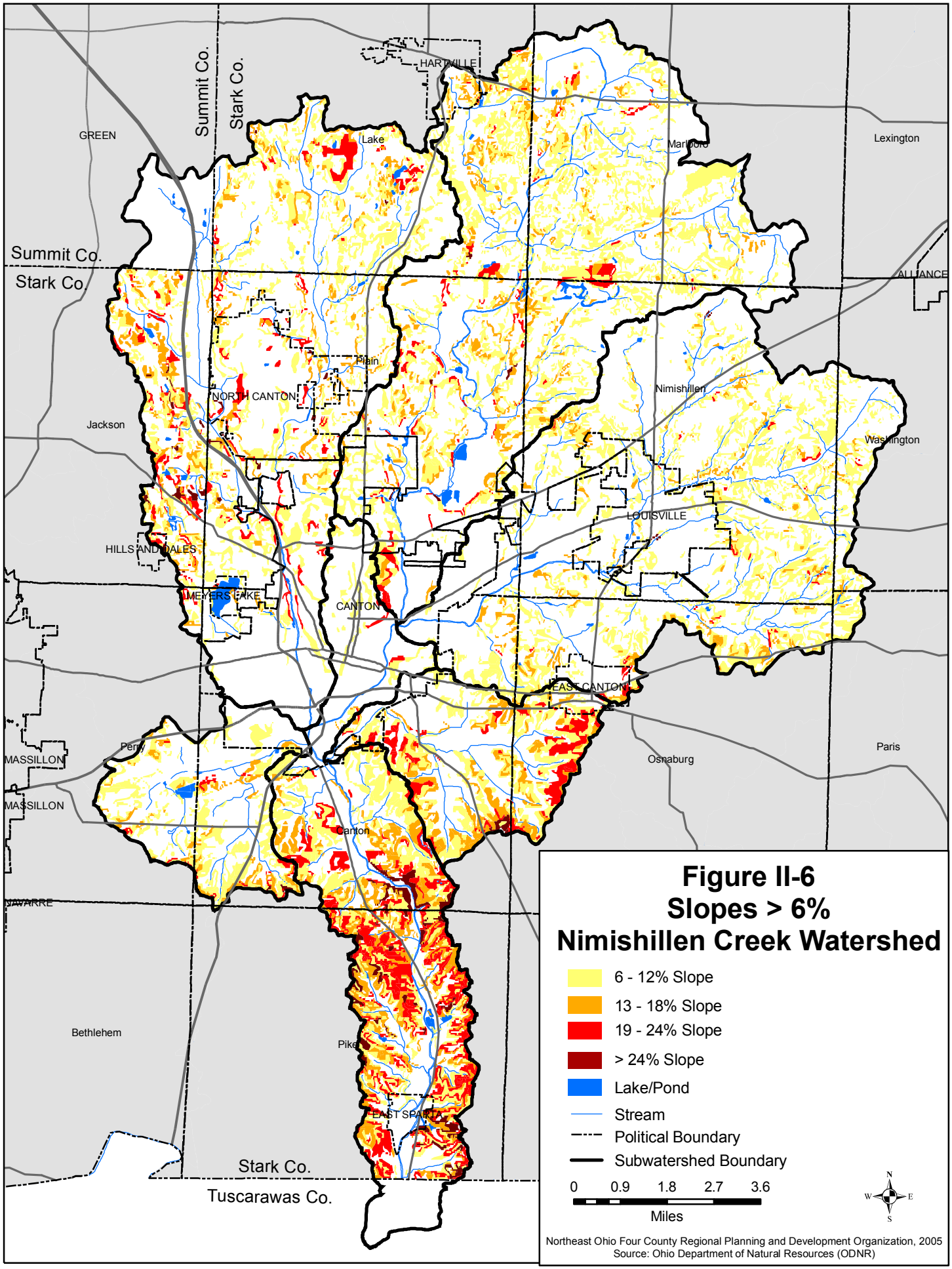


Figure II-6
Slopes > 6%
Nimishillen Creek Watershed

The various Wisconsin glaciers advanced into the Nimishillen Creek Watershed area in two different lobes, melding nearly in the center of the watershed. The Killbuck lobe covered the western part of the glaciated watershed, while the Grand River lobe covered the eastern part. Because the two lobes did not advance at the same pace, there is a zone of overlap and outwash in an interlobate area that extends from Canton northward to Lake Township (Stark County Soil Survey, 1971).

Bedrock Geology

The Nimishillen Creek Watershed is underlain by bedrock from the Pennsylvanian era and the formations mainly consist of sandstone, siltstone, shale, coal, and limestone formed from sediments deposited sometime between 286 and 320 million years ago (Stark County Soil Survey, 1971). Figure II-7 shows the eight different bedrock types in the watershed.

The northern glaciated portion of the watershed has a diverse mix of Middle Kittaning Coal, Brookville Coal, and Mercer Limestone as the dominate bedrock types. Vast areas of bedrock are buried by glacial deposits of more than 60 feet, primarily along valleys of Nimishillen Creek and its major tributaries. In addition, the headwater areas of the Middle Branch of Nimishillen Creek also have bedrock buried by over 60 feet of glacial deposits.

The bedrock composition in the southern unglaciated portion of the watershed is dissimilar from the northern section. The dominant bedrock types are Mahoning Sandstone, Middle Kittaning Coal, and Brookville Coal. Thick glacial deposits only reside in a narrow strip along the Mainstem of Nimishillen Creek near the Stark County - Tuscarawas County boundary.

Mineral Resources

Coal was and continues to be an important resource for development and manufacturing in Ohio and the Nimishillen Creek region. Coal from the Brookville and Kittaning bedrock has previously been mined from locations in the Nimishillen Creek Watershed. The peak for coal mining occurred from the late 1880s to the 1930s. According to the ODNR Division of Mineral Resources Management, at least 38 local underground mines, primarily in the unglaciated regions of the watershed, were in operation during this time producing coal to meet the industrial needs of Northeast Ohio. Figure II-8 shows the location of the abandoned mines in the watershed. However, these mines had all been abandoned by the end of the 1930s as coal deposits became more difficult to mine and the more profitable surface mining technique became the standard for coal mining in Ohio. Unfortunately standards for abandoning mining operations did not exist prior to 1972 resulting in acid water polluted with heavy metals discharging directly into Nimishillen Creek and its tributaries. This problem is known as acid mine drainage (AMD). See Section IV, Water Quality Issues, for more information on the known abandoned mines in the watershed.

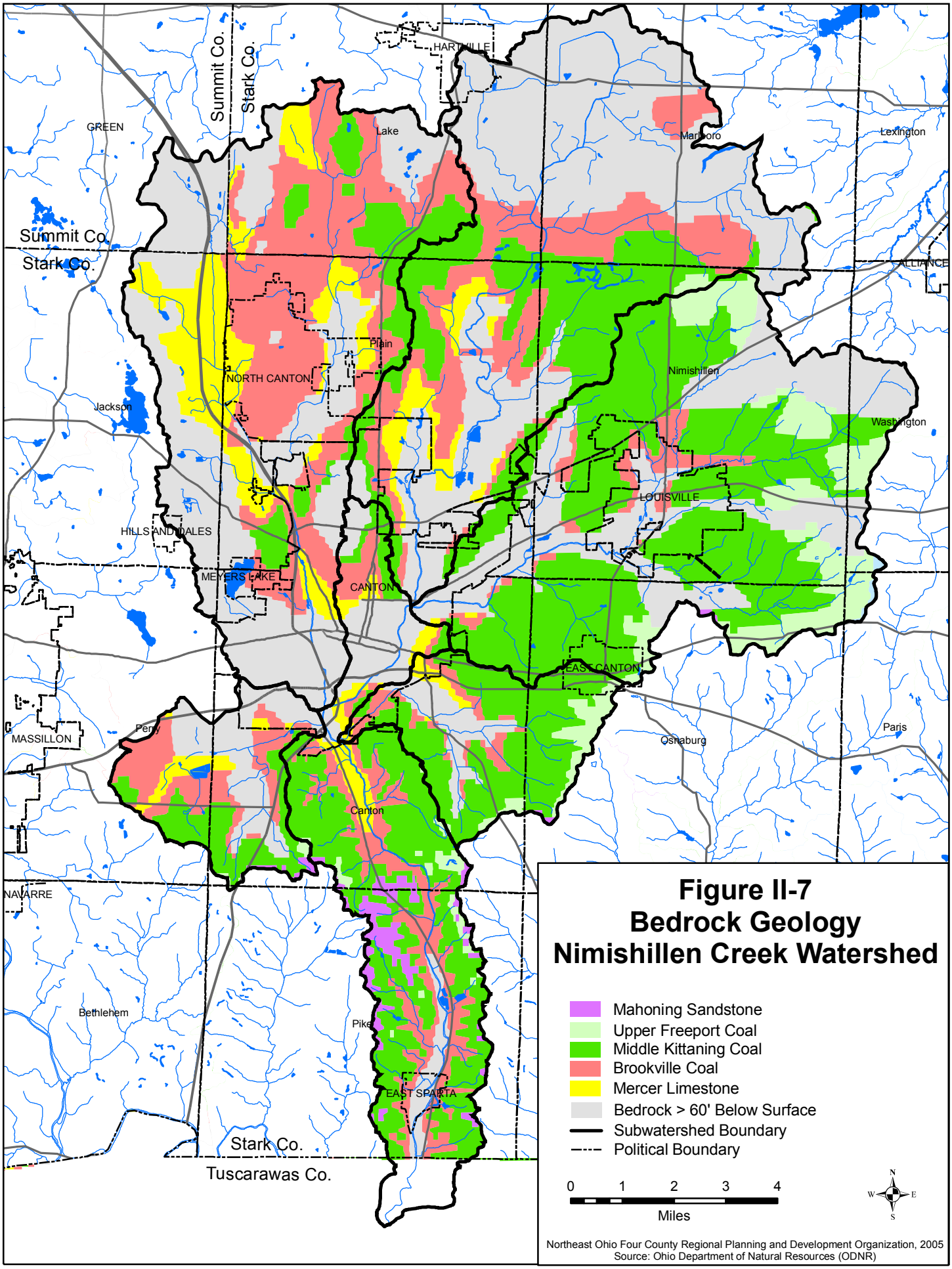


Figure II-7
Bedrock Geology
Nimishillen Creek Watershed

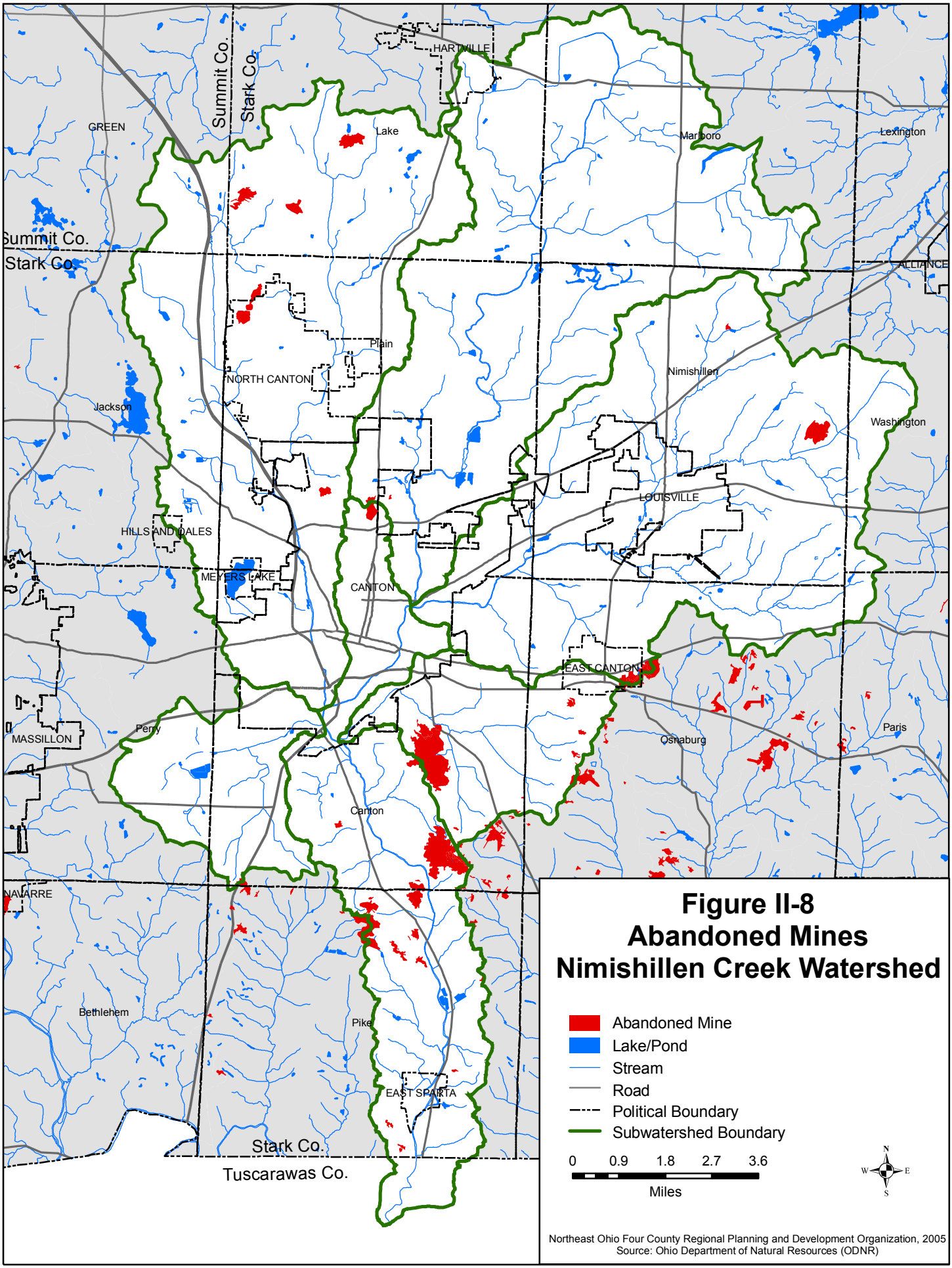


Figure II-8
Abandoned Mines
Nimishillen Creek Watershed

Also according to the ODNR Division of Mineral Resources Managment, there are eight “active” mines in the Nimishillen Creek Watershed. Three of the mines produce coal and are located in Sandy Township (Tuscarawas County) and Pike Township (Stark County) and all are located in the Mainstem subwatershed. Combined they produced 33,000 tons of coal in 2004. The remaining five mines are sand, gravel, and clay producing over 815,747 tons. Two of the mines are located in Jackson Township, two are in Plain Township, and the final one is located within Canton Township. One of the mines is in the Hurford subwatershed, two in the Middle Branch subwatershed, and two are in the West Branch subwatershed. The largest sand and gravel mine is operated by Central Allied Enterprises, Inc. and produced 777,908 tons in 2004 (ODNR, 2004).

Soils

Soils play a integral role in the overall quality of Nimishillen Creek. The type of soil determines, in part, the vegetation cover, farming practices, rainfall infiltration, pollution runoff rates, erosion, and sedimentation (Ohio EPA, 1997). Varying soil characteristics can also affect development by limiting areas suitable for building or for the installation of home sewage treatment systems (See Section VI: HSTS Plan).

Nimishillen Creek has nine major soils associations each with unique characteristics and properties: Fitchville-Sebring, Chili-Wheeling-Shoals, Ravenna-Canfield, Canfield-Wooster, Carlisle-Willette-Linwood, Wadsworth-Rittman, Loudonville-Wooster, Latham-Keene, and Muskingum-Gilpin-Dekalb. Below is a brief description of each of these soil types.

Fitchville-Sebring Soil Association:

The Fitchville-Sebring soils are found on near level area or old glacial lake beds and are generally lower than the surrounding topography. These areas are scattered throughout the watershed, but are mainly found in the headwater areas of the Middle and West Branches of Nimishillen Creek and along the middle portion of Sherrick Run. These soils are generally somewhat poorly drained soils with a loamy subsoil. Poor drainage is the main limitation for both farming and development. Undrained areas with this association are valuable as habitat for wetland wildlife.

Chili-Wheeling Association:

The Chili-Wheeling soil deposits are irregularly shaped surrounding Canton and extending northward primarily along the West and Middle Branches. The soils occupy sloping and steep hills in Lake, Plain, and Jackson Townships. The Chili and Wheeling soils were formed primarily in glacial outwash areas characterized by silty material underlain by gravely outwash. These soils are well drained. However, the Shoals soils formed in more recent alluvium and are somewhat poorly drained. The soils in this association are well suited for general farming and dairying, and they have few limitations for development. Erosion of these soils is a hazard in the more sloping areas, and flooding is a concern with Shoals soils. Lastly, groundwater contamination from failing HSTSs is a concern,

especially in high density housing areas, because of the high permeability of the soils.

Ravenna-Canfield Association:
The soils in this association occupy large undulation to rolling areas in Marlboro, Nimishillen, and Tuscarawas Townships in the East and West Branches of Nimishillen Creek. Topography, like similar glacial till areas, is nearly level. The Ravenna soil types are less sloping than the Canfield soils and are somewhat poorly drained. Conversely, Canfield soils are moderately well drained. The subsoils for this association have a dense, compact subsoil that restricts the movement of water and the growth of roots. These soils reside in the less populated areas of the Nimishillen Creek Watershed and are primarily used for general farming and pastures. Wetness from the poor subsoils is the main limiting factor for these soils. Artificial drainage is usually needed for good crop growth and dry building foundations and basements. Erosion is also a concern with these soils in cultivated areas and/or construction sites. Lastly, poor permeability can limit the effectiveness of tradition HSTS leach fields.

Canfield-Wooster Association:
The Canfield-Wooster soils occur in various formations throughout the glaciated northern portion of the watershed. The soils were formed in deep glacial till and are moderately to well-drained soils. The Canfield soils, like mentioned previously, have a dense, compact subsoil that limits the movement of water and plant roots. The Wooster soils do not have compacted subsoils and are generally higher and steeper than the Canfield soils. This association is used for both farming and development in the watershed. Erosion is the primary hazard with these soils, but seasonal wetness in the spring can delay usage of the land. For non-agriculture uses, soils are limited by moderately slow permeability and, in some areas, by steep slopes. For buildings, Canfield soils need artificial drainage to insure dry foundations and basements. The compact subsoils of the Canfield soils can also limit the function of a HSTS leach field.

Carlisle-Willette-Linwood Association:
The soils of the Carlisle-Willette-Linwood Association occur in scattered, nearly level and depressional areas in Lake, Plain, Jackson, and Canton Townships. The association consists of muck soils that are underlain by mineral soil material at various depths. Naturally these are wetlands because of the very poorly drained organic soils. Poor drainage is the main limitation to farming because the muck tends to oxidize and subside when the water tabled is lowered. When dry, all areas of these soils can be damaged or destroyed by fire; as well as, being susceptible to soil blowing. Farming these soils requires intensive management that includes artificial drainage and control of the water table. The soils have severe development limitations because the muck is unstable and often subsides.

Wadsworth-Rittman Association:
In the Nimishillen Creek Watershed, the Wadsworth-Rittman soils occur only in the headwater of the Middle Branch in Marlboro Township. These soils were formed in clay loam or silty clay loam glacial till and have a compact layer in the subsoil that restricts the infiltration of water. The Wadsworth soils are mainly level and are somewhat poorly drained. The Rittman soils are sloping and moderately well drained. Both soil types naturally have a seasonally high water table. Farming and pasturing are the primary uses of this land, and artificial drainage is needed on the Wadsworth soil for good crop production. Erosion from farming or construction is a hazard for Rittman soils. Development of these soils is severely limited due to the seasonally high water table. Home sewage treatment systems with filter beds will also not function properly even during dry periods.

Loudonville-Wooster Association:
This association occurs in widely separate areas mainly in the southern half of the Nimishillen Creek Watershed. In most areas the glacial till is less than four feet thick over residuum from shale and sandstone. Loudonville soils are formed in glacial till 20 to 40 inches thick over bedrock. These soils are well drained on sloping to very steep sloping land. The Wooster soils formed in glacial till greater than 40 inches thick and are well drained and contain a fragipan. Much of the land with these soils is used for pasture, but can be used for general farming, dairying, or growing fruit. In many areas these soils are so steep that erosion is a severe hazard if cultivated or developed. Rapid runoff is also common with these soils. However, many areas have scenic values because of these unique characteristics.

Latham-Keene Association:
The soils of the Latham-Keene Association occupies scattered areas in the south-central, unglaciated portion of the Nimishillen Creek Watershed. Sloping to steep topography is commonly associated with these soil types. Latham soils developed in place from weathered shale and are well drained but have a low permeable subsoil. Keene soils also formed in place from weathered shale and a thin layer of siltstone bedrock. Keene soils are generally not as steep as Latham soils and are moderately well drained, but permeability is moderately slow in the upper part or the subsoil and slow in the lower part. Most of these area are forested, but some acreage have been strip mined for coal and shale. Erosion is a hazard because of the steep slopes and rapid runoff from these soil areas. Dense development is limited due to the steep slopes, but some areas have been used for single family homes. However, even developing homestead sites is limited because the poor soil permeability is not suitable for HSTSs.

Muskingum-Gilpin-Dekalb Association:
This soil association occurs in the unglaciated, sloping to steep areas in the southern portions of the Nimishillen Creek Watershed. The Muskingum soils formed in the residuum from siltstone, sandstone, and shale. The Gilpin soils

formed in the residuum from thin beds of siltstone, shale, and sandstone, and the Dekalb soils originated in the residuum from sandstone and thin beds of siltstone. All of these soil types are well drained, low in natural fertility, and droughty. Large areas of this association have been strip mined for coal. Row crops are grown in very few areas, but general farming and fruit production can be accomplished in these soils. The less sloping areas can also be used for pasture lands. Because runoff is very rapid on these soils, intense erosion control is needed in all cultivated and construction areas. Development is limited due to slopes and, in some areas, by bedrock near the surface.

Biological Features

Rare, Threatened, and Endangered Plant Species

According to the Ohio Department of Natural Resources (ODNR) Division of Natural Areas and Preserves, the Nimishillen Creek Watershed and surrounding areas (Stark County) have six endangered, sixteen threatened, and thirty-two potentially threatened plant species (ODNR-DNAP, 2001). There are currently no plant species that are presumed locally extirpated. A complete list of these plants listed on the Ohio Natural Heritage Data Base for Stark County can be found in Appendix D. Also, none of the plants in the watershed found on the State of Ohio's threatened and endangered species list are currently included on the federal threatened and endangered species list.

Several factors account for the list of threatened and endangered plant species in the Nimishillen Creek Watershed. Some of the plants require specialized habitats such as bogs or fens, which naturally limit a plant's abundance. While other species range has been limited by current and past land use practices that have turned areas such as native forest, wetlands, and grasslands into farms, houses, and businesses. Also the invasion of non-native plant species (see below) can also reduce habitat. In order to increase the numbers of a rare plant species, the habitat in which it thrives must be increased in any watershed.

Invasive, Non-Native Species

An inventory of invasive, non-native exotic species has not been conducted for Stark County, Summit County, or the Nimishillen Creek Watershed. However, the types of invasive species and the ensuing problems created are equivalent to other areas in Northeast Ohio.

Fortunately, the Stark County Park District has recently begun tracking and removing invasive plant species in their parks. Invasive species they have documented are Japanese knotweed (*Polygonum cuspidatum)*, garlic mustard (*Alliaria petiolata)*, multiflora rose (*Roda multiflora*), purple loosestrife (*Lythrum salicaria*), privet (*Ligustrum spp.)*, amur honeysuckles (*Lonicera maackii*), Canada thistle (*Cirsium arvense*), phragmites (*Phragmites austrails*), crown vetch (*Coronilla varia*), Queen Ann's lace (*Daucus carota*), and reed canary grass (*Phalaris arundinacea*).

Invasive plants can cause severe economic, recreational, or environmental harm if left uncontrolled. Nearly all invasive species are non-native to the watershed thereby lacking natural predators or controls which results in rapid reproduction and dispersion. Because of these traits, invasive plants force out native plants often creating monocultures of the invasive plant. Wildlife is often affected by plant invasions because many animals depend on a variety of native plants for food and cover. In Ohio, invasive plants are now considered the second largest threat to biodiversity and endangered species, only behind habitat loss (Windus, 2003).

Controlling invasive plant species is often a time, labor, and/or resource-intensive process. Attacking invasive plants during the early stages of establishment is generally the best strategy because once well established, multiple control strategies with follow-up treatment are often needed. Specific control measures will vary depending on the targeted plant, but will fall into one of three control categories: biological (natural enemies), mechanical (cutting, digging, etc.), or chemical (herbicides).

Wildlife

An extensive survey of wildlife has not been completed for the Nimishillen Creek Watershed. However, various organizations and agencies have conducted surveys of certain wildlife segments providing a general picture of animal diversity found in the watershed. Specifically, the Stark County Parks Department conducts bird, amphibian, and reptile surveys, while the Ohio EPA has extensively sampled fish and macroinvertebrates. Generally the wildlife is typical of similar areas in Northeast Ohio. The list below is a condensed list of the most common wildlife in the watershed as gathered from the surveys and general field observations:

Fish:
Largemouth Bass
Smallmouth Bass
Rock Bass
White and Black Crappie
Yellow, Brown, and Black Bullhead
Common Carp
Bluegill Sunfish
Green Sunfish
Pumpkinseed Sunfish
Yellow Perch
White Sucker
Northern Hog Sucker
Creek Chub
Blacknose Dace
Striped Shiner
Bluntnose Minnow
Central Stoneroller
Johnny Darter
Greenside Darter
Rainbow Darter
Mottled Sculpin

Amphibians:
American Toad
Bull Frog
Green Frog
Grey Tree Frog
Spring Peeper
W. Chorus Frog
Wood Frog
Four-Toed Salamander
Tiger Salamander

Waterfowl:
Canada Goose
Mallard Duck
Wood Duck

Mammals:
White-Tailed Deer
Beaver
Red Fox
Muskrats
Ground Hogs
Mink
Raccoons
Coyotes
Least Weasels
Long Tail Weasels
Eastern Chipmunk
Squirrels (Fox, Grey, Flying, Black)
Eastern Cottontail Rabbit
Striped Skunk
Voles
Deer Mice
Big Brown and Little Brown Bats

Raptors/Birds:
Bald Eagle
Broad-Winged Hawk
Coopers Hawk
Red-Tailed Hawk
Sharp-Shinned Hawk
Great Blue Heron
Osprey

Reptiles:
Eastern Garter Snake
Eastern Box Turtle
Spotted Turtle
Snapping Turtle
Northern Brown Snake
Water Snake

Water Resources

Climate and Precipitation

Weather conditions in Northeast Ohio throughout most of the year are generally mild, but can be extreme in the winter. The region in which the Nimishillen Creek resides averages approximately 37 inches of precipitation each year. May through September are generally the wettest months averaging better than 3.4 inches per month. January and February typically have the least amount of precipitation averaging less than 2.6 inches. However, extreme variations in precipitation can occur for any month, any given year (Oelker, 2005). Average monthly temperatures range from a low of 33ºF in January to 82ºF in July.

Surface Water

The Nimishillen Creek Watershed covers 188 square miles in Stark, Summit and Tuscarawas Counties of Northeast Ohio. The Mainstem has a length of 24.5 miles and flows into Sandy Creek to the south. The five major tributaries to Nimishillen Creek are Hurford Run, Sherrick Run (also called Sherrie Run), West Branch, Middle Branch, and East Branch. Sherrick Run has a length of 6.8 miles and drains an area of just over 11.2 square miles. Hurford Run's length is 4.95 miles with a drainage area of approximately 8 square miles. The Middle Branch is the longest of the tributaries flowing 16.6 miles and covering over 95.2 square miles. East Branch length is 10.4 miles with an area of 43.56 square miles. And finally the West Branch flows for 9 miles and drains 46.5 square miles.

Lake resources in the Nimishillen Creek Watershed are limited. According to the Ohio Department of Natural Resources' *Ohio Lake Inventory*, there are only sixteen waterbodies greater than five acres in size in the entire Nimishillen Creek Watershed. Of that total, ten are ten acres or less in size and are primarily man

made impoundments as a result of mining activities or recreational enhancements like fishing ponds. The only public lake is the twelve acre Pertos Lake located on Stark County Metro Parks property in the Hurford Run Subwatershed. Meyers Lake has the largest surface area of 134 acres and is located between the Cities of Canton and Massillon in the West Branch Subwatershed.

Appendix E contains information on lakes greater than 5 acres listed in the *Ohio Lake Inventory*. However, this should not be considered a comprehensive list of waterbodies since the inventory was completed in 1980 and there are additional lakes greater than five acres that have been created over the past 26 years. Conversely, some of the waterbodies listed in the inventory may have been filled in and no longer exist, especially in mineral resource areas like mines or gravel pits. In general, lakes may provide localized water quality, wildlife, and/or recreational benefits in their immediate vicinities, but the influence on the overall surface water quality, wildlife, and recreational opportunities in the Nimishillen Creek Watershed is minimal.

Flow Regime

The United States Geological Survey (USGS) operates two stream gauges along Nimishillen Creek to measure the Creek's height and flow volume (discharge). Figure II-9 shows the guage locations, and listed below is a summary information from the USGS about these gauging stations.

Gauge Identification: 03118000 - Middle Branch Nimishillen Creek, Canton, OH
Location: Lat 40°50'29", Long 81°21'14", on the downstream end of right bridge abutment on Martindale Road, 0.8 mile upstream from Rt. 62 bridge over Middle Branch Nimishillen Creek, and 2.4 miles upstream from the mouth.
Drainage Area: 43.1 mi^2
Period of Record: September 1941 to Current Year
Annual Mean Flow Range: 16.4 ft^3/sec (1944) to 70.5 ft^3/sec (1996)
Peak Flow: 2,470 ft^3/sec (Jan. 22, 1959)
Comments: Station operated in cooperation with the City of Canton

Gauge Identification: 03118500 - Nimishillen Creek at North Industry, OH
Location: Lat 40°44'03", Long 81°21'08", on left bank upstream abutment of Baum Rd. bridge, 400 feet northeast of Ridge St., and 2.1 miles downstream from Sherrick Run.
Drainage Area: 175 mi^2
Period of Record: October 1921 to Current Year
Annual Mean Flow Range: 86.9 ft^3/sec (1931) to 355 ft^3/sec (1990)
Peak Flow: 8,600 ft^3/sec
Comments: Station operated in cooperation with the Ohio Department of Natural Resources - Division of Water and the U.S. Army Corps of Engineers

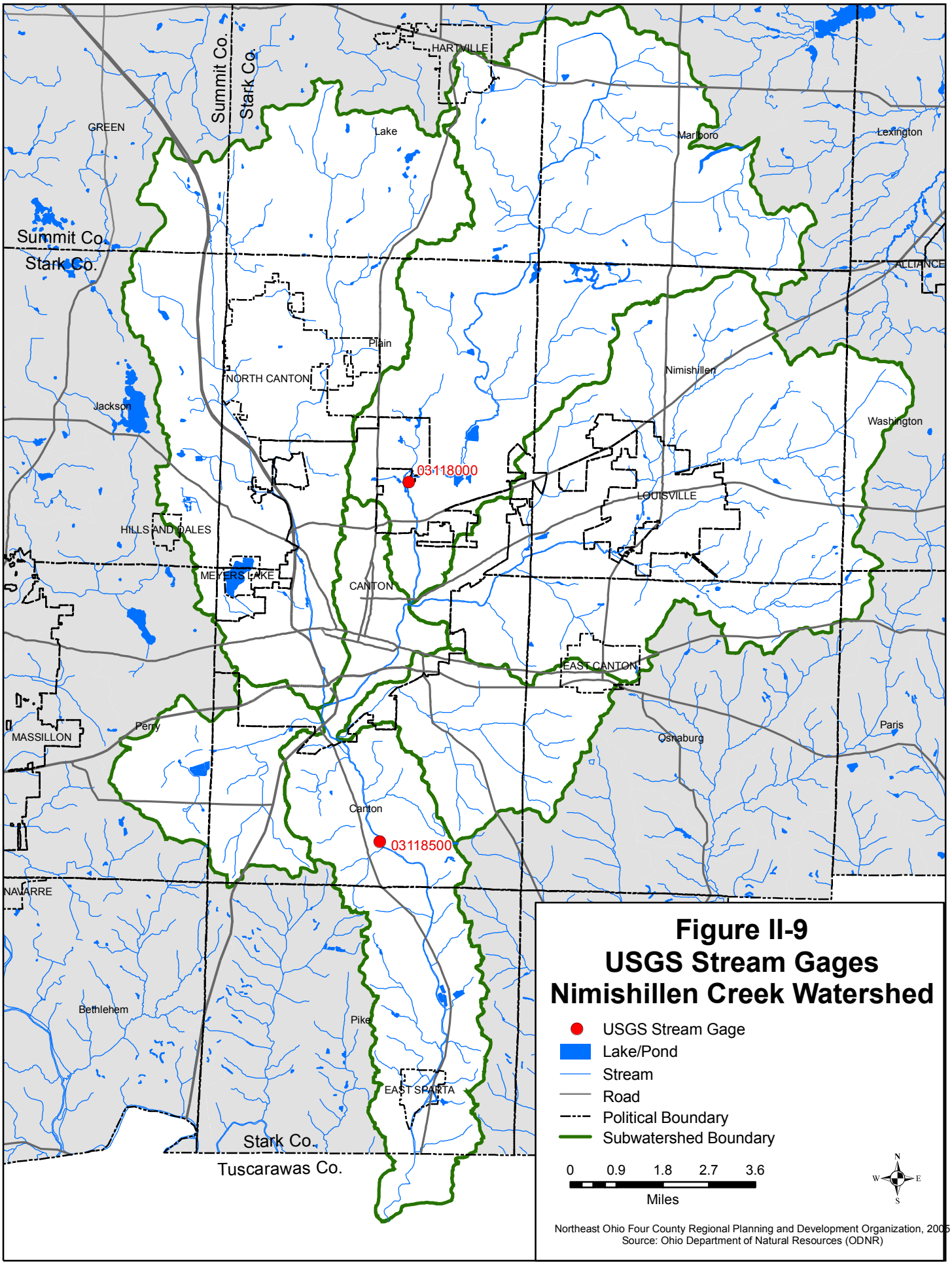


Figure II-9
USGS Stream Gages
Nimishillen Creek Watershed

Floodplain Areas

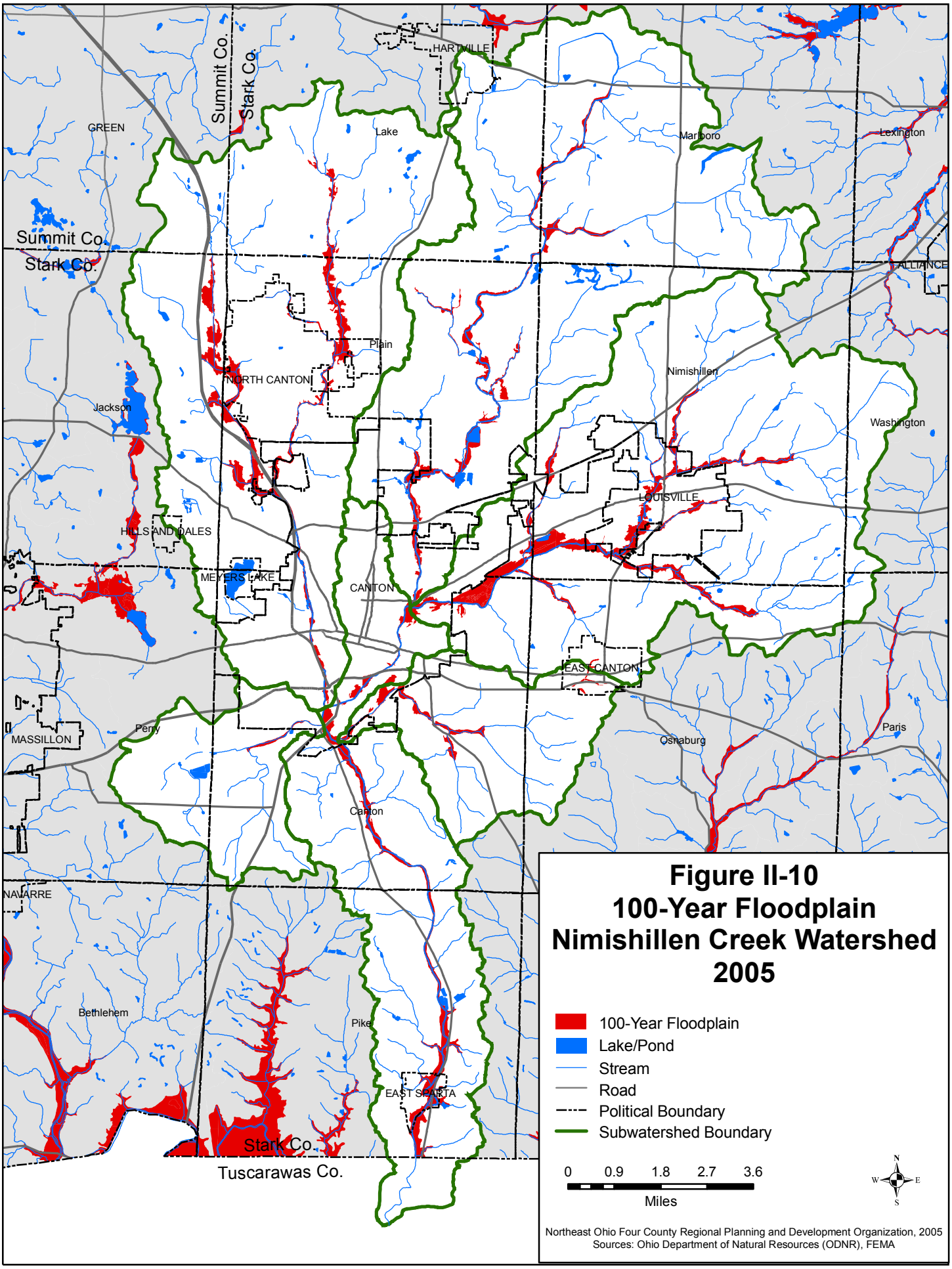
Floodplains are land areas along Nimishillen Creek that are subject to recurring water inundation during high water flows. Events that trigger flooding of these areas are typically heavy rain storms and/or snow melt. Flooding is a natural process and can be beneficial to both the creek and adjacent lands. Specifically, floodplains act as natural water retention basins slowing down and holding flood waters. Floodplains reduce the force and volume of water transported downstream resulting in less erosion and flooding. A floodplain is functioning properly when the deposition of soil and mineral particles occurs in flooded areas which results in less sediment, nutrients, and pollutants being transported downstream. An ancillary benefit from this deposition is that floodplains are often fertile agriculture lands.

Nimishillen Creek's floodplain areas vary in both size and frequency of inundation. Like many streams in Ohio, the floodplain of Nimishillen Creek has been altered over the years by human actions, primarily urban/suburban development and agriculture. The reduction in floodplain land from encroachment in conjunction with sections of the Nimishillen Creek being straightened, wetlands filled, and open land covered with buildings and pavement has resulted in more water reaching Nimishillen Creek at a faster rate and in greater volumes. Over time the floodplain areas of the creek change in response to these and other actions.

Mapping of the floodplain areas is the responsibility of the Federal Emergency Management Agency (FEMA) and is primarily for insurance purposes. Figure II-10 shows the 100-year floodplain areas in Nimishillen Creek as determined by FEMA. The term "100-year floodplain" is used to express the probability of a given area to flood any given year, and not the occurrence interval between major floods. A 100-year floodplain simply means that the area has a one percent chance of flooding in any given year, while a 50-year floodplain has a two percent chance of flooding. The extent of floodplain areas fluctuate to reflect changes within the basin. For example, if a floodplain is filled (developed) upstream, the footprint of downstream floodplains will likely increase to hold the increase volume of water.

Figure II-10 was created using the current FEMA floodplain map; however, the map is currently being updated and digitized by FEMA and should be available in 2006. For the new flooding maps, the 100-year floodplain areas are anticipated to increase in size to reflect increased flood volumes from development within the watershed.

Extensive flooding occurred within the Nimishillen Creek Watershed in 2003 and 2004. Some areas significantly impacted by these floods include the cities of Louisville, Canton, North Canton, Jackson Township, and Canton Township. Damage primarily affected houses and businesses built within the current 100-year floodplain. Although the focus of this study is water quality, flooding and water quality issues should also be considered for projects or action when appropriate.


Summit Co.
Stark Co.
HARTVILLE
GREEN
Lake
Marlboro
Lexington
Summit Co.
Stark Co.
ALLIANCE
Plain
NORTH CANTON
Nimishillen
Jackson
Washington
LOUISVILLE
HILLS AND DALES
MEYERS LAKE
CANTON
EAST CANTON
MASSILLON
Perry
Osnaburg
Paris
Canton
NAVARRE
Bethlehem
Pike
EAST SPARTA
Stark Co.
Tuscarawas Co.
Figure II-10
100-Year Floodplain
Nimishillen Creek Watershed
2005
100-Year Floodplain
Lake/Pond
Stream
Road
Political Boundary
Subwatershed Boundary
0 0.9 1.8 2.7 3.6
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Sources: Ohio Department of Natural Resources (ODNR), FEMA

Water Quality Improvement Efforts

Water quality improvement efforts in the watershed have largely been limited to existing programs administered through various agencies. Some examples of these typical efforts include the Stark Soil and Water Conservation District (SWCD) monitoring construction site runoff, the Natural Resources Conservation Service (NRCS) working with the agricultural community to implement various agricultural best management practices, and the Stark County Health Department investigating failing HSTSs.

Some improvement efforts that are unique to the watershed include the City of Canton constructing a storm water treatment wetland adjacent to the Middle Branch. Modest testing of the wetland's efficiency at removing pollutants has shown a reduction in sediment and nutrients from storm water runoff entering the Middle Branch. Also, the Nimishillen Creek Watershed Partners hold an annual creek clean-up each fall to remove trash and tires from various sections of Nimishillen Creek. The Stark County Health Department held an Environmental Expo in 2005 to promote, in part, the health of local water resources. Lastly, the Stark County Parks District has been purchasing riparian habitat along various sections of Nimishillen Creek for habitat preservation and community recreation. They have a long-term goal of establishing a recreational trail along the Nimishillen Creek corridor.

These current efforts show the interest and commitment from local stakeholders to improve their local water resources. Future programs and activities like the TMDL study and NPDES Storm Water Phase 2 (see below) will call on the stakeholders to implement and support additional improvement efforts. This Action Plan is an initial attempt to focus both on-going and future efforts on water quality improvements.

Storm Water

NPDES Storm Water Phase 2 Communities

In an effort to preserve, protect, and improve water resources throughout the nation from polluted storm water runoff (drainage), the United States Environmental Protection Agency (USEPA) in 2003 mandated that most urban areas develop a program to manage their community's runoff. This regulatory mechanism is called the National Pollutant Discharge Elimination System (NPDES) Storm Water Program Phase 2 and is authorized by the 1987 Water Quality Act (WQA). By 2008, all affected communities must develop and implement at least six minimum control measures to control polluted storm water runoff. Those control measures are:

1. Public Education and Outreach Program
2. Public Involvement and Participation
3. Elimination of Illicit (Illegal) Discharges
4. Construction Site Storm Water Ordinance
5. Post Construction Storm Water Ordinance
6. Pollution Prevention and Good Housekeeping

The following communities in the Nimishillen Creek Watershed are designated as NPDES Phase II communities:

- **Counties**: Stark and Summit
- **Cities**: Canton, Green, Louisville, and North Canton
- **Villages**: East Canton, Hartville, Hills and Dales, and Meyers Lake
- **Townships**: Canton, Jackson, Lake, Marlboro, Nimishillen, Osnaburg, Perry, Pike, and Plain

All of the above communities except the City of Green, Village of Hills and Dales, and Marlboro Township submitted individual applications for their NPDES Phase 2 permit from the Ohio EPA. Marlboro Township and Hills and Dales received waivers from the Ohio EPA and do not have to participate in the Phase 2 Program. The City of Green is a co-permittee in the *Summit County Countywide Storm Water Management Program* Phase 2 Permit application. For more information about NPDES Phase II in the Watershed, refer to the above plans available from the Ohio EPA's Division of Surface Water or any of the permitted communities.

Stark County Drainage Task Force

The Stark County Drainage Task Force is a coalition of elected officials, water resource professionals, and citizens that was formed in the fall of 2003 in response to extensive flooding that occurred in Stark County that year. The Task Force is directed by a Steering Committee comprised of representatives from every township, village, and city in the county, local environmental professionals (SWCD, County Engineer, NEFCO, non-profit organizations, etc.), and citizens. Their initial goals are:

1. Categorize drainage problems and create a list of short-term and long-term projects in both municipal and township areas.
2. Review current municipal and county regulations, address jurisdiction issues, and create uniformity of regulations throughout Stark County.
3. Create opportunities for public input throughout the planning process and explain to the public the pros and cons of various solutions.
4. Educate Stark County citizens about watersheds and increase awareness of proper environmental/water management.
5. Identify possible funding options and create criteria which promotes equitable resolution of drainage problems.

To accomplish these goals, four subcommittees were formed: problem identification, education, regulations, and business plan. The Task Force's subcommittees in 2004 and 2005 mapped all known problem flooding areas, created a website, held public meetings, reviewed current regulations (subdivision, floodplain, etc.), and worked to secure money for a diagnostic study for the County. As a result of these efforts, Stark County was appropriated one million dollars by Congress through the U.S. Army Corps of Engineers for a detailed engineering study of drainage issues. The study will likely occur in 2007.

The Task Force intends to improve both water quantity and quality issues when addressing flooding. Open space preservation, riparian protection/restoration, wetland mitigation, and water quality detention ponds are all proposed methods of dealing with drainage issues in the Stark County and the Nimishillen Creek Watershed.

Wetlands

Wetlands have been described as the kidneys of a watershed because of the functions that they perform in the hydrologic and chemical cycles. They function as the downstream receivers of wastes from both natural and human sources. Wetlands can cleanse polluted waters, prevent floods, protect shorelines, and recharge groundwater. They also provide unique and important habitat for plants and animals (Mitsch, 1993). Unfortunately, the benefits of wetlands have not always been appreciated by mankind. Over the years they have been drained, ditched, and filled for agriculture and development. Mass wetland destruction began in the mid-1800s and continued nearly unchecked until the mid-1970s when wetlands began receiving legal protection by the United States and state governments.

In Ohio, wetland area has declined by an estimated 90 percent over the last 200 years. Wetlands currently cover 1.8 percent of the State covering approximately 483,000 acres (Dahl, 1990). No study has been done for the Nimishillen Creek Watershed to determine historic wetland loss, but it is believed to be equal to or greater than the percentage of wetland loss throughout the State. This observation is based on the extensive urban/suburban development in the Canton region and the extensive agricultural activity in the headwater sections of the East and Middle Branches.

The Ohio Department of Natural Resources and Natural Resources Conservation Service maintains the Ohio Wetlands Inventory database. This inventory was conducted using digital satellite data and other digital data to attain an estimate of wetland areas in Ohio. Figure II-11 shows the wetland areas in the watershed as determined by the Ohio Wetland Inventory. The inventory provides a general picture of wetland areas in the watershed. The largest contiguous wetlands are farmed and wooded wetlands in northern Marlboro Township and south of Hartville. The farmed wetlands in Marlboro and Lake Townships are primarily in muck soils. Woods on hydric (wetland) soils appear to be the most common wetland type in the entire watershed, primarily located along stream banks. The West Branch contains the greatest number of shrub/scrub wetlands while Middle Branch has the largest shallow marsh wetland.

However, information displayed on Figure II-11 should be viewed with caution since the data for the Ohio Wetland Inventory was collected between 1985 and 1987. Changes have likely occurred to a number of these wetland areas, especially in the Plain, Jackson, and Lake Township areas due to pressures of suburban sprawl. In addition, the wetland areas were not field checked in the Nimishillen Creek

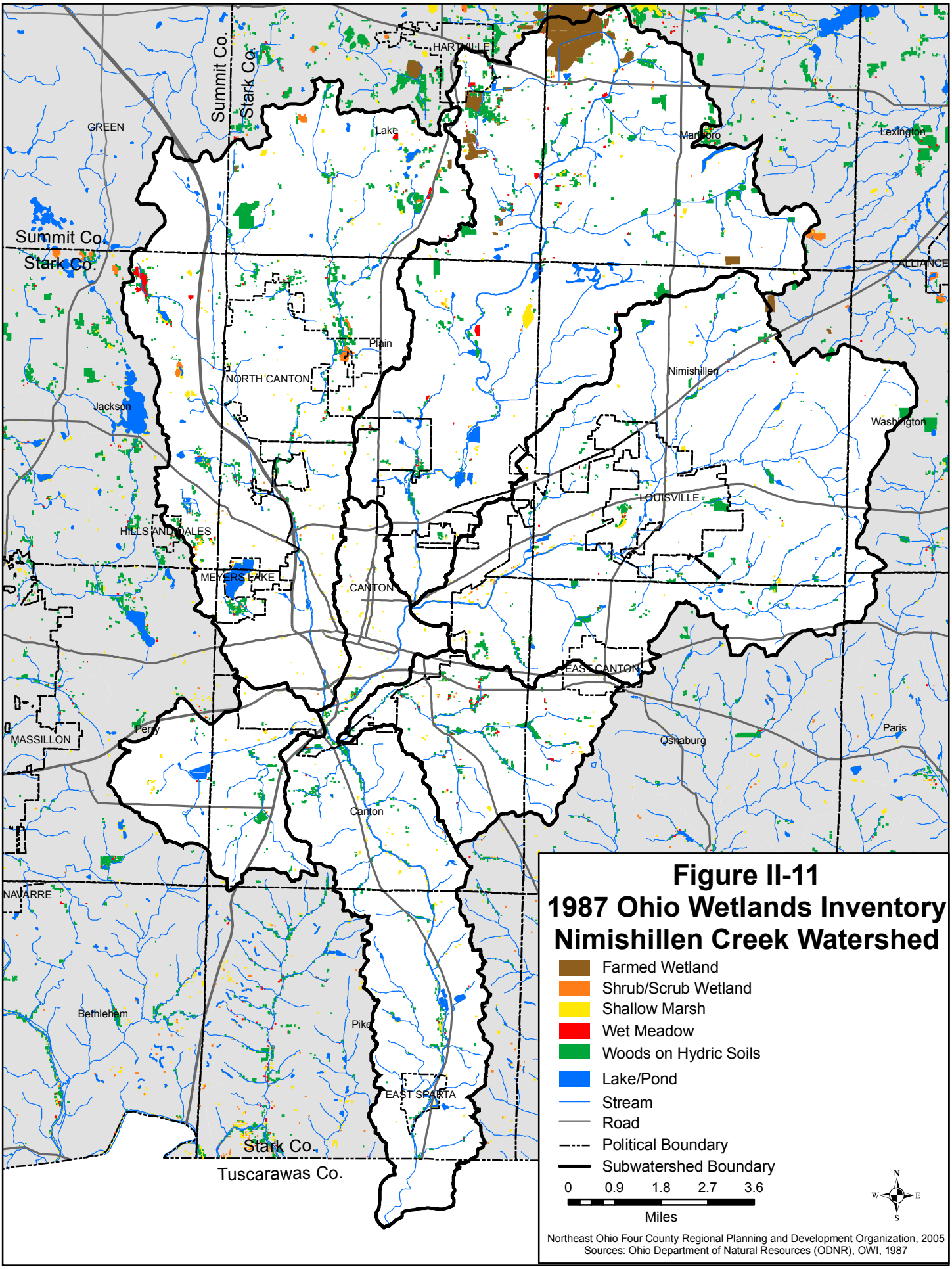


Figure II-11
1987 Ohio Wetlands Inventory
Nimishillen Creek Watershed

Watershed and areas represented as wetlands in the inventory may never have been wetlands. Conversely, there are likely wetland areas in the watershed that did not show up on the inventory due to the either the method of data collection used or wetland restoration efforts occurring after the survey was completed.

The Stark County Parks Department is in the preliminary stages of conducting a countywide wetland survey for the purposes of protecting and restoring wetland areas. Their end goal is to establish wetland mitigation banks with the county and watershed. This and similar wetland identification projects need to be supported in order to attain a clear picture of the wetland status within the watershed. The benefits of an accurate wetland inventory can lead to better wetland mitigation options, targeted wetland restorations, and enhanced protection of existing wetlands.

Ground Water

Water Suppliers

Four cities or villages, Canton, North Canton, Louisville, and East Sparta, obtain their municipal water supply from wellfields located within the Nimishillen Creek Watershed. East Canton and Hartville do not have a municipal water system and draw their drinking water from private wells. All of the above water supply areas are within areas serviced by sewers. The City of Canton also receives drinking water from wellfields outside of the Nimishillen Creek Watershed in the Sandy Creek Watershed.

Most of the remaining homes in the watershed rely on individual wells for their drinking water and are located in areas dependant on home sewage treatment systems. These areas include portions of Jackson, Lake, Marlboro, Plain, Nimishillen, Canton, Osnaburg, and Pike Townships.

Ground Water Pollution Potential

In 1991, the Ohio Department of Natural Resources Division of Water completed the mapping of the pollution potential of ground water resources in Stark County. The mapping program used by ODNR is called DRASTIC method and it identifies areas that are vulnerable to contamination. The program takes into account characteristics of an area including depth to water, net recharge of the ground water, aquifer media, soil types, and topography to determine a numeric value indicating the potential pollution risk to ground water resources. The higher the DRASTIC values calculated by ODNR, the greater the vulnerability to contamination. Figure II-12 shows the findings of this analysis.

In general, the ground water pollution potential is higher in the northern portion of the Nimishillen Creek Watershed. This is generally due to reduced topography and the glacial deposits underlying much of the northern portion of the watershed. The highest values are located in Canton, North Canton, Louisville, Nimishillen Township, and Plain Township along Nimishillen Creek and its East, Middle, and West Branches. In the southern portion of the watershed including

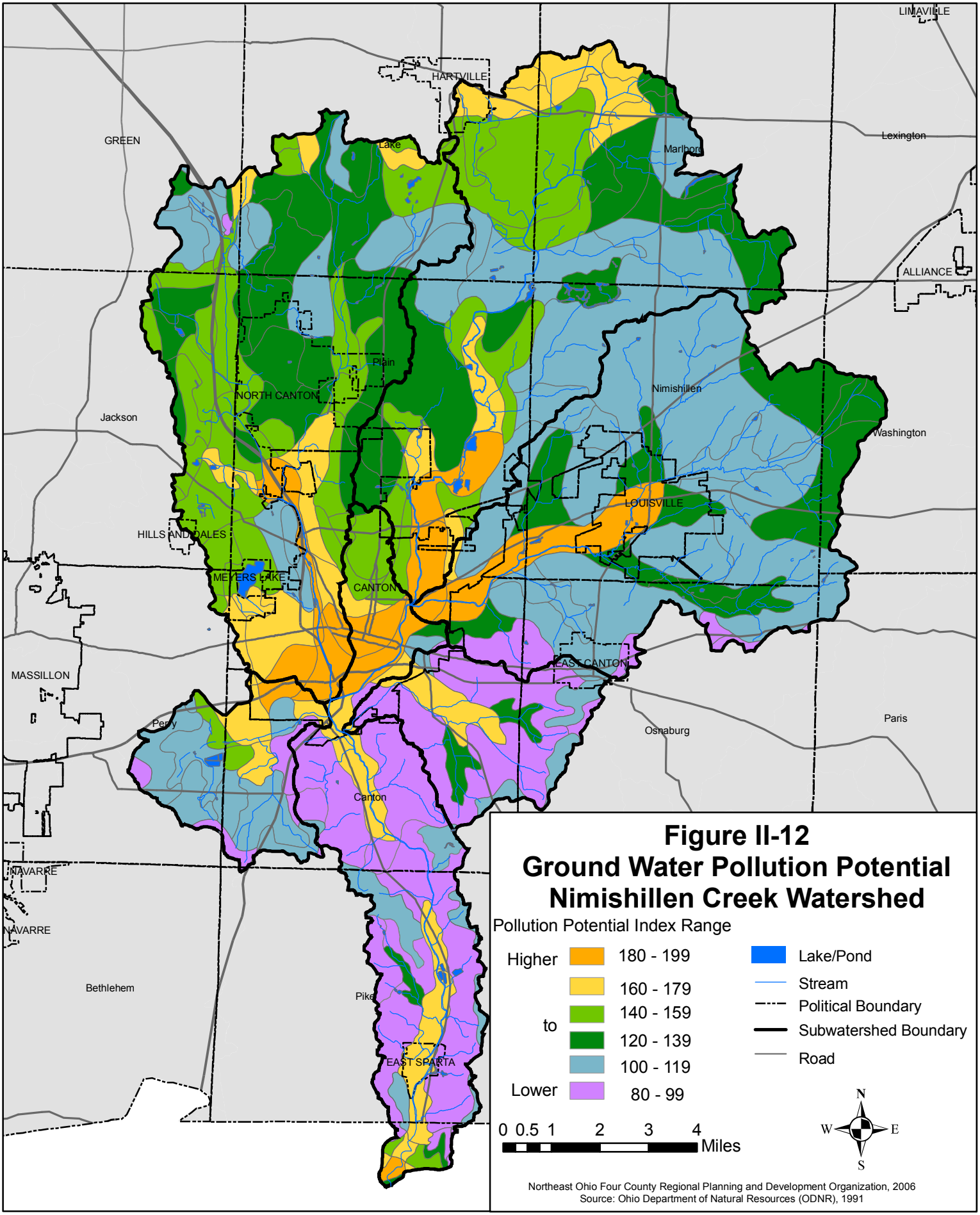


Figure II-12
Ground Water Pollution Potential
Nimishillen Creek Watershed

Northeast Ohio Four County Regional Planning and Development Organization, 2006
Source: Ohio Department of Natural Resources (ODNR), 1991

the Sherrick Run and Mainstem subwatersheds, the highest pollution potential areas are located in the valleys created by the streams. The pollution potential is limited in other areas of these subwatershed due to the steep slopes.

ODNR's *Ground Water Pollution Potential of Stark County, Ohio*, study is useful in developing protection strategies for a large area. It can be used to help prioritize ground water monitoring or clean-up efforts by stakeholders in the county. However, it is not designed to take the place of site investigations for specific projects. The results of the study should not be applied to areas less that 100 acres (Williams, 1991).

SWAP Program

Ohio's Source Water Assessment and Protection (SWAP) Program is designed to protect ground and surface water resources that are used for public drinking water from contamination. There are two phases in the SWAP Program: assessment and protection. The Ohio EPA completed the assessment phase for all public drinking water systems in the State. The assessment includes a determination of the protection areas, identifying potential contamination sources in the area, and determining the susceptibility of the drinking water to contamination. How long it takes, or the time-of-travel, for water to reach a well used for public drinking water is also determined in the assessment phase. The time-or-travel is typically delineated for up to 5 years. Figure II-13 shows the time-of-travel boundaries for public drinking water systems in the watershed. Land within these areas should be carefully managed to prevent contamination of a drinking water system.

To aid in protection, the Ohio EPA recommends that owners and operators of public water systems complete the second phase of the SWAP Program by developing and implementing a local drinking water source protection plan. The protection plan is locally designed and the content is dependent on the size and type of water systems. All the drinking water systems in the Nimishillen Creek Watershed are from groundwater wells, and typical drinking water protection plans for groundwater sources include public education guidance, water system concerns, contingency plans, and strategies to reduce contamination risks. Completion and implementation of a protection plan is not required by the Ohio EPA, but is highly recommended to ensure an abundant supply of safe drinking water. All public water supply wells in the watershed have a completed assessment analysis, but none have completed a source water protection plan.

Land Use

Characterization of a watershed's land use/land cover can lend a better understanding of potential threats to water quality. A study of the Nimishillen Creek's land use/land cover was achieved by combining 1977 digital land use data with 1994 digital satellite land cover data resulting in a generalized categorization of land use/land cover types. Results of the study revealed that the watershed is comprised of various types of land use/land cover. The most substantial form of land use in the watershed is

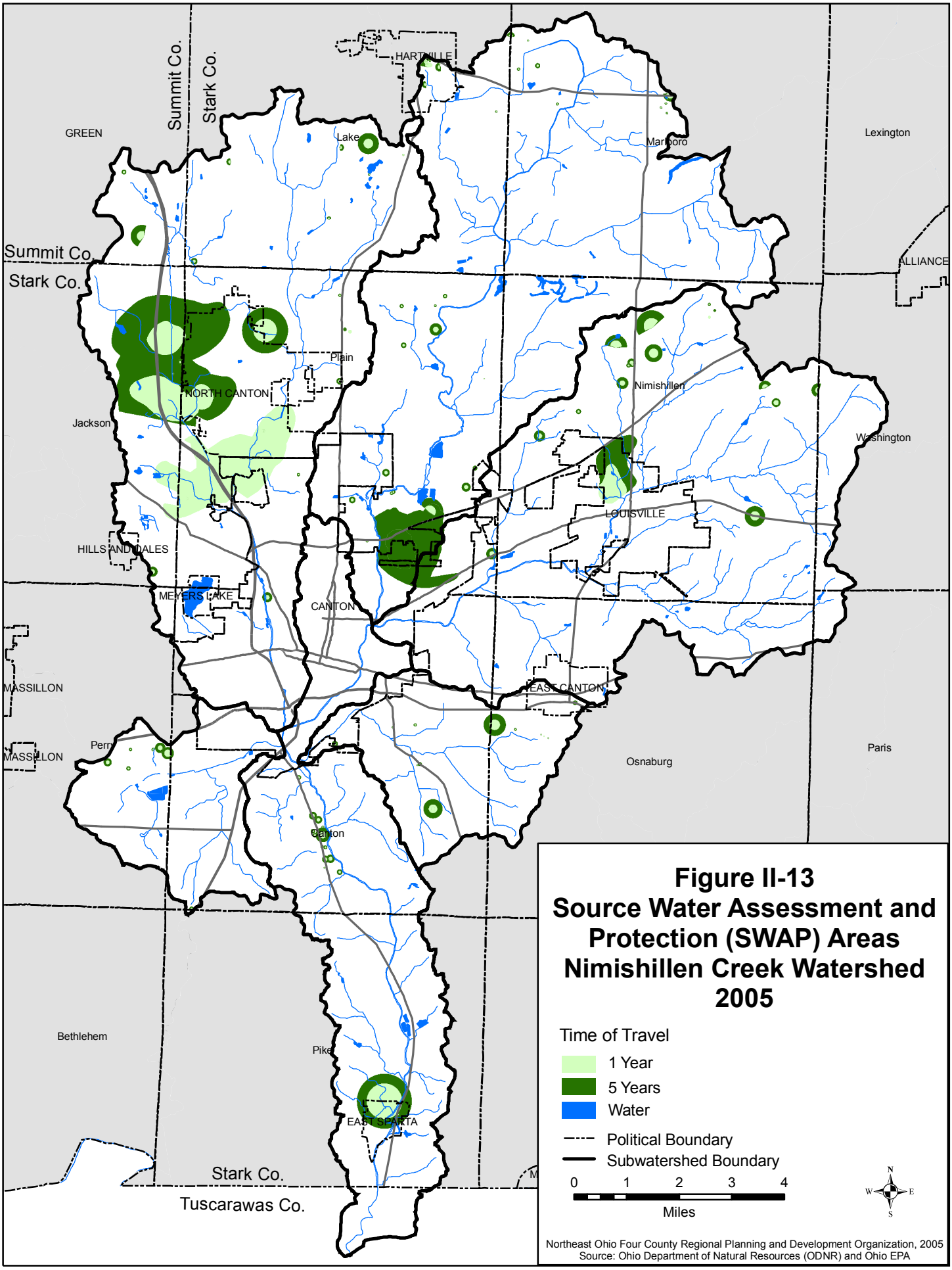


Figure II-13
Source Water Assessment and Protection (SWAP) Areas
Nimishillen Creek Watershed
2005

agricultural/open and urban areas. Potential products of agricultural storm water runoff from fields included animal waste, nutrients, and sediment. Urban areas are also found in the watershed. These areas have the potential to be sources of nutrients, bacteria and other pollutants. Sections of undeveloped land remains in the form of wooded, shrub/scrub, non forested wetland and open area. These areas may help alleviate the impacts from storm water runoff from urbanized areas.

Land Cover

Understanding land uses within the watershed can offer clues as to the types of nonpoint source (NPS) pollutants, subwatersheds at high risk of NPS pollution, and appropriate best management practices (BMPs) to address the problems. The watershed constitutes a total area of approximately 117,826 acres. The majority of the watershed is located in Stark County (98.5%), with a minor portion in Summit and Tuscarawas Counties (1.5%).

The land use/land cover categories for the study area include: 1) Agriculture (cropland, pasture, and orchards)/Open Urban Area (parks, golf courses, lawns, and open grassy areas); 2) Industrial (heavy and light industrial operations); 3) Urban (residential areas, roads, shopping centers, warehouses, office buildings, educational, religious and health care facilities, and parking lots); 4) Non-Forested Wetlands (wetlands identified from the 1994 Thematic Mapper data as well as from the Ohio Wetland Inventory); 5) Barren (strip mines, quarries, sand and gravel pits, and beaches); 6) Wooded (deciduous and coniferous forest land)/Shrub/Scrub (young, sparse, woody vegetation); and 7) Water (lakes, ponds and streams).

The land use/land cover for the watershed is illustrated in Figure II-14. Table II-4 presents the acreage and percentage of land use/land cover in the watershed.

Table II-4:
Land Use/Land Cover by Subwatershed for the Nimishillen Creek Watershed

Land Use/Cover	Total Area		Subwatersheds							
			1, 5, and 6		2		3		4	
	acres	(%)	acres	(%)	acres	(%)	acres	(%)	acres	(%)
Ag/Open	52,716	44.7	9,457	32.9	9,605	32.1	16,965	56.8	16,689	56.9
Industrial	2,924	2.5	1,430	5.0	416	1.4	218	0.7	860	2.9
Urban	34,852	29.6	8,751	30.4	14,018	46.9	6,086	20.4	5,997	20.5
Non-Forested Wetland	1,203	1.0	97	0.3	246	0.8	805	2.7	55	0.2
Barren	42	0.0	28	0.1	2	0.0	5	0.0	7	0.0
Wooded	25,106	21.3	8,815	30.6	5,362	17.9	5,402	18.1	5,527	18.9
Shrub/Scrub	556	0.5	178	0.6	87	0.3	139	0.5	152	0.5
Open Water	427	0.4	19	0.1	159	0.5	228	0.8	21	0.1
Total Area	**117,826**		**28,775**		**29,895**		**29,848**		**29,308**	

Source: Department of Natural Resources, Division of Real Estate and Land Management, 1977 and 1994.

