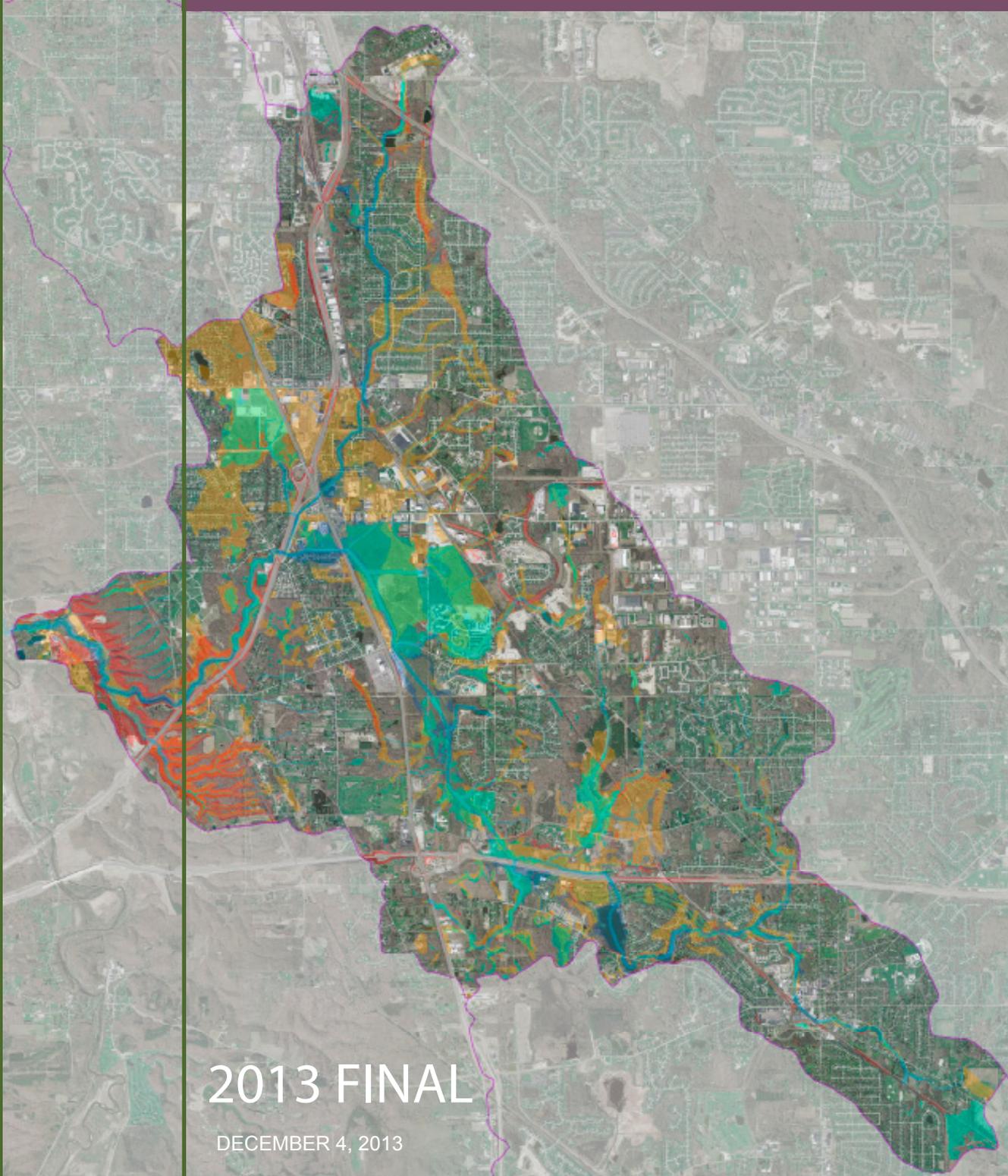




# Brandywine Creek Balanced Growth Initiative Watershed Plan



2013 FINAL

DECEMBER 4, 2013

BRANDYWINE CREEK  
WATERSHED  
PLANNING  
PARTNERSHIP

Village of Boston Heights  
William Goncy, Mayor

City of Hudson  
William Currin, Mayor

Northfield Center Township  
Sam Ciocco, Administrator

City of Macedonia  
Donald Kuchta, Mayor

## Acknowledgements

This watershed plan has been developed by the Cuyahoga River Community Planning Organization (CRCPO) in collaboration with the Brandywine Creek Watershed Planning Partnership under the auspices of the Ohio Balanced Growth Initiative (BGI).

### ABOUT THE BRANDYWINE CREEK WATERSHED PLANNING PARTNERSHIP

The members of the Brandywine Creek Watershed Planning Partnership are appointed by the leadership of the watershed communities and are assisted in the planning process by agencies and institutions working toward watershed stewardship.

### ABOUT THE CUYAHOGA RIVER COMMUNITY PLANNING ORGANIZATION (CRCPO)

The CRCPO is the nonprofit organization that manages the Cuyahoga River Remedial Action Plan (RAP) and the Cuyahoga American Heritage River Initiative, and works to support cleanup efforts and long term community stewardship of the Cuyahoga River Watershed and Area of Concern.



Additional Support for the work of the Brandywine Creek Watershed Partners comes from:

Cuyahoga Valley National Park – Kevin Skerl

Summit County Soil & Water Conservation District - Joan Hug-Anderson

Summit County Planning Commission – Susan DeChant

Summit County Board of Health – Bob Hasenyager

Summit County Engineer - David White



# Brandywine Creek Balanced Growth Initiative 2013

## OVERALL METHODOLOGY

1. Identify and Evaluate Community Issues and Desires (eg. frequent flooding, etc.)
2. GIS Data Analysis of Natural Features
3. Qualitative Assignment of Natural Features: Reflect Community Needs & Watershed Function
4. Identify Undeveloped Land with Relation to Natural Features
5. Priority Conservation Areas & Priority Development Areas

The Brandywine Creek Balanced Growth Initiative is a community-driven land suitability plan that will assist communities in balancing economic growth with conservation of critical and valuable natural resources.

An important part of the Cuyahoga River Remedial Action Plan for delisting beneficial use impairments in the Cuyahoga is building and strengthening stewardship in the tributaries that feed the river.

Brandywine Creek is one of the fastest-urbanizing watersheds in the Cuyahoga River basin and as a target for development it is experiencing the most drastic changes to its natural storm water management and water quality infrastructure. The Creek flows to the Cuyahoga Valley National Park and problems there continue from increased flooding due to that urbanization

The Cuyahoga River Community Planning Organization has been working with the largest of the nine communities whose land drains to Brandywine Creek. Community representatives have identified the land areas for conservation and for development.

This Plan contains input from a broad collaboration of community representatives and the data and portrait of the watershed they have used in identifying their Priority Conservation Areas and Priority Development Areas. It also contains target area maps and profiles. Finally, the Plan includes lists of the tools and strategies they can use for implementation.



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The statements, findings, conclusions, and recommendations  
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# Brandywine Creek Balanced Growth Initiative

2013

## Executive Summary



# Executive Summary

## Brandywine Creek

**BRANDYWINE CREEK** is located in Northeast Ohio's Summit County, and drains an area of land into the Cuyahoga River from the east. From its headwaters in Hudson it flows westward for 11 miles and joins the Cuyahoga River in Sagamore Hills within the Cuyahoga Valley National Park. What happens upstream can have serious effects on what is currently one of the highest quality stretches of the Cuyahoga River's main stem.

This watershed is experiencing ever-increasing rates of urbanization - approximately 10% per year - as population sprawls south from Cuyahoga County and brings with it shopping and commercial development. Some of the region's busiest transportation routes pass through the Brandywine Creek watershed. Development of the Route 8/I-271/1-80 (turnpike) corridors places stress on the existing natural systems. The change from rolling hills to paved parking lots, new construction of regional medical centers, and plans for new commercial developments will further reduce the natural infrastructure's ability to manage stormwater and water quality.

### WATERSHED CHARACTERISTICS

Brandywine Creek Watershed covers approximately 26 square miles and drains portions of nine communities – Boston Heights Village, Boston Township, Hudson, Macedonia, Northfield Center Township, Sagamore Hills Township and Twinsburg Township, and a small portion of Oakwood Village in Cuyahoga County. It drops from 1072 feet to 662 feet, falling 410ft over its course, which includes the 65-foot-high Brandywine Falls.

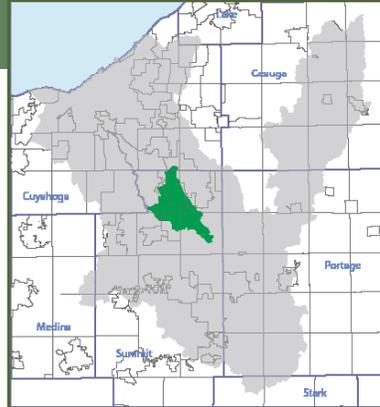
The most well-known geologic formation in the watershed is Brandywine Falls. This 65-foot waterfall drops over bedrock comprised of erosion resistant Berea Sandstone, which settled upon a deep deposit of red Bedford Shale close to 360 million years ago.

The glacial action that dug Lake Erie also had a role in the type of soil deposits in the watershed. Brandywine Creek, along with other streams in the region, flow over loose glacial till and carve many of the spectacular valleys we see today.

The glacial deposits, primarily of silt and clay, are characterized by slow permeability and seasonal wetness, which can present problems for homes that rely on septic systems, and also can cause basement flooding.

More than 40% of the watershed remains undeveloped and these areas are filled with critical natural features, notably some of the last large wetlands in the basin. Suburban development, and the related polluted runoff and stream encroachment, has impacted the headwater streams and biological community.

Downstream of Hudson the creek has been channelized to move water from the community more quickly. Results of removing meanders and riffle/pool sequences creates faster flow, more erosion and sedimentation, and degrades aquatic habitat.



### MAJOR ISSUES

in the Brandywine Creek Watershed

- Loss of Wetlands
- Increasing urbanization
- Addressing remaining large tracts of undeveloped land
- Loss and fragmentation of forest canopy and natural areas
- Critical downstream natural resources
- Integrating BGI plans into local master plans and regulations

Further downstream, in the Cuyahoga Valley National Park, the stream suffers from heavy sediment loads and bank erosion.

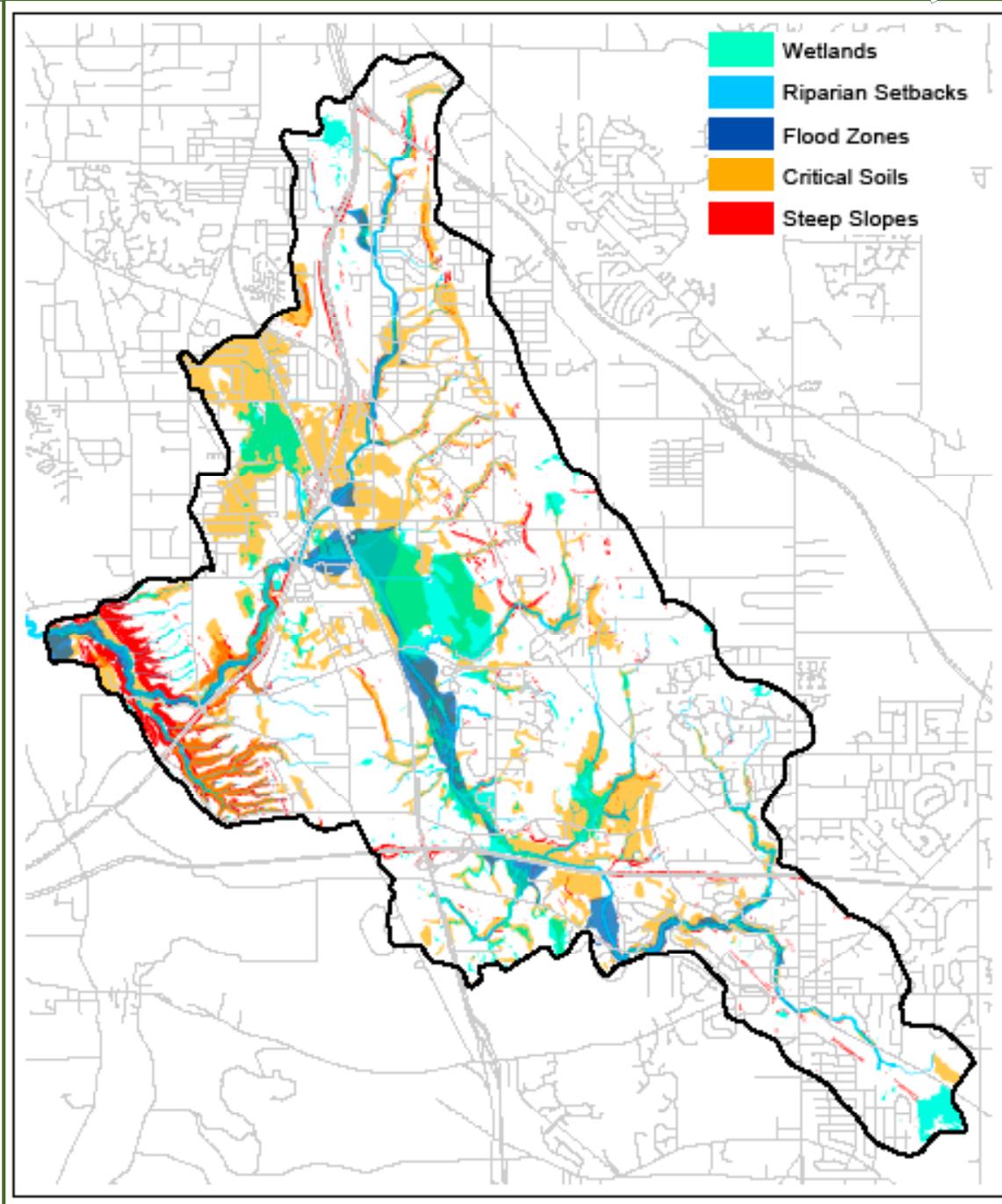
The vegetated protection that the CVNP provides to the last stretch where the creek joins the Cuyahoga has allowed the creek to maintain good water quality, the first Full Attainment Ohio that the EPA has recorded in Brandywine Creek.

It is a goal of the RAP and this Plan that the character of this stream segment be protected from serious threats upstream.

### USE-ATTAINMENT

Brandywine Creek is designated a Warm Water Habitat (WWH). This designation means that Brandywine Creek should be able to support a well-balanced population of fish and aquatic insects. The majority of Brandywine Creek does not meet Ohio EPA's water quality standards, but the creek steadily improves as it flows into the Cuyahoga Valley National Park.

Brandywine Creek has decent water quality. However, phosphorous levels just downstream of Hudson remain high, possibly due to fertilizer runoff from lawns, failing septic systems and nutrient-laden lakes in the area.



## CRITICAL NATURAL FEATURES

The natural features that are the focus of study when addressing how effectively the watershed functions include:

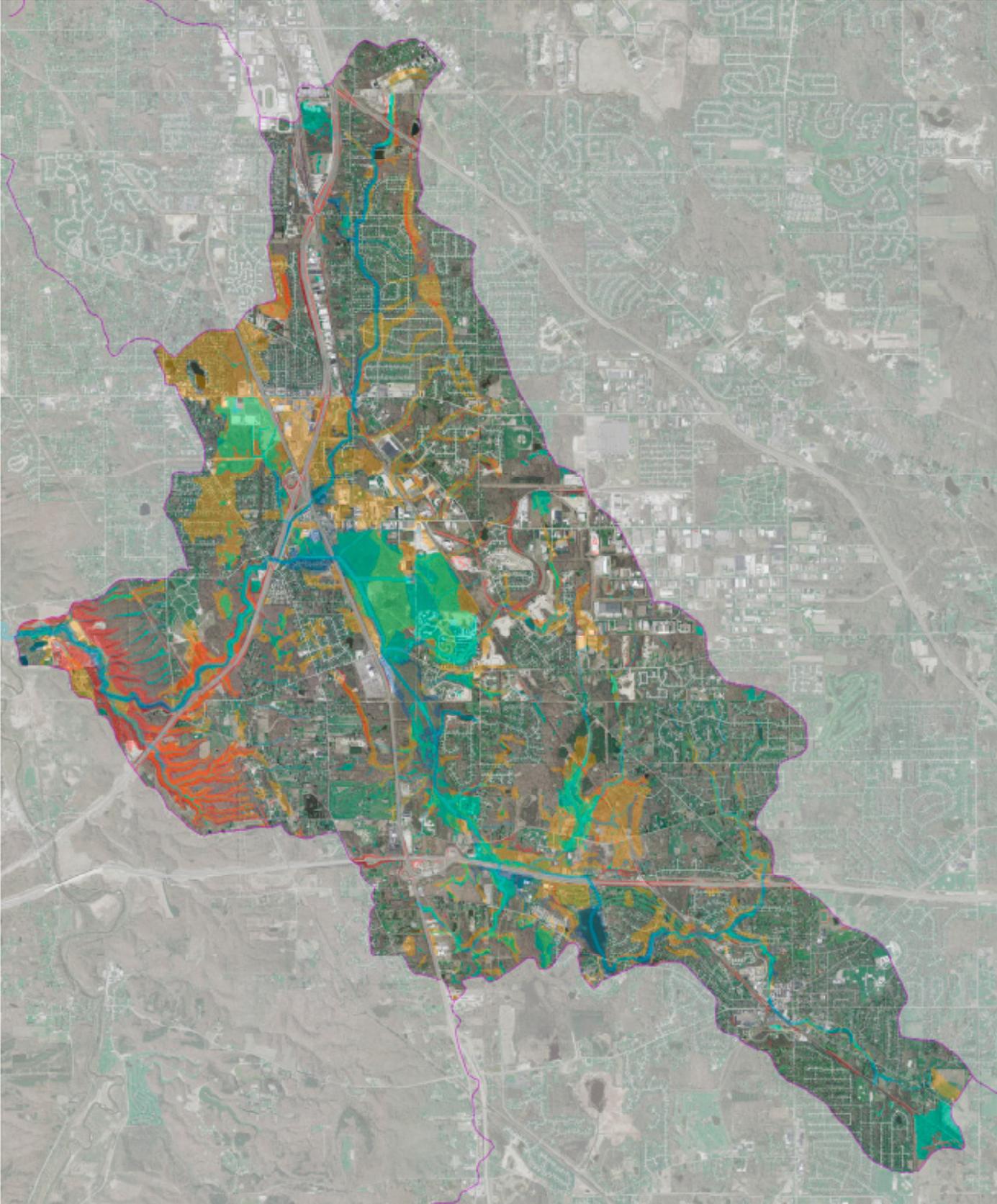
- soils • slopes • streams and riparian zones • flood plains • wetlands • forests.

Each feature was mapped individually to show where that feature appeared in the watershed, then combined to show the concentration of features in certain areas of the watershed.

This map displays the critical natural features “layered-up”. It represents the most important functional elements of the watershed.

# Executive Summary

## Brandywine Creek



## Priority Conservation Areas

Priority conservation areas are locations where land use change is predicted to have a high impact on the watershed in terms of flooding, erosion, and water quality, based on the analysis of several data sets representing criteria that the watershed planning partners determined were of interest.

### • STREAMS & NATURAL RIPARIAN AREAS

Recommendation: Stream and riparian corridor areas should be protected from encroachment at all costs. Communities should adopt riparian setback ordinances to protect both headwater and primary headwater streams. Where impacts occur in these areas, mitigation within the immediate drainage area should be required .

### • FLOODPLAINS

Recommendation: Communities should conserve flood plains to accommodate excess flow, protect health and property. Community regulations need to maintain current flood plain maps and adequately protect floodplains from development to reduce future damages.

### • WETLANDS

Recommendation: Wetland areas should be conserved as essential storage and filtration systems. Communities should adopt ample setback ordinances for all wetlands categories.

### • CRITICAL SOILS

Recommendation: In critical soil areas, communities should develop soil compaction limitations to help conserve this resource during construction. Conservation and low impact design standards are recommended.

### • STEEP SLOPES

Recommendation: In steep slope areas, communities should conserve these resources to the maximum extent possible for health, safety, property and environmental concerns. Setbacks should be implemented on slopes of 12% or more.

### • FORESTS

Recommendation: Communities should conserve forested areas within riparian corridors and minimize the loss of existing forested areas throughout the entire watershed, through conservation development and tree preservation regulations.

## Priority Development Areas

Priority development areas are locations where land use changes are predicted to have minimal impact on the watershed and where conditions suggest that additional development may be appropriate.

The Brandywine Creek Watershed includes parts of nine municipalities with zoning, water and sewer availability and many other factors deemed important for development.

Priority development areas have been identified tract by tract with community recommendations regarding the suitability of each tract.

PDA characteristics are:

1. Undeveloped land that does not lie within critical watershed features (i.e. list at left) or that will not adversely affect those features when developed in compliance with community regulations.
2. Previously developed areas suitable for redevelopment.

In addition, a number of the large tracts, whether priority development or priority conservation, contain portions that have characteristics of the other. That is, development with conservation elements and vice versa. These tracts are designated as PCA\*\* or PDA\*\* in the table on page 52 and shown on the map in the appendix. The watershed communities believe that their codes and/or review processes afford appropriate controls and protection of sensitive areas should development be pursued in these tracts.

# Executive Summary

## Brandywine Creek

### DEVELOPING EVALUATION CRITERIA for PRIORITY CONSERVATION and PRIORITY DEVELOPMENT AREAS

The Plan seeks to provide guidance on which land is suitable for development and which is a priority for conservation, as well as how such land can be preserved and protected.

The Brandywine Creek prioritization process has gathered community input to identify and prioritize critical areas and features.

The results of scoring priorities identified the most important issues for the watershed planning process. These priorities provide a focus and, in turn, have been used to identify priority conservation areas.

The entries below and on the next page were those that have been identified throughout the watershed partnership meetings and have been prioritized.

Identifying and Evaluating Community Issues and Desires  
Brandywine Creek Priorities for Conservation of Important Watershed Features  
(PCA methodology)

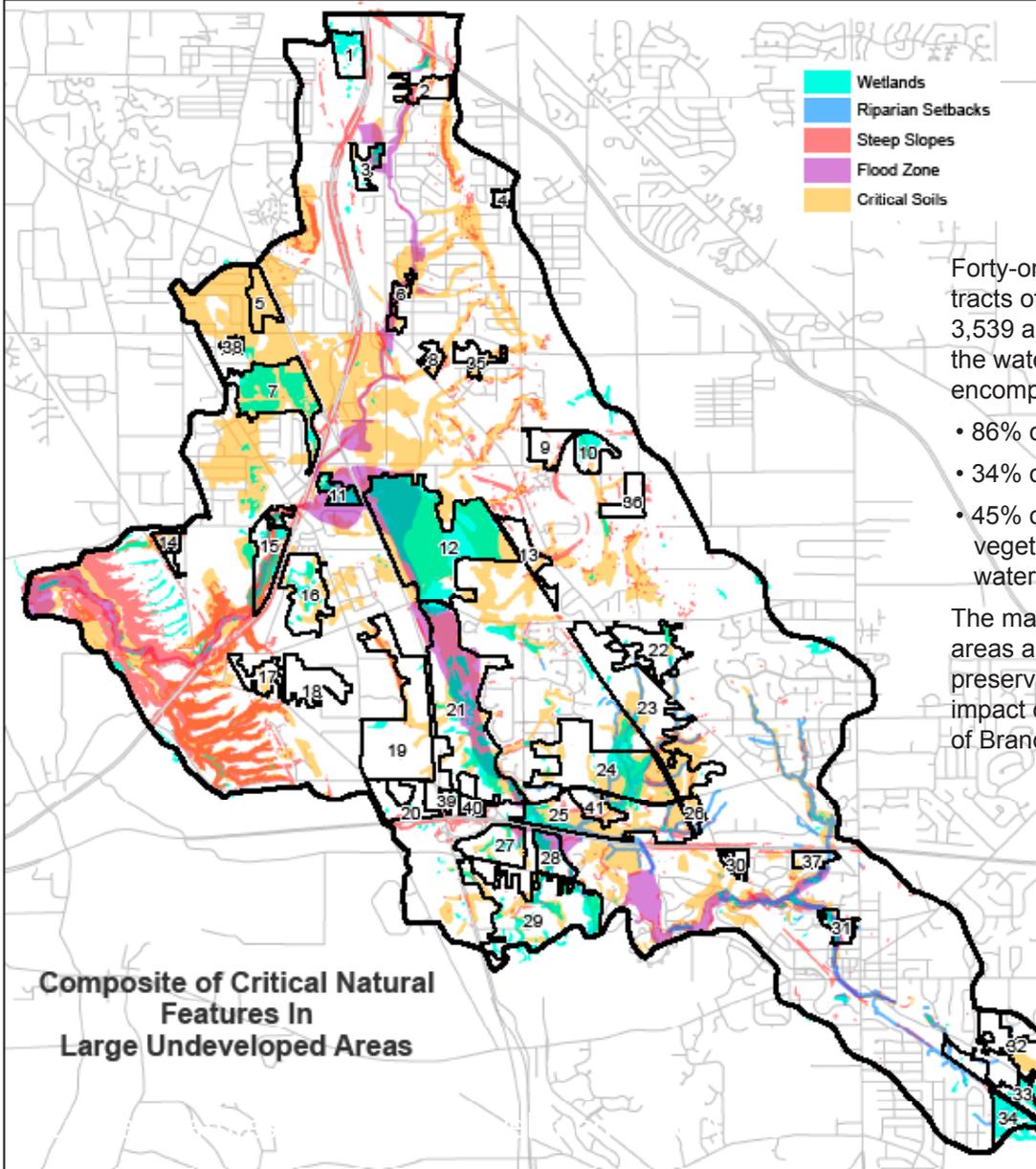
<b>Prioritized Criteria for Priority Conservation Areas (PCA)</b>
Areas in imminent danger of property damage or loss from flooding or erosion
Stream banks and adjacent vegetated corridors for erosion prevention
Floodplains for flood water management purposes
Small streams and primary headwater areas for flow management
Steep Slopes for erosion protection
Wetlands for flood water management
Forest corridors for flow and bank stability purposes
Soils which allow high infiltration for storm water
Soils which are highly erosive and fragile
Soils which support wetlands
Wetlands for water quality and filtering
Areas with potential for green space connections and new trails
Areas adjacent or in close proximity to Metropark / CVNP / local parks
Stream banks and adjacent vegetated corridors for habitat benefit
Forest areas which provide significant habitat and connections
Areas with high infiltration for aquifer/ well replenishment
Areas that provide multiple functions and benefits –e.g. trails in riparian corridors
Wetlands for habitat enrichment
Large land tracts for significant vistas / green space
Floodplains for open space/ park purposes
Area providing scenic/tourist value
Steep slopes for vistas
Forested areas for carbon sequestration
Forest areas which provide scenic vistas

<b>Prioritized Criteria for Priority Development Areas (PDA)</b>
Land areas with adequate existing utility services: electric / gas / water/ sewer
Location on adequate primary roads
Land areas already characterized by urbanization
Visual separation from residential / rural settings
Existing areas that can be redeveloped
Land areas that are in close proximity for planned or existing related urban services: retail/ restaurants
Close ( within 500 yards) proximity to highway interchanges
Areas which are located away (greater than 100 yards) from critical watershed features
Flat, yet well-drained, terrain
Larger tracts (e.g. greater than 4 acres) capable of optimizing low impact development features
Areas which will not detract from historic sites / vistas
Areas which do not include prime agricultural soils/ areas
Close accessibility to alternate transportation systems
Close proximity to natural areas
Close proximity to recreational corridors

# Executive Summary

## Brandywine Creek

The next step in the analysis is to identify large areas of undeveloped land, where pressures to develop would be greatest.



Forty-one large undeveloped tracts of land totaling more than 3,539 acres comprise 20% of the watershed, yet these areas encompass at least:

- 86% of the wetlands;
- 34% of the critical soils; and
- 45% of the naturally vegetated areas in the watershed.

The manner in which these areas are developed and/or preserved will have a material impact on the long-term stability of Brandywine Creek.

**Composite of Critical Natural Features In Large Undeveloped Areas**

	Total	Critical Soils	Steep Slopes	Flood Zones	Riparian Corridors	Wetlands	Natural Vegetation
41 Large Undeveloped Tracts acreage	3,539	1,279.4	88.8	373.2	289.3	890.3	2,750.7
Large Tracts as % of Watershed	20%	34%	11%	47%	33%	86%	45%
TOTAL WATERSHED ACRES	17,406	3740.3	848	789.6	876.9	1032.4	6115.8

# TOOLS AND PRACTICES FOR WATERSHED MANAGEMENT

The watershed communities are working to more fully understand management tools and strategies that they could implement throughout the watershed. These management tools can help address a wide range of issues through planning measures, design standards, regulations, inter-community cooperation, funding etc.

Throughout the organizing process and discussions, the participants have grown to appreciate Low Impact Development (LID) practices which could be adopted in their own government operations and to encourage those strategies among property holders.

The table below presents a pallette of the tools and practices available to communities and property owners to more effectively control stormwater and manage growth. These tools and practices will be implemented through changes in land development codes, zoning regulations and design standards as well as operational practices by communities and individuals.

<b>TOOLS &amp; PRACTICES</b>
Maximum Impervious lot area
On-Site retention
Tree Mitigation
Forest Canopy/natural area conservation
Traffic Impact Study/Mitigation
Roadway (public land/right-of-way) stormwater BMP
Storm Drain flow reduction/filtration
Pervious paving
Parking lot minimum infiltration areas
Greenspace overlay to Master Plan
Master Plan updates
Conservation Development Zoning
In-Watershed Mitigation
Mitigation Bank
Model Operations for Communities to follow to educate public <ul style="list-style-type: none"> <li>• no mow areas</li> <li>• “mow high” areas</li> </ul>
Prohibition and removal of invasive species
Low impact development options in building/housing codes

## INVENTORY OF LAND USE ORDINANCES

Land use activities directly influence the levels of pollution, flooding and erosion problems in the Cuyahoga River. Political fragmentation and uneven implementation and enforcement throughout these communities can lead to uneven protection of environmental and economic quality.

This is a summary of current ordinances in the Brandywine Creek Watershed. Analyzing this inventory can help our partnership more effectively identify gaps and to promote and educate for consistent protection measures watershed-wide.

PARAMETERS	BOSTON HEIGHTS	BOSTON TOWNSHIP	HUDSON	MACEDONIA	NORTHFIELD CENTER TWP	NORTHFIELD	OAKWOOD	SAGAMORE HILLS	TWINSBURG TWP
1. Flexible Development Options	Y	N	Y	Y	Y	N	Y	Y	Y
1a. Is the Flexible Development permitted "By Right"?	N	--	N	N	Y	N	N	N	N
1b. Minimum of Amount of Open Space (target 40%)	N	--	Y	20	Y	--	--	Y	Y
1c. Are Density Bonuses provided for?	--	--	Y	N	N	--	--	N	Y
1d. Low Impact Development Ordinance	N	N	N	N	N	N	N	N	N
2. Riparian Setbacks Meet Recommended Widths	Y	Y	Y	Y	Y	N	N	Y	Y
2a. Riparian Setback is restricted from any changes (prohibited / permitted uses)	N	--	Y	--	--	--	N	N	N
3. Wetland Setbacks Meet Recommended Widths?	Y	Y	Y	Y	Y	N	N	Y	Y
3a. Isolated and Connected Wetlands are protected?	N	N	Y	N	Y	N	N	N	N
3b. Wetland Setback is restricted from any Changes (prohibited / permitted uses)	N	N	Y	N	Y	N	N	N	N
4. Variance procedures in ordinances	Y	Y	Y	Y	Y	N	N	Y	Y
5. Mitigation Plan for Wetland & Riparian Impacts?	N	N	N	N	N	N	N	N	N
6. Steep Slope Protection?	Y	N	N	N	N	N	N	Y	Y
7. Conserve Floodplains- riparian setback includes floodplain?	Y	Y	Y	Y	Y	Y	N	Y	Y
8. Critical Soils- minimize disturbance to natural features	-	-	Y	Y	-	-	-	-	Y
9. Tree / Forest Management Plan	N	N	Y	N	Y	Y	Y	N	N



## In Conclusion:

Continued support by the communities of Brandywine Creek and the Cuyahoga River RAP will be essential for ongoing improvement and stewardship within the watershed.