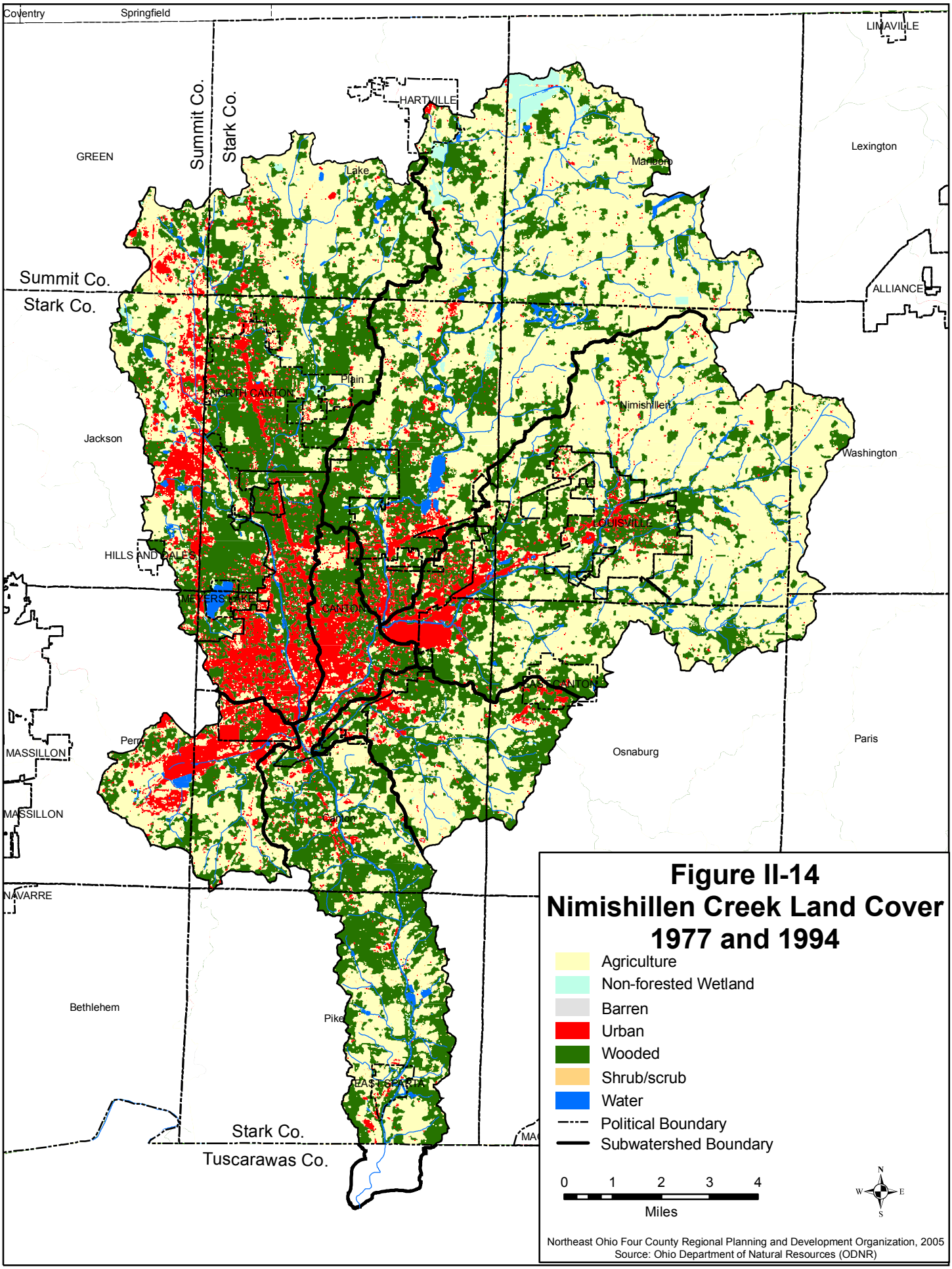


Figure II-14
Nimishillen Creek Land Cover
1977 and 1994

Table II-4 reveals that the predominate land use in the watershed is agricultural/open land (44.7%). Other significant forms of land use/land cover consist of urban (29.6%) and wooded (21.3%).

As residential development continues, the demand for clean and safe water is on the rise. Residential areas have the potential to be sources of nutrients and bacteria, particularly if located in unsewered areas with poor soils for home sewage treatment systems (HSTSs). Nutrients and bacteria can originate from failed HSTSs, while other pollutants can arise as the result of lawn fertilizers, pesticides and general household wastes. As development proceeds, the level of imperviousness and storm water drainage increases. The impacts of storm water runoff from urbanized areas can destabilize streams and ditches. Streams respond to increased flows by eroding (usually along stream banks), transporting and depositing sediment downstream. Increased sediment and attached nutrients may well exacerbate other pollutant impacts, i.e. reducing a stream's ability to assimilate pollution.

Significant portions of wooded, shrub/scrub and open areas are located throughout the watershed (Figure II-14). For example, vast tracts of wooded and shrub/scrub areas are located in the southern and eastern portions of Subwatershed 1, in Pike and Osnaburg Townships, along the Nimishillen Mainstem and Sherrick Run; scattered in the northern portion of Subwatershed 3; and eastern section of Subwatershed 4. The presence of these natural areas probably moderates the impact of runoff from many of the land uses throughout the watershed. These natural areas act as buffers and filters to moderate water flow and reduce erosion and the transport of pollutants downstream.

Status and Trends

The general trend in land usage in the Nimishillen Creek Watershed is nearly identical to land use trends in Stark County. Specifically, the watershed's population is moving towards an uneven suburban growth distribution coupled with increasing abandonment of urban areas and a decrease in rural areas. Areas receiving the bulk of the suburban boom are Plain, Lake, and Jackson Townships in the West and Middle Branches of Nimishillen Creek. Water quality and other environmental degradations are a concern in these developing suburban areas. Also, suburban areas generally lack the open space and park land associated with rural and urban areas, respectively (Stark County RPC, 2005).

The trend of watershed residents moving to suburban areas is reflected in the new single family housing permits issued within Stark County for 2005 and 2006. According to the Stark County Building Industry Association (BIA), the county had 1,031 single family housing permits issued in 2005. The Nimishillen Creek Watershed suburban communities of Jackson Township, Plain Township, and the City of Louisville were all in the top 4 of permits issued with 230, 98, and 63, respectively. The traditional urban centers of Canton and North Canton in 2005 had 49 and 19 single family house permits issued, respectively. Through July of 2006, these housing trends have continued with Jackson Township (108 permits) and Plain

Township (48 permits) having issued the most single family housing permits in Stark County (Stark BIA, 2006).

Impervious Surfaces

Impervious areas in the watershed are those areas where vegetation has been replaced by nearly impermeable surfaces such as roads, sidewalks, parking lots, and roof tops. As the level of impervious cover increases it prevents the infiltration of water into the soil. This can reduce ground water recharge, exacerbate runoff and streambank erosion, and impact the natural aquatic community. Research indicates that stream degradation occurs at levels of imperviousness as low as 10% (Ohio EPA, 1997). Impervious areas can also be the source of a magnitude of pollutants, since gasoline, oil, and chemical spills are likely to occur on impervious surfaces, such as: trucking docks and yards, gasoline stations, and roads. The location of urbanized areas, as well as roads, in the watershed indicate where a high degree of impervious surfaces are found.

Road and bridge construction and maintenance provides an indication of which areas in the watershed are increasing impervious area. Rapidly developing suburban areas are generally going to need more road construction and maintenance projects as the expanding population overwhelms the existing road infrastructure. In addition to the water quality concerns from impervious areas listed above, road construction can also increase sediment loads of nearby streams from construction site erosion and runoff. Road and bridge construction can alter a stream's physical characteristics by building culverts, relocating the stream channel, armoring of the stream banks, and other common construction practices.

Table II-5 shows all the future road and bridge construction and maintenance projects in the Nimishillen Creek Watershed through 2008. Over half of the future projects are located in the quickly developing Plain, Lake, and Jackson Townships. In addition to Stark County road and bridge projects, the Ohio Department of Transportation is working through 2008 to improve and widen the Interstate 77 from Ohio Route 30 to the City of Akron. Interstate 77 runs adjacent to and crosses the West Branch of Nimishillen Creek throughout much of these construction areas.

Table II-5: Future Road and Bridge Construction and Maintenance Projects in the Nimishillen Creek Watershed			
Project Name	**Type of Construction and Maintenance**	**Subwatershed - Municipality/Township**	**Start Date**
Paris - Meese Intersection	Road	East Branch - Nimishillen Twp.	2006
Georgetown	Bridge	East Branch - Osnaburg Twp.	2006
Trump - Georgetown Intersection	Road	East Branch - Canton Twp.	2006
Beck Street	Bridge	East Branch - Nimishillen Twp.	2007
Broadway Street	Bridge	East Branch - Nimishillen Two.	2007
Columbus - Paris Intersection	Road	East Branch - Nimishillen Twp.	2007
Miday Ave.	Bridge	East Branch - Nimishillen Twp.	2007
Easton Street. - Paris Intersection	Road	East Branch - Nimishillen Twp.	2008
30th St. - Harrisburg Intersection	Road	Middle Branch - Plain Twp.	2006
55th Street	Bridge	Middle Branch - Plain Twp.	2007
Middlebranch - State Intersection	Road	Middle Branch - Lake Twp.	2007
Werner Church Street	Bridge	Middle Branch - Plain Twp.	2007
Market - Mt. Pleasant Intersection	Road	Middle Branch - Lake Twp.	2008
Portage Street Widening	Road	West Branch - Jackson Twp.	2004
Applegrove - Frank - Strausser	Road	West Branch - Jackson Twp.	2005
12th Street	Bridge	West Branch - Perry Twp.	2006
20th Street - Lakeside Intersection	Road	West Branch - Plain Twp.	2007
Everhard - Whipple Intersection	Road	West Branch - Plain Twp.	2008
Applegrove Widening	Road	West Branch - Jackson Twp.	2008
Ridge Ave.	Bridge	Mainstem - Canton Twp.	2006
Source: Ohio Public Works Commission. *Stark County - Five Year Capital Improvement Plan/Maintenance of Effort.* 2003.			

Protected Lands

Protected lands within the Nimishillen Creek Watershed can generally be divided into two categories: agricultural best management programs and recreational parks. As noted above there are a number of parks within the Nimishillen Creek Watershed. Although primarily used for recreation, the parks provide environmental benefits including floodplain preservation, wildlife habitat, and riparian habitat protection.

Agricultural best management programs offered through the United States Department of Agriculture also protects lands through the Conservation Reserve Program or CRP. The CRP is a voluntary program where agricultural land owners receive rental payments and cost-share assistance to establish long-term cover crops to protect eligible lands. Contracts with land owners are for 10 to 15 years. Stark County has 334.3 acres enrolled in the CRP. The total acreage for land enrolled within the Nimishillen Creek Watershed was requested, but not provided in time for inclusion in this plan.

Additional protected lands include agricultural easement, land owned by Earth Action Partnership, and additional land owned by Stark Parks that have yet to be developed into active parks or trails. These lands are summarized in Table II-6. This section will be updated to include new lands that come under protection and/or existing protected lands not included in this original plan.

Table II-6: Known Protected Lands in the Nimishillen Creek Watershed

Entity	Property Name - Location	Size (acres)	Type of Protection	Subwatershed
Earth Action Partnership	Mt. Pleasant St. & Elmhurst	12.8	Ownership	Middle Branch
Stark Parks	Aultman Property - Martindale Road	14.7	Ownership	Middle Branch
Stark Parks	Boettler Barn - Werner Church Rd. & Boettler	5.9	Ownership	Middle Branch
Stark Parks & North Canton	Hoover Connector Trail - Hoover Park	Not Given	Ownership	West Branch
Stark Parks	Linder - 55th St. & Harmont	8.7	Ownership	Middle Branch
Stark Parks	Nickle Plate Trail - Georgetown Road	39.8	Ownership	East Branch
Stark Parks	Plain Center Trail and Wetland - Plain Center Rd. & 55th St.	26.8	Ownership	Middle Branch
Stark Parks	Reno Drive	7.5	Ownership	East Branch
Stark Parks	Sanctuary - Applegrove Rd.	2.3	Ownership	East Branch
The Wilderness Center	State Street & Market Ave.	99.5	Agricultural Easement	Middle Branch

Agriculture

Agricultural data for Nimishillen Creek has not been separated from information provided by various agencies for Stark, Summit, and Tuscarawas Counties. However, the majority of the agricultural lands and activities occur in subwatersheds 2 and 3 which are entirely located in Stark County. Therefore, agricultural

information for the Nimishillen Creek Watershed is assumed to be similar to agricultural data provided for Stark County.

According to the *2003 Ohio Department of Agriculture Annual Report and Statistics* Stark County has a total of 1,330 farms with the average size of 109 acres. The total land in farms for the entire county is 145,000 acres which translates into a commercial grain capacity of 483,000 bushels. Since 1990, their has been 13,000 acre reduction in the amount of farm land in Stark County.

Crop Type

Table II-7 contains a summary of crops produced in Stark County. The county ranks high in the State for production of oats and hay and near the middle for corn, grain, soybean, and wheat.

Table II-7: 2003 Crop Production for Stark County, Ohio

2003 Crop	Acres Harvested	Yield	Production	State Rank
Corn and Grain (bushels)	23,900	137.9	3,295,500	47
Soybean (bushels)	23,000	38.5	884,800	53
Wheat (bushels)	6,900	59.3	409,400	45
Oats (bushels)	1,900	66.7	126,700	7
All Hay (tons)	24,400	3.28	80,00	13

Source: 2003 Ohio Department of Agriculture Annual Report and Statistics

Tillage

Many crop producers in Stark County have adopted conservation tillage techniques. Conservation tillage, or “no-till”, is when farmers use specialized equipment to plant their field(s) without turning the soil and exposing the topsoil. Conservation tillage has become a popular practice since the early 1990s because it can produce the same or greater yields for a farmer while lowering production costs, eliminating plowing/discing/cultivating, improving soil moisture, reducing soil compaction, increasing organic matter, and reducing insect and disease problems. Local water resources benefit from no-till practices because they can reduce soil erosion by up to 90 percent. Also, conservation tillage increases infiltration rates resulting in less runoff. Reduction in erosion and runoff from fields reduces the sediment, chemicals, and nutrients entering a stream or lake. Below is a summary of tillage practices in Stark County.

As Table II-8 indicates, over 78 percent of the active crop lands in Stark County are utilizing a conservation tillage practice. The majority of the conservation tillage is no-till, the most environmentally beneficial type. However, nearly a quarter (22 percent) of acreage in corn production still uses conventional tillage (residue <30%).

Table II-8: Summary of Tillage Statistics in Stark County, Ohio							
Crop Type	Overall Acres	Conservation Tillage > 30% Residue			Conservation Tillage Total	Other Tillage Systems	
		No-Till	Ridge-Till	Mulch-Till		15-30% Residue	0-15% Residue
Corn	29,900	19,435	0	3,887	23,332	3,289	3,289
Small Grain	8,900	6,410	0	0	6,410	2,145	345
Soybeans	23,000	19,550	0	0	19,550	1,500	1,950
Forage Crops	2,000	500	0	0	500	0	1,500
Total	**63,800**	**45,895**	**0**	**3,887**	**49,782**	**6,934**	**7,084**
Source: Conservation Technology Information Center - 2004 Summaries for Stark County, Ohio							

Rotations

In general, crop rotating increases crop yield by improving the soil, reduces weeds and insects, and is instrumental in a successful conservation tillage program. It is well documented that yields increase if a crop rotation procedure is followed. Increased yields are often accomplished with less fertilizers and insecticides than using a continuous one crop plan.

According to the Stark County Soil and Water Conservation District, crop rotations in the Nimishillen Creek Watershed and Stark County are similar to the rest of Ohio's counties. Grain farmers often use a rotation of corn, soybeans, and wheat. Dairy producers' rotation is typically a corn silage followed by a hay and wheat crop. Beef producers usually use a corn, hay, and pasture rotation.

Irrigation

Irrigation is used during dry periods to ensure the continued health of a crop and to protect crops from cold weather. Well watered crops have increased size and weight and a reduction in defects. Ohio is a water-rich state that has historically received enough precipitation to satisfy growers' needs limiting the need for irrigation. A survey conducted in 1989 found less than 40,000 acres were irrigated in Ohio. However, advances in irrigation knowledge coupled with periods of drought over the last 20 years has likely increase the total acres irrigated statewide since 1989 (Brown, 1991). Specifically, vegetables and fruits need a steady supply of water throughout their development for high yields and good quality. Moisture shortage at critical times during development can greatly limit growth and yields.

The Ohio Farm Bureau Federation (OFBF) recently conducted a state-wide survey to better assess irrigation in the state. There were seven responses from farmers in Stark County covering 1050 acres of vegetable crops, 66 acres of fruit crops, and 2 acres of horticultural crops produced under irrigation. Six out of seven respondents use irrigation for crop production. Irrigation water sources are wells (71 percent), ponds (14 percent), and lakes (14 percent). None of the

producers draw water directly from Nimishillen Creek. The survey also shows that only 29 percent of the respondents use soil moisture devices to determine when to irrigate crops, depending more on visual condition of crop (86 percent) and feel of the soil (43 percent). All of the survey respondents indicated they irrigate in June, July, and August, 80 percent irrigate in September and October, and 60 percent in April (Antosch, 2006).

There are several potential impacts to local water resource from irrigation. Excessive irrigation can result in polluted runoff with concentrated nutrients, sediments, pesticides, and other chemicals reaching surface water resources. Using wells to supply irrigation waters could lead to the lower of the local water table and the pollution of the groundwater through leachate from irrigated fields.

The largest farm that uses irrigation in the Nimishillen Creek Watershed is K. W. Zellers & Sons, Inc. producing vegetables for commercial sale on 600 farmable acres of muck soils in Marlboro Township. They draw their irrigation water from wells that are regularly tested for total coliform, heavy metals, nitrates, and nitrites. Ground water from K. W. Zellers & Sons, Inc. wells have never tested above the standards for these parameters as established by Food and Drug Administration and the Ohio Department of Health.

Zellers & Sons also have a extensive drainage system to complement their irrigation practices. Field tile drains water to sumps which is then pumped into ditches that empty into Swartz Ditch in the Middle Branch Subwatershed. The water in these ditches is also regularly tested for nitrates, nitrites, and phosphorus before discharging into Swartz Ditch. Nitrate and nitrite levels have never exceeded 10 mg/l, Ohio's maximum contamination levels for public drinking water standards, and are often below detection limits. Phosphorus readings range between below detection limits to 0.3 mg/l. Lastly, Zellers & Sons can control the water levels in both their drainage tile system and nine acre pond through water control structures. This allows the farm to absorb or retain over 10 inches of precipitation without an increased discharge to Swartz Ditch (Lukens, 2006)

Livestock Inventory and Grazing

Stark County ranks as one of the top 10 for inventory of cattle, calves, and mild cows. Table II-9 summarizes the livestock inventory for the county.

Table II-9: 2003 Livestock Inventory for Stark County, Ohio

2003 Livestock	Number	State Rank
All Cattle and Calves	24,800	9
Mild Cows	9,000	6
All Hogs and Pigs	7,000	48
All Sheep and Lambs	1,400	36

Source: 2003 Ohio Department of Agriculture Annual Report and Statistics

A grazing survey for the Watershed has not been completed. However, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) District Technician for Stark County judges that the majority of the grazing in the Nimishillen Creek Watershed occurs south of Nimishillen Creek Township due to the unglaciated topography. Beef cattle constitute the majority of the grazing animals in this area. Dairy operations in the watershed are located north of Osnaburg Township in the glaciated portions of the watershed. The NRCS District Conservationist estimates that 10 to 15 percent of the watershed is grazed (Bayham, 2006).

Agriculture and Economy

According the Ohio Farm Bureau Federation, agriculture contributes $2.3 billion in output and employees 32,800 people in Stark County. Table II-10 shows the total value cash receipts from marketing of farm commodities from Stark County farms in 2002.

Table II-10: 2002 Cash Receipts from Marketing of Farm Commodities in Stark County, Ohio

Commodity	Value
Dairy and Milk	$26,573,000
Poultry and Other Livestock	$14,336,000
Cattle and Calves	$5,999,000
Corn	$2,833,000
Soybean	$3,388.000
Oats and Hay	$1,525,000
Hogs and Pigs	$1,498,000
Wheat	$1,196,000
Other Crops	$15,019,000
Total	**$72,367,000**
Average Per Farm	**$56,537**

Source: 2003 Ohio Department of Agriculture Annual Report and Statistics

Socioeconomics

Demographics

Over 95 percent of the Nimishillen Creek Watershed is located in Stark County. The total population of Stark County is 378,098, with 90 percent of the population white and 7 percent black. The largest age group represented is the 35-44 year olds which comprises over 15 percent of the county's population. The City of Canton is the largest populated entity with 80,806 residents. Other city's and village's populations within the watershed are North Canton (16,369), Louisville (8,904), Hartville (2,174), East Canton (1,629), Hills and Dales (216), and Meyers Lake (480) (U.S. Census, 2000).

Table II-11 shows the population trend in Stark County since the 1860 U.S. Census. Overall population growth has been modest since 1980 with a 2.8 percent increase from 1990 to 2000. The principal trends in population have been suburbanization, changing household composition, and increases in aging and minorities among residents (Stark County RPC, 2005).

Table II-11: Stark County's Decennial Population Since 1860				
1860	**1870**	**1880**	**1890**	**1900**
42,987	52,508	64,031	84,170	94,747
1910	**1920**	**1930**	**1940**	**1950**
122,987	177,218	221,784	234,887	283,194
1960	**1970**	**1980**	**1990**	**2000**
340,345	372,210	378,823	367,585	378,098
Source: 2000 U.S. Census				

Economics

Based on information from the Stark County Regional Planning Commission, Stark County's total labor force is 175,401 and total employment equals 204,702. The commercial sector employs 35,739, industrial employment is 43,599, the service industry has 96,315 workers, and all other employers provide 29,049 jobs in the county. Stark County's 2003 unemployment rate was 6.7 percent, which ranked 41st highest of the 88 Ohio counties.

A significant trend in Stark County is suburbanization. Jobs have followed population shifts to the suburbs, especially in the commercial and retail sectors. In 1970, there was a balance between jobs located in the City of Canton and the rest of Stark County. Since then Canton and other cities have lost jobs while other areas have become major employment centers like Plain Township, Jackson Township, and North Canton. Other employment trends show growth of service jobs at the expense of traditional manufacturing employment (Stark County RPC, 2005).

There is also an increase in commuting times as jobs become more decentralized from suburbanization. Daily vehicle miles traveled by people from urban areas has increased over 66 percent (4,295 to 6,480 miles) from 1990 to 2000. Daily miles traveled by rural residents has slightly decreased from 1,843 miles in 1990 to 1,663 miles in 2000 (Stark County RPC, 2005).

Physical Attributes

Riparian Corridor Study

NEFCO completed a riparian corridor survey as part of its *Comprehensive Watershed Management Plan - Phase I* in 2000. The purpose of this Nimishillen Creek Riparian Habitat Inventory is to evaluate the condition of the riparian corridor along the Nimishillen Creek Mainstem, Sherrick Run, Hurford Run (Nimishillen Creek

Subwatershed); West Branch Nimishillen Creek, West Branch Tributary-1 (West Branch Subwatershed); Middle Branch Nimishillen Creek, Swartz Ditch (Middle Branch Subwatershed); and East Branch Nimishillen Creek, East Branch Tributary-1 and East Branch Tributary-2, as they existed in March 1997.

The riparian inventory report was completed by using 1997 aerial photos of the watershed to investigate riparian habitat along the Nimishillen Creek mainstem and major tributaries. The criteria used to evaluate the riparian habitat were developed from the Ohio EPA Qualitative Habitat Index (QHEI). Each streambank was analyzed for both riparian width and quality, then scored numerically. See the *Comprehensive Watershed Management Plan - Phase I* for more information on the methodology used.

The study was conducted under the belief that riparian corridors are important components of the environment, and that such natural areas are subject to adverse impacts caused by commercial and residential development, which is exacerbated by habitat and hydraulic modifications. The integrity of the riparian corridor habitat is a key component of a watershed because an intact corridor helps the stream resist erosion and protects water quality from influxes of pollutants, sediment and overland runoff.

Based on the results of the riparian habitat evaluation for the watershed, NEFCO has been able to conclude that residential and commercial development as well as agricultural practices have fragmented much of the riparian habitat (FIgure II-15). Numerous segments indicate a loss of riparian habitat through habitat modification caused by channelization, streambank alteration, stream burial, removal of riparian vegetation and an increase in impervious surface areas. Such impacts contribute to the instability of riparian corridor ecosystems and raise serious concerns regarding water quality issues by increasing the amount of storm water runoff, streambank erosion, sedimentation, loss of shading, and the inability to serve as filter areas to trap sediment.

Table II-12 indicates that the following streams received average riparian habitat scores from highest to lowest: for the “High” category: no average stream scores were above 5.0; “Moderate”: Nimishillen Creek Mainstem - 4.76; Sherrick Run - 4.54; East Branch Nimishillen Creek - 3.09, East Branch Tributary 2 - 2.98, West Branch Tributary 1 - 2.86, West Branch Nimishillen Creek - 2.85; “Low” category: Swartz Ditch - 1.87, and Hurford Run - 1.58. Additionally, each subwatershed received an average riparian habitat score, of which the Mainstem Subwatershed received the highest score of 4.76, follow by Sherrick Run Subwatershed, East Branch Subwatershed, West Branch Subwatershed, Middle Branch Subwatershed, and Hurford Run Subwatershed with scores of 4.54, 3.80, 2.86, 2.48, and 1.58, respectively.

Table II-12: Nimishillen Creek Watershed Percentage of Low, Moderate and High Quality Riparian Habitat

Stream Name	Subwatershed	Average Riparian* Habitat Score	Ranking based on Average Riparian Habitat Score	Subwatershed Average Riparian Habitat Score	Ranking based on Subwatershed Average Riparian Habitat Scores
Nimishillen Creek (Mainstem)	Mainstem	4.76	1	4.76	1
Sherrick Run	Sherrick Run	4.54	2	4.54	2
Hurford Run	Hurford Run	1.58	10	1.58	6
West Branch Nimishillen Creek	W. Branch	2.85	8	2.86	4
West Branch Trib. 1		2.86	7		
Middle Branch Nimishillen Creek	M. Branch	3.09	5	2.48	5
Swartz Ditch		1.87	9		
East Branch Nimishillen Creek	E. Branch	4.39	3	3.80	3
East Branch Trib. 1		4.03	4		
East Branch Trib. 2		2.98	6		

Habitat Scores: > 5 = "High"; 2 - 5 = "Moderate"; <2 = "Low"
* Calculated by dividing the total points by the total number of stream segments.

Tables and additional information about the riparian habitat can be found in the Riparian Corridor Study, as part of the *Nimishillen Creek Comprehensive Watershed Management Plan - Phase I*. This information can be used to target severely altered riparian segments, streams or subwatersheds for remediation activities or target areas with intact riparian habitat for protection/preservation efforts.

Ohio EPA's Habitat Restorability Rating

The Ohio EPA in its 2000 Ohio Water Resource Inventory ranked stream segments based on their likelihood of having their aquatic life use restored to a condition comparable to reference conditions in each ecoregion. The major factors used to determine the restorability of a stream segment included habitat quality, watershed conditions, stream gradient, and aquatic life use designations. Stream segments were then categorized from least restoration potential, or "Essentially None"; to most restoration potential, or "Extremely High". The results of this effort by the Ohio EPA are summarized in Table II-13.

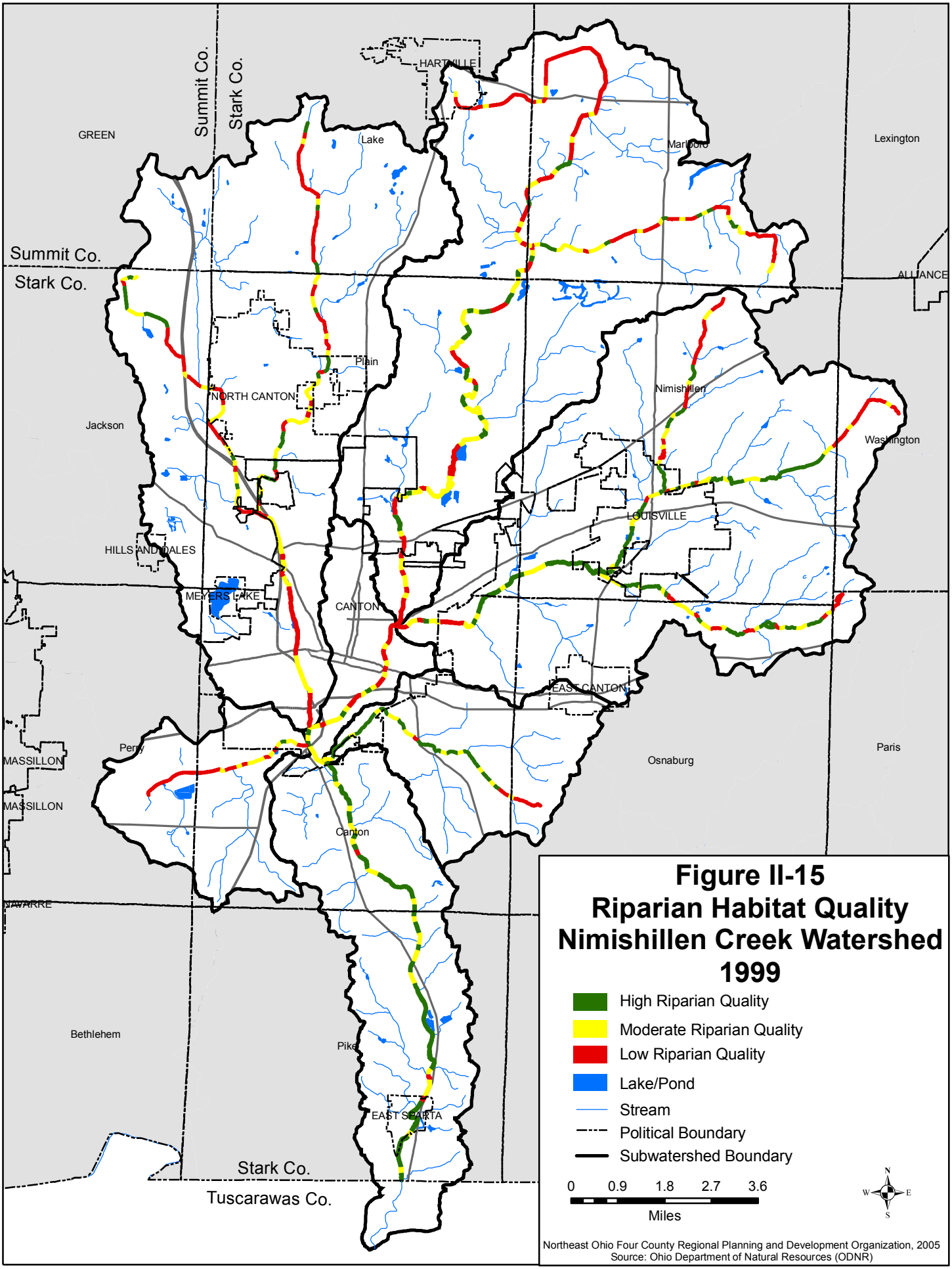

Summit Co.
Stark Co.
GREEN
Lake
Marlboro
Lexington
Summit Co.
Stark Co.
ALLIANCE
Plain
NORTH CANTON
Nimishillen
Jackson
Washington
LOUISVILLE
HILLS AND DALES
MEYERS LAKE
CANTON
EAST CANTON
Perry
MASSILLON
MASSILLON
Osnaburg
Paris
Canton
NAVARRE
Bethlehem
Pike
EAST SPARTA
Stark Co.
Tuscarawas Co.
Figure II-15
Riparian Habitat Quality
Nimishillen Creek Watershed
1999
High Riparian Quality
Moderate Riparian Quality
Low Riparian Quality
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 0.9 1.8 2.7 3.6
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

Table II-13: Ohio EPA Restorability Rating Factor for Aquatic Life Based on Stream Habitat Quality Index for Nimishillen Creek

Creek Segment (Upper/Lower River Mile)	Segment Mean QHEI	Mean Gradient (feet/mile)	Drainage Area (square miles)	Restorability Rating*	Ohio EPA Confidence
Nimishillen Creek Mainstem (14.70/0.00)	73.80	8.9	150.05	High	High
Hurford Run (4.95/0.00)	41.64	23.4	6.34	Essentially None	High
- Domer Ditch (3.21/0.00)	58.10	17.9	2.34	Moderate - High	High
Sherrick Run (6.80/0.00)	53.17	16.6	5.40	Essentially None	High
- Osnaburg Ditch (1.50/0.00)	40.50	34.87	1.00	Essentially None	High
West Branch Nimishillen Creek (9.00/0.00)	51.81	8.0	38.75	Moderate - High	High
- McDowell Ditch (6.27/0.00)	34.00	8.4	10.00	Essentially None	High
- Hoover Ditch (1.23/0.00)	48.00	11.6	1.50	Essentially None	High
- Zimber Ditch (4.46/0.00)	47.31	13.2	6.38	Essentially None	High
Middle Branch Nimishillen Creek (16.60/0.00)	54.67	4.4	31.50	Moderate - High	High
- Swartz Ditch (8.10/0.00)	35.17	3.0	8.67	Essentially None	High
- Guiley/Hartfield Ditch (4.00/0.00)	34.33	10.36	1.87	Essentially None	High
East Branch Nimishillen Creek (10.40/0.00)	66.83	85	148.50	High	High
- Tributary to East Branch (3.98/0.00)	44.00	16.2	3.00	Low	Moderate

Source: 2000 Ohio Resource Inventory, Appendix E
QHEI = Qualitative Habitat Evaluation Index
* Essentially None: Limited Resource Water (LRW) or Modified Warm Water Habitat (MWH)
Low: Mean QHEI > 30 and $\leq$ 45; Mean Gradient Score < 7
Moderate - High: Mean QHEI $\geq$ 60 and < 75; Mean Gradient $\leq$ 4
High: Mean QHEI $\geq$ 60 and < 75; Mean Gradient > 4

The Qualitative Habitat Evaluation Index (QHEI) is the methodology used by the Ohio EPA to assess habitat conditions in Ohio's waterways. The evaluation of habitat is important because it is one of the primary factors affecting the biological integrity of streams (Karr, 1983). QHEI factors that greatly affect a stream's

biological composition include recent channelization, silt/muck substrates, non-sparse cover, and shallow depths. QHEI scores at the segment level will reflect these factors.

Riparian Miles with Permanent Protection

Currently there are no protected areas within the Nimishillen Creek Watershed with the specific rationale of preserving or restoring riparian habitat. That is, no conservation easements or land purchases have been completed with the sole intent of protecting riparian areas. However, there are significant portions of the riparian corridor that are protected parkland. Figure II-3 and Table II-2 summarize the parks located adjacent to Nimishillen Creek and its tributaries.

Riparian protection is a priority in the watershed given the multiple functions it provides from storing flood waters to reducing pollution entering the creek. Ideally, high quality habitat such as forested riparian areas and intact riparian corridors in sections of the watershed facing development (e.g. Plain and Lake Townships) should be investigated first for protection. Coupling riparian protection with existing or future recreational or flooding prevention projects will likely result in the greatest success.

Dams

According to the ODNR Division of Water record, there is only one low head dam along Nimishillen Creek and its tributaries. This is located along the Middle Branch near Martindale Park (RM 3.5). There are likely other low head dams along Nimishillen Creek that have not been reported to ODNR. Overall, dam removal is not a priority for water quality improvement in this watershed.

Gradient

Stream gradient can indirectly indicate how quickly a stream segment can recreate needed habitat features over time. With all else equal, the steeper the gradient of a stream, the more power the stream possess allowing it to more quickly recover from perturbations such as flooding or sedimentation. Based upon observed relationships between stream gradient and fish sampling by the Ohio EPA, a gradient of 6 ft./mile of watershed less than 20 square miles, or 2 feet per mile for watersheds between 20-200 square miles is needed to achieve a normal Warm Water Habitat fish community

Table II-14 shows the average stream gradients and percent of slope for Nimishillen Creek and it major tributaries. Typically, a stream with a steep gradient has more energy available for stream flow. This increases its capacity to headwardly erode and transport sediment loads and debris downstream. The stream gradient diminishes as it approaches the convergence with the mainstem or higher order stream.

Table II-14: Nimishillen Creek Watershed Average Stream Gradient and Percent of Slope		
Stream Name	**Average Stream Gradient**	**Percent of Slope**
	height/length = avg. stream gradient	vertical distance/horizontal distance x 100 = % of slope
Nimishillen Creek Mainstem*	107'/13.5 mi = 7.93 ft/mi	107'/72,280' x 100 = .15%
Sherrick Run	141'/5.70 mi = 24.74 ft/mi	141'/30,096' x 100 = .47%
Hurford Run	54'/3.50 mi = 15.43 ft/mi	54'/18,480' x 100 = .29%
West Branch Nimishillen Creek	148'/14.10 mi = 10.5 ft/mi	148'/74,448' x 100 = .20%
West Branch Trib. -1	124'/6.70 mi = 18.51 ft/mi	124'/35,376' x 100 = .35%
Middle Branch Nimishillen Creek	212'/17.80 mi = 11.91 ft/mi	212'/93,984' x 100 = .22%
Swartz Ditch	38'/8.9 mi = 4.27 ft/mi	38'/47,400' x 100 = .08%
East Branch Nimishillen Creek	178'/13.50 mi = 13.19 ft/mi	178'/71,280' x 100 = .25%
East Branch Trib. -1	168'/6.20 mi = 27.10 ft/mi	168'/32,736' x 100 = .51%
East Branch Trib. -2	141'/4.45 mi = 31.69 ft/mi	141'/23,496' x 100 = .60%

*Any Stream Gradient to the Stark/Tuscarawas County Line
Source: Nimishillen Creek Comprehensive Watershed Management Plan - Phase I

Channelization and Other Modifications

Portions of Nimishillen Creek and its tributaries have been modified for various reasons over the last several decades. Maps dating back to the early 1900s show heavy channelization in agricultural areas to improve drainage in “swamp” lands and increase the available acreage for crops along the West and Middle Branches. According to the Stark County Engineer’s records, the first Stark County “dedicated” ditch was completed in 1867 with the last finished in 1948. A total of 77 “dedicated” ditches created over this span were located in the Nimishillen Creek watershed. The Middle Branch and West Branch subwatersheds contain the majority of these ditches with 33 and 29, respectively. Hurford Run has six “dedicated” ditches, while Sherrick Run has contains five. The Mainstem of Nimishillen Creek (three ditches) and East Branch (one ditch) were the least impacted by this 81 years of ditching projects. Table II-15 has a summary of largest ditches in the watershed. Appendix E has a complete list of Stark County “dedicated” ditches within the Nimishillen Creek watershed.

In 1957, the State revised the Ohio County Ditch Law establishing a framework for creating (petitioning) and maintaining ditches at the county level. Since all major ditching in the watershed occurred prior to the creation of these laws, maintenance by Stark County was not required and often ignored. Consequently, many of these ditches no longer provide the drainage function they were intended due to sedimentation and debris located in the channel. Without maintenance, some of the smaller “dedicated” ditches reverted back to a natural creek shape. Ditches that are still providing drainage to farmland have by-in-large been maintained by the private sector.

Table II-15: Large Ditches in the Nimishillen Creek Watershed			
Ditch Name	**Subwatershed**	**Length (miles)**	**Drainage Area (mi^2)**
Domer	Hurford Run	3.21	2.34
Gailey - Hartfield	Middle Branch	4.00	1.87
Hoover	West Branch	1.23	1.50
McDowell	West Branch	6.27	10.00
Osnaburg	Sherrick Run	1.50	1.00
Swartz	Middle Branch	8.10	8.67
Zimber	West Branch	4.46	6.38
	Totals =	**28.77**	**31.76**
Source: 2000 Ohio Resource Inventory, Appendix E			

Also, many of these areas that were ditched over 50 years ago have been converted from agriculture to urban/suburban areas. This has resulted in localized flooding of homes and businesses in areas drained by these aging drainage systems. In response to these events, the Stark County Commissioners and Engineer have recently established a ditch maintenance program to help alleviate some of these drainage problems. A long term goal of the Stark County Drainage Task Force is to develop a comprehensive county drainage plan to address water quantity and quality problems which will include these ditched areas (see above).

Eroded Banks

No quantitative data have been collected documenting bank erosion along Nimishillen Creek and its primary tributaries. However, observations of stream bank conditions have been documented to some extent during NEFCO macroinvertebrate surveys in 2000, 2002, and 2004. In general, areas that lacked riparian habitat vegetation and/or had grassed banks, were areas commonly cited as having some bank erosion problems. Also, Sherrick Run was noted as having some bank erosion problems, but this is likely the result of the steep gradient and topography of the basin. For more details on observations from these studies, please refer to NEFCO's *Nimishillen Creek Macroinvertebrate Surveys.*

Presumably there are many sections of the creek outside of the macroinvertebrate sampling stations detailed above that have bank erosion problems. Channelized or ditched areas, especially without regular maintenance, will gradually seek a more natural serpentine or meandering footprint resulting inevitably in bank erosion. Agricultural areas, and in particular livestock operations, are likely to have bank erosion occurring if certain best management practices such as exclusion fencing are not being used. An eroded bank survey is not planned for the watershed, but could be included in future projects. Examining stream banks in agricultural areas and along ditched sections of the creek would be a logical starting point.

Floodplain Connectivity
A study of Nimishillen Creek and its tributaries' connection with the floodplain has not been completed. However, the Stark County Drainage Task Force is working with the U.S. Army Corps of Engineers to conduct an engineering study of the areas that will likely document this attribute. The Nimishillen Creek Watershed Partners will promote the inclusion of floodplain connective analysis for headwater and other smaller streams in the U.S. Army Corps study. The study should be started in 2007.

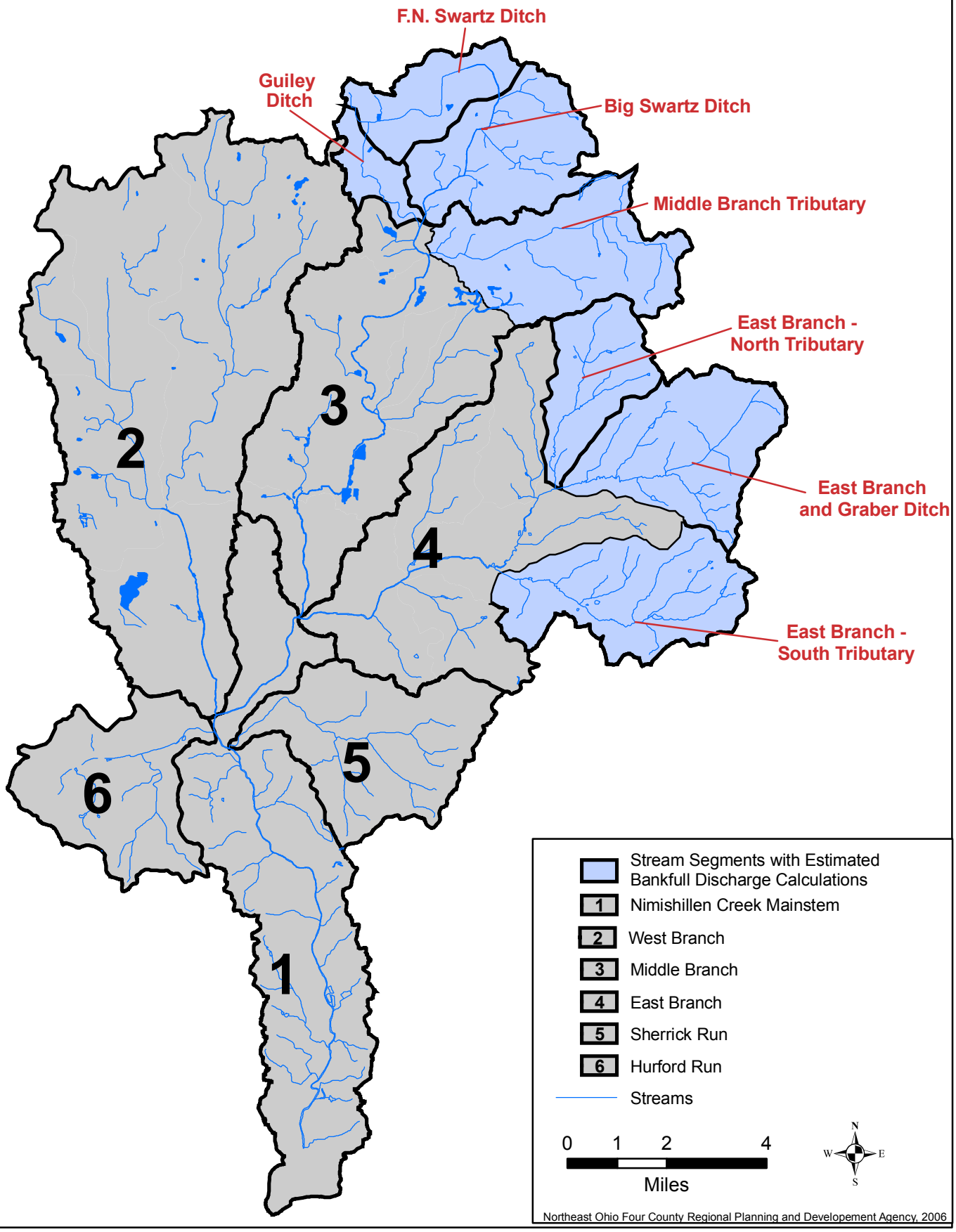
Riparian Levees
An extensive levee system has not been constructed along Nimishillen Creek. It is possible that localized levees have been placed over the years to prevent flood waters from inundating specific locations, but none have been documented. This section will be updated should such levees be discovered. Also, the Nimishillen Creek Watershed Partners will request the inclusion of a riparian levees inventory as part of the upcoming U.S. Army Corps of Engineers engineering study in Stark County.

Entrenched Miles, Bankfull Discharge, and Stream Power
An analysis of the length and severity of entrenched portions of Nimishillen Creek has not been attempted. Information regarding entrenchment will be collected when appropriate and/or needed.

However, an estimate can be made regarding the amount of water, or discharge, at certain sections of the Middle and East Branches of Nimishillen Creek. The United States Geological Survey (USGS) developed a method to estimate bankfull discharges along rural streams that lack dams. Bankfull is the height of the stream where water first begins to overflow its natural banks onto the active floodplain. Bankfull discharge is the amount of water that would fill the main channel to an elevation equal to the active floodplain and is important because flows near bankfull stage do much of the work in moving sediment and forming the shape of the channel. Under normal conditions, a bankfull discharge occurs about once every one to two years (Sherwood, 2005).

Using the USGS method, bankfull discharges were estimated for seven Nimishillen Creek segments in the Middle Branch and East Branch Subwatersheds. The method was developed to apply to rural areas that were unregulated; therefore, the West Branch, Mainstem, Sherrick Run, and Hurford were not considered because the subwatersheds are located in predominately urban, suburban, and/or industrial areas. Four of the selected reaches were in the Middle Branch while the remaining three stream segments studied were located in the East Branch Subwatershed (Figure II-16). Table II-16 contains the bankfull discharge values as determined using equation #15 in the USGS report (Sherwood, 2005). Drainage area, main-channel slope, and main channel elevation index were calculated by NEFCO staff

Figure II-16
Nimishillen Creek Stream Segments with Estimated Bankfull Discharge Calculations 2006



using geographic information systems (GIS) mapping. The results show that the three lowest bankfull discharges were in the Middle Branch and the two highest were for segments in the East Branch.

Table II-16: Estimated Bankfull Discharge for Selected Nimishillen Creek Segments

Segment Name	Subwatershed	Drainage Area (mi^2)	Main-Channel Slope (ft./mile)	Main Channel Elevation Index (ft.)	Bankfull Discharge ($ft.^3$/sec.)	Bankfull Discharge (gal./sec.)
F.N. Swartz Ditch	Middle Branch	4.32	4.25	1127	42.00	314.18
Big Swartz Ditch	Middle Branch	7.81	11.68	1124	147.98	1,106.97
Guiley Ditch	Middle Branch	1.87	10.36	1130	34.78	260.32
Middle Branch Trib.	Middle Branch	6.69	21.35	1144	268.62	2,009.42
East Branch and Graber Ditch	East Branch	9.19	27.51	1151	301.77	2,257.39
North Tributary	East Branch	5.15	33.17	1166	195.02	1,458.85
South Tributary	East Branch	9.42	30.12	1135	333.97	2,498.27

Sources: NEFCO; Sherwood, 2005
mi^2 = square mile; ft. = foot; ft^3 = cubic foot; gal. = gallon; sec. = second

As mentioned above, bankfull discharge is an important measurement because streams typically have the most energy to transport sediment and develop channel features during this stage. However, a better indicator of a stream's ability to move sediments is unit stream power. Unit stream power is the rate of potential energy expenditure per unit weight of water at bankfull stage. The higher the unit stream power the more energy the flowing water has at the bankfull stage to move sediments and develop channel characteristics like riffles, runs, meanders, and pools. The Ohio Department of Natural Resource developed equations to estimate unit stream power. Using the bankfull discharge determined in Table II-16 and bank widths as determined by a regional curve, unit stream power calculations were completed for each of the seven Nimishillen Creek segments (Table II-17).

Table II-17: Estimated Unit Stream Power for Selected Nimishillen Creek Segments					
Segment Name	**Subwatershed**	**Bankfull Discharge[1] ($ft.^3$/sec.)**	**Stream Power[2] (lbs./sec.)**	**Bankfull Width[2] (ft.)**	**Unit Stream Power[2] (lbs./sec./ft.)**
F.N. Swartz Ditch	Middle Branch	42.00	2	31	0.07
Big Swartz Ditch	Middle Branch	147.98	21	39	0.54
Guiley Ditch	Middle Branch	34.78	4	22	0.20
Middle Branch Trib.	Middle Branch	268.62	70	43	1.63
East Branch and Graber Ditch	East Branch	301.77	101	42	2.41
North Tributary	East Branch	195.02	78	33	2.38
South Tributary	East Branch	333.97	122	72	2.89

Sources: [1] Sherwood, 2005; [2]Mecklenburg, 2006
ft^3 = cubic foot; sec. = second; lbs. = pound; ft. = foot

A unit stream power of 0.7 lbs./sec./ft. is considered very low, while a value of 2.4 lbs./sec./ft. is a high value (Mecklenburg, 2006). Three of the four Middle Branch segments are below the very low threshold, all three East Branch sites are at or above the high value, and the Middle Branch Tributary is between these two groups at 1.63 lbs./sec./ft.

The bankfull discharge and unit stream power values are rough estimates to be used for general planning purposes. These findings can be further refined and improved with field measurements of many of the parameters found in the Table II-16 and Table II-17, particularly bankfull discharge and bankfull width. The development of a regional curve for bankfull widths specific to the Nimishillen Creek Watershed would greatly improve the accuracy of future estimated power calculations for different stream segments.

Despite the margin of error associated with this assessment, the results clearly show a significant difference in both bankfull discharge and unit stream power for the Middle Branch's F.N. Swartz Ditch, Big Swartz Ditch, and Guiley Ditch and the rest of the studied stream sections. The three ditches have extremely low unit stream power values which indicate a lack of ability for these sections to naturally restore features and functions needed for a healthy stream. These ditches simply do not have enough power to transport and sort the sediment load in order to restore natural features like riffles, pools, and meanders. Restoration of these channelized areas would require stakeholders to actively build these features into the stream using natural channel design principles at a significant cost. But given the low slope, bankfull discharge, and unit stream power of these three segments, the success of

any stream restoration project is questionable. Because of the high costs and an uncertain outcome based on the information above, stream restoration in these three watershed should rank behind other water resource protection actions like wetlands restoration and protection.

Fortunately the other four stream segments analyzed above do show potential for stream restoration projects. The Middle Branch Tributary (1.63 lbs./sec./ft), East Branch - North Tributary (2.38 lbs./sec./ft.), East Branch/Graber Ditch (2.41 lbs./sec./ft.), and East Branch - South Tributary (2.89 lbs./sec./ft.) have enough energy to transport the sediment needed to restore natural features. These sections of Nimishillen Creek are good candidates for either active or passive stream restoration techniques. Active restoration, as described above, normally involves going into a stream and manually restoring features and functions using natural channel design techniques. Active restoration is an option and would likely be successful in quickly restoring natural features and functions to a stream segment. However, costs can be prohibitive with active restoration methods and typically result in only small stream sections being restored.

A more cost effective option for restoration in these four Nimishillen Creek segments is passive restoration techniques. Generally this involves providing the disturbed or degraded stream segments the needed conditions to recover on their own. For streams that are entrenched or ditched, passive restoration entails restoring the active floodplain at or below the bankfull discharge stage, commonly referred to as a two stage ditch design. For stream channels with sufficient energy for sediment transport, near bankfull discharges over time will develop natural channel features in the newly constructed active floodplain. Other than restoring the floodplain to approximately five times the width of the bankfull width, little in-stream work is required since natural processes during near bankfull stages complete the restoration work. Passive restoration is less costly than active natural channel design restoration, but the results are not as immediate as it will take several months or years for a restored stream section to fully develop all of its features and functions. However, the lower cost potentially will result in more linear feet of Nimishillen Creek being restored.

Recreation

There are numerous recreational opportunities in and around Nimishillen Creek and its tributaries. As shown in Table II-2, there are numerous parks directly adjacent to Nimishillen Creek with various recreational amenities such as hiking trails, basketball courts, baseball fields, fitness circuit, tennis courts, skating park, picnic areas, and playgrounds. Fishing and nature watching can also be enjoyed in these parks. The lower portions of the Nimishillen Creek Mainstem offers adequate water depth for canoeing. Local liveries offer a variety of options for those interested in planning canoe trips. Other local attractions near Nimishillen Creek are the Pro Football Hall of Fame, Canton Garden Center, John F. Kennedy Memorial Fountain, and the McKinley National Memorial.

Park districts and other recreation advocates are important partners in protection and restoration of the Nimishillen Creek corridor. Continued enhancement of recreational opportunities along the creek will increase stakeholder awareness of the value of this local resource. The Stark County Park District long range plans include purchasing land along Nimishillen Creek for increased recreational opportunities for watershed residence. Contact any of the park districts listed in Table II-2 for more information about recreation opportunities in the watershed.

Cultural Resources

Historical Information

Almost the entire Nimishillen Creek Watershed rests in Stark County, with small portions in Summit and Tuscarawas County. The first inhabitants of this are thought to be the Mound Builders present during the stone ages. Little is known between the time of the Mound Builders and Native Americans, but by the mid-1770s there were seven major tribes of Native Americans in Ohio. Stark County held several important cross trails, with the two most famous being the Great Trail and the Muskingum Trail.

The first European explorers to enter the area were the French in the 1660s who laid claim to the entire region. The first English explorers visited between 1730 and 1740. The English and the United States fought the French for control of the area for several years, and it was not until the war of 1812, that the United States' control of the region was affirmed. The Northwest Territory was created by the Continental Congress in 1787 and the passage of the Land Ordinance Act of 1785 authorized the sale of land in Ohio. In 1803, Ohio became the first state admitted from the Northwest Territory.

Stark County was created in 1808 and was named after Revolutionary War General John Stark, though he never actually visited the county. It originally had 22 townships and included all but one of the townships (Sandy) that is part of the Nimishillen Creek Watershed. In 1805, Canton was the first town to be established in the Nimishillen Creek Watershed, and became a city in 1854. In 1834, Stark County lost three southeast townships to Carroll County and two northeast townships to Summit County, including Green Township which contains a portion of the watershed, leaving the County with its present 17 townships.

The start of the industrial revolution after the Civil War brought about change to the Nimishillen Creek basin. The areas around Canton and North Canton became industrial centers and the work force changed from agrarian to industrial jobs. The area emerged from this era as one of the America's industrial leaders. However, agricultural areas in the watershed remained very productive and helped support booming communities throughout northeast Ohio.

Today, Canton and North Canton remain primarily industrial, with the areas to the north and east largely agricultural. Industries still located within the watershed

include the Timken Company, the Hoover Company, the Belden Brick Company, and Diebold. The watershed is also home to rich agricultural areas that provide dairy products, poultry, vegetables and produce to various communities in the region.

In recent years, employment in the industrial sector has been in decline. The Nimishillen Creek Watershed like many areas with industrial areas is undergoing a transition to a retail and service-based economy. This is resulting in increased suburbanization and urban sprawl primarily along Interstate 77 in the West Branch subwatershed.

Historical Sites

According to the Stark County - Ohio Bicentennial Committee, there are 35 sites in the Nimishillen Creek Watershed on the National Register of Historical Places. Nearly all of these sites are located in the City of Canton. None of the sites listed are directly related to Nimishillen Creek or its tributaries. There are no historic dams, locks, or other creek related structures that are listed as historical sites in the watershed. For more information on these historical sites, please refer to the *Stark County Historic Sites Map* published by the Stark County - Ohio Bicentennial Committee.

Nimishillen and Sandy Canal

The Ohio and Erie Canal was built in the 1820s and 1830s connecting Lake Erie to the Ohio River. In Stark County, the Canal followed the Tuscarawas River and went through Massillon and other areas to the west of the Nimishillen Creek Watershed. The Canal increased local commerce by providing reliable transportation to move various products and people to and from the larger eastern cities and markets. Towns all along the Canal prospered from all the benefits this new transportation system provided.

Having been bypassed by the initial canal construction, community leaders from Canton and surrounding areas began plans in the 1830s to construct the Nimishillen and Sandy Canal to tie into the Ohio and Erie Canal. This canal was planned to follow a 12 mile route from Canton south to Sandyville along Nimishillen Creek. Work began on the Canal in 1835, and a small portion of the waterway was completed. However, the project was quickly abandoned primarily due to an insufficient water supply for the canal. Also, a trip by boat from Canton to Massillon, which were less than eight miles apart, would have been a 30 mile journey going through three different canal systems. Lastly, an economic “slowdown” hit the area in 1837 reducing the resources available to fund canal construction. Remnants of the incomplete Nimishillen and Sandy Canal can seen in East Sparta near the corner of Walnut Street and Willow Avenue (Loomis, 1994).

III. Water Resource Quality

Designated Uses for Ohio Surface Water Resources

The Ohio EPA is required by the Federal Clean Water Act to develop water quality standards in order to protect, maintain, and improve surface water in the state. Consequently, the agency created standards in two designated categories: Aquatic Life Uses and Non-Aquatic Life Uses. Aquatic Life Use designations vary depending upon where the segment is located in the state and the demonstrated potential of that section of a stream. Non-Aquatic Life Use designations are used to determine a stream's ability as a viable water supply and for recreation.

Aquatic Life Use Designations

An aquatic life use designation is assigned to a stream or river based on the potential aquatic biological community that can realistically be sustained given the biological, physical, and chemical attributes of the waterway. Ohio's aquatic life use designations are:

Exceptional Warm Water Habitat (EWH): A designation given to waterbodies with the most productive environment. These streams support unusual and exceptional assemblages of aquatic organisms, which are characterized by a high diversity of species, particularly those that are highly intolerant and/or rare, threatened, or endangered. This use represents a protection goal for water resource management efforts dealing with Ohio's best water resources.

Warmwater Habitat (WWH): A designation given to streams and rivers with a typical warmwater assemblage of aquatic organisms. It is the principal restoration goal for the majority of water resource management efforts in Ohio. Criteria vary by ecoregion and site type.

Modified Warmwater Habitat (MWH): This designation applies to streams with extensive and irretrievable physical habitat modifications, and where the biological criteria for warmwater habitat is not attainable. The activities contributing to the modified warmwater habitat designation have been sanctioned and permitted by state or federal law. The representative aquatic assemblages are generally composed of species that are tolerant to low dissolved oxygen, silt, nutrient enrichment and poor habitat quality. The three primary types of modification are acid mine drainage runoff, heavily channelized streams, and extensively impounded rivers.

Limited Resource Water (LRW): Designation applies to small streams in watersheds of less than 3 square miles and other waterbodies which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported. Limiting factors often include acid mine drainage, drainage way maintenance, or other specified conditions. No biological criteria has been established for LRW streams.

Coldwater Habitat (CWH): These are designated waters that support assemblages of coldwater organisms and/or those that are stocked with salmonids with the intent of providing a fishery on a year round basis. No specific biological criteria has been established for this use designation.

Seasonal Salmonid Habitat (SSH): A designation used for waters that are capable of supporting the passage of salmoinids from October to May and large enough to support recreational fishing. This designation is only in effect from October to May each year.

As documented in Chapter 3745-1-24 in the Ohio Administrative Code, Nimishillen Creek and its tributaries have the aquatic life habitat designations of warmwater habitat (WWH), modified warmwater habitat (MWH), and limited resource water (LRW). No segment in the Nimishillen Creek Watershed was designated as exceptional warmwater habitat (EWH), seasonal salmonid habitat (SSH), or coldwater habitat (CWH). Aquatic Life Use designations for various segments of Nimishillen Creek are summarized in Table III-1.

Most of the segments in the Nimishillen Creek Watershed are designated as WWH. However, there are significant segments in the watershed that are classified as MWH. These are all the result of past ditching efforts, primarily occurring in the Middle and West Branches, to improve agricultural drainage. Some channelization has also occurred along Hurford Run and Sherrick Run. Lastly, three stream segments located in Hurford Run, Sherrick Run, and Hoover Ditch are designated as LRW. This means that the fish and invertebrate communities are severely limited by irreversible habitat conditions.

Table III-1: Aquatic Life Use Designations for Nimishillen Creek and Tributaries				
Nimishillen Creek Segment	**WWH**	**MWH**	**LRW**	**Comments**
Nimishillen Creek Mainstem - all segments	X			
Hurford Run: Headwaters to River Mile (RM) 1.71 (Domer Ditch)			X	Small Drainage Way Maintenance
Hurford Run: RM 1.71 (Domer Ditch) to RM 0.8 (Harrison Ave.)		X		Channel Modifications
Hurford Run: RM 0.8 to mouth	X			
Hurford Run: Domer Ditch	X			
Sherrick Run: Headwaters to RM 5.2 (Osnaburg Ditch)			X	Small Drainage Way Maintenance
Sherrick Run: RM 5.2 to Mouth	X			
Sherrick Run: Osnaburg Ditch		X		Channel Modifications
West Branch: McDowell Ditch: Headwaters to RM 2.3 (Zimber Ditch)		X		Channel Modifications
West Branch: McDowell Ditch: RM 2.3 to Mouth		X		Channel Modifications
West Branch: Zimber Ditch: Headwaters to RM 1.2 (Rettig Ditch)	X			
West Branch: Zimber Ditch: RM 1.2 to Mouth		X		Channel Modifications
West Branch: Hoover Ditch			X	Small Drainage Way Maintenance
West Branch: All Other Segments	X			
Middle Branch: Swartz Ditch		X		Channel Modifications
Middle Branch: Guiley Ditch		X		Channel Modifications
Middle Branch: All Other Segments	X			
East Branch: All Segments	X			
RM = River Mile; WWH = Warmwater Habitat; MWH = Modified Warmwater Habitat; LRW = Limited Resource Water Source: Ohio Administrative Code, Chapter 3745-1-24				

Non-Aquatic Life Use Designation - Water Supply

Ohio has three categories for surface water supply: public water supply (PWS), agricultural water supply (AWS), and industrial water supply (IWS). The water supply use designations for Nimishillen Creek are summarized in Table III-2. Currently no surface water in the Nimishillen Creek Watershed is used as a potable drinking water source. Agricultural water supply is defined as surface water that is

used, or potentially used, for watering livestock or irrigation. Nearly all but a few segments of the creek have this use designation. Lastly, IWS is surface water that can be used for industrial purposes. All stream segments in the Nimishillen Creek Watershed are classified as being suitable for this use. For more information about Nimishillen Creek's water supply use designations, refer to the Ohio Administrative Code, Chapter 3745-1-24.

Table III-2: Water Supply Use Designation for Nimishillen Creek and Tributaries

Nimishillen Creek Segment	PWS	AWS	IWS
Nimishillen Creek Mainstem - all segments		X	X
Hurford Run - all segments		X	X
Sherrick Run - all segments		X	X
West Branch - McDowell Ditch: headwaters to RM 2.3 (Zimber Ditch)		X	X
West Branch - McDowell Ditch: RM 2.3 to mouth			X
West Branch - Zimber Ditch: headwaters to RM 0.8 (North Canton Ditch)		X	X
West Branch - Zimber Ditch: RM 0.8 to mouth			X
West Branch - Hoover Ditch			X
West Branch - all other segments		X	X
Middle Branch- all segments		X	X
East Branch - RM 6.0 to mouth			X
East Branch - all other segments		X	X

RM = River Mile; PWS = Public Water Supply; AWS = Agricultural Water Supply; IWS = Industrial Waters Supply
Source: Ohio Administrative Code, Chapter 3745-1-24

Non-Aquatic Life Use Designation - Recreation

The Ohio EPA designates waterbodies based on recreational activities that can occur. The three designations used are bathing waters (BW), primary contact recreation (PCR), and secondary contact recreation (SCR). Bathing waters include swimming beaches with lifeguards and/or bath houses. No areas within the Nimishillen Creek Watershed fall under this classification. Therefore, all creek segments fall in either the PCR or SCR designation. One or more of the following characteristics must be met to receive the primary contact recreation designation: water depth allows for full body immersion; creek segment in close proximity to residential areas; or the water present and intermediate potential exposure to bacteria. Characteristics to qualify as a SCR designated creek segment are water depth precludes full body immersion, not near residential areas, and low potential to bacteria exposure. Table III-3 summaries the recreation activities designations for

Nimishillen Creek and tributaries as reported in the Ohio Administrative Code, Chapter 3745-1-24.

Table III-3: Recreation Use Designation for Nimishillen Creek and Tributaries

Nimishillen Creek Segment	Use Designation
Nimishillen Creek Mainstem - all segments	PCR
Hurford Run - all segments	PCR
Hurford Run - Domer Ditch	SCR
Sherrick Run - all segments	SCR
West Branch - McDowell Ditch	SCR
West Branch - Zimber Ditch	SCR
West Branch - North Canton Ditch`	SCR
West Branch - all other segments	PCR
Middle Branch - Swartz Ditch	SCR
Middle Branch - Guiley Ditch	SCR
Middle Branch - all other segments	PCR
East Branch - all segments	PCR

PCR = primary contact recreation; SCR = secondary contact recreation
Source: Ohio Administrative Code, Chapter 3745-1-24

Non-Aquatic Life Use Designation - State Resource Waters

State Resource Waters (SRW) are surface waters that lie within national, state, and local park systems, wetland, and wildlife refuges, areas, and preserves and are designated in Ohio's Water Quality Standards. According to the Chapter 3745-1 of the Ohio Administrative Code (OAC), no section of Nimishillen Creek is classified as a SRW. Although still used, the SRW designation is being phased out and replaced by four different categories to describe "high quality waters" (OAC, 3745-1-05). Currently there is no information designating any segment within the Nimishillen Creek Watershed as "high quality waters".

Biological Criteria

The Ohio EPA adopted biological criteria into the Ohio Water Quality Standards in 1990. Specifically, two fish and one macroinvertebrate indices are used to determine if a specific stream segment is reaching its aquatic life use designation (Table III-1).

These indices are:

IBI - Index of Biological Integrity

The Index of Biological Integrity (IBI) is a measure of fish species diversity and species populations. The index is a number that reflects total native species composition, indicator species composition, pollutant tolerant and intolerant species

composition, and fish condition. The higher the calculated score, the healthier the stream system with the highest score being 60 (Ohio EPA, 1997).

ICI - Invertebrate Community Index
The Invertebrate Community Index (ICI) is based on measurements of the macroinvertebrate communities living in a given stream or river. It is a useful evaluation tool of a stream health because: (1) there are a wide variety of pollution tolerant macroinvertebrate taxa; and (2) there are a number of macroinvertebrate types which are known to be intolerant to pollution. The ICI is also on a scale of 0 to 60 with higher scores reflecting healthier macroinvertebrate communities and therefore more diverse communities (Ohio EPA, 1997).