## Status and Recommendations

This Balanced Growth Plan is the product of strong collaboration among the Brandywine Creek communities with substantial and important support of the Cuyahoga River Remedial Action Program organization. There is general recognition that the map of the Brandywine Watershed would be very different had this effort been undertaken 30 years ago. The Plan is a set of strategies that capitalizes on the opportunities and benefits of balancing economic development and growth with protection of the environment. Particularly important derivative benefits of balanced growth are assuring a continuing and abundant supply of high quality fresh drinking water to Northeast Ohio communities whose source is Lake Erie, as well as protecting private and public property from stormwater damage.

A number of short term actions that member communities will consider have surfaced in the process of creating this plan:

- Incorporate the PCA / PDA map and watershed stewardship objectives into local comprehensive plans or similar documents that drive local codes and ordinances. Of course, each community should adhere to its established public comment and review practices.
- Update local ordinances and zoning codes as recommended in the Plan. Jurisdictions should work together on this task as appropriate, particularly where they share portions of targeted PCAs or PDAs.
- Continue to collaborate in the direction of uniform storm water codes throughout the watershed. This is to ensure that watershed protection and site development review processes are fair, consistent and apply evenly to all areas of the watershed as development and plan implementation moves forward.
- Revisit the watershed partnership structure and refresh it. As our watershed communities are gaining in their understanding of balanced growth and its complexities and opportunities, especially funding, a forum or organization will be needed to facilitate continuing community collaboration, education, coordinated action and updating of the Plan. It should also assist individual community initiatives that are undertaken to enhance the watershed improvement objectives. However, the organization needs to be cost effective requiring a critical mass enabling it to be successful, yet not so large as to be distant and unresponsive to local needs. Partnering with other watershed groups may be an option.

Other possibilities exist for community action, but they require additional time for community understanding and commitment:

- Explore developing a Transfer Development Rights / Purchase Development Rights / Density Transfer Program. As a long term goal, development rights programs should be considered as part of the tool box of options to achieve conservation and direct development away from sensitive areas.
- Develop a mitigation banking system for wetlands and streams. Should an unavoidable impact occur, a compensatory mitigation plan needs to be ready to keep these critical resources in the watershed.
- Identify needed restoration and enhancement sites in Brandywine Creek Watershed. Wetland sites in the watershed are currently being analyzed for restoration and enhancement potential. These wetland results, along with stream data, will be shared with the partnership and targeted for funding and remediation.



## The Plan

### INTRODUCTION

Brandywine Creek, located in Cuyahoga County, is a rapidly urbanizing sub-watershed within the Cuyahoga River Watershed and the Cuyahoga Remedial Action Plan Area of Concern.

Brandywine Creek drains portions of nine communities and flows to the Cuyahoga River in the Cuyahoga Valley National Park. The watershed serves as a natural water management system, but past and current changes in land use continue to alter the watershed and reduce functionality of this natural infrastructure.

The Ohio Lake Erie Commission (OLEC) is guiding the development of Balanced Growth Plans (BGP) for watersheds of major streams flowing into Lake Erie. These plans identify Priority Conservation Areas (PCAs), Priority Development Areas (PDAs), and hybrid areas with portions appropriate for development and conservation (PCA\*\* or PDA\*\*). The Commission is coordinating with state agencies to develop state incentives and funding opportunities to assist communities in implementing those -plans.

As with all other BGPs, the Brandywine Creek Balanced Growth Plan is a resource for community decision makers to evaluate the potential impacts of land use changes in the watershed. Its purpose is to inform and guide communities as they create or revise comprehensive plans and consider changes to their land development codes and zoning regulations. Changes may be needed in order to manage and protect floodplains, wetlands, and open spaces that can flood control, erosion control and water quality protection.

For additional information on the OLEC initiative, go to the Balanced Growth website at <http://balancedgrowth.ohio.gov/> .

# Brandywine Creek

## GOALS of THE BRANDYWINE CREEK BALANCED GROWTH INITIATIVE PLAN

1. Preserve existing watershed features and system capacity to manage stormwater runoff.
2. Restore / Enhance the watershed to improve stormwater management.
3. Recommend best land use practices to avoid or minimize impacts from development.

The Brandywine Creek Balanced Growth Plan is a community driven land suitability plan that will assist in balancing economic growth while conserving critical natural resources that benefit the watershed communities.

Every portion of the earth's landscape is characterized by a different set of features that render it more suitable for certain uses than others. Since all the earth's surface is divided into drainage areas, or watersheds, the concept of land suitability applies to watersheds. That is, different areas of a watershed are characterized by different sets of features that render them more suitable for certain uses and less suitable for others. This concept emphasizes that land use planning and development should recognize watershed functions and other natural processes.

The objective of a land suitability process is to direct development to areas that are capable of handling this type of land use and, on the other hand, to avoid or minimize development in areas where that could prove environmentally hazardous.

## PROJECT SCOPE

1. Organizing the Brandywine Creek Watershed Planning Partnership representing communities, organizations, agencies and residents.
2. Gathering data about the watershed's physical characteristics, geography, biology, geology and water quality so as to identify a baseline against which improvements can be measured.
3. Developing and agreeing upon criteria and creating a model for designating Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs)
4. Identifying Priority Areas for development and conservation using the criteria
5. Providing guidance and action items for communities on land use ordinances and regulations
6. Developing a resolution for community adoption.
7. Finalizing the Brandywine Creek BGI Watershed Plan for state endorsement

## PCA

### Priority Conservation Areas

Priority conservation areas are locations where land use change is predicted to have a high impact on the watershed in terms of flooding, erosion, and water quality, based on the analysis of several data sets representing criteria that the watershed planning partners determined were of interest.

## PDA

### Priority Development Areas

Priority development areas are locations where land use changes are predicted to have minimal impact on the watershed and where conditions suggest that additional development may be appropriate.

# BALANCED GROWTH INITIATIVE

“Linking Land Use Planning to the Health of Watersheds”

Balanced Growth is a strategy being led by the Ohio Lake Erie Commission to protect and restore Lake Erie and its watersheds in order to assure long-term economic competitiveness, ecological health and quality of life.

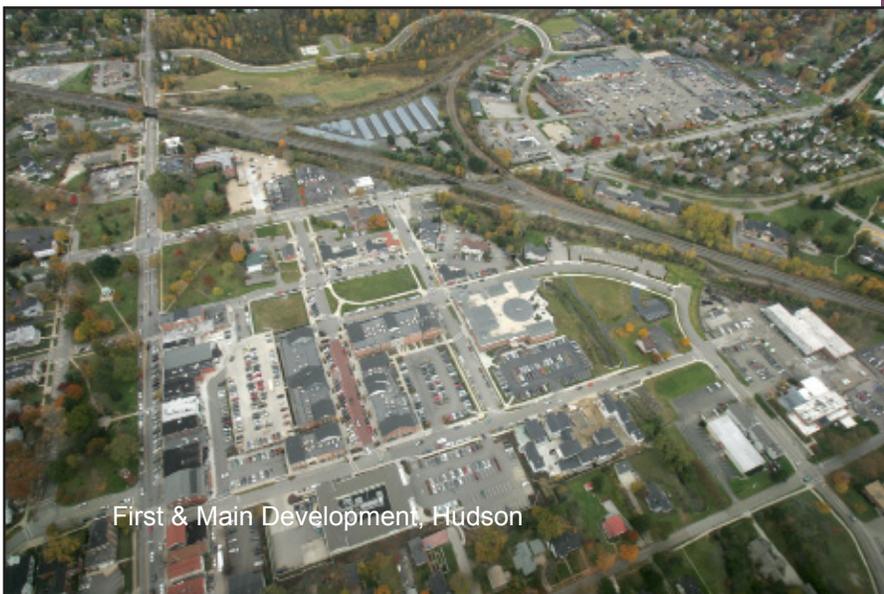
Lake Erie is Ohio’s greatest natural resource and provides tremendous natural and economic benefits. Despite this, Lake Erie’s watershed has endured and continues to face many challenges. Urban Sprawl is one of the greatest of these.

Total population in northeast Ohio has remained relatively stable. However, we continue to expand and develop. While development and community growth is encouraged, it is the manner in which the development occurs that is the most damaging. Of the 11,649 square mile area comprising the Ohio Lake Erie Watershed, over 78% has been altered from its original form, leaving only 22% relatively intact.

As a result of these ongoing problems, the Ohio Lake Erie Commission recognized the need to encourage communities to use their natural resources efficiently to benefit the economy and quality of life.

The Balanced Growth Initiative is both a response to this need and a framework around which can be built elements that will support watershed stewardship and land use management for the future:

- Communities setting priorities in a watershed context
- Whole-watershed collaborations on land use planning, and
- Consistency among ordinances and municipal operations.



## KEY BGI GUIDELINES

- Use a regional focus in land use and planning.
- Create local Watershed Planning Partnerships to designate Priority Conservation Areas and Priority Development Areas.
- Adopt Watershed Plans and recommend model regulations to help promote best local land use practices that minimize impact on water quality and provide for well-planned development efficiently served by infrastructure.
- Align state policies, incentives, funding, and other resources to support watershed balanced growth planning and implementation.

## BGI LONG-TERM INTERESTS

- Sustaining and restoring natural systems in the Lake Erie basin.
- Encouraging the reuse and re-development of urban lands
- Maximizing the efficient use of infrastructure
- Conserving farmland
- Providing open space and recreational opportunity
- Promoting compact development patterns
- Helping local governments plan for economic development opportunities and stream-lined decision making
- Providing consistency and predictability for private and public development decisions

# Brandywine Creek

## Planning By Watershed

Ohio is a home rule state and much of the land use decisions are made at the local level. However, local officials are often faced with pressing issues (flooding) that cannot be effectively addressed within political jurisdictions.

Flooding and water quality problems transcend community boundaries. Multi-community cooperation and planning by watersheds is imperative in order to address these problems. Watershed planning also helps to leverage resources and complement regulatory programs (ex. NPDES Phase II) of local and state agencies.

### WATERSHEDS

Watersheds are complex systems of soils, waterways, water storage areas and vegetation that work together to manage the precipitation falling as rain or snow within a geographic area. All the water in a single watershed that does not evaporate into the air will eventually drain to a single stream, river or lake.

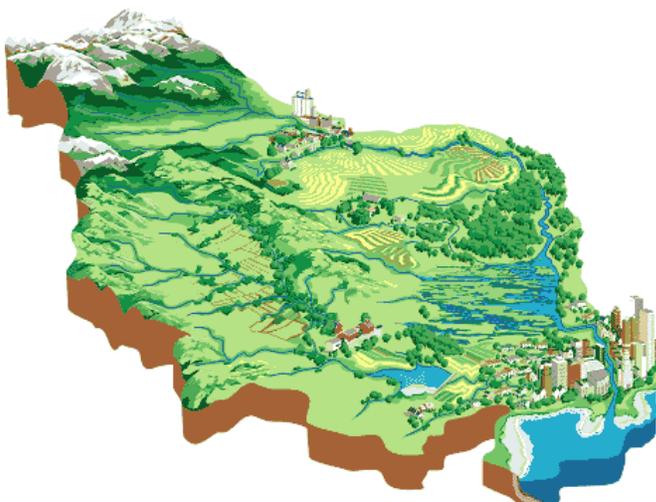
Watersheds function by:

- Pooling water to evaporate
- Soaking water into the soil
- Gathering surface water into streams

Streams and watersheds work together.

Streams are dynamic systems that adjust to compensate for changes in their watersheds and have the capacity to:

- Moderate the volume and energy of water
- Transport and deposit sediment
- Create and sustain aquatic habitat, and
- Assimilate or process a limited amount of pollutants and still achieve water quality standards.



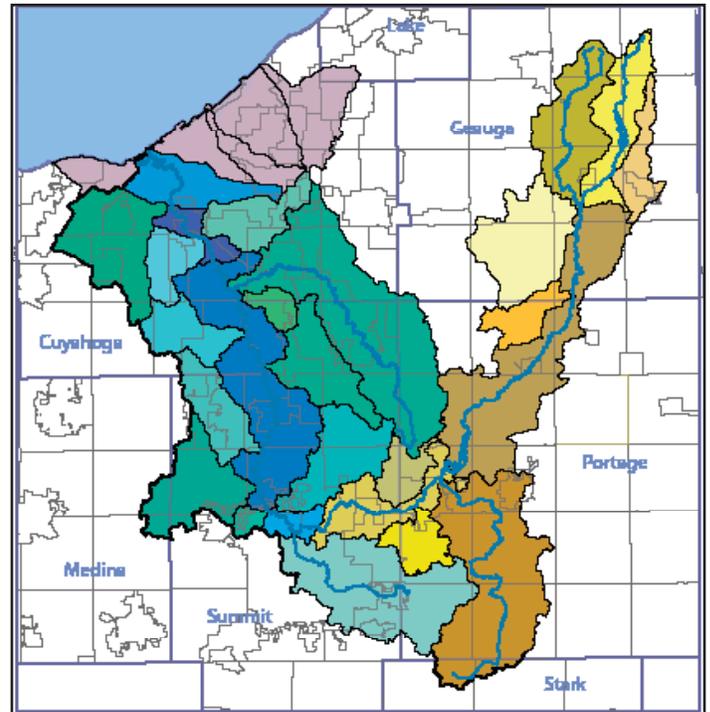
# The Cuyahoga River Watershed HISTORY & PROFILE

The Cuyahoga River basin drains 813 square miles and includes 1,220 stream miles spanning parts of Geauga, Medina, Portage, Summit and Cuyahoga counties, emptying into Lake Erie at Cleveland. The basin contains parts of three major physiographic provinces: the glaciated Allegheny Plateau, the till plains, and the lake plains. Most of the basin occurs in the glaciated Allegheny Plateau, and owes its topographic and hydrologic features to a complex glacial history. A small portion of the basin in south-west Cuyahoga County lies within the till plains, a relatively flat area more characteristic of north central and northwestern Ohio. The Cuyahoga River basin also cuts through the narrow border of the nearly level lake plains that surround Lake Erie and represents the ancient bottom of the predecessors to Lake Erie.

The Cuyahoga basin is situated within the Erie/Ontario Lake Plain (EOLP) ecoregion, a glacial plain that lies between the unglaciated Western Allegheny Plateau (WAP) ecoregion to the southeast and the relatively flat Eastern Corn Belt Plains (ECBP) ecoregion to the west and southwest. The EOLP ecoregion is characterized by glacial formations that can have a significant local relief of up to 300 feet and exhibits a mosaic of cropland, pasture, woodland, and urban areas.

Soils are mainly derived from glacial till and lacustrine deposits and tend to be light colored, acidic, and moderately to highly erodible. Many glacial features characteristic of the EOLP ecoregion are found in the Cuyahoga River basin. The northern and eastern boundaries of this v-shaped watershed are largely defined by the terminal moraines left by two fingers of glacial ice. Retreating glaciers then buried the ancient river valleys with glacial outwash. The headwaters originate in northeastern Geauga County and flow southwest to Akron through relatively hilly knob and kettle topography. The river generally follows the course of the buried valleys, but does traverse a ridge of erosion resistant sandstone, resulting in the falls and cascades of Cuyahoga Falls. The river turns sharply to the northwest at the confluence with the Little Cuyahoga River in north Akron, then winds through outwash terraces, till plains, and till ridges before reaching the flat lake plain of the Cleveland area.

Land cover information from the 2003 Lower Cuyahoga TMDL report shows that approximately 36% of the watershed is covered by deciduous forest. 28% of the watershed is residential, 16% is pasture/hay/row crop agriculture, 11% is industrial/

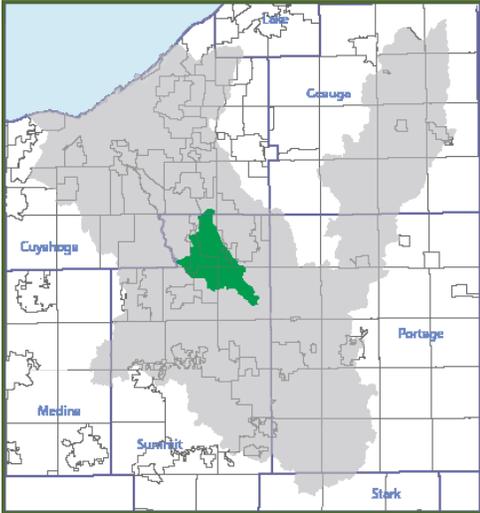


commercial/transportation, and 2% urban/recreational grasses. Slightly over 3% is determined to be woody or emergent herbaceous wetlands.

Land use patterns vary greatly from the upper basin that is primarily agricultural, to the lower basin which is among the most densely populated and industrialized urban areas in the state. Agriculture is the predominant land use in the upper basin, and while less prevalent in the middle basin, the soils are highly erodible and can result in significant sedimentation and nutrient loadings. Resource extraction and hydromodification are localized throughout the basin. The waters of the heavily populated areas of the middle and lower basin are influenced by urban and construction site runoff, combined/sanitary sewer overflows, and land disposal.

Part of the upper Cuyahoga River is a designated State Scenic River and several stream segments within the basin have been designated as State Resource Waters. The Cuyahoga River, from the Ohio Edison Dam to the mouth and the nearshore area two miles west to ten miles east of the mouth has been identified as an Area of Concern by the International Joint Commission. Twenty-two miles of the lower Cuyahoga River in the flow through the Cuyahoga Valley National Park, additionally both the Cleveland Metro Parks and MetroParks Serving Summit County have waterways contained in their respective holdings. The Cuyahoga River was designated an American Heritage River in 1998.

# Brandywine Creek



**BRANDYWINE CREEK** is located in Northeast Ohio's Summit County, and drains an area of land into the Cuyahoga River from the east. From its headwaters in Hudson it flows westward for 11 miles and joins the Cuyahoga River in Sagamore Hills within the Cuyahoga Valley National Park. What happens upstream can have serious effects on what is currently one of the highest quality stretches of the Cuyahoga River's main stem.

This watershed is experiencing ever-increasing rates of urbanization - approximately 10% per year - as population sprawls south from Cuyahoga County and brings with it shopping and commercial development. Some of the region's busiest transportation routes pass through the Brandywine Creek watershed. Development of the Route 8/I-271/1-80 (turnpike) corridors places stress on the existing natural systems. The change from rolling hills to paved parking lots, new construction of regional medical centers, and plans for new commercial developments will further reduce the natural infrastructure's ability to manage stormwater and water quality.

## WATERSHED CHARACTERISTICS

Brandywine Creek Watershed covers approximately 26 square miles and drains portions of nine communities – Boston Heights Village, Boston Township, Hudson, Macedonia, Northfield Center Township, Sagamore Hills Township and Twinsburg Township, and a small portion of Oakwood Village in Cuyahoga County. It drops from 1072 feet to 662 feet, falling 410ft over its course, which includes the 65-foot-high Brandywine Falls.

The most well-known geologic formation in the watershed is Brandywine Falls. This 65-foot waterfall drops over bedrock comprised of erosion resistant Berea Sandstone, which settled upon a deep deposit of red Bedford Shale close to 360 million years ago.

The glacial action that dug Lake Erie also had a role in the type of soil deposits in the watershed. Brandywine Creek, along with other streams in the region, flow over loose glacial till and carve many of the spectacular valleys we see today.

The glacial deposits, primarily of silt and clay, are characterized by slow permeability and seasonal wetness, which can present problems for homes that rely on septic systems, and also can cause basement flooding.

At least 40% of the watershed remains undeveloped and these areas are filled with critical natural features, notably some of the last large wetlands in the basin. Suburban development, and the related polluted runoff and stream encroachment, has impacted the headwater streams and biological community.

Downstream of Hudson the creek has been channelized to move water from the community more quickly. Results of removing meanders and riffle/pool sequences creates faster flow, more erosion and sedimentation, and degrades aquatic habitat.

Further downstream, in the Cuyahoga Valley National Park, the stream suffers from heavy sediment loads and bank erosion.

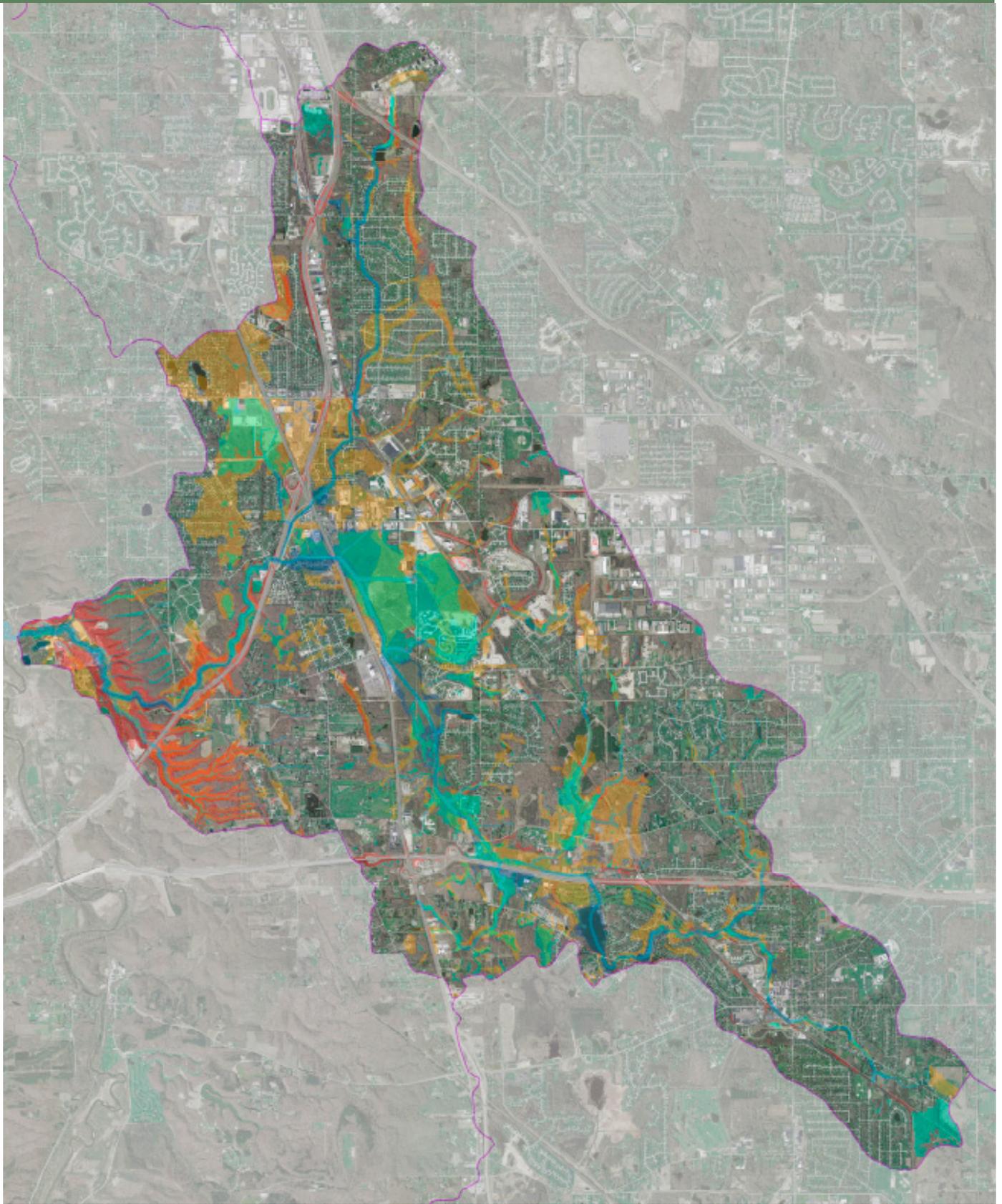
The vegetated protection that the CVNP provides to the last stretch where the creek joins the Cuyahoga has allowed the creek to maintain good water quality, the first Full Attainment that the Ohio EPA has recorded in Brandywine Creek.

It is the goal of the RAP and this Plan that the character of this stream segment be protected from serious threats upstream.

## USE-ATTAINMENT

Brandywine Creek is designated a Warm Water Habitat (WWH). This designation means that Brandywine Creek should be able to support a well-balanced population of fish and aquatic insects. The majority of Brandywine Creek does not meet Ohio EPA's water quality standards, but the creek steadily improves as it flows into the Cuyahoga Valley National Park (CVNP).

Brandywine Creek has decent water quality. However, phosphorous levels just downstream of Hudson remain high, possibly due to fertilizer runoff from lawns, failing septic systems and nutrient-laden lakes in the area.



# Brandywine Creek Watershed Features

**WETLANDS** are nature's way of trapping water, storing it, dissipating its energy, filtering out impurities, and slowly releasing it into streams and groundwater supplies. Wetlands store excess water that would otherwise contribute to flooding and stream bank erosion.

Wetlands provide critical habitat - food, shelter and nursery - for a wide variety of plants, birds, amphibians, insects and fish, all of which are necessary in order for ecosystems to thrive. Filling in and paving over wetlands eliminates these important functions and forces the water to flow headlong and unfiltered into streams.



**RIPARIAN ZONES** are heavily vegetated lands along streams that absorb water and dissipate energy. Leaves, soil and roots absorb water, reduce erosion and stabilize banks.

Vegetated corridors along streams provide for fish and wildlife migration: shade and cool water allowing more oxygen retention; and support habitats by providing nutrients and woody debris and cleaner runoff by filtering pollutants. Natural riparian zones are essential to stream function and need to be preserved.



**FLOODPLAINS** are natural rights-of-way and temporary storage areas for flooding events.

Floodplains are relatively flat areas along stream banks that absorb floodwaters, allowing for the slow release of water back into the stream.

Floodplains enhance biological productivity by supporting a high rate of plant growth. Floodplains provide excellent habitats for fish and wildlife by serving as breeding and feeding grounds. This helps to maintain biodiversity and the integrity of ecosystems.

Floodplains need to be kept undeveloped to allow for stormwater release and space for streams to meander.



## **PRIMARY HEADWATER STREAMS:**

Every stream begins somewhere. That somewhere is its headwaters, the network of small streams that blanket the landscape of every watershed. Primary headwater streams are like the capillary system of a blood supply network- just as the health of whole organism depends upon a functioning capillary system, the health of larger streams and rivers depend upon an intact primary headwater system. These small streams help control the flow of storm water, sediment and nutrients to larger streams. Headwaters are typically impacted the most during development and need protection.



**STEEP SLOPES** are features of stream valleys and need to be protected. Any significant disturbance to the hillside's environment may result in landslides or land instability, alteration in drainage patterns; and loss of scenic value. When development takes place on or near steep slopes (15% or greater), vegetative cover is greatly reduced, significantly increasing soil instability and erosion. Soil erosion and sedimentation into waterways poses several threats to public health and safety, including increased potential for flooding, that are difficult and expensive to correct. Property damage is commonly associated with development on steep slopes.

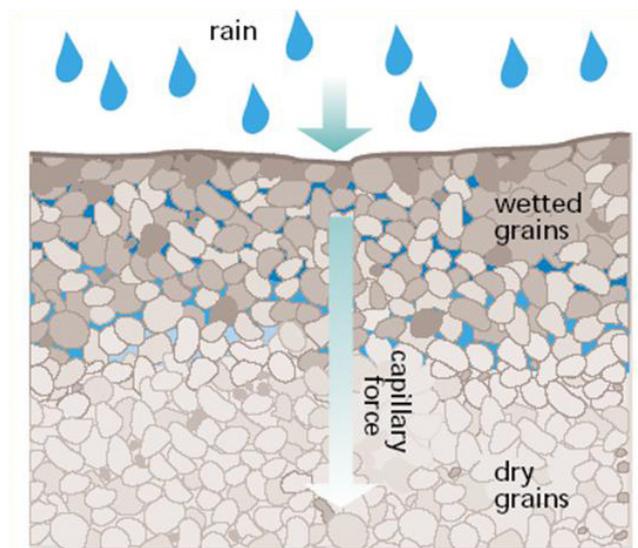


### CRITICAL SOILS

*Porous soils* such as sand and gravels provide an opportunity for groundwater recharge by stormwater and should be preserved as a potential stormwater management option. *Unstable or easily erodible soils* should be managed carefully with proper erosion and sedimentation practices.

Infiltration of stormwater into the soil reduces both the volume and peak discharge of runoff from a given rainfall event, and also provides for water quality treatment and groundwater recharge. Soils with maximum permeabilities (moderate infiltration and well drained soils) allow for the most infiltration of runoff into the subsoil.

Thus, areas of a site with these soils should be conserved as much as possible and these areas should ideally be incorporated into undisturbed natural or open space areas.



**FOREST COVER** supports a community's quality of life by maintaining the proper functions of watersheds. Wooded areas support water quality, stream health and aquatic habitat and keep soils in place, reducing sediment.

A healthy forest system can reduce communities' storm water infrastructure costs by intercepting rain, increasing ground absorption and slowing the rate of runoff. Other community benefits include: protecting drinking water supplies, enhancing property values and reducing household energy costs.

Communities need to develop forest cover programs that help maintain and restore tree cover to beneficial levels.



These watershed features reflect long-term geologic, climatic and vegetative patterns. They exist in the watershed to fulfill a specific need, and any disruption to this system often results in downstream costs. These impacts must be carefully balanced through mitigation or avoidance.

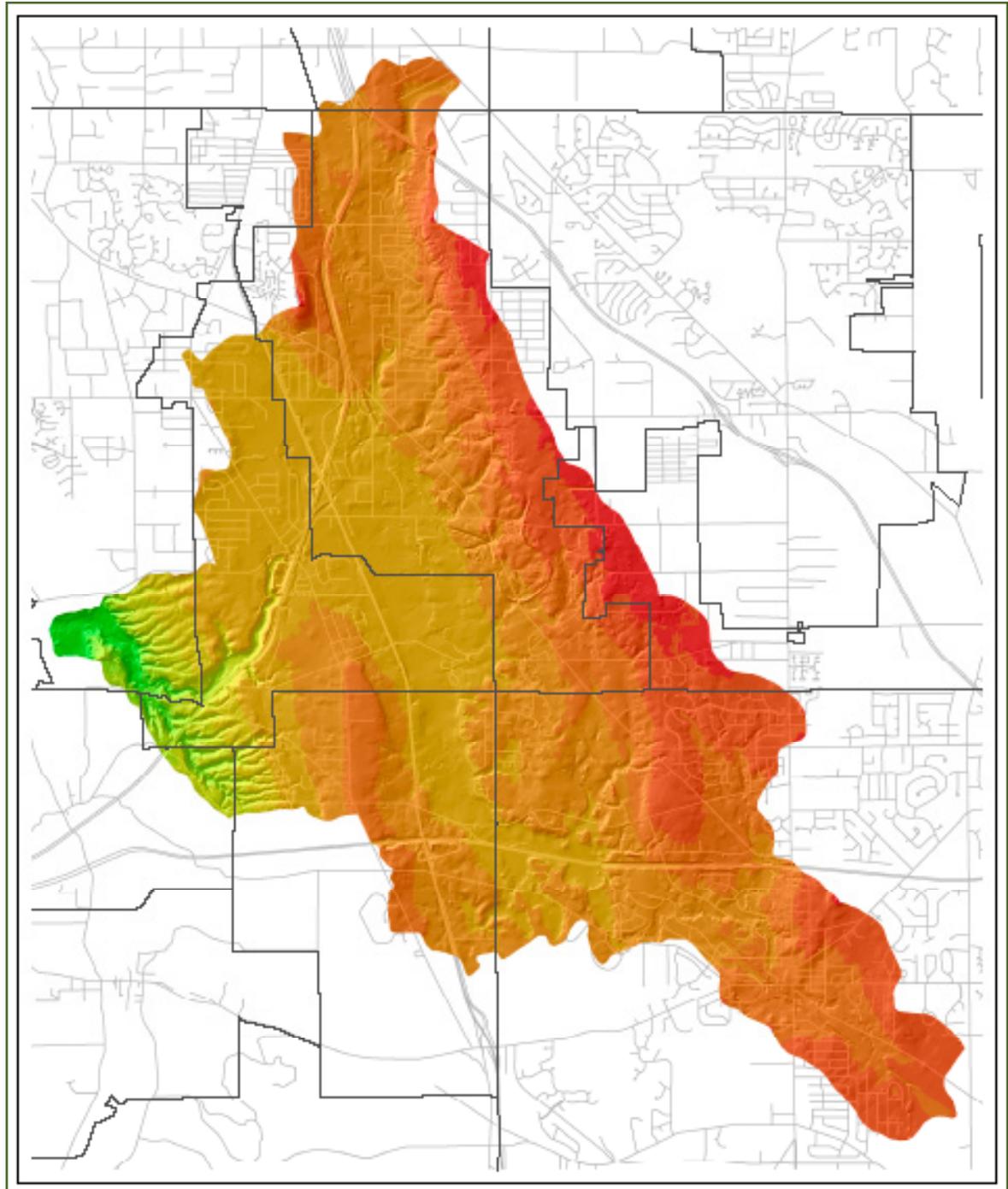
# Brandywine Creek Elevation

The watershed is characterized by rolling terrain generally sloped toward the Cuyahoga River with relatively deep ravines along downstream tributaries.