MIwb - Modified Index of Well Being
The Modified Index of Well Being (MIwb) filters out 13 pollutant tolerant fish species and includes fish mass in the final analysis. Using both the IBI and MIwb can give a clear picture of the health of the fish and biological community along a section of stream. Also, by comparing the fish mass versus fish abundance, the Ohio EPA may be able to determine which pollution source is impacting the biological community more than others (Ohio EPA, 1997).

To be in full attainment, all three of these indices must meet standards from regional reference sites reflecting natural or least impacted habitats in each ecoregion. If only one or two of the indices is met, then a stream segment is in partial attainment. If none of the standards are meet then the waterbody is considered to be in non-attainment.

Aquatic Life Use Attainment Status of Nimishillen Creek
Ohio has five ecoregion that have distinct assemblages of biological communities (Figure III-1). Aquatic life use standards for streams in each ecoregion are based on reference sites that reflect natural or optimal conditions. As shown in Table III-1, Nimishillen Creek has been assigned three different aquatic life use designations: Warmwater Habitat (WWH), Modified Warmwater Habitat (MWH), and Limited Resource Water (LWR). For the Nimishillen Creek to be in attainment, each designated use listed in Table III-1 must meet IBI, ICI, and MIwb standards based on reference streams in the Erie-Ontario Lake Plain (EOLP) or West Allegheny Plateau (WAP) ecoregions. The southern sections of the Nimishillen Creek Mainstem resides in the WAP ecoregion, while all other subwatersheds utilize EOLP ecoregion standards (Figure III-1). Water quality standards are generally higher for segments located in the WAP than in the EOLP. Table III-4 summaries biocriteria standards for each aquatic life use designation for each ecoregion.

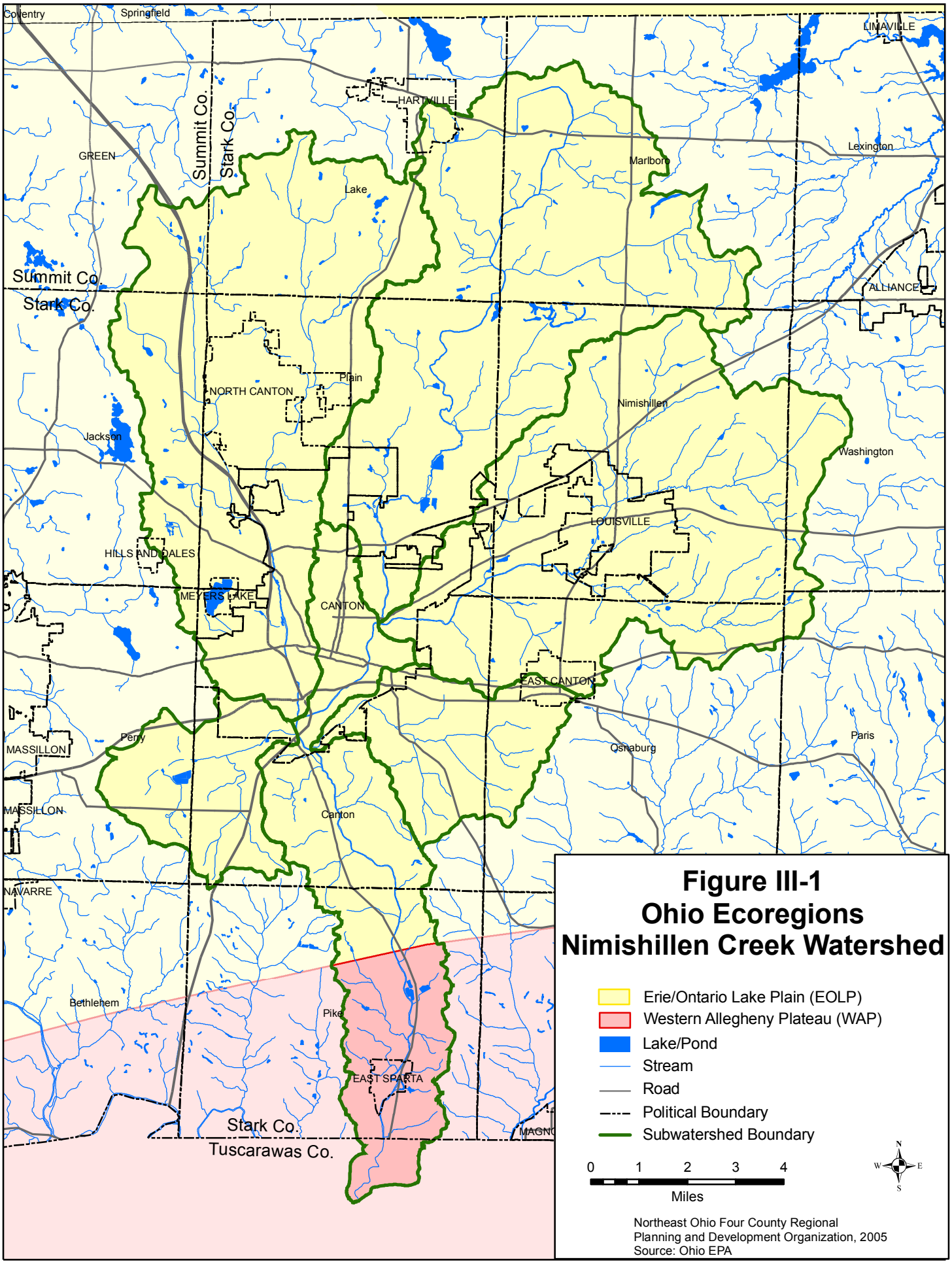


Figure III-1
Ohio Ecoregions
Nimishillen Creek Watershed

Table III-4: Ecoregion Biocriteria for the Erie/Ontario Lake Plain (EOLP) and the Western Allegheny Plateau (WAP)		
Aquatic Life Use Designation	**EOLP**	**WAP**
EWH	IBI - Headwaters = 50 IBI - Wading = 50 IBI - Boat = 48 MIwb - Wading = 9.4 MIwb - Boat = 9.6 ICI = 46	IBI - Headwaters = 50 IBI - Wading = 50 IBI - Boat = 48 MIwb - Wading = 9.4 MIwb - Boat = 9.6 ICI = 46
WWH	IBI - Headwaters = 40 IBI - Wading = 38 IBI - Boat = 40 MIwb - Wading = 7.9 MIwb - Boat = 8.7 ICI = 34	IBI - Headwaters = 44 IBI - Wading = 44 IBI - Boat = 40 MIwb - Wading = 8.4 MIwb - Boat = 8.6 ICI = 36
MWH	IBI - Headwaters = 24 IBI - Wading = 24 IBI - Boat = 24 MIwb - Wading = 6.2 MIwb - Boat = 5.8 ICI = 22	IBI - Headwaters = 24 IBI - Wading = 50 IBI - Boat = 24 MIwb - Wading = 6.2 MIwb - Boat = 5.8 ICI = 22
LWR	IBI - Headwaters = 18 IBI - Wading = 18 IBI - Boat = 18 MIwb - Wading = 4.0 MIwb - Boat = 4.0 ICI = 6	IBI - Headwaters = 18 IBI - Wading = 18 IBI - Boat = 18 MIwb - Wading = ?? MIwb - Boat = ?? ICI = 8
EWH = Exceptional Warmwater Habitat; WWH = Warmwater Habitat; MWH = Modified Warmwater Habitat; LWR = Limited Resource Water; IBI = Index of Biotic Indegrity; MIwb = Modified Index of Well Being; ICI = Invertebrate Community Index		

As of 2004, only 18 percent of the sites assessed in Nimishillen Creek are in full attainment (all three indices meeting ecoregion standards), 45 percent are in partial attainment (one or two of the indices meeting ecoregion standards), and the remaining 37 percent of the sites are in non-attainment (no indices meeting ecoregion standards). Figure III-2 shows the attainment status of the assessed portions of Nimishillen Creek. The entire length of the Mainstem and the most of the East Branch up through the City of Louisville has been assessed for aquatic life use by the Ohio EPA. However, the West Branch, Sherrick Run, Hurford Run, and the Middle Branch have had little or no assessment work completed. Table III-5 summarizes the Ohio EPA's results for aquatic life uses in the watershed.

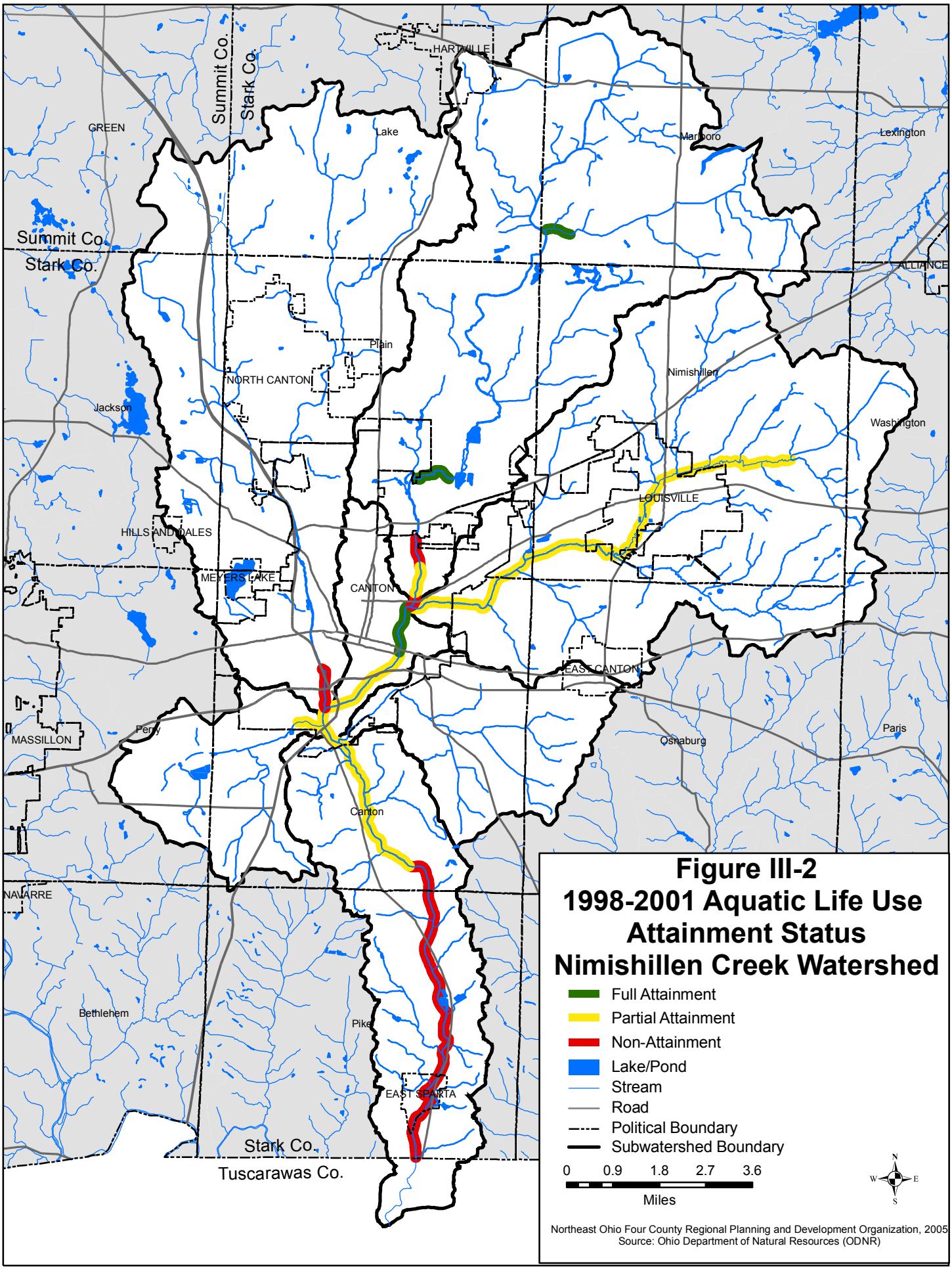


Figure III-2
1998-2001 Aquatic Life Use Attainment Status
Nimishillen Creek Watershed

Table III-5: Summary of Designated Aquatic Life Uses and Attainment Status for Nimishillen Creek and Tributaries

Creek Segment	Segment River Miles (Upper/Lower)	Use Designation(s)	Attainment Status (miles)	Biological Indices: Range in Scores
-Mainstem	14.70/0.00	WWH	Partial = 5.6 Non = 9.10	IBI: 20 - 35* MIwb: 5.4 - 7.4* ICI: 30 - 34*
-Hurford Run	4.95/0.00	MWH, LRW	Partial = 0.40 Non = 2.70	Data Not Available
-Domer Ditch	3.21/0.00	WWH	Non = 3.21	Data Not Available
-Sherrick Run	No Data	WWH, LRW	No Data	No Data
-West Branch	9.00/0.00	WWH	Non = 1.30	Data Not Available
-Middle Branch	16.60/0.00	WWH	Full = 9.40 Partial = 7.20	IBI: 27 - 35^ MIwb: 6.2 - 7.1^ ICI: 36^
-Swartz Ditch	8.10/0.00	MWH	Full = 0.80	Data Not Available
-East Branch	10.40/0.00	WWH	Partial = 5.10 Non = 5.30	Data Not Available

Source: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory
* October 200 Water Quality Permit Support Document for Canton WWTP
^ 2001 Biological and Aquatic Life Use Attainment Study: Lower Middle Branch Nimishillen Creek

Reported causes of water quality impairments from the Ohio EPA include flow alteration, metals, zinc, ammonia, nutrients, pH, organic enrichment, thermal modifications, and pathogens. Sources of pollution cited by the Ohio EPA are industrial point source, municipal point source, and nonirrigated crop production. See Section III for more information on specific water quality data (Ohio EPA 305b Report).

QHEI - Qualitative Habitat Evaluation Index

In addition to surveying the biology of a specific stream segment, the Ohio EPA also examines the in-stream and bank-side (riparian) habitat. This survey is called the Qualitative Habitat Evaluation Index (QHEI) and is designed to provide measures of habitat that normally correspond to physical features that affect biological communities in a stream. Physical features used in this index include composition of the substrate, type and magnitude of cover, condition of the riparian habitat, the quality of the pool and riffles areas, and channel dimensions (Rankin, 1989). Scores can range between 0 and 100 with higher scores equating to better habitat conditions. However, unlike the above indices the **QHEI is not used to determine aquatic life use attainment status for**

streams. However, it has been shown that there is a strong relationship between QHEI scores and aquatic life use scores. Table III-6 shows the relationship between the QHEI and aquatic life use.

Table III-6: Relationship between Ohio's Aquatic Life Uses and the QHEI

Aquatic Life Use	Habitat Characteristics
Exceptional Warmwater Habitat (EWH)	QHEI Scores > 70-75 Excellent Habitat Heterogeneity
Warmwater Habitat (WWH)	QHEI Scores > 60 Good to Fair Habitat Heterogeneity
Modified Warmwater Habitat (MWH)	QHEI Scores < 45 Poor Habitat Heterogeneity
Limited Resource Water (LRW)	QHEI Scores < 20-30 Habitat Limited Sites, Usually < 3 mi^2 Drainage Area

Source: Ohio EPA, "The Use of the Qualitative Habitat Evaluation Index for Use Attainability Studies in Streams and River in Ohio" by Edward Rankin.

Other Water Quality Studies

Over the years there have been numerous studies and documents from various agencies and organizations that directly or indirectly deal with watershed and water quality management for Nimishillen Creek. Information from several of these reports and documents have been incorporated into this Plan. Some of these include:

- *Nimishillen Creek Comprehensive Watershed Management (CWMP) Plan - Phase I*, November 2000, by NEFCO. This is the first Phase of NEFCO's watershed study to aid in the protection and restoration of Nimishillen Creek's water quality. The report is essentially a diagnostic study contain detailed information about land use and land cover, potential sources of pollution, a riparian zone analysis, water quality data, and public meeting information.

- *Nimishillen Creek Comprehensive Watershed Management Plan - Phase II*, November 2000, by NEFCO. This is a continuation of NEFCO's watershed planning for Nimishillen Creek. This Phase evaluates the potential of each land use identified in Phase I to impair the Creek's water quality. It also contains data on the water quality based on macroinvertebrate sampling from six stations in the watershed. Lastly, this report contains preliminary information on the formation of the Nimishillen Creek Action Plan.

- *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III*, June 2001, by NEFCO. Phase III of the Nimishillen CWMP contains additional water quality information based on macroinvertebrate sampling at ten sites throughout the watershed. The main section of this report is the Nimishillen Creek Watershed Action Plan and Cost Analysis which is a strategic plan that

aims to restore and protect water quality, habitat, wildlife, and recreational/commercial uses of natural resources in the watershed. The Action Plan outlines a series of seven goals and numerous objectives that, if achieved, should lead to a higher level of environmental quality and the preservation of important resources.

- *Nimishillen Creek Comprehensive Watershed Management Plan - Phase IV*, April 2003, by NEFCO. Phase IV is the Home Sewage Treatment System (HSTS) Plan developed by the Stark County Health Department and NEFCO. This Plan identifies likely areas where failing systems are affecting surface water quality, provides guidance for financial assistance to homeowners who need to repair or replace their existing systems, summaries long-term inspection and monitoring goals by the Health Department, and outlines a comprehensive educational and outreach program.

- *Nimishillen Creek Macroinvertebrate Surveys*, 2001, 2003, and 2005, by NEFCO. These surveys were funded by the City of Canton to establish baseline data, characterize Nimishillen Creek's water quality in the Canton area, and monitor significant changes to the biology or habitat at the sampling locations. Sampling was conducted in late summer and early fall at sixteen locations throughout the watershed, but mainly around the confluence of the three primary tributaries near downtown Canton. Sampling results for each tributary can be found in the subwatershed plans' portion of this report (Section VII).

- The Ohio EPA has conducted water quality surveys in Nimishillen Creek. A summary of surveys conduced from 1992-2002 can be found in *2002 Integrated Water Quality Monitoring and Assessment Report.*

- *Reifsynder Park Constructed Storm Water Wetland - Macroinvertebrate Monitoring Results*, by NEFCO, November 2004. The City of Canton contracted with NEFCO to conduct macroinvertebrate monitoring up stream and downstream of a constructed storm water treatment wetland to monitor any changes in the macroinvertebrate community as a result of the wetland's installation. The results showed that the constructed wetland had little to no effect on the macroinvertebrate community. However, the results do not rule out the likelihood of water quality (chemistry) improvements resulting from the wetland. The macroinvertebrate monitoring results can be found in the Middle Branch Subwatershed Plan in Section VII of this report.

- Sherrick Run Sampling Results. City of Canton, 2003-2004. In 2003 and 2004, staff from the City of Canton's Water Pollution Control Center tested a abandoned mine effluent into Sherrick Run. Data collected included pH, heavy metals, nutrients, and temperatures. The results from the testing indicated heavy metals from the abandoned mine are impacting the water quality and in-stream

habitat of Sherrick Run. Detailed results can be found in the Sherrick Run Subwatershed Plan in Section VII of this report.

- *Pollutant Removal Efficiencies of a Constructed Storm Water Treatment Wetland in Canton, Ohio*, Spring 2005, by Jim Eynon as part of the requirement for the Masters of Science in Engineering degree at Youngstown State University. This study's goal was to ascertain the effectiveness of a recently constructed treatment wetland along the Middle Branch for removing pollutants from urban runoff. This was completed by comparing the levels of total suspended solids and nutrients in storm water before and after treatment by the wetland. The study provided initial insight regarding the effectiveness of the constructed wetland. High removal efficiencies were documented for total suspended solids, phosphorus, and nitrogen. However, the study was conducted during three rain events range measuring between 0.05 to 0.54 inches. Additional monitoring is needed throughout the year and during higher flow events to gain a more accurate understanding of the overall effectiveness of the constructed wetland.

IV. Water Quality Issues

Overview of Water Quality Impairments

According to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase I*, there are a wide variety of potential pollution sources in the watershed. Pollution sources that can be divided into two categories: Point Source and Nonpoint Source (NPS). Point sources of pollution are those that have a known discharge point, such as a pipe. Nonpoint sources of pollution refers pollution that cannot be tracked back to a single origin or source. Pollution acquired while water drains off of farms, parking lots, yards, and roads are typical examples of NPS pollution.

Point Source Pollution

Figure IV-1 shows the seventy-five permitted point source dischargers in the watershed. These discharges are divided into three categories: municipal, industrial, and private. Municipal discharges are from public water or wastewater treatment plants. There are currently seven municipal dischargers in the watershed. Permitted discharges from industrial plants are generally the byproduct of an industrial process. There are currently eighteen permitted dischargers of this type, and each subwatershed contains at least one industrial discharger. Lastly, private permitted discharges are primarily smaller wastewater treatment systems serving a private residence or business. Fifty of these private discharges are permitted in the Nimishillen Creek Watershed (Figure IV-1). There are also several off-site home sewage treatment systems (HSTSs) in the watershed that should be considered point sources, but are not mapped due to insufficient information. However, locating these off-site HSTSs is currently being addressed as part of the NPDES Storm Water Phase 2 permit being implemented by local entities listed above.

Point sources of pollution have historically been a major cause of water quality degradation in the United States. However, in 1972 the National Pollution Discharge Elimination System (NPDES) was established giving the Ohio EPA the authority to permit or limit what is released into the waterways by point source dischargers. In Stark County, the Ohio EPA monitors all permits that discharge more than 25,000 gallons per day into Nimishillen Creek or its tributaries. The Stark County Health Department regulates discharges less that 25,000 gallons per day that have a NPDES permit. Since inception of the NPDES program, pollution from point source discharges has been greatly reduced and water quality has generally improved. Consequently, this plan will only address point source discharges if they are determined to be illegal, abandoned (mines), and/or the primary factor in preventing a stream segment from meeting state water quality standards.

A new requirement to the NPDES program was added in 2003 to control pollution for storm sewer systems. The NPDES Storm Water Phase 2 permit program was established by the USEPA. It requires nearly all urbanized areas to develop minimum measures to control storm water runoff. Information about this program can be found in Section II of this report. Most communities have until 2008 to fully

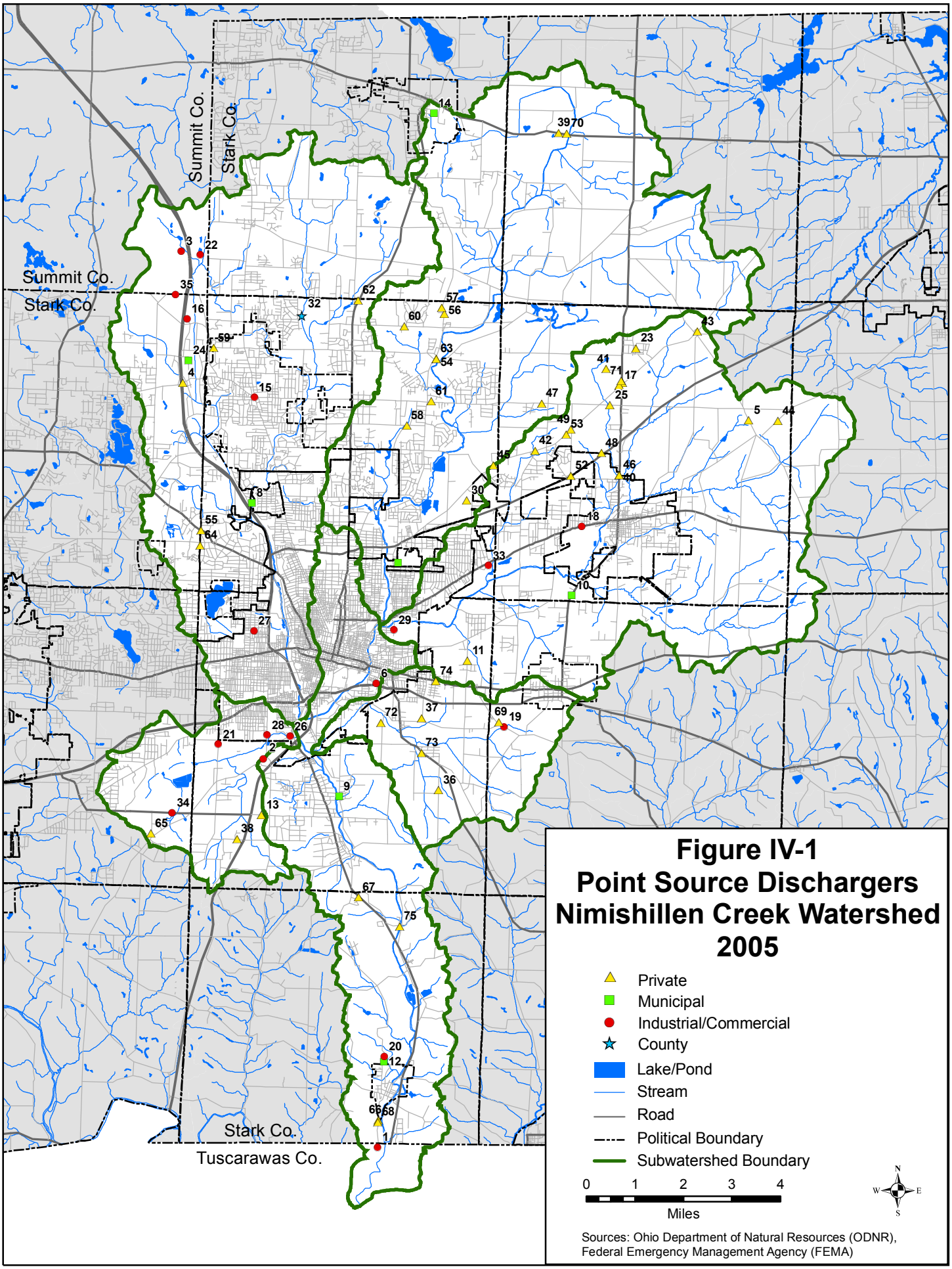


Figure IV-1
Point Source Dischargers
Nimishillen Creek Watershed
2005

implement their Phase 2 program, so little information was available for inclusion in this report. Information, activities, and projects resulting from this program will appropriately be added to this report when available.

Section VII of this report contains a summary of point source dischargers for each of the six subwatersheds. Additional information pertaining to point source dischargers can be found in Appendix B.

Nonpoint Source Pollution

Despite the improved water quality resulting from the NPDES permits limiting point source pollution, streams and rivers are still impacted by pollution. Nonpoint source pollution (NPS) or pollution that has no known discharge point is now seen as the primary cause of water quality problems in the United States including Ohio. These pollutants can have harmful effects on drinking water supplies, recreation, fisheries, and other wildlife.

For Nimishillen Creek, the major sources of NPS pollution in the watershed are directly related to land use and human activity. Failing home sewage treatment systems in unsewered areas, agricultural practices, construction sites, petroleum production, impervious areas, and the seasonal spreading of road salt are all examples of potential sources of NPS pollution in the Nimishillen Creek Watershed.

Over half the watershed is unsewered, so there is a very high potential for these areas to be a source of untreated or inadequately treated sewage entering the creek. When home sewage treatment systems fail, untreated sewage containing nutrients and disease-causing organisms can be released into local streams or groundwater. The potential for HSTS failure is especially high when unsewered areas are within urban areas with unsuitable soils for properly functioning treatment systems. See the HSTS Plan in Section VI for more information.

Agricultural areas in the watershed can also be potential sources of nutrients (nitrogen, phosphorus, and potassium), pesticides, herbicides, organic wastes and associated disease-causing organisms. However, the impact of agricultural areas is gradually decreasing as agricultural areas are converted to residential, commercial, or industrial areas. Subwatersheds 3 and 4 will be the most impacted by agricultural activities since they have the most farm land.

Construction sites can contribute sediment loadings to nearby lakes and streams through erosion of disturbed soils during rain events. This is of particular concern in subwatersheds such as the West Branch with a myriad of construction sites due to suburban sprawl. Suburban development also leads to an increase in impervious or hardened areas. All of the parking lots, buildings, roads, and sidewalks are impervious areas that can facilitate the transportation of spilled pollutants and exacerbate runoff and flooding problems. In addition, impervious areas can also reduce groundwater recharge resulting in lower water tables. Subwatersheds 1, 2,

4, and 6 have the most development resulting in the increase of NPS pollution concerns from impervious areas.

Considering these and other dispersed sources of potential pollution, it is apparent that the entire watershed is highly susceptible to the affects of NPS pollution. Each subwatershed will differ on the type and magnitude of NPS pollution impacting water quality. Therefore, actions to reduce the impacts of NPS pollution will differ to some degree from subwatershed to subwatershed. Section VII contains individual action plans for each of the six Nimishillen Creek subwatersheds to address specific NPS issues for that basin.

Potential Contamination Sources

Lacking specific water quality data to catagorize nonpoint source pollution problems at the time of this report, NEFCO worked with watershed stakeholders to rate potential pollution sources in the Nimishillen Creek Watershed. NEFCO asked stakeholders to rate the level of impact potential pollution sources has on each subwatershed. NEFCO asked the watershed stakeholders to rank 25 different land uses in the subwatershed based on potential impact to Nimishillen Creek water quality. NEFCO then applied the concepts of the Ohio Comparative Risk Project (OCRP) to the local land use rankings.

The OCRP ranked 45 potential threats to human health, ecosystems, and quality of life in Ohio (Ohio EPA, 1995). The result of these efforts was the production of a list of potential point source and NPS pollution sources for the watershed. Table IV-1 has the ranking for the entire watershed of these pollution sources. The table also provides a rating score for each subwatershed with “1" equaling virtually no threat of impairment from that source to “5" representing a high potential pollution threat. For more information on this methodology or study results, refer to the *Nimishillen Creek Comprehensive Watershed Management Plan - Phase II*. Note that subwatersheds 1, 5, and 6 were treated as a single subwatershed for purpose of this survey.

Results from this planning activity show stakeholders rated industrial areas, failing home sewage treatment systems (HSTS), oil and gas exploration (Figure IV-2), and runoff from agricultural lands and construction sites as having the greatest potential to harm the waters of Nimishillen Creek. Also, subwatershed scores of potential pollution sources can help with identify priority areas for water quality restoration and protections measures.

Spills

Spills is a broad term used to cover a variety of past, current, and future pollution threats to Nimishillen Creek’s water resources. A spill is generally the non-permitted release of liquids that present an ecological and/or health risk to the watershed’s wildlife and residents. Common types of spills include petroleum products (diesel fuel, crude oil, etc.), sewage releases, NPDES permit violations, and fish kills. The causes for the spills range from accidents to illegal dumping to bypassing of a

Table IV-1: Ranking of 25 Land Uses in the Watershed and Land Use Characterization Rating for each Subwatershed

Identified Potential Pollution Source	Subwatershed			
	1, 5, & 6	2	3	4
1. Industrial Land Use Areas	5	3	2	5
2. Off-Lot (Discharging) Home/Semi-Public Sewage Treatment Systems (Septic Tanks)	4	1	4	4
2. Failing On-Lot Home/Semi-Public Sewage Treatment Systems (Septic Tanks)	4	1	4	4
3. Oil and Gas Wells (i.e., Oil and Gas Production and Exploration/Drilling Activity)	5	3	5	4
3. Gasoline Use (Including Storage and Transportation of Gasoline)	5	4	4	4
4. Construction Sites	2	3	3	3
5. Industrial Dischargers	4	1	2	2
6. Agricultural Areas	3	2	3	3
7. Trucking Activity and Related Maintenance (Including Diesel Fuel Use)*	3	4	1	2
8. Oil and Gas Pipelines (i.e., Oil and Gas Transportation)	4	4	2	2
9. Mining Activity*	4	3	1	1
10. Landfills and dumps*	3	1	1	1
11. Nurseries/Greenhouses and Landscaping Operations*	2	2	2	2
11. Golf Courses*	1	3	3	1
12. Impervious Areas (e.g., Rooftops, Roads, Parking Lots, etc.)	4	5	2	2
13. Semi-Public Wastewater Treatment Plants (Package Plants-discharging less than 100,000 gpd)	3	2	3	3
14. Public Wastewater Treatment Plants (Municipal and County POTWs)	3	2	2	3
14. Lawn and Garden/Household Maintenance Activity*	2	4	2	2
14. Excess Nutrients From Natural Sources (e.g., Geese)*	2	2	1	1
15. Salt Storage and Seasonal Spreading of Salt	3	2	2	2
16. Fuel Oil Use (Including Storage and Transportation of Fuel Oil)*	3	2	2	2
17. Polychlorinated Biphenyls (PCBs) Use (Used in Some Electrical Transformers)*	3	1	1	3
Leaking Underground Storage Tanks (information was not available at time of evaluation)**	--	--	--	--
Registered Underground Storage Tanks (information was not available at time of evaluation)**	--	--	--	--
Abandoned Drinking Water Wells (information was not available at time of evaluation)**	--	--	--	–

*Documentation is not available at this time.
**Ranking was not possible.
1 = Virtually no potential to impair surface water and/or ground water quality.
2 = Low potential to impair surface water and/or ground water quality.
3 = Moderate to impair surface water and/or ground water quality.
4 = High to impair surface water and/or ground water quality.
5 = Very high to impair surface water and/or ground water quality

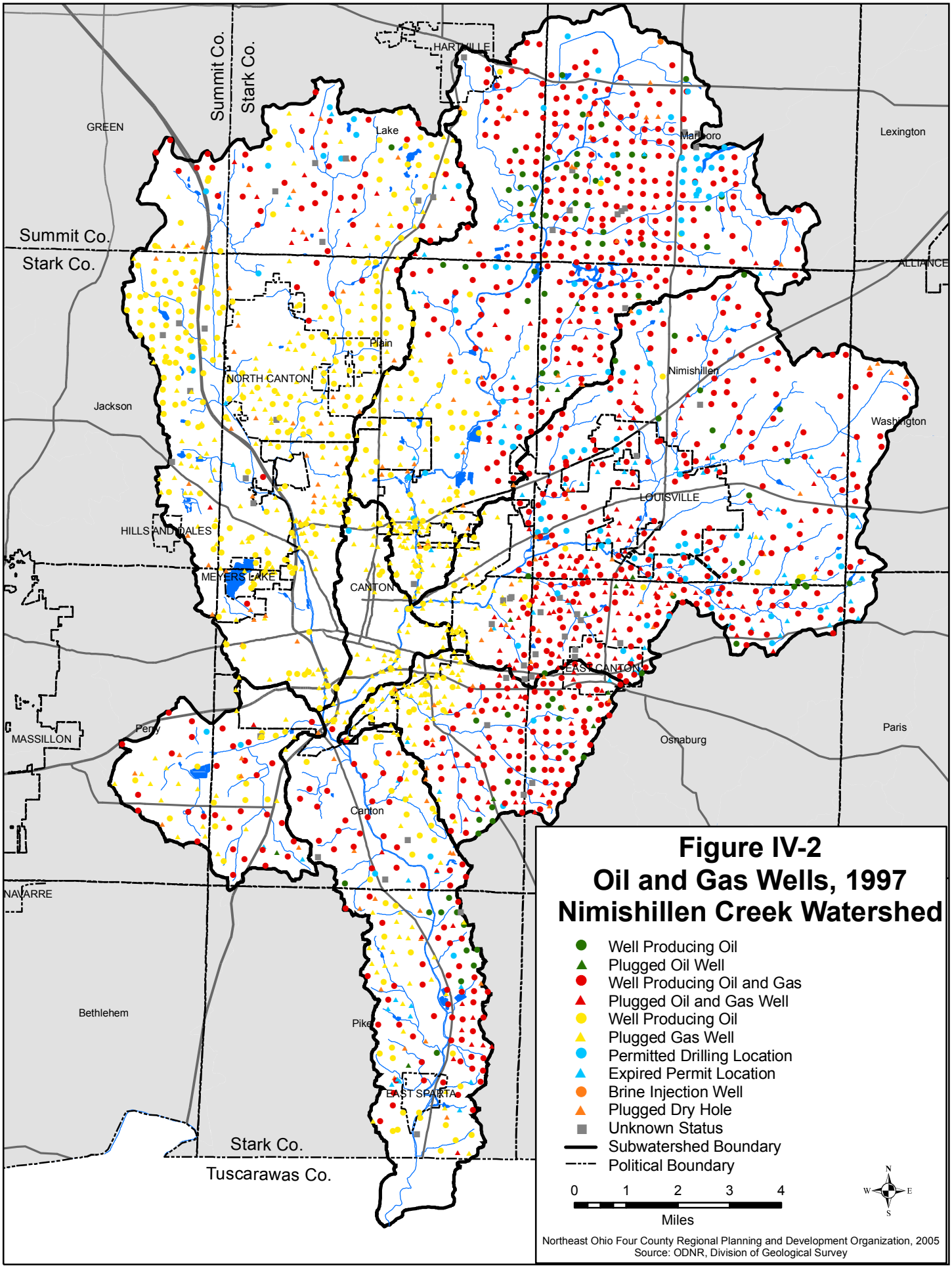


Figure IV-2
Oil and Gas Wells, 1997
Nimishillen Creek Watershed

Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: ODNR, Division of Geological Survey

sewage treatment systems during high volume flows. Unfortunately, a good number of spills occurring in the Nimishillen Creek Watershed and Ohio are often unknown.

The Ohio EPA Division of Emergency and Remedial Responses (DERR) takes the lead on significant spills in Ohio. Since 1990, the DERR has responded to 75 spills in the Nimishillen Creek Watershed, an average of nearly 5 spills per year. This is not surprising since the watershed is partially located in a densely populated urban/suburban area with major highways, manufacturing facilities, an oil refinery, and other businesses.

Each of the six subwatersheds has had a spill reported to DERR, with spills occurring more frequently in the subwatersheds with dense population and major highways. The Mainstem, West Branch, East Branch, Middle Branch, Hurford Run, and Sherrick Run Subwatersheds have had respectively 34, 16, 14, 7, 4, and 1 spills reported since 1990. Petroleum based spills are the most common types with 23 on record with DERR. The second and third most common spills are wastewater permit violations and sewage spills with 16 and 15 reported, respectively. There have been four fish kills and three paint spills since 1990. A variety of materials, some unknown, comprise the remaining 14 spills in the watershed. Figure IV-3 shows the location and general type of spills in the watershed, and Appendix H has detailed information about each spill.

Please note that the spills information provided by the Ohio EPA DERR to create Figure IV-3 and Appendix H appears to contain errors. The Nimishillen Creek Watershed Partners Core Committee reviewed the Ohio EPA report and identified some inaccuracies regarding entities responsible for the spills and the spill locations. Specifically, some of the entities cited in the Ohio EPA report do not exist, like the North Canton Waste Water Treatment Plant. Also general locations were given for some of the spills making precise mapping of the spills difficult. If updated and/or corrected Ohio EPA DERR information becomes available regarding these reporting errors, it will be included in future Action Plan updates. Lastly, despite these apparent reporting errors the information provided by Ohio EPA clearly shows spills as a past, present, and future threat to all the Nimishillen Creek subwatersheds.

General Watershed Issues

Nimishillen Creek is not meeting State of Ohio water quality standards as a result of various natural processes and human activities. Some of these activities directly lead to pollution being dumped into the Creek. Other activities lead to the indirect introduction of pollutants to the stream. Still other activities may not lead to pollutants being introduced to the Creek, but ultimately reduce the ability of Nimishillen Creek to process or assimilate increase pollution or water loads. It is a combination of all of these actions and pollution sources that have lead to degraded water quality in the basin.

Below are general watershed issues that affect the water quality in the entire Nimishillen Creek Watershed. These issues represent, in the view of local stakeholders, either a

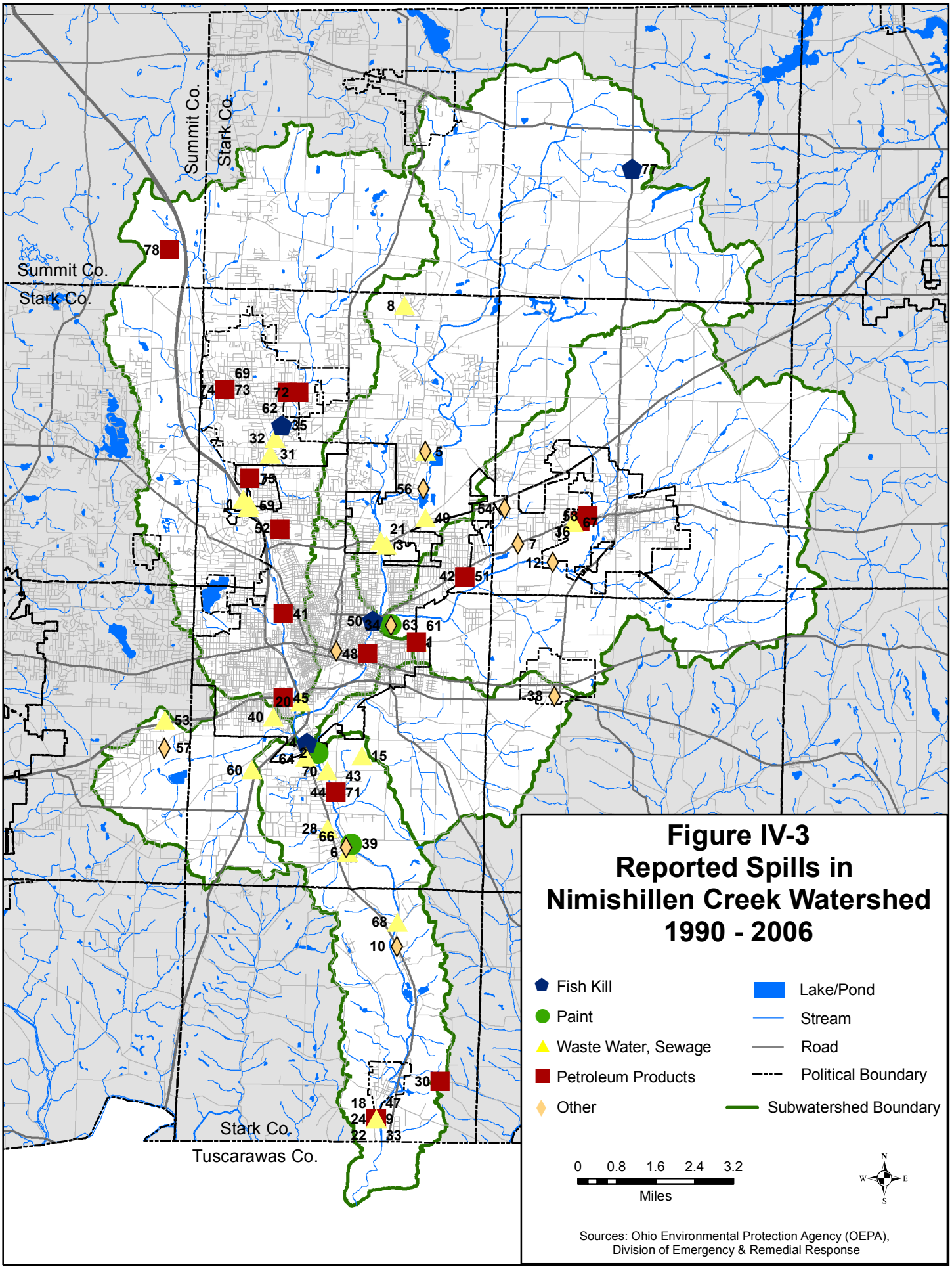


Figure IV-3
Reported Spills in Nimishillen Creek Watershed 1990 - 2006

primary reason why the water quality is not meeting standards and/or a prominent local water issue. Each issue contains a brief overview of the problem and the subwatersheds most impacted by the issue. The individual subwatershed plans contained in Section VII expand on these issues by establishing goals, objectives, and actions to address these issues. Please refer to these subwatershed plans for more information regarding specific watershed issues for each of the six subwatersheds.

- **Issue: Erosion and Sedimentation**
  Subwatersheds of Concern: East Branch, West Branch, and Middle Branch

  Erosion and sedimentation of concern in the Nimishillen Creek Watershed occurs when excessive soil particles are transported from land by wind or water and deposited in nearby streams and lakes. Erosion and deposition of sediments is a natural and beneficial process that occurs in every river basin. However, excess erosion and sedimentation in a watershed can severely impact a stream. Sediments can cloud the water reducing the sunlight reaching aquatic plants, blanketing the streambed covering fish spawning areas and macroinvertebrate habitat, and clogging the gills of fish. In addition, eroded soil particles often have attached to them other pollutants like nutrients, heavy metals, and pathogens that can also degrade water quality. For these reasons, the Ohio EPA ranks sedimentation as one of the leading causes of aquatic life use impairment.

  The two primary erosion types of concern in the basin are in-stream erosion and erosion associated with storm water runoff. In-stream erosion occurs when the water velocity is sufficient to remove soil particles. This type of erosion results in either a combination of lateral erosion along the banks, down cutting (deepening) of the stream bed, or headward erosion along the stream's upslope. An increase in water velocity and/or volume can increase a streams in-stream erosion potential.

  Erosion from runoff after a rain event is also a concern. As rain water moves over a field, lawn, or parking lot it picks up loosened dirt and other particles. Areas with exposed or barren soils are most at risk of being eroded by rain water because the lack of cover to break the fall of rain and hold the soil together. The type of areas often susceptible include construction sites, tilled agricultural fields, animal pastures, and any barren areas near a stream or lake.

  Best management practices are available to combat both in-stream and runoff erosion to reduce the amount of sediment entering Nimishillen Creek. The NPDES Storm Water Phase 2 permit program requires all construction sites over one acre in size to implement erosion prevention measures. There are also several erosion prevention programs available through the United States Department of Agriculture and other similar agencies to educate and assist farmers and ranchers in reducing erosion. Lastly, there are techniques based on natural channel design principals that can help repair and/or stabilize in-stream erosion. All of these options should be promoted as appropriate to address erosion and sedimentation problems in the watershed.

- **Issue: Urbanization/Suburbanization**
  Subwatersheds of Concern: West Branch, Middle Branch (Canton Portion), Mainstem (Canton Portion), and Hurford Run

  Historically, the development of urban and suburban areas often come as a detriment to the health of local water resources. Although water is a valuable resource for any community, it was often utilized and controlled without regard for the health of the stream or lake. Streams were straightened, dammed, moved, filled in, and/or used as waste dumps depending on the needs of the community. It was not until the passage of the Clean Water Act in the 1970s that streams and lakes began to receive protection from these actions. However, many of these historical modifications to and uses of the lakes and streams still impact the health of the water body today.

  The protections now in place prevent many of the most directively destructive actions to local water resources that have historically occurred as a result of development. However, urbanization and suburbanization still can and do negatively impact the quality of local water resources. Development typically leads to increased impervious areas, more storm water runoff, decreased groundwater recharge, increased water volume in streams, more pollution in runoff, and decreased open space and agricultural lands.

  New regulations as a result of the NPDES Storm Water Phase 2 permit program require minimum measures to address current and future water quality concerns with regards to development and urbanization (see Section II). However, water quality impacts as the result of development prior to the implementation of the Phase 2 requirements will remain and continue to impact the Creek. A wide variety of preventative and restorative measures to deal with past, current, and future development pressures are needed to ensure healthy water quality in the Nimishillen Creek Watershed.

- **Issue: Improperly Treated Wastewater**
  Subwatersheds of Concern: East Branch, Middle Branch, West Branch, Mainstem, and Sherrick Run

  Failing wastewater treatment systems add pollutants to a waterway that can prevent attainment of aquatic life use designation standards and jeopardize the public's health. Untreated or poorly treated wastewater, or sewage, often contains bacteria, viruses, parasites, and other pathogenic organisms from humans that are transmitted through water and infect individuals who come into contact with a polluted waterway. Wastewater can also contain chemicals and nutrients (nitrates and phosphorus) that also impact a stream and cause local health concerns. In addition to public health, improperly treated wastewater can affect in-stream vegetation and organisms. Increased phosphorus levels can cause algae blooms and increased weed growth killing off more beneficial, native vegetation. Organic

material in sewage is broken down by bacteria which consumes oxygen and in effect starves other organisms in the water of oxygen.

Fortunately, since the passage of the federal Clean Water Action in the 1970s, the U.S. and Ohio Environmental Protection Agencies have regulated discharges from wastewater treatment (sewage) plants and other point source dischargers through the National Pollutant Discharge Elimination System (NPDES) permit program. This program monitors and limits the amount of pollution that sewage treatment facilities can discharge in to nearby surface waters and has been responsible for significant water quality improvements in Ohio including Nimishillen Creek. The Cities of Canton and Louisville and the Village of Hartville have wastewater treatment plants that discharge into the Mainstem and East Branch, respectively. No area within the Nimishillen Creek Watershed has a combined storm water and municipal sewage system. Ths limits the occurrences of untreated or “raw” sewage from being dumped into Nimishillen Creek without treatment.

Since discharges from a wastewater treatment plant is regulated by the Ohio EPA and combined storm water and sanitary sewer overflows do not exist in the Nimishillen Creek Watershed, the impact of improperly treated wastewater on water quality is primarily the result of failing home sewage treatment systems (HSTSs), often referred to as septic systems.

Over half the watershed is unsewered and uses HSTSs. The Stark County Health Department estimates that there are approximately 3,000 to 5,000 systems in the watershed. Section VI contains an HSTS Plan designed to reduce pollution from failing septic systems including the establishment of an operations and maintenance (O&M) program. The greatest concern for HSTS pollution into Nimishillen Creek is unsewered areas with high housing densities which are located on soils that poorly treat home sewage. These are mainly located in townships surrounding the Cities of Canton, North Canton, and Louisville.

- **Issue: Riparian Corridor Segmentation and Incursion**
  Subwatersheds of Concern: Middle Branch, West Branch, Swartz Ditch, Mainstem within the City of Canton, and Hurford Run

As discussed in Section II, riparian or streamside vegetation plays an important role in the overall health on Nimishillen Creek. In general, riparian vegetation reduces the amount of sediment and nutrients introduced to the stream by filtering runoff and stabilizing streambanks. Riparian vegetation also provides shade or cover that decreases the maximum temperatures in the summer and increasing minimum temperatures in the winter. Lastly, riparian areas provide important habitat to wildlife (Allan, 1995).

However, removal or degradation of the riparian habitat is often commonplace when human settlement occurs (Allan, 1995). Native vegetation is often cleared to make

room for cropland, houses, roads, railroads, and/or businesses. This streamside vegetation removal results in increases in sediment and nutrients reaching nearby streams, increased variations in water temperature due to the loss of shade, and reduction in wildlife habitat.

In the Nimishillen Creek Watershed, the riparian habitat has been disturbed in both agricultural and urban areas. Riparian habitat degradation from agricultural improvements occurred primarily along the headwaters of the Middle and East Branches in Nimishillen, Marlboro, and Lake Townships. The loss of riparian vegetation along the West Branch was the combination of agricultural improvements in the first half of the 1900s followed by urbanization and suburbanization along Interstate 77 and near the Akron-Canton Airport. Riparian vegetation within the City of Canton has been removed as the city has expanded. However, Canton has numerous parks along Nimishillen Creek that would be logical areas for riparian habitat restoration. Lastly, Hurford Run was found to have the most degraded riparian vegetation of any of the areas studied due to the heavy industrial use of the area. Restoration along most sections of Hurford Run will be difficult and require the cooperation of the industrial owners of the riparian areas.

- **Issue: Channel Modification**
  Subwatersheds of Concern: West Branch, Middle Branch, and Hurford Run

Channel modification is a human alteration of the natural condition of a stream's shape and/or flow. Typical modifications include channelization, dams, culverts, dredging, and ditches. Channel modifications disrupt the natural functions of a stream often leading to number of problems that can include changes in water velocities, changes in water temperature, reduced habitat for aquatic organisms, and changes to the stream's ability to transport sediment. In addition, channel modification not only impacts the section of a stream being modified, but can also change the stream characteristics upstream and downstream of the modified section. These impacts can include channel downcutting, excess bank erosion, and aquatic habitat loss.

Channelization and ditching are the primary channel modification issues for Nimishillen Creek and its tributaries. As the watershed was settled and developed, the Creek was straightened to "improve" drainage and provide more land for farming and buildings. Most of this work was completed prior to the 1950s. Some of the ditches created include Swartz Ditch (Middle Branch), McDowell-Zimber Ditch (West Branch), and Domer Ditch (Hurford Run). Maintenance of the ditches has been sporadic over the years resulting in problems such as sedimentation and log jams.

It is impractical return all these modified sections of Nimishillen Creek back to a natural condition. However, where appropriate, improvements to these channelized sections must be considered and implemented to improve channel and habitat conditions. Types of improvements could include better riparian vegetation, bank

stabilization, two-stage ditches, and limited restoration of natural channel geomorphology.

- **Issue: Flooding**
  Subwatersheds of Concern: East Branch, West Branch, and Mainstem

Floods are natural events for all stream and rivers and occur when there is enough water to spill over streambanks and onto adjacent land called the floodplain. Typically, communities experience some kind of flooding after spring rains, heavy thunderstorms, or winter snow melts. These events generally develop over a period of days. However flash floods, as the name implies, develop quickly when intense storms dump a large amount of rain in a small area over a short time. Flash floods provide little or no warning and reach their maximum intensity in just a few minutes.

The magnitude of flooding in a given area results from both environmental and societal factors. Climate, land slope, soils, and other environmental factors all influence the amount, duration, and frequency of floods in a given area. However, society, collectively and individually, also make choices that influence flooding, usually for the worse. All of the following can affect the frequency, duration and magnitude of a flood and increase damage caused by an event: increasing the number of people living in or near floodplains, reducing the amount of wetlands, increased pavement (impervious area) over soil, removing stream-side (riparian) vegetation, filling in floodplains, and altering the shape of a stream channel (straightening or ditching).

Nimishillen Creek is typical in that it has had its share of flooding. Community interest in flooding has recently heightened due to above average rainfall in the watershed since late 2002 which has resulted in several minor and two serious flood events. The most severe flooding within the last few years occurred in July 2003 resulting in the Federal Emergency Management Agency (FEMA) declaring the watershed area a "major disaster." Homes, businesses, roads, and infrastructure were damaged or lost as a result of the flooding. The Cities of Canton, Louisville, and North Canton along with neighboring townships all received flood damage. A county-wide initiative called the Stark County Drainage Task Force was initiated after the July 2003 flooding to address both environmental and societal issues related to reducing flooding impacts to Stark County and Nimishillen Creek Watershed residents (see Section II).

Although reducing flooding in Stark County is a water quantity (amount) and not a water quality issue, many of the factors exacerbating flooding also adversely impact water quality. The reduction of wetlands, increase of impervious areas, removal of stream-side vegetation, and stream ditching are all practices that have been shown to increase the amount or magnitude of flooding while decreasing water quality. In addition, some traditional approaches to reducing flooding impacts such as dredging, dikes, levees, and channelization can also have a negative impact on

water quality. Therefore, the goal in the Nimishillen Creek Watershed in addressing flooding problems is to promote practices or actions that are beneficial to both water quantity and quality concerns while working to limit or eliminate water quantity practices that impair water quality.

- **Issue: Acid Mine Drainage**
  Subwatersheds of Concern: Sherrick Run, Mainstem

Acid Mine Drainage (AMD) is a common byproduct of coal mining that results when mineral pyrite (FeS_2) is exposed to air and water producing a reaction that forms sulfuric acid and iron hydroxide. This drainage can severely impact local waterways by lowering pH levels and coating stream bottoms with orange sediment comprised of iron hydroxide, commonly called "yellow boy". The problem occurs primarily in areas with old abandoned coal mines.

The Nimishillen Creek Watershed has a history of coal mining, particularly in the unglaciated southern portion of the watershed. Sherrick Run and the Mainstem have the greatest number of abounded mines as shown in Table IV-2. Both waterbodies show signs of decreased water quality from AMD in a few distinct locations. These sites clearly display the typical "yellow boy" colored coating on the stream bottom, and preliminary tests show an impact on the biological communities downstream of these sites. Treatment options for AMD sites need to be explored to alleviate AMD's impacts on Nimishillen Creek and its tributaries.

Table IV-2: Abandoned Underground Coal Mines in the Nimishillen Creek Watershed

Mine Name	Identification Number	Bedrock Formation	Year Abandoned	Subwatershed
Arntz Coal	341518011402	Middle Kittanning No.6	1914	Mainstem
Bernhardt	341538002102	Brookville No. 4	1918	West Branch
Black Oak	341518014602	Not Given	1921	Mainstem
Black Oak No. 2	341518009802	Brookville No. 4	1938	Mainstem
Canton Hollow Block	341518002302	Brookville No. 4	1914	Sherrick Run
Chestnut Ridge	341518019802	Lower Kittanning No. 5	1922	Mainstem
Coal and Limestone	341518022002	Brookville No.4	1919	Mainstem
Deibel	341518027102	Not Given	Not Given	Mainstem
Eberhart	341518016402	Middle Kittanning No. 6	1932	Mainstem
Edegefield	341518009202	Brookville No. 4	1917	West Branch
Edegefield No. 2	341518021102	Brookville No. 4	1935	Sherrick Run

Mine Name	Identification Number	Bedrock Formation	Year Abandoned	Subwatershed
Failor	341518027202	Not Given	Not Given	Mainstem
Harrisburg	34158021402	Middle Kittanning No. 6	1916	East Branch
Hipple	341518025702	Middle Kittanning No. 6	1942	Mainstem
Hoover	341518013602	Not Given	Not Given	West Branch
Immel No. 1	341518022202	Middle Kittanning No.6	1924	Sherrick Run
Jones	341518013402	Not Given	1923	Sherrick Run
Lake Erie No. 1	341518001002	Not Given	1898	Sherrick Run
Martin	341518024202	Not Given	1920	Middle Branch
Massillon Standard	341518004002	Not Given	1896	Sherrick Run
McGintey	341518018402	Middle Kittanning No. 6	1919	East Branch
Milton	341518020502	Brookville No. 4	1920	Mainstem
Myers	341518017302	Brookville No. 4	1939	West Branch
Pike	341518010502	Brookville No. 4	1919	Mainstem
Pike Run No. 2+4	341518014502	Brookville No. 4	1922	Mainstem
Pike Run No. 1	341518014302	Brookville No. 4	1920	Mainstem
Pike Run No. 6	341518019002	Not Given	1938	Mainstem
Rindchen	341518024302	Middle Kittanning No. 6	1937	Sherrick Run
Sauter	341518018702	Middle Kittanning No. 6	1938	Mainstem
Shotmacher	341518017202	Brookville No. 4	1934	West Branch
Sonnhalter No. 1	341518016102	Brookville No. 4	1924	Mainstem
Summit Hill	341518002402	Not Given	1915	West Branch
Sunnyside	341518027302	Not Given	Not Given	Mainstem
Swan	341518007502	Lower Kittanning No. 5	1901	Mainstem
Thouverin	341518023302	Middle Kittanning No. 6	1935	Sherrick Run
Tressel	341518004402	Not Given	1896	Sherrick Run
Willow Springs	341518005302	Lower Kittanning No. 5	1896	Mainstem
Wymer	341518012202	Middle Kittanning No. 6	Not Given	Sherrick Run

Source: Ohio Department of Natural Resources, Division of Geological Survey.

V. Load Reductions

Load reduction calculations of water quality pollutants in Nimishillen Creek are currently being done by the Ohio EPA as part of its Total Maximum Daily Load (TMDL) study for the watershed. The TMDL report is scheduled to be completed in 2006, at which time any load reduction calculations or modeling results will be included in this section of the watershed action plan. Until then, load reductions of various pollutants will be determined on a project by project basis. In other words, projects completed from this plan will include load reduction information, where appropriate. Lastly, the subwatershed plans (Section VII) contains load reduction estimates for certain actions and best management practices.

VI. Home Sewage Treatment System Plan

Purpose of the HSTS Plan

The Stark County Health Department (SCHD), along with assistance from the Northeast Ohio Four County Regional Planning and Development Organization (NEFCO), has developed a Home Sewage Treatment System (HSTS) Plan for the Nimishillen Creek Watershed (Figure VI-1) to effectively coordinate the correction of failing HSTSs. The HSTS Plan:

- Identifies target areas of impairment caused by failing HSTSs
- Provides guidance for financially assisting homeowners in order to correct failing systems
- Outlines long-term inspection and monitoring goals
- Offers a comprehensive educational and outreach program

The Stark County Health Department covers essentially all unsewered areas of the watershed and county. The vast majority of the other health districts in the watershed primarily cover sewered areas. Furthermore, if a land parcel within another health department's jurisdiction within Stark County is proposed to be served by a home sewage treatment system, then the Stark County Health Department, having expertise in the program, does all the siting and installation inspections.

Within its jurisdiction, the Stark County Health Department requires a home sewage treatment system upgrade usually for one of the following reasons:

A. Nuisance abatement program: inspects a HSTS upon submission of a written complaint.
B. Evaluation for an addition to a home i.e. adding living space to home.
C. Home sale inspection conducted by Health Department personnel or a private contractor. However, this program is highly subject to contractor interpretation, and relies on the buyer or seller to notify the department.
D. Evaluation of a community with a high density of failing systems, which typically results in working with the community for the expansion of sewers.

Currently, the SCHD investigates an average of 55 HSTS written nuisance complaints per year throughout Stark County. With additional funding, the Health Department would increase HSTS inspections and establish an Operation and Maintenance (O&M) Program in the Nimishillen Creek Watershed. The three year goal will be to inspect between 3,000 to 5,000 HSTSs in the watershed to determine system location, type, and condition. Also, 100 percent of HSTSs inspected in the watershed would be enrolled in the O&M Program resulting in follow-up inquiries and, if needed, enforcement actions following standard Health Department protocol for the repair or replacement of failing HSTSs.

The Stark County Health Department also proposes to initiate a cost-sharing program for homeowners in need of financial assistance to correct failing, non-discharging

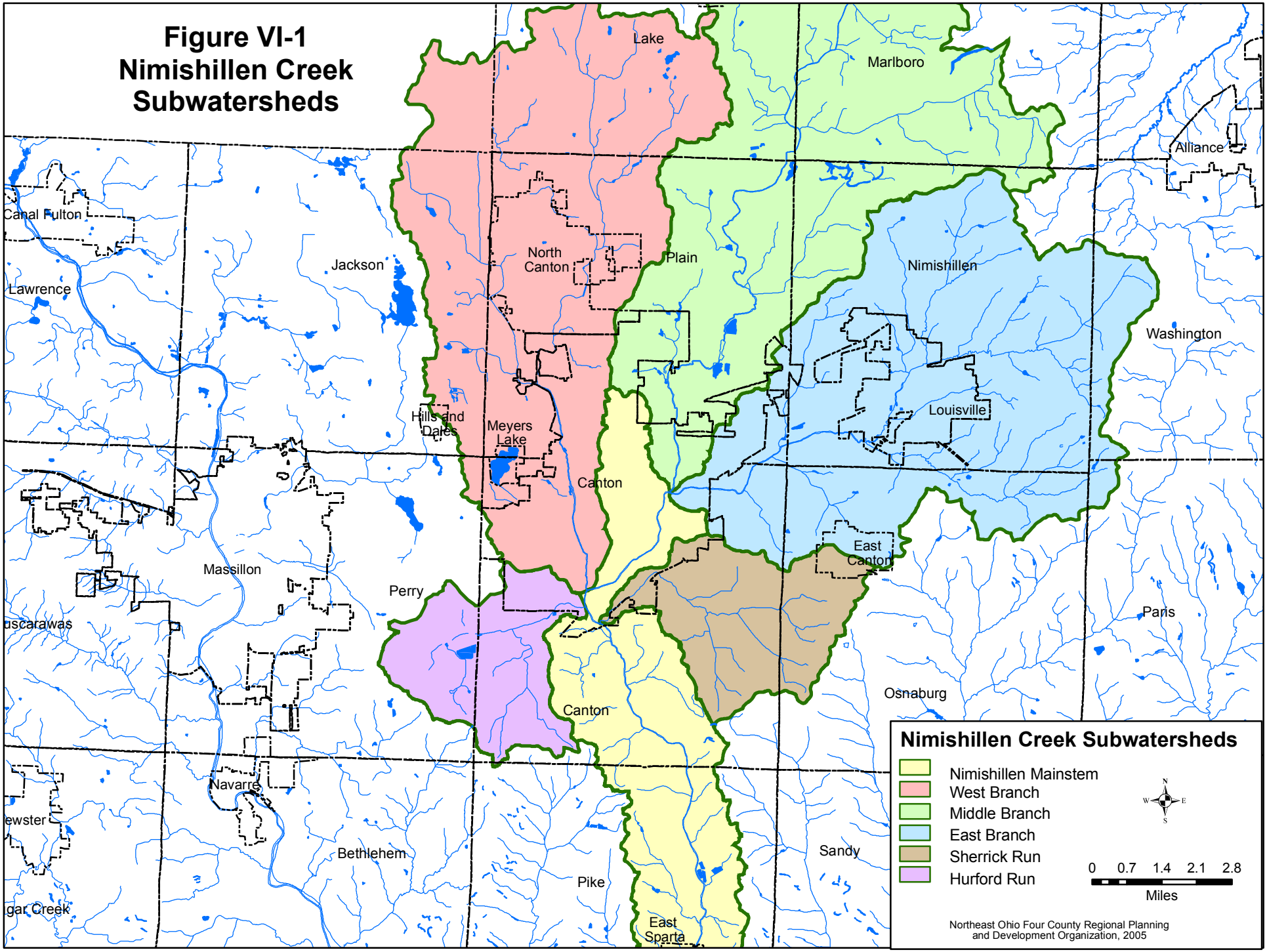


Figure VI-1
Nimishillen Creek Subwatersheds

HSTSs. Furthermore, a comprehensive education and outreach program will be implemented to include public meetings and consultation/education with individual homeowners during HSTS inspections. Lastly, the Health Department would like to offer incentives for the use of alternative HSTS technology, enabling the county to further develop non-discharging options for difficult repair situations.

The Stark County Health Department's HSTS Plan for the Nimishillen Creek Watershed focuses on the reduction of nonpoint source (NPS) pollution arising from home systems; however, it will also serve as a model for the development of a county-wide O&M Program. Thus, funding for this HSTS Plan will continue to benefit the watershed, as well as other watersheds within Stark County.

Key Features Affecting HSTSs in the Nimishillen Creek Watershed

Topography and Geology

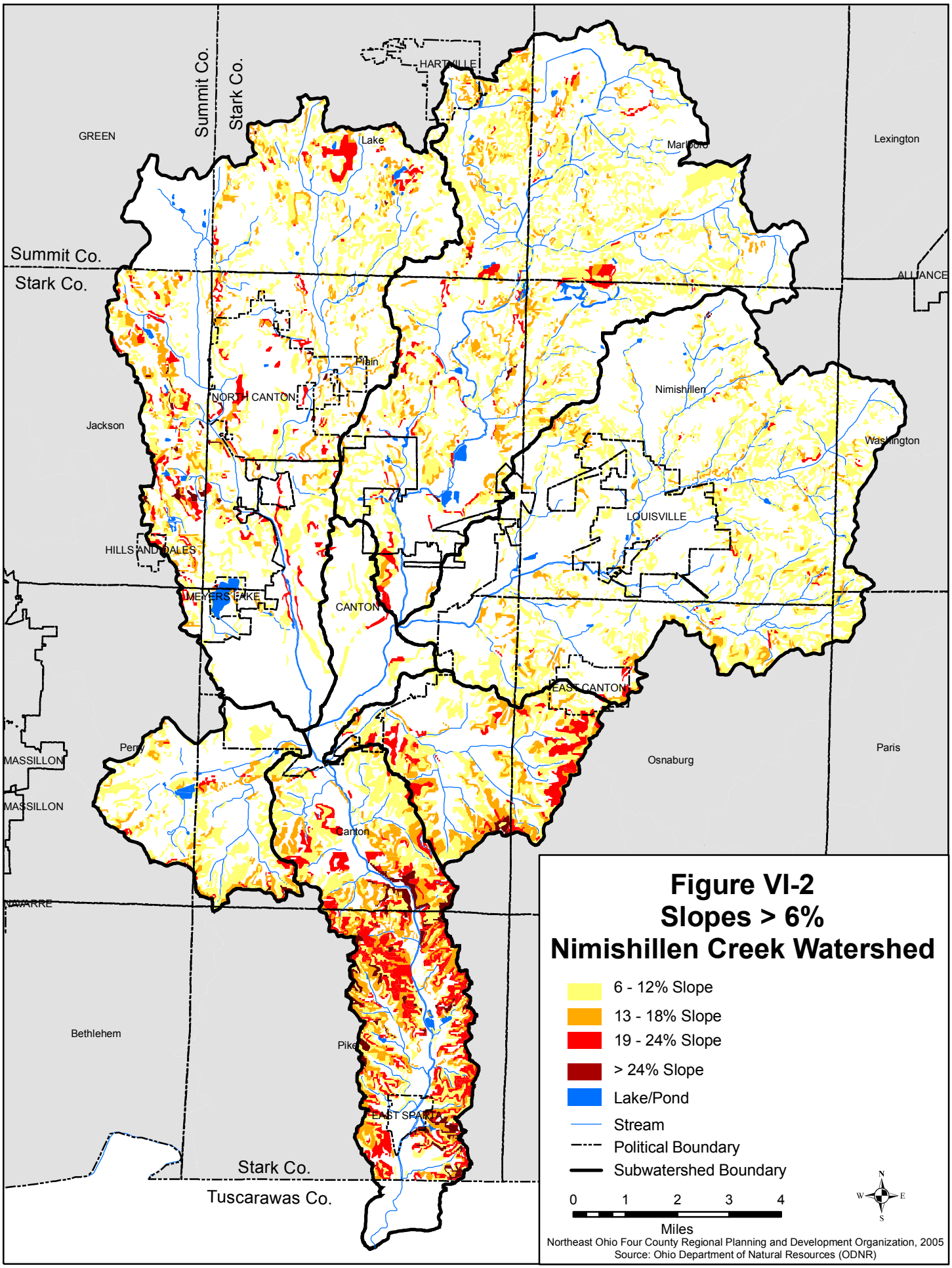
As mentioned above, the Nimishillen Creek Watershed lies in two subdivisions of the Appalachian Plateau province. The northern two-thirds of the watershed resides in the glaciated section of the Appalachian Plateau, and the southern one-third in the unglaciated section (Figure II-5). The headwaters in the northern and central portions of the county have moderate relief and gentle slopes due to glacial movement and depositions. However, in the unglaciated southern portion of the watershed, the Creek's Mainstem has cut a narrow gorge through highlands resulting in steep sloping upland areas and broad flat expanses in the floodplains.

Figure VI-2 shows the areas in the watershed where slopes are greater than 6 percent, with the steepest slopes predominately occurring in the southern portion of the watershed. The townships of Canton, Osnaburg, and Pike in the southern unglaciated section of the watershed have the most areas affected by steep slopes. Slopes greater than 12 percent are generally poor conditions for the installation of a properly functioning HSTS. However, this has not been a severe problem for two main reasons. First, to construct a home and driveway on steeply sloping ground has its own limitations, so many potential sites have not been developed. Second, sewage site evaluations have excluded development on steep slopes. These two factors have limited growth in these areas. In the Nimishillen Creek Watershed, severe soil types have by far caused the greatest problem for HSTSs.

Soils

The principal natural feature limiting HSTS installation and/or function in the Nimishillen Creek Watershed and all of Stark County is its soils. Within the unsewered portions of the watershed, there are 101 HSTS-limiting soil types, as determined by the Stark County Health Department. Figure VI-3 shows all of the soils in the unsewered areas of Nimishillen Creek Watershed which limit HSTS installation and function. The limiting soil types covering the largest areas (greater than 2,000 acres) in the watershed are:

- Ravenna Silt Loam, 0 to 2% slopes (ReA) - 3,344 acres - These soils consist of somewhat poorly drained soils in broad areas in the glaciated (northern)


Summit Co.
Stark Co.
HARTVILLE
GREEN
Lake
Marlboro
Lexington
Summit Co.
Stark Co.
ALLIANCE
Plain
NORTH CANTON
Nimishillen
Jackson
Washington
LOUISVILLE
HILLS AND DALES
MEYERS LAKE
CANTON
EAST CANTON
Perry
MASSILLON
MASSILLON
Osnaburg
Paris
Canton
NAVARRE
Bethlehem
Pike
EAST SPARTA
Stark Co.
Tuscarawas Co.
Figure VI-2
Slopes > 6%
Nimishillen Creek Watershed
6 - 12% Slope
13 - 18% Slope
19 - 24% Slope
> 24% Slope
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 1 2 3 4
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

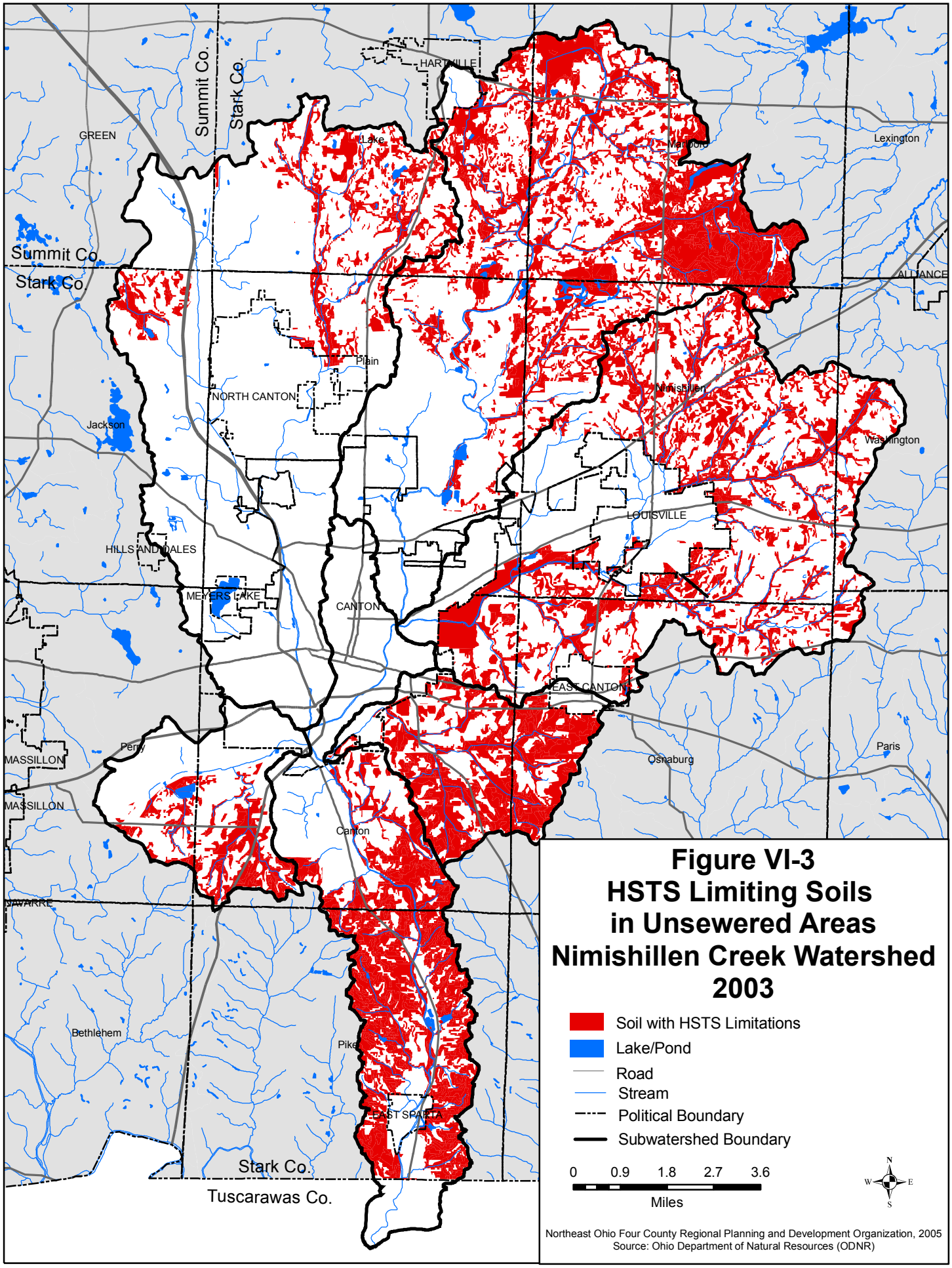


Figure VI-3
HSTS Limiting Soils in Unsewered Areas
Nimishillen Creek Watershed
2003

parts of the watershed. They have a seasonally high water table for significant periods and are slow to dry out in the spring. They are categorized as having "severe" limitations in treating home sewage effluent.

- Sebring Silt Loam (Se) - 2,642 acres - This soil occurs in concave areas in shallow drainageways and in broad basin-like areas on the glacial till plain. Excessive wetness is the major limitation to the use of this soil for most non-farming uses. It is categorized as having "severe" limitations in treating home sewage effluent.

- Canfield Silt Loam, 6 to 12% slopes (CdC2) - 2,527 acres - These soils occur along drainageways and in the lower part of long slopes. Areas are irregular in size and shape. Limitations to the treatment of home sewage effluent are the soil's moderately slow permeability and the slope.

- Fitchville Silt Loam, 0 to 2% slopes (FcA) - 2,370 acres - This soil is in broad areas in valleys and in partly blocked drainageways on uplands in the glaciated part of the county. Ponding and seasonal wetness are the major limitation to the use of the soil for home sewage treatment systems.

Water Supply

Three cities and a village, Canton, North Canton, Louisville, and East Sparta, obtain their municipal water supply from wellfields located within the Nimishillen Creek Watershed (Figure II-12). East Canton and Hartville do not have a municipal water system and draw their drinking water from private wells. All of the above water supply areas are within areas serviced by sewers. The City of Canton also receives drinking water from wellfields outside of the Nimishillen Creek Watershed in the Sandy Creek Watershed.

Most of the remaining homes in the watershed rely on individual wells for their drinking water and are located in areas dependant on home sewage treatment systems. These areas include portions of Jackson, Lake, Marlboro, Plain, Nimishillen, Canton, Osnaburg, and Pike Townships. To date, the Stark County Health Department has not recorded a drinking well being contaminated by a failing HSTS.

Land Uses

A detailed description of land usage within the Nimishillen Creek Watershed can be found in Section II - Inventory of the Watershed of this report or in *Phase I* of the *Nimishillen Creek Comprehensive Watershed Management Plan (CWMP)* beginning on page six. In general, the watershed is dominated by three land use/land cover types: 1) agriculture and open areas occupy 52,716 acres or 44.7 percent of the watershed; 2) urban areas (34,852 acres, 29.3 percent); and 3) wooded lands (25,106 acres, 21.3 percent).

Residential areas (which fall under the urban areas category above) with high densities of homes in unsewered portions of the watershed are likely to have the highest concentrations of failing HSTSs. The reasoning being that generally the higher the housing density the smaller the lot sizes, and therefore, less area to treat home sewage effluent. In addition, unsewered urban areas with homes built before 1980 are also a concern because the average life of a full functioning HSTS is approximately 20 years.

Demographics, Socioeconomic, and the 2000 U.S. Census

Like land uses, the demographic characteristics vary greatly throughout the Nimishillen Creek Watershed. Fortunately, most of the densely populated urban areas in and around the Cities of Canton, Louisville, and North Canton are serviced by sewers. However, there are still highly populated areas in the watershed that are dependent on HSTSs, and several of these populated areas have poor soils for HSTSs.

A socioeconomic and demographic analysis was done using 2000 U.S. Census information at the census tract level. Figure VI-4 shows the U.S. Census Tract numbers in relation to sewered and unsewered areas in the watershed. A tract was included if a portion of its area has unsewered areas. Table VI-1 shows the total number of structures built prior to 1980, median household income, population, and the population below the poverty level for each tract number. Please note that these are totals for the entire tract and not just unsewered areas. Therefore, the totals for unsewered areas will be less than those represented on the table. Despite this issue, the census data provides pertinent information for relatively small areas which helps prioritize future actions.

Figure VI-5 shows information for housing units per square mile for Census tract numbers with unsewered areas. In general, areas with high housing densities next to sewered areas would be candidates for sewer extensions if there were numerous failing HSTSs. Also, knowing which areas have lower household incomes or a higher population of people below the poverty level will aid in focusing any future cost-share assistance programs.

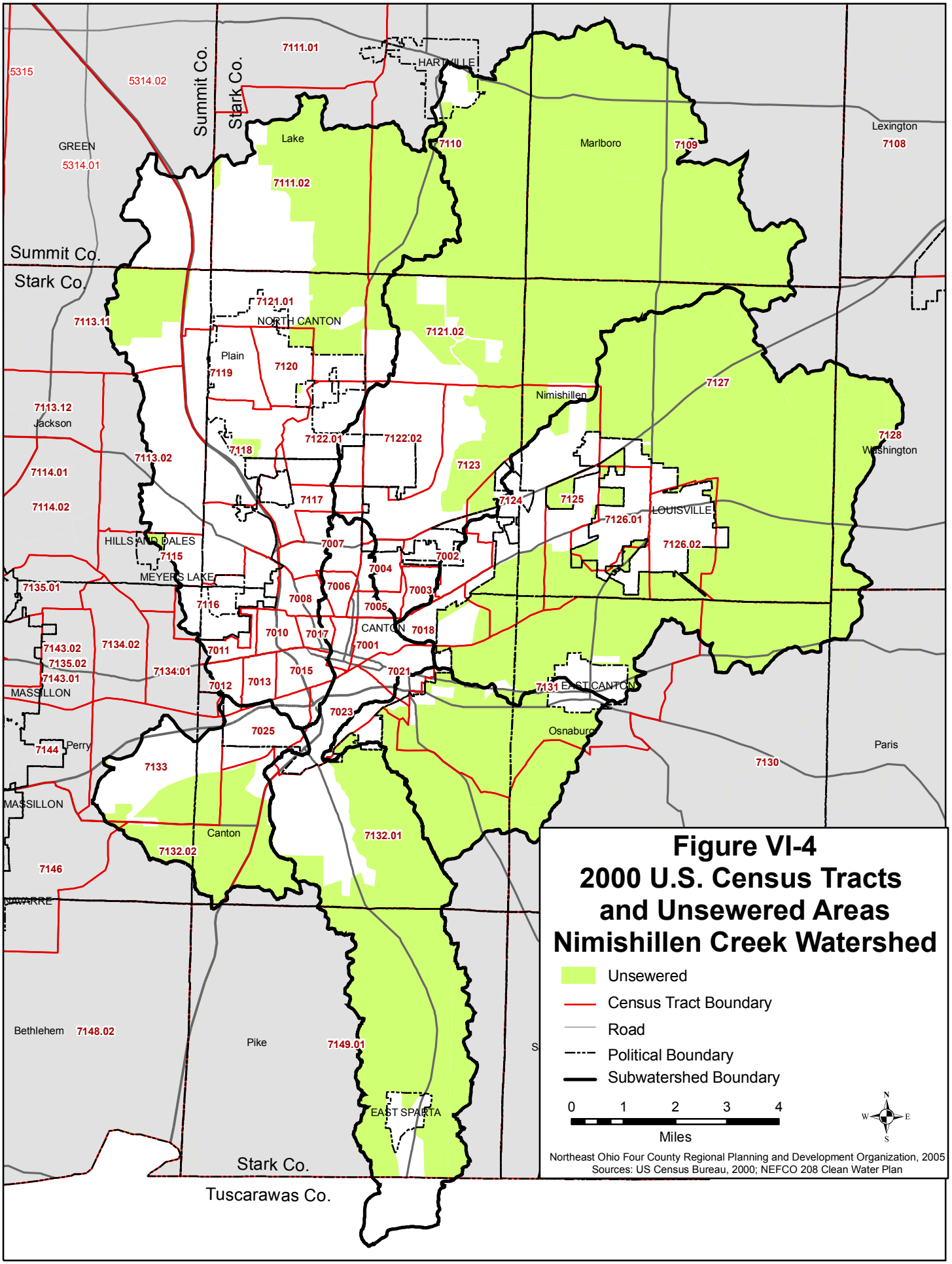


Figure VI-4
2000 U.S. Census Tracts
and Unsewered Areas
Nimishillen Creek Watershed
Unsewered
Census Tract Boundary
Road
Political Boundary
Subwatershed Boundary
0 1 2 3 4
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Sources: US Census Bureau, 2000; NEFCO 208 Clean Water Plan
Summit Co.
Stark Co.
Tuscarawas Co.
HARTVILLE
Lake
Marlboro
Lexington
GREEN
NORTH CANTON
Plain
Nimishillen
Jackson
Washington
LOUISVILLE
HILLS AND DALES
MEYERS LAKE
CANTON
EAST CANTON
MASSILLON
Perry
Osnaburg
Paris
Canton
NAVARRE
Bethlehem
Pike
EAST SPARTA
5315
5314.02
5314.01
7111.01
7111.02
7110
7109
7108
7113.11
7121.01
7121.02
7120
7119
7113.12
7118
7122.01
7122.02
7123
7127
7128
7113.02
7114.01
7114.02
7117
7124
7125
7126.01
7126.02
7007
7002
7004
7003
7115
7135.01
7006
7008
7116
7005
7018
7010
7017
7001
7143.02
7134.02
7011
7135.02
7143.01
7134.01
7012
7013
7015
7021
7131
7023
7025
7144
7133
7130
7132.01
7132.02
7146
7148.02
7149.01

Table VI-1: 2000 U.S. Census Information for Areas in the Nimishillen Creek Watershed Containing Poor Soils in Unsewered Areas

U.S. Census Tract Number	Number of Structures Built before 1980	Median Household Income	Population	Population Below Poverty
7018	1,164	$20,206	3,366	845
7021	1,641	$24,028	4,282	1,254
7023	1,046	$9,006	2,906	1,778
7109	1,088	$53,351	4,227	187
7110	2,226	$51,013	7,506	387
7111.02	1,814	$62,875	9,324	193
7113.11	1,812	$64,720	7,045	154
7120	1,593	$42,180	4,372	160
7121.01	1,415	$53,112	7,837	277
7121.02	1,626	$51,653	6,940	195
7123	2,177	$44,726	6,339	403
7124	1,533	$39,471	6,351	723
7125	623	$41,116	1,838	78
7126.01	1,687	$39,070	2,286	81
7126.02	1,485	$44,206	4,867	204
7127	1,419	$47,236	5,010	172
7130	1,135	$43,581	3,938	196
7131	2,170	$38,607	6,270	656
7132.01	2,411	$41,217	7,485	346
7132.02	718	$44,268	2,223	24
7133	1,567	$43,234	4,778	254
7134.01	2,120	$40,376	5,239	311
7149.01	1,285	$40,433	4,088	203
Totals*	**35,755**	**N/A**	**118,517**	**9,091**

* Only Tract Numbers 7109, 7127, 7128, and 7130 were 100 percent unsewered; therefore, totals for structures built prior to 1980, population, and poverty rates for unsewered areas will be lower than these totals.

Home Sewage Treatment System Problem Definition

Sewered and Unsewered Areas

Figure VI-4 shows the extent of sewered areas in the Nimishillen Creek Watershed. Generally, sewered areas are limited to the Cities of Canton, North Canton, and Louisville, and the Villages of Hartville, East Canton, and East Sparta. Well over half of the watershed area remains dependent on some type of home sewage treatment system. Where practicable, the Stark County Health Department will promote the

extension of sewers to areas with a large percentage of failing HSTSs. Typically, sewer expansion is practicable only if an existing sewer line is in close proximity.

Characterization of Existing Home Sewage Systems

In 1994 the Stark County Residential Sewage Regulation revisions prohibited off-lot discharge and leach wells for new construction. Since that time, the majority of systems installed for new construction have consisted of a leaching tile field or some modification, based upon soil severity. Additional components such as Class 1, NSF approved aeration units or lift stations may be added to the system based upon need. For repairs, again on-lot treatment and disposal are highly preferred. However, when soils, lot size, or topography dictate, an off-lot discharging sewage treatment system may be used. Currently, that would consist of either: a) a Class 1 NSF approved aeration system with 100 sq. ft. filter and failsafe, or b) a subsurface sand filter (with 24" of Ohio EPA approved filter sand). This may also be followed by chlorination or a french drain, depending upon site characteristics.

The Stark County Health Department records do not predate the 1960s. Between the 1960s and early 1990s, leach fields were again the most common system used. In sand and gravel areas, leach wells may have also been used. Less frequently, an off-lot discharging system was used if soils were severe or the lot size was small. Prior to the 1960s, systems varied between leach fields, leach wells, cesspools, or some type of off-lot discharging systems. Variation was great due to the lack of oversight at that time.

Known Impacts on Specific Stream Segments

The only evidence of water quality impacts from failing HSTSs is contained in the Water Resource Quality (Section III) above. Despite strong indications that failing home sewage treatment systems are a factor in degraded water quality, neither the Ohio EPA information or NEFCO's macroinvertebrate information directly identifies this as a cause. A water survey focusing generally on nonpoint source pollution or specifically on the effects of failing home sewage systems on the Nimishillen Creek would greatly assist the Health Department in focusing future corrective actions.

Critical Areas

HSTS Inspections

Identifying critical areas for home sewage treatment systems inspections and enrollment into an Operations and Maintenance Program is primarily based on the combination of three factors: 1) housing units per square mile; 2) HSTS limiting soils; and 3) proximity to already sewered areas. Higher priority will be given to unsewered areas with a concentration of housing units that are located on poor soils adjacent to or near areas with installed sewer lines. Figure VI-5 shows the priority areas within the watershed based on the above criteria.

The Health Department's goal is to eventually inspect every HSTS in the watershed, but it realizes that some sections of the watershed are worse than others due to the factors outlined above. Therefore, the SCHD will start inspections in all Priority 1

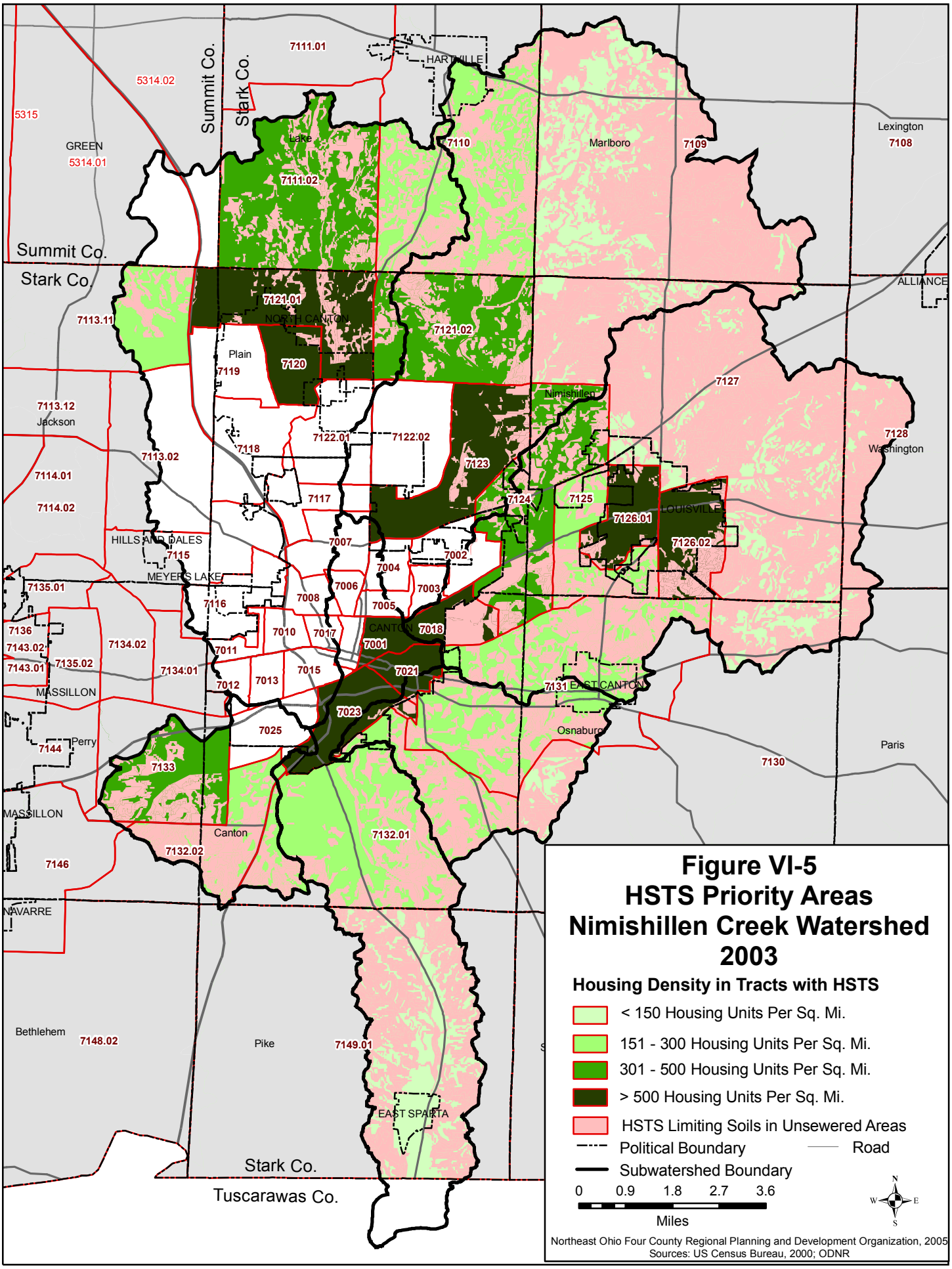


Figure VI-5
HSTS Priority Areas
Nimishillen Creek Watershed
2003
Housing Density in Tracts with HSTS
< 150 Housing Units Per Sq. Mi.
151 - 300 Housing Units Per Sq. Mi.
301 - 500 Housing Units Per Sq. Mi.
> 500 Housing Units Per Sq. Mi.
HSTS Limiting Soils in Unsewered Areas
Political Boundary
Road
Subwatershed Boundary
0 0.9 1.8 2.7 3.6
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Sources: US Census Bureau, 2000; ODNR
Summit Co.
Stark Co.
Tuscarawas Co.
HARTVILLE
Lake
Marlboro
Lexington
GREEN
NORTH CANTON
Plain
Nimishillen
Jackson
Washington
ALLIANCE
HILLS AND DALES
MEYERS LAKE
LOUISVILLE
CANTON
MASSILLON
EAST CANTON
Osnaburg
Paris
Perry
Canton
NAVARRE
Bethlehem
Pike
EAST SPARTA
5315
5314.01
5314.02
7111.01
7111.02
7110
7109
7108
7113.11
7121.01
7121.02
7120
7119
7127
7113.12
7122.01
7122.02
7118
7128
7113.02
7123
7114.01
7114.02
7117
7124
7125
7126.01
7126.02
7115
7007
7002
7004
7135.01
7006
7003
7116
7008
7005
7136
7010
7017
7018
7143.02
7134.02
7011
7001
7143.01
7135.02
7134.01
7015
7021
7012
7013
7131
7023
7025
7144
7133
7130
7132.01
7132.02
7146
7148.02
7149.01

Areas, then move to Priority 2 Areas, and so on. For each Area, Health Department personnel will inspect every HSTS and enroll the homeowner in the Operations & Maintenance Program. If a system is found to be not functioning properly, then corrective action(s) will be ordered following standard Health Department protocol. Also, if the Stark County Health Department determines there is a significant public health risk as a result of multiple failing HSTSs in a small area, then a likely option would be the extension of an existing sewer system to service the area, if practical.

Priority Area 1 - Unsewered areas with greater than 500 housing units per square mile with substantial sections of HSTS limiting soils. These areas are primarily located on the fringe of cities and villages with existing sewers, and include Census tract numbers 7018, 7021, 7023, 7120, 7121.01, 7123, 7126.01, and 7126.02. These regions will be the first to be inspected by the Stark County Health Department and the first to be enrolled in the Operation and Maintenance Program. Because of the high housing densities, likely small lot sizes, and the fairly close proximity to existing sewers, the Health Department's preferred option would be the expansion of an existing sewer system into these priority areas if a significant number of failing systems are discovered during inspections.

Priority Area 2 - Unsewered areas with 301 to 500 housing units per square mile with substantial sections of HSTS limiting soils. Like Priority 1 Areas, these areas are principally located adjacent to cities and villages with existing sewers. Priority 2 Areas include Census tract numbers 7111.02, 7121.02, 7124, and 7133. These regions will be inspected after all Priority 1 Areas have been inspected. Do to the close proximity to existing sewer lines in most Priority 2 Areas, sewer extension will be a possible option for the Health Department to alleviate concentrated pockets of failing systems.

Priority Area 3 - Unsewered areas with 151 to 300 housing units per square mile with substantial sections of HSTS limiting soils. These areas are primarily located to the southeast of the City of Canton and north of the City of North Canton in Lake Township. Priority 3 Areas include U.S. Census tract numbers 7110, 7113.11, 7125, 7131, 7132.01, 7132.02, and 7146. These regions will be inspected after the inspection of all Priority 2 Areas. The Stark County Health Department will consider the extension of an existing sewer system only if feasible.

Priority Area 4 - Unsewered areas with 1 to 150 housing units per square mile with substantial sections of HSTS-limiting soils. These sections are primarily located in the agricultural areas located in the northeastern section of the watershed. The unglaciated southern portion of the watershed is also a Priority 4 Area due to steep slopes which limit development. Census tract numbers falling into this category include 7109, 7127, 7128, 7130, and 7149.01. These regions will be the last to be inspected due to the low housing densities. In most cases, the extension of sewers into these areas is not a practicable option.

Financial Assistance

Pending funding, financial assistance will be concentrated in areas (based on 2000 Census tract numbers) where the average household annual income is below $35,000 and/or areas with high poverty population rates (greater than 500). Census tracts in the Nimishillen Creek Watershed that fit these criteria include 7018, 7021, 7023, 7124, and 7131 (Table VI-1). It is anticipated that significant financial assistance will be needed in order to correct all failing HSTSs and eliminate the resulting water pollution. Although the focus of any cost-share assistance program will be in the areas above, all homeowners in the watershed needing financial assistance to correct failing HSTSs will be eligible for financial assistance, if available.

Proposed Corrective Action Plan

Current Actions

Currently, the Stark County Health Department, in its 1994 revisions to its county home sewage regulations, established no off-lot discharges for new construction. When doing a repair, all reasonable on-lot possibilities are reviewed before off-lot discharge is considered. Typically, off-lot discharge is only used when dictated by small lot-sizes or poor soil types. The Stark County Health Department criteria for upgrading HSTSs can be found above in the section titled “Characterization of Existing Home Sewage Systems.”

The Health Department does not currently have a financial assistance program for the repair or replacement of failing HSTSs. However, financial assistance for HSTS repairs and replacements can be attained through the Stark County Regional Planning Commission (RPC). Through the RPC’s Stark County Rehabilitation Emergency Assistance Program, eligible homeowners can receive up to $3,500 in grants to repair or replace failing HSTSs. Anything over $3,500 can be covered by a deferred loan. Eligibility for this program is based on household income.

Proposed Actions

When funding becomes available, the Stark County Health Department will work in critical areas to aid in either correcting HSTSs or promoting the extension of sanitary sewers to eliminate water quality degradation from failing systems. In addition, between 3,000 and 5,000 HSTSs will be inspected to determine system location, type, and condition over a three year period. Health Department personnel will begin by inspecting all systems in the first priority areas, then move inspection efforts to the next priority areas in the watershed. For example, Health Department personnel will inspect all HSTSs and order corrections for failing systems in all of the Priority 1 Areas before moving to Priority 2 Areas.

All (100 percent) of the HSTSs inspected will be enrolled in the Stark County operation and maintenance program that will be established. Follow-up and necessary enforcement will be conducted under normal Health Department protocol

for the repair and replacement of failing HSTSs, where extension of sanitary sewer is unlikely within three years.

The Stark County Health Department also proposes to initiate a cost-share program for homeowners in need of financial assistance to correct a HSTSs problem. It is envisioned that the establishment in an Operation and Maintenance Program within the Nimishillen Creek Watershed will result in a substantial increase in the number of homeowners needing financial assistance. Once funding is secured, the SCHD will work with the Stark County RPC to establish an assistance program that is complementary, and not in "competition", with their assistance programs. The Health Department also understands that it will have to work under the conditions (if any) imposed by the funding agency when establishing a cost-share assistance program.

Furthermore, a comprehensive education and outreach program will be implemented to include several public meetings and consultation/education with individual homeowners during HSTS inspection. Informational pamphlets will be distributed detailing proper system maintenance and operation unique to each type of HSTS. The Health Department estimates that between 3,000 to 5,000 watershed residents will be contacted through their education and outreach program over a three year period. Lastly, the SCHD will offer incentives, pending funding, for the use of alternative HSTS technology, enabling the county to further develop non-discharging options for difficult repair situations.

The efforts outlined above will focus on the reduction of NPS pollution arising from HSTSs within the Nimishillen Creek Watershed; however, it will also serve as a model for the development of a county-wide Operation and Maintenance Program. Thus, the funding of this plan will continue to benefit the watershed, as well as other watersheds within Stark County, long after the initial funding is utilized.

Tracking and Documenting Success

In 2000, the Stark County Health Department acquired environmental health software that enables the entry of sewage records. Currently, all new systems are recorded in the database. Additional funding will allow existing records to be entered into this same database. Once entered, the database can be used to track inspections, document problems, and provide statistical information.

VII. Subwatershed Action Plans

East Branch Subwatershed Action Plan

Inventory

Physical Description

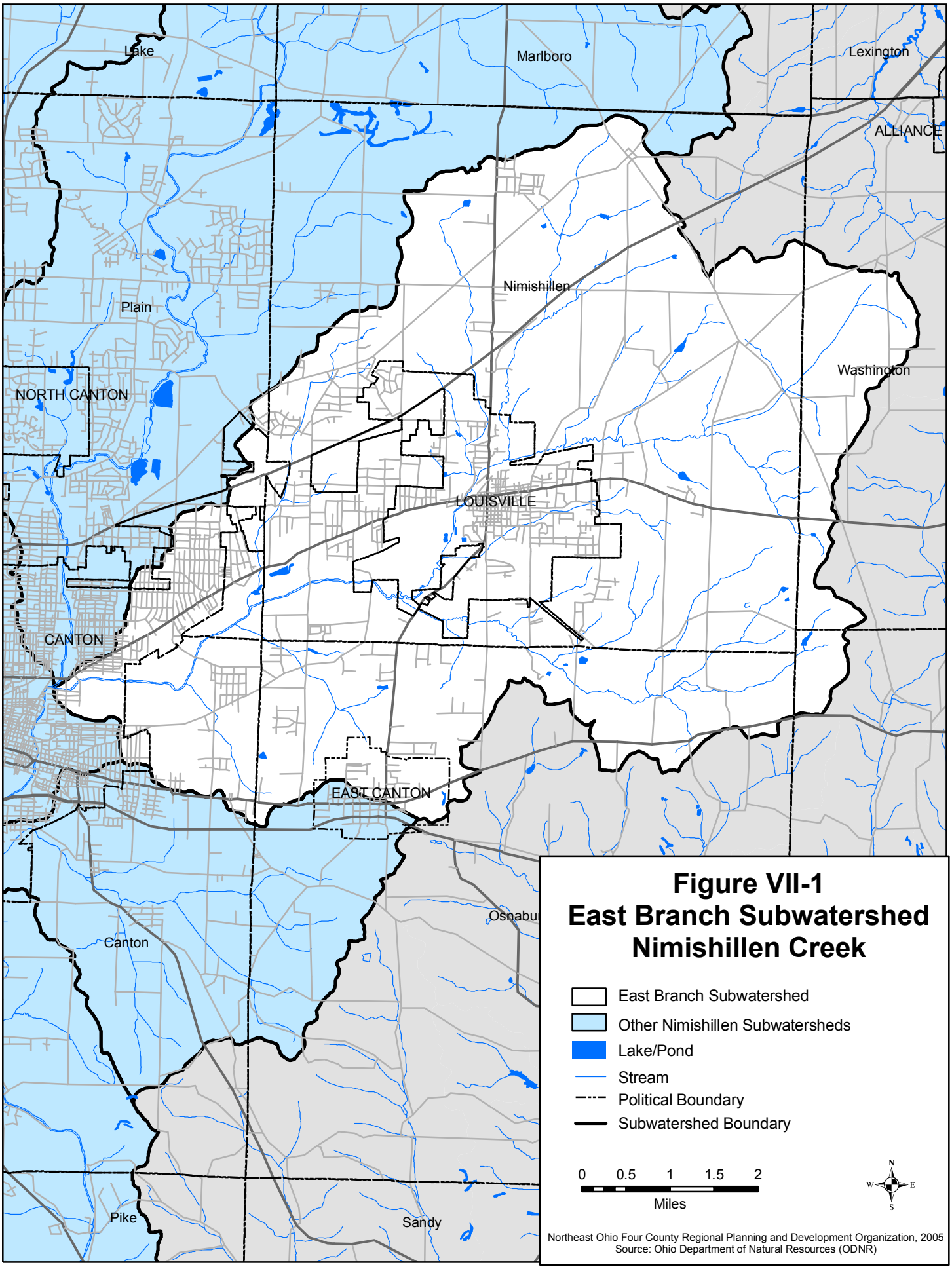
The East Branch of Nimishillen Creek rests entirely in Stark County and originates in the areas around the City of Louisville in Nimishillen, Marlboro, Paris, Osnaburg, and Washington Townships. These small headwater streams flow and join in or near the City of Louisville and flow westerly towards the City of Canton (Figure VII-1). In Canton, the East Branch joins with the West Branch of Nimishillen Creek at river mile (RM) 15 forming the Mainstem. The total length of the East Branch is approximately 10.4 miles.

The East Branch subwatershed resides in the glaciated portion of the Nimishillen Creek watershed (Figure II-5). As a result the area has moderate relief and gentle slopes due to glacial actions and depositions. Most of the subwatershed has less than a six percent slope with few slopes above 12 percent (Figure II-6). The soils in the region reflect the area's glacial activities with the primary associations being the Canfield-Wooster, Fitchville-Sebring, Chili-Wheeling-Shoals, and Ravenna-Canfield. Several soil types in this area are poor for the installation of home sewage treatment systems due to poor drainage or permeability (Figure VI-3). The areas along the East Branch and its major tributaries are covered with over 60 feet of glacial outwash. The dominate bedrock types in the areas not covered by a thick layer of glacial outwash are Middle Kittaning Coal, Brookeville Coal, Upper Freeport Coal (Figure II-7). Lastly, flooding has been a documented problem along the East Branch from the City of Louisville until it merges with the West Branch in Canton.

Land Use

The East Branch of Nimishillen Creek has a diverse mix of land use and cover (Figure II-13). The headwater areas upstream of the City of Louisville consist primarily of agricultural land, open space, and wooded - shrub/scrub cover. The riparian habitat in these headwater areas are somewhat impacted, primarily along the smaller stretches of the creek. Agriculture in this area is typical for Stark County and includes cattle and dairy operations, row cropping, poultry, and cover crops. Water quality issues associated with these uses include nutrient and pesticide runoff, soil erosion, channel modifications, and riparian habitat degradation.

Just outside of the city limits of Louisville, the primary land use for the East Branch watershed transitions from agricultural/open space to suburban/urban mix. Near the mouth of the East Branch in Nimishillen Township and the City of Canton, the primary land cover is industrial. Point source discharges, storm water runoff, illegal dumping, and failing wastewater systems are water quality concerns along this portion of the East Branch. However, the riparian habitat is largely intact from the City of Louisville to approximately 1,000 feet prior to its confluence with the West Branch (Figure VII-2).


Lake
Marlboro
Lexington
ALLIANCE
Nimishillen
Plain
Washington
NORTH CANTON
LOUISVILLE
CANTON
EAST CANTON
Canton
Osnabu
Pike
Sandy
Figure VII-1
East Branch Subwatershed
Nimishillen Creek
East Branch Subwatershed
Other Nimishillen Subwatersheds
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 0.5 1 1.5 2
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

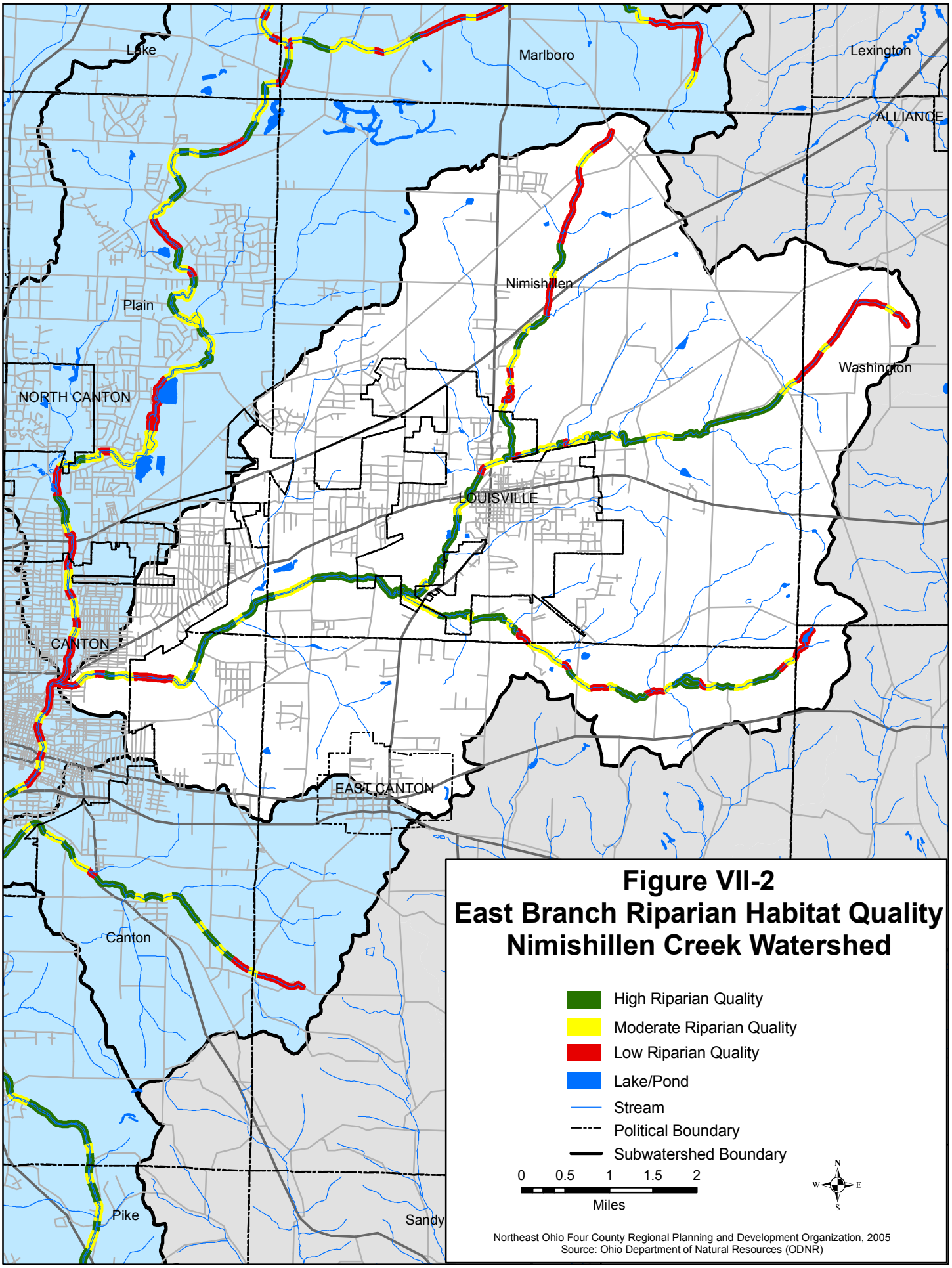


Figure VII-2
East Branch Riparian Habitat Quality
Nimishillen Creek Watershed

Point Source Discharges

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer and into a waterbody after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges have the potential to introduce high levels of nutrients and chemicals into a waterbody. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

There are twenty-four entities in the East Branch basin that are permitted by the Ohio EPA or the Stark County Health Department to discharge water into the creek. The entities that discharge vary from municipal wastewater treatment plan, and various industrial operations, to private wastewater systems. Table VII-1 shows a list of permitted operations within the East Branch subwatershed. It contains the map symbols for Figure IV-1, the name of the operation, the design flow, and its classification. This table does not show illegal dischargers or storm water discharge pipes.

Table VII-1: Point Source Discharging Operations in the East Branch Subwatershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
5	Biery Cheese Company 66544 Paris Ave. NE Paris, OH 44669	Not Given	Private Discharging Semi-Public Sewage Treatment System
10	City of Louisville WWTP 3101 Ravenna Ave. NE Louisville, OH 44266	2,000,000	Municipal Wastewater Treatment Plant
11	Cornerstone Church of God Elementary, Junior, and Senior Schools 511 Trump Ave. NE Canton, OH 44730	Not Given	Private Discharging Semi-Public Sewage Treatment System
17	Hot Laps Sports Bar 536 S. Canal St. Louisville, OH 44641	Not Given	Private Discharging Semi-Public Sewage Treatment System
18*	Allegheny Ludlum 1500 West Main St. Canton, OH 44641	Not Given	Industrial Discharger
23	Nazarene Camp Center 820 Nazarene Ave. Louisville, OH 44641-9720	Not Given	Private Discharging Semi-Public Sewage Treatment System
25	North Nimishillen School 7337 Easton St. NE Louisville, OH 44641	>10,000	Private Discharging Semi-Public Sewage Treatment System
29	Republic Storage Systems Co. 1038 Belden Ave. NE Canton, OH 44705	Not Given	Industrial Discharger

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
33	Thakar Aluminum Corp. 4420 Louisville St. NE Canton, OH 44705	Not Given	Industrial Discharger
40	Akron Dist. Church of Nazarene 8020 Nazarene St. Canton, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
41	Altercare of Louisville 7121 St. Francies St. NE Louisville, OH 44641	<10,000	Private Discharging Semi-Public Sewage Treatment System
42	Bud's Corner Tavern 5750 Columbus Rd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
43	Carriage House East 9033 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
44	Elm's Inn 6786 Meese Rd. NE Alliance, OH 44601	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
45	Hammco Industries 9040 Columbus Rd. NE Canton, OH 44705	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
46	Hot Laps Sports Bar 7512 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
47	Spee-D-Foods #29 5874 Easton St. NE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
48	Robert Rogers Apt. 6901 Atlantic Blvd. NE Louisville, OH 44641	1,500 to <10,000	Private Discharging Semi-Public Sewage Treatment System
49	Phil's Place 6509 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
50	Thompson Dairyland 7519 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
51	VFW 7459 Columbus Rd. NE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
52	WOLI-TV 17 Trinity 6600 Atlantic Blvd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
53	Windy Hill Motel 6404 Columbus Rd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
71	Northmark Inc. 7349 Ravenna Ave. SE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System

* Permit Expired in 2000; GPD = Gallons Per Day
Sources: Ohio EPA, 2005; Stark County Health Department, 2006

Water Quality Data and Impairments

Ohio EPA's Water Quality Results

Table VII-2 summaries the aquatic life use attainment based on sampling conducted by the Ohio EPA.

Table VII-2: East Branch Nimishillen Creek Aquatic Life Use Attainment Segment Summaries

Segment River Mile (Lower/Upper)	Reach Length	Attainment Miles Status			
		Full	Partial	Non	Not Assessed
0.00/10.40	10.40	0.00	5.10	5.30	0.00

Source: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory

Sampling occurred in 1998 and it was noted by the Ohio EPA that the lower reaches of East Branch continue to be degraded by nitrates from Allegheny Ludlum (formerly J&L Steel). Also found downstream of Allegheny Ludlum were highly elevated levels of sediment metals. A regional reference site is located at river mile 8.6 and was found to be in partial attainment. The degraded water quality was likely the result of agricultural activities in the upstream portions of the subwatershed.

Impairments

Aquatic Life Use:
The East Branch at 5.30 miles was not in attainment for IBI, MIwb, or ICI. At 5.10 miles it was in partial attainment, meeting one or two of the biological criteria.

Recreation:
The Nimishillen Creek East Branch is impaired for Primary Contact Recreation (PCR).

Fish Consumption:
There is a fish consumption advisory of only one meal per month of common carp caught from the Nimishillen Creek East Branch. In addition, the Ohio Department of Health has issued a statewide advisory to limit meals of fish caught from all Ohio waterbodies to one meal per week, due to mercury.

Ohio EPA's Causes and Sources of Impairments

The causes of impairments for a stream are the specific pollutants or alterations that result in the stream not meeting state water quality standards. Examples of common causes of water quality impairments are siltation, flow alteration, nutrient enrichment, metals, and temperature. Sources of impairments are where the causes originated or where the causes of impairments are supplied from. Sources

include crop production, channelization, urban runoff, dam construction, discharge pipes, and stream bank erosion. Table VII-3 lists the causes and sources of impairment for aquatic life use, recreation, and fish consumption along the East Branch of Nimishillen Creek.

Table VII-3: Ohio EPA's Causes and Sources of Impairments for the East Branch of Nimishillen Creek

Impairment Of:	Causes of Impairment (magnitude)	Sources of Impairment (magnitude)
Aquatic Life Use	Nutrients (high) Pathogens (high)	Industrial Point Source (high) Unknown (high) Municipal Point Sources (slight)
Recreation	Pathogens	Not Identified
Fish Consumption	Polychlorinated Biphenyls (PCBs)	Not Identified

Sources: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory and Ohio EPA 2004 Integrated Report

Other Water Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO and the City of Canton have conducted three macroinvertebrate surveys along Nimishillen Creek. Three of the seventeen sites were located in the East Branch watershed. The scores recorded in 2000 at all of the sites were higher than the following two surveys in 2002 and 2004. In 2004, the furthest downstream site, RM 15.21 near the mouth, recorded a "Poor" ranking with an average score of 9. No patterns in upstream to downstream scores are evident. Table VII-4 summarizes NEFCO macroinvertebrate monitoring results.

Table VII-4: Mean Cumulative Index Values* (CIV) for the East Branch of Nimishillen Creek Based on NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 0.21 - Cook Park on Mahoning Rd.	15 Fair	13 Fair	9 Poor
River Mile 2.14 - Georgetown and Trump Ave.	20 Good	13 Fair	15 Fair
River Mile 3.61 - Broadway Road Bridge	18 Good	17 Good	14 Fair

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

The Ohio EPA found that generally ODNR's Stream Quality Monitoring Program utilized by NEFCO tend to reflect attainment and non-attainment aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). The lower scores at Cook Park (downstream of Allegheny Ludlum) correspond with decreased water quality results from the Ohio EPA. However, Allegheny Ludlum no longer discharges into the East Branch and water quality recovery at this site is possible.

East Branch Subwatershed Issues and Actions

1. **Storm Water Runoff and Flooding**
2. **Riparian Corridor Protection**
3. **Failing HSTSs**
4. **Illegal Dumping**
5. **Agricultural Runoff**

Being a headwater stream of Nimishillen Creek, the water quality of the East Branch is almost entirely reflective of the activities that occur with its watershed. Storm water runoff from both agricultural and suburban/urban areas is a concern along with pollution from failing home sewage treatment systems. Water quantity is a local concern stemming from the severe flooding that occurred along sections of the East Branch in 2003. Other issues include riparian habitat encroachment and illegal dumping along isolated sections of the East Branch.

Using the available data and information along with personal knowledge of the East Branch, watershed stakeholders ranked the top five issues they believe to be hindering water quality attainment in this subwatershed. Under each of the five issues is a goal and objective statements accompanied by recommended actions to address each issue. Please note that the recommended actions are not intended to be a comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe is the best course of action given the current circumstances and available information. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III* for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001). "Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Lastly, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could or will take the lead on actions not yet being implemented.

East Branch Issue #1 - Storm Water Runoff and Flooding

Goal: Improve the ability of the East Branch watershed to assimilate and treat storm water runoff by promoting the protection and restoration of wetlands, the restoration of floodplains, and the minimization of runoff from impervious areas.

Objectives:

1. Restore and protect active floodplain areas.

Focus Areas: City of Louisville and Nimishillen Township
Target: 10 acres of floodplain restored or protected per year

2. Promote the use of storm water treatment wetlands in urban/suburban areas.
   Focus Areas: City of Louisville, City of Canton
   Target: 1 demonstration storm water treatment wetland
3. Permanently protect and restore natural wetland areas.
   Focus Areas: Entire Subwatershed
   Target: 20 acres of wetlands protected or restored per year
4. Reduce obstructions such as log jams that cause flooding or water quality problems along the East Branch.
   Focus Areas: City of Louisville to the mouth of the East Branch
   Target: To be determined

East Branch Issue #1- Recommended Actions:

Action A: Implement NPDES Phase II Storm Water Management Program	
Responsible Parties:	Stark County Regional Planning; City of Louisville; City of Canton
Funding:	Local; Storm Water Utility
Time Frame:	Ongoing - Deadline for Full Development and Implementation is Dec. 8, 2007
Expected Improvements:	Significant reduction of pollution in urban storm water runoff through the establishment of the six minimum control measures.
Evaluation Method:	Annual Review of the Program by permitted communities and the Ohio EPA
Estimated Costs:	Not Given
Estimated Load Reduction:	Variable depending on the practices implemented by each permitted community

Action B: Purchase and Protect Active Floodplain Areas.	
Suggested Responsible Parties:	Federal Emergency Management Agency (FEMA), City of Louisville. City of Canton, Stark County, Stark Parks, Stark County Drainage Task Force, Muskingum Watershed Conservancy District
Funding Options:	FEMA Grants, Clean Ohio Fund, Storm Water Utility, Conservancy District Assessment, Private Sector
Time Frame:	Louisville - Ongoing Balance of the Subwatershed: 2006 and beyond
Expected Improvements:	Reduction in flood damage; Improved water quality from intact, protected river corridor.
Evaluation Method:	Acres of Active Floodplain Purchased and Protected
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the condition and restoration potential of purchased or protected parcels

Action C: Identify natural wetland areas that can be protected or restored.	
Suggested Responsible Parties:	NEFCO, Stark Parks, Earth Action Partnership, ODNR, Stark County Drainage Task Force
Funding Options:	Ohio EPA Section 319 NPS Grant, Local Funds
Time Frame:	2007-2008
Expected Improvements:	The action will identify wetland areas in need of protection and restoration in the East Branch watershed for future actions.
Evaluation Method:	Acres of wetlands identified
Estimated Costs:	To Be Determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Promote the construction of storm water treatment wetlands for storm sewer outlets near the East Branch.	
Suggested Responsible Parties:	NEFCO, City of Louisville; City of Canton; Townships; Stark County Drainage Task Force, Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility, Conservation District Assessment, WRRSP, Local Funds
Time Frame:	Ongoing
Expected Improvements:	Reductions in nutrients and sediments from storm water runoff entering the East Branch; Increased flood water retention; Creation of wetland habitat for wildlife.
Evaluation Method:	Acres of Storm Water Wetlands Constructed
Estimated Costs:	$50,000 - $100,000 and up per constructed wetland
Estimated Load Reduction:	Treatment Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33%

Action E: Educate riparian landowners on stewardship including the removal of downed trees in the East Branch.	
Suggested Responsible Parties:	Earth Action Partnership, Stark SWCD, NEFCO, Stark Parks, Stark County Drainage Task Force, Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility; Conservation District Assessment; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond

Expected Improvements:	Decrease in obstructions resulting in less localized flooding problems.
Evaluation Method:	Number of Riparian Homeowners Contacted
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	Variable: Removal will likely decrease localized erosion caused by the redirection of flow around the obstruction. Increase in dissolved oxygen levels likely if the log jam has a standing pool.

East Branch Issue #2 - Riparian Corridor Protection and Restoration

Goal: Maintain and protect areas with "high" riparian habitat scores, and restore habitat areas with "poor" or "moderate" riparian habitat scores to the next attainment level.

Objectives:

1. Establish policies to protect the riparian corridor and habitat.
   Focus Areas: Entire Subwatershed
   Target: Adoption of policies by the county and municipalities
2. Restore riparian habitat where possible.
   Focus Areas: Headwater Streams in Nimishillen, Washington and Paris Townships.
   Target: Restore 1 percent or approximately 700 linear feet of "poor" or "moderate" quality riparian habitat; Protect 5 percent or approximately 2,800 linear feet of "high" quality riparian habitat
3. Purchase land along the riparian corridor for habitat protection and/or public use.
   Focus Areas: Entire Subwatershed
   Target: Purchase or protect 5 acres per year of "high" quality riparian habitat

East Branch Issues #2 - Recommended Actions:

Action A: Encourage city and county park districts to purchase selected areas to protect and/or increase intact riparian corridor.	
Suggested Responsible Parties:	Stark Parks; Canton Parks Commission; City of Louisville
Funding Options:	Clean Ohio Fund; Ohio EPA Section 319 NPS Grant; WPCLF; PL-566
Time Frame:	Ongoing
Expected Improvements:	Maintain or increase riparian habitat scores.
Evaluation Method:	Number of riparian acres purchased; Riparian habitat scores
Estimated Costs:	$0 - $5,000 and up per acre; $4,000 and up average set up and maintenance fee

Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action B: Assist communities with the development of township or municipal ordinances requiring new construction sites to leave easements or a specific distance near shorelines of targeted wetlands and flood plains of streams.	
Suggested Responsible Parties:	Local and County Planning and Zoning Boards; Stark SWCD
Funding Options:	NPS Education Grant and OEEF
Time Frame:	2006 thru 2009
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Number of ordinances established and enforced; Riparian and shoreline miles protected; Riparian habitat scores
Estimated Costs:	Variable
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Provide incentives for landowners to protect shoreline or riparian corridor with long-term protection or permanent conservation easements.	
Suggested Responsible Parties:	Local and County Planning and Zoning Boards; Non-Profit Environmental Groups; Land Conservancies
Funding Options:	Clean Ohio Fund; CWA Section 319 NPS Grant; WRP; CRP; PL-566
Time Frame:	2006 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Linear feet set aside for long-term protection; Number of permanent conservation easements; Riparian habitat scores
Estimated Costs:	$0-$5,000 per acre and up; $4,000 and up average set up and maintenance fees
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, long-term or permanent protection measures will reduce future pollution loading.

Action D: Assist shoreline and riparian landowners to replant shoreline and riparian corridor for selected wetlands, lakes and streams.	
Suggested Responsible Parties:	Stark SWCD; NEFCO; USDA - NRCS; Earth Action Partnership; Ohio EPA; ODNR - DSWC; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2006 thru 2010
Expected Improvements:	Restoration of shoreline and riparian corridor, increased riparian habitat scores, improved wildlife habitat, and reduction in stream bank erosion during high flow events.
Evaluation Method:	Linear feet of replanted riparian habitat; Wildlife surveys; Riparian habitat scores
Estimated Costs:	\$0.25 - \$1.10 per yd^2 seeded and mulched; \$0.40 - \$0.49 per seedling planted
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action E: Assist landowners in installing storm water reduction and treatment best management practices like rain gardens, rain barrels, etc.	
Suggested Responsible Parties:	Stark and Summit SWCDs; Earth Action Partnership; NEFCO; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	Ohio EPA Section 319 NPS Grant; Storm Water Utility; Conservation District Assessment; Local and Private Funds
Time Frame:	2006 thru 2010
Expected Improvements:	Reduction in volume, velocity, and amount of storm water runoff for residential areas entering the West Branch; Improved quality of the storm water runoff entering the West Branch.
Evaluation Method:	Number of best management practices installed; Macroinvertebrate and habitat monitoring
Estimated Costs:	Rain Gardens = Variable Rain Barrel = \$50 to \$100 and up per barrel
Estimated Load Reduction:	Rain Gardens: TSS = 60%-90%; TP = 60%-90%; TN = 50%-100%; Metals = 50%-100%

East Branch Issue #3 - Failing Home Sewage Treatment Systems

Goal: Reduce the nutrient and bacteria pollution in the East Branch from failing home sewage treatment systems (HSTSs).

Objectives:

1. Establish a comprehensive education and outreach program for stakeholders using home sewage treatment (septic) systems (HSTSs).
   Focus Areas: All unsewered areas
   Target: Program established by 2008
2. Begin an operations and maintenance program in the watershed.
   Focus Areas: Unsewered areas near Louisville and along State Route 62; Route 44 and Columbus Road
   Target: Inspection of 250 systems per year in the subwatershed
3. Provide financial support for the repair and replacement of failing HSTSs for low income property owners.
   Focus Areas: Entire Subwatershed
   Target: Assistance for all low income property owners, if needed

East Branch Issue #3 - Recommended Actions:

Action A: Establish education efforts to increase public awareness of faulty HSTSs through door-to-door surveys, information materials, educational video, public meetings, and/or informational booths at local public events such as fairs	
Suggested Responsible Parties:	Stark County Health Department, Ohio Department of Health; Ohio EPA; NEFCO; Earth Action Partnership
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant; Local Funding
Time Frame:	Door-to-Door Survey: 2007 - 2008 Information Material: Ongoing Public Meetings: 2007 - 2008 Informational Booths: 2007 - 2008
Expected Improvements:	Increased awareness of water quality impacts associated with malfunctioning or failing HSTSs.
Evaluation Method:	Number of surveys completed; Number of informational materials distributed; Number of public meetings held; Number of fairs or public events attended; Surveys before and after education efforts begin to gauge a change in general knowledge among watershed residents
Estimated Costs:	– Surveys = $2.00 per survey – Pamphlets and Flyers = $1.50 - $3.00 per item – Public Meetings = $1,200 per 2 hour meeting – Displays = $1,000 and up
Estimated Load Reduction:	Variable depending on the number of homeowners that follow the educational information distributed

Action B: Seek funding assistance for homeowners to repair or replace faulty HSTSs.	
Suggested Responsible Parties:	Stark County Health Department; Stark County Regional Planning
Funding Options:	WPCLF; Ohio EPA Section 319 NPS Grant; WPCLF; HUD Block Grant
Time Frame:	2007 - 2010
Expected Improvements:	Lower the number of malfunctioning or failing HSTSs
Evaluation Method:	Number of systems repaired or replaced
Estimated Costs:	$3,000 - $8,000 average cost to replace a HSTS; Up to $1,000 to repair HSTS
Estimated Load Reduction:	Variable depending on the number of homeowners who repair or replace failing HSTSs On-Site HSTS Repair or Replacement: 100% reduction in bacteria and nutrient pollution from a HSTS Off-Site Repair or Replacement: Variable reduction for each HSTS

Action C: Establish an operations and maintenance inspection program to facilitate the repair and replacement of failing home sewage treatment systems (HSTS)	
Suggested Responsible Parties:	Stark County Health Department
Funding Options:	Local Property/Home Owner Operations and Maintenance Fee; Ohio EPA Section 319 NPS Grant; WPCLF
Time Frame:	2007 - 2010
Expected Improvements:	A lower number of malfunctioning or failing HSTSs in the East Branch subwatershed; Reduction in nutrient and pathogens entering the stream
Evaluation Method:	Number of systems inspected, pumped, and/or repaired; water quality sampling
Estimated Costs:	Approximately $250,000 for the Stark County Health Department to establish and run a permit system for three years in the entire Nimishillen Creek Watershed
Estimated Load Reduction:	Variable depending on the number of HSTSs inspected and ordered to be repaired or replaced

Action D: Promote the extension of sewers in the watershed, especially where high concentrations of HSTSs are located on poor soils for septic systems.	
Suggested Responsible Parties:	Stark County Sanitary Engineer; Stark County Health Department; Ohio EPA; Ohio Department of Health
Funding Options:	WPCLF; Local Property/Homeowner via Assessment; WRRSP; USDA - Rural Development Grant
Time Frame:	Ongoing when needed
Expected Improvements:	A lower number of malfunctioning or failing HSTSs polluting local water resources
Evaluation Method:	The Number of homeowners in areas of high housing concentrations with poor soils contacted about sewer expansion; Future plans or projects for sewer expansion into these areas
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $2.00 per survey; $9,000 per home and up for sewer tap-in fee.
Estimated Load Reduction:	Up to 100% reduction in pollution including bacteria and nutrients originating from HSTSs in newly sewered areas

East Branch Issue #4 - Illegal Dumping

Goal: Reduce the amount of litter and debris from illegal dumping along the East Branch.

Objectives:

1. Reduce the dumping of trash and debris into the East Branch by increasing local awareness and enforcement of anti-litter laws.
   Focus Areas: Entire Subwatershed
   Target: To be determined
2. Remove trash and debris from the East Branch.
   Focus Areas: City of Louisville to the mouth of the East Branch in Canton
   Target: One clean-up event per year along the East Branch

East Branch Issue #4 - Recommended Actions:

Action A: Educate watershed residences, industries, and businesses about litter prevention and recycling	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; Stark County Regional Planning; Stark-Tuscarawas-Wayne Joint Solid Waste District; Canton Regional Chamber of Commerce; Stark County Drainage Task Force
Funding Options:	Local Sponsorship; Private Sector; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	Ongoing by the Nimishillen Creek Watershed Partners, Stark County Regional Planning, and the Canton Regional Chamber of Commerce.
Expected Improvements:	Increased awareness of littering issues and proper waste disposal

Evaluation Method:	Number of educational items distributed; Number of hits on stream clean-up webpage
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $10.00 per T-shirt; $8.00 - $25.00 per month for website hosting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Organize stream clean-ups along stretches of the East Branch that are heavily polluted with trash and debris.	
Responsible Parties:	Nimishillen Creek Watershed Partners
Funding Options:	Private Sector; Ohio EPA Section 319 NPS Grant; Sponsorships
Time Frame:	Ongoing
Improvements:	Reduction in debris in and along selected clean-up sections along the East Branch
Evaluation Method:	Linear feet of the creek cleaned; Number of tires removed; Weight or volume of litter removed
Costs:	$500 - $1,000 and up for up to a half-mile clean-up
Estimated Load Reduction:	Variable depending on location and items removed from the East Branch

Action C: Report illegal dump sites to local law enforcement officials.	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; Stark County Health Department; Ohio EPA; Stark County Drainage Task Force
Funding Options:	Private Sector; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond
Expected Improvements:	Increased monitoring of known illegal and chronic dumping sites
Evaluation Method:	Number of fines given out for littering; Visual inspection of known chronic dumping sites
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the type of illegal activity prevented or cleaned up

East Branch Issue #5 - Agricultural Runoff

Goal: Reduce nonpoint source pollution from agricultural lands.