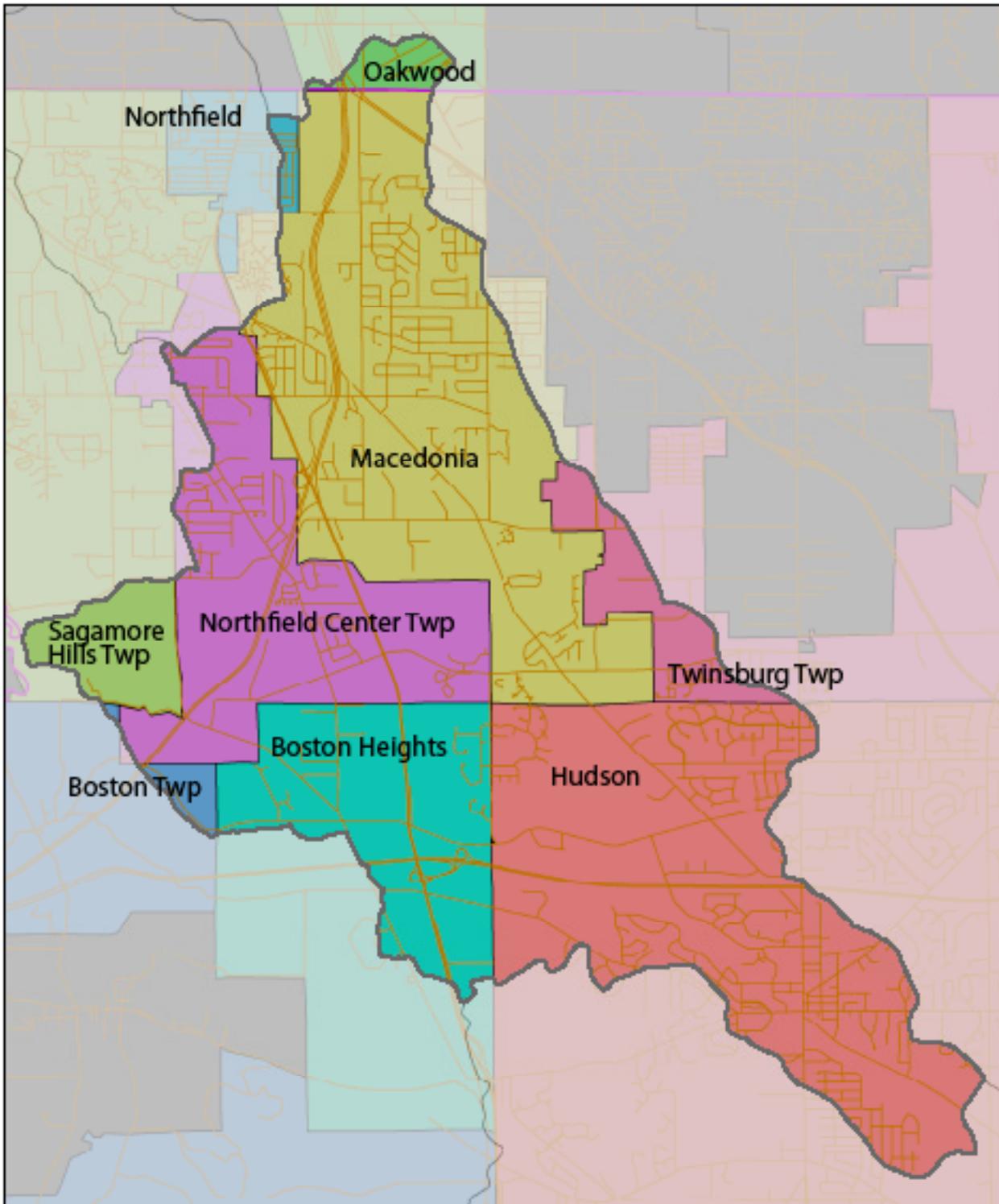
Topography ranges from an elevation of approximately 1,072 ft. (the red area in the accompanying map) along the eastern

edge of the watershed to 662 ft. at the confluence of Brandywine Creek and the Cuyahoga River (in green at the western point on the map.)

This relatively flat slope in land surface has implications on the volume of water stored in the watershed's wetlands.



# Brandywine Creek Political Boundaries

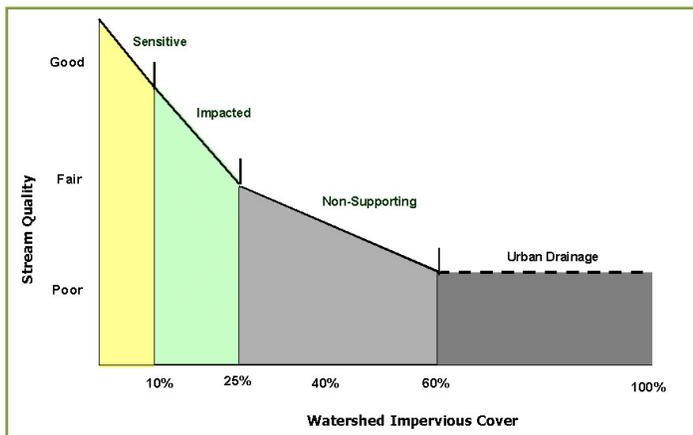


# Brandywine Creek

## Impervious Cover and Watershed Quality

The most important hydrologic characteristic affecting storm water runoff is impervious cover. Impervious surfaces are hard surfaces (ex. roads, rooftops) that do not allow stormwater to infiltrate into the ground, causing the runoff to flow directly into drainage systems. The amount of imperviousness in a watershed correlates directly with frequent flooding and poor water quality. Highly urbanized areas, where much of the land surface has been either paved or covered with buildings, are considered highly impervious. Rural areas tend to have low imperviousness, in which case stormwater infiltration and runoff is controlled by the surrounding soil type.

Diagram: As impervious surface increases, stream quality decreases



### IMPERVIOUS COVER MODEL

The Center for Watershed Protection (CWP) has summarized research findings and created an Impervious Cover Model (ICM). The ICM predicts that most stream quality indicators show a decline as the total impervious cover within a watershed increases. (Source: Center for Watershed Protection)

Watershed Impervious Cover 0-10%- these streams usually sustain a high quality, and are often typified by stable channels and healthy biotic communities. The streams may not experience as frequent flash flooding as other urbanized streams.

Watershed Impervious Cover 11-25%- these streams are described as impacted and flooding will occur more frequently. Watershed urbanization may cause stream degradation and alter the stream geometry as a result of increased storm flow and erosion. Some sensitive species may also disappear from the stream.

Watershed Impervious Cover >25%- streams are described as damaged with more frequent flooding and poor water quality. This category of stream becomes unstable and experiences severe erosion and channel widening. Aquatic life becomes dominated by a small variety of pollution tolerant fish and insects.

### IMPERVIOUS COVER MAPPING

allows communities to gain an idea of how impacted their watersheds currently are, allows them the opportunity to evaluate potential impacts from future development and provides a means to make better-informed site-design decisions.

Understanding the link between impervious cover and watershed quality is essential for communities, organizations and agencies to appropriately deal with the issues of watershed and stream degradation now and in the future.

# Brandywine Creek Impervious Cover

Approximately 22% of the Brandywine Creek watershed is covered by impervious surfaces. Many of these surfaces contain no stormwater management devices and directly drain and contribute excessive runoff to receiving streams, causing downstream flooding and property erosion.

Research indicates that 15% is the maximum percentage of impervious cover in which streams can still commonly meet aquatic life standards. However, when important watershed features exist, such as forested riparian corridors and influx of groundwater, streams may still meet attainment even at greater levels of urban land use. (Yoder et al., 2000)



# Brandywine Creek Forest Canopy Cover

An important, yet often undervalued, resource in urban watershed management is forest canopy cover. A healthy forest system can save communities storm water infrastructure costs by intercepting rain, increasing ground absorption and slowing the rate of runoff. A strong correlation exists between the extent of forest canopy cover and the health and functioning of a watershed and its streams.

Data indicates that forest canopy in Brandywine Creek has decreased significantly. As of 2001, 38% of the watershed was wooded. Future watershed management opportunities include:

1. Working with the communities to develop target canopy cover goals that are appropriate for the level of development and for optimal watershed function;
2. Developing a tree canopy program that can be implemented by communities to preserve and restore canopy on public and private lands.



# Brandywine Creek Water Quality & Biological Integrity

The quality of water and the health of aquatic life in Brandywine Creek is a useful indicator of the collective land use conditions in the watershed. Problems with poor water quality or aquatic life do not simply originate from a factory effluent pipe. They originate with the way land is used throughout the watershed. The problems can often be initiated by the location of development (i.e. building in flood zones or riparian corridors) and the design of the development (development that creates large amounts of impervious cover and stormwater runoff).

## USE ATTAINMENT IN BRANDYWINE CREEK

Brandywine Creek is designated by Ohio EPA as a “Warm Water Habitat”. This designation means that Brandywine Creek should be able to support a well-balanced population of fish and aquatic insects. However, increased urbanization and resultant runoff continues to be a major pollution source that needs to be addressed throughout the creek.

## HABITAT EVALUATION

In 2002 the Northeast Ohio Regional Sewer District assessed aquatic habitat conditions at two sites, one at River mile 8.0, approximately .2 kilometers upstream of the decommissioned Hudson Wastewater Treatment Plant and the other approximately 10-15 feet downstream of the former discharge. Investigators used Ohio EPA’s Qualitative Habitat Evaluation Index (QHEI.)

The scores revealed below average habitat conditions at both sites. A variety of conditions pointed to poor fish community conditions:

- extremely low flow leaving underdeveloped pools and riffles, absence of deep pools and lack of functional substrate such as submerged boulders to provide cover and macroinvertebrate shelter structures;
- stream habitat alterations from Ohio Department of Transportation (ODOT) reconstruction of a bridge, approximately 100 feet upstream of the sites, left formerly deep pools filled in and sedimentation, spars instream cover, embedded stream bottom substrates and no riffles.

Index of Biological Integrity (IBI) scores averaged in the “Fair” range. Scores upstream stayed relatively constant from 1998 to 2002, while scores downstream fell from “Fair” to “Poor”.

(Greater Cleveland Area Environmental Water Quality Assessment, 1999 - 2002, NEORS.D.)



# Brandywine Creek

## Major Issues to Manage in the Brandywine Creek Watershed

- Storm Water - Flooding
- Loss of Wetlands
- Addressing Remaining Large Land Tracts (or undeveloped sites)
- Loss and Fragmentation of Forest Canopy and Natural Areas
- Critical Downstream Natural Resources
- Integrating Balanced Growth Plans into local master plans and regulations

## Methodology

Step 1. Identify and Evaluate Community Issues and Desires (ie. frequent flooding etc.)

Step 2. GIS Data Analysis of Brandywine's Natural Features

Step 3. Qualitative Assignment of Natural Features: Reflect Community Needs & Watershed Function

Step 4. Identify Undeveloped Land with Relation to Natural Features

Step 5. Identify Priority Conservation Areas & Priority Development Areas

The Brandywine Creek Balanced Growth Plan has been developed to provide a proactive approach to managing development and ensuring the protection of natural resources and watershed function. The Plan provides guidance on which land is suitable for development and conservation as well as, how such land can be preserved and protected.

The process to identify Priority Conservation Areas (PCAs) and Priority Development Areas (PDAs) began with identifying community needs and incorporating these ideas into the planning process. Numerous Watershed Planning Partnership meetings were conducted. We solicited feedback from the partnership to help shape the evaluation criteria for identifying conservation and development areas.

Each community representative received a scoring priority worksheet titled "Scoring Priorities for Conservation of Important Watershed Features". The worksheet listed the watershed features and their associated function, as noted in table 1 on the next page. Each person was asked to rank the importance of each item. These individual member responses were combined to create a composite prioritized list of the features which the Partnership used to identify areas that should be conserved, the PCAs. The prioritised list follows in Step 5, page 56.

Similarly, a worksheet was provided to community representatives titled "Scoring Priorities for Priority Development Areas." The criteria used drew upon the work of the Ohio Lake Erie Commission's development suitability technical advisory committee, which determined those factors that are most important to the development community. Table 2 on the next page lists the top ten factors for the three principal development categories. Again, the Partnership created a composite prioritized list to identify the PDAs. That list is also in the Step 5 section, page 57.

# Step I: Identify and Evaluate Community Issues

## DEVELOPING EVALUATION CRITERIA

Table 1: Scoring Priorities for Conservation of Important Watershed Features
Areas with potential for green space connections and new trails
Areas in imminent danger of property damage or loss from flooding or erosion
Areas adjacent or in close proximity to Metropark / CVNP / Local Parks
Areas that provide multiple functions and benefits –e.g. trails in riparian corridors
Floodplains for Flood water management purposes
Floodplains for open space/ park purposes
Forest Corridors for Flow and bank stability purposes
Forest Areas which provide scenic vistas
Forest Areas which provide significant habitat and connections
Large land tracts for significant Vistas / Green space
Soils which allow high infiltration for storm water
Soils which are highly erosive and fragile
Soils which support wetlands
Small streams and Primary Headwater areas for flow management
Steep Slopes for Erosion protection
Steep slopes for vistas
Stream banks and adjacent vegetated corridors for erosion prevention
Stream Banks and adjacent vegetated corridors for habitat benefit
Wetlands for Water quality and filtering
Wetlands for Flood Water Management
Wetlands for Habitat enrichment

Table 2: Top Ten Development Suitability Factors		
RESIDENTIAL	COMMERCIAL	INDUSTRIAL
1. Public water availability	1. Public water availability	1. Proximity to highway
2. Public sewer availability	2. Public sewer availability	2. Public sewer availability
3. Pro-development community attitude	3. Median household income in community	3. Public water availability
4. School quality	4. Community population density	4. Land availability
5. Land cost	5. Proximity to highway	5. Proximity to highway interchange
6. Median household income in community	6. Community growth characteristics	6. Pro-development attitude of community
7. Land availability	7. Land availability	7. Proximity to employees.
8. Community growth characteristics	8. Pro-development community attitude	8. Land cost
9. Proximity to highway	9. Proximity to highway interchange	9. Soil type / stability
10. Proximity to highway interchange	10. Proximity to other commercial development	10. Median household income

## Step 2: GIS Data Analysis of Brandywine Creek Natural Features

The process for developing evaluation criteria to identify priority conservation and development areas in the Brandywine Creek Watershed was a necessary first step in creating the balanced growth plan. Based on the results of the scoring priorities, a Geographical Information Systems (GIS) approach was used to identify watershed characteristics that best reflected the community's needs.

### GIS ANALYSIS

Geographical Information Systems (GIS) are some of the most comprehensive tools available for watershed and land use planning. The implementation of GIS can not only reduce time needed for analyzing information about a watershed, but can also ensure a more efficient use of resources. GIS enables users to display large amounts of data graphically to greatly enhance interpretation and analysis.

The Brandywine Creek planning process included numerous data layers from the most current available data sources to map existing landscape features, both natural and manmade. This provides a starting point from which to formulate future land use scenarios.



## Step 3: Qualitative Assignment of Natural Features Reflect Community Needs & Watershed Function

The key resource data layers were identified and run through a qualitative analysis. Resource layers were measured based on their importance to watershed function and how they matched up to the local community needs (see Table #2 Qualitative Criteria Focus). A qualitative assignment was necessary to prioritize the environmentally sensitive areas in the planning area for their value in maintaining a healthy watershed and to begin to recognize degrees of sensitivity as they relate to proposed future land uses.

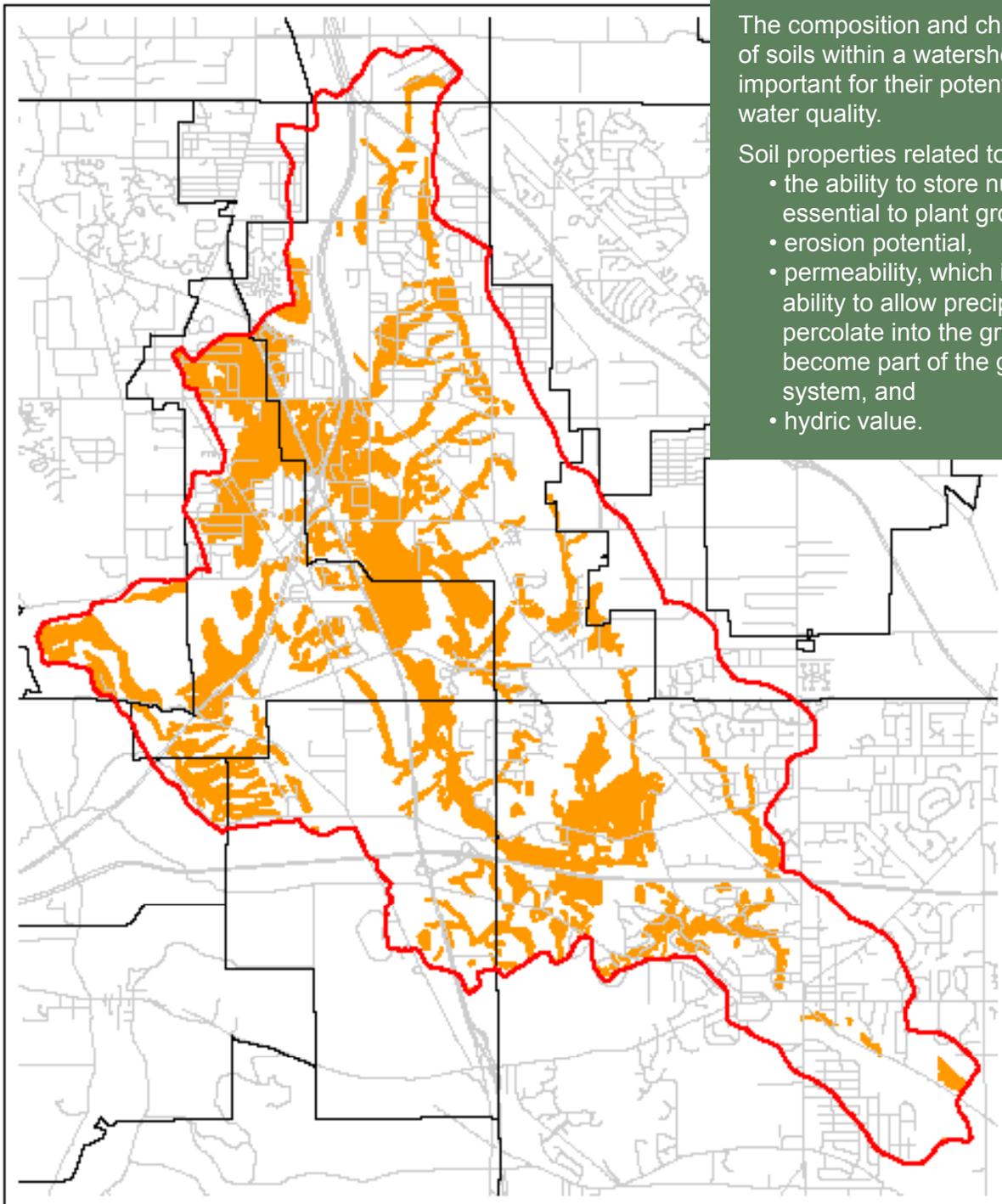
Table 2: Qualitative Criteria Focus

1. Water Quantity Management
  - Stormwater & Flood Management
2. Soil Conservation
  - Minimize Erosion
3. Optimizing Green Infrastructure Services
  - Use the natural resources of the watershed to provide storm water services

### Key Natural Resource GIS Data Layers

- A. Soils-
  - Infiltration Rate
  - Drainage Rate
  - Hydric
  - Erodibility
- B. Steep Slopes
  - Slopes > or = 12%
- C. Streams
  - Headwaters Streams
  - Primary Headwater Streams
- D. Floodplains
  - 100 year flood zone
  - 500 year flood zone
- E. Riparian Corridors
  - 75 ft. width
  - 25 ft. width
- F. Wetlands
- G. Forest Cover
  - Forested Areas (dominated by trees).  
2002 orthophotos by CVNP

## Natural Feature: Critical Soils



The composition and characteristics of soils within a watershed are important for their potential impacts on water quality.

Soil properties related to this are

- the ability to store nutrients essential to plant growth,
- erosion potential,
- permeability, which is the soil's ability to allow precipitation to percolate into the ground and become part of the groundwater system, and
- hydric value.

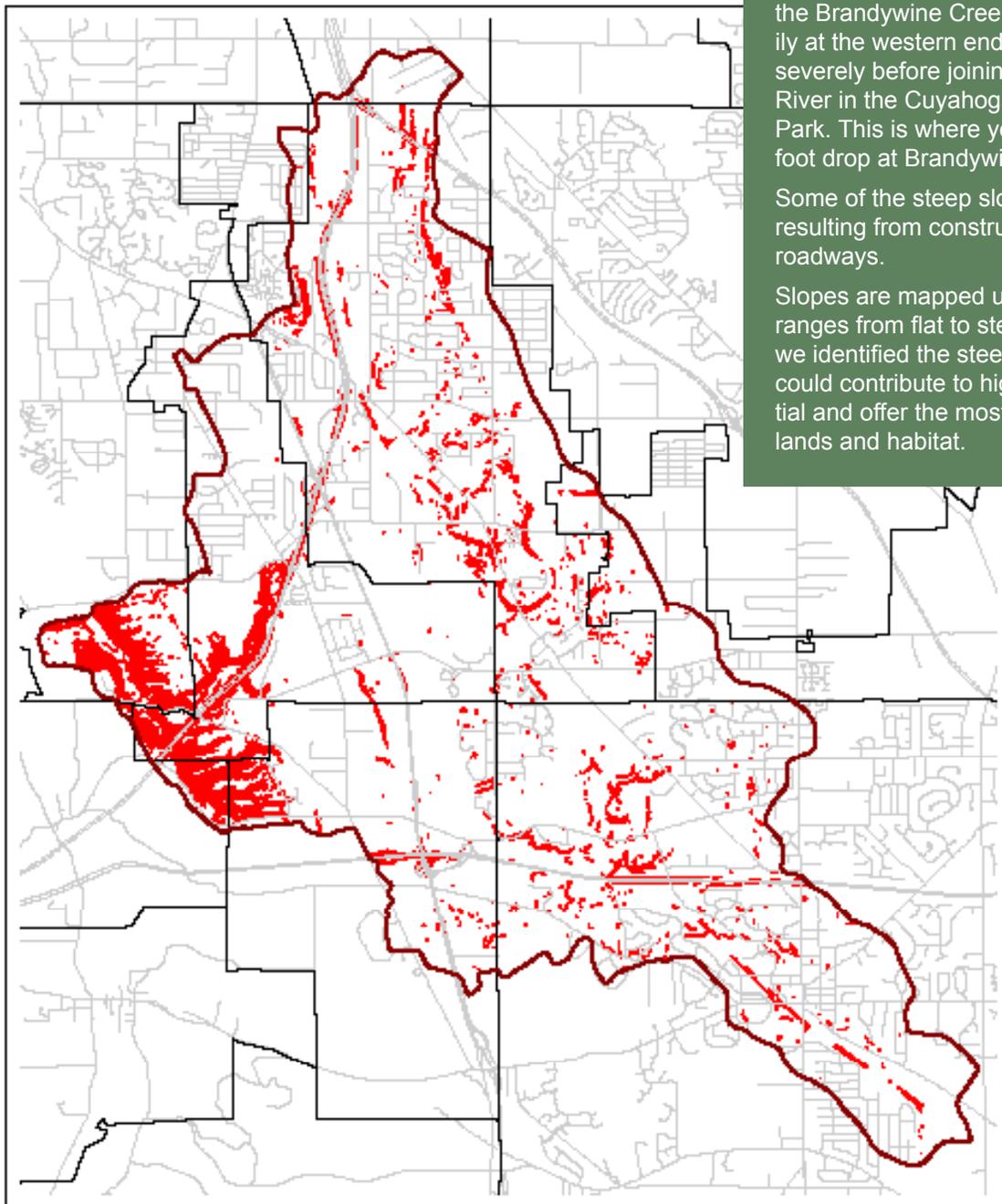
**Soil Infiltration Rate:** Rate at which water penetrates the surface of the soil at any given instant. The rate at which infiltration takes place, usually in inches per hour, can be limited by infiltration capacity of the soil.

**Infiltration Parameters:** Unrated / Moderate / Slow / Very Slow

Moderate soil infiltration rate was selected. Areas that contain these soil conditions help absorb stormwater more quickly and thereby minimize runoff and erosion rates downstream. These are "working soils" which are providing a valuable function to the communities.

# Brandywine Creek

## Natural Feature: Steep Slopes



Steep slopes are distributed throughout the Brandywine Creek Watershed, primarily at the western end where it drops most severely before joining the Cuyahoga River in the Cuyahoga Valley National Park. This is where you will find the 65-foot drop at Brandywine Falls,

Some of the steep slopes are man-made, resulting from construction along major roadways.

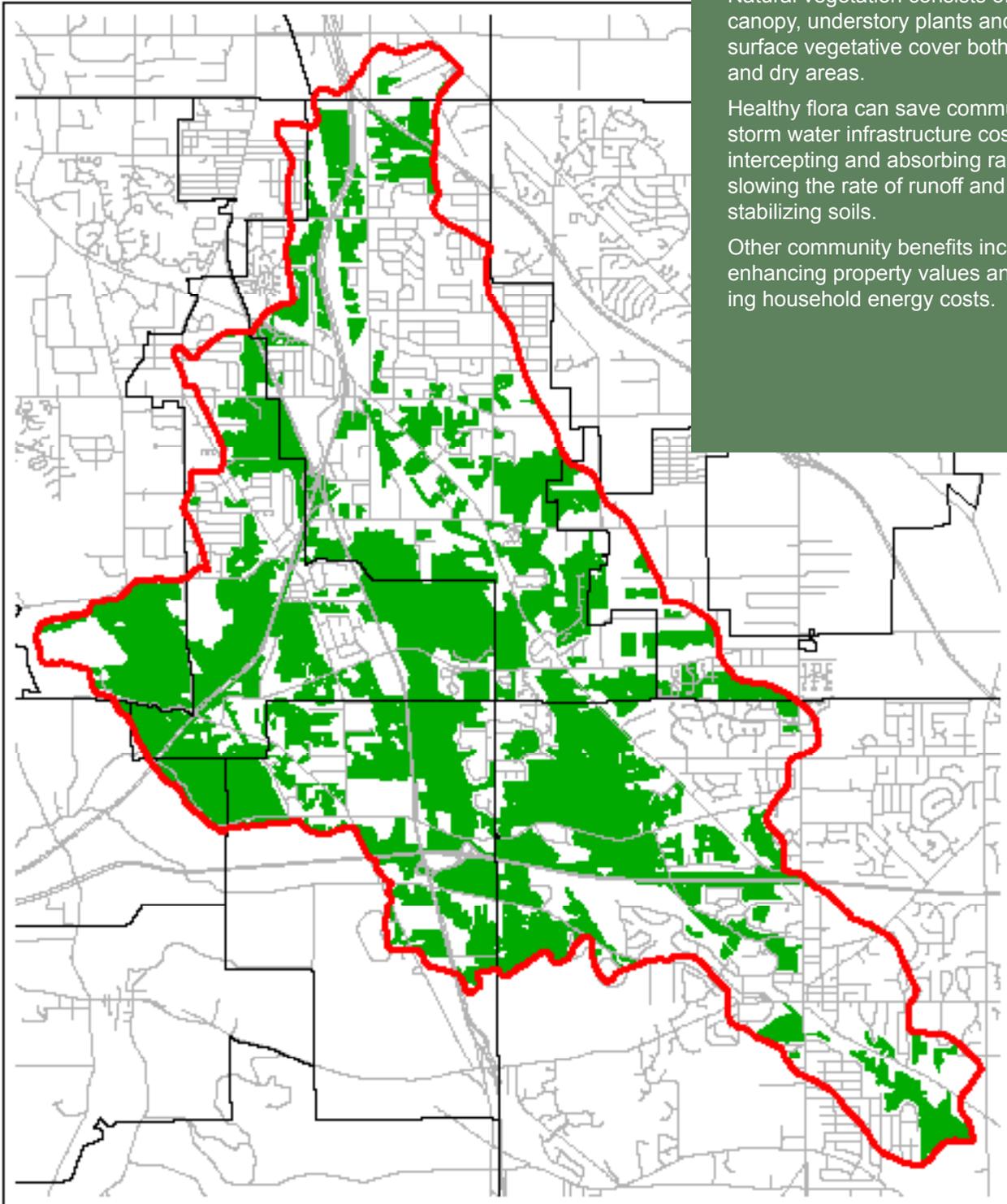
Slopes are mapped using a scale that ranges from flat to steep. For our analysis, we identified the steep sloped areas that could contribute to higher erosion potential and offer the most value for sensitive lands and habitat.

Slopes with a grade of 15% or more are considered steep slopes. Vegetated steep slopes provide an important resource to be preserved because any significant disturbance to the hillside's environment may result in: landslides or land instability, unacceptable alteration in the drainage patterns and loss of scenic value all of which pose risks to local property owners.

Slope Parameters: 0-5%, >5-10%, >10-15%, >15-20%, >20-25%, Over 25%

Steep slopes with grade of 12% or more were selected. The need to protect these slopes is based on percent and length of slope, the fact that soils in these areas are often easily erodible, and that other important natural resources (ex. streams and wetlands) can be in close proximity.