Objectives:

1. Reduce soil erosion transport and deposition of sediment associated with agricultural areas.
   Focus Areas: Headwater streams north, east, and south of the City of Louisville
   Target: To be determined
2. Reduce fertilizer, herbicide and pesticide runoff from agricultural areas.
   Focus Areas: Headwater streams north, east, and south of the City of Louisville
   Target: To be determined
3. Reduce nutrient and bacteria loads from livestock.
   Focus Areas: Headwater streams north, east, and south of the City of Louisville
   Target: To be determined

East Branch Issue #5 - Recommended Actions:

Action A: Educate farmers about the benefits of implementing appropriate BMPs, e.g., conservation tillage, conservation cropping sequence, contour strip cropping, contour farming, and precision farming, to reduce the impacts associated with sediment.	
Responsible Parties:	Stark SWCD; USDA - NRCS; Ohio Department of Agriculture; ODNR - DSWC; Earth Action Partnership
Funding Options:	EQUIP; Ohio EPA Section 319 NPS Grant; OEEF; WPCLF; CRP
Time Frame:	Ongoing through the USDA - NRCS
Expected Improvements:	Reduction in sediment and nutrient loads entering waterways from agricultural areas
Evaluation Method:	Increase in participation in: Conservation tillage; Conservation cropping sequence; Contour strip cropping; Contour farming; and Precision farming
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $3,000 and up for an 80 slide PowerPoint presentation.
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, reduction could occur if highlighted BMPs are voluntarily implemented.

Action B: Establish grassed and forested buffer strips on farm croplands, especially adjacent to streams.	
Suggested Responsible Parties:	Stark SWCD; ODNR - DSWC; Ohio Department of Agriculture; USDA - NRCS
Funding Options:	EQUIP; CRP; WPCLF; Ohio EPA Section 319 Grant
Time Frame:	2007-2010

Expected Improvements:	Lower nutrient, sediment, and bacterial pollution from agricultural areas
Evaluation Method:	Linear feet of grassed and forested buffer strips established; Modeled pollution reduction for grassed or forested buffer strips installed
Estimated Costs:	\$0.25 - \$1.10 per yd^2 seeded and mulched; \$0.40 - \$0.50 per seeding planned
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Implement fencing and development of off-stream watering facilities to limit or exclude livestock from stream areas.	
Suggested Responsible Parties:	Stark SWCD; ODNR - DSWC; USDA - NRCS
Funding Options:	EQUIP; WPCLF; Ohio EPA Section 319 NPS Grant; Private Sector
Time Frame:	2007 to 2009
Expected Improvements:	Reduction of nutrients and pathogens entering the East Branch from livestock; Reduced erosion along the stream banks; Improved in-stream habitat
Evaluation Method:	Number of off-stream watering facilities developed; Linear feet of exclusion fencing along streams and lakes
Estimated Costs:	\$500 per linear foot for barbed wire fencing; \$1,500 - \$2,000 and up for off-stream watering sites.
Estimated Load Reduction:	Livestock Exclusion Fencing and Off-Stream Watering Facilities = Variable Reduction in TP, TN, TSS, and Bacteria Pollution

Action D: Establish settling, grass filtration, or soil infiltration systems around animal feeding and containment areas, e.g., buffer strips.	
Suggested Responsible Parties:	Stark SWCD; USDA - NRCS; ODNR - DSWC
Funding Options:	EQUIP; WPCLF; Ohio EPA Section 319 NPS Grant; Private Sector
Time Frame:	2007 - 2009
Expected Improvements:	Reduction in runoff from concentrated animal holding areas resulting in decreases in sediment, nutrients, and pathogens entering local streams and lakes.
Evaluation Method:	Number of buffer strips established and maintained; Water sampling in adjacent streams and lakes to track reductions in nutrients, pathogens, and/or sediment

Estimated Costs:	$0.25 - $1.10 per square yard seeded and mulched; $0.40 - $0.50 per seedling planted; $3.50 per linear foot of grassed diversion; Chemical Sampling = $500 to $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	Vegetated Filter Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-90%; Metals = 20%-80% Grassed Swales General Removal Efficiencies: TSS = 20%-40%; TP = 20%-40%; TN = 10%-30% Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action E: Complete and implement manure management plans for agricultural operations.	
Responsible Parties:	USDA - NRCS; Stark SWCD; Certified Consultant
Funding Options:	EQUIP; Private Sector
Time Frame:	Ongoing
Expected Improvements:	Reduced levels of nutrient and bacteria contamination in waterbodies adjacent to the operation.
Evaluation Method:	Number of manure management plans implemented and degree of success; Pre and post plan water quality sampling in adjacent waterbody
Estimated Costs:	Currently NRCS does not charge for plans under the EQUIP program; $10,000 - $50,000 for a concrete holding facility; $15,000 - $20,000 for a lined lagoon
Estimated Load Reduction:	Variable depending on the type of BMPs included in the manure plan and the size of the operation.

Middle Branch Watershed Action Plan

Inventory

Physical Description

The Middle Branch of Nimishillen Creek originates in the northern section of Stark County in Marlboro and Lake Townships including the southern portion of the Village of Hartville (Figure VII-3). Sections of the headwater areas have been modified or ditched long ago to improve drainage in agricultural areas in these townships. Swartz Ditch, a major tributary to the Middle Branch, is an example of this hydromodification. From the creek's origins in the northern portion of Stark County, the Middle Branch and its tributaries flow primarily southwardly into Nimishillen and Plain Township before entering the City of Canton and joining with the East Branch at about RM 15 to form the Mainstem of Nimishillen Creek.

Similar to the East Branch, the Middle Branch watershed resides entirely in the glaciated portion of Stark County (Figure II-5). As a result, the basin has moderate relief and gentle slopes due to glacial actions and depositions. Most of the subwatershed has less than a six percent slope with few slopes above 12 percent (Figure II-6). The soils in the region reflect the area's glacial activities with the primary soil associations being Fitchville-Sebring, Chili-Wheeling-Shoals, Ravenna-Canfield, and Carlisle-Willette-Linwood. Several soil types in this area are not suited for the installation of home sewage treatment systems do to poor drainage or permeability (Figure VI-3). Also like the East Branch, several areas along the Middle Branch and Swartz Ditch are covered with over 60 feet of glacial outwash. The bedrock formations within the middle consist of Middle Kittaning Coal, Brookeville Coal, and Mercer Limestone (Figure II-7). Of all the Nimishillen Creek subwatersheds, the Middle Branch has had the fewest problems with regards to flooding according to the Stark County Drainage Task Force. This is likely because a village, town, or city is not located adjacent to the Middle Branch until its final few miles in the City of Canton, and agricultural drainage systems such as Swartz Ditch continue to quickly remove water from agricultural areas in Marlboro and Lake Townships.

Land Use

The majority of the Middle Branch subwatershed is used for agriculture and open space. Nearly all the headwater areas in Lake, Nimishillen, and Marlboro Township are either agricultural lands, open space, or wooded lots. Old wetland and muck areas are also present in the headwater area of the Middle Branch around the Village of Hartville and northern Marlboro Township. These muck areas are primarily farmed and produce vegetables and other consumption crops. Development is limited in the headwater areas due to the lack of sanitary sewer service and poor soils for traditional home wastewater treatment systems (Figure VI-3). Development is primarily individual or large lot homesteads and businesses along the major roadways e.g. Middle Branch Road and State Route 44 (Figure VII-10). Agricultural runoff, degraded riparian habitat, failing home wastewater treatment systems, and channelization/ditching are the primary water quality concerns in the northern section of the subwatershed.

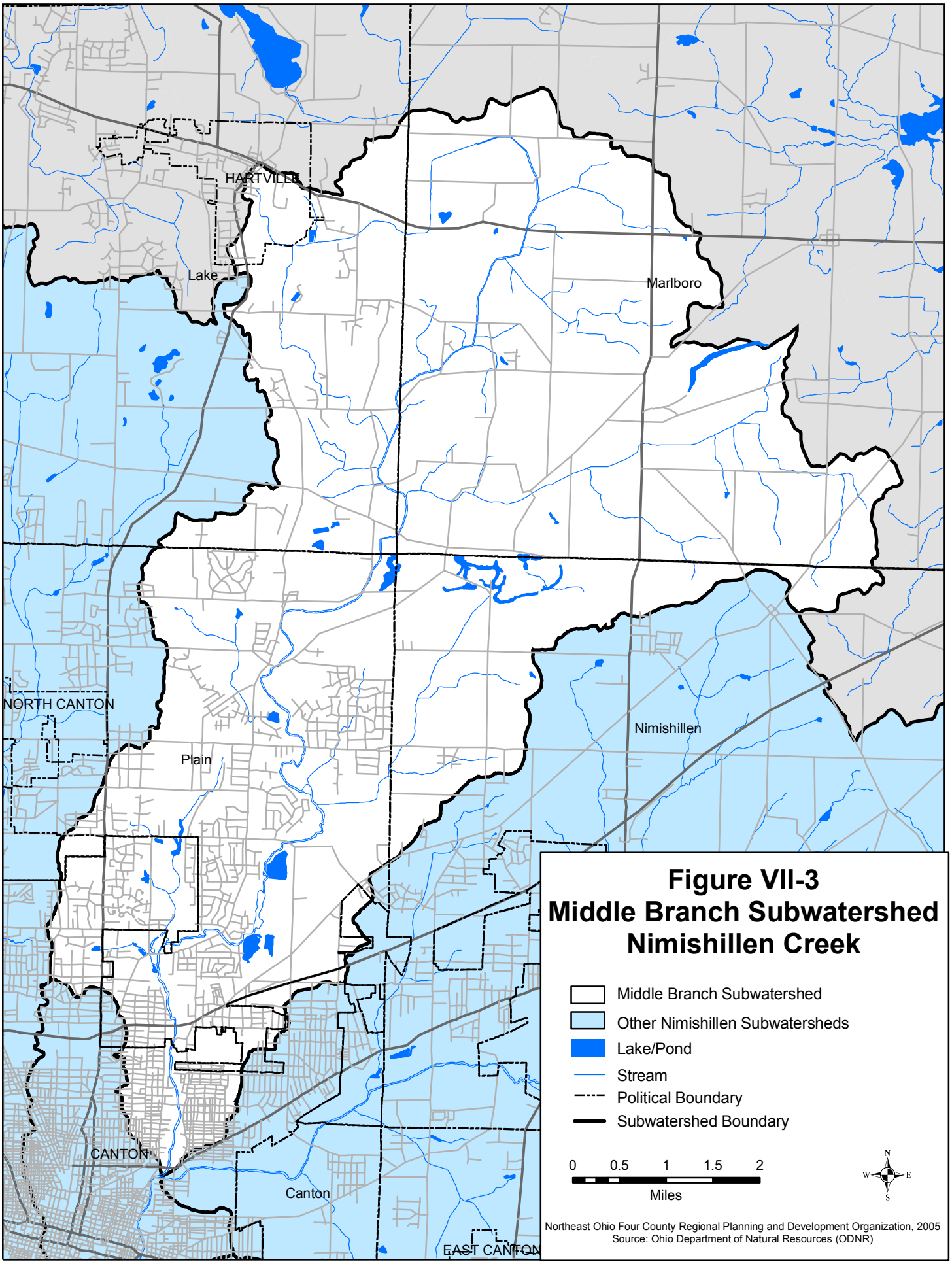


Figure VII-3
Middle Branch Subwatershed
Nimishillen Creek

As expected, an increase in development density mirrors the areas with access to sanitary sewer service in the lower portion of the Middle Branch basin. As the Middle Branch flows southward towards the City of Canton, urban/suburban development picks up around Easton Road in Plain Township (Figure II-13). This is also the same area where sewer service becomes readily available (Figure II-4). From the Easton Road region south, urban/suburban development increases as the Middle Branch moves through central Plain Township and into the City of Canton. The only industrial sites along the Middle Branch are located along the final mile of the creek before it merges with the East Branch at river mile 15. The total length of the Middle Branch is 16.6 miles long. Sampling conducted by the Ohio EPA along this lower portion of the Middle Branch revealed no water quality degradations from industrial discharges (see below). Therefore water quality concerns in the lower, more developed sections of the Middle Branch are storm water runoff from the urban and suburban areas and the protection and restoration of the riparian corridor (Figure VII-4).

Point Source Discharges

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer and into a waterbody after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges have the potential to introduce high levels of nutrients and chemicals into a waterway. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

Along the Middle Branch of Nimishillen Creek, fifteen point sources are permitted to discharge treated wastewater into the watershed. These include the Village of Hartville's wastewater treatment plan, Canton's NE Water Plan, one Stark County treatment facility, eleven private waste treatment systems, and one industrial discharger. The majority of the county and private wastewater treatment discharge points are located along Middlebranch Road that runs between the Cities of Hartville and Canton. The industrial discharger is located in the lower reaches of the Middle Branch. Table VII-5 provides information about each permitted discharge and Figure IV-1 maps their location in the watershed. Please note that this section does not include storm sewer outfalls, off-lot discharging home sewage treatment systems, or illegal point source discharges into the Middle Branch.

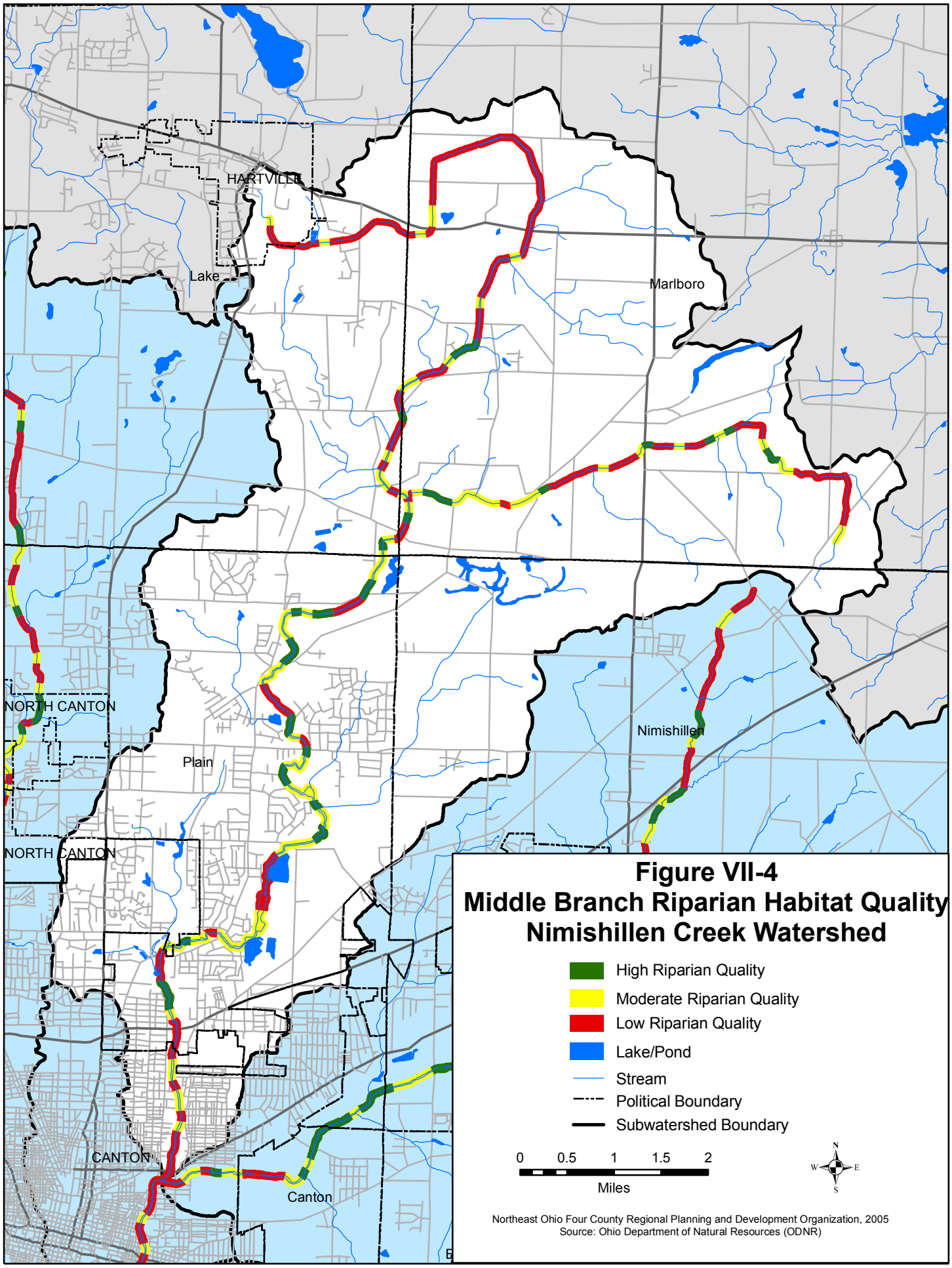


Figure VII-4
Middle Branch Riparian Habitat Quality
Nimishillen Creek Watershed

Table VII-5: Point Source Discharging Operations in the Middle Branch Subwatershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
6	BR Exploration & Oil Inc. 807 Hartford Ave. Canton, OH 44707	Not Given	Industrial Discharger
7	Canton NE Water Plant 2664 Harrisburg Road NE Canton, OH 44705	Not Given	Municipal Water Treatment Plant
14	Village of Hartville WWTP 565 Wales Drive Hartville, OH 44632	450,000	Municipal Wastewater Treatment Plant
30	Shady Knoll MHP 4689 Kirby Ave. N.E. Canton, OH 44705	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
31	Stark County 320 Columbus Rd. Louisville, OH 44641	Not Given	Municipal Wastewater Treatment System
39	Sable Creek Golf 5942 Edison St. Hartville, OH 44632	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
54	Apartment Building 7336 Middlebranch Ave. N.E. Canton, OH 44721	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
56	Axion Concrete Technology 8282 Middlebranch Ave. N.E. Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
57	Doug's Auto Service 8437 Middlebranch Ave. N.E. Canton, OH 44721	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
58	Glen Oak High School 2300 Schneider Rd. N.E. North Canton, OH 44721	>10,000	Private Discharging Semi-Public Sewage Treatment System
59	Leno's Restaurant 2494 Easton St. N.E. North Canton, OH 44720	5,000 to >10,000	Private Discharging Semi-Public Sewage Treatment System
60	Little Flower Church and School 2040 Diamond St. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
61	Master Touch Cleaners 2605 Easton St. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
63	Steiner Apartments 7330 Middlebranch Ave. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
70	Maize Valley Farm Market 6163 Edison St. Hartville, OH 44632	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System

GPD = Gallons Per Day
Sources: Ohio EPA, 2005; Stark County Health Department, 2006

Water Quality Data and Impairments

Ohio EPA's Water Quality Monitoring Results - 2001

The Ohio EPA conducted a biological and aquatic life use assessment along the lower portion of Nimishillen Creek's Middle Branch (Table VII-6). The sampling was the result of an evaluation under the Voluntary Action Program (VAP) at the IUSI-Union Metal facility in Canton. The goals of the sampling was to establish biological conditions in the Middle Branch in the vicinity of Union Metal by evaluating the fish and macroinvertebrate communities, and to determine the aquatic life use attainment status of that section of creek with regard to the Warm Water Habitat (WWH) standards.

Table VII-6: Ohio EPA 2001 Biological and Aquatic Life Use Sampling Results from the Middle Branch of Nimishillen Creek

River Mile	IBI	MIwb	ICI	QHEI	Attainment Status	Ohio EPA's Comments
0.8	32	6.2	26	63.5	Non	Upstream of Union Metal
0.6	**35**	7.1	26	54.0	Partial	Adjacent to Union Metal
0.3	27	6.4	26	57.0	Non	Downstream of Union Metal

BOLD = meeting or a nonsignificant departure from ecoregion biocriteria
IBI = Index of Biological Integrity (fish); MIwb = Modified Index of Well Being (fish); ICI = Invertebrate Community Index; QHEI = Qualitative Habitat Evaluation Index
Source: 2001 Biological and Aquatic Life Use Attainment Study: Lower Middle Branch Nimishillen Creek

The three biological indices used to determine attainment status are the Index of Biological Integrity (IBI), the Modified Index of Well Being (MIwb), and the Invertebrate Community Index (ICI). Both the IBI and MIwb are based on sampling of the fish community while the ICI scores are derived from examining the macroinvertebrate organisms.

The Middle Branch subwatershed resides in the Erie/Ontario Lake Plain (EOLP) ecoregion. In order to be in "Full" attainment, results from all three biocriteria (IBI, MIwb, and ICI) must be close to the numerical criteria set for the ecoregion. For the EOLP ecoregion, the IBI score must be no less than 4 units lower than 38, the MIwb has to be within 0.5 units of 7.7, and the ICI score can be no lower than 4 units from 34 to be in attainment. If one or two of the biocriteria meet the ecoregion scoring requirements, then the creek is said to be in partial attainment.

For this section of the Middle Branch, two of the three sections sampled were in non-attainment i.e. none of the indices met EOLP ecoregion requirements. The middle site sample at river mile (RM) 0.6 was in partial attainment because the IBI score of 35 was within 4 units of the ecoregion attainment value of 38. Therefore, of the one mile assessed by the Ohio EPA, 0.3 miles were in partial attainment and 0.7 miles were in non-attainment of the WWH aquatic life uses.

Physical habitat was evaluated using the Qualitative Habitat Evaluation Index (QHEI). Various attributes of the creek's habitat, like substrate, in-stream cover,

riparian habitat, etc. were scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic communities. Statewide, scores generally range from 20 to less than 100, and it has been shown from numerous sites throughout Ohio that values greater than 60 generally are conducive to the existence of warmwater fish and invertebrates, while scores less than 45 generally do not support warmwater fish or invertebrates. The scores for this section of the Middle Branch ranged from 54.0 to 63.5, indicating fair to marginally good stream habitat. Sedimentation and channel modification were cited as the reason for reduced QHEI scores.

Impairments

Aquatic Life Use:
No site sampled was in attainment. Only the middle site sampled, RM 0.6, was in partial attainment with an IBI score of 35. The IBI score at the last site, RM 0.3, was determined to be poor with a score of 27.

Recreation:
The Nimishillen Creek Middle Branch is impaired for Primary Contact Recreation.

Fish Consumption:
There is a fish consumption advisory of only one meal per month of common carp caught from the Nimishillen Creek Middle Branch. In addition, the Ohio Department of Health has issued a statewide advisory to limit meals of fish caught from all Ohio waterbodies to one meal per week due to mercury.

Ohio EPA's Causes and Sources of Impairments

The causes of impairments for a stream are the specific pollutants or alterations that result in the stream not meeting state water quality standards. Examples of common causes of water quality impairments are siltation, flow alteration, nutrient enrichment, metals, and temperature. Sources of impairments are where the causes originated or where the causes of impairments are supplied from. Sources include crop production, channelization, urban runoff, dam construction, discharge pipes, and stream bank erosion. Table VII-7 lists the causes and sources of impairment for aquatic life use, recreation, and fish consumption along the Mainstem of Nimishillen Creek.

Table VII-7: Ohio EPA's Causes and Sources of Impairments for the Middle Branch of Nimishillen Creek

Impairment Of:	Causes of Impairment (magnitude)	Sources of Impairment (magnitude)
Aquatic Life Use	Unknown (high)	Unknown (high)
Recreation	Pathogens	Not Identified
Fish Consumption	Polychlorinated Biphenyls (PCBs)	Not Identified

Sources: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory and Ohio EPA 2004 Integrated Report

The lower section of the Middle Branch of Nimishillen Creek from the 2001 sampling appears to largely reflect the urbanized nature of the lower one mile of the stream. It was not apparent from the results that the Union Metal site was influencing biological communities in this section of the creek. Numerous storm sewer pipes outflow into the lower mile of the creek, influencing biological communities (Ohio EPA, 2001).

Other Water Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO and the City of Canton have conducted three macroinvertebrate surveys along Nimishillen Creek. One of the seventeen sites sampled is located in the Middle Branch subwatershed. Table VII-8 summarizes the results of the sampling using ODNR's Stream Quality Monitoring Program protocol.

Table VII-8: Mean Cumulative Index Values* (CIV) for the Middle Branch of Nimishillen Creek Based on NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 2.1 - Reifsnyder Park on 31st St. and S.R. 62	21 Good	18 Good	19 Good

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

NEFCO's sampling results at this location have consistently scored in the "Good" range, and it has consistently been one of the top scoring sites among the sixteen or seventeen sampled in the surveys since 2000. However, the survey also noted that upstream of the area sampled, several storm water sewer pipes are discharging into the creek. Also, there is inadequate riparian vegetation and siltation is a concern at some locations.

The Ohio EPA found that generally ODNR's Stream Quality Monitoring Program tend to reflect attainment and non-attainment aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). Based on this study, this site is likely in or close to being in attainment for WWH aquatic life uses.

***Reifsnyder Park Constructed Storm Water Wetland - Macroinvertebrate Monitoring Results (November 2004)*:**
The City of Canton, in an effort to improve water quality flowing into the Nimishillen Creek from urban and suburban areas, constructed a wetland in Reifsnyder Park to treat effluent from storm water sewer outlets. The city contracted with NEFCO to monitor the macroinvertebrate community upstream and downstream of the site both before and after construction. Results of the monitoring are summarized in Table VII-9.

Table VII-9: Mean Cumulative Index Values (CIVs) and Stream Segment Conditions Based on Macroinvertebrate Surveys at Reifsynder Park in Canton, Ohio.

Sample Date	Sampling Location	Cumulative Index Values*				Mean	
		A	B	C	Total	CIV	Segment Condition**
6-28-02	River Mile 2.8: Upstream of the Storm Water Wetland - Before Construction	24	23	24	71	24	Excellent
6-09-04	River Mile 2.8: Upstream of the Storm Water Wetland - After Construction	21	25	29	75	25	Excellent
7-12-02	River Mile 2.1: Downstream of the Storm Water Wetland - Before Construction	17	18	22	57	19	Good
6-09-04	River Mile 2.1: Downstream of the Storm Water Wetland - After Construction	21	20	17	58	19	Good

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

The results show the Middle Branch going from an “Excellent” scoring creek to receiving “Good” scores as it meanders through Reifsnyder Park. This reduction in scoring from RM 2.8 to 2.1 correlates with a reduction of riparian vegetation (Figure VII-4) and the presence of numerous storm sewer discharge pipes located between the two sites. Based on the Ohio EPA studies on this sampling protocol, the upstream site (RM 2.8) is likely in attainment of aquatic life use attainment standards for WWH. The downstream sites attainment status may or may not be reaching WWH attainment standards (Yoder and Davis, 1996).

Pollutant Removal Efficiencies of a Constructed Storm Water Treatment Wetland in Canton, Ohio (2005):
Mr. Jim Eynon from Youngstown State University completed this study as part of his requirements for the Masters of Science in Engineering degree. The purpose of the study was to gauge the effectiveness at removing pollutants from urban

runoff of a storm water treatment wetland constructed by the City of Canton. The constructed wetland is located in Reifsynder Park along the Middle Branch of Nimishillen Creek (RM 2.4). The study monitored total suspended solids, nitrate/nitrite, soluble reactive phosphorus, total phosphorus, and ammonia before and after treatment by collecting grab samples in April 2005. Results show some indications of effective removal of pollutants from storm water runoff before entering the Middle Branch (Table VII-10). However, pollutant reduction was not monitored over an entire season or during an entire storm event (Eynon, 2005).

Table VII-10: Pollutant Removal Efficiencies from the Constructed Storm Water Treatment Wetland at Reifsynder Park in Canton, Ohio

Parameter	Removal Efficiency Range	Mean Removal Efficiency
Total Suspended Solids	45% - 95%	77%
Soluble Reactive Phosphorus	25% - 96%	68%
Total Phosphorus	59% - 86%	74%
Nitrate/Nitrite	98% - 100%	99%
Ammonia	93% - 100%	96%

Source: Jim Eynon. 2005. Pollutant Removal Efficiencies of a Constructed Storm Water Treatment Wetland in Canton, Ohio. Youngstown State University Graduate Project

Middle Branch Subwatershed Issues and Actions

1. **Failing HSTSs**
2. **Environmental Education**
3. **Agricultural Runoff and Practices**
4. **Riparian Corridor Restoration**
5. **Urban Storm Water Runoff**

As with most headwater streams, the water quality of the Middle Branch of Nimishillen Creek is almost entirely reflective of the activities occurring within its basin. This subwatershed has the largest area without sanitary sewer service. Coupled with significant sections of poor soils for home sewage treatment systems results in those systems failing, and thus be the primary concern for water quality. Storm water runoff from both urban/suburban areas and agricultural fields is also a concern that can be addressed through education and targeted best management practices. Lastly, the Middle Branch ranked next to last among Nimishillen Creek subwatersheds for suitable riparian habitat cover. Restoration of riparian cover in the headwater areas and in the City of Canton is a priority.

Using the available data and information along with personal knowledge of the Middle Branch, watershed stakeholders ranked the top five issues they believe to be hindering water quality attainment in this subwatershed. Under each of the five issues is a goal with objective statements accompanied by recommended actions to address each issue. Please note that the recommended actions are not intended to be a

comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe to be the best course of action given the current circumstances and available information. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III* for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001).

"Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Lastly, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could take the lead on actions not yet being implemented.

Middle Branch Issue #1 - Failing Home Sewage Treatment Systems

Goal: Reduce the nutrient and bacteria pollution in the Middle Branch from failing home sewage treatment systems (HSTSs).

Objectives:

1. Establish a comprehensive education and outreach program for stakeholders using HSTSs.
   Focus Areas: All unsewered areas
   Target: Program established by 2008
2. Begin an operations and maintenance program in the watershed.
   Focus Areas: HSTSs along Boettler Street, Easton Street, and Middle Branch Road.
   Target: Inspection of 250 systems per year in the subwatershed
3. Provide financial support for the repair and replacement of failing HSTSs for low income property owners.
   Focus Areas: Entire Subwatershed
   Target: Assistance for all low income property owners, if needed

Middle Branch Issue #1 - Recommended Actions Tables:

Action A: Establish education efforts to increase public awareness of faulty HSTSs through door-to-door surveys, information materials, educational video, public meetings, and/or informational booths at local public events e.g. fairs.	
Suggested Responsible Parties:	Stark County Health Department, Ohio Department of Health; Ohio EPA; NEFCO; Earth Action Partnership
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant; Local Funding
Time Frame:	Door-to-Door Surveys: 2007 - 2008 Information Materials: Ongoing Public Meetings: 2007 - 2008 Informational Booths: 2007 - 2008
Expected Improvements:	Increased awareness of water quality impacts associated with malfunctioning or failing HSTSs; Increased number of voluntary HSTS repairs
Evaluation Method:	Number of surveys completed; Number of informational materials distributed; Number of public meetings held; Number of fairs or public events attended; Surveys before and after educational efforts begin to gauge a change in general knowledge among watershed residents
Estimated Costs:	– Surveys = $2.00 per survey – Pamphlets and Flyers = $1.50 - $3.00 per item – Public Meetings = $1,200 per 2 hour meeting – Display = $1,000 and up
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, indirect reductions possible depending on the number of homeowners that utilize the information presented

Action B: Seek funding assistance for homeowners to repair or replace faulty HSTSs.	
Suggested Responsible Parties:	Stark County Health Department; Stark County Regional Planning
Funding Options:	WPCLF; Ohio EPA Section 319 NPS Grant; WPCLF; EDA Block Grant
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs
Evaluation Method:	Number of systems repaired or replaced
Estimated Costs:	$3,000 - $8,000 average cost to replace a HSTS; Up to $1,000 to repair a HSTS
Estimated Load Reduction:	On-Site HSTS Repair or Replacement: 100% reduction in bacteria and nutrient pollution from a HSTS Off-Site Repair or Replacement: Variable reduction for each HSTS

Action C: Establish an operations and maintenance inspection program to facilitate the repair and replacement of failing home sewage treatment systems (HSTS).	
Suggested Responsible Parties:	Stark County Health Department
Funding Options:	Local Property/Home Owner Operations and Maintenance Fee; Ohio EPA Section 319 NPS Grant; WPCLF
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs in the Middle Branch watershed; Reduction in nutrient and pathogens entering the stream
Evaluation Method:	Number of systems inspected, pumped, and/or repaired; Water quality sampling of effluent before and after repair or replacement
Estimated Costs:	Approximately $250,000 for Stark County Health Department to establish and run a permit system for three years in the entire Nimishillen Creek Watershed
Estimated Load Reduction:	Variable depending on the number of HSTSs inspected and ordered to be repaired or replaced

Action D: Promote the extension of sewers in the watershed, especially where high concentrations of HSTSs are located on poor soils for septic systems.	
Suggested Responsible Parties:	Stark County Sanitary Engineer; Stark County Health Department; Ohio EPA; Ohio Department of Health
Funding Options:	WPCLF; Local Property/Homeowner via Assessment; WRRSP; USDA - Rural Development Grant
Time Frame:	2007 and beyond
Expected Improvements:	Lower number of malfunctioning or failing HSTSs that pollute local water resources
Evaluation Method:	Number of homeowners in areas of high housing concentrations with poor soils who are contacted about sewer expansion; Future plans or projects for sewer expansion into these areas
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $2.00 per survey; $9,000 per home and up for sewer tap-in fee.
Estimated Load Reduction:	Up to 100% reduction in pollution including bacteria and nutrients originating from HSTSs in newly sewered areas

Middle Branch Issue #2 - Environmental Education

Goal: Educate residents, government officials, and businesses about watershed issues impacting the Middle Branch of Nimishillen Creek.

Objectives:

1. Educate riparian and shoreline landowners on the value of a healthy riparian habitat.
   Focus Areas: All riparian land owners
   Target: Provide education material to 75 percent of riparian land owners
2. Increase general knowledge of local watershed issues.
   Focus Areas: Entire Subwatershed
   Target: To be determined
3. Support and enhance educational efforts associated with the Storm Water NPDES Phase II permit program.
   Focus Areas: Entire Subwatershed
   Target: To be determined

Middle Branch Issue #2 - Recommended Actions:

Action A: Identify shoreline and riparian landowners and educate them about the importance of shoreline or riparian zone protection.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Stark Parks
Funding Options:	NPS Education Grant; OEEF; WPCLF; CWA Section 319 Grant; Private Sector
Time Frame:	2006 thru 2008
Expected Improvements:	Increased protection of shoreline and riparian corridor
Evaluation Method:	List of riparian landowners; Number of educational pamphlets distributed; Riparian habitat scores
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Educate residents about watershed issues through regularly scheduled events and activities that are recognized by the public. These events and activities can include watershed surveys, presentations at local meetings, information booths at local fairs, creek clean-ups, and other public meetings.	
Responsible Parties:	Nimishillen Creek Watershed Partners; NEFCO; Stark SWCD; Stark RPC
Funding Options:	Private Sector; NPS Education Grant; OEEF Grant; CWA Section 319 NPS Grant
Time Frame:	Ongoing
Expected Improvements:	Greater awareness regarding watershed issues
Evaluation Method:	Number of events held; Surveys taken; Presentations given; Fairs attended; Public meetings held
Estimated Costs:	Survey = $2.00 per survey; Presentation = $3,000 and up per 80 picture slide/PowerPoint show; County Fair Display = $1,000 and up + $1.50 to $3.00 per pamphlet + $15.00 per volunteer hour; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Implement a watershed protection and awareness program in local schools.	
Suggested Responsible Parties:	Stark Parks; Ohio EPA - Division of Surface Water; County SWCDs; Local Boards of Education; Local Schools; Earth Action Partnership
Funding Options:	OEEF; NPS Education Grant; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Stronger knowledge of future generations regarding the importance of watershed protection
Evaluation Method:	Number of local schools implementing program; Number of students exposed to watershed education efforts
Estimated Costs:	$400 - $7,000
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Educate riparian landowners on stewardship including the removal of downed trees in the Creek.	
Suggested Responsible Parties:	Earth Action Partnership; Stark SWCD; NEFCO; Stark Parks; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility; Conservation District Assessment; OEEF, Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond
Expected Improvements:	Decrease in obstructions resulting in less localized flooding and water quality problems.
Evaluation Method:	Number of riparian homeowners contacted
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Middle Branch Issue #3 - Agriculture Runoff and Practices

Goal: Reduce nonpoint source pollution from agricultural lands.

Objectives:

1. Reduce sediment transport and deposition of sediment associated with agricultural erosion.
   Focus Areas: Headwater streams and Swartz Ditch basin
   Target: To be determined
2. Reduce fertilizer, herbicide and pesticide runoff from agricultural areas.
   Focus Areas: Headwater streams and Swartz Ditch basin
   Target: To be determined
3. Reduce nutrient and bacteria loads from livestock.
   Focus Areas: Headwater streams and Swartz Ditch basin
   Target: To be determined

Middle Branch Issue #3 - Recommended Actions:

Action A: Educate farmers about the benefits of implementing appropriate BMPs, e.g., conservation tillage, conservation cropping sequence, contour strip cropping, contour farming, and precision farming, to reduce the impacts associated with sediment runoff.	
Responsible Parties:	Stark SWCD; USDA - NRCS; Ohio Department of Agriculture; ODNR - DSWC; Earth Action Partnership
Funding Options:	EQUIP; Ohio EPA Section 319 NPS Grant; OEEF; WPCLF; CRP
Time Frame:	Ongoing
Expected Improvements:	Reduction in sediment and nutrient loads entering waterways from agricultural areas
Evaluation Method:	Increase in participation in conservation tillage, conservation cropping sequence; contour strip cropping, contour farming, and precision farming in the Middle Branch subwatershed
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $3,000 and up for an 80 slide PowerPoint presentation.
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, reduction could occur if highlighted BMPs are voluntarily implemented.

Action B: Establish grassed and forested buffer strips on farm croplands, especially adjacent to streams.	
Suggested Responsible Parties:	Stark SWCD; ODNR - DSWC; Ohio Department of Agriculture; USDA - NRCS
Funding Options:	EQUIP; CRP; WPCLF; Ohio EPA Section 319 Grant
Time Frame:	2007-2010
Expected Improvements:	Lower nutrient, sediment, and bacterial pollution from agricultural areas
Evaluation Method:	Linear feet of grassed and forested buffer strips established; Modeled pollution reduction for grassed or forested buffer strips installed
Estimated Costs:	$0.25 - $1.10 per yd^2 seeded and mulched; $0.40 - $0.50 per seeding planed
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Implement fencing and development of off-stream watering facilities to limit or exclude livestock from stream areas.	
Suggested Responsible Parties:	Stark SWCD; ODNR - DSWC; USDA - NRCS
Funding Options:	EQUIP; WPCLF; Ohio EPA Section 319 NPS Grant; Private Sector
Time Frame:	2007 - 2009
Expected Improvements:	Reduction of nutrients and pathogens entering the Middle Branch from livestock; Reduced erosion along the stream banks; Improved in-stream habitat
Evaluation Method:	Number of off-stream watering facilities developed; Linear feet of exclusion fencing along streams and lakes
Estimated Costs:	$500 per linear foot for barbed wire fencing; $1,500 - $2,000 and up for off-stream watering sites.
Estimated Load Reduction:	Livestock Exclusion Fencing and Off-Stream Watering Facilities = Variable Reduction in TP, TN, TSS, and Bacteria Pollution

Action D: Establish settling, grass filtration or soil infiltration systems around animal feeding and containment areas, e.g., buffer strips.	
Suggested Responsible Parties:	Stark SWCD; USDA - NRCS; ODNR - DSWC
Funding Options:	EQUIP; WPCLF; Ohio EPA Section 319 NPS Grant; Private Sector
Time Frame:	2007 - 2009
Expected Improvements:	Reduction in runoff from concentrated animal holding areas resulting in decreases in sediment, nutrients, and pathogens entering the Middle Branch.
Evaluation Method:	Number of buffer strips established and maintained; Water sampling in adjacent streams and lakes to track reductions in nutrients, pathogens, and/or sediment
Estimated Costs:	$0.25 - $1.10 per square yard seeded and mulched; $0.40 - $0.50 per seedling planted; $3.50 per linear foot of grassed diversion; Chemical Sampling = $500 to $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	Vegetated Filter Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-90%; Metals = 20%-80% Grassed Swales General Removal Efficiencies: TSS = 20%-40%; TP = 20%-40%; TN = 10%-30% Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action E: Complete and implement manure management plans for agricultural operations.	
Responsible Parties:	USDA - NRCS; Stark SWCD; Certified Consultant
Funding Options:	EQUIP; Private Sector
Time Frame:	Ongoing
Expected Improvements:	Reduced levels of nutrient and bacteria contamination in waterways adjacent to the operation.
Evaluation Method:	Number of manure management plans implemented and degree of success; Pre and post plan water quality sampling in adjacent waterways
Estimated Costs:	Currently NRCS does not charge for plans under the EQUIP program; $10,000 - $50,000 for concrete holding facility; $15,000 - $20,000 for lined lagoon
Estimated Load Reduction:	Variable depending on the type of BMPs included in the manure plan and the size of the operation.

Middle Branch Issue #4 - Riparian Corridor Restoration

Goal: Restore habitat areas with “poor” or “moderate” riparian habitat scores to the next attainment level.

Objectives:

1. Work with property owners to improve the riparian habitat in the Middle Branch basin.
   Focus Areas: Headwater streams and Swartz Ditch basin; Lake and Marlboro Townships
   Target: Restore 10 percent or approximately 7,000 linear feet of “poor” or “moderate” quality riparian habitat
2. Establish policies to protect the riparian corridor and habitat.
   Focus Areas: Entire Subwatershed
   Target: Adoption of policies by the county and municipalities

Middle Branch Issue #4 - Recommended Actions:

Action A: Provide incentives for agricultural landowners to protect shoreline or riparian corridor with long-term protection or permanent conservation easements.	
Responsible Parties:	Stark County SWCD; USDA - NRSC; Land Conservancies; Stark Parks
Funding Options:	EQUIP; Farm Bill; CRP; WRP
Time Frame:	2007 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Linear feet set aside for long-term protection; Number of permanent conservation easements; Riparian habitat scores
Estimated Costs:	$0.00 to $5,000 per acre and up; $4,000 and up on average to set up a maintenance fees
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, long-term or permanent protection measures will reduce future pollution loading or provide an opportunity to restore degraded riparian areas.

Action B: Encourage city and county park districts to purchase selected areas to protect and/or increase intact riparian corridor.	
Responsible Parties:	Stark Parks; Canton Parks Commission
Funding Options:	Clean Ohio Fund; Ohio EPA Section 319 NPS Grant; WPCLF; PL-566
Time Frame:	Ongoing
Expected Improvements:	Maintain or increase riparian habitat scores
Evaluation Method:	Number of riparian acres purchased; Riparian habitat scores
Estimated Costs:	$0 - $5,000 and up per acre; $4,000 and up average set up and maintenance fee
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, long-term or permanent protection measures will reduce future pollution loading or provide an opportunity to restore degraded riparian areas.

Action C: Assist communities with the development of township or municipal ordinances requiring new construction sites to leave easements of a specific distance near shorelines of targeted wetlands and flood plains of streams.	
Suggested Responsible Parties:	Stark County Regional Planning Commission; Stark SWCD
Funding Options:	NPS Education Grant; OEEF
Time Frame:	2007 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Number of ordinances established and enforced; Riparian and shoreline miles protected; Riparian habitat scores
Estimated Costs:	Variable
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action D: Assist shoreline and riparian landowners to stabilize shoreline and riparian corridor using appropriate BMPs.	
Suggested Responsible Parties:	County SWCDs; NEFCO; ODNR - DSWC; USDA - NRCS; Earth Action Partnership; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2005 thru 2008
Expected Improvements:	Restabilization of shoreline and riparian corridor; Reduction in stream bank erosion; Improved wildlife habitat
Evaluation Method:	Linear feet of bank or shoreline stabilized; Wildlife survey; Riparian habitat scores
Estimated Costs:	Approximately $350,000 to restore or stabilize 1,300 linear feet of stream channel; Fiber Rolls = $12.00 per linear foot; Plant Cuttings = $0.40 - $0.50 per cutting; Erosion Control Blankets = $2.00 per yd^2
Estimated Load Reduction:	Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75% Fiber Rolls: TSS Reduction = 58% Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Middle Branch Issue #5 - Storm Water Runoff from Urban and Suburban Areas

Goal: Improve the ability of the Middle Branch watershed to assimilate and treat storm water runoff by promoting the protection and restoration of wetlands, the restoration of floodplains, and minimizing runoff from impervious areas.

Objectives:

1. Create or restore wetland areas in the Middle Branch subwatershed.
   Focus Areas: Martindale Park to Cook Park
   Target: Construct or restore 20 acres of wetlands per year
2. Permanently protect and restore natural, high quality wetland areas
   Focus Areas: Entire Subwatershed
   Target: Protect 10 acres of existing wetlands per year
3. Reduce flow obstructions like log jams along the Middle Branch.
   Focus Areas: Headwater streams and Swartz Ditch basin
   Target: To be determined
4. Restore and protect active floodplain area.
   Focus Areas: Martindale Park to Cook Park
   Target: Protect or restore 5 acres per year of active floodplain

Middle Branch Issue #5 - Recommended Actions:

Action A: Implement NPDES Phase II Storm Water Management Program	
Responsible Parties:	Stark County; City of Canton; City of Hartville
Funding:	Local; Storm Water Utility
Time Frame:	Ongoing - Deadline for Full Development and Implementation is Dec. 8, 2007
Expected Improvements:	Significant reduction of pollution in urban storm water runoff through the establishment of six minimum control measures.
Evaluation Method:	Annual Review of the Program by permitted communities and the Ohio EPA
Estimated Costs:	Not given
Estimated Load Reduction:	Variable depending on the practices implemented by each permitted community

Action B: Purchase and protect active floodplain areas.	
Suggested Responsible Parties:	Federal Emergency Management Agency (FEMA); City of Canton; Stark County; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	FEMA Grants, Clean Ohio Fund, Storm Water Utility, Conservancy District Assessment, Private Sector
Time Frame:	2006 and beyond
Expected Improvements:	Reduction in flood damage, improved water quality from intact, protected river corridor.
Evaluation Method:	Acres of active floodplain purchased or protected
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the condition and restoration potential of purchased or protected parcels

Action C: Identify natural wetland areas that can be protected or restored.	
Suggested Responsible Parties:	NEFCO; Stark Parks; Earth Action Partnership; ODNR; Stark County Drainage Task Force
Funding Options:	Ohio EPA Section 319 NPS Grant, Local Funds
Time Frame:	2007-2008
Expected Improvements:	The action will identify wetland areas in need of protection and restoration in the Middle Branch subwatershed for future actions.
Evaluation Method:	Acres of wetlands identified
Estimated Costs:	To be determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Promote the construction of storm water treatment wetlands for storm sewer outlets near the Middle Branch.	
Suggested Responsible Parties:	NEFCO; Local Municipalities; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility, Conservation District Assessment, WRRSP, Local Funds
Time Frame:	Ongoing
Expected Improvements:	Reductions in nutrients and sediments from storm water runoff entering the East Branch; Increased flood water retention; Creation of wetland habitat for wildlife
Evaluation Method:	Acres of storm water wetlands constructed
Estimated Costs:	$50,000 - $100,000 and up per constructed wetland
Estimated Load Reduction:	Constructed Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33%

West Branch Watershed Action Plan

Inventory

Physical Description

The West Branch subwatershed begins in Lake Township in northern Stark and near the Akron-Canton Regional Airport in the City of Green in Summit County. The West Branch drains central and southern Lake Township then flows south into Plain Township and North Canton. The major tributary to the West Branch is Zimber Ditch which begins around the Akron-Canton Airport and also flows directly south into Jackson Township, Plain Townships and the City of North Canton while nearly paralleling Interstate 77. At approximately river mile 4.0, the Zimber Ditch joins the West Branch in the City of Canton and flows south along Interstate 77 before joining with the Mainstem just south of the Interstate 77/State Route 30 interchange in the City of Canton at river mile 12 (Figure VII-5).

The West Branch subwatershed is positioned in the glaciated portion of Stark and Summit Counties (Figure II-5). The resulting topography in the watershed is primarily moderate relief and gentle slopes. Most of the subwatershed contains slopes of less than twelve percent. However, isolated area in the western edge of the subwatershed in Jackson Township has some slopes greater than 25 percent (Figure II-6). Soils in the West Branch are typical of glaciated regions in the area with the primary associations being Chili-Wheeling-Shoals, Fitchville-Sebring, Canfield-Wooster, Ravenna-Canfield, and Carlisle-Willette-Linwood. Although several of the soil types in each of these associations is poorly suited for the installation of home sewage treatment systems due to poor drainage or permeability, most of the watershed is served by sanitary sewers. Only the areas around the Akron-Canton Airport and sections in Lake or Plain Townships in the northeast portion of the subwatershed do not currently have access to a sanitary sewer system.

The bedrock within the West Creek basin consists of Mercer Limestone, Brookville Coal, and Middle Kittaning Coal (Figure II-7). The Mercer Limestone is located largely along Zimber Ditch in the west portion of the subwatershed. Brookville Coal bedrock is dominant in the area between Zimber Ditch and West Branch, with Middle Kittaning Coal bedrock scattered throughout the area. However, significant portions of the bedrock in the West Branch subwatershed are covered by over 60 feet of glacial outwash.

Hydromodification in the form of channelization (ditching) has influenced the characteristics of the West Branch. Zimber Ditch is the primary example of these past practices that has lead to flood problems and reduced water quality as agricultural lands have been converted to urban and suburban areas. Lastly, several flooding issues have been documented throughout the West Branch subwatershed by the Stark County Drainage Task Force.

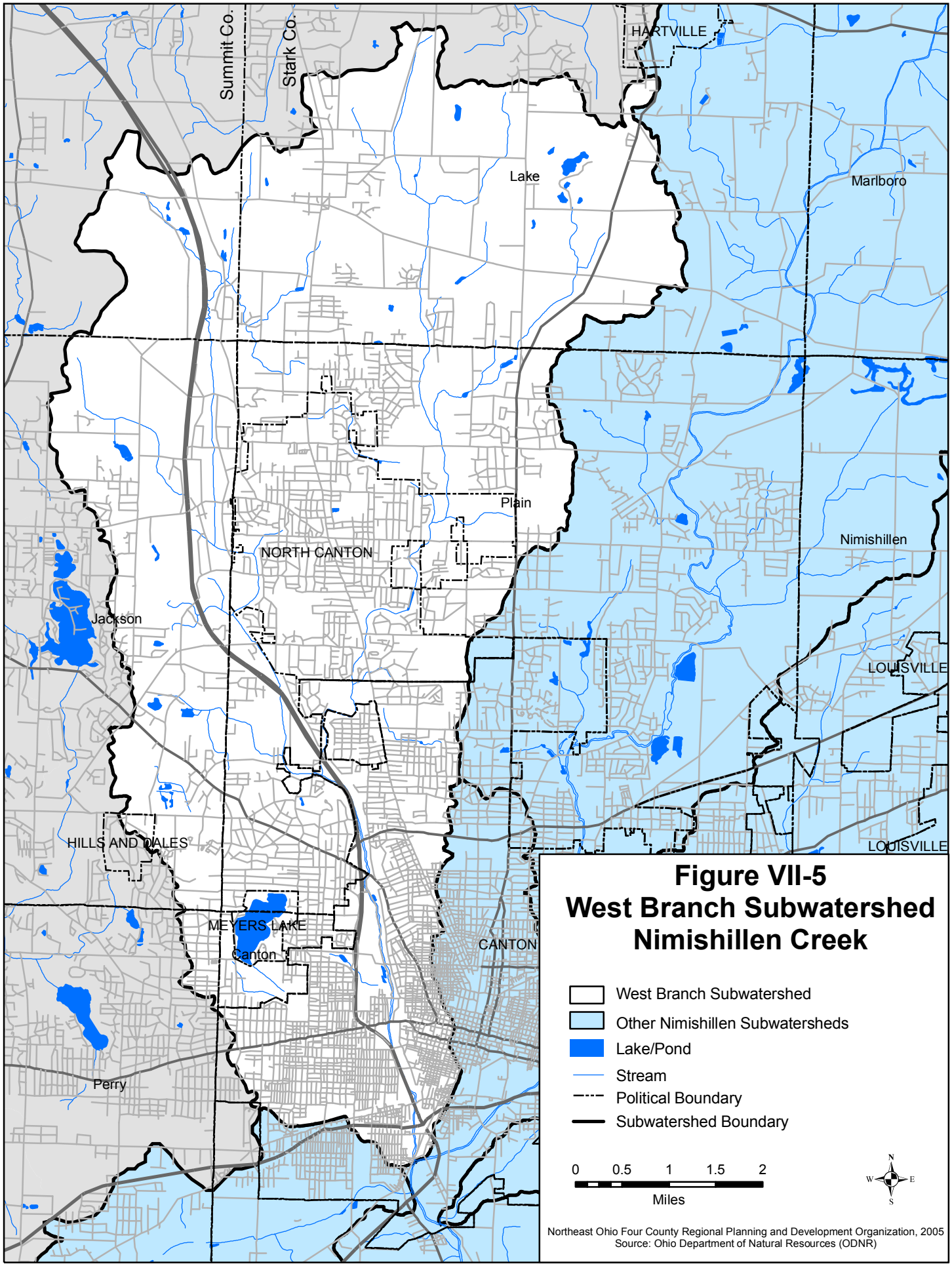


Figure VII-5
West Branch Subwatershed
Nimishillen Creek

Land Use

The West Branch subwatershed is the most developed in the Nimishillen Creek basin (Figure II-13). Nearly half of the watershed is used for urban, suburban, or industrial uses. The Cities of Canton and North Canton are both partially located in the West Branch Watershed. Interstate 77 between Akron and Canton parallels the creek from the headwaters of Zimber Ditch to is confluence with the Mainstem in the City of Canton. As a result, urban sprawl from both the Akron and Canton metropolitan areas has occurred. Industrial areas are concentrated around the Akron-Canton Regional Airport, the Hoover Company in the City of North Canton, and the lower mile of the West Branch in the City of Canton. Agriculture, open, and wooded areas are mostly found in the headwaters of the West Branch in Lake Township. However, the City of Canton has developed an extensive park system along the West Branch from the State Route 62 bridge south to the State Route 30 bridge (Figure II-3). These riparian parks are the primary open areas/buffers in the lower reaches of the West Branch.

The riparian habitat was rated as moderate to poor along most sections of the West Branch (Figure VII-6). The worst riparian scores were found in the headwaters in Lake Township, along Zimber Ditch in Jackson Township and North Canton, along the riparian parks in the City of Canton, and the final half mile of the West Branch. Restoration of this habitat will be limited in some areas due to encroachment from development, but is possible in select locations. Other water quality concerns from the land usage include storm water runoff from urban and suburban areas, lack of environmental education by the watershed stakeholders, and the need to monitor water quality changes from the continued development of agriculture and open lands. Lastly, abandoned land mines, primarily in the lower portion of the subwatershed, is also of concern.

Point Source Discharges

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer and into a waterbody after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges have the potential to introduce high levels of nutrients and chemicals into a stream or lake. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

Along the West Branch of Nimishillen Creek a total of thirteen discharge points are permitted. Five sources release treated wastewater, six are industrial dischargers, and two are effluents from water treatment plants. The remaining permitted discharges are from private wastewater treatment systems. Table VII-11 provides information about each permitted discharge and Figure IV-1 maps the location in the watershed. Please note that this section does not include storm sewer outfalls, off-lot discharging home sewage treatment systems, or illegal point source discharges

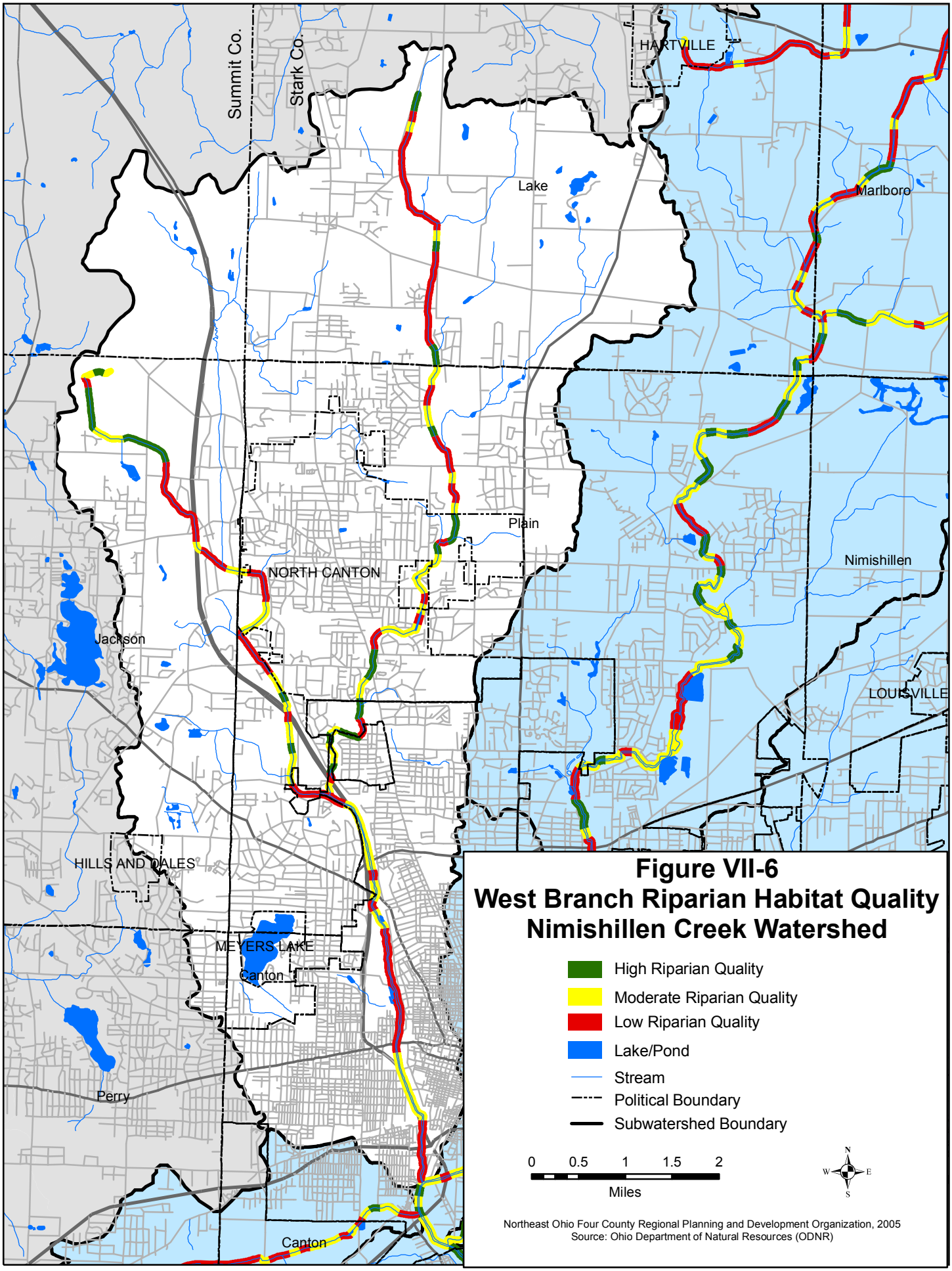


Figure VII-6
West Branch Riparian Habitat Quality
Nimishillen Creek Watershed

into the Nimishillen Creek Watershed. Additional point source dischargers will be added as information becomes available.

Table VII-11: Point Source Discharging Operations in the West Branch Subwatershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
3	Akron Canton Regional Airport 5400 Lauby Rd. North Canton, OH 44720	100,000	Commercial Discharger
4	Akron Canton Truck Plaza Inc. 4450 Portage Rd. North Canton, OH 44720	Not Given	Private Discharging Semi-Public Sewage Treatment System
8	Canton NW Water Plant 44044 Guilford NW Canton, OH 44709	Not Given	Municipal Water Treatment Plant
15	The Hoover Company Plant 1 101 East Maple St. North Canton, OH 44720	600,000	Industrial Discharger
16	Hoover Co. Industrial Park 8200 Freedom Ave. North Canton, OH 44720	300,000	Industrial Discharger
22	McCann Plastics Inc. 5600 Mayfair Rd. North Canton, OH 44720	Not Given	Industrial Discharger
24	North Canton Water Plant 7300 Freedom Ave. NW North Canton, OH 44720	Not Given	Municipal Water Treatment Plant
27*	Republic Engineered Steels 2633 8th St. NW Canton, OH 44708	Not Given	Industrial Discharger
32	Stark County - Bob-O-Link 2000 Mohler Dr. North Canton, OH 44720	Not Given	Private Discharging Semi-Public Sewage Treatment System
35	Timken Co. Research Center 500 Mt. Pleasant Rd. North Canton, OH 44720	Not Given	Industrial Discharger
55	Avondale Professional Building 3996 Fulton Rd. N.W. Canton, OH 44718	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
62	North Market Home Sales 8139 Kent Ave. N.E. Louisville, OH 44646	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
64	Whipple Center Building 2922 Whipple Ave. N.W. Canton, OH 44708	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System

* Permits Expired in 2005; GPD = Gallons Per Day
Sources: Ohio EPA, 2005; Stark County Health Department, 2006

Water Quality Data and Impairments

Ohio EPA's Water Quality Results

The Ohio EPA last sampled the West Branch in 1998 to primarily determine the impact of various industrial discharges on the water quality. The results found undetermined sources of impairments along the lower one and quarter mile of the West Branch. Also, Gregory Galvanizing was found to be impacting the stream near the mouth with high concentrations of zinc. Previous testing by the Ohio EPA in the mid-1980s found impacts from the Hoover Corporation and de-icing materials from the Akron-Canton Regional Airport, but these sources were not evaluated in 1998 (Ohio EPA, 2000). Table IV-12 summarizes the Ohio EPA's monitoring results. None of the 1.3 miles of the West Branch sampled met state water quality standards.

Table VII-12: Aquatic Life Use Attainment Segment Summaries for the West Branch of Nimishillen Creek

Segment River Mile (Lower/Upper)	Reach Length Miles	Attainment Miles Status			
		Full	Partial	Non	Not Assessed
0.00/9.00	9.00	0.00	0.00	1.30	7.7

Source: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory

Impairments

Aquatic Life Use:

The lower 1.3 miles of the West Branch were not in attainment for any of the three biological criteria used by the Ohio EPA.

Recreation:

The Nimishillen Creek West Branch is impaired for Primary Contact Recreation (PCR).

Fish Consumption:

There is a fish consumption advisory of only one meal per month of common carp caught from the Nimishillen Creek West Branch. In addition, the Ohio Department of Health has issued a statewide advisory to limit meals of fish caught from all Ohio waterbodies to one meal per week due to mercury.

Ohio EPA's Causes and Sources of Impairments

The causes of impairments for a stream is the specific pollutant or alteration that results in the stream not meeting state water quality standards. Examples of common causes of water quality impairments are siltation, flow alteration, nutrient enrichment, metals, and temperature. Sources of impairment are where the causes originate or where the causes of impairments are supplied from. Sources can include crop production, channelization, urban runoff, dam construction, discharge pipes, and stream bank erosion. Table VII-13 lists the causes and sources of

impairment for aquatic life use, recreation, and fish consumption for the West Branch of Nimishillen Creek.

Table VII-13: Ohio EPA's Causes and Sources of Impairments for the West Branch of Nimishillen Creek

Impairment Of:	Causes of Impairment (magnitude)	Sources of Impairment (magnitude)
Aquatic Life Use	Zinc (high) Unknown (high)	Minor Industrial Point Source (high) Unknown (high)
Recreation	Pathogens	Not Identified
Fish Consumption	Polychlorinated Biphenyls (PCBs)	Not Identified

Sources: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory and Ohio EPA 2004 Integrated Report

Other Water Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO and the City of Canton have conducted three macroinvertebrate surveys along Nimishillen Creek. Four of the seventeen sites are located in the West Branch watershed. Scores over the years have ranged from "Excellent" to "Fair" with a general trend of decreasing scores from upstream to downstream sites. A summary of the West Branches macroinvertebrate scores are summarized in Table VII-14.

Table VII-14: Mean Cumulative Index Values* (CIV) for the West Branch from NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 0.26 - Cleveland Ave. and Market St.	15 Fair	11 Fair	12 Fair
River Mile 0.84 - Navarre Rd.	16 Fair	14 Fair	16 Fair
River Mile 2.45 - Monument Park at 12th St.	26 Excellent	17 Good	22 Good
River Mile 6.52 - Everhard Rd. Bridge	11 Fair	22 Good	17 Good

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

The Ohio EPA found that generally ODNR's Stream Quality Monitoring Program used by NEFCO tend to reflect attainment and non-attainment for

aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). Consequently, it is likely that the upstream sites (RM 2.45 and 6.52) are closer to attaining WWH aquatic life use standards than the two downstream locations at RM 0.84 and RM 0.26.

West Branch Subwatershed Issues and Actions

1. **Environmental Education**
2. **Storm Water Runoff**
3. **Watershed Monitoring**
4. **Mine Drainage**
5. **Riparian Corridor Restoration**

The location of the West Branch subwatershed along Interstate 77 has hastened the development of open areas in Lake, Plain, and Jackson Townships in Stark County. Nearly half of the watershed has already been developed, and the continued urban and suburban sprawl in this area ensures more development in the foreseeable future. Therefore, West Branch subwatershed issues are those commonly associated with urban or suburban development including storm water runoff and riparian habitat reduction. Another priority is establishing a watershed monitoring program to assess water quality shifts as the landscape continues to change. The increasing level of knowledge among residents regarding water resources and watershed concepts and problems is a core component for water quality improvement in the basin. Lastly, small isolated areas of drainage from old abandoned mines needs to be further investigated to determine their impact on the West Branch.

Using the available data and information along with personal knowledge of the West Branch, watershed stakeholders ranked the top five issues they believe to be hindering water quality attainment in this subwatershed. Under each of the five issues are a goal and objective statements for each issues accompanied by recommended actions. Please note that the recommended actions are not intended to be a comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe is the best course of action given the current information and circumstances. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III* for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001).

"Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Finally, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could take the lead on actions not yet being implemented.

West Branch Issue #1 - Environmental Education

Goal: Acquire a stronger understanding, cooperation, and participation among residents, students, government officials, and businesses regarding watershed issues impacting the West Branch of Nimishillen Creek.