# Natural Feature: Natural Vegetation



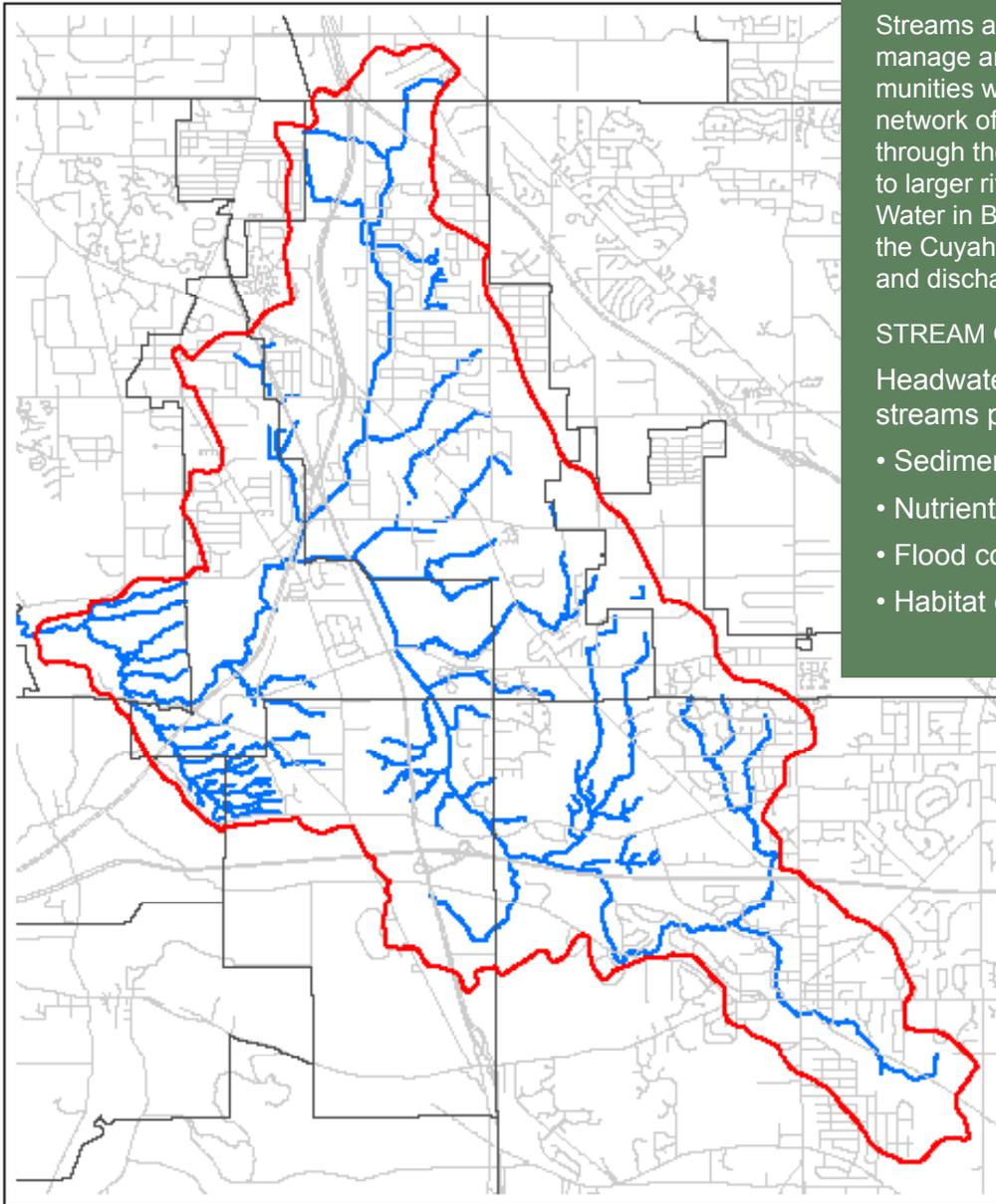
Natural vegetation consists of tree canopy, understory plants and low, surface vegetative cover both in wet and dry areas.

Healthy flora can save communities storm water infrastructure costs by intercepting and absorbing rain, slowing the rate of runoff and stabilizing soils.

Other community benefits include enhancing property values and reducing household energy costs.

# Brandywine Creek

## Natural Feature: Streams



Streams are the conduits that receive, manage and distribute water. The communities within a watershed drain to a network of streams that transport water through the system, from small streams to larger rivers and eventually to a lake. Water in Brandywine Creek flows into the Cuyahoga River and finally reaches and discharges into Lake Erie.

### STREAM ORDER

Headwater and primary headwater streams provide:

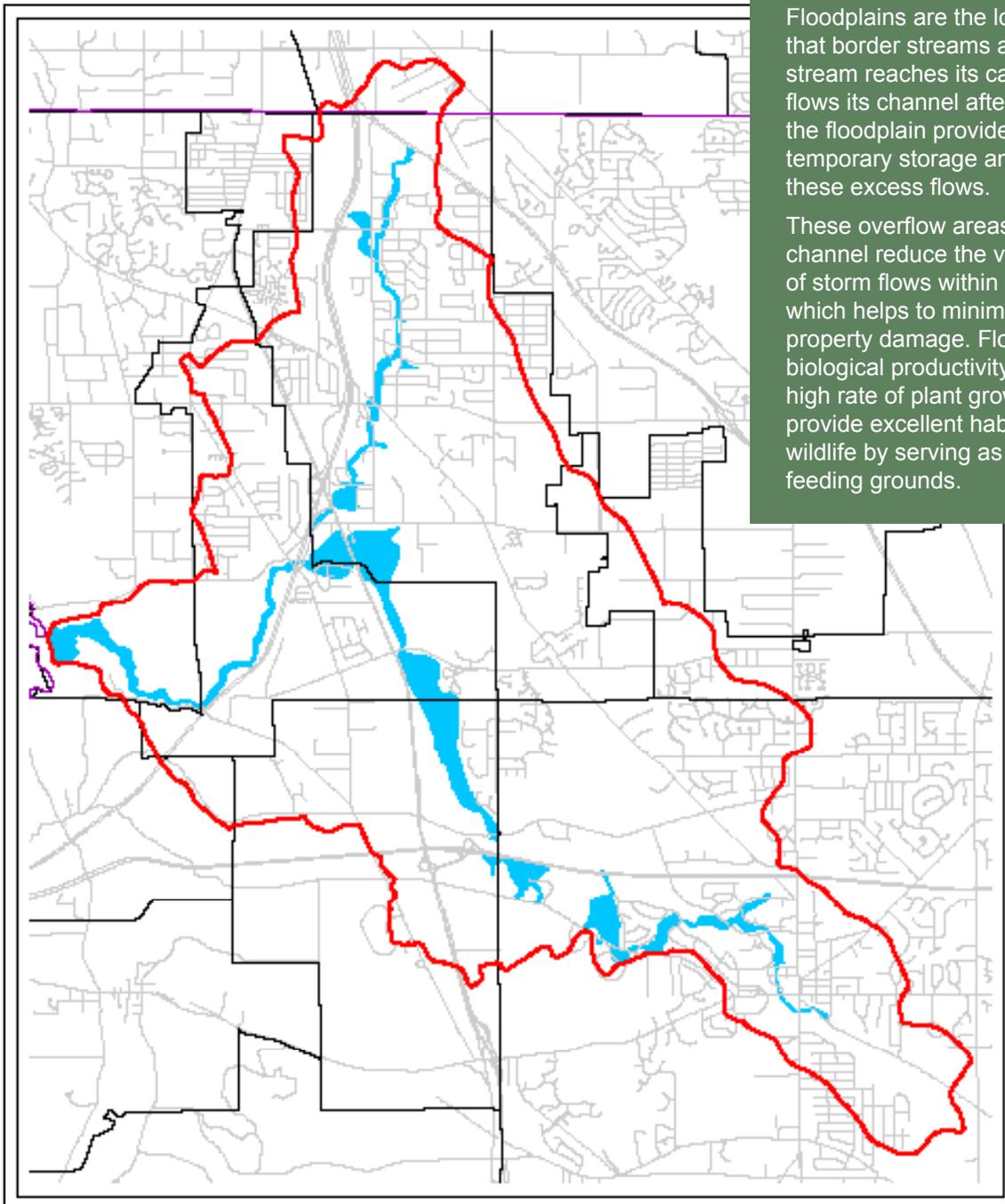
- Sediment control
- Nutrient control
- Flood control
- Habitat corridors

For our analysis, streams with their associated sub-watershed were identified and sorted into two primary groups: Streams that have a drainage area of approximately 0.5-20sq miles and streams that drain approximately <0.5 sq. miles. The streams were organized in this manner to help determine riparian width size.

**Headwater Streams-** Streams that drain a watershed of 20 sq. miles or less are called headwater streams. These are the creeks and streams that feed larger rivers. These small streams join together to form larger streams and rivers or run directly into larger streams and lakes. Brandywine Creek, by definition, is a headwater to the Cuyahoga River. When headwater streams become damaged or impaired, the larger, downstream river will suffer as well.

**Primary Headwaters Streams-** Streams that drain a watershed less than 1sq. mile are called primary headwater streams. Every stream begins somewhere. That somewhere is its primary headwaters. Primary headwater streams are like the capillary system of a blood supply network- just as the health of the whole organism depends upon a functioning capillary system, the health of larger streams and rivers depend upon an intact primary headwater stream network.

# Natural Feature: Floodplains



Floodplains are the low-lying flat lands that border streams and rivers. When a stream reaches its capacity and overflows its channel after storm events, the floodplain provides land area for temporary storage and conveyance of these excess flows.

These overflow areas outside the channel reduce the volume and energy of storm flows within the channel, which helps to minimize downstream property damage. Floodplains enhance biological productivity by supporting a high rate of plant growth. Floodplains provide excellent habitats for fish and wildlife by serving as breeding and feeding grounds.

For our analysis, the 100 year and 500 year floodplain was identified.

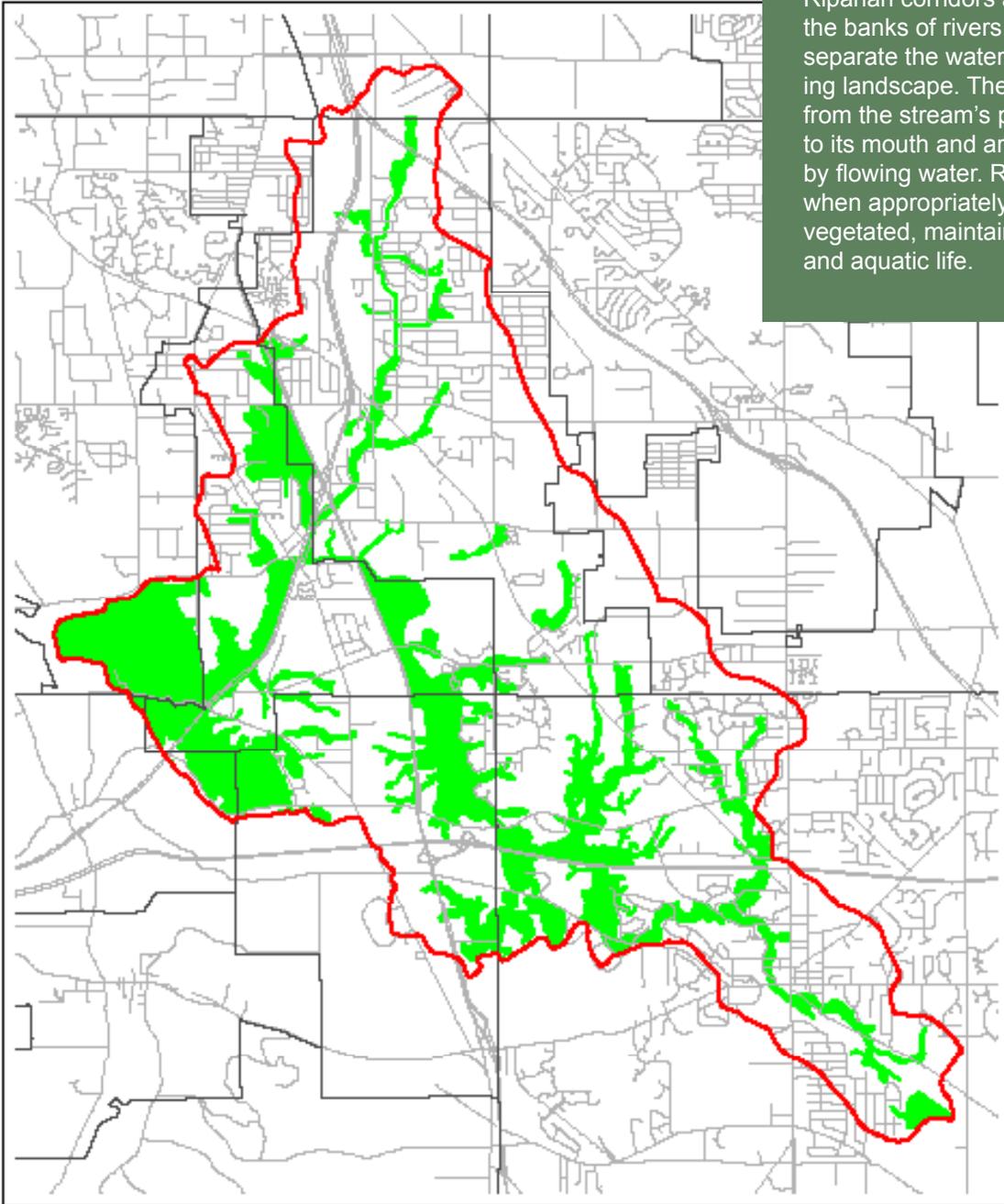
**100 Year Flood Plain:** An area of land that would be inundated by a flood having a 1% chance of occurring in any given year – also referred to as the 100 year flood. A 100 year flood is calculated to be the level of flood water expected to be equaled or exceeded at least once in a 100-year period.

**500 Year Flood Plain:** An area of land that would be inundated by a flood having a 0.2% chance of occurring in any given year – also referred to as the 500-year flood. A 500 year flood is calculated to be the level of flood water expected to be equaled or exceeded at least once in a 500-year period.

# Brandywine Creek

## Natural Feature: Riparian Corridors

Riparian corridors are the lands along the banks of rivers and creeks that separate the water from the surrounding landscape. These corridors stretch from the stream's primary headwaters to its mouth and are directly influenced by flowing water. Riparian corridors, when appropriately sized and well-vegetated, maintain healthy streams and aquatic life.



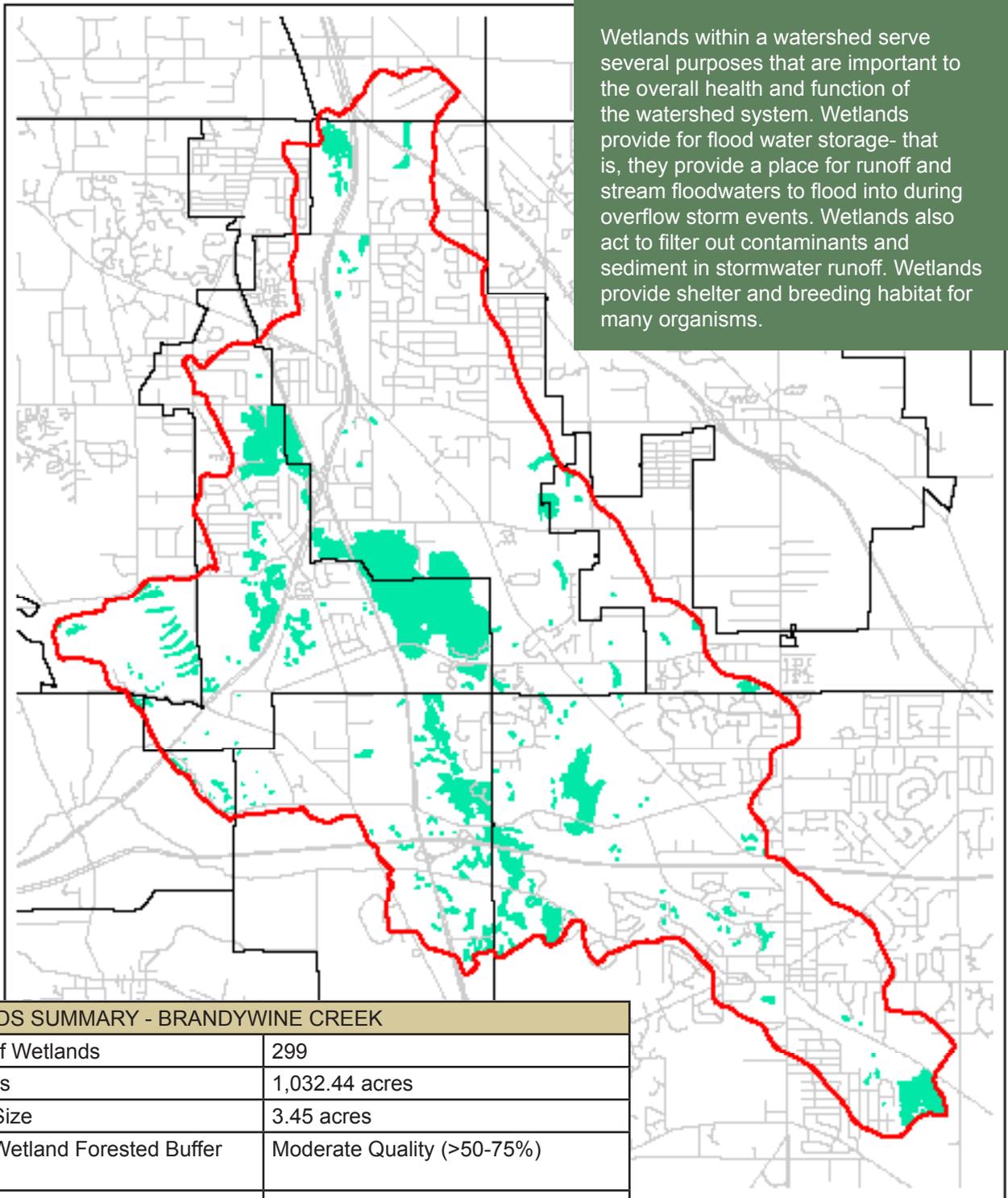
For the riparian corridor analysis, stream drainage areas of 0.5-20 sq. miles and <0.5 sq. miles were incorporated to determine riparian width. Recommended riparian corridor setback distances are based on the analysis of scientific studies that indicate the minimum setbacks required to maintain the functioning of riparian areas. These distances change as streams and their drainage areas get larger.

A 75 ft. riparian setback is recommended for streams that have a drainage area of 0.5-20 sq. miles

A 25 ft. riparian setback is recommended for streams that have a drainage area of <0.5 sq. miles

# Natural Feature: Wetlands

Wetlands within a watershed serve several purposes that are important to the overall health and function of the watershed system. Wetlands provide for flood water storage- that is, they provide a place for runoff and stream floodwaters to flood into during overflow storm events. Wetlands also act to filter out contaminants and sediment in stormwater runoff. Wetlands provide shelter and breeding habitat for many organisms.



WETLANDS SUMMARY - BRANDYWINE CREEK	
Number of Wetlands	299
Total Acres	1,032.44 acres
Average Size	3.45 acres
Average Wetland Forested Buffer Condition	Moderate Quality (>50-75%)
Top Ten Wetland Acres	554.26 acres
Top Ten Average Size	55.43 acres
Top Ten Average Wetland Buffer Condition	Moderate Quality (>50-75%)
Total Restoration Potential Costs	\$1,910,127

# Brandywine Creek

In June of 2008, the Cuyahoga River Community Planning Organization produced a report titled, “Prioritizing Wetland Restoration Potential in the Tributaries of the Cuyahoga River Area of Concern (AOC,)” under a grant from the Ohio EPA. The analysis undertaken and assessments resulting from that study are meant to inform and provide scientific bases for conservation and restoration projects, and to help communities identify potential sites to support their efforts toward in-watershed mitigation.

Since wetlands provide valuable ecosystem services, a watershed planning model is needed to strategically identify key wetlands for conservation. Systematically identifying and conserving such sites can help maximize stormwater management, non-point source pollution control and watershed protection efforts in the Cuyahoga River AOC.

The goal of the project was to identify wetland sites to target for future conservation efforts. A ranking model has been developed to assist in identifying the “top wetland sites” in each tributary watershed of the Cuyahoga River AOC. By identifying wetland sites, this project helps to expedite and focus efforts to meet mitigation needs, as well as make the best use of other public or private funding sources.

A watershed-level model was developed by using Geographic Information System (GIS) to identify wetland sites based on analysis of overall:

- 1) **Watershed Performance-** We identified key wetland sites based on a ranking system. The ranking system highlights wetland sites that are specifically important for managing water quality and quantity. Directing conservation efforts at these sites can help maximize the improvement of our stream resources. The top wetland sites identified through the ranking system are then examined for restoration potential.
- 2) **Restoration Potential-** We analyzed land cover in the 50m buffer surrounding the key wetland sites. The intensity of land cover (measured in percent) surrounding a wetland affects restoration and enhancement options and influences the long-term effectiveness of projects. Restoration and enhancement options are examined in relation to land cover stressors. Options will be examined in the wetland itself and the land area or buffer around the wetland.

Options for restoration and enhancement are analyzed from field analysis data and/or aerial photography. Not all wetland sites in the study area have field data. However, when available, field data is the primary source for guiding conservation options. Aerial photography, supporting literature and best professional judgment will guide conservation options for wetland sites lacking field data.

We define restoration, enhancement, preservation, and conservation below:

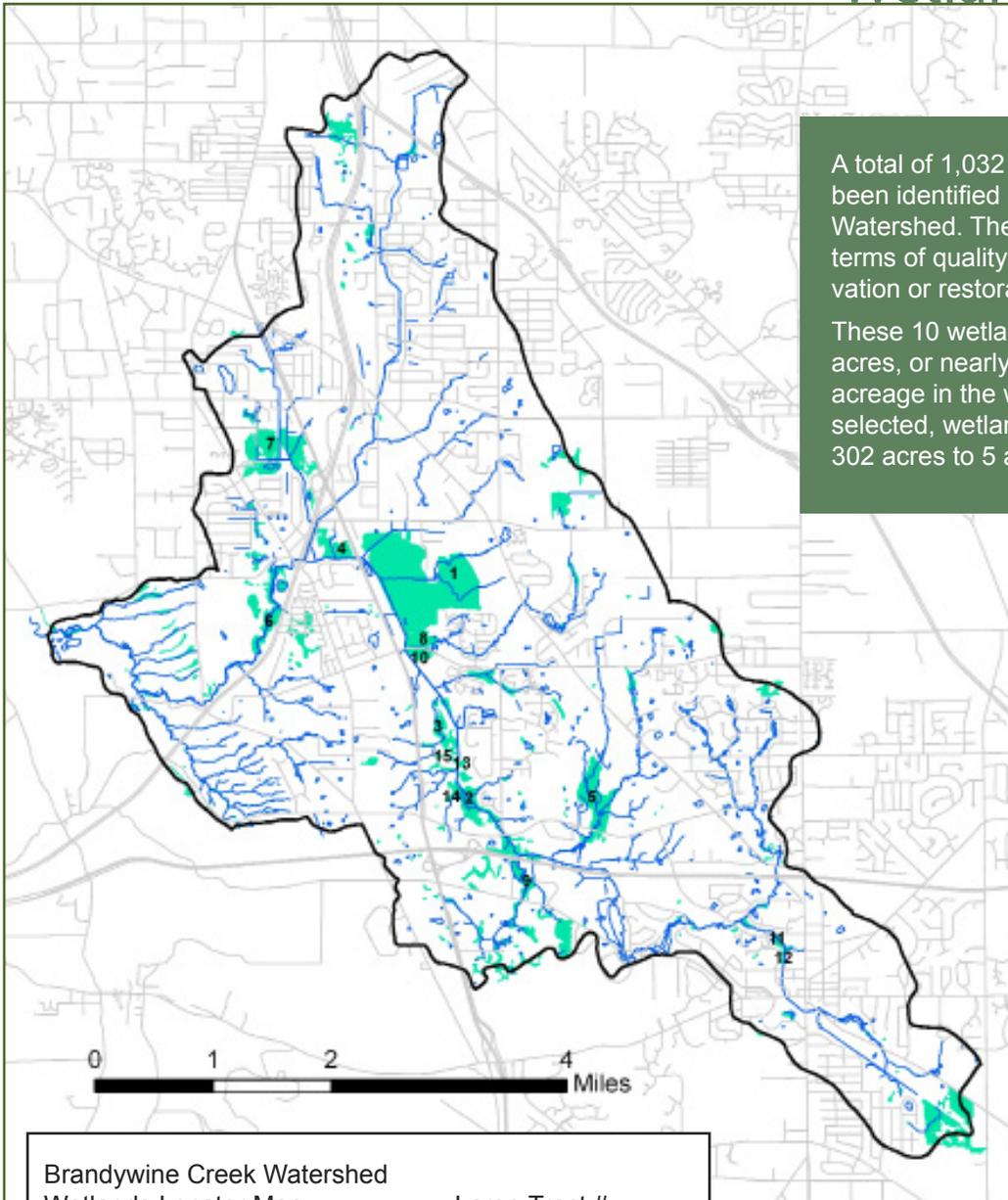
- Restoration means the rehabilitation of a degraded wetland or a hydric soil area that was previously a wetland.
- Enhancement means improving upon the function of an already existing wetland.
- Preservation means the protection of ecologically important wetlands, other aquatic resources, or other natural habitats in perpetuity through the implementation of appropriate legal and physical mechanisms.
- Conservation refers to any one or combination of restoration, enhancement and preservation.

The objectives in this project included:

1. Identify all existing wetlands in each tributary watershed. This involves gathering and integrating data from multiple credible sources.
2. Develop a ranking methodology to prioritize all the wetland sites, within each tributary, based on water quantity and quality performance.
3. Identify the top ten wetland sites in each of the eleven tributary watersheds to the Cuyahoga River in the AOC, with a goal of 110 wetland project sites assembled.
4. Establish restoration and enhancement options for each wetland site.
5. Assemble a library of cost estimates for the various types of conservation options.

Descriptive details for each of the top ten priority wetlands follow. A large tract number is also listed for each wetland. This is the same number assigned in the next step (4) of the watershed characterization process in which remaining large tracts are identified and designated as PCAs, PDAs or a hybrid.

# Brandywine Creek Wetlands Prioritized

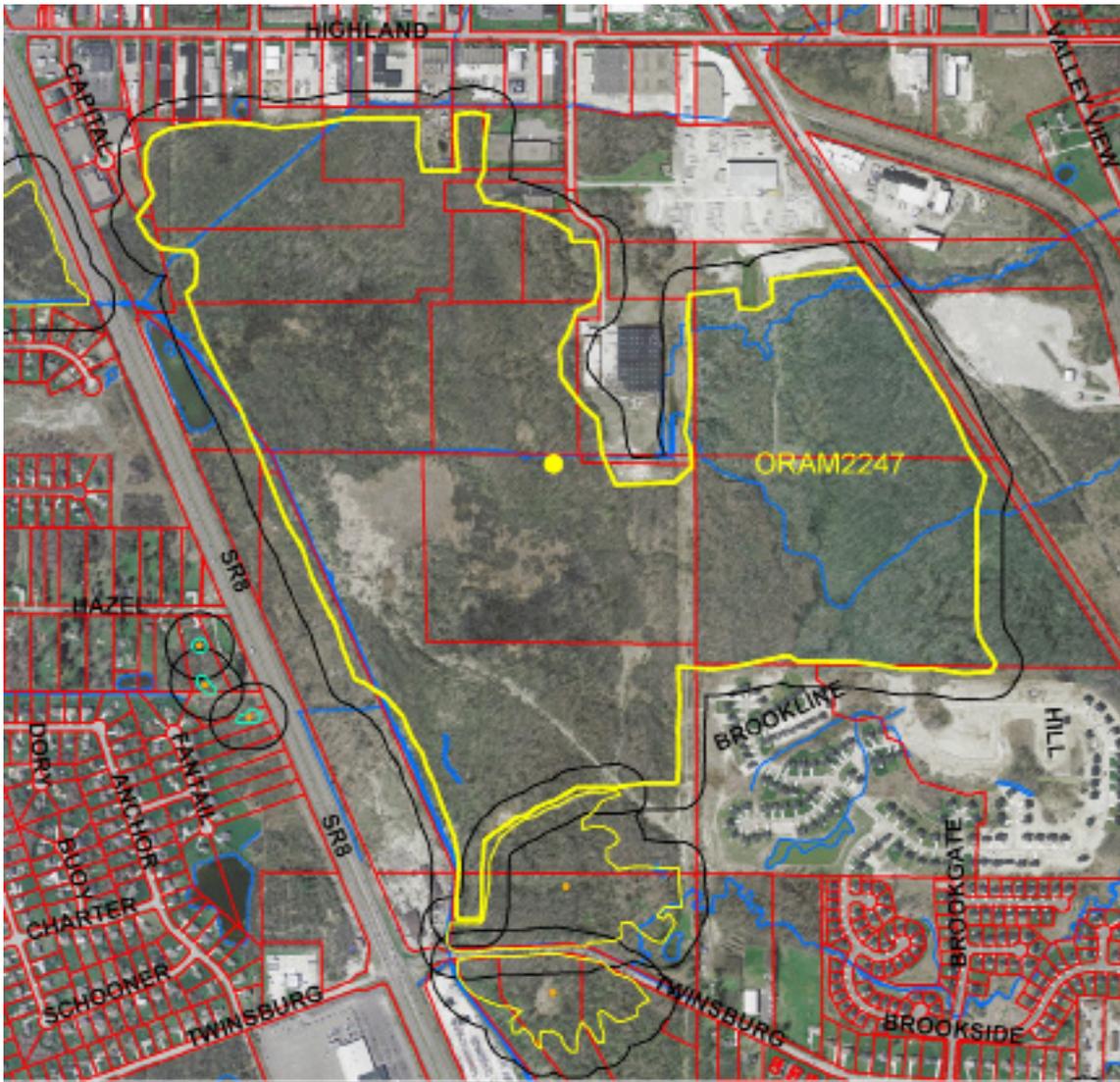


A total of 1,032 acres of wetlands have been identified in the Brandywine Creek Watershed. The top 10 wetlands sites in terms of quality and feasibility of conservation or restoration, are shown here.

These 10 wetlands sites equal 554 acres, or nearly 54% of the total wetland acreage in the watershed. Of the sites selected, wetland sizes range from 302 acres to 5 acres.

Brandywine Creek Watershed Wetlands Locator Map	Large Tract #
Wetland Ranked #1: ORAM2247	12
Wetland Ranked #2: SMP_BW2331	21, 25 portions
Wetland Ranked #3: SMP_BW2330	21
Wetland Ranked #4: SMP_BW2324	11
Wetland Ranked #5: ORAM2203	24
Wetland Ranked #6: SMP_BW2326	15
Wetland Ranked #7: ORAM2318	7
Wetland Ranked #8: SumDRG_BW276	12
Wetland Ranked #9: SumDRG_BW138	28
Wetland Ranked #10: MP_BW2329	21

# Brandywine Creek Wetlands Prioritized



**Brandywine Creek Wetland Ranked #1: ORAM2247**

Scale: 1:13,000

Large tract # 12 (PCA)

**Map Key**

- Yellow Lines -Wetland boundary
- Yellow Points -Centroid point calculated from wetland polygon
- Black Lines -Wetland 50m buffer
- Green Lines -Other wetlands
- Blue Lines -Streams
- Red Lines -Parcel boundary

Base Layer -Ohio 2006 orthophotos

# Brandywine Creek Wetlands Prioritized

Ranked #1: WETLAND ID# ORAM2247 Site Description	
Wetland Classification (Hydrogeomorphic or Corwardin)	Riverine Mainstem Wetland
Size (acres)	302.94
ORAM Score (if available)	Category 2
Wetland Buffer Condition	Low Quality
Impacts (Field Assessments)	Hydrologic Modification (roadbed) Sedimentation Contaminants (spill) Vegetation Alteration (cutting)
Restoration Potential	Stream Restoration Remove Invasive Plants Riparian/Wetland Plantings
Ownership (Public or Private)	Private
Number of Parcels	27 Parcels / 17 Property Owners
Location (Lat/Long)	41.2916792136 / -81.5023903499
Community	Northfield Center Township & Macedonia

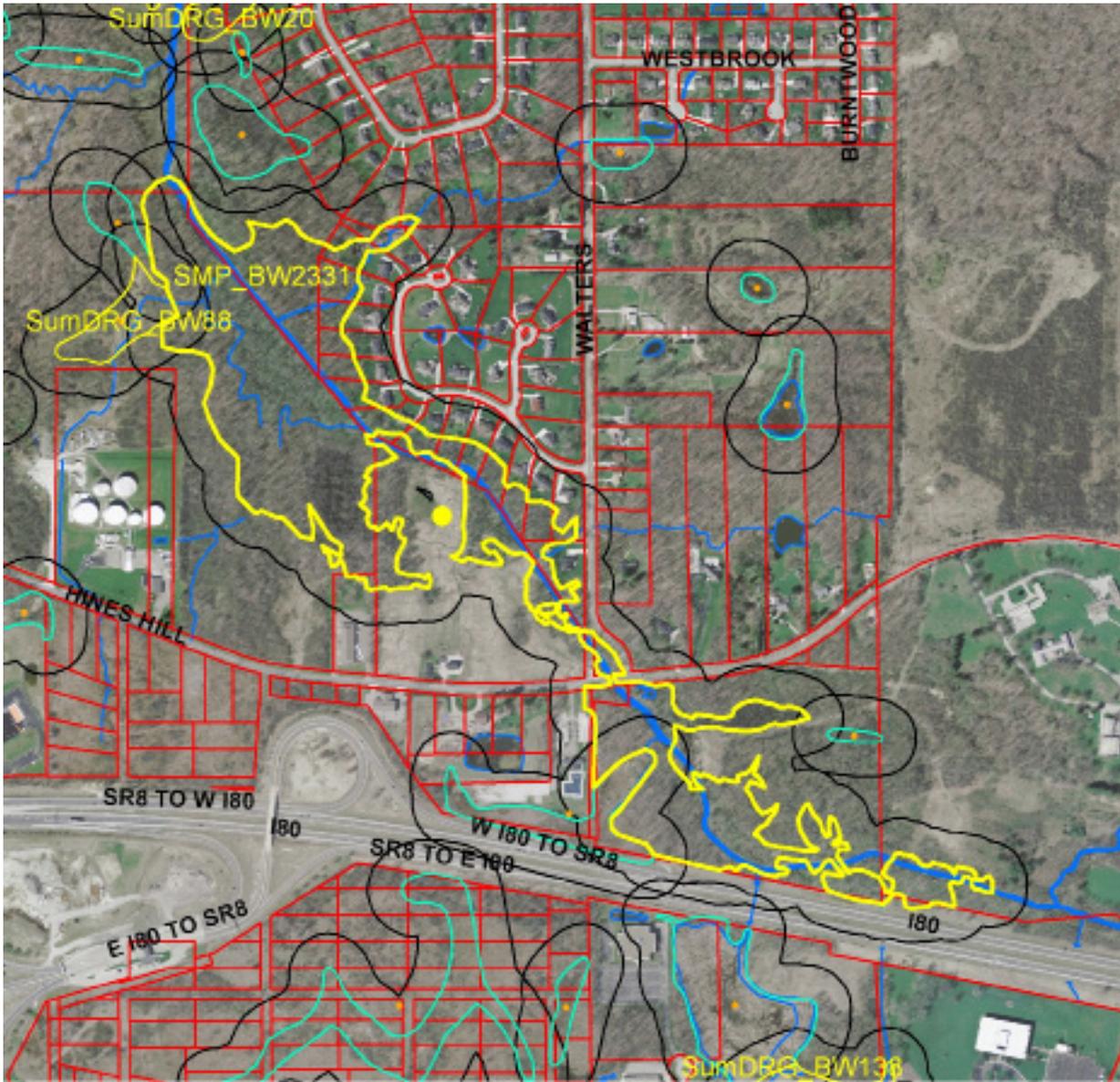
Wetland ORAM2247 is a 302-acre, riverine mainstem wetland located along Brandywine Creek in the middle of the watershed. Notable features include the size of the wetland, its location in the floodplain and riparian corridor of Brandywine Creek. This wetland is currently being impacted by the Route 8 expansion project and proposed surrounding development. Wetland ORAM2247 is located in Northfield Center Township and Macedonia. Ownership complexity is high with 27 parcels and 17 property owners.

Wetland ORAM2247 is a category 2 wetland. The wetland has good connectivity; it is located on the 100 year flood plain and provides a buffering effect to downstream water quality from human land uses upstream. This site has moderately good habitat development which is an important ecological indicator for biodiversity. A field assessment prior to the Route 8 expansion noted the wetland was still recovering from recent impacts from surrounding land use. Impacts included hydrologic modification from nearby roadbed(s), excessive sedimentation, contamination was noted probably from upstream runoff, cutting of woody vegetation, and 25-75% invasive plant species coverage. Sources of water entering the wetland are precipitation and seasonal/intermittent surface water indicated by streams flowing through the complex.

A combination of wetland enhancements and restoration is possible in this area.

A more detailed study would have to be undertaken to determine the location and extent of the hydrological modification, but a potential stream restoration could occur. This could improve sinuosity and connection with the wetland. Invasive plant species is a problem in this area. Both uplands and wetlands invasive species would require treatment in this wetlands.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #2: SMP\_BW2331

Scale: 1:10,000

## Map Key

	Large Tract #21 (PDA**) and #25 portions (PCA)
Yellow Lines	-Wetland boundary
Yellow Points	-Centroid point calculated from wetland polygon
Black Lines	-Wetland 50m buffer
Green Lines	-Other wetlands
Blue Lines	-Streams
Red Lines	-Parcel boundary
Base Layer	-Ohio 2006 orthophotos
Projection	-Ohio State Plane North, NAD83

# Brandywine Creek Wetlands Prioritized

Ranked #2: WETLAND ID# SMP_BW 2331 Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Shrub/Scrub & Forested (PSS) (PFO)
Size (acres)	49.77
ORAM Score (if available)	Moderate Quality
Wetland Buffer Condition	N/A
Impacts (Field Assessments)	Remove Invasive Plants*
Restoration Potential	Riparian/Wetland Plantings*
Ownership (Public or Private)	Public & Private
Number of Parcels	29 Parcels / 29 Property Owners
Location (Lat/Long)	41.262438412 / -81.4920655163
Community	Boston Heights & Hudson

Wetland 2331 is a large 49-acre shrub/scrub and forested wetland located on the mainstem of Brandywine Creek. Notable features include the large size of the wetland, its location in the floodplain and riparian corridor of Brandywine Creek, numerous surrounding wetlands and a moderate quality forested buffer zone. This wetland is located in the communities of Boston Heights and Hudson. Ownership complexity is high with 29 parcels and 29 property owners. Three parcels are public property owned by Summit and Cuyahoga Counties.

Wetland 2331 is most likely a moderate quality wetland. This is due to the suburban nature of the watershed, fairly intact forested buffer zone and surrounding wetlands. These additional wetland sites should be included in any future conservation projects.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include removing invasive plants and adding riparian/wetland plantings.

The major land holder is Boston Heights Properties, with 38% of the site. The portion formerly owned by Cuyahoga County with 24% is now owned by the City of Hudson. Acquisition through easements and purchasing parcels should be pursued in detail.



# Brandywine Creek Wetlands Prioritized

Ranked # 3: WETLAND ID# SMP_BW2330 Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Shrub/Scrub & Forested (PSS) (PFO)
Size (acres)	21.24
ORAM Score (if available)	High Quality
Wetland Buffer Condition	N/A
Impacts (Field Assessments)	Remove Invasive Plants*
Restoration Potential	Riparian/Wetland Plantings*
Ownership (Public or Private)	Private
Number of Parcels	3 Parcels / 1 Property owner
Location (Lat/Long)	41.2731131397 / -81.4988467857
Community	Boston Heights & North Field Center Township

Wetland BW2330 is a 21-acre shrub/scrub and forested wetland and is located on the mainstem of Brandywine Creek. Notable features include the large size of the wetland, its location in the floodplain and riparian corridor, neighboring wetlands including BW20 and BW21 and a high quality forested buffer zone. This wetland is located in the communities of Boston Heights and North Field Center Township. Ownership complexity is easy with 3 parcels and 1 property owner. American Dream Productions is the owner.

Wetland BW2330 is most likely a moderate to high quality wetland. This is due to the intact forested buffer, relatively low intensity of the surrounding land use and the buffering effect provided by the surrounding wetlands. These additional wetland sites should be also be considered in any future conservation projects.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #4: SMP\_BW2324

Scale: 1:6,000

Large Tract #11 (PCA)

## Map Key

- Yellow Lines -Wetland boundary
- Yellow Points -Centroid point calculated from wetland polygon
- Black Lines -Wetland 50m buffer
- Green Lines -Other wetlands
- Blue Lines -Streams
- Red Lines -Parcel boundary
- Base Layer -Ohio 2006 orthophotos
- Projection -Ohio State Plane North, NAD83

# Brandywine Creek Wetlands Prioritized

Ranked #4: WETLAND ID# SMP_BW2324 Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested (PFO)
Size (acres)	22.21 acres
Wetland Buffer Condition	Low Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings* Stream Restoration
Ownership (Public or Private)	Public & Private
Number of Parcels	14 Parcels / 14 Property Owners
Location (Lat/Long)	41.2957057557 / -81.5161220598
Community	Macedonia

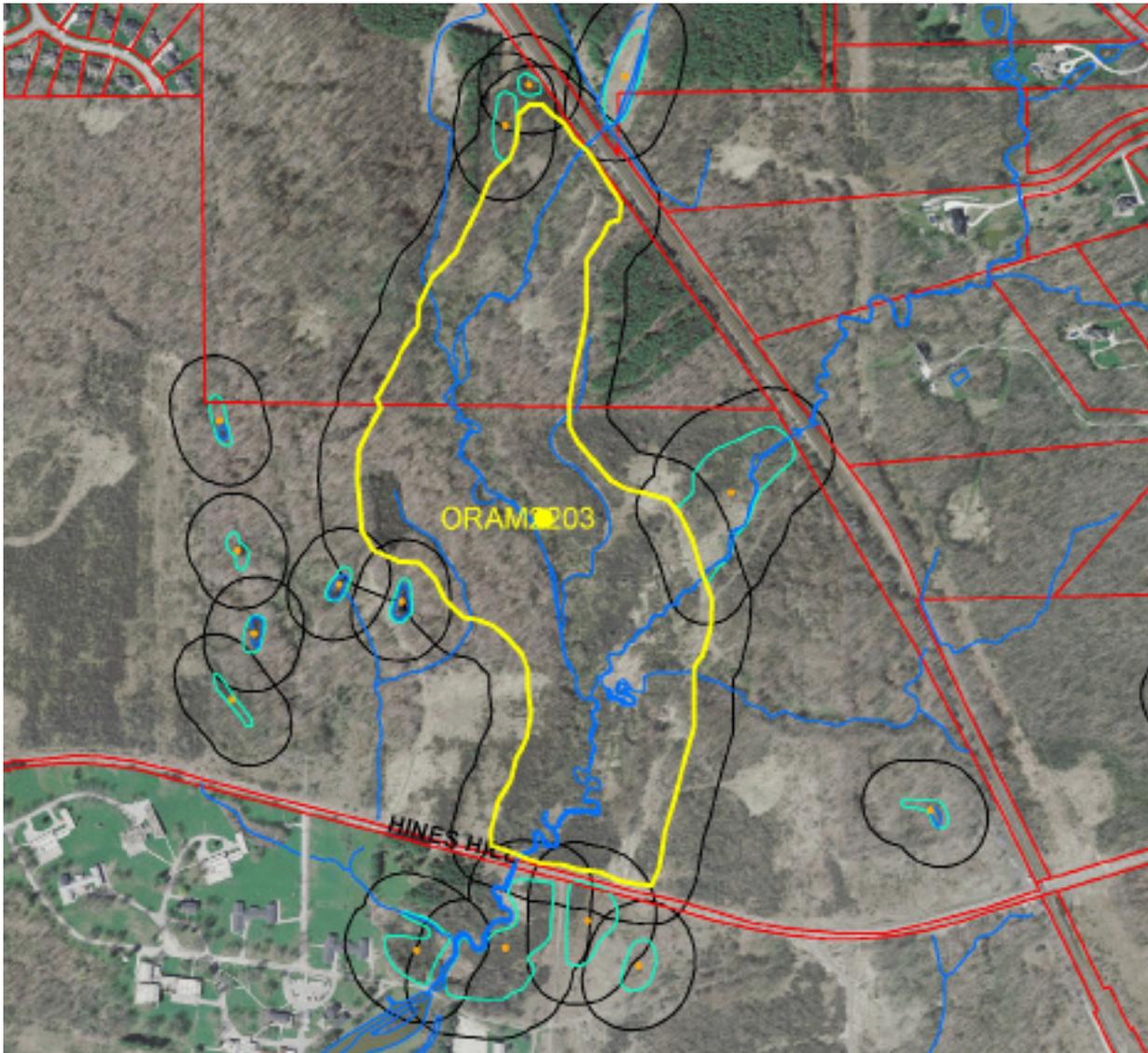
\* Extrapolated Restoration Potential

Wetland BW2324 is a large 22-acre forested wetland located on the mainstem of Brandywine Creek. Notable features include the large size of the wetland, its location in the floodplain and riparian corridor and a small tributary that bisects the site and feeds into Brandywine Creek. This wetland is located in the city of Macedonia. Ownership complexity is high with 14 property owners. However, the majority of the wetland is located on three parcels. Summit County owns 23% of the site.

Wetland BW2324 is most likely a moderate to moderately low quality wetland. This is in consideration of the low quality buffer condition, intensity of surrounding land use and it is directly downstream of the Route 8 expansion project. Another wetland is located just north of the site. Further investigation could determine that the small wetland is part of BW2324.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include removing invasive plants species, adding riparian/wetland plantings and pursuing site acquisition through conservation easements. Another option is to restore the stream channel, creating more sinuosity and connectivity with the wetland. Currently the stream appears to have been straightened from ditching activities. Discussions should begin with Summit County.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked#5: ORAM2203

Scale: 1:9,000

## Map Key

Yellow Lines

Large Tract #24 (PCA)

-Wetland boundary

Yellow Points

-Centroid point calculated from wetland polygon

Black Lines

-Wetland 50m buffer

Green Lines

-Other wetlands

Blue Lines

-Streams

Red Lines

-Parcel boundary

Base Layer

-Ohio 2006 orthophotos

Projection

-Ohio State Plane North, NAD83

# Brandywine Creek Wetlands Prioritized

Ranked #5: WETLAND ID# ORAM2203 Site Description	
Wetland Classification (Hydrogeomorphic or Corwardin)	Slope Headwater Wetland
Size (acres)	57.30
ORAM score	Category 3
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	Hydrologic Modification (Railroad) Sedimentation Adjacent Land Use
Restoration Potential	Remove Invasive Plants Seeding/Wetland Plantings Wetland Expansion
Ownership (Public or Private)	Public - City of Hudson
Number of Parcels	2 Parcels / 2 Owners
Location (Lat/Long)	41.2647525173 / -81.4743413118
Community	Hudson

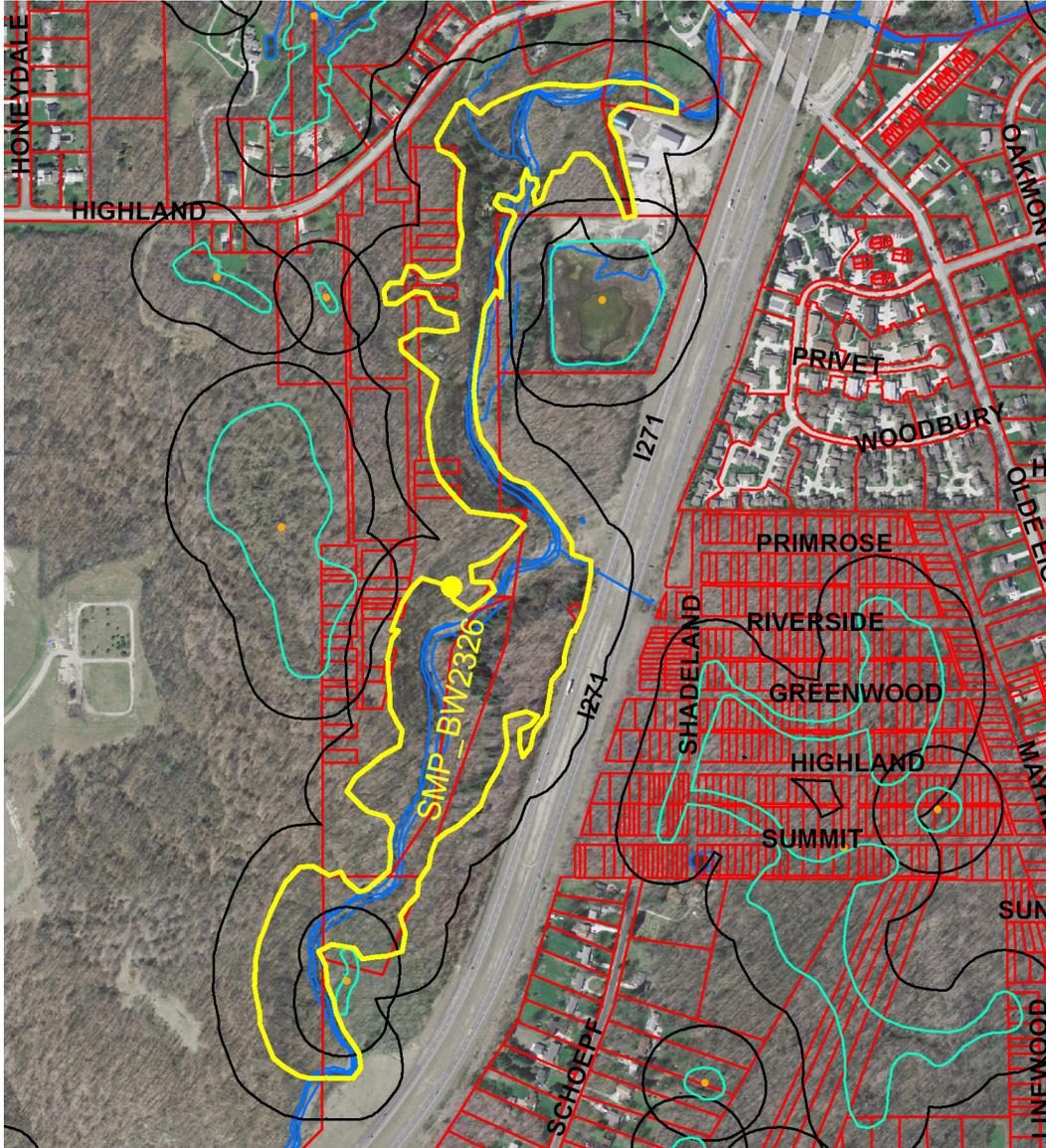
Wetland 2203 is a 57-acre slope-headwater wetland located in the upper reaches of Brandywine Creek. Notable features include the large size of the wetland, good habitat, its location along a headwater stream and riparian corridor and it is surrounded by several smaller wetlands. This wetland complex, located in Hudson, has several headwater streams and smaller, adjacent wetlands. The ownership complexity is low with only two public property owners, which includes Cuyahoga County and City of Hudson Parks Board.

Wetland ORAM2203 is a high quality Category 3 wetland. The wetland has very good habitat development and no habitat or substrate disturbances. Wetland plants are a mix of emergent, shrub/scrub and forest. A sparse infestation of invasive plant coverage of 5-25% was noted. The surrounding buffer has low intensity land uses, with exceptions of Hines Hill road to the south and the railroad to the north. Sources of water feeding into Wetland 2203 include ground-water, precipitation and seasonal surface water.

This is a valuable natural resource that provides good connectivity to the stream for water storage and habitat benefits. A future enhancement project should include targeting invasive plant species and enhancing with riparian/wetland plants. Suitable soils exist onsite to allow for a wetland expansion project (expand 3 acres).

This site lies within the boundaries of an existing City of Hudson park, Maple Grove, and the former Cuyahoga County Youth Development Center (YDC). Hudson purchased YDC and has protected critical habitat under conservancy agreements with the Western Reserve Land Conservancy. MetroParks serving Summit County will develop the northern portion of the property into a nature oriented passive park.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #6: SMP\_BW2326

Scale: 1:9,000

Large Tract #15 (PCA)

## Map Key

- Yellow Lines -Wetland boundary
- Yellow Points -Centroid point calculated from wetland polygon
- Black Lines -Wetland 50m buffer
- Green Lines -Other wetlands
- Blue Lines -Streams
- Red Lines -Parcel boundary
- Base Layer -Ohio 2006 orthophotos
- Projection -Ohio State Plane North, NAD83

# Brandywine Creek

## Wetlands Prioritized

Ranked #6: WETLAND ID# SMP_BW2326 Site Description	
Wetland Classification (Hydrogeomorphic or Corwardin)	Palustrine Shrub/Scrub & Forested (PSS) (PFO)
Size (acres)	35.08
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings*
Ownership (Public or Private)	Public & Private
Number of Parcels	19 Parcels / 15 Property Owners
Location (Lat/Long)	41.288188167 / -81.5269612746
Community	Northfield Center Township

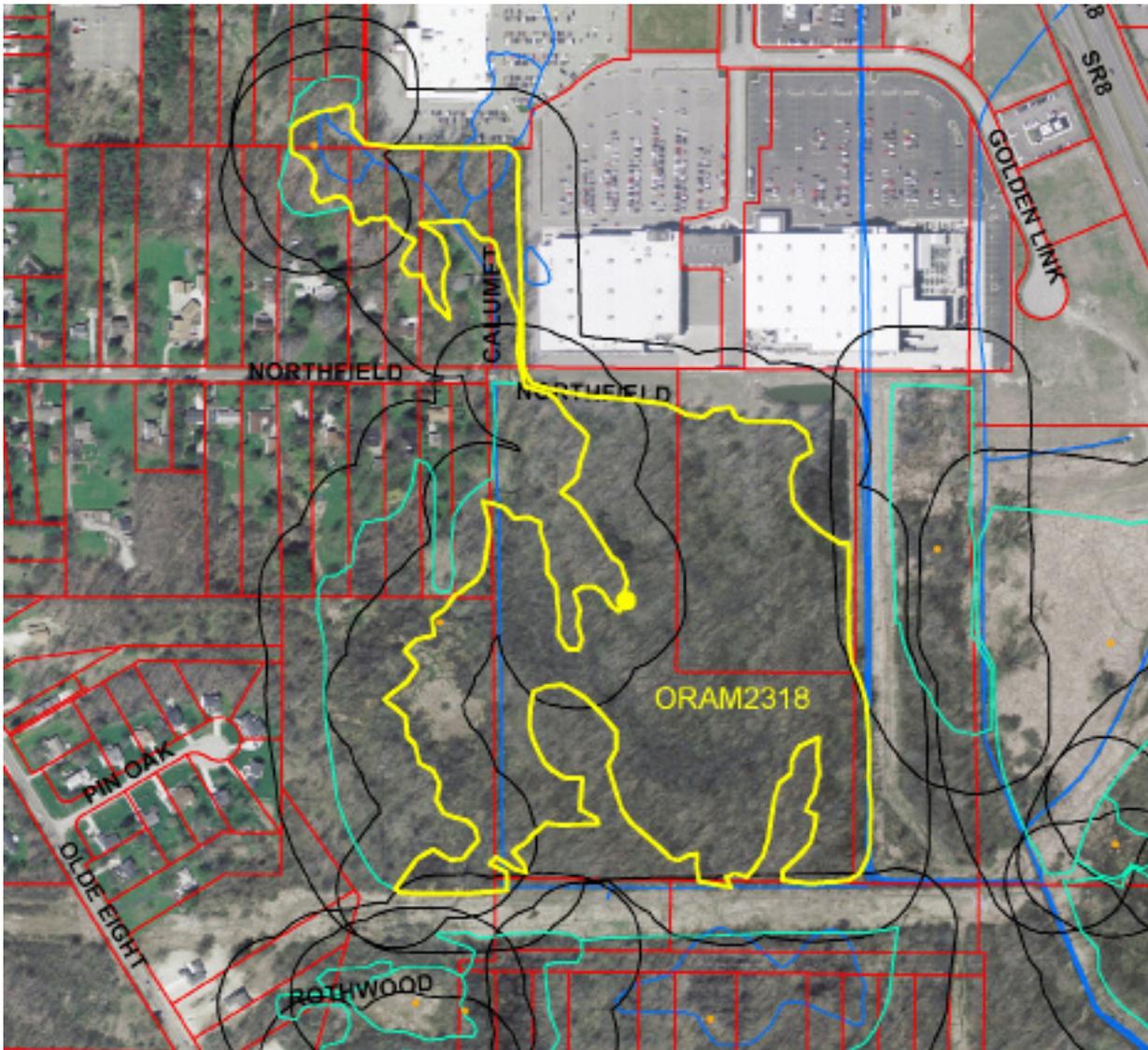
\* Extrapolated Restoration Potential

Wetland BW2326 is a large 35-acre shrub/scrub and forested wetland system located on the mainstem of Brandywine Creek. Notable features include Brandywine Creek bisecting this wetland, four smaller wetlands along the perimeter, a moderate quality forested buffer zone, and its location on the floodplain and in the riparian corridor. This wetland is located in Northfield Center Township. Ownership complexity is relatively high with 19 parcels and 15 separate property owners. Public owners include the State of Ohio and Northfield Center Township.

Wetland BW2326 is most likely a moderate quality wetland. This is in consideration of both the moderate intensity land use and forested buffer surrounding the wetland. The northern section of the wetland has incurred some development and the eastern edge most likely receives runoff from Interstate 271.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include removing invasive plants, and adding riparian/wetland plantings. Site acquisition should include conservation easements on developed parcels and purchasing the major, undeveloped parcels. Parcel 4001614 is the major parcel containing 46% of the site.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #7: ORAM2318

Scale: 1:6,000

Large Tract #7 (PCA)

## Map Key

- Yellow Lines -Wetland boundary
- Yellow Points -Centroid point calculated from wetland polygon
- Black Lines -Wetland 50m buffer
- Green Lines -Other wetlands
- Blue Lines -Streams
- Red Lines -Parcel boundary
- Base Layer -Ohio 2006 orthophotos
- Projection -Ohio State Plane North, NAD83

# Brandywine Creek

## Wetlands Prioritized

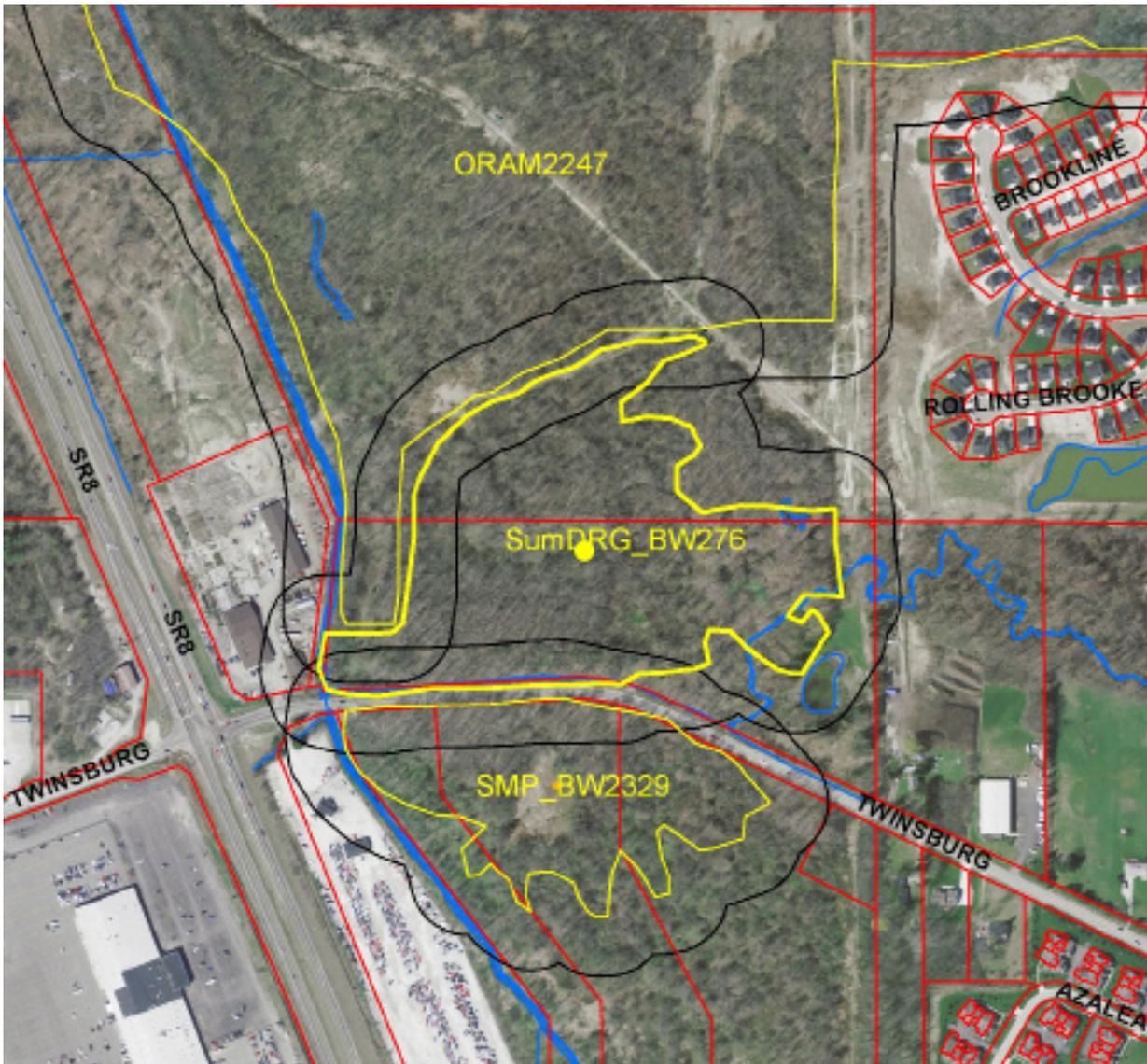
Ranked #7: WETLAND ID# ORAM 2318 Site Description	
Wetland Classification (Hydrogeomorphic or Corwardin)	Depressional & Human Impoundment
Size (acres)	31.08
ORAM score	Category 2
Wetland Buffer Condition	Low Quality
Impacts (Field Assessments)	Hydrologic Modification (sewer) Vegetation Alteration (off-roading)
Restoration Potential	Restore Buffer Zone
Ownership (Public or Private)	Public & Private
Number of Parcels	15 Parcels / 9 Property Owners
Location (Lat/Long)	41.3089193676 / -81.5274486197
Community	Northfield Center Township

Wetland ORAM2318 is a large depressional wetland located on a tributary to Brandywine Creek in the northwest portion of the watershed. Notable features include the large size of the wetland, two streams that pass through on the eastern and western boundaries, several surrounding wetlands and its location in the riparian corridor. Wetland 2318 is located in Northfield Center Township. Ownership complexity is high with 15 parcels and 9 property owners. Public ownership solely includes City of Macedonia.

Wetland ORAM2318 is a moderate quality Category 2 wetland. Field data and recent mapping indicate considerable changes in land use from 2000 to 2006. The surrounding wetland buffer has moderately high land use intensity. These changes are related to the hydrologic impact and vegetation alteration noted. The wetland has “moderately good” habitat development with portions still recovering from recent impacts. The habitat is a mix of emergent, shrub/scrub and forest cover. No invasive plants were identified. Primary sources of water are groundwater and precipitation.