Objectives:

1. Strengthen awareness of and involvement in watershed issues.
   Focus Areas: Entire Subwatershed
   Target: Direct contact with 100 West Branch stakeholders per year
2. Reduce fertilizer, herbicide, pesticide, and other lawn care by-products from reaching the West Branch.
   Focus Areas: Zimber Ditch Subwatershed
   Target: To be determined
3. Support and enhance education efforts associated with the Storm Water NPDES Phase II permit program.
   Focus Areas: North Canton, Canton, and Plain Townships
   Target: To be determined

West Branch Issue #1 - Recommended Actions:

Action A: Educate residents about watershed issues through regularly scheduled events and activities that are recognized by the public. These events and activities can include watershed surveys, presentation at local meetings, information booths at local fairs, creek clean-ups, and other public meetings.	
Responsible Parties:	Nimishillen Creek Watershed Partners; NEFCO; Summit and Stark SWCDs; Stark RPC; City of Green
Funding Options:	Private Sector; NPS Education Grant; OEEF Grant; CWA Section 319 NPS Grant
Time Frame:	Ongoing
Expected Improvements:	Greater awareness regarding watershed issues.
Evaluation Method:	Number of: Events held; Surveys taken; Presentations given; Fairs attended; Public meetings held
Estimated Costs:	Survey = $2.00 per survey; Presentation = $3,000 and up per 80 picture slide/PowerPoint show; County Fair Display = $1,000 and up + $1.50 to $3.00 per pamphlet + $15.00 per volunteer hour; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Identify shoreline and riparian landowners and educate them about the importance of shoreline or riparian zone maintenance and protection.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Stark Parks; Summit County Metro Parks
Funding Options:	NPS Education Grant; OEEF; WPCLF; CWA Section 319 Grant; Private Sector
Time Frame:	2006 thru 2008
Expected Improvements:	Increased protection of the shoreline and riparian corridor
Evaluation Method:	List of riparian landowners; Number of education pamphlets distributed; Riparian habitat scores
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Implement a watershed protection and awareness program in local schools.	
Suggested Responsible Parties:	Stark Parks; Summit County Metro Parks; Ohio EPA - Division of Surface Water; County SWCDs; Local Boards of Education; Local Schools; Earth Action Partnership
Funding Options:	OEEF; NPS Education Grant; CWA Section 319 NPS Grant
Time Frame:	2007 thru 2009
Expected Improvements:	Stronger knowledge of future generations regarding the importance of watershed protection
Evaluation Method:	Number of local schools implementing program; Number of students exposed to watershed education efforts
Estimated Costs:	$400 - $7,000
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Educate riparian landowners on stewardship including the removal of downed trees in the Creek.	
Suggested Responsible Parties:	Earth Action Partnership; Stark SWCD; NEFCO; Stark Parks; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility; Conservation District Assessment; OEEF, Ohio EPA Section 319 NPS Grant

Time Frame:	2007 and beyond
Expected Improvements:	Decrease in obstructions resulting in less localized flooding problems.
Evaluation Method:	Number of riparian homeowners contacted; Stewardship Survey
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	Variable depending on stewardship practices adopted by landowners

West Branch Issue #2 - Storm Water Runoff from Urban and Suburban Areas

Goal: Improve the ability of the West Branch subwatershed to assimilate and treat storm water runoff by promoting the protection and restoration of wetlands, the restoration of floodplains, and minimizing runoff from impervious areas.

Objectives:

1. Restore and protect active floodplains where possible.
   Focus Areas: Entire Subwatershed
   Target: Restore or protect 5 acres of active floodplains per year
2. Reduce flow obstructions like log and debris jams along the West Branch.
   Focus Areas: Zimber Ditch
   Target: To be determined
3. Promote the use of storm water treatment and retention practices such as rain gardens or constructed treatment wetlands in urban/suburban areas.
   Focus Areas: Canton; North Canton
   Target: Two demonstration projects by 2008
4. Permanently protect and restore natural wetland areas.
   Focus Areas: Lake and Jackson Townships
   Target: Protect or restore 5 acres of natural wetlands per year

West Branch Issue #2 - Recommended Actions:

Action A: Construct regional detention basins in the headwaters of the Zimber Ditch basin.	
Responsible Parties:	Stark County Regional Planning Commission
Funding:	U.S. Army Corps of Engineers 594 Program; Local
Time Frame:	Ongoing; Completion date in 2006
Expected Improvements:	Reduction in excess water entering Zimber Ditch for industrial and business areas around the Akron-Canton Regional Airport. This will reduce peak flows downstream of the basins reducing flood damage to adjacent properties and habitat areas. A secondary benefit includes the removal of sediment from storm water runoff.
Evaluation Method:	Total capacity of the basins; Macroinvertebrate Survey; Modeling or directly measuring sediment reduction

Estimated Costs:	$1,000,000 and up
Estimated Load Reduction:	Detention basins general removal efficiency for TSS = 60%-97%

Action B: Implement NPDES Phase II Storm Water Management Program	
Responsible Parties:	Stark County; City of Canton; City of North Canton; City of Green
Funding:	Local; Storm Water Utility
Time Frame:	Ongoing - Deadline for Full Development and Implementation is Dec. 8, 2007
Expected Improvements:	Significant reduction of pollution in urban storm water runoff through the establishment of six minimum control measures.
Evaluation Method:	Annual Review of the Program by permitted communities and the Ohio EPA
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the practices implemented by each permitted community

Action C: Promote the construction of storm water treatment wetlands for storm sewer outlets near the West Branch basin.	
Suggested Responsible Parties:	NEFCO; Local Municipalities; Stark County Drainage Task Force; Muskingum Watershed Conservancy District
Funding Options:	Storm Water Utility; Conservation District Assessment; WRRSP, Local Funds
Time Frame:	2007 and beyond
Expected Improvements:	Reductions in nutrients and sediments from storm water runoff entering the East Branch; Increased flood water retention; Creation of wetland habitat for wildlife
Evaluation Method:	Acres of storm water wetlands constructed
Estimated Costs:	$50,000 - $100,000 and up per constructed wetland
Estimated Load Reduction:	Treatment Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33%

Action D: Identify natural wetland areas that can be protected or restored.	
Suggested Responsible Parties:	NEFCO; Stark Parks; Summit Metro Parks; Earth Action Partnership, ODNR, Stark County Drainage Task Force
Funding Options:	Ohio EPA Section 319 NPS Grant, Local Funds

Time Frame:	2007-2008 (Completed in Summit County by the Metro Parks)
Expected Improvements:	The action will identify wetland areas in need of protection and restoration in the East Branch watershed for future actions.
Evaluation Method:	Acres of wetlands identified
Estimated Costs:	To be determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action E: Assist landowners in installing storm water reduction and treatment best management practices such as rain gardens, rain barrels, etc.	
Suggested Responsible Parties:	Stark and Summit SWCDs; Earth Action Partnership; NEFCO; Stark County Storm Water Task Force; Muskingum Watershed Conservancy District
Funding Options:	Ohio EPA Section 319 NPS Grant; Storm Water Utility; Conservation District Assessment; Local and Private Funds
Time Frame:	2006 thru 2010
Expected Improvements:	Reduction in volume, velocity, and amount of storm water runoff for residential areas entering the West Branch; Improved quality of the storm water runoff entering the West Branch.
Evaluation Method:	Number of best management practices installed; Macroinvertebrate and habitat monitoring
Estimated Costs:	Rain Gardens = Variable Rain Barrel = $50 to $100 and up per barrel
Estimated Load Reduction:	Rain Gardens: TSS = 60%-90%; TP = 60%-90%; TN = 50%-100%; Metals = 50%-100%

West Branch Issue #3 - Watershed Monitoring

Goal: Establish a monitoring system to document changes to the water resources, record changes to riparian habitat, and document illegal discharges or dumping into the West Branch.

Objectives:

1. Implement local macroinvertebrate sampling and habitat assessment along the West Branch.
   Focus Areas: Everhard Road bridge to the mouth.
   Target: Program established by 2008
2. Establish a citizens monitoring program for basic water chemistry parameters.
   Focus Areas: Headwater Tributaries
   Target: Program established by 2008

3. Establish and promote a protocol to report illegal dumping, discharges, or other activities that might threaten the West Branch's water quality.
   Focus Areas: Entire Subwatershed
   Target: To be determined

West Branch Issue #3 - Recommended Actions:

Action A: Continue and expand NEFCO's macroinvertebrate and habitat monitoring at station in the West Branch basin.	
Responsible Parties:	NEFCO
Funding Options:	Local Funding; Ohio EPA Section 319 NPS Grant
Time Frame:	Ongoing
Expected Improvements:	Increase knowledge macroinvertebrate, water quality, and habitat conditions over time
Evaluation Method:	Macroinvertebrate monitoring scores; Photograph comparison of sites over time; Habitat rating scores
Estimated Costs:	- NEFCO Macroinvertebrate Monitoring = $750 per site - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Establish a procedure to report activities (illegal dumping) or flow impairments (log jams) that impact local water resources.	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; Stark County Health Department; Ohio EPA; Stark County Drainage Task Force; NEFCO
Funding Options:	Private Sector; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond
Expected Improvements:	Increased monitoring of known illegal and chronic dumping sites; Correction of illicit discharges into the West Branch
Evaluation Method:	Number of activities or situation reported; Corrective actions taken
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the type of activity or impairment reported

Action C: Establish citizens monitoring program for the West Branch subwatershed focusing on headwater areas.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County and Summit SWCD; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond
Expected Improvements:	Increase knowledge of the water quality in the basin
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling
Estimated Costs:	- Macroinvertebrate monitoring: $15 per volunteer per hour + $50 monitoring kit; - Chemical Sampling: $500 to $1,000 and up for laboratory tests + cost of collection and transportation +$15 per volunteer per hour + $35 chemical monitoring kit
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

West Branch Issue #4 - Abandoned Mine Drainage

Goal: Identify and reduce pollution from acid mine drainage sources in order to improve aquatic life along the West Branch of Nimishillen Creek.

Objectives:

1. Investigate known abandoned mines in the watershed to determine which are impacting Nimishillen Creek Mainstem.
   Focus Areas: Altman Road and State St.; Green; Lake Township; North Canton
   Target: Completed by 2007
2. Decrease the impacts of acid mine drainage entering the West Branch.
   Focus Areas: To be determined
   Target: To be determined
3. Establish a biological and chemical monitoring program for areas impacted by acid mine drainage.
   Focus Areas: To be determined
   Target: To be determined

West Branch Issue #4 - Recommended Actions:

Action A: Investigate abandoned mines in the watershed and determine if acid mine drainage is impacting the water quality of the West Branch and its tributaries.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark and Summit SWCDs; Stark and Summit County Health Departments; Local University

Funding Options:	Private Sector; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem
Evaluation Method:	List of sites visited; Documentation of AMD problems
Estimated Costs:	To be determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Decrease acid mine drainage entering the West Branch by using the best available technology.	
Suggested Responsible Parties:	ODNR - Division of Mineral Resources Management; Stark County; Stark and Summit County Health Department; Ohio EPA; NEFCO; Crossroads RC&D; Rural Action; USDA - NRCS
Funding Options:	CWA Section 319 NPS Grant; State and Federal Abandoned Mine Land (AML) Reclamation Programs; Rural Abandoned Mine (RAMP) Program; Appalachian Clean Stream Program (ACSP); Ohio EPA's WRRSP
Time Frame:	2007 thru 2010
Expected Improvements:	Reduction in dissolved metals, acids, and flocculates (yellow boy) associated with AMD; Improved biology in West Creek
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent; Number of AMD abatement projects completed
Estimated Costs:	Variable - site dependent
Estimated Load Reduction:	To be determined

Action C: Establish long-term chemical and biological monitoring program for AMD areas.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem; Better evaluation of AMD abatement projects
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent

Estimated Costs:	- Macroinvertebrate monitoring: $15 per volunteer per hour + $50 monitoring kit - NEFCO Macroinvertebrate Monitoring = $750 per site - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

West Branch Issue #5 - Riparian Corridor Restoration

Goal: Where possible, restore habitat areas with "poor" or "moderate" riparian habitat scores to the next attainment level.

Objectives:

1. Work with property owners to improve the riparian habitat in the West Branch basin.
   Focus Areas: Canton Parks; Lake Township
   Target: Restore one percent or approximately 900 linear feet of "poor" or "moderate" quality riparian habitat
2. Establish policies to protect the riparian corridor and habitat.
   Focus Areas: Entire Subwatershed
   Target: Adoption of policies by the county and municipalities
3. Update the riparian zone analysis for the West Branch.
   Focus Areas: Entire Subwatershed
   Target: Update completed by 2007

West Branch Issue #5 - Recommended Actions:

Action A: Provide incentives for agricultural landowners to protect shoreline or riparian corridors with long-term protection or permanent conservation easements.	
Responsible Parties:	Stark County SWCD; USDA - NRSC
Funding Options:	EQUIP; Farm Bill; CRP; WRP
Time Frame:	2007 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Linear feet set aside for long-term protection; Number of permanent conservation easements; Riparian habitat scores
Estimated Costs:	$0.00 to $5,000 per acre and up; $4,000 and up on average to set up a maintenance fees
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action B: Encourage city and county park districts to purchase selected areas to protect and/or increase intact riparian corridor.	
Responsible Parties:	Stark Parks; Canton Parks Commission; North Canton
Funding Options:	Clean Ohio Fund; Ohio EPA Section 319 NPS Grant; WPCLF; PL-566
Time Frame:	Ongoing
Expected Improvements:	Maintain or increase riparian habitat scores.
Evaluation Method:	Number of riparian acres purchased; Riparian habitat scores
Estimated Costs:	$0 - $5,000 and up per acre; $4,000 and up average set up and maintenance fee
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Assist communities with the development of township or municipal ordinances requiring new construction sites to leave easements or a specific distance near shorelines of targeted wetlands and floodplains of streams.	
Suggested Responsible Parties:	Stark County; Stark and Summit SWCDs; City of Canton; City of North Canton; City of Green
Funding Options:	NPS Education Grant; OEEF
Time Frame:	City of Green adopted riparian setback regulations in 2003 Rest of the basin: 2006 thru 2008
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection.
Evaluation Method:	Number of ordinances established and enforced; Riparian and shoreline miles protected; Riparian habitat scores
Estimated Costs:	Variable
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action D: Assist shoreline and riparian landowners to stabilize shoreline and riparian corridor using appropriate BMPs.	
Suggested Responsible Parties:	County SWCDs; NEFCO; ODNR - DSWC; USDA - NRCS; Earth Action Partnership; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP

Time Frame:	2006 and beyond
Expected Improvements:	Stabilization of shoreline and riparian corridor; Reduction in stream bank erosion; Improved wildlife habitat
Evaluation Method:	Linear feet of bank or shoreline stabilized; Wildlife survey; Riparian habitat scores
Estimated Costs:	Approximately $350,000 to restore or stabilize 1,300 linear feet of stream channel; Fiber Rolls = $12.00 per linear foot; Plant Cuttings = $0.40 - $0.50 per cutting; Erosion Control Blankets = $2.00 per yd^2
Estimated Load Reduction:	Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75% Fiber Rolls: TSS Reduction = 58% Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80% Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75%

Action E: Update NEFCO's riparian habitat evaluation.	
Responsible Parties:	NEFCO
Funding Options:	Local Fund; Ohio EPA Section 319 NPS Grant
Time Frame:	2006 to 2007
Expected Improvements:	Updated information on the riparian habitat along the West Branch; Monitor the change in riparian habitat since 1999
Evaluation Method:	Completed riparian evaluation
Estimated Costs:	$500 to $1,000
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Sherrick Run Subwatershed Action Plan

Inventory

Physical Description

Sherrick Run is a 6.8 mile long tributary located in the southeastern portion of the Nimishillen Creek Watershed (Figure VII-7). Its headwaters are located in Osnaburg Township and flows east into Canton Township before joining Nimishillen Creek south of the City of Canton. Sherrick Run's watershed resides on the divide between the glaciated and unglaciated portions of Stark County (Figure II-5) resulting in varying topography. The northern portion of the subwatershed has gentle to rolling slopes, while the southern section is characterized by steep upland areas and broad, flat expanses in the floodplain. In the areas with steep slopes, erosion and rapid runoff during storm events is an issue.

Soil associations in this area include Fitchville-Sebring, Chili-Wheeling, Loudonville-Wooster, Latham-Keene, and Muskingum-Gilpin-Dekalb. The dominant bedrock in the watershed is Middle Kittaning Coal and there are several abandoned underground coal mines in the watershed (Figure VII-8). The largest abandoned mine is located just south of the unincorporated Village of Waco along State Route 43 (RM 3.1). Lastly, primarily due to the topography, Sherrick Run's riparian habitat is mainly intact (Figure VII-9). The riparian area near Alderman Trucking and State Route 43 and a stretch along the headwaters are the only poor riparian quality areas of note.

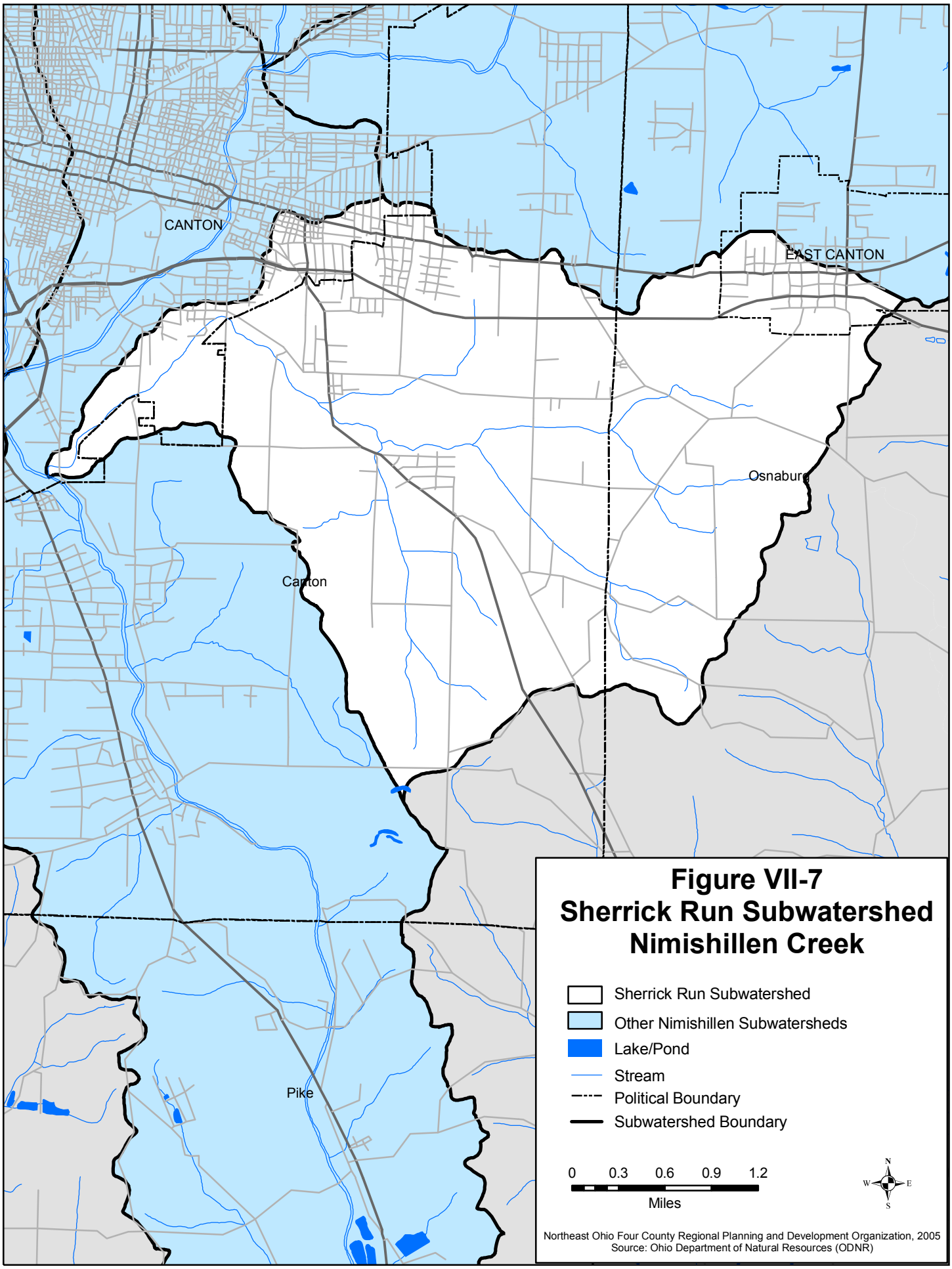
Land Use

The Sherrick Run watershed is the least developed of all the Nimishillen Creek subbasins. The steep topography associated with this unglaciated section of the Nimishillen Creek Watershed leaves few suitable sites for development, especially in the southern portions of the basin (Figure II-6). The primary land covers in the headwater areas are wooded, shrub/scrub, agriculture, and open land (Figure II-13). Some housing developments and business in these headwater areas have been along primary roads. The population density increases downstream (west) of State Route 43 as it nears the City of Canton. Land cover in the downstream section of the basin is a mix of urban, industrial, wooded, and shrub/scrub. Historically, areas within the Sherrick Run watershed have been mined for coal resulting in abandoned mines peppering the basin. The largest of the abandoned coal mines is located in Canton Township near the intersection of State Route 43 and Millerton Road (Figure VII-8). All mines in the watershed have been abandoned since at least 1934.

Water quality concerns primarily for this watershed center around discharges from the abandoned mine land, failing HSTSs in areas of concentrated development, and illegal dumping along isolated sections of Sherrick Run.

Point Source Dischargers

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer into a waterway after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges have the


CANTON
EAST CANTON
Osnaburg
Canton
Pike
Figure VII-7
Sherrick Run Subwatershed
Nimishillen Creek
Sherrick Run Subwatershed
Other Nimishillen Subwatersheds
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 0.3 0.6 0.9 1.2
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

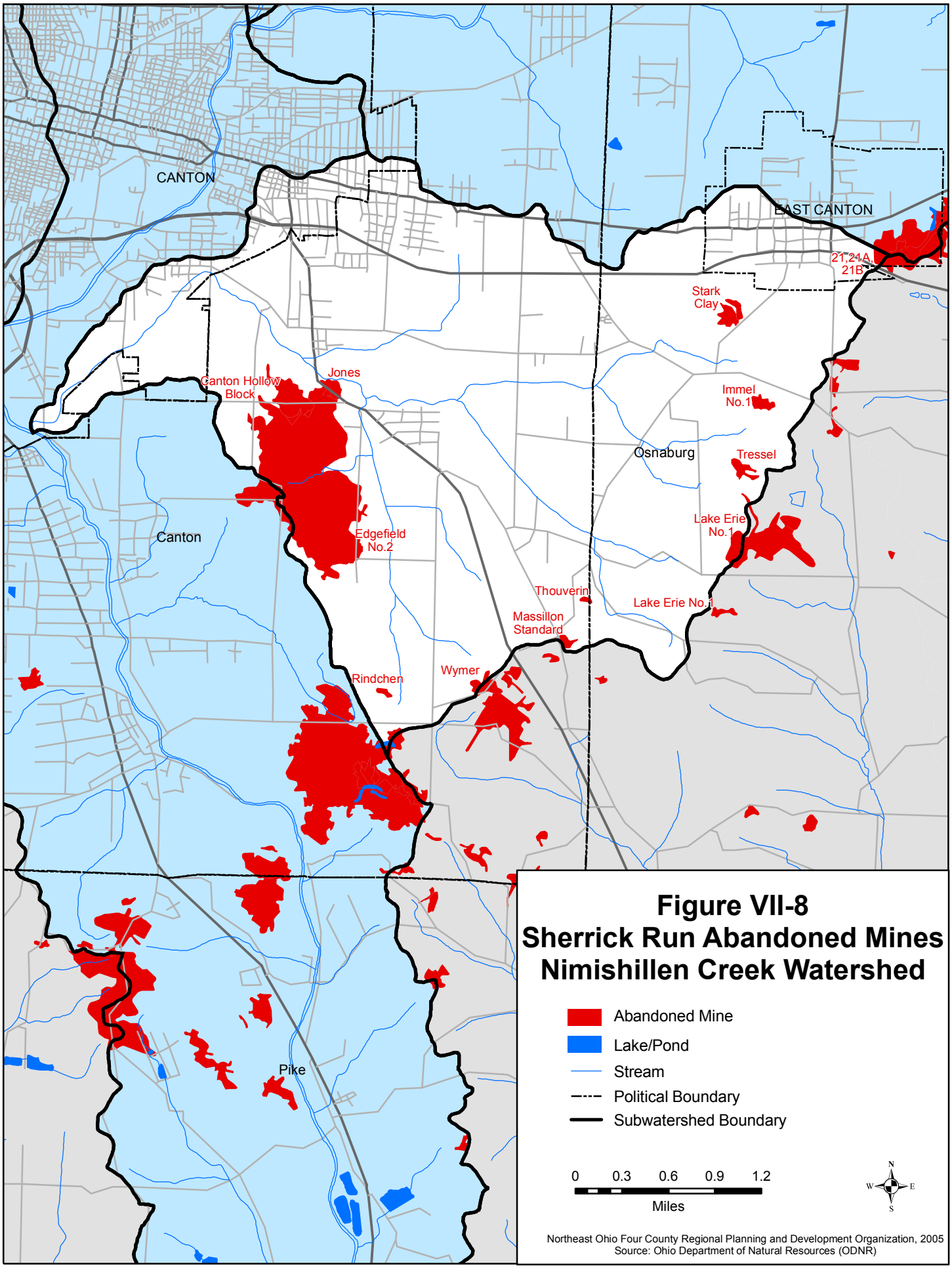
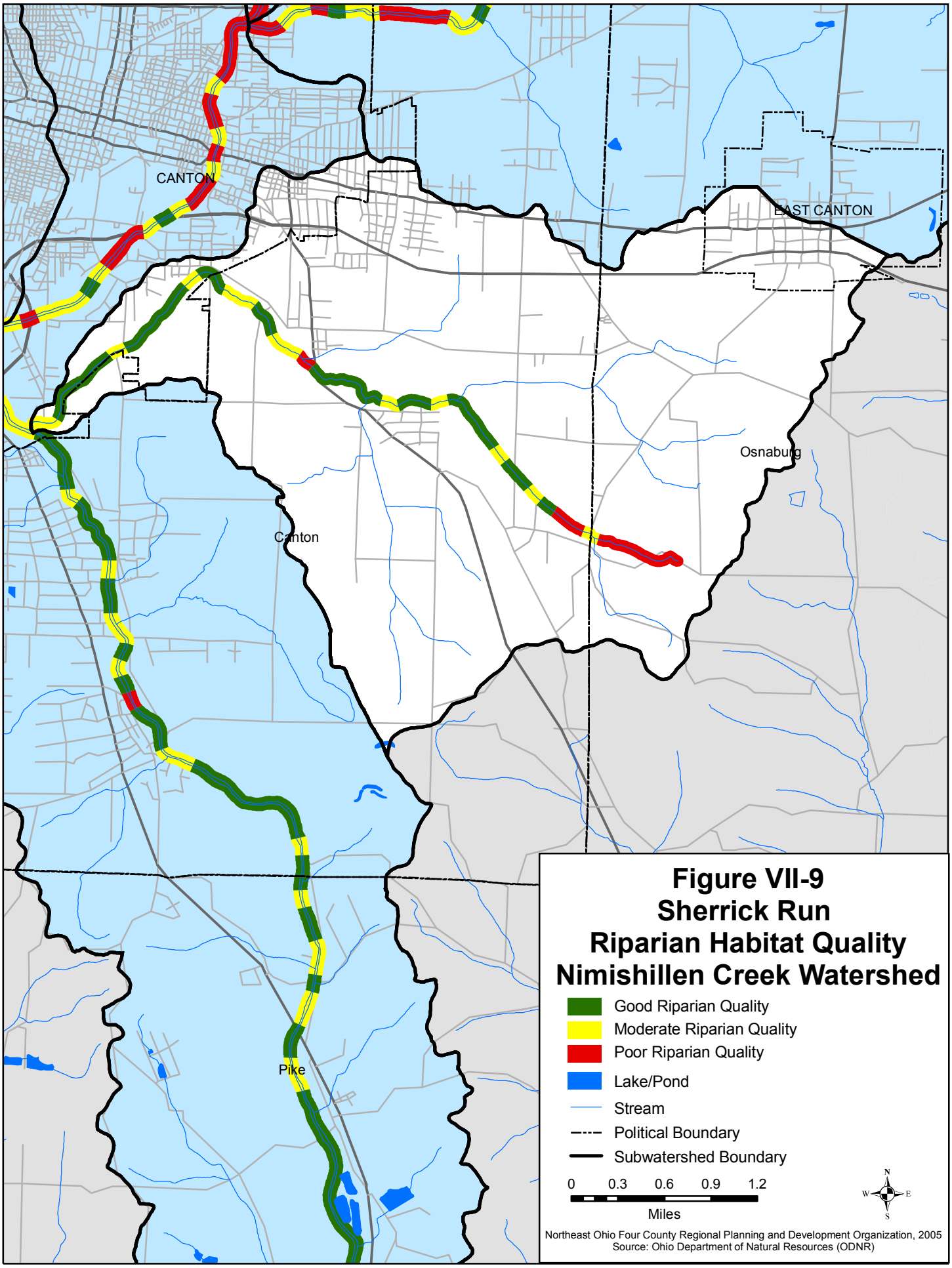


Figure VII-8
Sherrick Run Abandoned Mines
Nimishillen Creek Watershed


CANTON
EAST CANTON
Osnaburg
Canton
Pike
Figure VII-9
Sherrick Run
Riparian Habitat Quality
Nimishillen Creek Watershed
Good Riparian Quality
Moderate Riparian Quality
Poor Riparian Quality
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 0.3 0.6 0.9 1.2
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

potential to introduce high levels of nutrients and chemicals into a stream or lake. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

Along Sherrick Run, seven point sources have permits to discharge water into the watershed. Six of the permits are for sewage treatment systems for private businesses without access to sanitary sewers. There is one permit issued to an industrial discharger, but no permitted public treatment plants in the Sherrick Run subwatershed. Table VII-15 provides information about each permitted discharge and Figure IV-1 maps the location in the watershed. Please note that this section does not include storm sewer outfalls, off-lot discharging home sewage treatment systems, or illegal point source discharges into the Nimishillen Creek Watershed. Additional discharge information will be added as it becomes available.

Table VII-15: Point Source Discharging Operations in the Sherrick Run Subwatershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
19	Koch Engineering 5385 Orchard Drive East Canton, OH 44730	Not Given	Industrial Discharger
36	Walker Elementary School 3525 Sandy Ave. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
37	Anheuser Busch Sales of Canton 1611 Marietta Ave. S.E. Canton, OH 44707	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
69	Thunderbird Terrace 1581 Pekin Dr. S.E. East Canton, OH 44730	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
72	Arvilla oil Field Service Co. 1821 Moore Ave. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
73	Roadside Tavern 2521 Waynesburg Dr. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
74	Vine Ministries 3206 Lincoln St. E Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System

GPD = Gallons Per Day;
Sources: Ohio EPA, 2005; Stark County Health Department, 2006

Water Quality Data and Impairments

Ohio EPA's Water Quality Results

No data for Sherrick Run has been collected and/or included in the Ohio EPA's Integrated Water Quality Monitoring and Assessment Reports.

Impairments

No impairments given by the Ohio EPA.

Ohio EPA's Causes and Sources of Impairments

Causes and sources of water quality impairments not given by the Ohio EPA.

Other Waters Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO and the City of Canton have conducted three macroinvertebrate surveys along Nimishillen Creek. Four of the seventeen sites in the survey are located in the Sherrick Run watershed. Sherrick Run consistently scored the worst among all the Nimishillen Creek subwatersheds. In 2004, none of the four sites sampled scored out of the poor range. Table VII-16 summaries NEFCO macroinvertebrate monitoring results from 2000 to 2004.

Table VII-16: Mean Cumulative Index Values* (CIV) for Sherrick Run Based on NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 0.4 - Allen Rd. Bridge	10 Poor	14 Fair	8 Poor
River Mile 1.3 - Cherry Rd/Central Ave. Bridge	13 Fair	12 Fair	9 Poor
River Mile 2.5 - Moore Rd. Bridge	10 Poor	11 Poor	4 Poor
River Mile 3.1 - Upstream of Route 43 Bridge	No Sample	No Sample	9 Poor

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

The Ohio EPA found that generally ODNR's Stream Quality Monitoring Program tends to reflect attainment and non-attainment aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). Based on correlation, Sherrick Run is believed not to be meeting WWH aquatic life use standards at any of these sampling locations.

Canton Water Pollution Control Center Chemical Sampling of Sherrick Run
In 2003 and 2004, staff from the City of Canton's Water Pollution Control Center conducted pH measurements of a suspected acid mine drainage discharge point at RM 3.1, immediately upstream of Waynesburg Road in Canton Township. Four samples were taken from December 23, 2003, to November 30, 2004, and the pH values ranged from 6.31 to 7.2. From these results, acidic conditions were determined not be a cause of impairment. However, Canton submitted a water quality grab sample collected on September 9, 2003, from the acid mine discharge point to the Aqua Tech Environmental Laboratories, Inc. (ATEL) for a complete analysis of possible contaminants. The results of the water sample for components found above detection limits are summarized in Table VII-17.

Table VII-17: Selected Water Chemistry Results from Grab Sample at the Acid Mine Drainage Discharge Point (RM 3.1) on Sherrick Run

Test	Result	Analysis Date	EPA Method
Iron, Fe	1,900 ug/l	9/16/03	200.7/6010B
Manganese, MN	3,970 ug/l	9/16/03	200.7/6010B
Nickel, Ni	21ug/l	9/15/03	200.8/6020
Nitrogen, Ammonia, N	0.58 mg/l	9/15/03	350.1
Nitrogen, Total Kjaldahl, TKN	0.73 mg/l	9/19/03	351.2
pH, Lab	6.43	9/10/03	150.1/9040
Sulfate, SO4	730 ug/l	9/16/03	300.0

ug/l = micrograms per liter; mg/l = milligrams per liter

The results from the testing indicate that the discharge from an adjacent abandoned mine is impacting Sherrick Run. Metals found in the water quality samples can affect both Sherrick Run's water quality and the physical habitat of the biological community. As a dissolved form, metals can be poisonous to aquatic life. As a precipitate often referred to as "yellow boy", metals from AMD can coat the substrate of a stream covering fish eggs and crevasses between rocks which reduces macroinvertebrate habitat. Metal precipitate can also cover the gills of fish reducing oxygen intake.

The combination of low macroinvertebrate scores and high metal concentrations point to acid mine drainage being the primary source of impairment along Sherrick Run. The Ohio Department of Natural Resources Division of Mineral Resource Management is investigating the extent of the mine drainage problem along Sherrick. The extent of the problem and pollution abatement options should be determined by ODNR in 2006.

Sherrick Run Watershed Issues and Actions

1. **Acid Mine Drainage**
2. **Failing HSTSs**
3. **Illegal Dumping**
4. **Environmental Education**

The water quality of Sherrick Run is a reflection of past activities and current land uses. Specifically, past coal mining activity and the water discharges from these remnant mines significantly impact Sherrick Run. Although mine drainage seepage can be observed in several locations, especially during wet periods, the primary mine discharge point is located immediately upstream of the State Route 43/Waynesburg Road bridge. The impact on the water chemistry, biology, and habitat have been well documented from this location to the mouth of Sherrick Run (see above). Addressing impairments caused by mine drainage is the top priority in Sherrick Run. Additional concerns include failing HSTSs in dense residential areas without sewers that are situated on poor soils for wastewater treatment. Illegal dumping into Sherrick Run has in the past been a concern due to the isolated location of many bridges over the stream. Some sections of Sherrick Run have been modified over time reducing in-stream and riparian habitat and its connection to an active floodplain. Lastly, environmental education and water quality monitoring is lacking in this tributary to Nimishillen Creek.

Using the available data and information along with personal knowledge on this section of Nimishillen Creek, watershed stakeholders ranked the top four issues they believe to be hindering water quality attainment in this subwatershed. Under each of the four issues are a goal and objective statements for each issues accompanied by recommended actions. Please note that the recommended actions are not intended to be a comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe is the best course of action given the current circumstances and available information. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III* for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001).

"Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Lastly, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could take the lead on actions not yet being implemented.

Sherrick Run Issue #1 - Acid Mine Drainage

Goal: Identify and reduce pollution from acid mine drainage sources in order to improve aquatic life along Sherrick Run.

Objectives:

1. Treat the acid mine drainage from abandoned coal mine(s) in Canton Township.
   Focus Areas: Discharge point upstream of the State Route 43 bridge at RM 3
   Target: Treatment project completed by 2008

2. Establish biological and chemical monitoring program for areas impacted by acid mine drainage.
   Focus Areas: RM 3 to confluence with Nimishillen Creek
   Target: Program established by 2008
3. Investigate known abandoned mines in the watershed to determine which are impacting Sherrick Run.
   Focus Areas: Abandoned mines in the headwaters of Sherrick Run
   Target: Completed by 2007

Sherrick Run Issue #1 - Recommended Actions Tables

Action A: Develop and acid mine drainage abatement and treatment (AMDAT) plan for the mine drainage discharge located at RM 3.1 (upstream of the State Route 43 bridge) on Sherrick Run.	
Responsible Parties:	ODNR - Division of Mineral Resources Management
Funding Options:	ODNR - Division of Mineral Resources
Time Frame:	Ongoing
Expected Improvements:	Completion of a plan to reduce the impacts of mine drainage on Sherrick Run
Evaluation Method:	Completed plan
Estimated Costs:	Unknown
Estimated Load Reduction:	To be determined

Action B: Implement the AMDAT plan in Action A.	
Suggested Responsible Parties:	ODNR - Division of Mineral Resources; Nimishillen Creek Watershed Partners; NEFCO; City of Canton; Stark County Health Department
Funding Options:	Ohio EPA Section 319 NPS Grant; State and Federal Abandoned Mine Land (AML) Reclamation Programs; Rural Abandoned Mine (RAMP) Program; Appalachian Clean Stream Program (ACSP); Ohio EPA's WRRSP
Time Frame:	2006 - 2007
Expected Improvements:	Reduction in heavy metals (Fe, MN, Ni), ammonia, nitrogen, sulfates, and sediment entering Sherrick Run for the RM 3.1 AMD discharge; Improved in-stream habitat; Increase macroinvertebrate scores
Evaluation Method:	Chemical testing before and after restoration projects; Macroinvertebrate sampling after completion of restoration plan
Estimated Costs:	Unknown until the AMDAT plan is completed
Estimated Load Reduction:	Unknown until the AMDAT plan is completed

Action C: Establish long-term chemical and biological monitoring program for AMD areas.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem; Better evaluation of AMD abatement projects
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent
Estimated Costs:	- Macroinvertebrate monitoring: $15 per volunteer per hour + $50 monitoring kit; - NEFCO Macroinvertebrate Monitoring = $750 per site; - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Investigate remaining abandoned mines in the watershed and determine if acid mine drainage is impacting the water quality of Sherrick Run and its tributaries.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	Private Sector; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Sherrick Run
Evaluation Method:	List of sites visited; Documentation of AMD problem
Estimated Costs:	To Be Determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action E: Educate riparian landowners on stewardship including the removal of downed trees and debris in Sherrick Run.	
Suggested Responsible Parties:	Earth Action Partnership; Stark and Summit SWCDs; NEFCO; Stark Parks; Summit County Metro Parks; Stark County Drainage Task Force; Muskingum Watershed Conservancy District

Funding Options:	Storm Water Utility; Conservation District Assessment; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond
Expected Improvements:	Decrease in obstructions resulting in less localized flooding and water quality problems.
Evaluation Method:	Number of riparian homeowners contacted
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	Variable depending on landowner's adoption of stewardship actions

Sherrick Run Issue #2 - Failing Home Sewage Treatment Systems

Goal: Reduce the nutrient and bacteria pollution in the East Branch from failing home sewage treatment systems (HSTSs).

Objectives:

1. Establish a comprehensive education and outreach program for stakeholders using HSTSs.
   Focus Areas: All unsewered areas
   Target: Program established by 2008
2. Begin an operations and maintenance program in the watershed.
   Focus Areas: 24th Street and State Route 43; 17th St. and State Route 43
   Target: Inspection of 25 systems per year in the subwatershed
3. Provide financial support for the repair and replacement of failing HSTSs for low income property owners.
   Focus Areas: Entire Subwatershed
   Target: Assistance for all low income property owners, if needed

Sherrick Run Issue #2 - Recommended Actions Tables

Action A: Establish education efforts to increase public awareness of faulty HSTSs through door-to-door surveys, information materials, educational video, public meetings, and/or informational booths at local public events like fairs	
Suggested Responsible Parties:	Stark County Health Department, Ohio Department of Health; Ohio EPA; NEFCO; Earth Action Partnership
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant; Local Funding
Time Frame:	Door-to-Door Survey: 2007 - 2008 Information Materials: Ongoing Public Meetings: 2007 - 2008 Informational Booths: 2007 - 2008
Expected Improvements:	Increased awareness of water quality impacts associated with malfunctioning or failing HSTSs

Evaluation Method:	Number of surveys completed; Number of informational material distributed; Number of public meetings held; Number of fair or public event attended; Surveys before and after education efforts begin to gauge a change in general knowledge among watershed residents
Estimated Costs:	– Surveys = $2.00 per survey – Pamphlets and Flyers = $1.50 - $3.00 per item – Public Meeting = $1,200 per 2 hour meeting – Display = $1,000 and up
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, indirect reductions possible depending on then number of homeowners the utilize the information presented.

Action B: Seek funding assistance for homeowners to repair or replace faulty HSTSs.	
Suggested Responsible Parties:	Stark County Health Department; Stark County Regional Planning
Funding Options:	WPCLF; Ohio EPA Section 319 NPS Grant; WPCLF; Community Development Block Grant
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs
Evaluation Method:	Number of systems repaired or replaced
Estimated Costs:	$3,000 - $8,000 average cost to replace a HSTS; Up to $1,000 to repair HSTS
Estimated Load Reduction:	On-Site HSTS Repair or Replacement: 100% reduction in bacteria and nutrients pollution from a HSTS Off-Site Repair or Replacement: Variable reduction for each HSTS

Action C: Establish an operations and maintenance inspection program to facilitate the repair and replacement of failing home sewage treatment systems (HSTS)	
Suggested Responsible Parties:	Stark County Health Department
Funding Options:	Local Property/Home Owner Operations and Maintenance Fee; Ohio EPA Section 319 NPS Grant; WPCLF
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs in the Sherrick Run basin; Reduction in nutrient and pathogens entering the stream
Evaluation Method:	Number of systems inspected, pumped, and/or repaired

Estimated Costs:	Approximately $250,000 for Stark County Health Department to establish and run a permit system for three years in the entire Nimishillen Creek Watershed
Estimated Load Reduction:	Variable depending on the number of HSTSs inspected and ordered to be repaired or replaced

Action D: Promote the extension of sewers in the watershed, especially where high concentrations of HSTSs are located on poor soils for septic systems.	
Suggested Responsible Parties:	Stark County Sanitary Engineer; Stark County Health Department; Ohio EPA; Ohio Department of Health
Funding Options:	WPCLF; Local Property/Homeowner via Assessment; WRRSP; USDA - Rural Development Grant
Time Frame:	2007 and beyond
Expected Improvements:	Lower number of malfunctioning or failing HSTSs polluting local water resources
Evaluation Method:	Number of homeowners in areas of high housing concentrations with poor soils contacted about sewer expansion; Future plans or projects for sewer expansion into these areas
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $2.00 per survey; $9,000 per home and up for sewer tap-in fee
Estimated Load Reduction:	Up to 100% reduction in pollution including bacteria and nutrients originating from HSTSs in newly sewered areas

Sherrick Run Issue #3 - Illegal Dumping

Goal: Reduce the amount of litter and debris from illegal dumping along Sherrick Run.

Objectives:

1. Reduce the dumping of trash and debris into Sherrick Run by increasing local awareness and enforcement of anti-litter laws.
   Focus Areas: Entire Subwatershed
   Target: To be determined
2. Remove trash and debris from the East Branch.
   Focus Areas: Route 43 Bridge to confluence with Nimishillen Creek; Crenshaw Park.
   Target: One clean-up event once every two years

Sherrick Run Issue #3 - Recommended Actions Tables

Action A: Education watershed residences, industries, and businesses about litter prevention and recycling	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; Stark County Regional Planning; Stark-Tuscarawas-Wayne Joint Solid Waste District; Canton Regional Chamber of Commerce; Stark County Drainage Task Force
Funding Options:	Local Sponsorship; Private Sector; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	Ongoing by the Nimishillen Creek Watershed Partners, Stark County Regional Planning, and the Canton Regional Chamber of Commerce
Expected Improvements:	Increased awareness of littering issues and proper waste disposal
Evaluation Method:	Number of educational items distributed; Number of hits on stream clean-up webpage
Estimated Costs:	$1.50 - $3.00 per pamphlet or fact sheet; $10.00 per T-shirt; $8.00 - $25.00 per month for website hosting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Organize stream clean-ups along stretches of Sherrick Run that are heavily polluted with trash and debris.	
Responsible Parties:	Nimishillen Creek Watershed Partners
Funding Options:	Private Sector; Ohio EPA Section 319 NPS Grant; Sponsorships
Time Frame:	Ongoing
Improvements:	Reduction in debris in and along selected clean-up sections along the East Branch
Evaluation Method:	Linear feet of the creek cleaned; Number of tires removed; Weight or volume of litter removed
Costs:	$500 - $1,000 and up for up to a half-mile clean-up
Estimated Load Reduction:	Variable depending on location and items removed from Sherrick Run

Action C: Report illegal dump sites to local law enforcement officials.	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; Stark County Health Department; Ohio EPA; Stark County Drainage Task Force
Funding Options:	Private Sector; OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 and beyond

Expected Improvements:	Increased monitoring of known illegal and chronic dumping sites
Evaluation Method:	Number of fines for littering given out; Visual inspection of known chronic dumping sites
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the type of illegal activity prevented or cleaned up

Sherrick Run Issue #4 - Environmental Education and Monitoring

Goal: Educate residents, government officials, and businesses about watershed issues impacting Sherrick Run.

Objectives:

1. Establish a water quality monitoring program to document current and future condition along Sherrick Run
   Focus Areas: RM 3 (State Route 43 bridge) to confluence with Nimishillen creek; areas identified to be impacted by AMD
   Target: Program established by 2008
2. Educate riparian and shoreline landowners on the value of a healthy riparian habitat.
   Focus Areas: All riparian land owners
   Target: Distribute education information to 75 percent of riparian landowners
3. Increase general knowledge of local watershed issues.
   Focus Areas: Entire Subwatershed
   Target: Direct contact with 25 Sherrick Run stakeholders per year

Sherrick Run Issue #4 - Recommended Actions Tables

Action A: Distribute flyers informing watershed residents on how to identify suspicious activities and who to contact to report illegal activities. Types of activities targeted illegal dumping, illegal discharges, and the filling in of floodplain and wetland areas.	
Suggested Responsible Parties:	Ohio EPA - Division of Environmental and Remedial Response; NEFCO; Earth Action Partnership; Stark County Health Department
Funding Options:	NPS Education Grant; OEEF; CWA Section 319 Grant; Private Sector
Time Frame:	2006 and beyond
Expected Improvements:	Decrease in illegal activities that can cause reduced habitat and/or water quality
Evaluation Method:	Number of flyers distributed; Number of contacts made to authorities listed on flyers; Number of illegal water resource activities stopped or corrected
Estimated Costs:	$1.50 - $3.00 per flyer or fact sheet
Estimated Load Reduction:	Variable depending on the type of illegal activity cleaned up

Action B: Establish long-term chemical and biological monitoring program for subwatershed focusing on any AMD impacted areas.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem; Better evaluation of AMD abatement projects
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent
Estimated Costs:	- Macroinvertebrate monitoring: $15 per volunteer per hour + $50 monitoring kit; - NEFCO Macroinvertebrate Monitoring = $750 per site; - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Educate residents about watershed issues through regularly scheduled events and activities that are recognized by the public. These events and activities can include watershed surveys, presentation at local meetings, information booths at local fairs, creek clean-ups, and other public meetings.	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; NEFCO; Stark SWCD; Stark RPC; Stark Parks; Stark County Drainage Task Force
Funding Options:	Private Sector; NPS Education Grant; OEEF Grant; CWA Section 319 NPS Grant
Time Frame:	Ongoing
Expected Improvements:	Greater awareness regarding watershed issues.
Evaluation Method:	Number of events held; Surveys taken; Presentations given; Fairs attended; Public meeting held
Estimated Costs:	Survey = $2.00 per survey; Presentation = $3,000 and up per 80 picture slide/PowerPoint show; County Fair Display = $1,000 and up + $1.50 to $3.00 per pamphlet + $15.00 per volunteer hour; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Implement a watershed protection and awareness program in local schools.	
Suggested Responsible Parties:	Stark Parks; Ohio EPA - Division of Surface Water; County SWCDs; Local Boards of Education; Local Schools; Earth Action Partnership
Funding Options:	OEEF; NPS Education Grant; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Stronger knowledge of future generations regarding the importance of watershed protection
Evaluation Method:	Number of local schools implementing program; Number of students exposed to watershed education efforts
Estimated Costs:	$400 - $7,000
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Hurford Run Subwatershed Action Plan

Inventory

Physical Description

Hurford Run is a five mile long tributary in the southwest portion of the Nimishillen Creek Watershed draining approximately 8.5 square miles of Stark County. The headwaters are located in Perry Township and flow primarily northeast before merging with the Nimishillen Creek Mainstem at RM 11.5. The only significant tributary to Hurford Run is Domer Ditch which originates in Canton Township. Domer Ditch flows north near Interstate 77 for approximately three miles before joining Hurford Run east of Linwood Road (Figure VII-10).

Nearly the entire watershed resides in the unglaciated portion of Stark County (Figure II-5) resulting in moderate relief and generally less than six percent slopes (Figure II-6). The primary soils are the Fitchville-Sebring, the Chili-Wheeling-Shoals, and the Canfield-Wooster associations, typical of glaciated areas in Stark County. Also like other areas in the watershed, most soils in the basin have poor drainage and infiltration properties resulting in poor locations for HSTSs (Figure VI-3). Fortunately, only the headwater areas are without sanitary sewers (Figure VI-4). The bedrock in the area along Domer Ditch is covered by over 60 feet of glacial outwash. In areas not covered by this thick layer of glacial sediment, the primary bedrock types are Brookville Coal, Mercer Limestone, and Middle Kittaning Coal (Figure II-7).

Land Use

Hurford Run has the greatest concentration of industrial land usage of any of the six subwatersheds of Nimishillen Creek. Industrial companies in the subwatershed include the Marathon Petroleum Company, Canton Alloys Inc., Republic Engineered Steel Inc., and the Timken Company. Point source discharges, storm water runoff, and riparian habitat degradation are concerns in these areas. Other land uses in the area include urban/suburban areas primarily in the northern portions of the subwatershed, with agriculture and wooded areas the dominant use in the southern portion (Figure II-13). Soil erosion, nutrient runoff, channel modification, and riparian habitat destruction are concerns. In addition, the Hurford Run watershed is encountering development pressures from continued suburbanization of Stark County due to its location near both Massillon and Canton and being adjacent to two highways. Habitat encroachment and increased runoff from increasing impervious area is a long-term concern for water quality. Lastly, the riparian habitat quality along Hurford Run was rated the lowest in NEFCO's evaluation (Figure VII-11). Riparian habitat restoration, where possible, is a priority.

Point Source Dischargers

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer and into a waterbody after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges

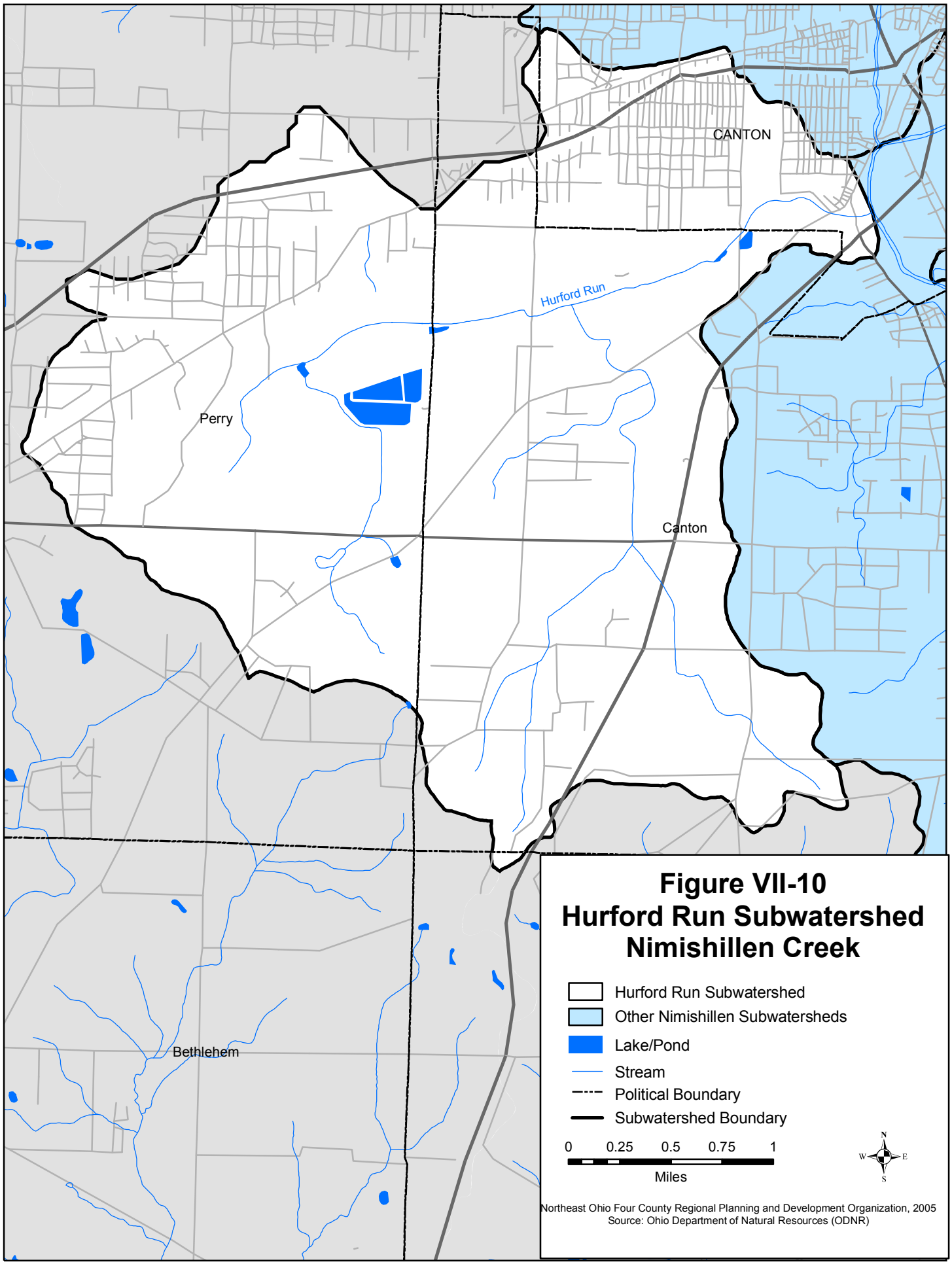


Figure VII-10
Hurford Run Subwatershed
Nimishillen Creek

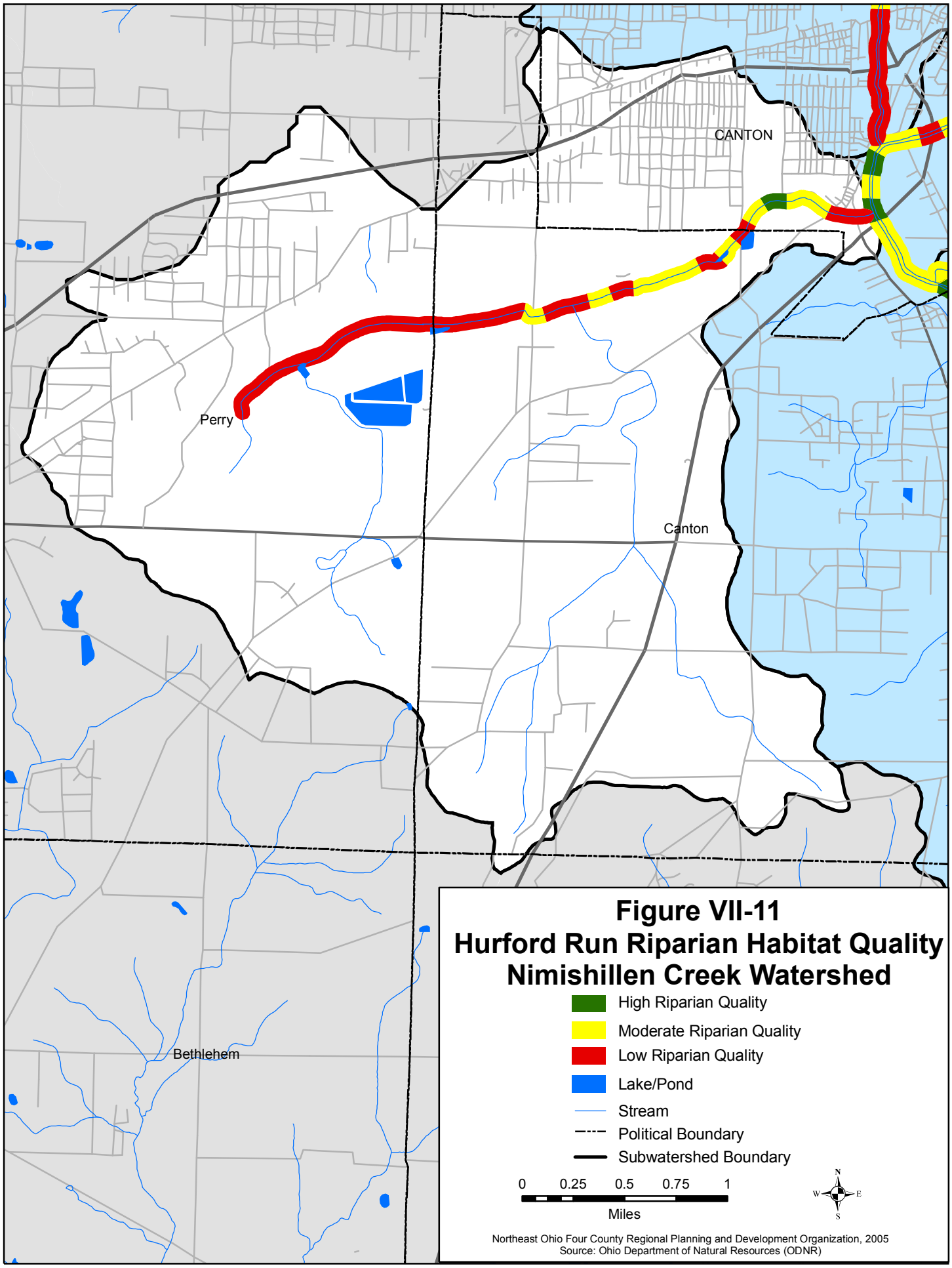


Figure VII-11
Hurford Run Riparian Habitat Quality
Nimishillen Creek Watershed

have the potential to introduce high levels of nutrients and chemicals into a waterway. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

Along Hurford Run, eight point sources were identified as discharging into the watershed. These include five industrial dischargers and three private wastewater treatment systems. Table VII-8 provides information about each permitted discharge and Figure IV-1 maps the location of them in the watershed. Please note that this section does not include storm sewer outfalls, off-lot discharging home sewage treatment systems, or illegal point source discharges into the Nimishillen Creek Watershed. Additional point source discharge information will be added when it becomes available.

Table VII-18: Point Source Discharging Operations in the Hurford Run Subwatershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
2	AGA Gas Incorporated 2505 Shepler Church S.W. Canton, OH 44706	Not Given	Industrial Discharger
13	Gullivers 77 Travel Center Inc. 2320 Faircrest St. SW Canton, OH 44706	Not Given	Private Discharging Semi-Public Sewage Treatment System
21*	Marathon Ashland Petroleum LLC - Ohio Refining Div. 2408 Gambrinus Rd. SW Canton, OH 44706	Not Given	Industrial Discharger
26	Praxair (Liquid Carbonic Corp.) 2225 Bolivar Rd. S.W. Canton, OH 44706	Not Given	Industrial Discharger
28	Republic Engineered Steel Inc. Special Metals Division 2201 Harrison Ave. S.W. Canton, OH 44706	Not Given	Industrial Discharger
34	The Timken Company - Faircrest Steel Plant Canton, OH 44706	Not Given	Industrial Discharger
38	Prairie College School 3021 Prairie College Ave. S.W. Canton, OH 44706	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
65	The WG Fairfield Co. 4255 Kropf Ave. S.W. Canton, OH 44706	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System

* Permit Expired in 2004; GPD = Gallons Per Day; Source: Ohio EPA, 2005

Water Quality Data and Impairments

Ohio EPA's Water Quality Results

Of the 3.1 miles of Hurford Run assessed by the Ohio EPA, 2.7 miles were in non-attainment, or none of the three biological indices (IBI, ICI, MWwb) were meeting or near state standards. Only 0.4 miles were in partial attainment (one or two of the three indices meeting respective criteria), and no sections of Hurford Run were meeting state water quality standards. Table IV-19 summarizes the Ohio EPA's results.

Table VII-19: Hurford Run Aquatic Life Use Attainment Segment Summaries

Segment River Mile (Lower/Upper)	Reach Length	Attainment Miles Status			
		Full	Partial	Non	Not Assessed
0/4.95	4.95	0	0.40	2.70	1.85

Source: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory

In the comments section of the 2000 305(b) Ohio Water Resource Inventory, the Ohio EPA noted high levels of manganese present in the headwaters of Hurford Run. Downstream of the Timken Company Outfall 006 there were high levels of pH. In addition, the Marathon Petroleum Company's effluent increased stream temperature and has high ammonia concentrations. They noted additional exceedences of pH, temperature, conductivity and ammonia. Historically, biology surveys have been poor, but improved scores at the mouth of Hurford Run in 1998 brought the segment into partial WWH attainment for the first time.

Impairments

Aquatic Life Use:

Of the 3.1 miles accessed by the Ohio EPA in 1998, 0.40 miles were in partial attainment and 2.70 miles were in non-attainment.

Recreation:

All of Hurford Run, except Domer Ditch, is impaired for Primary Contact Recreation. Domer Ditch is impaired for Secondary Contact Recreation.

Fish Consumption:

There is a fish consumption advisory of only one meal per month of common carp caught from Hurford Run. In addition, the Ohio Department of Health has issued a statewide advisory to limit meals of fish caught from all Ohio waterbodies to one meal per week due to mercury.

Ohio EPA's Causes and Sources of Impairments

The causes of impairments for a stream are the specific pollutants or alterations that result in the stream not meeting state water quality standards. Examples of common causes of water quality impairments are siltation, flow alteration, nutrient enrichment,

metals, and temperature. Sources of impairments are where the cause(s) originated or where the causes of impairments are supplied from. Sources include crop production, channelization, urban runoff, dam construction, discharge pipes, and stream bank erosion. Table VII-20 lists the causes and sources of impairment for aquatic life use, recreation, and fish consumption for Hurford Run.

Table VII-20: Ohio EPA's Causes and Sources of Impairments for Hurford Run

Impairment Of:	Causes of Impairment (magnitude)	Sources of Impairment (magnitude)
Aquatic Life Use	Unionized Ammonia (high) Thermal Modifications (high) pH (high) Metals (high) Unknown (moderate)	Major Industrial Point Source (high) Unknown (high)
Recreation	Pathogens	Unknown
Fish Consumption	Polychlorinated Biphenyls (PCBs)	Unknown

Sources: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory and Ohio EPA 2004 Integrated Report

Other Water Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO and the City of Canton have conducted three macroinvertebrate surveys along Nimishillen Creek. Three of the seventeen sites sampled are located in Hurford Run. The two downstream sites, RM 0.5 and 1.1, are situated in heavily industrial areas that include The Timken Company Canton Steel Plant, Republic Engineered Steel Inc. Special Metals Division, and Marathon-Ashland Petroleum LLC refinery. The location of the upstream site, RM 2.5, is on an unnamed tributary to Hurford with a subwatershed comprised mainly of wooded and agricultural/pasture areas. Table VII-21 summaries the sampling results.

Table VII-21: Mean Cumulative Index Values* (CIV) for Hurford Run Based on NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 0.5 - Bolivar Ave. and I-77 Off Ramp	13 Fair	15 Fair	16 Fair
River Mile 1.1 - Harrison Ave. Bridge	17 Good	18 Good	20 Good
River Mile 2.5 - Shepler Church Rd. Bridge	22 Good	19 Good	18 Good

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

The general trend for the sampling locations is a gradual decrease in macroinvertebrate scores from upstream to downstream sites. This corresponds with decreased riparian cover and increased industrial land use. River miles 1.1 and 2.5 consistently scored in the "Good" range, while RM 0.5, near the mouth of Hurford Run, ranked as only "Fair" each year.

It is likely that the upstream sites are closer to attainment of state water quality standards than the downstream location because the Ohio EPA found that generally ODNR's Stream Quality Monitoring Program tend to reflect attainment and non-attainment aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). Based on this assumption, it is believed that Hurford is in or close to attainment for aquatic life uses in the headwaters and becomes gradually worse and likely in non-attainment as it flows through urban and industrial areas near the confluence with Nimishillen Creek.

Hurford Run Subwatershed Issues:

1. **Industrial Site Runoff**
2. **Environmental Education**
3. **Riparian Corridor Restoration**
4. **Failing HSTSs**

Hurford Run, as noted above, has the greatest concentration of industrial activity of any of Nimishillen Creek's subwatersheds. Both nonpoint and point source water quality concerns result from discharges and runoff from these vast industrial sites. Pollution discharges for point sources is strictly monitored by the Ohio EPA through the National Pollutant Discharge Elimination System (NPDES) permits, although spills and accidental discharges are still possible. Another issue is the storm water runoff from the large and old industrial complexes which pickup various pollutants before entering Hurford Run.

Hurford Run also has the most degraded riparian corridor of any of the Nimishillen Creek tributaries (Table II-10 and Figure VII-11). This is due to the heavy concentration of industrial sites along the downstream section and agricultural areas in the headwaters. Restoration of the riparian habitat is a priority in this subwatershed. Where development has occurred without the aid of a sanitary sewer system, failing home sewage treatment systems (HSTSs) is also an issue due to the prevalence of poor soils in the subwatershed.

Using available data and information along with personal knowledge of Hurford Run, watershed stakeholders ranked the top four issues they believe to be hindering water quality attainment in this subwatershed. Under each of the four issues are goal and objective statements accompanied by recommended actions. Please note that the recommended actions are not intended to a comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe is the best course of action given the current circumstances and available information. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III*

for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001).

"Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Lastly, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could take the lead on actions not yet being implemented.

Hurford Run Issue #1 - Industrial Site Runoff

Goal: Decrease the levels of toxic substances and dissolved solids (heavy metals, petroleum products, etc.) entering surface water and/or groundwater.

Objectives:

1. Decrease levels of toxic substances from industrial land use areas.
   Focus Areas: Watershed area between Shepler Church Ave. and U.S. Route 30; Timken Company Property; Republic Steel Property; Marathon Petroleum Company
   Target: To be determined
2. Decrease levels of toxic substances from storm water runoff.
   Focus Areas: Watershed area between Shepler Church Ave. and U.S. Route 30; Timken Company Property; Republic Steel Property; Marathon Petroleum Company
   Target: To be determined

Hurford Run Issue #1 - Recommended Actions Tables:

Action A: Implement a regional/watershed-based storm water management plan.	
Responsible Parties:	Stark County Drainage Task Force
Funding Options:	Local; Conservancy District; Storm Water Utility
Time Frame:	Ongoing
Expected Improvements:	Improved water quality and moderated peak storm water flows.
Evaluation Method:	Completion of the plan; Level of participation; Improved macroinvertebrate and water chemistry results
Estimated Costs:	$300,000 and up annually for all of Stark County
Estimated Load Reduction:	To be determined

Action B: Implement NPDES Phase II Storm Water Program	
Responsible Parties:	Stark County; City of Canton
Funding:	Local
Time Frame:	Ongoing

Expected Improvements:	Significant reduction of pollution in urban storm water runoff through the establishment of six minimum control measures.
Evaluation Method:	Annual review of the Program by permitted communities and the Ohio EPA
Estimated Costs:	Variable
Estimated Load Reduction:	Variable depending on the practices implemented by each permitted community

Action C: Identify by-products of industrial processes taking place in the watershed.	
Suggested Responsible Parties:	Ohio EPA; Stark County Health Department; Private Sector
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant; Private Sector
Time Frame:	2006 - 2007
Expected Improvements:	Lower releases of toxic substances from Industrial operations.
Evaluation Method:	A listing of identified by-products from industrial processes.
Estimated Costs:	Sorting through RCRA Documents = $500
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Limit the amount of impervious areas for commercial and industrial establishments.	
Suggested Responsible Parties:	Stark County Zoning Commission; Canton Zoning Commission; Building Industry Association
Funding Options:	OEEF; Private Sector; Ohio EPA Section 319 NPS Grant; Smart Growth Grant
Time Frame:	2007 and beyond
Expected Improvements:	Lower levels of toxic substances entering the environment due to runoff from impervious areas
Evaluation Method:	Number of permits or ordinances in effect; Number of companies voluntarily adopting best management practices
Estimated Costs:	Variable

Estimated Load Reduction:	Porous Pavement General Removal Efficiencies: Sediment = 82%-95%; TPs = 65%; TN = 80%-85% Infiltration Basin General Removal Efficiencies: TSS = 75%; TP = 60%-70%; TN = 55%-60%; Metals = 85%-90%; Bacteria = 90% Treatment Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33% Grass Swales General Removal Efficiencies: TSS = 81%; TP = 29%; Nitrate = 38%; Metals =14%-55%; Bacteria = -50%

Hurford Run Issue #2 - Environmental Education

Goal: Educate residents, government officials, and businesses about watershed issues impacting Hurford Run.

Objectives:

1. Increase awareness among operators of industrial facilities of the implementing preventative and control measures to reduce pollutants.
   Focus Areas: Industrial Sites
   Target: Direct contact with 10 Hurford Run industrial stakeholders per year
2. Strengthen awareness of and involvement in watershed issues.
   Focus Areas: Residential and Commercial Areas
   Target: Direct contact with 15 Hurford Run residential or commercial stakeholders per year
3. Increase awareness regarding the location and pollution potential of oil and gas pipelines in relation to drinking water wells.
   Focus Areas: Entire Subwatershed
   Target: To be determined
4. Monitor and evaluate surface water quality in the watershed.
   Focus Areas: Sherrick Run and Domer Ditch
   Target: Program established by 2008

Hurford Run Issue #2 - Recommended Actions Tables:

Action A: Educate owners and operators of industrial facilities about the benefits of implementing preventive and control measures to reduce pollutants.	
Suggested Responsible Parties:	Ohio EPA; City of Canton; Stark County Regional Planning Commission; NEFCO; Stark County and Canton Health Departments; Canton Regional Chamber of Commerce
Funding Options:	OEEF; WPCLF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 - 2008
Expected Improvements:	Increased awareness about the benefits of BMPs and reduced levels of pollutants from industrial land use areas.

Evaluation Method:	List of contacts; Number of operations that have implemented BMPs; Water quality testing showing the reduction of pollutants after implementation
Estimated Costs:	Workshop = $15 per person; Pamphlet or fact sheet = $1.50 to $3.00 per sheet; Chemical Sampling = $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Educate industrial owners and operators about the hazards of negligent management of industrial by-products.	
Suggested Responsible Parties:	Ohio EPA; Stark and Canton Health Departments; Private Sector
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant
Time Frame:	2007 - 2008
Expected Improvements:	Lower releases of toxic substances from industrial operations
Evaluation Method:	Number of owners/operators educated about the hazards of negligent management
Estimated Costs:	Workshop = $15 per person; Pamphlet or fact sheet = $1.50 to $3.00 per sheet
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Educate residents about watershed issues through regularly scheduled events and activities that are recognized by the public. These events and activities can include watershed surveys, presentation at local meetings, information booths at local fairs, creek clean-ups, and other public meetings.	
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; NEFCO; Stark SWCD; Stark RPC
Funding Options:	Private Sector; NPS Education Grant; OEEF Grant; CWA Section 319 NPS Grant
Time Frame:	Ongoing
Expected Improvements:	Greater awareness regarding watershed issues
Evaluation Method:	Number of events held; Surveys taken; Presentations given; Fairs attended; Public meetings held

Estimated Costs:	Surveys = $2.00 per survey; Presentations = $3,000 and up per 80 picture slide/PowerPoint show; County Fair Display = $1,000 and up + $1.50 to $3.00 per pamphlet + $15.00 per volunteer hour; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D: Create a map of pipeline and drinking well locations to provide to community planning and zoning officials.	
Suggested Responsible Parties:	ODNR - Div. of Oil and Gas; Stark County Regional Planning Commission; NEFCO
Funding Options:	Private Sector; Local Funds; Ohio EPA Section 319 NPS Grant
Time Frame:	2006 - 2009
Expected Improvements:	More precise locations of oil and gas pipelines; Detection of leaks or ruptures in pipelines; Increased knowledge regarding pipeline location and potential drinking water wells
Evaluation Method:	Detailed maps of oil and gas pipeline locations in relation to drinking water wells
Estimated Costs:	$7,000 to $25,000; $140 t0 $490 and up per map
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action E: Establish long-term chemical and biological monitoring program for subwatershed.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem; Better evaluation of AMD abatement projects
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent
Estimated Costs:	- Macroinvertebrate monitoring: $15 per volunteer per hour + $50 monitoring kit; - NEFCO Macroinvertebrate Monitoring = $750 per site; - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Hurford Run Issue #3 - Riparian Corridor Restoration

Goal: Restore habitat areas with "poor" or "moderate" riparian habitat scores to the next attainment level.

Objectives:

1. Work with industrial property owners to improve the riparian habitat along Hurford Run.
   Focus Areas: Watershed area between Shepler Church Ave. and U.S. Route 30; Timken Company Property; Republic Steel Property; Marathon Petroleum Company
   Target: Restore 5 percent or approximately 900 linear feet of "poor" or "moderate" quality riparian habitat
2. Establish policies to protect the riparian corridor and habitat.
   Focus Areas: Entire Subwatershed
   Target: Adoption of policies by the county and municipalities

Hurford Run Issue #3 - Recommended Actions:

Action A: Provide incentives for industrial landowners to protect the shoreline, riparian corridor, or wetlands with long-term protection or permanent conservation easements.	
Suggested Responsible Parties:	Stark County RPC; City of Canton; Stark Parks; Land Conservancy Organizations
Funding Options:	Clean Ohio Fund; Ohio EPA Section 319 NPS Grant; Private Sector; WRRSP
Time Frame:	2007 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increase riparian habitat scores, reduction in stream bank erosion, and floodway protection
Evaluation Method:	Linear feet set aside for long-term protection; Number of permanent conservation easements; Riparian habitat scores
Estimated Costs:	$0.00 to $5,000 per acre and up; $4,000 and up on average to set up a maintenance fees
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, long-term or permanent protection measures will reduce future pollution loading.

Action B: Assist landowners in re-vegetating shoreline and riparian areas.	
Suggested Responsible Parties:	Stark SWCD; NEFCO; Earth Action Partnership; Stark Parks; City of Canton; ODNR - DSWC
Funding Options:	WPCLF; Ohio EPA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2006 thru 2010

Expected Improvements:	Restoration of shoreline and riparian corridor; Increased riparian habitat scores; Improved wildlife habitat; Reduction in stream bank erosion during high flow events
Evaluation Method:	Linear feet of replanted riparian habitat; Wildlife surveys; Riparian habitat scores
Estimated Costs:	\$0.25 - \$1.10 per yd^2 seeded and mulched; \$0.40 - \$0.50 per seedling planted
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Assist shoreline and riparian landowners to stabilize shoreline and riparian corridor using appropriate BMPs.	
Suggested Responsible Parties:	County SWCDs; NEFCO; ODNR - DSWC; USDA - NRCS; Earth Action Partnership; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2006 thru 2009
Expected Improvements:	Stabilization of shoreline and riparian corridor; Reduction in stream bank erosion; Improved wildlife habitat
Evaluation Method:	Linear feet of bank or shoreline stabilized; Wildlife survey; Riparian habitat scores
Estimated Costs:	Approximately \$350,000 to restore or stabilize 1,300 linear feet of stream channel; Fiber Rolls = \$12.00 per linear foot; Plant Cuttings = \$0.40 - \$0.50 per cutting; Erosion Control Blankets = \$2.00 per yd^2
Estimated Load Reduction:	Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75% Fiber Rolls: TSS Reduction = 58% Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action D: Assist communities with the development of township or municipal ordinances requiring new construction sites to leave easements or a specific distance near shorelines of targeted wetlands and floodplains of streams.	
Suggested Responsible Parties:	Stark County Regional Planning Commission; Stark SWCD; City of Canton
Funding Options:	OEEF
Time Frame:	2007 thru 2009

Expected Improvements:	Protection of shoreline and riparian corridor resulting in increases in riparian habitat scores, reduction in stream bank erosion, and floodway protection
Evaluation Method:	Number of ordinances established and enforced; Riparian and shoreline miles protected; Riparian habitat scores
Estimated Costs:	Variable
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Hurford Run Issue #4 - Failing Home Sewage Treatment Systems

Goal: Reduce the nutrient and bacteria pollution in the Hurford Run and Domer Ditch from failing home sewage treatment systems (HSTSs).

Objectives:

1. Establish a comprehensive education and outreach program for stakeholders using HSTSs.
   Focus Areas: All unsewered areas
   Target: Program established by 2008
2. Begin an operations and maintenance program in the watershed.
   Focus Areas: Prairie College Subdivision
   Target: Inspection of 25 systems per year in the subwatershed
3. Provide financial support for the repair and replacement of failing HSTSs for low income property owners.
   Focus Areas: Entire Subwatershed
   Target: Assistance available for all low income property owners

Hurford Run Issue #4 - Recommended Actions Tables

Action A: Establish education efforts to increase public awareness of faulty HSTSs through door-to-door surveys, information materials, educational video, public meetings, and/or informational booths at local public events like fairs	
Suggested Responsible Parties:	Stark County Health Department, Ohio Department of Health; Ohio EPA; NEFCO; Earth Action Partnership
Funding Options:	OEEF; Ohio EPA Section 319 NPS Grant; Local Funding
Time Frame:	Door-to-Door Survey: 2007 - 2008 Information Material: Ongoing Public Meetings: 2007 - 2008 Informational Booths: 2007 - 2008
Expected Improvements:	Increased awareness of water quality impacts associated with malfunctioning or failing HSTSs

Evaluation Method:	Number of surveys completed; Number of informational material distributed; Number of public meetings held; Number of fair or public events attended; Surveys before and after education efforts begin to gauge a change in general knowledge among watershed residents
Estimated Costs:	– Surveys = $2.00 per survey – Pamphlets and Flyers = $1.50 - $3.00 per item – Public Meeting = $1,200 per 2 hour meeting – Display = $1,000 and up
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, indirect reductions possible depending on the number of homeowners that utilize the information presented.

Action B: Seek funding assistance for homeowners to repair or replace faulty HSTSs.	
Suggested Responsible Parties:	Stark County Health Department; Stark County Regional Planning Commission; Ohio EPA
Funding Options:	WPCLF; Ohio EPA Section 319 NPS Grant; WPCLF; Community Development Block Grant
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs
Evaluation Method:	Number of systems repaired or replaced
Estimated Costs:	$3,000 - $8,000 average cost to replace a HSTS; Up to $1,000 to repair HSTS
Estimated Load Reduction:	On-Site HSTS Repair or Replacement: 100% reduction in bacteria and nutrient pollution from a HSTS Off-Site Repair or Replacement: Variable reduction for each HSTS

Action C: Establish an operations and maintenance inspection program to facilitate the repair and replacement of failing HSTSs.	
Suggested Responsible Parties:	Stark County Health Department
Funding Options:	Local Property/Home Owner Operations and Maintenance Fee; Ohio EPA Section 319 NPS Grant; WPCLF
Time Frame:	2007 - 2010
Expected Improvements:	Lower number of malfunctioning or failing HSTSs in the Hurford Run subwatershed; Reduction in nutrient and pathogens entering the stream
Evaluation Method:	Number of systems inspected, pumped, and/or repaired
Estimated Costs:	Approximately $250,000 for Stark County Health Department to establish and run a permit system for three years in the entire Nimishillen Creek Watershed
Estimated Load Reduction:	Variable depending on the number of HSTSs inspected and ordered to be repaired or replaced

Action D: Promote the extension of sewers in the watershed, especially where high concentrations of HSTSs are located on poor soils for septic systems.	
Suggested Responsible Parties:	Stark County Sanitary Engineer; Stark County Health Department; Ohio EPA; Ohio Department of Health
Funding Options:	WPCLF; Local Property/Homeowner via Assessment; WRRSP; USDA - Rural Development Grant
Time Frame:	2007 and beyond
Expected Improvements:	Lower number of malfunctioning or failing HSTSs polluting local water resources
Evaluation Method:	Number of homeowners contacted about sewer expansion in areas of high housing concentrations with poor soils; Future plans or projects for sewer expansion into these areas
Estimated Costs:	$1.50 - $3.00 per Pamphlet or Fact Sheet; $2.00 per Survey; $9,000 per Home and Up for Sewer Tap-in Fee
Estimated Load Reduction:	Up to 100% reduction in pollution including bacteria and nutrients originating from HSTSs in newly sewered areas

Nimishillen Creek Mainstem Subwatershed Action Plan

Inventory

Physical Description

For this action plan, the Nimishillen Creek Mainstem begins when the Middle and East Branches merge in Cook Park around river mile (RM) 15 on the east side of the City of Canton. It flows south and west a few miles through the urban areas of Canton before the West Branch joins in on the south side of the city at approximately RM 12. From this point it begins a nearly due south course out of Canton where it meets with Hurford Run (RM 12) and Sherrick Run (RM 11). Canton's Water Pollution Control Center (wastewater treatment plant) is located adjacent to the river just south of Sherrick Run at RM 9.9. The plant has a designed flow capacity of 39 million gallons per day (MGD) and discharged an average of 30.76 MGD in 2005. It continues to flow south through a narrow valley in the unglaciated southern portion of the county. The Mainstem passes through East Sparta before entering Tuscarawas County and emptying into Sandy Creek (Figure VII-12).

As the Mainstem flows from north to south, around the confluence with Sherrick Run it crosses from the northern glaciated portion of the Appalachian Plateau into the unglaciated section of the watershed (Figure II-5). The topography switches from flat to gently rolling lands to steep sloping uplands and broad flat floodplains resulting in the Mainstem cutting through a narrow valley through the unglaciated southern highlands (Figure II-6). The majority of the northern portion of the Mainstem is covered with over 60 feet of glacial outwash from the Chili-Wheeling-Shoals soil association over the bedrock. In the southern section of the Nimishillen Creek Mainstem the dominant bedrock is Middle Kittaning Coal with some areas of Brookville Coal and Mahoning Sandstone (Figure II-7). Soil associations in the unglaciated area include Chili-Wheeling-Shoals in the narrow river valley and with Loudonville-Wooster, Latham-Keene, and Muskingum-Gilpin-Dekalb covering the steep slopes. The steep slopes in the southern portion of the watershed result in rapid storm water runoff and increases the likelihood of soil erosion on land with insufficient cover.

Land Use

The usage of land in the Mainstem of the subwatershed is largely dictated by its past glacial history. Areas in the northern glaciated portion of the subwatershed are primarily used for urban or industrial uses in or near the City of Canton (Figure II-13). Water quality issues associated with an urban and industrial setting, such as increased runoff, point source discharges, and illegal dumping, are typical of this section of the watershed.

Land use in the unglaciated southern portion of the Mainstem is limited due to steep slopes and thin soils creating poor sites for development. Wooded and shrub/scrub areas are the primary land cover in this area. Land development is mostly limited to the narrow creek valley that is primarily used for homesteads and agriculture. However, because the dominate bedrock in this section of the Mainstem is either

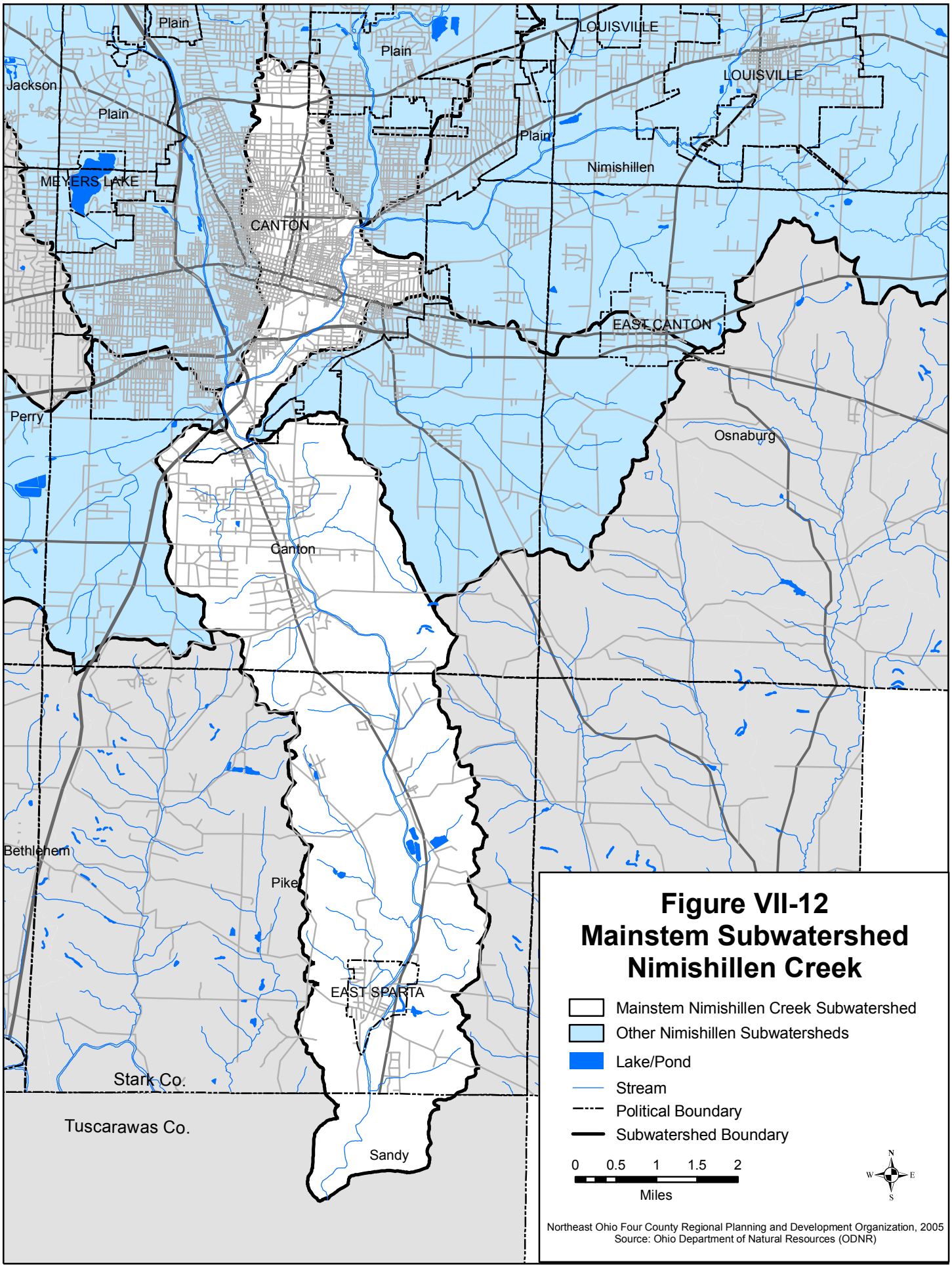
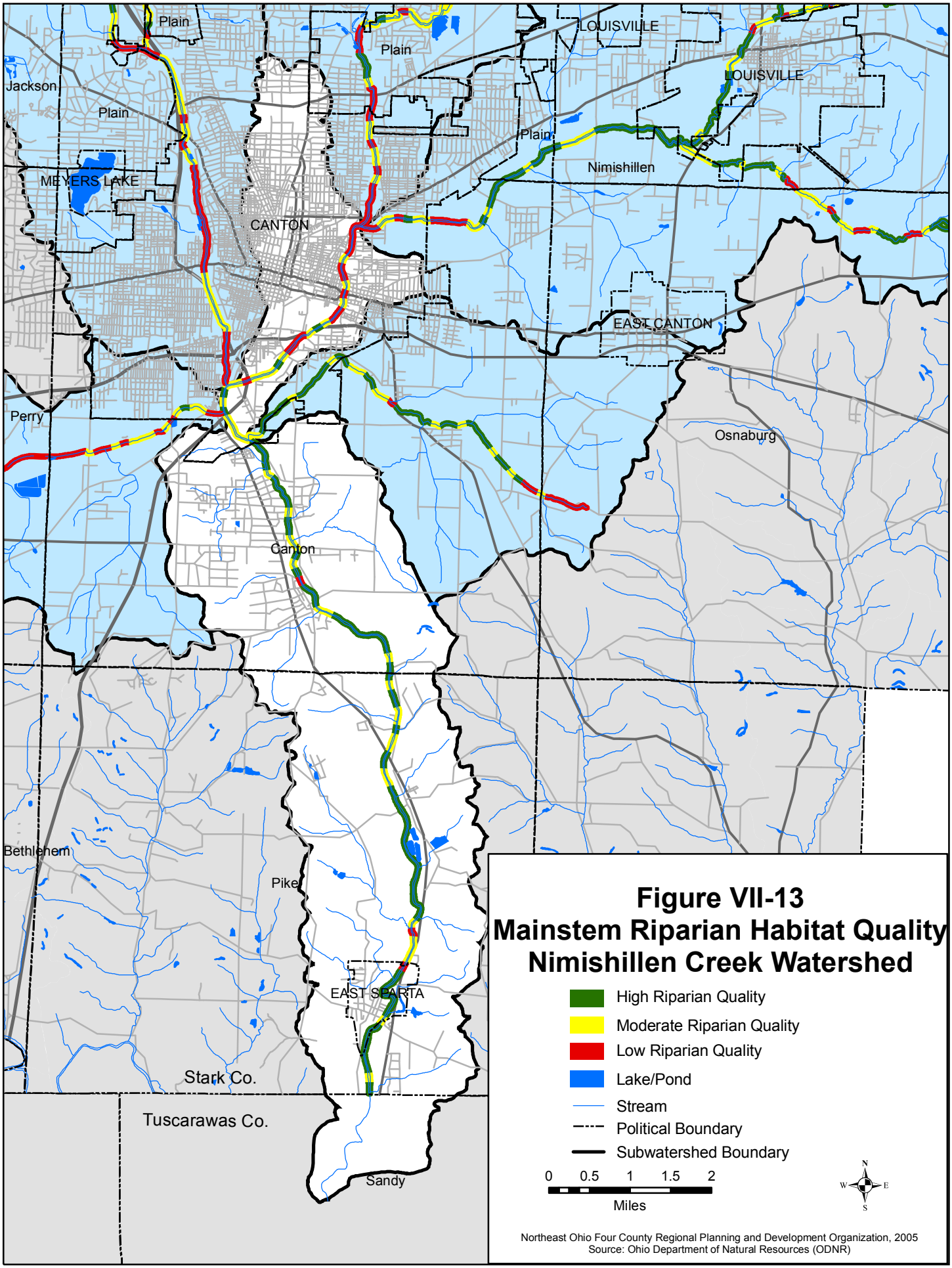


Figure VII-12
Mainstem Subwatershed
Nimishillen Creek


Plain
Jackson
Plain
MEYERS LAKE
CANTON
Plain
LOUISVILLE
LOUISVILLE
Plain
Nimishillen
EAST CANTON
Perry
Osnaburg
Canton
Bethlehem
Pike
EAST SPARTA
Stark Co.
Tuscarawas Co.
Sandy
Figure VII-13
Mainstem Riparian Habitat Quality
Nimishillen Creek Watershed
High Riparian Quality
Moderate Riparian Quality
Low Riparian Quality
Lake/Pond
Stream
Political Boundary
Subwatershed Boundary
0 0.5 1 1.5 2
Miles
N
W
E
S
Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

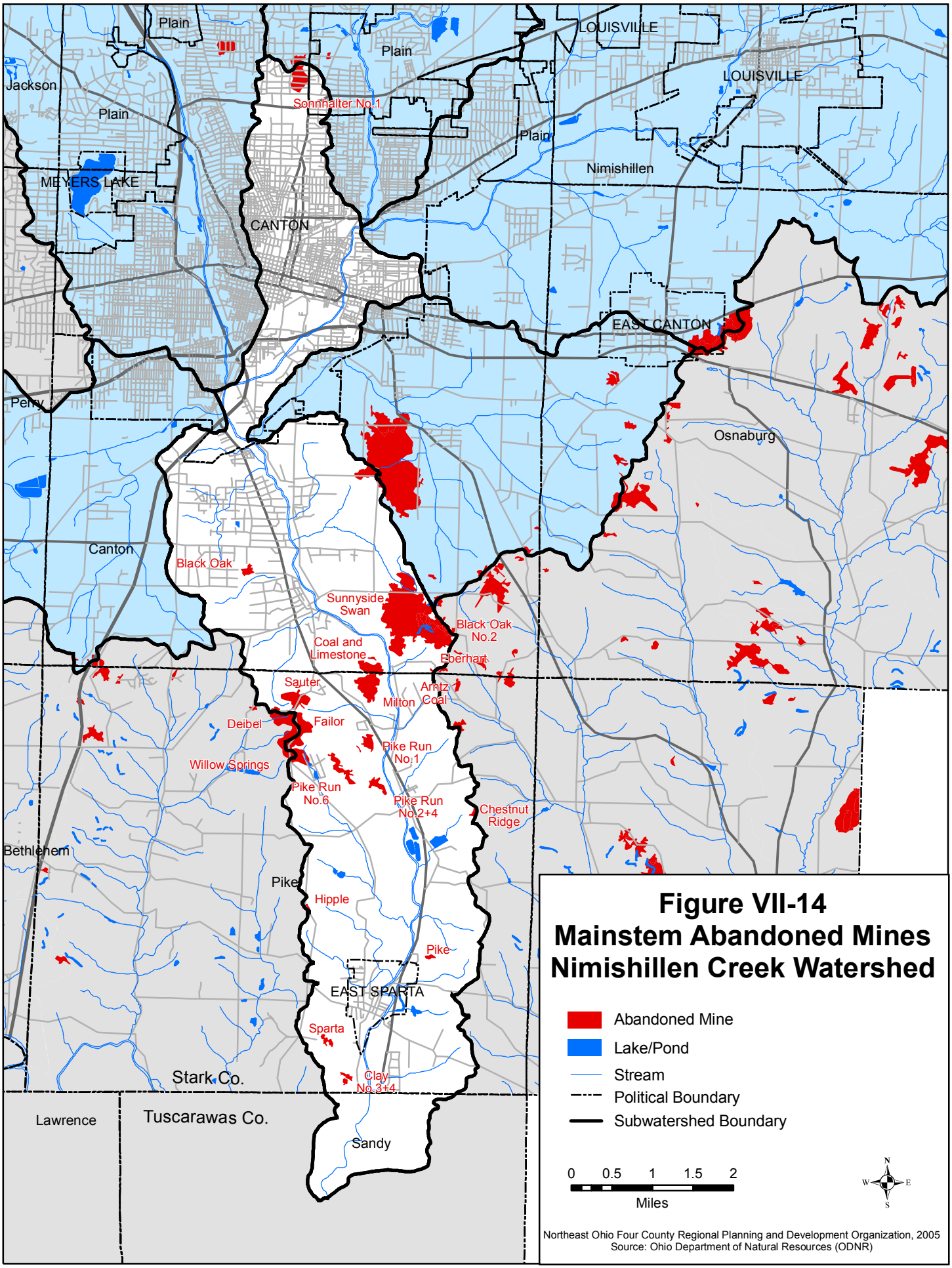


Figure VII-14
Mainstem Abandoned Mines
Nimishillen Creek Watershed

Northeast Ohio Four County Regional Planning and Development Organization, 2005
Source: Ohio Department of Natural Resources (ODNR)

Kittaning Coal or Brookville Coal, there are several current and abandoned coal mining operations. Runoff from these mines, particularly older abandoned mining areas, can negatively impact water quality of the Mainstem (Figure VII-14).

The condition of the riparian habitat is reflective of development in the basin. As would be expected in an urban area, the northern unglaciated, developed portion of the subwatershed has riparian habitat ratings of primarily “low” to “moderate” quality. In contrast, the riparian habitat in the unglaciated portion of the Mainstem is predominately “high” quality habitat (Figure VII-13). Protection of “high” quality and restoration of “low” to “moderate” quality riparian habitat is a priority.

Point Source Discharges

A point source is defined as a source that discharges pollutants, or any effluent, from a known discharge point, such as a pipe, ditch, or sewer and into a waterbody after treatment (Miller, 1988). Treatment can vary depending on the type of effluent, but generally includes the removal of solids and disinfection. Point source discharges have the potential to introduce high levels of nutrients and chemicals into a waterbody. However, these discharges are monitored and tracked by the Ohio EPA via the National Pollutant Discharge Elimination System (NPDES) program to protect local water resources.

Along the Mainstem of Nimishillen Creek, eight point sources are permitted to discharge water. These include the City of Canton’s Water Pollution Control (sewage) Center, East Sparta’s water treatment plant, two industrial effluents, and four private wastewater treatment systems. Table VII-22 provides information about each permitted discharge and Figure IV-1 depicts their locations in the watershed. Please note that this section does not include storm sewer outfalls, off-lot discharging home sewage treatment systems, or illegal point source discharges into the Nimishillen Creek Watershed. Point source discharge Information will be added as it becomes available.

Table VII-22: Point Source Discharging Operations in the Nimishillen Creek Mainstem Watershed			
Map Symbol	**Discharging Operation**	**Design Flow (GPD)**	**Classification**
1	A&R Machine Co. Inc. 11882 Sandyville Rd. East Sparta, OH 44626	Not Given	Industrial Discharger
9	City of Canton WPCC 3550 Central Ave. Canton, OH 44707	33.0 M	Municipal Wastewater Treatment Plant
12	East Sparta Water Treatment Plant 8930 Maplehurst Dr. East Sparta, OH 44626	Not Given	Municipal Water Treatment System
20*	Marathon Ashland Petroleum LLC 8930 Maplehurst Ave. SE East Sparta, OH 44626	Not Given	Industrial Discharger
66	Adams Fabricating Inc. 10125 Sandyville Rd. SE East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System
67	Barb Huff Apartments 5477 Cleveland Ave. SE East Sparta, OH 44626	2,500	Private Discharging Semi-Public Sewage Treatment System
68	*U.S. Ceramic Tile Co. 10233 Sandyville Rd. SE East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System
75	Stanley Miller Construction 2250 Howenstine Dr. East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System
* Permit Expired in 2005; GPD = Gallons Per Day Source: Ohio EPA, 2005			

Water Quality Data and Impairments

Ohio EPA's Water Quality Results

The Ohio EPA extensively sampled the Mainstem of Nimishillen Creek in 1998 to determine NPDES permit limits for the City of Canton's Water Pollution Control Center (wastewater treatment plant) located at river mile 9.9 (Table VII-23). The focus of the sampling was to determine the impact of point source dischargers into this section of Nimishillen Creek. Although causes of impairments were identified, nonpoint sources of impairment were not investigated in this report.

Table VII-23: Ohio EPA 1998 Aquatic Life Use Sampling Results from Nimishillen Creek Mainstem

River Mile	IBI	MIwb	ICI	QHEI	Attainment Status	Ohio EPA's Comments
14.2	**35**	**7.4**	**34**	76.5	**Full**	Downstream of East & Middle Branches
11.7	30	5.7	**30**	79.5	Non	Downstream of West Branch
11.2	32	6.1	**30**	77.0	Partial	Downstream of Hurford Run
10.2	30	6.1	**32**	76.5	Partial	Upstream of Canton WWTP
9.9	20	4.4	--	--	--	Canton WWTP Mix Zone
9.8	31	5.5	--	66.5	Non	Downstream of Canton WWTP
6.7	35	6.2	--	75.0	Partial	Howenstine Road
0.6	32	5.4	--	73.0	Non	Upstream of Mouth

BOLD = meeting or a nonsignificant departure from ecoregion biocriteria
IBI = Index of Biological Integrity (fish); MIwb = Modified Index of Well Being (fish); ICI = Invertebrate Community Index; QHEI = Qualitative Habitat Evaluation Index; WWTP = Wastewater Treatment Plant
Source: October 2000 Water Quality Permit Support Document for Canton WWTP

The subwatershed resides in two ecoregions: Erie/Ontario Lake Plain (EOLP) and Western Allegheny Plateau (WAP). Each of these ecoregions have different values for attainment in each biocriteria category. The Index of Biological Integrity (IBI) and the Modified Index of Well Being (MIwb) are based of fish sampling. The Invertebrate Community Index (ICI) is determined by measuring the macroinvertebrate community. Below is the criteria each stream must reach to be considered in attainment for each ecoregion:

EOLP Ecoregion Biocriteria for WWH Attainment:
IBI = 38 (wading)
MIwb = 7.9 (wading)
ICI = 34

WAP Ecoregion Biocriteria for WWH Attainment:
IBI = 44 (wading)
MIwb = 8.4 (wading)
ICI = 36

All sites sampled by the Ohio EPA except the two most downstream sites (river mile 6.7 and 0.6) reside in the EOLP ecoregion, with the two downstream sites in the WAP ecoregion. For ICI and IBI biocriteria, values cannot be more than 4 units lower than the ecoregion attainment value to be considered in attainment. The MIwb score must not be more than 0.5 units lower than the ecoregion attainment value to be considered in attainment.

The Qualitative Habitat Evaluation Index (QHEI) is used by the Ohio EPA to evaluate the physical habitat at each sampling site. Statewide, scores generally range from 20 to less than 100. Data from hundreds of sites throughout Ohio show that values greater than 60 generally are conducive to the existence of warmwater fish and invertebrates, while scores less than 45 generally do not support these warmwater species. QHEI scores for all the areas sampled are above 60 and therefore should be able to support a normal array of warmwater aquatic life. The majority of the

QHEI scores are above 75 which is frequently associated with habitat in areas with exceptional warmwater biology.

Impairments

Aquatic Life Use:
Only one of eight sites sampled by the Ohio EPA was in full attainment and not impaired (river mile 14.2) based on the 1998 Ohio EPA sampling. Three sites are in partial attainment (river miles 11.2, 10.2, and 6.7) as the ICI scores do not significantly depart from the ecoregion criteria. The remain four sample locations are in non-attainment (river miles 11.7, 9.8, and 0.6) and are impaired for all three indices.

Recreation:
The Nimishillen Creek Mainstem is impaired for Primary Contact Recreation.

Fish Consumption:
There is a fish consumption advisory of only one meal per month of common carp caught from the Nimishillen Creek Mainstem. In addition, the Ohio Department of Health has issued a statewide advisory to limit meal of fish caught from all Ohio waterbodies to one meal per week due to mercury.

Ohio EPA's Causes and Sources of Impairments:
The causes of impairments for a stream are the specific pollutants or alterations that result in the stream not meeting state water quality standards. Examples of common causes of water quality impairments are siltation, flow alteration, nutrient enrichment, metals, and temperature. Sources of impairments are from where the causes originated or from where the causes of impairments are supplied from. Sources include crop production, channelization, urban runoff, dam construction, discharge pipes, and stream bank erosion. Table VII-24 lists the causes and sources of impairment for aquatic life use, recreation, and fish consumption along the Mainstem of Nimishillen Creek.

Table VII-24: Ohio EPA's Causes and Sources of Impairments for Nimishillen Creek Mainstem

Impairment Of:	Causes of Impairment (magnitude)	Sources of Impairment (magnitude)
Aquatic Life Use	Nutrients (high) Zinc (moderate) Pathogens (moderate)	Major Industrial Point Source (high) Major Municipal Point Source (high)
Recreation	Pathogens	Unknown
Fish Consumption	Polychlorinated Biphenyls (PCBs)	Unknown

Sources: Ohio EPA's 2000 305(b) Ohio Water Resource Inventory and Ohio EPA 2004 Integrated Report

Other Water Quality Information

Nimishillen Creek Macroinvertebrate Survey - 2000, 2002, and 2004: Since 2000, NEFCO has conducted three macroinvertebrate surveys along Nimishillen Creek. Two of the seventeen sites sampled are located along the Creek's Mainstem. Table VII-25 summarizes the results of the sampling using ODNR's Stream Quality Monitoring Program protocol.

Table VII-25: Mean Cumulative Index Values* (CIV) for the Nimishillen Creek Mainstem Based on NEFCO's Macroinvertebrate Surveys

Station Location	Mean CIV**		
	2000 Segment Condition	2002 Segment Condition	2004 Segment Condition
River Mile 13.14 - Cherry Rd. and Sherrick Dr.	15 Fair	13 Fair	18 Good
River Mile 8.97 - Baum Rd. Bridge	12 Fair	14 Fair	14 Fair

* Stream Quality Assessment (Source: ODNR, Stream Quality Monitoring Manual)
**Excellent: >22, Good: 17-22, Fair: 11-16, Poor < 11.

Results show "Fair" to "Good" mean scores for river mile 13.14 site and "Fair" scores for the site at river mile 8.97. The Ohio EPA found that generally ODNR's Stream Quality Monitoring Program tend to reflect attainment and non-attainment aquatic life uses. "Excellent" scores in the ODNR method commonly meet the Ohio EPA attainment standards, while stream segments with "Fair" or "Poor" scores generally are assessed as being in non-attainment (Yoder and Davis, 1996). The 2004 scores for both sites along the Mainstem, which have the highest scores of the three years of sampling, indicate that the macroinvertebrate community is not declining.

Mainstem Subwatershed Issues:

1. **Riparian Corridor Protection**
2. **Soil Erosion and Sedimentation**
3. **Acid Mine Drainage**
4. **Environmental Education**
5. **Storm Water Runoff and Flooding**

The Mainstem has several nonpoint source pollution issues resulting in water quality impairments. Due to its location at the lower end of the watershed, many of the Mainstem's problems originate outside of its subwatershed boundaries along its primary tributaries. However, there are NPS pollution issues occurring within the Mainstem watershed that are contributing to its continued impairment, or working against the recovery of Mainstem's water quality.

Using available data and information along with personal knowledge on this section of Nimishillen Creek, watershed stakeholders ranked the top five issues they believe to be hindering water quality attainment in this subwatershed. Under each of the five issues

are a goal and objectives statements accompanied by recommended actions. Please note that the recommended actions are not intended to be a comprehensive list of actions that could address each issue; but rather, a list of actions that the stakeholders believe is the best course of action given the current circumstances and available information. Refer to NEFCO's *Nimishillen Creek Comprehensive Watershed Management Plan - Phase III* for a more comprehensive list of water quality improvement actions for Nimishillen Creek (NEFCO, 2001).

"Focus Areas" were also included under each objective to indicate specific areas to direct actions, if known, and a "Target" was establish to help evaluate the objective and measure accomplishments. Lastly, "Responsible Parties" are identified if a watershed action is ongoing, while "Suggested Responsible Parties" indicate who could take the lead on actions not yet being implemented.

Mainstem Issue #1 - Riparian Corridor Restoration and Protection

Goal: Maintain and protect areas with "high" riparian habitat scores, and restore habitat areas with "poor" or "moderate" riparian habitat scores to the next attainment level.

Objectives:

1. Purchase land along the riparian corridor for habitat protection and public use.
   Focus Areas: Mouth (RM 0) to Sherrick Run (RM 11)
   Target: Purchase or protect 5 acres per year of "high" quality riparian habitat
2. Establish policies to protect the riparian corridor and habitat.
   Focus Areas: Entire Subwatershed
   Target: Adoption of policies by the county and municipalities
3. Restore riparian habitat where possible.
   Focus Areas: Sherrick Run (RM 11) to Cook Park (RM 15)
   Target: Restore 3 percent or approximately 1,000 linear feet of "poor" or "moderate" quality riparian habitat

Mainstem Issue #1 - Recommended Actions Tables:

Action A: Encourage city and county park districts to purchase selected areas to protect and/or increase intact riparian corridor.	
Suggested Responsible Parties:	Stark Parks; Canton Parks Commission; Village of East Sparta
Funding Options:	Clean Ohio Fund; Ohio EPA Section 319 NPS Grant; WPCLF; PL-566
Time Frame:	Ongoing
Expected Improvements:	Maintain or increase riparian habitat scores
Evaluation Method:	Number of riparian acres purchased; Riparian habitat scores

Estimated Costs:	$0 - $5,000 and up per acre; $4,000 and up average set up and maintenance fee
Estimated Load Reduction:	Riparian Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action B: Assist communities with the development of township or municipal ordinances requiring new construction sites to leave easements or a specific distance near shorelines of targeted wetlands and flood plains of streams.	
Suggested Responsible Parties:	Local and County Planning and Zoning Boards; Stark SWCD
Funding Options:	NPS Education Grant; OEEF; Local Funds
Time Frame:	2006 thru 2008
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increased riparian habitat scores, reduction in stream bank erosion, and floodway protection
Evaluation Method:	Number of ordinances established and enforced; Riparian and shoreline miles protected; Riparian habitat scores
Estimated Costs:	Variable
Estimated Load Reduction:	Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80%

Action C: Provide incentives for landowners to protect shoreline or riparian corridor with long-term protection or permanent conservation easements	
Suggested Responsible Parties:	Local and County Planning and Zoning Boards; Non-Profit Environmental Groups and Land Conservancies
Funding Options:	Clean Ohio Fund; CWA Section 319 NPS Grant; WRP; CRP; PL-566
Time Frame:	2006 thru 2010
Expected Improvements:	Protection of shoreline and riparian corridor resulting in increased riparian habitat scores, reduction in stream bank erosion, and floodway protection
Evaluation Method:	Linear feet set aside for long-term protection; Number of permanent conservation easements; Riparian habitat scores
Estimated Costs:	$0-$5,000 per acre and up for easement; $4,000 and up average set up and maintenance fees
Estimated Load Reduction:	No direct reduction in pollution loads expected from action; however, long-term or permanent protection measures will reduce future pollution loading

Action D: Assist shoreline and riparian landowners to replant shoreline and riparian corridor for selected wetlands, lakes and streams.	
Suggested Responsible Parties:	Stark SWCD; NEFCO; USDA - NRCS; Earth Action Partnership; Ohio EPA; ODNR - DSWC; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2006 thru 2010
Expected Improvements:	Restoration of shoreline and riparian corridor, increased riparian habitat scores, improved wildlife habitat, and reduction in stream bank erosion during high flow events
Evaluation Method:	Linear feet of replanted riparian habitat; Wildlife surveys; Riparian habitat scores
Estimated Costs:	\$0.25 - \$1.10 per yd^2 Seeded and Mulched; \$0.40 - \$0.50 per Seedling Planted; Tree Plantings = \$800 per acre; Fiber Rolls = \$12.00 per Linear Foot; Plant Cuttings = \$0.40 - \$0.50 per Cutting; Erosion Control Blankets = \$2.00 per yd^2
Estimated Load Reduction:	Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75% Fiber Rolls: TSS Reduction = 58% Vegetated Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80% Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33%

Mainstem Issue #2 - Soil Erosion and Sedimentation

Goal: Establish appropriate best management practices to reduce soil erosion on steep slopes and along stream banks.

Objectives:

1. Reduce erosion of stream banks and shorelines.
   Focus Areas: 9th Street and Fulton
   Target: To be determined
2. Ameliorate impacts of soil erosion from construction sites.
   Focus Areas: To be determined
   Target: To be determined
3. Reduce soil erosion from agriculture and pasture areas.
   Focus Areas: To be determined
   Target: To be determined
4. Reduce the impact of storm water runoff from urban and suburban areas.
   Focus Areas: To Be Determined
   Target: To be determined

Mainstem Issue #2 - Recommended Actions:

Action A: Assist shoreline and riparian landowners to stabilize shoreline and riparian corridor using appropriate BMPs.	
Suggested Responsible Parties:	County SWCDs; NEFCO; ODNR - DSWC; USDA - NRCS; Earth Action Partnership; ODNR - Division of Wildlife
Funding Options:	EQUIP; CRP; WPCLF; CWA Section 319 NPS Grant; PL-566; SIP
Time Frame:	2005 thru 2008
Expected Improvements:	Restabilization of shoreline and riparian corridor; Reduction in stream bank erosion; Improved wildlife habitat
Evaluation Method:	Linear feet of bank or shoreline stabilized; Wildlife survey; Riparian habitat scores
Estimated Costs:	Approximately $350,000 to restore or stabilize 1,300 linear feet of stream channel; Fiber Rolls = $12.00 per linear foot; Plant Cuttings = $0.40 - $0.50 per cutting; Erosion Control Blankets = $2.00 per yd^2
Estimated Load Reduction:	Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75% Fiber Rolls: TSS Reduction = 58% Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80% Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75%

Action B: Implement control measures to reduce impacts from construction sites. Control measures include frequent inspection of construction site, vegetated buffer strips and riparian zones near construction sites, and promoting the design of post-construction BMPs that addresses both water quantity and quality.	
Responsible Parties:	Stark County SWCD; Stark County Regional Planning
Funding Options:	Locally Funded
Time Frame:	Currently ongoing as part of the Storm Water NPDES Phase II Program
Expected Improvements:	Reduction in sediment erosion, transport, and deposition from construction sites
Evaluation Method:	Number of construction site inspections; Number of riparian buffer strips at construction sites; Number of post-construction BMPs implemented; Calculated/modeled reduction in sediment entering Nimishillen Creek as a result of control measures

Estimated Costs:	Site Inspections = $250 - $2,000 depending on size (Stark SWCD); Buffer Strips = $0.25 - $1.10/yd^2 seeded and mulched, $0.40 - $0.49/seeding planted; Detention Basin = $10,000 - $50,000 per system depending on size and features; Fiber Rolls = $12.00 per linear foot; Plant Cuttings = $0.40 - $0.50 per cutting; Erosion Control Blankets = $2.00 per yd^2
Estimated Load Reduction:	Detention Basin General Removal Efficiencies: TSS = 55%-100% Grass Swales General Removal Efficiencies: TSS = 81%; TP = 29%; Nitrate = 38%; Metals =14%-55%; Bacteria = -50% Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80% Porous Pavement General Removal Efficiencies): Sediment = 82%-95%; TPs = 65%; TN = 80%-85% Silt Fence General Removal Efficiency: TSS = 75%-80% Erosion Control Blankets: Runoff Reduction = 80%; Erosion Rate Reduction = up to 99%; Weed Growth Reduction = 75%

Action C: Implement appropriate structural BMPs to alleviate soil-related pollution for agricultural runoff. Appropriate BMPs include livestock exclusion fencing, off-stream watering facilities, grassed and forested buffer strips in agricultural areas, and water and sediment control basins equipped with treatment systems for water quality improvements.	
Responsible Parties:	Stark SWCD; USDA - NRCS; Ohio Farm Bureau; ODNR - DSWC
Funding Options:	EQUIP; CRP; WPCLF; PL-566; CWA Section 319 NPS Grants; SIP
Time Frame:	Ongoing
Expected Improvements:	Lower soil-related pollution from agricultural areas; Reduction in bacteria and pathogens entering Nimishillen Creek via livestock
Evaluation Method:	Linear feet of livestock exclusion fencing installed; Number of off-stream watering facilities associated with livestock exclusion fences; Linear feet of grassed and forested buffer strips established; Number of water and sediment control basins established; Calculated or modeled reduction in sediment entering Nimishillen Creek as a result of control measures.
Estimated Costs:	Fencing = $4.70 per linear foot for barbed wire; Watering Station = $1,500 - $2,000 and up; Buffer Strips = $0.25 - $1.10 per yd^2 seeded and mulched, $0.40 - $0.49 per seeding planted; Detention Basin = $10,000 - $50,000 per system depending on size and features

Estimated Load Reduction:	Livestock Exclusion Fencing and Off-Stream Watering Facilities = Variable Reduction in TP, TN, TSS, and Bacteria Pollution Buffer Strips General Removal Efficiencies: TSS = 40%-90%; TP = 30%-90%; TN = 20%-60%; Metals = 20%-80% Water and Sediment Control Basins General Removal Efficiencies: TSS = 50%-90%; TP = 20%-90%; TN = 10%-90%

Action D: Installing BMPs to treat and absorb runoff from impervious areas. Types of BMPs include porous pavement, infiltration basins, treatment wetlands, and grass swales.	
Responsible Parties:	Stark County SWCD; County Engineers; Local and County Planning and Zoning Boards; USDA - NRCS; NEFCO
Funding Options:	WPCLF; CWA Section 319 NPS Grant
Time Frame:	Grass Swales - ongoing Infiltration Basins - ongoing Impervious Pavement - 2006 thru 2010 Treatment Wetland - ongoing
Expected Improvements:	Decreased runoff, which may contain dissolved solids and other pollutants, from impervious areas; Decreased quantity of water reaching Nimishillen Creek; Decrease in nutrients, sediment, and other pollutant from reaching the creek
Evaluation Method:	Acres of impervious pavement installed; Linear feet of grass swales installed; Number of infiltration basin and treatment wetlands installed
Estimated Costs:	$3.20/linear foot for grass-lined diversion; $3.60/linear foot for grass-lined waterway; Approximately $15,000 for 5,000 ft^2 Grasspave porous pavement installed; Infiltration Basin = $10,000 to $50,000 and up; Treatment Wetland = $50,000 - $100,000 and up
Estimated Load Reduction:	Porous Pavement General Removal Efficiencies): Sediment = 82%-95%; TPs = 65%; TN = 80%-85% Infiltration Basin General Removal Efficiencies: TSS = 75%; TP = 60%-70%; TN = 55%-60%; Metals = 85%-90%; Bacteria = 90% Treatment Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33% Grass Swales General Removal Efficiencies: TSS = 81%; TP = 29%; Nitrate = 38%; Metals =14%-55%; Bacteria = -50%

Mainstem Issue #3 - Acid Mine Drainage (AMD)

Goal: Identify and reduce pollution from acid mine drainage sources in order to improve aquatic life along the Mainstem of Nimishillen Creek.

Objectives:

1. Decrease the impacts of acid mine drainage entering Nimishillen Creek Mainstem.
   Focus Areas: Howentein Rd. Bridge (RM 6.7)
   Target: Complete abatement plan by 2007
2. Establish a biological and chemical monitoring program for areas impacted by acid mine drainage.
   Focus Areas: Mouth (RM 0) to Sherrick Run (RM 11)
   Target: To be determined
3. Investigate known abandoned mines in the watershed to determine which are impacting Nimishillen Creek Mainstem.
   Focus Areas: Mouth (RM 0) to Sherrick Run (RM 11) and Tributaries
   Target: Completed by 2007

Mainstem Issue #3 - Recommended Actions:

Action A: Decrease acid mine drainage entering the Mainstem of Nimishillen Creek by using the best available technology.	
Suggested Responsible Parties:	ODNR - Division of Mineral Resources Management; Stark County; Stark County Health Department; Ohio EPA; NEFCO; Crossroads RC&D; Rural Action; Nimishillen Creek Watershed Partners
Funding Options:	CWA Section 319 NPS Grant; State and Federal Abandoned Mine Land (AML) Reclamation Programs; Rural Abandoned Mine Program (RAMP); Appalachian Clean Stream Program (ACSP); WRRSP
Time Frame:	2006 thru 2010
Expected Improvements:	Reduction in dissolved metals, acids, and flocculates (yellow boy) associated with AMD; Improved biology in the Creek
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent; Number of AMD abatement projects completed
Estimated Costs:	Variable - site dependent
Estimated Load Reduction:	To be determined

Action B: Establish long-term chemical and biological monitoring program for AMD areas.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	CWA Section 319 NPS Grant; OEEF; Private Sector
Time Frame:	2007 and beyond

Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem; Better evaluation of AMD abatement projects
Evaluation Method:	Macroinvertebrate monitoring; Chemical sampling of effluent
Estimated Costs:	- Macroinvertebrate Volunteer Monitoring: $15 per volunteer per hour + $50 monitoring kit; - NEFCO Macroinvertebrate Monitoring = $750 per site; - Chemical Sampling: $500 - $1,000 and up for laboratory tests + cost of collection and transportation
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Investigate remaining abandoned mines in the watershed and determine if acid mine drainage is impacting the water quality of Nimishillen Creek Mainstem and its tributaries.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Crossroads RC&D; Stark County SWCD; Stark County Health Department; Local University
Funding Options:	Private Sector; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Increase knowledge of the extent of the AMD problem along the Mainstem
Evaluation Method:	List of sites visited; Documentation of AMD problems
Estimated Costs:	To Be Determined
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Mainstem Issue #4 - Environmental Education

Goal: Educate residents, government officials, and businesses about watershed issues impacting Nimishillen Creek Mainstem.

Objectives:

1. Educate riparian and shoreline landowners on the value of a healthy riparian habitat.
   Focus Areas: All riparian land owners
   Target: Distribute information to 50% of the riparian land owners
2. Reduce illegal dumping into the Mainstem.
   Focus Areas: City of Canton and Canton Township
   Target: To be determined
3. Increase general knowledge of local watershed issues.
   Focus Areas: Entire Subwatershed
   Target: Direct contact with 25 Mainstem stakeholders per year

Mainstem Issue #4 Recommended Actions Tables:

Action A: Identify shoreline and riparian landowners and educate them about the importance of shoreline or riparian zone protection.	
Suggested Responsible Parties:	NEFCO; Earth Action Partnership; Stark Parks
Funding Options:	NPS Education Grant; OEEF; WPCLF; CWA Section 319 Grant; Private Sector
Time Frame:	2006 thru 2008
Expected Improvements:	Increased protection of shoreline and riparian corridor
Evaluation Method:	List of riparian landowners; Number of education pamphlets distributed; Riparian habitat scores
Estimated Costs:	Riparian landowner list = 3 days work; Pamphlets = $1.50 - $3.00 per pamphlet
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action B: Distribute flyers informing watershed residents on how to identify suspicious activities and who to contact to report illegal activities. Types of activities targeted illegal dumping, illegal discharges, and the filling in of floodplain and wetland areas.	
Suggested Responsible Parties:	Ohio EPA - Division of Environmental and Remedial Response; NEFCO; Earth Action Partnership; Stark County Health Department
Funding Options:	NPS Education Grant; OEEF; CWA Section 319 Grant; Private Sector
Time Frame:	2006 and on
Expected Improvements:	Decrease in illegal activities that can cause reduced habitat and/or water quality
Evaluation Method:	Number of flyers distributed; Number of contacts made to authorities listed on flyers; Number of illegal water resource activities stopped or corrected
Estimated Costs:	$1.50 - $3.00 per flyer or fact sheet
Estimated Load Reduction:	Variable depending on the type of illegal activity prevented

Action C:	Educate residents about watershed issues through regularly scheduled events and activities that are recognized by the public. These events and activities can include watershed surveys, presentations at local meetings, information booths at local fairs, creek clean-ups, and other public meetings.
Suggested Responsible Parties:	Nimishillen Creek Watershed Partners; NEFCO; Stark SWCD; Stark County RPC; Stark County Health Department
Funding Options:	Private Sector; NPS Education Grant; OEEF Grant; CWA Section 319 NPS Grant; Local Funds; Private Sector
Time Frame:	Ongoing
Expected Improvements:	Greater awareness regarding watershed issues
Evaluation Method:	Number of: Events held; Surveys taken; Presentations given; Fairs attended; Public meetings held
Estimated Costs:	Survey = $2.00 per survey; Presentation = $3,000 and up per 80 picture slide/PowerPoint show; County Fair Display = $1,000 and up + $1.50 to $3.00 per pamphlet + $15.00 per volunteer hour; Public Meeting = $1,200 per meeting
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action D:	Implement a watershed protection and awareness program in local schools.
Suggested Responsible Parties:	Stark Parks; Ohio EPA - Division of Surface Water; County SWCDs; Local Boards of Education; Local Schools; Earth Action Partnership
Funding Options:	OEEF; NPS Education Grant; CWA Section 319 NPS Grant
Time Frame:	2006 thru 2007
Expected Improvements:	Stronger knowledge of future generations regarding the importance of watershed protection
Evaluation Method:	Number of local schools implementing program; Number of students exposed to watershed education efforts
Estimated Costs:	$400 - $7,000
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action E:	Educate homeowners on ways to deter waterfowl from grazing on their property and on the proper disposal of pet wastes.
Suggested Responsible Parties:	Earth Action Partnership; Stark Parks; NEFCO; Stark SWCD

Funding Options:	OEEF; NPS Education Grant; CWA Section 319 NPS Grant; Private Sector
Time Frame:	2006 and beyond
Expected Improvements:	Reduced nutrients and bacteria entering Nimishillen Creek from waterfowl and domestic animal waste
Evaluation Method:	Number of information pamphlets or fact sheets distributed
Estimated Costs:	$1.50 - $3.00 per pamphlet of fact sheet
Estimated Load Reduction:	Localized Decrease in Bacteria, Phosphorus, and Nitrogen Levels Estimated Nitrogen Reduction = Number of Geese Reduced x 82 g/day in Waste x 4.5% Nitrogen Estimated Phosphorus Reduction = Number of Geese Reduced x 82 g/day in Waste x 1.3% Phosphorous.

Mainstem Issue #5 - Storm Water Runoff and Flooding

Goal: Reduce storm water runoff and flooding along the Nimishillen Creek Mainstem while protecting and promoting water quality and riparian habitat protection and restoration.

Objectives:

1. Reduce stressors that contribute to flooding (log jams, floodplain incursion, decreased riparian vegetation, wetland filling, etc.).
   Focus Areas: Canton South; Canton Township; East Sparta
   Target: To be determined
2. Educate subwatershed stakeholder about flooding issues.
   Focus Areas: Entire Subwatershed
   Target: Direct contact with 50 subwatershed stakeholders per year
3. Improve floodplain management.
   Focus Areas: Entire Subwatershed
   Target: To be determined
4. Promote natural channel design principles in the Nimishillen Creek Watershed.
   Focus Areas: To be determined
   Target: Organize a workshop to promote natural channel design

Mainstem Issue #5 - Recommended Actions:

Action A: Remove log jams and other obstructions that cause localized flooding in the Subwatershed	
Suggested Responsible Parties:	Landowners; Stark County Drainage Task Force; Stark County Engineer; Stark Parks; Stark County RPC; Muskingum Watershed Conservancy District; Stark SWCD; Municipalities; Stark EMA
Funding Options:	Storm Water Utility; Conservation District Assessment; Private Sector
Time Frame:	Ongoing by Stark County

Expected Improvements:	Reduction in localized flooding and erosion caused by obstructions like log jams
Evaluation Method:	Number of obstructions removed
Estimated Costs:	$0 - $1,000 and up; dependent on the size of the obstruction
Estimated Load Reduction:	Variable: Removal will likely decrease localized erosion caused by the redirection of flow around the obstruction. Increase in dissolved oxygen levels likely if the log jam has a standing pool.

Action B: Distribute information from Ohio Emergency Management Agency (OEMA) and the Federal Emergency Management Agency (FEMA) about flooding and mitigation to residence. Hold regular meetings about local flooding issues.	
Suggested Responsible Parties:	Stark County Drainage Task Force; Stark County EMA; Nimishillen Creek Watershed Partners; Stark County RPC; Municipalities; Stark Parks; Stark SWCD
Funding Options:	OEEF; Storm Water Utility; Conservation District Assessment
Time Frame:	Ongoing by the Stark County Drainage Task Force and Stark County EMA
Expected Improvements:	Increased understand by residents of flooding issues and assistance available in the Nimishillen Creek Watershed
Evaluation Method:	Number of pamphlets distributed; Number of meetings held
Estimated Costs:	Public Meeting = $1,200 per meeting; $15 per person for workshop; $1.50 - $3.00 per pamphlet or fact sheet
Estimated Load Reduction:	No direct reduction in pollution loads expected from action

Action C: Develop a comprehensive flood abatement strategy for the entire Nimishillen Creek Watershed that includes problem identification, a funding strategy, and an education plan.	
Suggested Responsible Parties:	Nimishillen Creek Drainage Task Force; Stark Parks; Stark RPC; Municipalities; U.S. Army Corps of Engineers
Funding Options:	Storm Water Utility; Conservation District Assessment; Private Sector; Federal Appropriations
Time Frame:	Ongoing
Expected Improvements:	Understanding of flooding issues by local government officials and residents; Coordinated efforts in handling flooding problems
Evaluation Method:	Completion of a comprehensive flooding plan for the watershed.
Estimated Costs:	$1,000,000 and up
Estimated Load Reduction:	To be determined

Action D: Encourage and support activities and/or policies that reduces floodplain incursion, wetland filling, riparian habitat loss, and other activities that contribute to increased flooding.	
Suggested Responsible Parties:	Nimishillen Creek Drainage Task Force; Stark Parks; Stark RPC; Municipalities;
Funding Options:	Storm Water Utility; Conservation District Assessment; WRP; CRP; Clean Ohio Fund; Private Sector; CWA Section 319 NPS Grant; Private Sector
Time Frame:	2006 thru 2020
Expected Improvements:	Preserve and maintain remaining natural features (floodplains, wetlands, etc.) that helps abate flooding in the Nimishillen Creek Watershed.
Evaluation Method:	Number of local policies or ordinance adopted to protect floodplains, riparian habitat, and wetlands; Acres protected and preserved
Estimated Costs:	Storm Water Utility = $20 - $50 per parcel per year (residential); Conservation District Assessment = $2 - $35 per year per parcel (residential); Conservation Easement = $0 - $5,000 and up per acre + $4,000 and up average set up and maintenance fee; Constructed Wetland = $45,000 - $110,000 and up
Estimated Load Reduction:	Constructed Wetland Median Removal Efficiencies: TSS = 76%; TP = 46%; Orthophosphate Phosphorus = 28%; Nitrate = 46%; and NH_3 = 33%

Action E: Investigate establishing a watershed program to reward landowners that adopt natural channel design principles on their property.	
Suggested Responsible Parties:	NEFCO; Stark County Drainage Task Force; Stark RPC; Stark SWCD; ODNR
Funding Options:	Storm Water Utility; Conservation District Assessment; CWA Section 319 NPS Grant
Time Frame:	2007thru 2008
Expected Improvements:	Increased understanding of natural channel design concepts in the watershed; Improved biological and QHEI scores if enacted
Evaluation Method:	Miles of stream restored using natural channel design techniques; QHEI scores; Macroinvertebrate scores
Estimated Costs:	To be determined
Estimated Load Reduction:	To be determined

VIII. Water Quality Monitoring

The City of Canton and NEFCO have been conducting macroinvertebrate and habitat monitoring in the Nimishillen Creek Watershed since 2000. Results have been used to establish base line information regarding the creek's water quality and habitat conditions in addition to identifying causes and sources of water quality impairments. Results from these monitoring efforts can be located in the subwatershed plans in Section VII of this plan.

As mentioned in Section V, the Ohio EPA is currently working on the Total Maximum Daily Load (TMDL) report for the Nimishillen Creek Watershed. This report will provide detailed water quality monitoring information collected by the agency in 2004 and 2005. In addition, the report will contain modeling information for the sections of Nimishillen Creek that are not meeting designated water quality standards. This report is scheduled for completion by 2007. It is hoped that this study will help local stakeholders focus future water quality monitoring efforts to reduce cost and improve effectiveness.

Current and future water quality monitoring efforts are also outlined in each subwatershed plan found in Section VII. Please refer to this section from more monitoring information.

IX. Evaluation and Funding

Evaluation

Evaluation of the effectiveness of this action plan will largely rest on the ability to evaluate the success of the actions this plan recommends. To this end, each action found in Section VII contains information on evaluation methods, estimated costs, general load reduction values. The ultimate goal of each action is to help the Nimishillen Creek and its tributaries meet state water quality standards. Therefore, any evaluation of this plan or actions it outlines should be evaluated as to whether it is helping achieve this ultimate goal in the short or long term.

The evaluation and updating of the content in this plan will be the responsibility of the Watershed Coordinator for the Nimishillen Creek area. Absent a Watershed Coordinator, NEFCO will take charge of evaluation and updating this action plan. As with the creation of this plan, whomever leads the update process should do so with direct input and guidance from private, government, business, commercial, and industrial watershed stakeholders.

Funding

A formal funding strategy has not been done for implementation of this entire plan. Instead, funding strategies will be completed on a project by project basis. To help stakeholder in the completing these funding strategies, most actions in Section VII provide an estimate on costs for implementation. Some actions with great variability in costs or unknown costs do not have these estimates. Each action also contains potential funding sources from the federal, state, and local sources. Although some of the actions can and are completely funded by local stakeholders, the overall goal is to leverage local money to bring in outside monies to pay for the various water quality improvement projects.

X. Appendices

Appendix A:
Acronyms

AMD	Acid Mine Drainage
AML	Abandoned Mine Land
BMP	Best Management Practice
CIV	Commutative Index Value
CRP	Conservation Reserve Program
CWA	Clean Water Act
CWH	Coldwater Habitat
CWMP	Comprehensive Watershed Management Plan
DSWC	Division of Soil and Water Conservation
EOLP	Erie/Ontario Lake Plain Ecoregion
EPA	Environmental Protection Agency
EQUIP	Environmental Quality Incentive Program
EWH	Exceptional Warmwater Habitat
FPA	Facilities Planning Area
GPD	Gallons Per Day
HSTS	Home Sewage Treatment System
HUC	Hydrologic Unit Code
IBI	Index of Biological Integrity
ICI	Invertebrate Community Index
LRW	Limited Resource Water
MIwb	Modified Index of Well Being
MWCD	Muskingum Watershed Conservancy District
MWH	Modified Warmwater Habitat
NEFCO	Northeast Ohio Four County Regional Planning and Development Organization
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
MGD	Million Gallons per Day
NPS	Nonpoint Source Pollution
NSF	National Sanitation Foundation
ODNR	Ohio Department of Natural Resources
OEEF	Ohio Environmental Education Fund
O&M	Operation and Maintenance
PCBs	Polychlorinated Biphenyls
QHEI	Qualitative Habitat Evaluation Index
RC&D	Resource Conservation and Development
RM	River Mile
SCHD	Stark County Health Department
SWCD	Soil and Water Conservation Districts
SWP3	Storm Water Pollution Prevention Plan
TN	Total Nitrogen
TSS	Total Suspended Solids

TP	Total Phosphorus
USGS	United States Geological Survey
WAP	Western Allegheny Plateau Ecoregion
WPCLF	Water Pollution Control Loan Fund
WRP	Wetland Reserve Program
WRRSP	Water Resource Restoration Sponsor Program
WWH	Warmwater Habitat

Appendix B:
Nimishillen Creek Watershed Partners' By-Laws

1.01 PURPOSE

The mission of the Nimishillen Creek Watershed Partners is to promote the restoration of the Creek's water quality to fishable, swimable standards and the protection of the Creek corridor.

2.0 MEMBERSHIP

2.1 Membership is open to any individual, family, or organization that subscribes to the purposes of the Watershed Partners.

2.2 The Watershed Partners will be directed by the Nimishillen Creek Core Committee consisting of voting representatives from the following:
- At least 5 members who are residents of the watershed.
- 5 to 10 members from any of the following sectors: jurisdictional units of government in the watershed, educational, recreational, commercial, and agriculture.
- The Core Committee shall consist of no more that 15 members.

2.3 Each participating state or federal agency may be represented by one (1) ex-officio, non-voting member of the Core Committee.