This wetland was field verified during a 2005 RAP funded project. This wetland resource provides good connectivity to the stream and other wetlands for water storage and habitat benefits. A future enhancement project should include improving the wetland buffer zone where possible. Additional field studies are needed to determine available acres. Site acquisition should be explored through conservation easements on the developed parcels and purchasing the major, undeveloped parcels. Discussions should begin with City of Macedonia which owns over 86% of the site.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #8: DRG\_BW276

Scale: 1:6,000

Large Tract # 12 (PCA)

## Map Key

Yellow Lines	-Wetland boundary
Yellow Points	-Centroid point calculated from wetland polygon
Black Lines	-Wetland 50m buffer
Green Lines	-Other wetlands
Blue Lines	-Streams
Red Lines	-Parcel boundary
Base Layer	-Ohio 2006 orthophotos
Projection	-Ohio State Plane North, NAD83

# Brandywine Creek Wetlands Prioritized

Ranked #8: WETLAND ID# SumDRG_BW276	Site Description
Wetland Classification (Hydrogeomorphic or Corwardin)	Palustrine Forested Wetland (PFO)
Size (acres)	19.17
Wetland Buffer Condition	Low Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings*
Ownership (Public or Private)	Private
Number of Parcels	3 Parcels / 3 Property Owners
Location (Lat/Long)	41.2844442408 / -81.5022283892
Community	Northfield Center Township

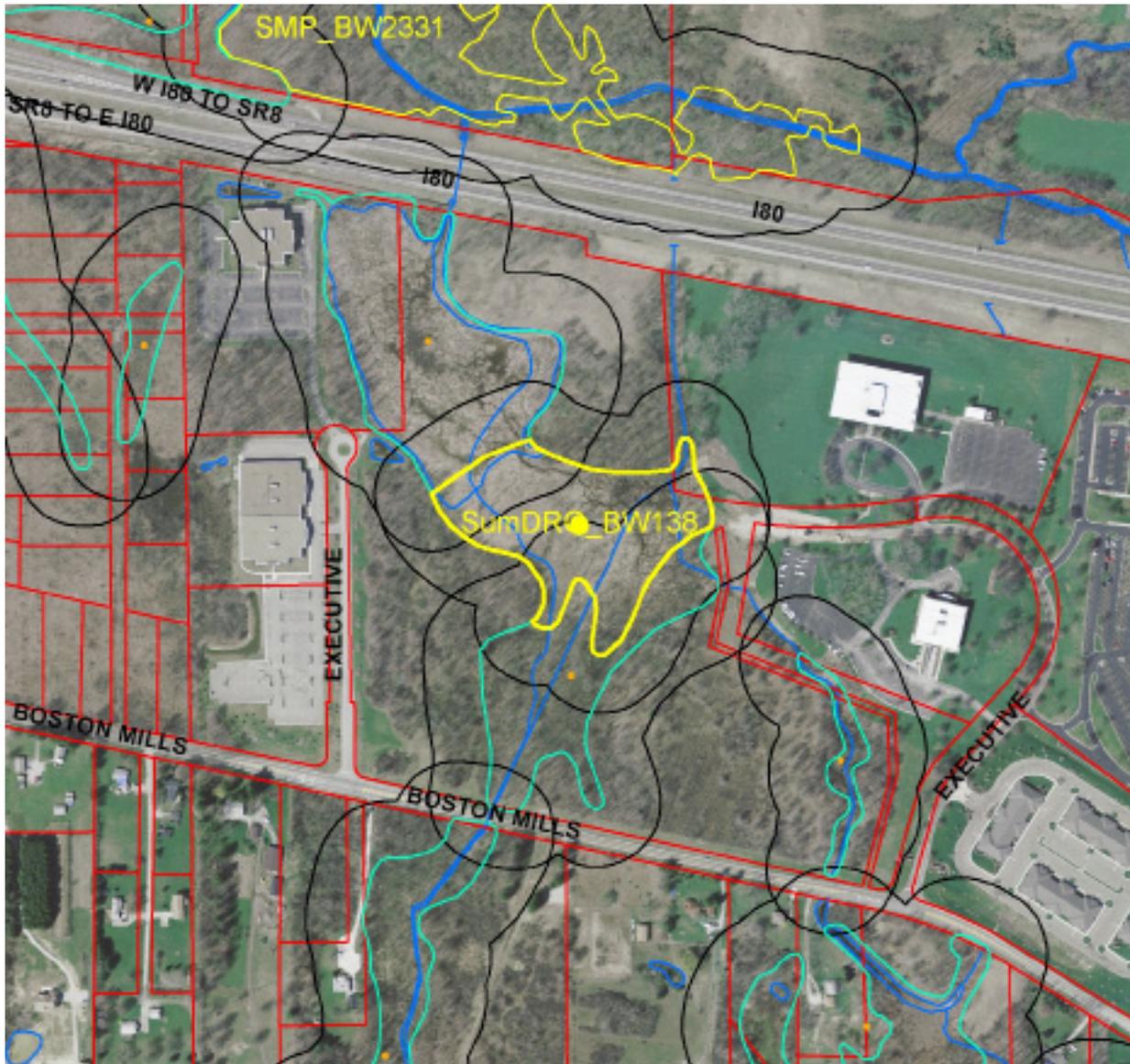
\* Extrapolated Restoration Potential

Wetland BW276 is a large 19-acre forested wetland located on the mainstem of Brandywine Creek. Notable features include the large size of the wetland, wetland ORAM2247 to the north and wetland BW2329 to the south and it is located in the floodplain and riparian corridor. Also, Brandywine Creek and a small tributary stream are located on-site. Wetland BW276 is located in Northfield Center Township. Ownership complexity is relatively easy with 3 parcels and 3 property owners.

Wetland BW276 is most likely a moderate quality wetland. This is in consideration of the relatively low to moderate quality buffer conditions and the encroaching land use changes. Between 2000 and 2006 a housing development was put in just east of the site. This wetland is located in the riparian corridor, 100 year floodplain and is surrounded by two larger wetlands. Additional studies may show that this wetland and wetland ORAM2247 are part of the same wetland system. This natural resource provides good connectivity to the stream and other wetlands for water storage and habitat benefits.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include removing invasive plants, adding riparian/wetland plantings and acquisition of the site through either a conservation easement or purchasing parcels. Parcel 4001487 contains 63% of the wetland, related pricing is listed below.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #9: SumDRG\_BW138

Scale: 1:6,000

Large Tract #28 (PCA)

## Map Key

- Yellow Lines -Wetland boundary
- Yellow Points -Centroid point calculated from wetland polygon
- Black Lines -Wetland 50m buffer
- Green Lines -Other wetlands
- Blue Lines -Streams
- Red Lines -Parcel boundary
- Base Layer -Ohio 2006 orthophotos
- Projection -Ohio State Plane North, NAD83

# Brandywine Creek Wetlands Prioritized

Ranked #9: WETLAND ID# SumDRG_BW138	Site Description
Wetland Classification (Hydrogeomorphic or Corwardin)	Palustrine Shrub / Scrub (PSS)
Size (acres)	5.68
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings*
Ownership (Public or Private)	Private
Number of Parcels	2 Parcels / 2 Property Owners
Location (Lat/Long)	41.2545180671 / -81.485508048
Community	Hudson

Wetland BW138 is a 5-acre, shrub/scrub wetland located on a tributary to Brandywine Creek just south of Interstate 80. Notable features include several surrounding wetlands, its location in the floodplain and riparian corridor, a tributary stream flowing through the site and the location is near the confluence with the mainstem of Brandywine Creek. Wetland BW138 is located in the City of Hudson. Ownership complexity is relatively easy with 2 parcels and 2 property owners.

Wetland BW138 is most likely a moderate quality wetland. This is due to the surrounding land use, the moderate quality forested buffer and the adjacent wetlands providing a buffering effect. From 2000 to 2006 very little to no land use changes occurred. Additional studies may show that the adjacent wetlands are part of the same wetland system. This natural resource, located at the confluence of two streams, provides good connectivity for stormwater management and habitat benefits.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include removing invasive plant species and adding riparian/wetland plantings. Efforts should be made to preserve this wetland through an easement on parcel 3203767. Discussions should begin with the property owner Lordstown LP, which owns 96% of the site. Parcel 3203767 market land value nearly \$1.7 million dollars.

# Brandywine Creek Wetlands Prioritized



Brandywine Creek Wetland Ranked #10: MP\_BW2329

Scale: 1:6,000

## Map Key

Yellow Lines	-Wetland boundary
Yellow Points	-Centroid point calculated from wetland polygon
Black Lines	-Wetland 50m buffer
Green Lines	-Other wetlands
Blue Lines	-Streams
Red Lines	-Parcel boundary
Base Layer	-Ohio 2006 orthophotos
Projection	-Ohio State Plane North, NAD83

Large Tract #21 (PDA\*\*)

# Brandywine Creek Wetlands Prioritized

Ranked #10: WETLAND ID# SMP_BW2329	Site Description
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested / Open Water (PFO)
Size (acres)	9.78
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Riparian/Wetland Plantings Wetland Expansion
Ownership (Public or Private)	Private
Number of Parcels	4 Parcels / 2 Property Owners
Location (Lat/Long)	41.2826385243 / -81.5025487607
Community	Northfield Center Township

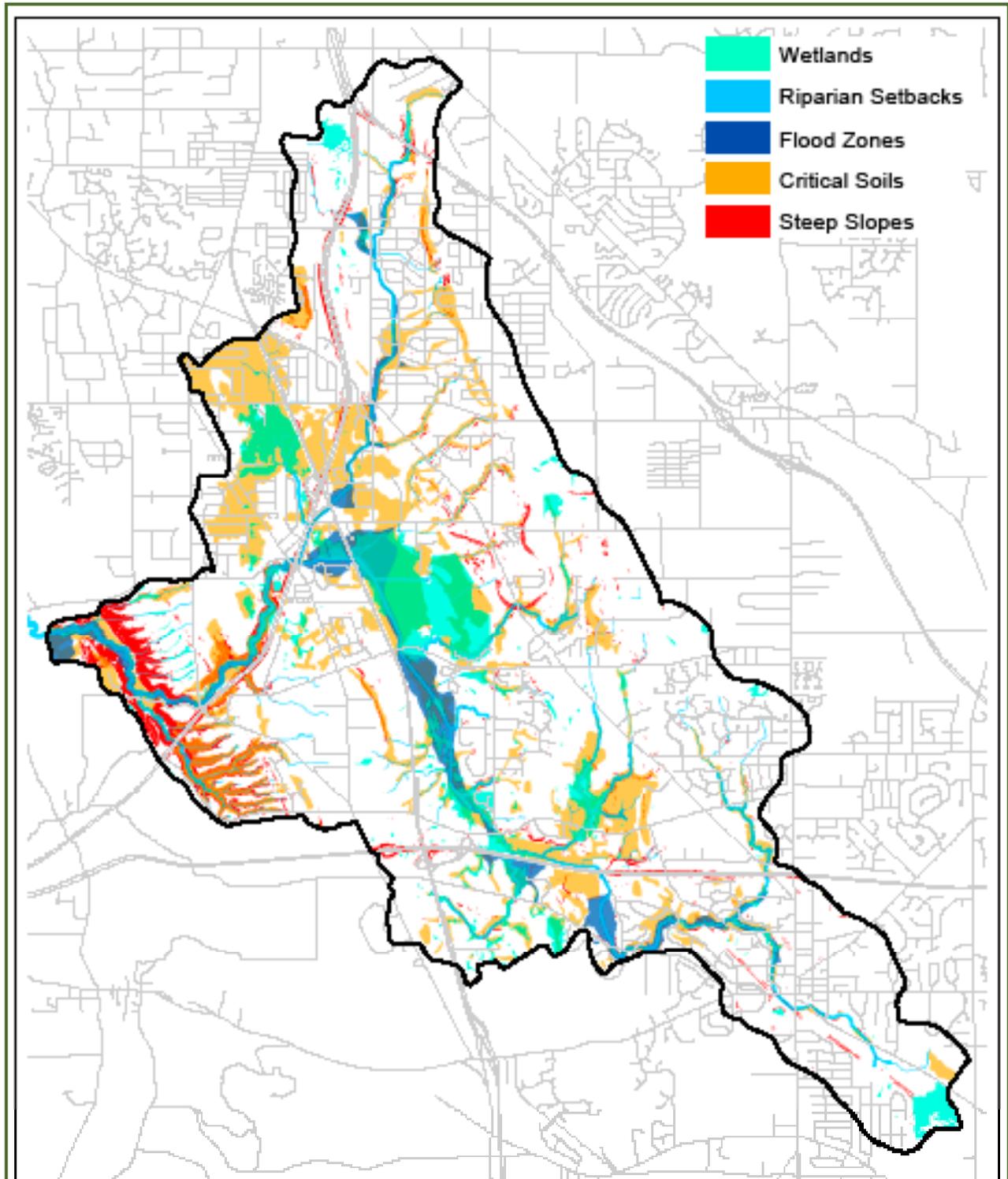
Wetland BW2329 is a 9-acre forested and open water wetland located on the mainstem of Brandywine Creek. Notable features include Brandywine Creek and wetland BW276 and the large wetland ORAM 2247, which is currently being impacted to the north. There is also 10 to 15 acres of suitable, hydric soils to the south of this site for restoration and expansion opportunities. Wetland BW2329 is located in Northfield Center Township. Ownership complexity is relatively easy with four parcels and two owners.

Wetland BW2329 is most likely a moderate to moderately low quality wetland. This is due to the moderate buffer quality and the encroaching development. From 2000 to 2006 very little to no land use changes occurred. This wetland is located in the riparian corridor and 100-year floodplain. At one time, prior to the construction of Twinsburg Road, this site was most likely part of the larger wetland complex to the north.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately better cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future enhancement project should include preserving this wetland and discussions should begin with the property owner American Dream Production, which owns 3 parcels and 99% of the site. The parcel containing the majority of the wetland is listed below. Other options include wetland expansion (expand 10 acres) and enhancement with riparian/wetland plantings.

# Brandywine Creek Composite of Critical Natural Features

The composite map embodies all the critical natural features “layered-up” in the Brandywine Creek Watershed. The rationale for choosing these features has been discussed. All together, this map represents the values the watershed partnership expressed and the necessary functional aspect of the Brandywine Creek Watershed.



# Step 4: Identify Undeveloped Land Areas and Relationship to Critical Features

Identifying undeveloped land in the Brandywine Creek watershed was the next step. This step helps to identify future development pressures and patterns, relationships to critical natural features, priority conservation areas and priority development areas. To determine the undeveloped land areas we use GIS land cover data generated by the Cuyahoga Valley National Park. The characteristics of the undeveloped land areas varied from flat upland areas that may have high development pressure; land adjacent to flood zones; to back lots that could be assembled for future development.

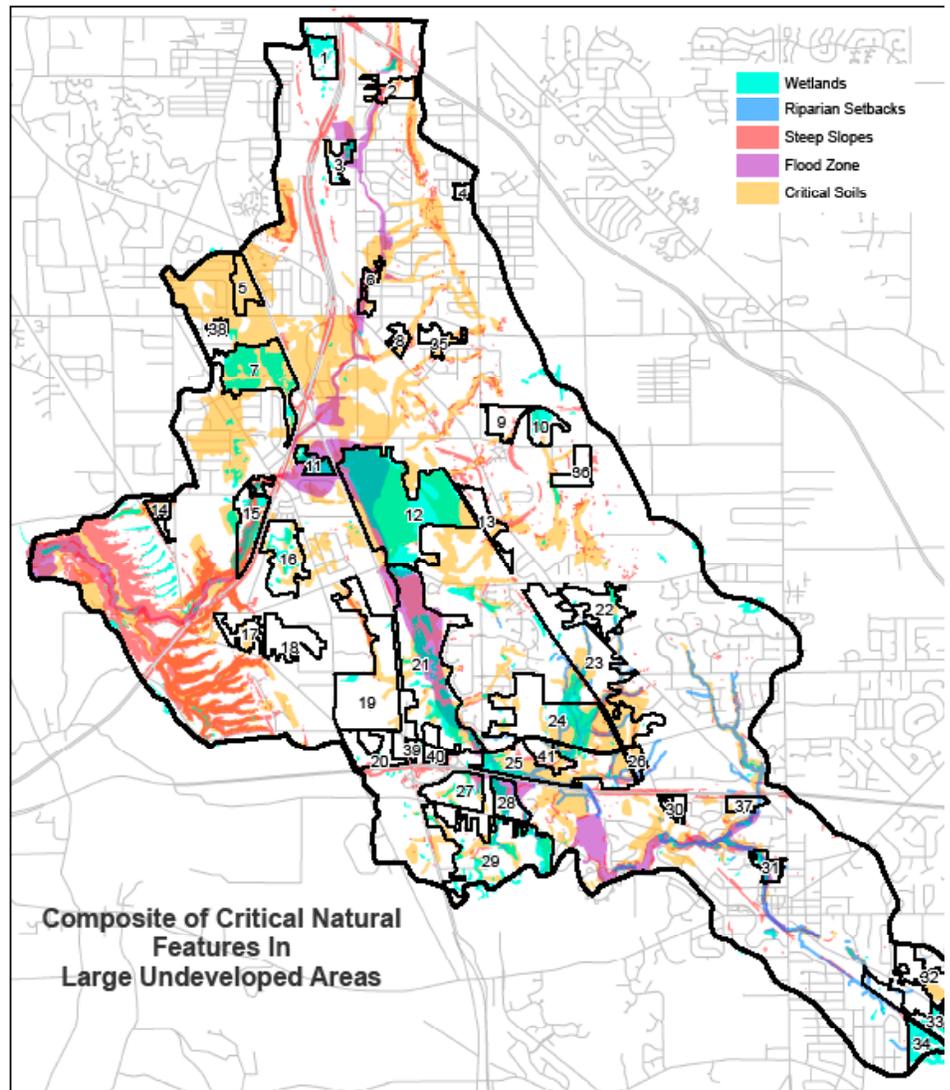
Forty-one large undeveloped tracts of land totaling 3,539 acres comprise 20% of the watershed, yet these areas encompass at least:

- 86% of the wetlands;
- 34% of the critical soils; and
- 45% of the naturally vegetated areas in the watershed.

The manner in which these areas are developed and/or preserved will have a material impact on the long-term stability of Brandywine Creek.

A table of these large tracts follows on the next page, #52. The table shows which of these tracts include the priority wetlands highlighted in the previous section.

Pages 53 and 54 show aerial photos of several of the tracts.



CRITICAL WATERSHED FEATURES IN LARGE UNDEVELOPED TRACTS

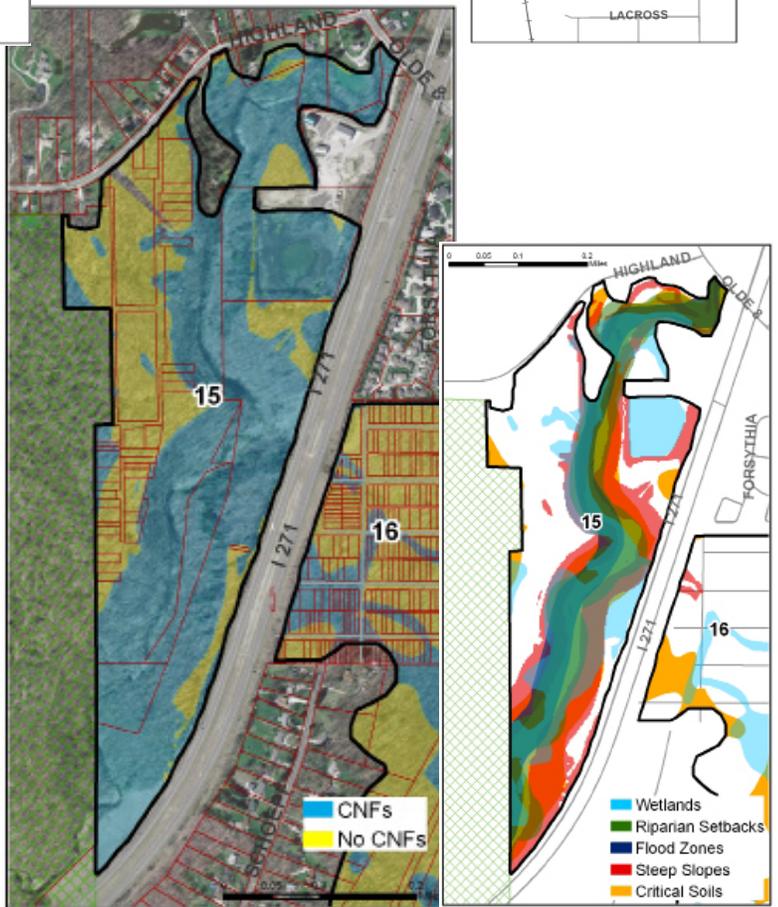
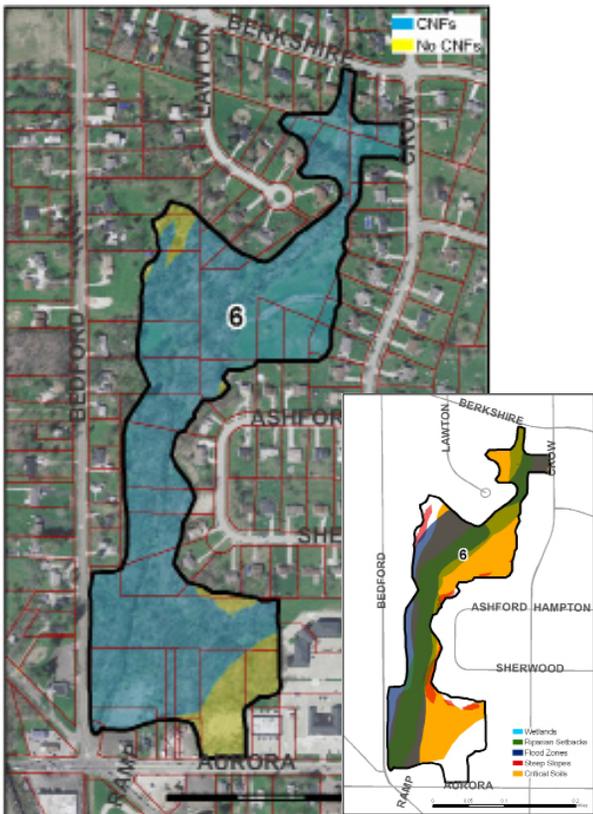
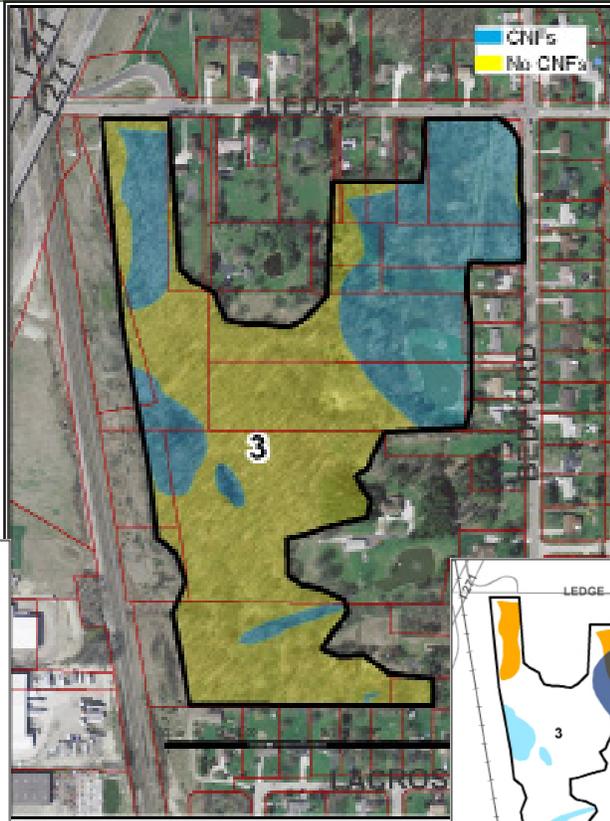
	Total	Critical Soils	Steep Slopes	Flood Zones	Riparian Corridors	Wetlands	Natural Vegetation
41 Large Undeveloped Tracts acreage	3,539	1,279.4	88.8	373.2	289.3	890.3	2,750.7
Large Tracts as % of Watershed	20%	34%	11%	47%	33%	86%	45%
TOTAL WATERSHED ACRES	17,406	3740.3	848	789.6	876.9	1032.4	6115.8

# Brandywine Creek

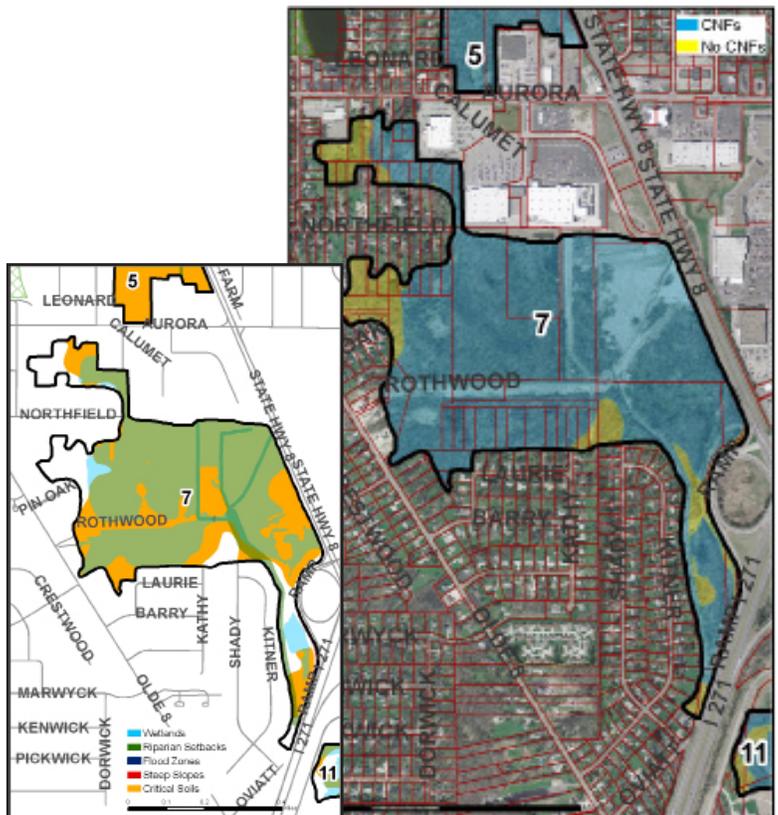
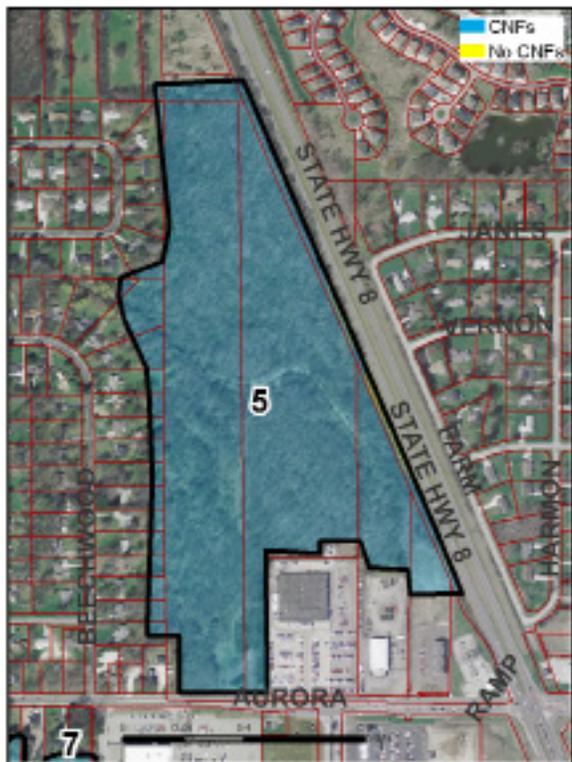
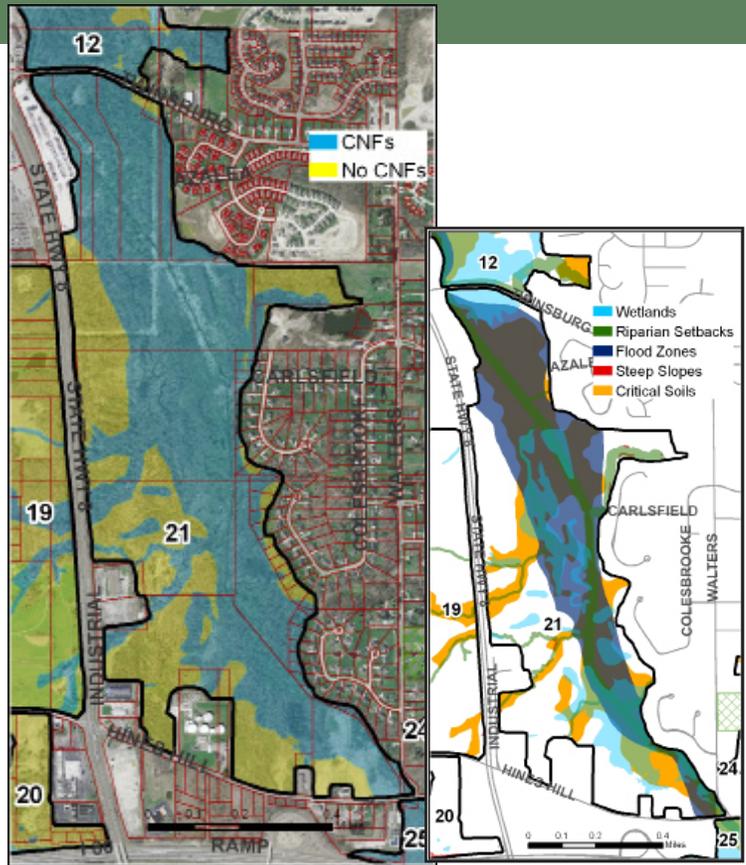
## Large undeveloped tracts within the Brandywine Creek watershed

Tract #	COMMUNITY	DESIGNATION	Acres	Critical Soils acres	Steep Slopes	Flood Zone acres	Riparian Setback	Wetlands acres	Natural Vegetation acres	Priority Wetland #
1	Macedonia	PCA	48.4	0.0	0.0	0.0	1.6	22.8	44.9	
2	Macedonia	PCA	40.1	0.0	0.0	4.1	4.1	0.0	0.0	
3	Macedonia	PCA	31.8	8.5	0.0	7.6	0.8	6.6	30.2	
4	Macedonia	PCA	12.2	0.0	0.0	0.0	0.0	0.0	0.0	
5	Macedonia/Northfield Center	PCA	47.2	46.5	0.0	0.0	2.6	0.7	47.2	
6	Macedonia	PCA	24.5	19.7	1.0	11.6	9.2	0.0	13.7	
7	Northfield Center	PCA	162.7	142.9	1.1	0.0	12.4	105.2	156.5	7
8	Macedonia	PCA	18.1	5.7	1.6	0.0	2.1	0.0	18.1	
9	Macedonia	PDA	48.1	1.8	3.4	0.0	0.0	0.0	42.5	
10	Macedonia/Twinsburgh Township	PCA**	41.8	4.5	1.0	0.0	1.0	15.8	35.9	
11	Macedonia	PCA	29.4	13.3	0.0	21.0	3.1	24.6	27.1	4
12	Macedonia/Northfield Center	PCA	408.9	308.5	0.6	100.9	40.4	360.1	384.9	1, 8
13	Macedonia/Northfield Center	PDA	51.8	5.2	3.2	3.2	4.4	0.3	31.8	
14	Sagamore Hills	PDA**	21.9	8.0	0.6	0.0	2.3	0.0	15.2	
15	Northfield Center	PCA	89.1	40.6	37.7	18.0	30.3	33.8	73.2	6
16	Northfield Center	PDA	110.4	28.4	0.5	0.0	0.4	16.8	102.8	
17	Boston Heights/Northfield Center	PDA	42.2	7.4	0.2	0.0	0.1	0.0	8.0	
18	Boston Heights	PDA	76.7	0.0	0.0	0.0	3.8	0.0	44.7	
19	Boston Heights/Northfield Center	PDA	255.4	27.9	3.4	0.0	5.7	3.5	124.8	
20	Boston Heights	PDA	60.2	0.0	3.2	0.0	0.0	1.1	46.7	
21	Boston Heights/Northfield Center	PDA**	353.7	172.5	0.8	168.2	52.8	81.7	318.4	2 partial, 3, 10
22	Hudson/Macedonia	PDA**	78.1	9.0	0.0	0.0	4.1	5.8	46.1	
23	Hudson/Macedonia	PCA	247.1	67.3	3.0	0.0	19.7	1.9	224.2	
24	Hudson	PCA	241.3	112.8	6.7	0.0	26.2	46.6	237.7	5
25	Hudson	PCA	185.7	105.2	11.5	0.0	29.6	28.6	158.9	2 partial
26	Hudson	PCA	19.6	7.3	1.0	0.0	1.0	0.0	18.0	
27	Boston Heights	PDA**	78.4	17.7	0.1	4.7	0.0	10.3	77.4	
28	Hudson	PCA	47.7	20.3	0.2	25.9	7.6	21.9	43.6	9
29	Boston Height/Hudson	PDA	259.1	65.9	2.7	0.0	17.2	58.1	214.7	
30	Hudson	PDA	20.4	0.0	1.0	0.0	0.0	0.0	19.3	
31	Hudson	PCA	26.4	9.6	1.6	7.7	6.0	6.0	24.8	
32	Hudson	PDA	79.2	16.9	0.0	0.0	0.7	0.0	15.4	
33	Hudson	PCA	62.6	0.0	0.1	0.4	0.0	5.7	30.0	
34	Hudson	PCA	46.3	0.3	1.0	0.0	0.0	32.3	43.7	
35	Macedonia	PCA	30.4	5.7	1.6	0.0	0.0	0.0	30.4	
36	Macedonia	PDA	40.9	0.0	0.0	0.0	0.0	0.0	0.0	
37	Hudson	PDA	24.5	0.0	0.0	0.0	0.0	0.0	0.0	
38	Northfield Center	PDA	10.2	0.0	0.0	0.0	0.0	0.0	0.0	
39	Boston Heights	PDA	7.0	0.0	0.0	0.0	0.0	0.0	0.0	
40	Boston Heights	PDA	17.6	0.0	0.0	0.0	0.0	0.0	0.0	
41	Hudson	PDA	41.6	0.0	0.0	0.0	0.0	0.0	0.0	
		Total	3538.7	1279.4	88.8	373.2	289.3	890.3	2750.7	

Added tracts - Feature areas to be determined



# Brandywine Creek



## Step 5: Identifying PCAs & PDAs



The Ohio Lake Erie Commission Balanced Growth Program established a development suitability technical advisory committee to determine which factors were most important to the development community. The table below lists the top ten factors for the three principal development categories. Together with elements of sound environmental practices, criteria were created and rank ordered by the community representatives to identify Priority Conservation and Priority Development Areas tract by tract as described in the following pages.

RESIDENTIAL	COMMERCIAL	INDUSTRIAL
1. Public water availability	1. Public water availability	1. Proximity to highway
2. Public sewer availability	2. Public sewer availability	2. Public sewer availability
3. Pro-development community attitude	3. Median household income in community	3. Public water availability
4. School quality	4. Community population density	4. Land availability
5. Land cost	5. Proximity to highway	5. Proximity to highway interchange
6. Median household income in community	6. Community growth characteristics	6. Pro-development attitude of community
7. Land availability	7. Land availability	7. Proximity to employees.
8. Community growth characteristics	8. Pro-development community attitude	8. Land cost
9. Proximity to highway	9. Proximity to highway interchange	9. Soil type / stability
10. Proximity to highway interchange	10. Proximity to other commercial development	10. Median household income

### Priority Conservation Areas

Priority conservation areas are locations where land use change is predicted to have a high impact on the watershed in terms of flooding, erosion, and water quality, based on the analysis of several data sets representing criteria that the watershed planning partners determined were of interest.

#### • CRITICAL SOILS

Recommendation: In critical soil areas, communities should develop soil compaction limitations to help conserve this resource during construction. Conservation and low impact design standards are recommended.

#### • STEEP SLOPES

Recommendation: In steep slope areas, communities should conserve these resources to the maximum extent possible for health, safety, property and environmental concerns. Setbacks should be implemented on slopes of 12% or more.

#### • STREAMS & NATURAL RIPARIAN AREAS

Recommendation: Stream and riparian corridor areas should be protected from encroachment at all costs. Communities should adopt riparian setback ordinances to protect both headwater and primary headwater streams. Where impacts occur in these areas, mitigation within the immediate drainage area should be required .

#### • FLOODPLAINS

Recommendation: Communities should conserve flood plains to accommodate excess flow, protect health and property. Community regulations need to maintain current flood plain maps and adequately protect floodplains from development to reduce future damages.

#### • WETLANDS

Recommendation: Wetland areas should be conserved as essential storage and filtration systems. Communities should adopt ample setback ordinances for all wetlands categories.

#### • FORESTS

Recommendation: Communities should conserve forested areas within riparian corridors and minimize the loss of existing forested areas throughout the entire watershed, through conservation development and tree preservation regulations.

### Priority Development Areas

Priority development areas are locations where land use changes are predicted to have minimal impact on the watershed and where conditions suggest that additional development may be appropriate.

The Brandywine Creek Watershed includes parts of nine municipalities with zoning, water and sewer availability and many other factors deemed important for development (see “Top Ten Development Suitability Factors inset).

The height of development pressure in the communities has largely passed. Most of the communities report a waning of development proposals.

PDA characteristics are:

1. Undeveloped land that does not lie within critical watershed features (i.e. list at left) or that will not adversely affect those features by implementing community regulations.
2. Previously developed areas suitable for redevelopment.

The Brandywine Communities reviewed each of the large tracts with the critical wetlands as discussed and summarized in the previous section. Each was designated as a PCA or PDA using the prioritized criteria listed on the next two pages. However, a number of the large tracts, whether priority development or conservation, contain portions that have characteristics of the other. That is, development with conservation elements or vice versa. These tracts are designated as PCA\*\* or PDA\*\* in the table on page 52 and shown on the map in the appendix. The watershed communities believe that their codes and/or review processes afford appropriate controls and protection of sensitive areas should development be pursued in these tracts.

**DEVELOPING EVALUATION CRITERIA for PRIORITY CONSERVATION and PRIORITY DEVELOPMENT AREAS**

The Plan seeks to provide guidance on which land is suitable for development and which is a priority for conservation, as well as how such land can be preserved and protected.

The Brandywine Creek prioritization process has gathered community input to identify and prioritize critical areas and features.

The results of scoring priorities identified the most important issues for the watershed planning process. These priorities provide a focus and, in turn, have been used to identify priority conservation areas.

The entries below and on the next page were those that have been identified throughout the watershed partnership meetings and have been prioritized.

Identifying and Evaluating Community Issues and Desires  
Brandywine Creek Priorities for Conservation of Important Watershed Features  
(PCA methodology)

<b>Prioritized Criteria for Priority Conservation Areas (PCA)</b>
Areas in imminent danger of property damage or loss from flooding or erosion
Stream banks and adjacent vegetated corridors for erosion prevention
Floodplains for flood water management purposes
Small streams and primary headwater areas for flow management
Steep Slopes for erosion protection
Wetlands for flood water management
Forest corridors for flow and bank stability purposes
Soils which allow high infiltration for storm water
Soils which are highly erosive and fragile
Soils which support wetlands
Wetlands for water quality and filtering
Areas with potential for green space connections and new trails
Areas adjacent or in close proximity to Metropark / CVNP / local parks
Stream banks and adjacent vegetated corridors for habitat benefit
Forest areas which provide significant habitat and connections
Other watershed feature #2: areas with high infiltration for aquifer/ well replenishment
Areas that provide multiple functions and benefits –e.g. trails in riparian corridors
Wetlands for habitat enrichment
Large land tracts for significant vistas / green space
Floodplains for open space/ park purposes
Other watershed feature #3: area providing scenic/tourist value
Steep slopes for vistas
Other watershed feature #1: forested areas for carbon sequestration
Forest areas which provide scenic vistas

<b>Prioritized Criteria for Priority Development Area (PDA)</b>
Land Areas with adequate existing utility services: electric / gas / water/ sewer
Location on adequate primary roads
Land areas already characterized by urbanization
Visual separation from residential / rural settings
Existing areas that can be redeveloped
Land areas that are in close proximity for planned or existing related urban services: retail/ restaurants
Close ( within 500 yards) proximity to highway interchanges
Areas which are located away (greater than 100 yards) from critical watershed features
Flat, yet well-drained, terrain
Larger tracts (e.g. greater than 4 acres) capable of optimizing low impact development features
Areas which will not detract from historic sites / vistas
Areas which do not include prime agricultural soils/ areas
Close accessibility to alternate transportation systems
Close proximity to natural areas
Close proximity to recreational corridors

Note: A map of the PCA, PDA and hybrid tracts is shown on page 51. A larger version is Appendix C of printed plans or a file accompanying the electronic format of this plan.

# Tools for Watershed Stewardship

## PRACTICES & STRATEGIES

Stormwater management begins with site planning and design. Development projects can be designed to reduce their impacts on watersheds when careful efforts are made to conserve natural areas, reduce impervious cover and better integrate stormwater treatment.

By implementing a combination of these nonstructural approaches it is possible to reduce the amount of runoff and pollutants that are generated from a site and provide for some nonstructural on-site treatment and control of runoff.

Better site design for stormwater management includes a number of site design techniques, such as preserving natural features and resources, effectively laying out the site elements to reduce impact, reducing the amount of impervious surfaces, and using natural features on the site for stormwater management. Many of the better site design concepts can reduce the cost of infrastructure while maintaining or even increasing the value of the property.

### BALANCED GROWTH LAND USE PRACTICES

- Adopt Watershed Map for Community Guidance
- Conserve Streams and Riparian Corridors
- Conserve Wetlands and Setbacks
- Avoid Floodplains
- Avoid Steep Slopes
- Minimize Development on Critical Soils
- Low Impact Development
- Conservation Development
- Woodland / Tree Canopy Protection

# Tools & Practices

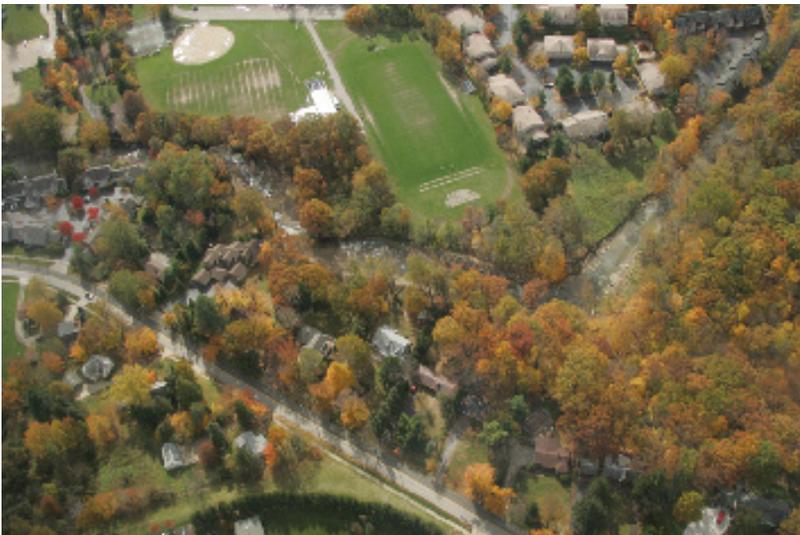
## Identifying Conservation Areas & Incorporating Better Site Design

Site design should be done in concert with the design and layout of stormwater infrastructure in order to reach stormwater management goals.

First, significant natural features and resources on a site are identified, such as undisturbed forest areas, stream buffers and steep slopes that should be preserved to retain some of the original hydrologic function of the site.

Next, the site layout is designed such that these conservation areas are preserved and the impact of the development is minimized. A number of techniques can then be used to reduce the overall imperviousness of the development site.

Finally, natural features and conservation areas can be used to manage stormwater quantity and quality.



Use Critical Watershed Feature Map as Guidance for Community Development and Conservation

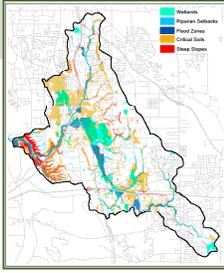
Design Site Layout to Preserve Conservation Areas and Minimize Impervious Cover & Stormwater Impacts

Use Natural Features and Conservation Areas to Manage Stormwater Quantity and Quality

THE GOALS OF BETTER SITE DESIGN include:

- Managing stormwater (quantity and quality) as close to the point of origin as possible
- Preventing stormwater impacts rather than mitigating them
- Using simple, nonstructural methods for stormwater management that are lower cost and lower maintenance than structural controls
- Using hydrology as a framework for site design

# ADOPT CRITICAL WATERSHED FEATURES MAP IN COMPREHENSIVE PLAN for Community Guidance



Important natural features such as primary headwater streams, wetlands and other important site features, when identified in the community's Comprehensive Plan, can assist with development and support conservation efforts.

### KEY BENEFITS

Provides an opportunity to update community zoning & plans

- Helps a community plan for, rather than react to proposed development
- Assists in managing floodplains, wetlands, riparian corridors that are currently providing flood control, erosion control and water quality protection.

A community's comprehensive plan helps to provide the framework for zoning that affects watershed quality. Priority Conservation and Development Areas should be included with the plan.

This should be done while examining local economics, plans for densities and land uses.

Preserving natural conservation areas such as undisturbed forested and vegetated areas, stream corridors and wetlands on a development site helps to preserve the original hydrology of the site and aids in reducing the generation of stormwater runoff and pollutants. Undisturbed vegetated areas also promote soil stabilization and provide for filtering, infiltration and evapotranspiration of runoff.

Conservation areas should be delineated before any site design, clearing or construction begins. When done before the concept plan phase, the planned conservation areas can be used to guide the layout of the site.

Conservation areas should be incorporated into site plans and clearly marked on all construction and grading plans to ensure that equipment is kept out of these areas and that native vegetation is kept in an undisturbed state. The boundaries of each conservation area should be mapped by carefully determining the limit which should not be crossed by construction activity.

Once established, natural conservation areas must be protected during construction and managed after occupancy by a responsible party able to maintain the areas in a natural state in perpetuity. Typically, conservation areas are protected by legally enforceable deed restrictions, conservation easements, and maintenance agreements.

### RECOMMENDATIONS:

- Incorporate the Priority Conservation Areas (PCA) and Priority Development Areas (PDA) into the Master Plan.

- ~ Accept PDAs and PCAs for each community through resolution or ordinance.
- ~ Update comprehensive/master plan and zoning to include PDAs and PCAs.
- ~ Discuss possible zoning changes, land owner assistance, and other steps necessary to facilitate development in PDAs and conservation/innovative site design in PCAs.

- Routinely Update Community Master Plans-

BRANDYWINE CREEK PARTNER COMMUNITY	LAST UPDATE TO MASTER PLAN
Boston Heights Village	2005/update in process
Boston Township	1996
Hudson	2004, 2014 update
Macedonia	1998
Northfield Center Twp	1998
Northfield Village	no plan
Oakwood	1972
Sagamore Hills Township	1990

# Tools & Practices

## Adopt Critical Watershed Features Map

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators	<ul style="list-style-type: none"> <li>• Update Community Master Plans, adopting Critical Features Map as overlay to guide land use decisions.</li> <li>• Incorporate Priority Conservation Areas (PCA) and Priority Development Areas (PDA) into community's Comprehensive Plan to guide zoning, and to identify natural areas as storm water management infrastructure assets</li> <li>• Develop or update building codes to include protections for critical areas</li> <li>• Use Map as reference to budget for protection, restoration and/or maintenance of natural infrastructure as is done for structural storm water infrastructure</li> </ul>
Planning Commissions	<ul style="list-style-type: none"> <li>• Develop and adopt Critical Features Map</li> <li>• Define specific allowable adjustments or variances based on the value and location of critical features, to guide appeals process</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Use Map as reference for decision making</li> <li>• Create guidelines, using Map to define allowable variances based on their potential impact on Conservation Areas, and to direct site design adjustments toward Preferred Development Areas.</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Work with communities that share the watershed to approve the Critical Features Map, PCA and PDA designations</li> <li>• Adopt the Map and use it to guide development and conservation</li> <li>• Establish policy to direct new development to Preferred Development Areas and reduce impacts in conservation areas</li> <li>• Educate residents, business owners and developers on the significance of critical watershed features and their roles in stewardship</li> </ul>
Service and Engineering	<ul style="list-style-type: none"> <li>• Use the Map as a guide to take advantage of the natural storm water management infrastructure</li> <li>• Respect the Map designations and establish policies to manage infrastructure improvements or repairs in ways that do not negatively affect conservation areas</li> </ul>
Residents, Business Owners and Property Owners or Managers	<ul style="list-style-type: none"> <li>• Support adoption of the Map in your community</li> <li>• Learn about the areas that hold your watershed's critical features and need conservation</li> <li>• Understand how activities that degrade or change the size, location or character of wetlands, forested areas, streams and soils affects your property</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Familiarize yourself with the Map and the watershed</li> <li>• Design sites so as not to infringe on critical features or conservation areas</li> <li>• Consider locating development in PDAs to avoid additional costs associated with critical soils.</li> </ul>

## CONSERVE STREAMS & RIPARIAN CORRIDORS

Natural riparian corridors are vegetated lands along rivers and streams. They can stretch from a stream's headwaters down to its mouth.

### Key Benefits

- Reduces Flooding and Erosion Problems
- Keep Structures away from Flood Prone Areas
- Filters Storm Water Runoff
- Provides Connected Wildlife Habitat

A riparian buffer is a special type of natural conservation area along a stream, wetland or shoreline where development is restricted or prohibited. The primary function of buffers is to protect and physically separate a stream, lake or wetland from disturbance or encroachment.

A properly designed buffer can provide stormwater management functions, can act as a right-of-way during floods, and can sustain the integrity of stream ecosystems and habitats. Forested riparian buffers should be maintained and reforestation should be encouraged where no wooded buffer exists. Proper restoration should include all layers of the forest plant community, including understory, shrubs and groundcover, in addition to trees.

The setback width needed to perform properly will depend on the size of the stream and the surrounding conditions. The setback should be continuous and not interrupted by impervious areas that would allow stormwater to concentrate and flow into the stream without first flowing through the buffer. Should the 100-year floodplain be wider than the riparian setback on either or both sides of the watercourse, the setback is extended to the outer edge of the 100-year floodplain.

Development within the riparian buffer should be limited only to those structures and facilities that are absolutely necessary. Such limited development should be specifically identified in any codes or ordinances enabling the buffers. When construction activities do occur within the riparian corridor, specific mitigation measures should be required, such as deeper buffers or riparian buffer improvements.

### RECOMMENDATIONS:

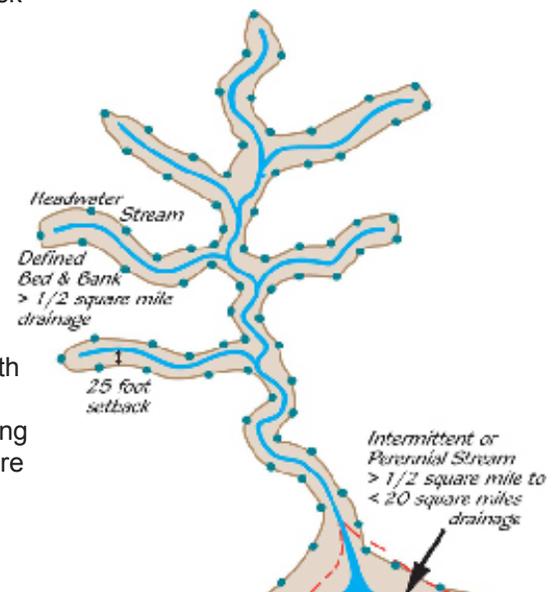
It is recommended that communities adopt zoning and other appropriate land-use and management provisions to address riparian protection. Protective areas along riparian corridors and around wetlands are best provided through local zoning setbacks.

Communities should adopt the Northeast Ohio Regional Stormwater Task Force Model riparian setback.

The riparian set back should :

- Apply to all designated watercourses in the community
- Conform to minimum widths (see recommended distances)
- Include 100 year floodplain and riparian wetlands
- Prohibit construction in riparian corridor
- Include variance and mitigation provisions to keep function within the same watershed.
- Provide for inspection and enforcement

As with all setbacks, riparian setbacks should be used in conjunction with conservation development design so that an economic hardship is not created for the landowner. The purpose is to preserve and protect existing riparian corridors from degradation and environmental damage, to restore the quality of degraded and damaged corridor, and to plan and control development around the feature with acceptable levels of quality and ecological character.



# Tools & Practices

## Conserve Streams & Riparian Corridors

### Recommended Riparian Distances

DRAINAGE AREA	SETBACK DISTANCE
<0.5 sq. miles	25 ft
0.5-20 sq. miles	75 ft.
20-300 sq. miles	100 ft.*
>300 sq. miles	300 ft.



### Community Riparian Setbacks

COMMUNITY	Riparian Setback	Setbacks Meet Recommended Standards	Lists Prohibited/ Permitted Uses	Variance Procedures	Provisions to Keep Mitigation w/in Same Watershed
Boston Heights Village	Y	Y	Y	Y	N
Boston Township	Y	Y	Y	Y	N
Hudson	Y	Y	Y	Y	N
Macedonia	Y	Y	Y	Y	N
Northfield Center Twp	Y	Y	Y	Y	N
Northfield Village	Y	Y	Y	Y	N
Oakwood	N	N	N	N	N
Sagamore Hills Township	Y	Y	Y	Y	N
Twinsburg Township	Y	Y	Y	Y	N

### Current Requirements in Brandywine Creek Communities:

Oakwood has not adopted riparian setback ordinances.

Sagamore Hills and Twinsburg Townships follow the Summit County model:

“Permitted by right: passive recreational activity, removal of damaged or diseased trees, revegetation and/or reforestation; Permitted by right with approval: stream bank stabilization/erosion control measures, crossings, placement of storm water retention or detention facilities;

Prohibited uses: construction, dredging or dumping, roads or driveways, motorized vehicles, modification of natural vegetation, parking lots, new surface or subsurface sewage disposal or treatment area”

Boston Heights Village has the strictest ordinance and fewest allowable variances, emphasizing that riparian areas be kept in their natural state.

\*The Summit County recommendations of 100-foot setbacks for areas draining between 20 and 300 square miles are smaller than the Cuyahoga County model of 120 feet.

# Tools & Practices

## Conserve Streams & Riparian Corridors

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Include Riparian Setbacks in zoning</li> <li>• Apply the setback to all designated watercourses in the community</li> <li>• Design setback codes to:               <ul style="list-style-type: none"> <li>• Conform to minimum widths and recommended distances</li> <li>• Include 100 year floodplain and riparian wetlands</li> <li>• Prohibit construction in riparian corridor</li> <li>• Include variance and mitigation provisions to keep function within the same watershed</li> <li>• Provide for inspection and enforcement</li> </ul> </li> <li>• Extend setbacks at least to the 100-year floodplain</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Respect riparian setback codes and be reluctant to allow incursions into riparian buffer areas</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Create incentives for preservation and improvement of existing vegetated buffers, and restoration of areas where riparian plantings have been lost</li> </ul>
Service and Engineering	<ul style="list-style-type: none"> <li>• Limit incursions into riparian zones when doing structural infrastructure repairs or improvements by adding a “no dig zone” beyond the setback written in the code, and/or use proper protection at zone edges.</li> <li>• Reduce the burden on riparian zones adjacent to paved or turf areas, where excessive runoff is common, by using infiltration calculations that reflect the actual soil infiltration conditions in the area.</li> </ul>
Tree Commissions	<ul style="list-style-type: none"> <li>• Institute a forest mitigation program wherein developers or property owners who remove trees and/or forested areas can replant trees or replace forest cover in riparian zones</li> <li>• Use riparian zones as forest mitigation banks to receive trees and forest cover</li> <li>• Create a forest mitigation fund to receive payments in lieu of planting from developers or property owners who remove trees or forest cover, and:               <ul style="list-style-type: none"> <li>• use the funds to improve riparian areas on public lands,</li> <li>• work with private property owners to restore riparian areas if buffer zones on public land are not available,</li> </ul> </li> <li>• In cases where neither of the above solutions are applicable, use the funds to support the city’s urban forest/street tree planting program</li> </ul>
Residents, Business Owners and Property Owners or Managers	<ul style="list-style-type: none"> <li>• Plant or improve riparian zones using the full range of forest vegetation – tree canopy, understory trees and shrubs, floor vegetation and ground cover, giving preference to native species and totally avoiding invasive or exotic species.</li> <li>• Commercial property owners can take advantage of the increase in bird life resulting from healthy riparian areas by working with local birding clubs and producing birdwatchers’ guides.</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Familiarize yourself with the Map and the watershed</li> <li>• Design sites so as not to infringe on critical features or conservation areas</li> </ul>

# Tools & Practices

## #3

### CONSERVE WETLANDS & SETBACKS

Wetlands are areas that are inundated or saturated by surface or ground water at a duration sufficient to support vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

#### Key Benefits

- Reduces Flooding and Erosion Problems
- Keep Structures away from Flood Prone Areas
- Filters Storm Water Runoff
- Provides Wildlife Habitat

Wetlands are important and complex ecosystems in the Brandywine Creek Watershed. Wetlands function as natural sponges, to absorb excess stormwater and as natural kidneys, to filter pollutants from the water. Wetlands minimize flooding problems by retaining stormwater and allowing the water to either evaporate or slowly release into stream systems.

In Brandywine Creek many wetlands are located along the stream and therefore fall within the riparian corridor and proposed setback. A properly sized riparian setback will completely include the wetlands plus a 50-foot setback extending beyond the outer boundary of a category 3 wetlands and a 30-foot setback extending beyond the outer boundary of a category 2 wetlands. As for category 1 wetlands no setback has been suggested in the model ordinance. However, these wetlands have the potential for enhancements and can be improved to category 2 wetlands.

It is also important to protect wetlands that do not fall within the riparian corridor or termed isolated wetlands. Isolated wetlands should receive the same amount of attention and setback protection. Many communities in Ohio require isolated wetlands buffers and have adopted policies of no net loss of wetlands for mitigation required for destroyed wetlands.

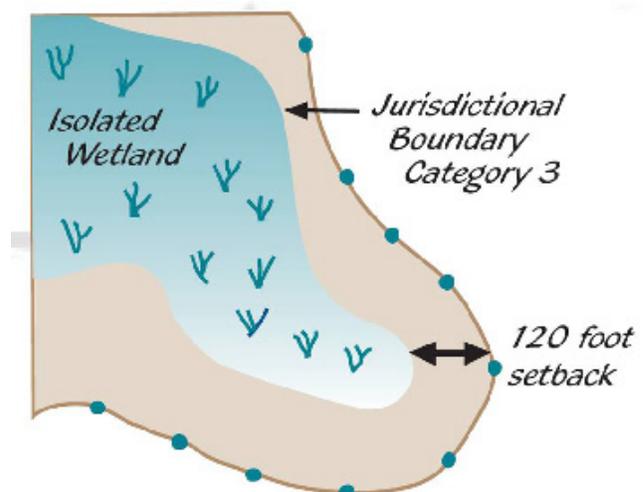
Category 3 wetlands have superior habitat, or superior hydrological or recreational functions.” They are typified by high levels of diversity, a high proportion of native species, and/or high functional values.

Category 2 wetlands support moderate wildlife habitat, or hydrological or recreational functions, and as wetlands which are dominated by native species but generally without the presence of, or habitat for, rare, threatened or endangered species; and have a potential for reestablishing lost wetland functions.”

Category 1 wetlands support minimal wildlife habitat, and minimal hydrological and recreational functions. They do not provide critical habitat for threatened or endangered species or contain rare, threatened or endangered species. In addition, Category 1 wetlands are often hydrologically isolated, and usually have: low species diversity, no significant habitat or wildlife use, limited wetland functions, and/or a predominance of non-native species.

Recommended Wetland Setbacks

WETLAND CLASS	SETBACK DISTANCE
1	Protect and enhance
2	75 ft.
3	120 ft.



# Tools & Practices

## Conserve Wetlands & Setbacks

### RECOMMENDATIONS:

It is recommended that communities adopt zoning and other appropriate land-use and management provisions to address wetland protection. Protective areas along riparian corridors and around wetlands are best provided through local zoning setbacks.

- Communities should adopt the Northeast Ohio Regional Stormwater Task Force Model Wetland Setback. The Northeast Ohio Regional Stormwater Model ordinance are available to protect and mitigate wetlands as part of a community's management program for flood control, erosion control, ground water recharge, and water quality protection.
- Include variance and mitigation provisions to keep function within the same watershed.
- As with all setbacks, wetlands setbacks should be used in conjunction with conservation development design so that an economic hardship is not created for the landowner. The purpose is to preserve and protect existing wetlands from degradation and environmental damage, to restore the quality of degraded and damaged wetlands, and to plan and control development around wetlands with acceptable levels of quality and ecological character.
- Conserve and enhance Category 1, 2 and 3 Wetlands. It is recommended that when wetlands are scarce in a drainage basin, the low quality wetlands still provide a valid public health and safety water quality and quantity function- and deserve protection. Category 1, 2 and 3 wetlands are defined by Ohio EPA using a qualitative assessment form.

### Community Wetland Setbacks

COMMUNITY	Wetland Setback	Protects Connected and Isolated Wetlands	Setback Width Meets Recommended Standards	Variance Procedures	Mitigation & Provisions to Keep Mitigation w/in Same Watershed
Boston Heights Village	Y	N	Y	Y	N
Boston Township	Y	N	Y	N	N
Hudson	Y	Y	Y	Y	N
Macedonia	Y	Y	Y	Y	N
Northfield Center Twp	Y	Y	N	N	N
Northfield Village	N	N	N	N	N
Oakwood	N	N	N	N	N
Sagamore Hills Township	Y	N	Y	Y	N
Twinsburg Township	Y	N	Y	Y	N

# Tools & Practices

## Conserve Wetlands

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Include Wetland Setbacks in zoning</li> <li>• Apply the setback to all category 2 and 3 wetlands, and on a selective basis to category 1 wetlands (if only as flood control resources)</li> <li>• Design setback codes to:               <ul style="list-style-type: none"> <li>• Conform to minimum widths and recommended distances:</li> <li>• Category 3 – 120 ft.</li> <li>• Category 2 – 75 ft.</li> </ul> </li> <li>• Include 100 year floodplains</li> <li>• Include variance and mitigation provisions to keep function within the same watershed</li> <li>• Provide for inspection and enforcement</li> <li>• Integrate in Conservation Development zoning</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Enforce wetland protection codes</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Create incentives for preservation and improvement of existing wetlands, and restoration of category 1 wetlands to provide in-watershed mitigation sites</li> </ul>
Service, Engineering, Building Inspectors	<ul style="list-style-type: none"> <li>• Observe Clean Water Act regulations and enforce US Army Corp of Engineers permits</li> <li>• Monitor construction sites closely for deviation from approved plans</li> <li>• Require construction vehicles to stay proper distances away from wetlands</li> </ul>
Residents, Business Owners and Property Owners or Managers	<ul style="list-style-type: none"> <li>• See wetlands as enhancements and scenic, educational or recreational resources</li> <li>• Maintain a dense buffer of native vegetation between any paved surfaces and the wetland</li> <li>• Do not plant invasive species where seeds can be blown or washed into wetlands</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Recognize the value of wetlands and preserve whenever possible</li> <li>• Mitigate lost wetlands on site when possible</li> <li>• Building “up” rather than “out” can help you use a site footprint limited by setback requirements</li> <li>• Respect permit requirements and keep construction vehicles far away</li> </ul>
Stewardship Groups	<ul style="list-style-type: none"> <li>• Use wetlands as educational resources</li> <li>• Create a guide to the birds and animals that live in or visit the wetland</li> <li>• Raise funds and work with landowners, city governments, state agencies, land conservancies and others to conserve strategic wetlands and setback areas.</li> </ul>

### CONSERVE FLOOD PLAINS

Floodplains are the low-lying flat lands that border streams and rivers. When a stream reaches its capacity and overflows its channel after storm events, the floodplain provides for storage and conveyance of these excess flows.

#### Key Benefits

- Preserving floodplains provides a natural right-of-way and temporary storage for large flood events
- Keeps people and structures out of harm's way
- Helps to preserve riparian ecosystems and habitats
- Can be combined with riparian buffer protection to create linear greenways

Floodplain areas should be avoided for homes and other structures to minimize risk to human life and property damage, and to allow the natural stream corridor to accommodate flood flows. In their natural state they reduce flood velocities and peak flow rates by the passage of flows through dense vegetation.