2.4 Core Committee membership shall be selected as follows:
- A list of candidates from an open invitation for nominations to represent the units of government, educational, recreational, commercial, and agriculture (non-residential) sectors shall be maintained; an election by written, secret ballot of all members present shall be conducted to elect Core Committee members.
- A list of candidates from an open invitation for nominations to represent residents of the watershed shall be maintained; an election by written, secret ballot of all members present shall be conducted to elect Core Committee members.
- The five (5) residential and the five (5) non-residential candidates with the most votes will be elected to the Core Committee.
- The last five (5) Core Committee members shall be the remaining five (5) candidates from both the residential and non-residential sectors with the most votes.

2.5 Core Committee vacancies shall be filled following the process in Section 2.4, except in the case of the Chair, which vacancy shall be filled pursuant to Section 3.3.

2.6 Except for the initial election, all Core Committee members shall be elected to a four-year term. For the initial election, the four (4) residential and four (4) non-residential candidates receiving the most votes will be elected to a four-year term. The remaining elected members will serve a two-year term. Re-election to the Core Committee is permitted.

3.0 ORGANIZATION AND OFFICERS

3.1 The officers of the Watershed Partners are the Chair, Vice-Chair, and Secretary. The Chair shall be one of watershed residents on the Core Committee.

3.2 The duties of the Chair include, but are not limited to:
- Developing meeting agendas;
- Presiding over all meetings of the Watershed Partners; and
- Serving as Chair of the Core Committee and as an ad-hoc member of other committees.

3.3 The Vice-Chair may be any member of the Core Committee. The Vice-Chair shall assume the duties of the Chair for the remainder of that term should that office become vacant, and shall preside at meetings of the Watershed Partners and Core Committee when the Chair is unable to attend.

3.4 The Secretary may be any member of the Core Committee. The duties of the Secretary include, but are not limited to:
- Maintaining the official records of the Watershed Partners;
- Recording and distributing the summaries of the Watershed Partners meetings;
- Maintaining a current record of the names and addresses of Watershed Partners members; and
- Sending out notices of meetings and any supporting meeting materials at least two (2) weeks prior to scheduled meetings.

3.5 Election of the Chair, Vice-Chair, and Secretary shall be by written, secret ballot by the Nimishillen Creek Watershed Partners members. For each vacant position, the candidate with the most votes wins the election. For the initial election, nomination shall be made by the Organizational Committee (refer to Section 4.2); in subsequent elections, nominations shall be made by the Core Committee. Additional nominations may be made by any Watershed Partners member from the floor or in writing to any member of the Organizational Committee (the Core Committee after the first election). It is incumbent upon the nominator to determine willingness of the nominee to serve.

3.6 The Chair shall be elected for a two-year term. The initial Vice-Chair shall be elected for a one-year term; thereafter, the Vice-Chair shall be elected for a two-year term. The Secretary shall be elected for a two-year term. Re-election of these offices is permitted.

3.7 If a Treasurer or Fiscal Agent becomes necessary, the Core Committee shall appoint a Treasurer or Fiscal Agent for the Watershed Partners. If it becomes legally necessary that a Treasurer be elected, the election procedures in Section 3.5 shall be followed.

4.0 COMMITTEES

4.1 Standing Committees:
The following standing committees shall be established by the Core Committee to address concerns of the Watershed Partners:

- Creek LEAP
- Education Committee

4.2 Organizational Committee

The Organizational Committee was previously established on 4/10/02. When the bylaws are adopted by the Watershed Partners, the Officers elected, and the Core Committee selected, the Organizational Committee will cease to exist.

4.3 Other Committees

The Core Committee may appoint such other Standing or Ad-Hoc Committees as deemed necessary to support the efforts of the Watershed Partners.

4.4 Core Committee

The Core Committee shall be composed of residential and non-residential sector members elected by the Watershed Partners as outlined in Section 2.4.

The duties of the Core Committee shall include, but not limited to:

A. Directing the business activities of the Task Force;
B. Nominating members for elected positions;
C. Creating or disbanding Standing or Ad -Hoc Committees;
D. Calling emergency meetings without two weeks' notice; and
E. Recommending projects to Committees.

4.5 Each Committee shall elect a Committee Chair by the end of its second meeting, except the Chair of the Core Committee which will follow the election procedure in Sections 3.2 - 3.5.

5.0 MEETINGS

5.1 The Watershed Partners shall meet as determined by the Core Committee.

5.2 Notice shall be sent (mail or email) to all members at least two (2) weeks in advance of all Watershed Partners meetings. Notice shall include an agenda and business material that may be considered or acted upon.

5.3 The Core Committee can meet as often as needed, but must meet at least 4 times during the calendar year.

6.0 DECISION MAKING

6.1 The Watershed Partners and its Core Committee shall strive to operate by consensus.

6.2 In the event consensus cannot be reached, any Watershed Partners Core Committee member may call for a vote on any issue during the course of any meeting. However, at least seven (7) Core Committee members must be present to call for a vote.

6.3 Decisions made by vote shall require a majority of the Core Committee members present for passage.

6.4 Core Committee members may be represented by designated alternates. Alternates must be designated by letter to the Chair or Vice Chair in advance of the meeting. The alternate shall have all the rights and duties of a voting member during the meeting(s) for which they are a designated alternate.

6.5 Any officer or Core Committee member may be removed, with or without cause, by the Core Committee. A written notice of a removal vote must be sent to all Core Committee members at least two (2) weeks in advance of the meeting where the vote will occur. Any such removal shall require a two-thirds (2/3) vote by the Core Committee members who are present. In accordance with Section 6.2, at least seven (7) Core Committee members must be present in order to call for a removal vote.

6.6 Any officer or Core Committee member may resign by giving written notice to the Core Committee. The acceptance of such resignation shall not be necessary to make it effective.

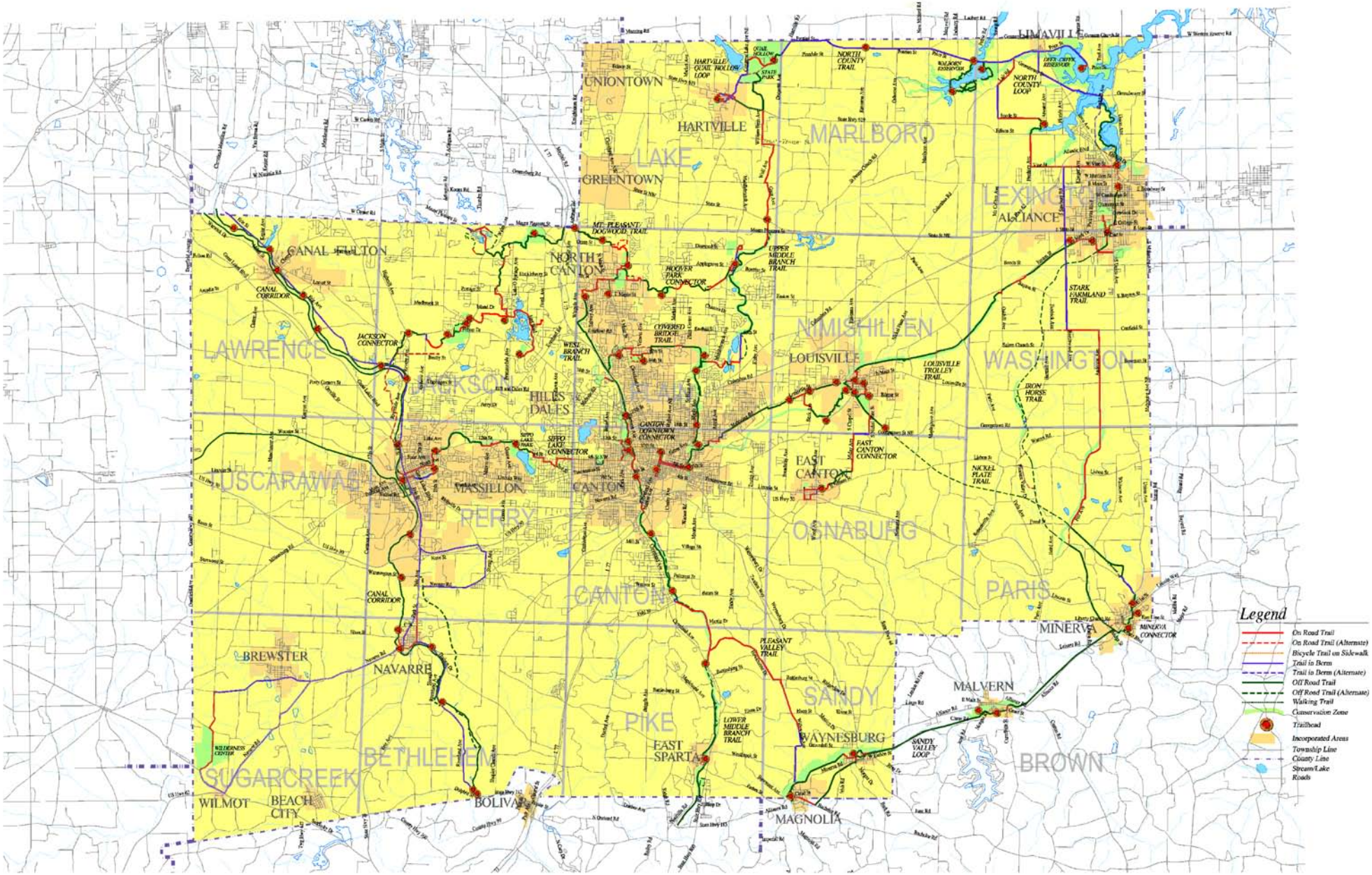
7.0 MISCELLANEOUS PROVISIONS

8.0 ADOPTION AND AMENDMENTS

8.1 These bylaws and any amendments shall be adopted by a simple majority vote of the Watershed Partners. Amendments to the bylaws shall be summarized in the notice of the Watershed Partners meeting at which the proposed amendments are to be voted on.

Adopted: 6/29/04

Appendix C:
Stark County Trail and Greenway Master Plan



Stark County Trail and Greenway Master Plan

Prepared By:

EDG ENVIRONMENTAL DESIGN GROUP
450 Grant St. Akron, Ohio 44113

In Association with:
Schmidt Copeland Parker Stevens
1220 West Sixth Street The Bradley Building Cleveland, Ohio 44113

STARK PARKS
STARK COUNTY PARK DISTRICT

January 1999

Overall Map

Appendix D:
2000-2001 Ohio Natural Heritage Database for Rare Plant Species in Stark County

Endangered (E):

1998 *Glyceria Acutiflora* - Sharp-Glumed Manna-Grass
1994 *Agalinis Purpurea Var. Parviflora* - Small Purple Foxglove
1993 *Galium Labradoricum* - Bog Bedstraw
1993 *Sphagnum Riparium* - Shore-Growing Peat Moss
1991 *Salix Pedicellaris* - Bog Willow
1960 *Juncus Platyphyllus* - Flat-Leaved Rush

Threatened (T):

1998 *Lechea Pulchella* - Leggett's Pinweed
1998 *Hypericum Boreale* - Northern St. John's-Wart
1998 *Tofieldia Glutinosa* - False Asphodel
1996 *Vaccinium Oxycoccos* - Small Cranberry
1995 *Carex Oligosperma* - Few-Seeded Sedge
1995 *Sagittaria Rigida* - Deer's-Tongue Arrowhead
1995 *Viburnum Opulus Var. Americanum* - Highbush-Cranberry
1995 *Zizania Aquatica* - Wild Rice
1994 *Aster Drummondii* - Drummond's Aster
1994 *Spiranthes Romanzoffiana* - Hooded Ladies'-Tresses
1994 *Utricularia Intermedia* - Flat-Leaved Bladderwort
1971 *Myriophyllum Sibiricum* - American Water-Milfoil
1972 *Lechea Intermedia* - Round-Fruited Pinweed
1960 *Epilobium Strictum* - Simple Willow-Herb
1960 *Equisetum Variegatum* - Variegated Scouring-Rush
1960 *Panicum Philadelphicum* - Philadelphia Panic-Grass

Potentially Threatened (P):

1998 *Calla Palustris* - Wild Calla
1998 *Eriophorum Viridicarinatum* - Green Cottongrass
1996 *Eriophorum Virginicum* - Tawny Cottongrass
1996 *Rhexia Virginica* - Virginia Meadow-Beauty
1996 *Sarracenia Purpurea* - Pitcher-Plan
1995 *Castanea Dentata* - American Chestnut
1995 *Chamaedaphne Calyculata* - Leather-Leaf
1995 *Corallorhiza Maculata* - Spotted Coral-Root
1995 *Glyceria Grandis* - Tall Manna-Grass
1995 *Hydrocotyle Americana* - American Water-Pennywort
1995 *Juglans Cinerea* - Butternut
1995 *Larix Laricina* - Tamerack
1995 *Potentilla Palustris* - Marsh Fivefinger
1994 *Carex Lasiocarpa* - Slender Sedge
1994 *Cladium Mariscoides* - Twip-Rush
1994 *Juncus Balticus* - Baltic Rush

1994 *Rhynchospora Alba* - White Beak-Rush
1994 *Triglochin Palustre* - Marsh Arrow-Grass
1993 *Carex Crawei* - Crawe's Sedge
1993 *Carex Flava* - Yellow Sedge
1993 *Deschampsia Caespitosa* - Tufted Hairgrass
1993 *Drosera Rotundifolia* - Round-Leaved Sundew
1993 *Gentianopsis Procera* - Small Fringed Gentian
1993 *Salix Serissima* - Autumn Willow
1993 *Solidago Ohioensis* - Ohio Goldenrod
1990 *Vaccinium Macrocarpon* - Large Cranberry
1984 *Carex Atlantica Var. Capillacea* - Howe's Sedge
1982 *Poa Languida* - Weak Spear-Grass
1981 *Potamogeton Zosteriformis* - Flat-Stem Pondweed
1979 *Platanthera Flava* - Tubercled Rein-Orchid
1976 *Lechea Villosa* - Hairy Pinweed
1961 *Zigadenus Elegans Var. Glaucus* - Wand-Lily

Appendix E:
Lakes Greater Than Five Acres in the Nimishillen Creek Watershed

Appendix E: Lakes Greater Than Five Acres in the Nimishillen Creek Watershed.					
Lake Name or Owner	**Size (acres)**	**Lake Type**	**Subwatershed**	**Township or Municipality**	**Public or Private**
Alpine Village Development	70	Dug Out Impoundment	Middle Branch	Plain Twp.	Private
Central Allied Lake	Not Given	Natural Lake and Dug Out Impoundment	Middle Branch	Plain Twp.	Private
H. Fry	5	Dam and Permanent Impoundment	Mainstem	Pike Twp.	Private
Mack Lake	9	Not Given	West Branch	Jackson Twp.	Private
Meyers Lake	134	Natural Lake	West Branch	Meyers Lake	Private
Lake O'Pines	16	Natural Lake	Middle Branch	Lake Twp.	Private
Petros Lake	12	Not Given	Hurford Run	Perry Twp.	Public
Unknown	6	Dug Out Impoundment	Middle Branch	Lake Twp.	Private
Unknown	10	Not Given	Middle Branch	Marlboro Twp.	Private
Unknown	6	Dam and Permanent Impoundment	East Branch	Nimishillen Twp.	Private
Unknown	5	Dug Out Impoundment	Sherrick Run	Osnaburg Twp.	Private
Unknown	10	Upground	Hurford Run	Perry Twp.	Private
Unknown	7	Upground	Hurford Run	Perry Twp.	Private
Unknown	18	Upground	Hurford Run	Canton	Private
Unknown	6	Dug Out Impoundment	Mainstem	Pike Twp.	Private
Zellers Lake	9	Dam and Permanent Impoundment	Middle Branch	Marlboro Twp.	Private

Sources: *Inventory of Ohio Lakes*, Ohio Department of Natural Resources - Division of Water, 1980. Stark Parks, 2006.
Northeast Ohio Four County Regional Planning and Development Organization (NEFCO), 2006.

Appendix F:
Stark County "Dedicated" Ditches in the Nimishillen Creek Watershed

Ditch Name	Subwatershed	Stark Co. Eng. Map Number	Map Coordinate	Date Petitioned	Stark Co. Eng. File Number
Graber	East Branch	35	H-19	9/10/1908	133
Domer	Hurford Run	11	M-10	4/21/1915	137
Kocher	Hurford Run	51	L-11	3/3/1898	126
Sweeny	Hurford Run	50	L-9	3/4/1921	130
Taylor	Hurford Run	156	M-9		124
Turner	Hurford Run	148	L-9	8/1/1948	133
Wentworth	Hurford Run	147	N-10	7/1/1948	137
Cunningham	Mainstem	149	L-11		128
Heinbuch	Mainstem	31	P-13	9/8/1937	123
Steinmetz	Mainstem	32	O-13	9/15/1937	130
A. J. Smith	Middle Branch	124	E-12	8/5/1912	
Adams	Middle Branch	134	C-16	4/8/1890	
Bixler	Middle Branch	110	H-14	1941	
Conrad	Middle Branch	53	H-14		
Duquette	Middle Branch	5	B-15	11/16/1938	123
Ebie	Middle Branch	78	C-14	1/13/1906	137
Elmer Smith	Middle Branch	57	C-15	1/15/1894	137
Etter	Middle Branch	80	C-15	6/13/1899	
F. N. Swartz	Middle Branch	37	C-14	8/16/1905	
Firestone	Middle Branch	63	G-13	4/28/1924	127-124
Frederick	Middle Branch	131	E-17	9/24/1887	
Guiley	Middle Branch	15	D-13	4/7/1909	
Immel	Middle Branch	126	E-14	11/11/1880	
Keener	Middle Branch	4	B-14	4/6/1911	126
Kinsley	Middle Branch	3	C-13	1/18/1938	126
Krammer-Glass	Middle Branch	88	C-13	4/21/1906	
Kurtz	Middle Branch	38	C-13	4/22/1912	126
Machmer	Middle Branch	16	C-12	7/7/1917	127
Monarch Rubber	Middle Branch	39	C-13	4/25/1928	130
Reed	Middle Branch	23	E-16	8/26/1929	129
Royer	Middle Branch	43	D-13	8/16/2005	
Snyder	Middle Branch	128	E-15	5/2/1883	
Steiner	Middle Branch	118	G-13	10/11/1935	130
Swartz, Big	Middle Branch	24	D-14	8/6/1900	
Sweitzer	Middle Branch	56	C-16	4/30/1903	
Uriah Brumbaugh	Middle Branch	62	C-15	6/28/1902	
Vaughn	Middle Branch	55	D-15	2/18/1907	

Ditch Name	Subwatershed	Stark Co. Eng. Map Number	Map Coordinate	Date Petitioned	Stark Co. Eng. File Number
Wales	Middle Branch	116	C-13	1/3/1930	
Wearstler	Middle Branch	125	E-13	1/30/1915	124
Werner, B. W.	Middle Branch	127	D-15	4/27/1882	
Werner, David	Middle Branch	136	D-15	8/29/1891	
Wiley	Middle Branch	113	C-14	5/2/1911	
Wymer	Middle Branch	129	C-15	7/25/1884	
Deckard	Sherrick Run	76	L-14	9/7/1931	123
Hayden	Sherrick Run	12	M-13	6/21/1913	
Neisz	Sherrick Run	60	L-13	6/7/1933	127
Osnaburg	Sherrick Run	27	L-15	12/12/1913	137
Rudnicka	Sherrick Run	155	L-12		129
Baker	West Branch	150	I-9		123
Correll	West Branch	114	H-12	1/11/1867	
Dockus	West Branch	75	D-10	5/6/1932	123-137-127
Eckroate	West Branch	81	I-9	11/22/1913	123
Edgefield	West Branch	79	I-11	5/25/1922	124
F.J. Hinkle	West Branch	119	F-9	5/17/1922	
Fair	West Branch	85	I-11	5/1/1937	124
Fry	West Branch	86	F-12	9/1/1921	124
Fulton Road	West Branch	83	I-10	11/22/1929	129
Grubb	West Branch	41	B-11	10/1/1926	133
Hoover	West Branch	33	G-11	6/23/1906	133
Marchand	West Branch	13	G-9	5/26/1911	127
McDowell	West Branch	45	G-9	9/18/1878	127
Mohler	West Branch	151	G-9		118
Patton	West Branch	1	J-10	2/11/1925	128
Phillips	West Branch	158	I-11		124
Pontius	West Branch	97	J-9	9/18/1912	124
Price	West Branch	98	C-10	8/31/1914	
Reemsnyder	West Branch	111	H-10	4/6/1905	129
Rettig	West Branch	14	F-9	10/7/1935	129
Schrantz-Slusser	West Branch	54	E-10	8/7/1925	130
Sichat	West Branch	104	H-9	7/26/1913	
Stickler	West Branch	17	D-11	8/17/1910	130
Stripe	West Branch	42	E-10	8/6/1918	128
Swanson	West Branch	157	G-9		130
Thomas	West Branch	101	H-9	10/18/1906	
Troyer	West Branch	99	E-11	6/11/1913	
Wackerly	West Branch	84	I-10	4/8/1922	
Zimber	West Branch	47	F-10	8/8/1908	131

Source: Stark County Engineer's Office, 2006

Appendix G:
Point Source Dischargers in the Nimishillen Creek Watershed

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
1	A&R Machine Co. Inc. 11882 Sandyville Rd. East Sparta, OH 44626	Not Given	Industrial Discharger
2	AGA Gas Incorporated 2505 Shepler Church S.W. Canton, OH 44706	Not Given	Industrial Discharger
3	Akron Canton Regional Airport 5400 Lauby Rd. North Canton, OH 44720	100,000	Commercial Discharger
4	Akron Canton Truck Plaza Inc. 4450 Portage Rd. North Canton, OH 44720	Not Given	Private Discharging Semi-Public Sewage Treatment System
5	Biery Cheese Company 66544 Paris Ave. NE Paris, OH 44669	Not Given	Private Discharging Semi-Public Sewage Treatment System
6	BR Exploration & Oil Inc. 807 Hartford Ave. Canton, OH 44707	Not Given	Industrial Discharger
7	Canton NE Water Plant 2664 Harrisburg Road NE Canton, OH 44705	Not Given	Municipal Water Treatment Plant
8	Canton NW Water Plant 44044 Guilford NW Canton, OH 44709	Not Given	Municipal Water Treatment Plant
9	City of Canton WPCC 3550 Central Ave. Canton, OH 44707	33.0 M	Municipal Wastewater Treatment Plant
10	City of Louisville WWTP 3101 Ravenna Ave. NE Louisville, OH 44266	2,000,000	Municipal Wastewater Treatment Plant
11	Cornerstone Church of God Elementary, Junior, and Senior Schools 511 Trump Ave. NE Canton, OH 44730	Not Given	Private Discharging Semi-Public Sewage Treatment System
12	East Sparta Water Treatment Plant 8930 Maplehurst Dr. East Sparta, OH 44626	Not Given	Municipal Water Treatment System

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
13	Gullivers 77 Travel Center Inc. 2320 Faircrest St. SW Canton, OH 44706	Not Given	Private Discharging Semi-Public Sewage Treatment System
14	Village of Hartville WWTP 565 Wales Drive Hartville, OH 44632	450,000	Municipal Wastewater Treatment Plant
15	The Hoover Company Plant 1 101 East Maple St. North Canton, OH 44720	600,000	Industrial Discharger
16	Hoover Co. Industrial Park 8200 Freedom Ave. North Canton, OH 44720	300,000	Industrial Discharger
17	Hot Laps Sports Bar 536 S. Canal St. Louisville, OH 44641	Not Given	Private Discharging Semi-Public Sewage Treatment System
18*	Allegheny Ludlum 1500 West Main St. Canton, OH 44641	Not Given	Industrial Discharger
19	Koch Engineering 5385 Orchard Drive East Canton, OH 44730	Not Given	Industrial Discharger
20^	Marathon Ashland Petroleum LLC 8930 Maplehurst Ave. SE East Sparta, OH 44626	Not Given	Industrial Discharger
21#	Marathon Ashland Pertoleum LLC - Ohio Refining Div. 2408 Gambrinus Rd. SW Canton, OH 44706	Not Given	Industrial Discharger
22	McCann Plastics Inc. 5600 Mayfair Rd. North Canton, OH 44720	Not Given	Industrial Discharger
23	Nazarene Camp Center 820 Nazarene Ave. Louisville, OH 44641-9720	Not Given	Private Discharging Semi-Public Sewage Treatment System
24	North Canton Water Plant 7300 Freedom Ave. NW North Canton, OH 44720	Not Given	Municipal Water Treatment Plant
25	North Nimishillen School 7337 Easton St. NE Louisville, OH 44641	>10,000	Private Discharging Semi-Public Sewage Treatment System
26	Praxair (Liquid Carbonic Corp.) 2225 Bolivar Rd. S.W. Canton, OH 44706	Not Given	Industrial Discharger

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
27^	Republic Engineered Steels 2633 8th St. NW Canton, OH 44708	Not Given	Industrial Discharger
28	Republic Engineered Steel Inc. Special Metals Division 2201 Harrison Ave. S.W. Canton, OH 44706	Not Given	Industrial Discharger
29	Republic Storage Systems Co. 1038 Belden Ave. NE Canton, OH 44705	Not Given	Industrial Discharger
30	Shady Knoll MHP 4689 Kirby Ave. N.E. Canton, OH 44705	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
31	Stark County 320 Columbus Rd. Louisville, OH 44641	Not Given	Municipal Wastewater Treatment System
32	Stark County - Bob-O-Link 2000 Mohler Dr. North Canton, OH 44720	Not Given	Private Discharging Semi-Public Sewage Treatment System
33	Thakar Aluminum Corp. 4420 Louisville St. NE Canton, OH 44705	Not Given	Industrial Discharger
34	The Timken Company - Faircrest Steel Plant Canton, OH 44706	Not Given	Industrial Discharger
35	Timken Co. Research Center 500 Mt. Pleasant Rd. North Canton, OH 44720	Not Given	Industrial Discharger
36	Walker Elementary School 3525 Sandy Ave. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
37	Anheuser Busch Sales of Canton 1611 Marietta Ave. S.E. Canton, OH 44707	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
38	Prairie College School 3021 Prairie College Ave. S.W. Canton, OH 44706	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
39	Sable Creek Golf 5942 Edison St. Hartville, OH 44632	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
40	Akron Dist. Church of Nazarene 8020 Nazarene St. Canton, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
41	Altercare of Louisville 7121 St. Francies St. NE Louisville, OH 44641	<10,000	Private Discharging Semi-Public Sewage Treatment System
42	Bud's Corner Tavern 5750 Columbus Rd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
43	Carriage House East 9033 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
44	Elm's Inn 6786 Meese Rd. NE Alliance, OH 44601	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
45	Hammco Industries 9040 Columbus Rd. NE Canton, OH 44705	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
46	Hot Laps Sports Bar 7512 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
47	Spee-D-Foods #29 5874 Easton St. NE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
48	Robert Rogers Apt. 6901 Atlantic Blvd. NE Louisville, OH 44641	1,500 to <10,000	Private Discharging Semi-Public Sewage Treatment System
49	Phil's Place 6509 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
50	Thompson Dairyland 7519 Columbus Rd. NE Louisville, OH 44641	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
51	VFW 7459 Columbus Rd. NE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
52	WOLI-TV 17 Trinity 6600 Atlantic Blvd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
53	Windy Hill Motel 6404 Columbus Rd. Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
54	Apartment Building 7336 Middlebranch Ave. N.E. Canton, OH 44721	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
55	Avondale Professional Building 3996 Fulton Rd. N.W. Canton, OH 44718	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
56	Axion Concrete Technology 8282 Middlebranch Ave. N.E. Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
57	Doug's Auto Service 8437 Middlebranch Ave. N.E. Canton, OH 44721	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
58	Glen Oak High School 2300 Schneider Rd. N.E. North Canton, OH 44721	>10,000	Private Discharging Semi-Public Sewage Treatment System
59	Leno's Restaurant 2494 Easton St. N.E. North Canton, OH 44720	5,000 to >10,000	Private Discharging Semi-Public Sewage Treatment System
60	Little Flower Church and School 2040 Diamond St. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
61	Master Touch Cleaners 2605 Easton St. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
62	North Market Home Sales 8139 Kent Ave. N.E. Louisville, OH 44646	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
63	Steiner Apartments 7330 Middlebranch Ave. N.E. North Canton, OH 44721	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
64	Whipple Center Building 2922 Whipple Ave. N.W. Canton, OH 44708	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
65	The WG Fairfield Co. 4255 Kropf Ave. S.W. Canton, OH 44706	1 to <1,500	Private Discharging Semi-Public Sewage Treatment System
66	Adams Fabricating Inc. 10125 Sandyville Rd. SE East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System
67	Barb Huff Apartments 5477 Cleveland Ave. SE East Sparta, OH 44626	2,500	Private Discharging Semi-Public Sewage Treatment System
68	*U.S. Ceramic Tile Co. 10233 Sandyville Rd. SE East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System

Map Symbol	Discharging Operation	Design Flow (GPD)	Classification
69	Thunderbird Terrace 1581 Pekin Dr. S.E. East Canton, OH 44730	5,000 to <10,000	Private Discharging Semi-Public Sewage Treatment System
70	Maize Valley Farm Market 6163 Edison St. Hartville, OH 44632	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
71	Northmark Inc. 7349 Ravenna Ave. SE Louisville, OH 44641	1,500 to <5,000	Private Discharging Semi-Public Sewage Treatment System
72	Arvilla oil Field Service Co. 1821 Moore Ave. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
73	Roadside Tavern 2521 Waynesburg Dr. SE Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
74	Vine Ministries 3206 Lincoln St. E Canton, OH 44707	Not Given	Private Discharging Semi-Public Sewage Treatment System
75	Stanley Miller Construction 2250 Howenstine Dr. East Sparta, OH 44626	Not Given	Private Discharging Semi-Public Sewage Treatment System

* Permit Expired in 2000; ^ = Permits Expired in 2005; # = Permit Expired in 2004; GPD = Gallons Per Day
Sources: Ohio EPA, 2005; Stark County Health Department, 2006

Appendix H: Spills in the Nimishillen Creek Watershed Responded to by Ohio EPA Division of Emergency and Remedial Response Since 1990.						
Entity	**Location**	**Material Spilled - Cause**	**Amount Spilled (Report Date)**	**Subwatershed - Township/City**	**Map Number**	**Ohio EPA Spill Number**
Republic Engineered Steels Inc.	2633 8th St. NE	Diesel Fuel - Leak	100 gallons (11/02/90)	East Branch - Canton	1	9077-76-5942
Unknown	Mill St. at Nimishillen Creek Near Allenford	Paint Waste & Sand - Unknown	Unknown (9/4/90)	Mainstem - Canton Twp.	2	9009-76-4292
Unknown	West of Harrisburg Road	Petroleum - Unknown	Unknown (8/25/90)	West Branch - Plain Twp.	3	9008-76-4155
Unknown	Thurman Munson Stadium	Fish Kill - Discharge/Bypass Treatment System	Unknown (6/26/91)	Mainstem - Canton	4	9106-76-2572
Unknown	Near 2714 Tulip St. NE	Oil - Dumping/Disposal	Unknown (1/10/91)	Middle Branch - Plain Twp.	5	9101-46-0098
Mr. Larry Krebs	5250 Ridge Ave. SE	Oil - Dumping/Disposal	Unknown (10/9/92)	Mainstem - Canton Twp.	6	9210-76-4364
Liquid Carbonic	SR 153 & Broadway	Material Unknown - Dumping/Disposal	Unknown (5/27/92)	East Branch - Nimishillen Twp.	7	9206-76-2171
Unknown	8120 Garnet Ave. NE	Diesel Fuel - Unknown	Unknown (4/29/92)	Middle Branch - Plain Twp.	8	9204-76-1630
US Ceramic Tile Company	10233 Sandyville Rd. SE	Oil - Dumping/Disposal	Unknown (4/18/92)	Mainstem - Pike Twp.	9	9204-76-1442
Unknown	SR 800 & Sparta Ave.	Material Black - Discharge/Bypass Treatment System	Unknown (4/10/92)	Mainstem - East Sparta	10	9204-76-1332
Unknown	Georgetown Rd. & SR 153	Flammable Stuff - Dumping/Disposal	Unknown (3/29/92)	East Branch - Louisville	12	9203-76-1133

Unknown	3800 Block of I-77 in South Bound Land	Diesel Fuel - Leak	30 Gallons (12/2/93)	West Branch - Canton	13	9312-76-4925
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Discharge/Bypass Treatment System	Unknown (11/15/93)	Mainstem - Pile Twp.	14	9311-76-7690
J M W Trucking	512 45th St. SW	Diesel Fuel - Equipment Failure	250 Gallons (11/2/93)	Mainstem - Canton Twp.	15	9311-76-4495
US Ceramic Steel	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (11/1/93)	Mainstem - East Sparta	16	9311-76-4482
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (10/13/93)	Mainstem - East Sparta	17	9310-76-4247
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (9/28/93	Mainstem - East Sparta	18	9309-76-4038
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (9/9/93)	Mainstem - East Sparta	19	9309-76-3796
H&H Auto Parts	Cleveland Ave. S & 15th St. SW	Oil - Unknown	50 Gallons (8/30/93)	West Branch - Canton	20	9308-76-3636
Unknown	Spangler Rd. & 35th St. NE	Oil - Unknown	Unknown (8/26/93)	Middle Branch - Canton	21	9308-76-3561
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (8/13/93)	Mainstem - East Sparta	22	9308-76-3398
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (8/2/93)	Mainstem - East Sparta	23	9308-76-3215
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (7/27/93)	Mainstem - East Sparta	24	9307-76-3129
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (7/15/93)	Mainstem - East Sparta	25	9307-76-2938
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (6/23/93)	Mainstem - East Sparta	26	9306-76-2523
US Ceramic Tile Company	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (6/15/93)	Mainstem - East Sparta	27	9306-76-2392

Quaker State Refinery Corp.	Walters St. NE	Oil -Leak	3 Gallons (6/9/93)	East Branch - Osnaburg	28	9306-76-2258
Old Dominion Trucking	I-77 Median @ Mile Marker 108	Diesel Fuel - Human Error	75 Gallons (6/8/93)	West Branch - Canton	29	9306-76-2223
Canton STP	Westbrook Park Pond (3530 Central Ave. SE)	Sewage - Discharge/Bypass Treatment System	Unknown (6/6/93)	Mainstem - Canton	30	9306-76-2200
J&L Specialty Prod	1600 W. Main St.	Oil & Water - Permit Violation	2,042 Gallons (4/9/93)	East Branch - Louisville	31	9304-76-1324
Ryder Truck Rental	5353 N. Circle Ct.	Diesel Fuel - Human Error	100 Gallons (3/16/93)	West Branch - North Canton	32	9309-76-0954
Romany Ceramics	10233 Sandyville Rd. SE	Waste Water - Permit Violation	Unknown (3/10/93)	Mainstem - East Sparta	33	9303-76-0888
Republic Storage Systems	1038 Belden Ave. NE	Paint - Leak	300 Gallons (2/23/93)	East Branch - Canton	34	9302-76-0666
Unknown	820 Lynbrook SE	Fish Kill - No Spill/ Natural Occurrence	Unknown (12/5/94)	West Branch - North Canton	35	9412-76-5150
J&L Speciality Steel Inc.	1500 W. Main St.	Waste Water - Permit Violation	Unknown (10/28/94)	East Branch - Louisville	36	9410-76-4680
Unknown	2715 Tulip St. NE	Orphan Drum - Dumping/Disposal	8.0 DMS (3/14/94)	Middle Branch - Canton	37	9403-76-1039
Stark Ceramics Inc.	600 W. Church St. SE	30% Ammonium Hydroxide Sollution - Tank Rupture	8,100 Gallons (8/25/95)	Sherrick Run - East Canton	38	9508-76-3656
Bison Painting & Sheeting	Baum & Central Bridge	Lead Paint - Improper Handling	7,000 CFT (8/25/95)	Mainstem - Canton Twp.	39	9507-76-2895
Timken Company	1835 Duber Ave. SW	Soluble Oil - Overflow	500 Gallons (6/11/95)	Hurford Run - Canton	40	9506-76-2389
Canton WWTP	Monument Rd. & Park Dr.	Sewage - Discharge/Bypass Treatment System	Unknown (10/27/97)	West Branch - Canton	41	9710-76-4286

Conrail	4000 Division Rd. NE	Waste Water - Permit Violation	Unknown (6/28/97)	East Branch - Canton	42	9706-76-3551
Canton WWTP	3530 Central Ave. SE	Sewage - Discharge/Bypass Treatment System	Unknown (5/5/97)	Mainstem - Canton	43	9705-76-1738
Canton WWTP	3530 Central Ave. SE	Sewage - Human Error	Unknown (4/8/97)	Mainstem - Canton	44	9704-76-1335
Chris Hauling Company	1500 Rte. 30 East Bound	Residential Solid Waste - DA/Cut or Break	16,000 Pounds (12/1/98)	Mainstem - Canton	45	9812-76-4761
Chris Hauling Company	1500 Rte. 30 East Bound	Petroleum - DA/Cut or Break	40 Gallons (12/1/98)	Mainstem - Canton	46	9812-76-4761
Unknown	10233 Sandyville Rd. SE	Petroleum - Unknown	25 Gallons (10/15/98)	Mainstem - East Sparta	47	9810-76-4248
Unknown	4th St. NE & Riverside St.	Sewage - Discharge/Bypass Treatment System	Unknown (11/20/99)	Mainstem - Canton	48	9911-76-4100
Central Allied Enterprises	2905 Columbus Rd.	Transformer Oil - Facility Fire	5 Gallons (11/19/99)	Middle Branch - Canton	49	9911-76-4089
Unknown	Ira Turpin Way	Fish Kill - Unknown	Unknown (6/1/99)	Mainstem - Canton	50	9906-76-1979
Conrail	4000 Division Rd.	Waste Water - Permit Violation	Unknown (4/12/99)	East Branch - Canton	51	9904-76-1294
Canton City	Mt. Vernon Blvd. & Overbrook	Sewage - Discharge/Bypass Treatment System	Unknown (2/12/99)	West Branch - Canton	52	9902-76-0590
Unknown	4731 Corporate St. SW	Unidentified Petroleum - Unknown	Unknown (2/5/99)	Hurford Run - Perry Twp.	53	9902-76-0462
Unknown	5200 Peach St.	Material Green - Unknown	Unknown (11/13/00)	East Branch - Nimishillen Twp.	54	0011-76-4244
Alpha Plating & Polishing Co.	601 Second St. NE	Fire Stream Runoff - Facility Fire	100,000 Gallons (3/15/00)	Mainstem - Canton	55	0003-76-0874

Nature	2660 46th St. NE	Blue Green Algae - Natural Phenomena	Unknown (12/12/01)	Middle Branch - Plain Twp.	56	0112-76-4685
Superior Dairy	4719 Navarre Rd. SW	Milk Production Waste - Discharge/Bypass Treatment System	Unknown (12/7/01)	Hurford Run - Perry Twp.	57	0112-76-4646
Louisville WWTP	Pennsylvania Ave. & Howard Ave.	Sewage - Discharge/Byapss Treatment System	Unknown (10/24/01)	East Branch - Louisville	58	0101-76-4046
Unknown	Guilford Ave. North of 38th St.	Oil - Unknown	Unknown (7/26/01)	West Branch - Plain Twp.	59	0107-76-2781
Greystone Trucking	3334 Bruening Circle	Diesel Fuel - Leak	100 Gallons (2/26/01)	Hurford Run - Canton Twp.	60	0102-76-0659
Republic Technologies International	2633 8th Street NE	Waste Water - Permit Violation	Unknown (1/19/01)	East Branch - Canton	61	0101-76-0178
North Canton WWTP	Briar Ave.	Sewage - Discharge/Bypass Treatment System	Unknown (10/28/03)	West Branch - North Canton	62	0310-76-4154
Republic Storage Systems	1038 Beldn Ave. NE	Xylene - Discharge/Bypass Treatment Systems	Unknown (7/28/03)	East Branch - Canton	63	0307-76-2880
South Haven Mobile Home Park	2812 Cleveland Ave. SW	Sheen/Fuel Oil - Natural Phenomena	Unknown (7/28/03)	Mainstem - Canton	64	0307-76-2867
South Haven Mobile Home Park	2812 Cleveland Ave. SW	Fuel Oil - Weather Related Damage (Flood)	25 Gallons (7/28/03)	Mainstem - Canton	65	0307-76-2861
Unknown	Baum Rd. @ Sinn Property	Garbage & Paint Cans - Unknown	Unknown (5/1/03)	Mainstem - Canton Twp.	66	0305-76-1445
AJ Diana Inc.	1704 W. Main St.	Diesel Fuel - Soil Contamination	5 Gallons (4/8/03)	East Branch - Louisville	67	0304-76-1166
Stanley Miller Construction, Inc.	2250 Howenstein Dr. SE	Oil - Dumping/Disposal	Unknown (4/4/03)	Mainstem - Pike Twp.	68	0304-76-1086

North Canton WWTP	Lindy Lane Manhole 17B	Sewage - Discharge/Bypass Treatment System	Unknown (1/31/03)	West Branch - North Canton	69	0301-76-0287
Cassandra Bey	3226 Allenford Dr. SE	Fuel Oil - Leak	Unknown (6/15/04)	Mainstem - Canton Twp.	70	0406-76-2634
Canton WWTP	3530 Central Ave. SE	Sewage - Discharge/Bypass Treatment System	Unknown (6/15/04)	Mainstem - Canton	71	0406-76-2617
North Canton WWTP	Marquardt Lift Station	Sewage - Discharge/Bypass Treatment System	Unknown (4/28/05)	West Branch - North Canton	72	0504-76-1979
North Canton WWTP	Lindy Lane Manholes 17B & 1341	Sewage - Discharge/Bypass Treatment System	Unknown (7/11/06)	West Branch - North Canton	73	0607-76-2457
North Canton WWTP	Lindy Lane Manholes 17B & 520	Sewage - Discharge/Bypass Treatment System	Unknown (6/23/06)	West Branch - North Canton	74	0606-76-2198
Canton WWTP	Guilford Rd.	Waste Water - Permit Violation	Unknown (6/5/06)	West Branch - Canton	75	0606-76-1905
Royer Farms	11617 SR 44 Ravenna Rd.	Manure/Fish Kill - Discharge/Bypass Treatment System	3,000 Gallons (6/30/99)	Middle Branch - Marlboro Twp.	77	9906-77-2373
Akron Canton Airport	5400 Lauby Rd.	Sewage - Discharge/Bypass Treatment System	Unknown (8/12/04)	West Branch - Green	78	0408-77-3439
Source: Ohio EPA RRS - 2000: Short Report, 2006						

Appendix I:
Nimishillen Creek Comprehensive Watershed Management Plan Comments
June 26, 2006
Eric Akin's Response

I. Introduction, Defining the Watershed

A) This plan needs to indicate park districts, school districts, regional planning and RC&D agencies. Plan does not show Phase II stormwater communities.
Response: All comments have been added to the new plan.

B) More specific detail needed on watershed population, ages, education levels, income levels, locations of growth and economic patterns.
Response: This information has been added to the new plan.

C) Show the six 14 digit HUC's in this plan, however, can work in the four subwatersheds already established.
Response: The watershed was broken into six subwatershed instead of four in the new plan. Specifically, subwatershed 1 was broken into 3 different subwatersheds to address unique water quality problems.

D) Summarize all watershed protection activities over the past 10 years.
Response: A list of watershed activities and reports completed over the last 10 years has been added.

II. Watershed Plan Development

A) The plan has listed the watershed partners, they will add an electronic list of contacts.
Response: An electronic list of the Watershed Partners can be provided upon request.

B) NEFCO has developed a mission statement, recommended the watershed group develop one. Add a section/chapter on the structure of the decision-making body, decision- making processes, organizational set-up, by-laws, etc.
Response: Information has been added in Appendix B with regards to the Nimishillen Creek Watershed Partners that include the group's structure, decision making process, and by-laws.

C) Have an established watershed group, however, do not have documented partner roles/responsibilities, procedures, bylaws, group decision-making processes and have not yet decided if they want to file for 501 (c) 3 status since Earth Action Partnership is a nonprofit partner.
Response: By-laws, procedures, and group decision-making processes are all outlined in Appendix B of the Action Plan. Roles and responsibilities for various current or future actions are indentified in the various Action Tables found in Section VII.

D) The Plan does not have an endorsement page to be signed by key partners. Also need to refine an informational/educational component for public understanding that encourages early and continued participation.

Responses:

- The Action Plan has been endorsed by NEFCO's General Policy Board which includes elected officials from the areas within and outside of the watershed. The General Policy Board resolution is found after the title page.
- Educational components can be found in each of the subwatershed action plans. It is believed that the plan reflects the need for great public understanding and encourages participation. The Watershed Partners annual stream clean-up is a reflection of this.

III. Watershed Inventory

A) Plan does not contain topographic maps of the watershed. Need to investigate existence of studies on fish, mussels, mammals, birds, reptiles, amphibians, plants invasive nonnative species and potential impacts. Need climate and precipitation info. Tributary information should include CFS, 10 year low flows, floodplain areas, sinuosity and entrenchment indices. Lakes & reservoirs have been identified, however, need sizes, uses, watersheds and detention times. Need to specify the location of aquifers, recharge rates, uses, flow regimes. Advised Eric to check with Kelvin Rogers from Ohio EPA NEDO about potential SWAP info and our groundwater section about DRASTIC. Land uses are discussed. Lacking specific breakdown info on agricultural uses such as tillage, rotations, livestock inventory, grazing chemical use patterns, and irrigation. Also need non-forested wetlands and protected lands indicated. Beneficial to have status and trends of land uses projected.

Responses:

- Relief is represented in the slope figures found in Sections II and IV. In addition, stream gradients for each of the major tributaries can be found in Table II-12. A topographic map was considered, but the size of the watershed limited the usefulness of an 8.5" x 11" topo map in the plan.
- Local experts were contacted with regards to plants and wildlife found within the watershed. The information is included in the Action Plan.
- Climate and precipitation information has been added.
- USGS gauging information from the two stations located in the watershed has been added.
- A 100-year FEMA floodplain map has been added.
- Lake and reservoir information outlined above is not currently available. It will be added in the future when available.
- SWAP information has been included into the plan.
- Information on tillage, rotations, livestock, and chemical use patterns have been added based on information provided by Wayne SWCD, Ohio Dept. of Agriculture, and the Farm Bureau.
- Wetland map was added that represents the best information available for the watershed basin (Ohio Wetland Inventory). Information on protected lands outside what is already provided in the plan (parks) was not found. Efforts were

made to attain Conservation Reserve Program (CRP) and other agricultural program information from the Farm Service Agency, but the information was not provide in time for inclusion into this Action Plan.
- Land usage trends provided by Stark County Regional Planning have been added.

B) Need to discuss sites of historical, cultural and recreational significance.
Response: This information has been included that addresses the historical, cultural, and recreational significance of Nimishillen Creek.

C) Needs a listing of all current efforts helping improve water quality in the watershed.
Response: This information is provided in the new Action Plan.

D) The watershed plan has a very detailed riparian corridor assessment. Need discussion on early settlement conditions, channel and floodplain condition, miles of forested riparian buffer, miles permanently protected, miles of natural channel, miles and location of modified channels, location of dams, streams with unrestricted livestock access, locations of eroding embankments, floodplain connectivity, riparian levees, entrenchment, expected residential/commercial development and expected road/highway/bridge construction.
Responses:
- Information on historical watershed conditions is limited, so limited information was included in the Action Plan.
- Ditch/channeled portions of Nimishillen Creek have been added, including length and location. Appendix E contains all the “dedicated” ditches in the watershed that are on record with the Stark County Engineers office.
- The location of known low head dams have been added to the Action Plan.
- Information on expected residential and commercial development has been added based on information provided by the Stark County Regional Planning Commission.
- Miles of permanently protected riparian habitat are addressed in Section II of the Action Plan.
- The type of riparian cover, including forested riparian habitat, was taken into consideration in developing the scoring for the Riparian Corridor Study found in Section II. Areas with “high” riparian quality will almost certainly contain a forested buffer. The overall goal of the plan is to protect high quality, forested buffers and restore the degraded riparian habitat to a similar “high” quality condition.
- The following recommendations have very limited information available: channel and floodplain condition, floodplain connectivity, entrenchment, miles of natural channel, streams with unrestricted livestock access, riparian levees, and locations of eroding embankments. Sections within the Action were added for future inclusion of this information when or if it become available.

E) The locations of point sources have been mapped and discussion on HSTS is present in this plan. Need to indicate use designations with use attainment, partial attainment or non-attainment. Incorporate causes and sources info from 305 (b) &

303(d) reports. Also include info on spills and illicit discharges, number of new homes being built, animal feeding operations, highly erodible lands, culverted streams, channelized streams, effluent volumes, stream miles impounded, petition ditches and areas susceptible to water quality degradation if conditions don't change.

Responses:

- All available water quality information has been added to the Action Plan, including designations for aquatic life uses, water supply, and recreation.
- The watershed has no traditional petitioned ditches. However, Appendix E contains a list of "dedicated" ditches created from the 1860s through 1940s.
- Land use and development trends were incorporated into the Action Plan's Land Use inventory found in Section II.
- There was insufficient information found on spills, illicit dischargers, and animal feeding operations to be included in this report.
- Again, limited information was available regarding culverted streams, effluent volume, and stream miles impounded. This information can be easily added to the Watershed Inventory section once collected.

F) The inventory needs to include water quality use attainment maps, with an analysis
linking causes of water quality impairment to sources.

Responses:

- Currently there is not enough information available to link water quality impairments to sources of impairments. The TMDL, which will greatly assist in this area, has been delayed due to flooding in 2003. The scheduled TMDL completion date has been pushed back to 2007.
- Available water quality attainment information can be found in Section III, titled Water Resource Quality, which contains an aquatic life use attainment map.
- The Load Reduction section (V) will contain an analysis linking the causes to the sources of water quality impairments once the TMDL is completed. Until that time, load reductions will be determined on a project by project basis.

IV. Watershed Impairments

A) The TMDL for this basin has been postponed and is not developed yet. Eric will need to request assistance from OEPA and ODNR to develop pollutant load calculations, once the inventory details exact locations and sources of impairments. Need to develop problem statements linking cause and sources with impairments and estimated loads.

Responses:

- Until the TMDL is completed, all the Nimishillen Creek Watershed Partners and NEFCO can do is prioritize watershed activities based on existing water quality data and "best professional judgments" by watershed stakeholders.
- Problem statements have been replaced by "Issues" in the Action Plan. The general watershed-wide issues can be found in Section IV. Also for each of the six subwatershed action plan, a prioritized list of issues was developed (Section VII). For each issue there is a goal, objectives, and specific actions. Where

known, these objectives and actions are directed to "Focus Areas" which are known sources of impairment.
- Issues, goals, objectives, and actions will be updated, if needed, to address impairments identified in the future Nimishillen Creek TMDL.

V. Watershed Restoration and Protection Goals

A) Streamline the document by organizing it according to Appendix 8 instead of each chapter as a Phase in the planning process. This should minimize the repeated information and make the document easier to work with into the future. For example, use 8 chapters according to the sections in Appendix 8, listed as such; Introduction, Watershed Plan Development, Watershed Inventory, Watershed Impairments, Watershed Restoration and Protection Goals, Implementation, Evaluation, and Plan Revision Strategy. Use Appendix 8 to guide the content of each.

Responses:
- The new Action Plan has been reformatted and streamlined to closely follow the Appendix 8 format. Some of the sections or chapters names have been changed and/or reordered from the Appendix 8 format to remain consistent with previous NEFCO reports.
- As part of the Action Plan update, repetitive information was removed by combining the four phases of the previous report into a single, stand-alone document.

B) Do not bury the goals/objectives in an appendix table. This should be the most important section to reference for implementation. Make it a major section of the Plan, preferably its own chapter.

Response: The goals and objectives are now found in the Subwatershed Action Plan Section (VII). Each of the six subwatershed has prioritized goals, objectives, and actions.

C) Define the goals and objectives in specific terms. Remove "suggested responsible parties" and identify the actual person/entity that has agreed to perform the action and when they intend to complete the task. Suggestions or recommendations tend not to get implemented. A workplan is needed to actually move things forward.

Responses:
- Comment noted. Responsible parties have been identified for several on-going and future actions (Section VII). However, NEFCO and the Nimishillen Creek Watershed Partners feel that the plan would be less useful and robust if we only put in actions that entities committed to doing at this time.
- The contributors to the plan prioritized watershed problems as best as possible (lacking needed TMDL-type data), but they do not believe it is appropriate to try and "force" an entity to fix a NPS pollution when a) there is no data to back up sources of impairments; and b) there is no regulatory backing in fixing NPS pollution problems.
- These comments seem to be more in-line with a grant application/agreement rather than a voluntary NPS reduction program/plan. To this end, a workplan will be developed by the responsible parties on a project by project basis.

- NEFCO and the Nimishillen Creek Watershed Partners intend to utilize this plan to work with watershed stakeholders to implement needed actions. The Action Plan will be updated accordingly as projects are identified, responsible parties take ownership, and actions are completed.

D) Likewise, priorities will need to be established. In no way can NEFCO or the "suggested responsible parties" complete all the actions recommended. A target of where to start is necessary and then the stakeholders must agree to do them, with a deadline to make them accountable.

Responses:

- Comment noted. The contributors to the new Action Plan prioritized the issues for each of the six subwatersheds (Section VII). Under each of the issues are a goal, objectives, and prioritized (specific) actions. Also added to each of the objectives is "Focus Areas" to indicate specific locations to direct actions, and a "Target" as a way to evaluate the success of a watershed improvement effort.
- In each of the Action Tables found in Section VII, a "Time Frame" is included. The term "deadline" seems more appropriate for a grant (Section 319) or regulatory (NPDES Phase II) program than a voluntary watershed NPS reduction plan.
- Lastly, the Watershed Partners are uncomfortable with using the language "must" and "make them" in associations with the Action Plan. Outside of NPDES Storm Water Phase II requirement, stakeholders are rarely obligated to implement any NPS pollution reduction practices. Attaching such language to this plan would hurt its acceptance among many of the needed stakeholders. Again, this comment seems more in line with a grant (Section 319) application/agreement or a regulatory program than a voluntary watershed action plan.

E) Once the actions are prioritized and responsible parties determined, consider using Memorandums of Understanding to manage all the many agreements that result with the stakeholders.

Response: Comment noted. Please provide examples of Memorandums of Understanding from other action plans. Again, this seems somewhat out of place for a voluntary watershed plan and more in-line with a grant requirement.

VI. Implementation

A) Objectives will need to be prioritized and an education/information/marketing strategy documented. Plan should clearly document in which subwatershed you will work first on what water quality issues. Include a rationale on why the Partners decided to start there first.

Responses:

- The Action Plan contributors prioritized the issues for each of the six subwatersheds (Section VII). Under each of the issues are a goal, objectives, and prioritized (specific) actions. Also added to each of the objectives is "Focus Areas" to indicate specific locations to direct actions, and a "Target" as a way to evaluate the success of a watershed improvement effort.
- The Action Plan does not prioritize which subwatershed to work in first. The

report is designed to act like six "mini" watershed plans for each of the subbasins. Therefore, any stakeholder, not just NEFCO or the Nimishillen Creek Watershed Partners can pursue any watershed project outlined in this plan.
- Watershed Partners and NEFCO will prioritize their future watershed activities, but was not included in the update.
- A detailed marketing strategy was not completed for this plan. Suggestions or examples of such a strategy would be welcomed.

B) NEFCO's effort on this Plan is to be commended. There is a wealth of information presented. The Plan just needs to go one step further by taking the recommended actions and putting them into a workplan, whereby people become accountable to make sure the actions happen.
Response: Please see the comments above regarding workplans and accountability.

VII. Evaluation

A) Specific load calculations will be necessary before setting criteria for determining progress. Criteria for determining when revising of the plan will be necessary must be documented. This part of the plan must specify who will monitor the plan's progress and how. Specify how progress of the plan will be publicized to the public and officials. Who will track and monitor water quality progress? What will trigger a revision of the implementation plan? Highlight successful activities and avoid activities that were unsuccessful. Macroinvertebrate monitoring is discussed, chemical monitoring should be documented as well.
Responses:
- Although important, the Watershed Partners do not entirely agree that load calculations are necessary for determining progress. Activities like public education and the protection of existing high quality natural areas aren't likely to be proven successful by specific load reduction calculations, but both actions would be considered progress in the watershed.
- For activities that can be directly tied to the reduction of specific pollutants, load reduction estimates have been provided when possible in the Action Tables found in Section VII.
- The action tables in Section VII have an evaluation method to monitor progress. In addition, the objectives in this section have a "Target" in order to help evaluate progress.
- Without a completed TMDL by Ohio EPA, it was not possible set criteria for reaching State water quality standards.
- The logical trigger for the next revision of the Action Plan will be the completion of the Nimishillen Creek TMDL.
- Resources currently are not in place for prolong, watershed-wide chemical monitoring program. Information regarding a cost effective implementation of such a watershed-wide monitoring program would be appreciated.

VIII. Plan Update/Revision

A) Need to have a title page with contact names, phone numbers and e-mail addresses. Need to publish a calendar of past and planned events. Also a table of acronyms used in this plan. Need one sentence that states that NEFCO will be the keeper of the records and documents.

Responses:

- A statement was added that Watershed Coordinator and/or NEFCO is responsible for maintenance and revisions to the Action Plan (Section I).
- Contact information is now on the title page.
- After the Action Plan is submitted for endorsement a calendar or spreadsheet of past and future watershed events and activity due dates will be completed. This action was identified as a need during this year's Functional Review with the AAT.
- A list of acronyms used in the plan is found in Appendix A.

IX. Other items for consideration

A) The public meetings focused on getting input only, not involvement. Please reconvene some work groups to define exactly "who is going to do what by when and with what resources". While stakeholder involvement was mentioned several times as necessary, participatory decision making on priorities and responsible parties has not occurred.

Response:

- The Nimishillen Creek Watershed Partners were convened several times to identify issues, determine goals, set objectives, and decide on needed actions. The Partners determined the priority of the issues in each subwatershed and determined responsible parties where appropriate.
- Please see my comments above regarding deadlines and responsible parties.
- In general, the obstacles for improving water quality in the Nimishillen Creek Watershed have not been due to a lack of involvement or participation by local stakeholder, but rather the lack of resources (money) available to complete needed best management practices.

B) The Plan needs to be updated to include a prioritization on the many recommended actions.

Response: Please see my comments above regarding prioritization.

C) Information is repeated in each of the sections i.e. "introductions" to the chapters are very similar which might discourage readership.

Response: The *Nimishillen Creek Watershed – State Action Plan* is an updated and new stand-alone report replacing the four phases of the *Nimishillen Creek Comprehensive Watershed Management Plan* (CWMP) previously submitted for endorsement. The new report eliminates the repetitive text of the previous plan.

D) The geographic area covered needs to be subdivided into smaller HUCs. The Plan is too big and complex, and the goals & objectives are not specific enough (according to research done by the Center for Watershed Protection, these are all reasons that

watershed plans fail to be implemented).
Responses:
- The new Action Plan has increased the number of subwatershed from four to six and each subwatershed has its own "mini" action plan specifically for that subbasin. In other words this report contains six individualized action plans for each of the primary Nimishillen Creek tributaries and the mainstem.
- Goals and objectives were completed with as much specificity as possible given the limit data available to the stakeholders. These goals and objectives will be reevaluated and almost certainly updated once Ohio EPA has completed the TMDL for the watershed.

E) We recommend that the plan highlight subwatersheds and implementation be detailed at the subwatershed scale in priority order of which implementation should occur first. Recommend reorganizing this plan with the Appendix 8 Update.
Response: Please see my responses above regarding prioritization, subwatershed action plans, and reorganization of this plan based on Appendix 8.

F) If NEFCO would prefer to take some low hanging fruit initially to learn and get some quick success, please tackle the big problem areas. We also agree with your project that preservation and restoration should have equal priority.
Responses:
- NEFCO feels picking "low hanging" fruit is vital to build momentum to tackle the bigger water quality problems. Tackling the "big problems" has been the result of lacking the financial resources to complete needed projects.
- If preservation and restoration are to have equal priority, then we would suggest modifying the "Guide to Developing Local Watershed Action Plans in Ohio" and specifically Appendix 8 so it reflects this view.

Specific Comments on Text:
Response: As already mentioned, the *Nimishillen Creek Watershed – State Action Plan* is a completely new and independent document produced by the Upper Tuscarawas River Watershed Coordinator, the Nimishillen Creek Watershed Partners, and NEFCO. As such, most of the comments below are regarding to text that was not included in the new Action Plan. However, comments from the previous plan were reviewed and given due consideration while completing the new Action Plan.

A) Place the "play-by-play" from the public meetings (i.e. Phase I, pgs. 84-85) into an appendix instead of in the body of the text, or remove it entirely. This is cumbersome, not necessary, and draws attention away from the important aspects of the plan ie."who is going to do what" matrix.
Response: This text does not appear in the new Action Plan.

Phase I
A) Page 11: Potential Pollution Sources: Rather than examine potential sources based on what is in the watershed that could affect water quality, as the plan does now, consider following "A Guide to Developing Local Watershed Action Plans in Ohio"

and look first at where the water quality is not in attainment with water quality standards (or threatened). Attempt to quantify the sources that are leading to the cause of this impairment and plan implementation that will address these sources.
Responses:

- Comments noted and have been incorporated into the new plan. However, the plan these comments are directed to was completed using the "Guide" and regular "Semi-Annual Evaluation Reports" were submitted to Ohio EPA from 1998 through 2001 for review. Please refer to these reports and point out where NEFCO and the Watershed Partners failed to follow the "Guide" when developing the watershed plan.
- Nearly 80% of the Nimishillen Creek and its tributaries are not in attainment and 40% of the stream miles have not been assessed. The assessments that have been conducted have primarily focused on point sources of pollution with little information on NPS pollution. Therefore, quantifying the sources that are causing impairments is not possible at this time. The TMDL is currently scheduled for completion in 2007 and should greatly help in this area.

B) Under this section, insert a water quality attainment table and map to document which segments are failing to meet designated uses. As it stands today, this plan focuses on potential sources of impairment instead of actual water quality impacts as documented by Ohio EPA's existing water quality data.
Response: All available water quality information from Ohio EPA is presented in Section III of the new Action Plan. It includes attainment tables for aquatic life uses, recreation, and water supply.

C) Page 22: Why are soils with "extremely high porosity and permeability" singled out as unsuitable soils, where household sewage treatment systems (HSTS) are likely to fail? The *Soil Survey of Stark County, Ohio* identifies a variety of soil properties that are associated with failed HSTS: subject to flooding, slope, seasonal high water table, depth to bedrock, and moderately slow to very slow permeability. In fact, soils with extremely high porosity and permeability in the underlying horizons or layers are generally rated in the soil survey as having slight limitations for HSTS, because they commonly have subsoil horizons that are ideal for treatment of household sewage. A footnote does recognize the hazard of "environment pollution" in the more porous soils, because the porous soils do present a greater hazard for groundwater pollution, where the moderately permeable subsoil horizons are too thin to allow complete treatment. On the other hand, soils with a seasonally high water table or a moderately slow to very slow permeability are unsuitable for uses as treatment because of saturation or slow movement of the effluent. If soils with extremely high porosity and permeability are considered unsuited, then soils that are unsuited are so common in the Nimishillen watershed that "unsuitable soils" need not be identified as one of the three elements in the identification of critical areas on Figure 6. HSTS are likely to fail in nearly all unsewered, urban areas in the watershed. Section II.2. in the Phase IV Ohio EPA Home Sewage Treatment System Plan, and particularly Figure 3 in the section, portrays the distribution of unsuitable soils much more accurately than this section in the Phase I part of the plan.
Response: This text is not included in the new Action Plan.

D) Page 25: It would be helpful if the text defined "steep sloped soils." Judging from Figure 10, it appears to be defined as soils with more than 6 percent slope. A map showing the distribution of soils with 6 to 12 percent slopes, 12 to 18 percent slopes, and more than 18 percent slopes would have been helpful. It would have demonstrated that Subwatershed 1 has the highest concentration of soils in the two steeper classes of slope. (See Figure 2 in Section II.2. in the Phase IV Ohio EPA Home Sewage Treatment System Plan.)
Response: This text is not included in the new Action Plan.

Phase III (June 2001)

A) Tables: Any objectives and action listing 319 as a possible funding source need to be measurable to achieve the numerical goals.
Response: These tables do not appear in the new action plan. However, the new action tables in Section VII include measurable goals with numerical achievement, when possible.

B) Table 4, Goal 2, Objective 2.1, Action 2.1b The "Cost Estimate" may be conservative for replacing failing systems with systems that are designed on the basis of soil characteristics observed and described on-site.
Response: Cost estimates for on-site HSTSs were reviewed by the Stark County Health Department for the new Action Plan.

C) Table 4, Goal 2, Objective 2.2, Action 2.2b
The "Cost Estimate" may be conservative for replacing failing systems with systems that are designed on the basis of soil characteristics observed and described on-site.
Response: Cost estimates for on-site HSTSs were reviewed by the Stark County Health Department for the new Action Plan.

D) Table 4, Objective 7.3 "Conduct Further Research regarding point and nonpoint source pollution. Each of these action items should already have been collected and included in the plan inventory.
Response: This objective is not included in the new Action Plan.

E) Table 5, Part D3, Local Health Departments and Ohio EPA: The average costs estimated by the local health departments may be conservative for replacing failing systems with systems that are designed on the basis of soil characteristics observed and described on-site.
Response: Cost estimates for on-site HSTSs were reviewed by the Stark County Health Department for the new Action Plan.

Phase IV (April 2003)

A) This report draft probably incorporates soils information better than any watershed management plan Tim Gerber has reviewed so far.
Response: Phase IV is included in almost its entirety in Section VI in the new Action Plan.

B) Figures 2, 3 and 5 are excellent, and the analysis on page 4, under II.2 accurately describes the distribution of common soils with greater limitations. The plan includes a strategy to target the most critical areas to maximize water quality improvements with public funding that is limited. Page 14 and 15: The statement below should be added in the text somewhere, perhaps in association with Table 4, Goal 2, Objectives 2.1 and 2.2, Action b and Table 5, Part D3, Local Health Departments and Ohio EPA: "To assure that the on-lot systems constructed with public funds are designed to treat household sewage adequately, a site evaluation that includes a detailed soil description should be conducted by a qualified individual. A professional soil scientist certified by the Association of Ohio Pedologists, the American Society of Agronomy's ARCPACS certification program, or other professional site evaluator certification may be designated by the local health district to meet such a requirement. The design of proposed systems should be compared with documented soil characteristics to assure that public funds are used for properly designed systems."
Response: This statement may no longer be needed with the new State HSTS rules being developed. The statement can be added if these new rules do not address this issues.

Endorsement

A) Most of this watershed plan was developed prior to the Appendix 8 Update. Eric Akin realizes that the plan needed to be updated accordingly. The TMDL for this watershed has been pushed back because of sampling difficulties in the summer of 2003. It is much more challenging to calculate necessary load reductions without the benefit of a TMDL. This watershed action plan is very strong at identifying good and poor riparian corridor areas. I would be in favor of partial endorsement, so the Nimishillen would be eligible for a 2005 /319 grant. The grant would have to focus primarily on areas needing riparian corridor improvements and conservation easements. If the Stark County Health Department develops an HSTS plan for Stark County that meets Ohio EPA approval, then we could consider approving an HSTS component in the 319 application.
Response: Many improvements have been made to the new Action Plan based on these comments from the original plan that was submitted. I appreciate your endorsement consideration for this new report.

Appendix J:
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