Floodplains also play an important role in reducing sedimentation and filtering runoff, and provide habitat for both aquatic and terrestrial life. Development in floodplain areas can reduce the ability of the floodplain to convey stormwater, potentially causing safety problems or significant damage to the site in question, as well as to both upstream and downstream properties. Most communities regulate the use of floodplain areas to minimize the risk to human life as well as to avoid flood damage to structures and property.

Floodplain protection is complementary to riparian corridor preservation. Both of these better site design practices preserve stream corridors in a natural state and allow for the protection of vegetation and habitat. Depending on the site topography, 100-year floodplain boundaries may lie inside the riparian setback, in other cases the riparian corridor should be extend outward to meet the flood zone boundary.

#### RECOMMENDATIONS:

Floodplain areas should be avoided on a development site in the Brandywine Creek Watershed. Ideally, the entire 100-year floodplain should be avoided for clearing or building activities, and should be preserved in a natural undisturbed state where possible.

Review Ohio Department of Natural Resources latest floodplain regulations and map modernization program

- Incorporate most up-to-date maps into zoning
- Riparian setback should extend out to FEMA 100 year floodplain.
- Review ODNR Floodplain Regs. for adoption.
- Focus development in areas where they will have the least impact - out of the floodway.



# Tools & Practices

## Conserve Flood Plains

### COMMUNITY 100-YEAR FLOODPLAIN SETBACK

COMMUNITY	RIPARIAN SETBACK INCLUDES 100-YEAR FLOOD PLAIN
Boston Heights Village	Y
Boston Township	Y
Hudson	Floodplain Overlay District
Macedonia	Y
Northfield Center Twp	Y
Northfield Village	Y
Oakwood	N
Sagamore Hills Township	Y
Twinsburg Township	Y



# Tools & Practices

## Conserve Flood Plains

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Incorporate the most up-to-date flood plain maps into zoning and building codes</li> <li>• Recognize that increased impervious surfaces in one area will have the effect of enlarging flood plains of downstream areas</li> <li>• Provide incentives or relief to landowners in areas where floodplains create un-buildable areas</li> <li>• Allow increased density on development sites in lowest-impact areas</li> <li>• Change codes to allow higher “weed” growth in flood plains</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Respect floodplain boundaries</li> <li>• Recognize that variances allowing structures to encroach on floodplains will inevitably create problems</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Support floodplain preservation with policies that support generous setbacks and encourage landowners to vegetate and maintain riparian corridors and floodplains</li> <li>• Focus development in areas where they will have the least impact</li> <li>• Encourage developers to design sites with structures away from flood plains, and with pervious surfaces and dense, natural landscaping close to flood plain boundaries</li> </ul>
Service and Engineering	<ul style="list-style-type: none"> <li>• Use structural flood management systems only as complements to natural systems.</li> <li>• Reduce channelization and culverts upstream so that floodplains downstream can handle increased loads</li> <li>• Keep riparian areas and flood plains vegetated by reducing mowing</li> </ul>
Residents, Business Owners and Property Owners or Managers	<ul style="list-style-type: none"> <li>• Be aware that solutions to “rush and flush” water off your land will invariably create flooding problems downstream</li> <li>• Accept the fact that streams will flood on occasion, and keep any structural solutions such as berms or dikes as far from the stream and as close to your buildings as possible</li> <li>• Use permeable paving surfaces in areas near flood zones to increase the speed at which the water infiltrates into soils</li> <li>• Let vegetation grow higher along flood plains</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Design sites so as to leave plenty of room beside flood plains</li> <li>• Keep areas along flood plain boundaries heavily vegetated</li> <li>• Use permeable paving throughout the site, and include vegetated areas to hold excess water (rain gardens, etc.)</li> </ul>

# Tools & Practices

## #5

### AVOID STEEP SLOPES

Steep slopes should be avoided due to the potential for soil erosion and increased sediment loading; especially those with a grade of 15% or greater. Excessive grading and flattening of hills and ridges should be minimized.

#### Key Benefits

- Prevents soil erosion and stormwater runoff
- Prevents property damage
- Building on flatter areas reduces the need for cut-and-fill and grading
- Keeping steep slopes vegetated helps to stabilize hillsides
- Maintains aesthetics

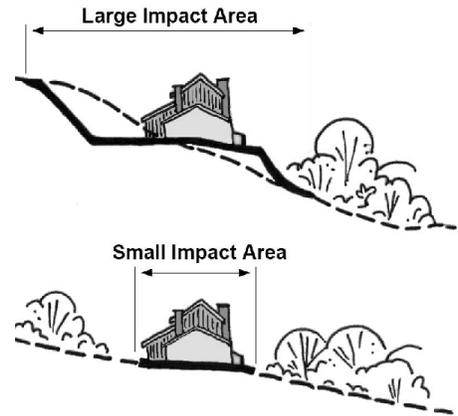
Vegetated steep slopes provide an important resource to be preserved because any significant disturbance to the hillside's environment may result in:

- Landslides or land instability;
- Unacceptable alteration in the drainage patterns and
- Loss of scenic value.

When development takes place on or near steep slopes, vegetative cover is greatly reduced. Loss of this vegetative cover on steep terrain significantly increases soil instability, and thus the risk of erosion.

Soil erosion and sedimentation into waterways poses several threats to public health and safety, which are difficult and expensive to correct. Property damage is commonly associated with development on steep slopes. Soil erosion and sedimentation into nearby waters increase the potential for flooding. In addition, the nature of steep slopes means that greater areas of soil and land area are disturbed to locate facilities on them compared to flatter slopes.

The need to protect these slopes is based on percent slope, the length of that percent slope, soil erodibility, percent of vegetation, and proximity to streams or wetlands. The maximum retention of natural topographical features such as natural drainage swales, slope ridge lines, and trees and other natural plant formations should be encouraged. Steep slope protection will conserve and promote public health and safety by minimizing problems due to water runoff and soil erosion incurred in adjustments of topography to meet developmental needs. In addition to public health and safety concerns, protecting steep slopes preserves the unique scenic resources and habitats.



#### Community Steep Slope Setbacks

COMMUNITY	Steep Slope Protection	Permit-Based	Setback% Slope	Setback Based on Analysis
Boston Heights Village	Y	-	Y	-
Boston Township	N	-	-	-
Hudson	N (recommended only)	-	-	-
Macedonia	N	-	-	-
Northfield Center Twp	N	-	-	-
Northfield Village	N	-	-	-
Oakwood	N	-	-	-
Sagamore Hills Township	Y	-	Y	-
Twinsburg Township	Y	Y (in PRDs)	Y	-

# Tools & Practices

## Avoid Steep Slopes

### RECOMMENDATIONS:

The development of areas containing steep slopes should generally be discouraged. In situations where this is not feasible, development should be done with the intent of minimizing soil disturbances, maximizing retention of trees and vegetation, and complementing steep slope character. Existing patterns of vegetation should be retained on all slopes over 15% to avoid erosion or slippage.

Three options can assist in establishing setback widths that provide the same watercourse protection as flatter areas.

#### Option 1: Permit Based Hillside Protection Zones

Regulations are passed that limit development activity in areas with slopes between 15% and 30%. In order for permits to be given for disturbances in these areas, additional information including topographic maps, grading and site plans, geotechnical reports, details on future and present site stability, and an erosion and sediment control plan must be submitted for review. Option 1 focuses mainly on structural integrity and not the functioning of the riparian area and watercourse. The recommendations given under this option may also not be appropriate for all areas of the watershed.

Example- Summit County Ordinance- steep slope development a conditional use

#### Option 2: Expansion of Riparian Setback for % Slope

For many communities in the nation, minimum widths are usually established for riparian setbacks. In areas in which steep slopes exist within the designated riparian setbacks, these widths are expanded.

The expansions to the original widths are as follows:

- Add 10 feet for slopes between 15-17%
- Add 30 feet for slopes between 18-20%
- Add 50 feet for slopes between 21-23%
- Add 60 feet for slopes between 24-25%

Option 2 (Preferred) focuses on the degree of sloping and may not cover other important factors that play a role in riparian effectiveness into consideration

Example- North Royalton's riparian setback adjustment based on % slope.

#### Option 3: Expansion of Riparian Setbacks Based on Analysis of Slope, Slope Length, Soil Erodibility and Existing Vegetation

Riparian setbacks are adjusted where steep slopes, 10% or greater, exist within 500 feet of a watercourse. In these areas, a plan is required that details information regarding the degree of sloping, the slope length, soil erodibility, vegetative cover, and sediment delivery. Option 3 (Preferred) provides the best alternative, as it based on site-specific conditions and recommendations.



Percent Slope is the ratio of the vertical distance to the horizontal distance, or the elevation change in feet divided by the distance in feet.

# Tools & Practices

## Avoid Steep Slopes

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Expand riparian setbacks based on site-specific conditions, especially where slopes are greater than 10% and are within 500 feet of a watercourse.</li> <li>• Conserve steep slopes, especially those close to riparian corridors, with special permitting that limits development and disturbances in areas with slopes greater than 15%.</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Do not allow variances that encroach on setbacks from steep slopes</li> <li>• Do not allow replacement of vegetation around steep slopes with impervious surfaces, including turf grass.</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Discourage development on or adjacent to steep slopes.</li> <li>• Work with private landowners to establish conservation areas where steep slopes exist.</li> <li>• Invest in restoration where development may already be negatively impacting soils and degrading slopes.</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Design sites to avoid building near steep slopes. Structural solutions may be short term remedies, but soils erode.</li> <li>• Avoid disturbing steep slopes during construction. Construction equipment will change soil character and compaction.</li> <li>• Replace any disturbed soils with native vegetation, preferably those with large and/or dense root systems.</li> </ul>
Stewardship Groups	<ul style="list-style-type: none"> <li>• Support preservation and enhancement of these areas, which are usually wooded.</li> <li>• Educate landowners about the importance of conservation.</li> </ul>



## MINIMIZE DISTURBANCES TO CRITICAL SOILS

Critical soils such as well drained, moderate infiltration and hydric soils provide an opportunity for groundwater recharge of stormwater runoff management and should be maintained as an additional source of stormwater management. These critical soils are “working” for the communities and disturbance and compaction to them should be limited.

### Key Benefits

- Allows stormwater to infiltrate into the ground
- Water that penetrates the soil gets filtered
- Slowly releases stormwater into the stream system

Infiltration of stormwater into the soil reduces both the volume and peak discharge of runoff from a given rainfall event, and also provides for water quality treatment.

Soils with maximum permeabilities (Well Drained and Moderate Infiltration) allow for the most infiltration of runoff into the ground.

Therefore, areas of a site with these soils should be conserved as much as possible and these areas should ideally be incorporated into undisturbed natural or open space areas. Conversely, buildings and other impervious surfaces should be located on those portions of the site with the least permeable soils.

### RECOMMENDATIONS:

Communities should protect critical soils by:

- Unpaved areas of pervious soils should be left undisturbed.
- Retaining natural drainage patterns where possible
- Retaining or integrating rough, native species vegetation
- Integrating large-scale restored natural landscapes
- Increasing the distances for stormwater runoff to travel
- Diverting runoff to grassy swales which feed into a meadow or woodlands

\* Adopt low impact and conservation development design standards that include the protections measures discussed above.

### Community Provisions to Minimize Disturbance

COMMUNITY	Provisions to Minimize Disturbance	Soil Provision Included in Low Impact / Conservation Design
Boston Heights Village		
Boston Township		
Hudson	Y	N
Macedonia	Y	N
Northfield Center Twp		
Northfield Village		
Oakwood		
Sagamore Hills Township		
Twinsburg Township		

# Tools & Practices

## Minimize Disturbances to Critical Soils

### MINIMIZE DISTURBANCE TO CRITICAL SOILS

KEY ROLES	KEY ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"><li>• Require that critical draining soils be protected from compaction or removal during construction.</li><li>• Encourage landowners to keep grassy swales maintained with native vegetation (change mowing laws to allow taller grasses/native vegetation.)</li></ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"><li>• Account for the value of drainage services that permeable soils provide in storm water management. It is the inverse of the damage that impervious surfaces cause.</li><li>• Discourage development on high quality permeable soils. Instead, encourage development on soils that are not as valuable.</li><li>• Work with private landowners to establish conservation areas where valuable draining soils exist.</li></ul>
Engineering	<ul style="list-style-type: none"><li>• Place compaction limitations on disturbed areas of critical soils.</li><li>• Retain natural drainage patterns whenever possible.</li><li>• Use infiltration tables that are appropriate for the actual condition that the soil on a construction site will be in after compaction.</li></ul>
Developers	<ul style="list-style-type: none"><li>• Design sites to avoid building on well-drained soils.</li><li>• Avoid compaction during construction.</li><li>• Replace topsoil after construction to the level before construction, and plant with native species, not turf grass.</li></ul>

### USE LOW IMPACT DEVELOPMENT (LID)

Low-impact development (LID) is a site design approach, which seeks to integrate hydrologically functional design with pollution prevention measures to compensate for land development impacts on hydrology and water quality.

#### Key Benefits

- Reduces Impervious cover
- Manages stormwater onsite
- Minimizes downstream flooding
- Maintains predevelopment runoff concentrations through innovative best management practices.

LID's goal is to mimic natural hydrology and processes by using small-scale, decentralized practices that infiltrate, evaporate, detain, and transpire stormwater. LID stormwater controls are uniformly and strategically located throughout the site.

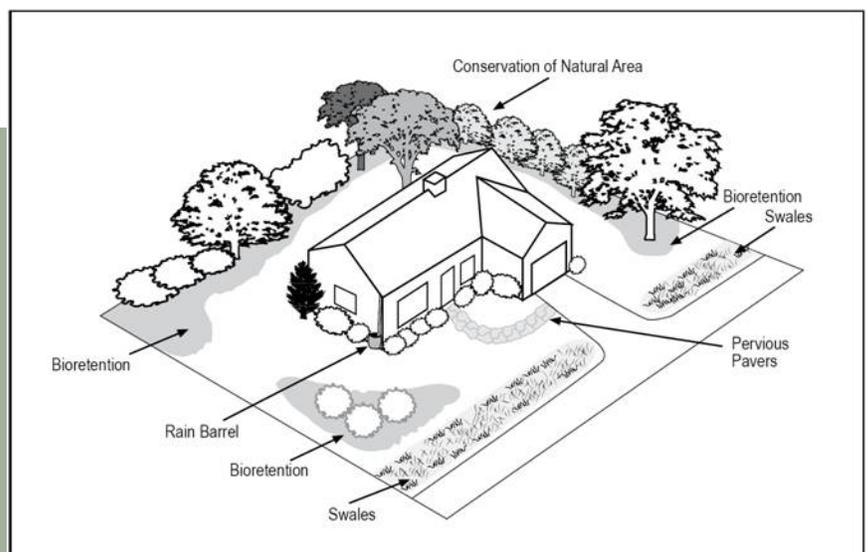
LID is achieved by:

- Minimizing stormwater runoff impacts to the extent practicable through preservation of existing landscape features and their hydrologic functions.
- Maintaining predevelopment time of concentration through strategic routing of flows using a variety of site design techniques.
- Dispersing runoff storage measures through a site's landscape through the use of a variety of detention, retention, and runoff practices.

LID practices manage stormwater at its source. LID measures reduce impervious cover, minimize disturbance, preserve and recreate natural landscape features, increase hydrologic disconnects and facilitate infiltration and detention opportunities. LID creates a multifunctional landscape which relies on natural features and processes and emphasizes simple, nonstructural, low-tech methods.

Due to maintenance considerations, LID may be most appropriately used on institutional, industrial, commercial and governmental developments. However, LID in tandem with conventional stormwater control features can be successfully integrated into any development. LID has been demonstrated to work in new developments and constrained sites involving urban infill.

LIDs can be effective tools to retrofit existing properties.



# Tools & Practices

## Use Low Impact Development (LID)

### RECOMMENDATIONS:

Allow for the Implementation of Low Impact Development Techniques.

- **Adopt Low Impact Development Provisions:** Adopt zoning and other appropriate land-use and management provisions to allow for the use of low impact development techniques for residential, business and industrial districts. This may be done through a comprehensive regulation related to site development or a set of related regulations.
- **Parking Lot Standards:** Include setting maximums of parking lots created (using average demand rather than peak demand), minimizing the dimensions of lot spaces, using alternative pavers in overflow parking areas, using bioretention areas to treat stormwater.
- **Impervious Surface Limits:** Place a percentage limit on impervious surface coverage. Examples include 10-20% in residential areas and 30% and up in commercial/high density residential.
- **Compacted Soils:** Unpaved areas of pervious soils should be left undisturbed. Retaining natural drainage features and encouraging conservation site design to protect against excessive soil compaction.
- **Allow for Integrated Stormwater Management Practices:** The LID principles are designed to minimize disturbance and manage storm water as close to its source as possible. Specific low impact development controls, called Integrated Management Practices (IMP's), are tools for developers to use to manage storm water at its source rather than relying solely on centralized Best Management Practices (BMP's), such as detention basins. These IMPs include a variety of non-structural and structural practices such as:

- o Riparian and wetland setbacks
- o Biofiltration facilities
- o Vegetated swales
- o Cistern & rain barrels
- o Infiltration trenches
- o Green roofs

- Examples:
1. City of Kent's Low Impact Development Ordinance- Chapter 1203
  2. City of Cuyahoga Falls' Green Overlay District- Chapter 1132

### Low Impact Development

COMMUNITY	Low Impact Development Ordinances	Impervious Surface Limits	Provisions for Pervious Pavers	Minimize Disturbance to Natural Site Features	Provisions to Integrate Stormwater BMPs
Boston Heights Village	N	N	N	Y	N
Boston Township	N	75%	N	Y	N
Hudson	N	Y - Single Family max 40% total area	N - Allowed	Y - Priority Retention Areas	N - Allowed
Macedonia	N	N	N	Y	N
Northfield Center Twp	N	Limits in floodways	N	Y	N
Northfield Village	-	-	-	-	-
Oakwood	N	Y - Residential Districts, all structures combined max 40% of lot	N	Y	N
Sagamore Hills Twp	N	N	N	N	N
Twinsburg Township	N	N	N	Y	N

\* Porous pavement- Porous pavement is a permeable pavement surface with a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the subsoil or discharging into a sewer system.

## Tools & Practices

### Use Low Impact Development (LID)

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Allow for implementation of LID techniques in building codes.</li> <li>• Adopt LID provisions in zoning of residential, commercial and industrial districts.</li> <li>• Set maximum parking lot size rather than minimum. Size for average demand rather than peak demand.</li> <li>• Limit area of impervious surface allowed, including roofs and impervious paving, as percentage of total area.</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Allow variances for LID techniques.</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Encourage residents and businesses to retrofit properties with LID elements, and support code changes if necessary.</li> <li>• Incentivize installation of LID practices on existing properties; recognize the stormwater management value and contribution to reduction of cost and burden on municipal systems.</li> <li>• Reward developers who use LID practices and reduce your stormwater infrastructure costs.</li> </ul>
Service and Engineering	<ul style="list-style-type: none"> <li>• Adopt LID for community-owned properties and offer as demonstration sites.</li> </ul>
Stewardship Groups	<ul style="list-style-type: none"> <li>• Train residents and landscapers to build raingardens, and sponsor demonstrations.</li> <li>• Encourage installation of rainbarrels, ponds and other backyard-friendly water storage and management practices.</li> </ul>
Residents, Business Owners and Property Owners or Managers	<ul style="list-style-type: none"> <li>• Use the areas on your property the way they want to work – an area that holds water wants to be a raingarden or pond, so surround it with decorative rocks and native plants or build a raingarden there, and direct roof runoff to your yard, not to the storm sewer.</li> <li>• Install pervious pavers in place of concrete or asphalt.</li> <li>• Replace turf grass with more pervious ground cover.</li> <li>• Plant trees.</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Use Integrated Stormwater Management Practices that minimize disturbance and manage stormwater at its source, rather than relying on BMPs such as detention basins. IMPs include structural and non-structural methods such as:               <ul style="list-style-type: none"> <li>• Riparian and wetland setbacks</li> <li>• Biofiltration facilities to hold and filter discharge</li> <li>• Vegetated swales to absorb and drain water</li> <li>• Green roofs to reduce runoff</li> <li>• Cisterns &amp; rainbarrels for water harvesting and temporary storage</li> <li>• Infiltration trenches</li> </ul> </li> <li>• Use Pervious/Permeable paving materials for significant portions, if not all, of paved walkways and parking surfaces.</li> <li>• Replant trees and forest cover lost during construction.</li> </ul>

# Tools & Practices

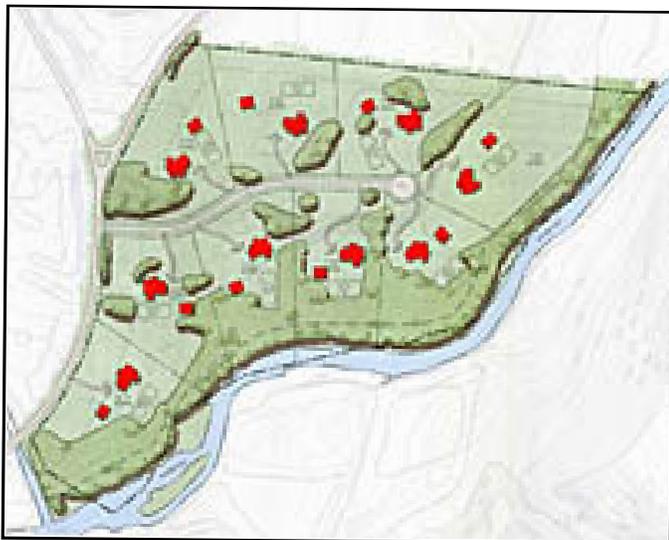
## #8 CONSERVATION DEVELOPMENT

Conservation Development refers to development practices that allow land to be developed while conserving a sense of rural character, protecting natural resource features, and insuring water quality. In the process, property rights are protected, the community retains its unique identity and resources, the developer benefits with a high-quality project, and the environmental impacts of development are reduced.

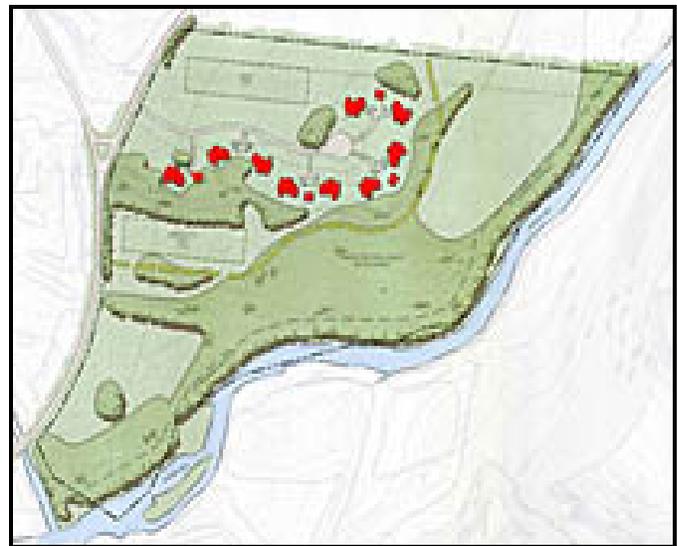
### Key Benefits

- Reduces impervious surface area
- Reduces development and community infrastructure costs
- Protects and integrates openspace areas into neighborhoods
- Open space can be used to protect natural resources onsite
- Reduces stormwater runoff
- Allows communities to retain rural character

Conservation Development typically allows higher density on a portion of the site in order to leave the rest of the site undeveloped. This results in the same number of structures that would be allowed in a traditional development on a particular parcel of land being located with more flexibility. This flexibility in housing lot sizes and setbacks makes it much more palatable to developers. As part of the site design, at least 40% of the land should be set aside as permanent open space. The resulting protected open space provides room for conservation practices that serve to buffer the impacts of the development.



Traditional Dispersed Development



Conservation Development

Conservation Developments should not be confused with Low Impact Development.

- Conservation Development involves the overall layout of the property to retain open space. It may or may not include Low Impact Development measures in its site plan.
- Low Impact Development practices apply to on-site measures used for stormwater retention and management.

# Tools & Practices

## Conservation Development

### Conservation Development (single family)

COMMUNITY	Flexible Development Options	Permitted-By-Right	40% Open Space Required	Density Bonuses	Open Space Used for Resource Protection
Boston Heights Village	Y - Residential Cons. Dev.	N Conditional	40%	Y	Y
Boston Township	N	N	N	N	N
Hudson	Y - Openspace Cons. Dev.	N Conditional	50%	Y	Y - open space land shall be contiguous
Macedonia	Y - PUD	N - District	20%	N	Y - contiguous
Northfield Center Twp	Y - Openspace Cons. Dev.	Y	50%	N	Y
Northfield Village	N	N	N	N	N
Oakwood	Y - RPD	N - Overlay	N	N	N
Sagamore Hills Township	Y - PUD & Cluster Dev.	By permit district	40%	N	Y
Twinsburg Township	Y - PRD	N - District	30-40% based on district	Y	Y - environmentally "sensitive areas"

### CONSERVATION DEVELOPMENT

KEY ROLES	KEY ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Make Conservation Development the default site design option.</li> <li>• Require minimum 40% naturalized open space.</li> <li>• Reduce open space credit for heavily-fertilized, barely pervious turf grass cover, and increase for forest area or use as mitigation bank.</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Do not allow variances post-construction or post-occupancy that would reduce conservation area percentage.</li> <li>• Require that variances you must approve be mitigated on site in comparable size or watershed function.</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Offer incentives for Conservation Development.</li> <li>• Use density bonus as incentives to cluster impervious surfaces.</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Choose site design options that maximize preservation and function of natural areas.</li> <li>• Avoid filling open space with barely-pervious turf grass.</li> <li>• Use Low Impact Design practices on parcel design.</li> </ul>

# Tools & Practices

## #9

### WOODLAND/TREE CANOPY PROTECTION

A Tree Canopy Program helps communities preserve existing canopy (or restore) to maintain a certain percent coverage. The percent coverage often depends on the underlying zoning (ie. residential, commercial) of the community.

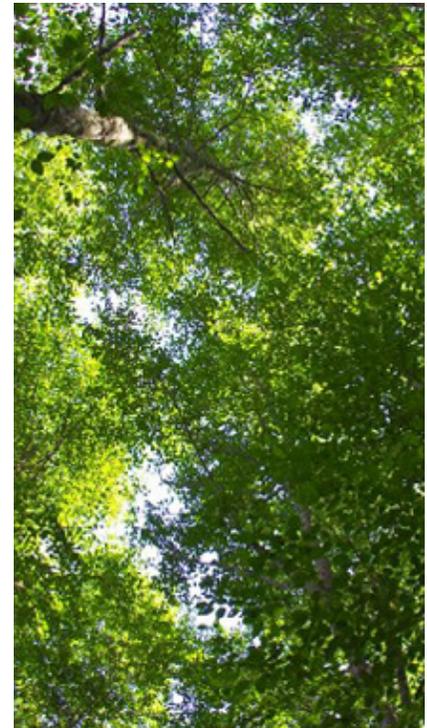
#### Key Benefits

- Stabilizes soils
- Cleanses stormwater helping to improve water quality
- Reduces flooding problems by managing stormwater
- Conserves household energy costs
- Provide wildlife habitat

Trees help support a community's quality of life by maintaining the proper functions of watersheds. A healthy forest system can reduce storm water infrastructure costs by intercepting rain, increasing ground absorption and slowing the rate of runoff. Other community benefits include: protecting drinking water supplies, enhancing property values and reducing household energy costs.

#### RECOMMENDATIONS:

- Communities should protect woodlands and valuable canopy cover by adopting measures in their codified ordinances. In the ordinances, woodland areas of likely high value to the community should be identified for further attention at the site design level.
- A minimum % coverage of forest cover should be determined for post construction goals for residential, nonresidential and varying densities. Example: The City of Roanoke, Virginia has recently adopted a 40% canopy goal with targets of 20% for commercial and industrial areas, and 50% for residential areas. Urban areas in Maryland have a target of 40% overall coverage.
- Require professional evaluation of blocks of woodland at the preliminary design stage (avoid the requirement for every tree on a site to be identified). The code should require a tree protection plan and its approval prior to permit, and assure that the plan is implemented and monitored during construction. Provisions for monitoring for at least a year after construction should be included.
- Allow applicants to seek variance to reduce lot sizes in order to preserve more natural features (i.e. forest cover, riparian zones etc.)



# Tools & Practices

## Woodland/Tree Canopy Protection

In order to establish canopy cover goals for a community, a community must first assess existing tree cover. There is an array of technology to accomplish this including GIS, aerial photographs, satellite images, and/or ground surveys. Using this benchmark data, the community must then decide, “What is a reasonable canopy goal for them to try to attain in a given period of time”? These goals should reflect both conservation efforts and planned restoration activities on public and private lands. Goals may be set for an overall canopy target for the jurisdiction or they may vary by land use— such as residential, industrial/commercial, streets, and/or parks and open spaces. American Forests recommends that urban areas strive for 40% canopy overall, 50% canopy in suburban residential areas, 25% canopy in urban residential areas, and 15% canopy in commercial areas.

There are four stages in the development process at which tree protection provisions can be applied:

- (1) Preliminary design – identifying woodland areas on a site or in a community which are of high value for preservation
- (2) Specific design – identifying specific trees on the site which will be preserved and those which will be removed, and specifying methods for protection of those to remain
- (3) Construction protection – implementation of the specifications for protection of trees during the construction process
- (4) Post construction monitoring – ongoing evaluation of tree health after construction and implementation of recommendations for remedial care if necessary

### Community Forest/Tree Canopy Protection

COMMUNITY	Woodland or Canopy Protection Ordinance	Provision to Protect Trees During Construction	Required # or % of Canopy Coverage Post Construction
Boston Heights Village	N	N	N
Boston Township	N	Y	N
Hudson	Y	Y	N - tree mitigation established
Macedonia	N	N - recommends	N
Northfield Center Twp	N - Street tree related	N	N
Northfield Village	N	Y	N
Oakwood	Y - Tree Protection Plan	Y	Y - Total Caliper of trees
Sagamore Hills Township	N	N	N
Twinsburg Township	N	Y	N

Caliper Inches is the diameter in inches of the tree trunk twelve (12) inches above the base of the tree

# Tools & Practices

## Woodland/Tree Canopy Protection

KEY ROLES	KEY RECOMMENDED ACTIONS
Legislators, Planning Commissions	<ul style="list-style-type: none"> <li>• Establish forest cover goals for your community. American Forests recommends that urban areas strive for 40% canopy overall, 50% canopy in suburban residential areas, 25% canopy in urban residential areas, and 15% canopy in commercial areas.</li> <li>• Goals should reflect both conservation efforts and planned restoration activities on public and private lands.               <ul style="list-style-type: none"> <li>• Preliminary Site Design – Identify high value woodland areas for preservation</li> <li>• Identify specific trees to be preserved and specify protection methods. Measure canopy cover and/or caliper inches of trees to be removed and determine the method of replacing a comparable volume of forest cover on site or in a forest mitigation bank.</li> <li>• Mandate protection of trees and avoidance of soil compaction during construction.</li> <li>• Monitor tree/forest health and require maintenance on an ongoing basis post-construction.</li> </ul> </li> <li>• View forest cover as infrastructure, and provide funds to maintain and improve your urban forest</li> <li>• Require developers to follow forest cover goals and integrate planting areas into parking lots to reduce runoff.</li> </ul>
Zoning Appeals Boards	<ul style="list-style-type: none"> <li>• Enforce codes that support preservation</li> <li>• If variances are allowed that remove forest cover, require mitigation</li> </ul>
Administration, Economic Development, Community Development	<ul style="list-style-type: none"> <li>• Work with private landowners to establish forest mitigation banks of land to accommodate replacement of lost canopy cover</li> <li>• Recognize the infrastructure value of woodlands and factor into the equation as assets</li> </ul>
Tree Commissions	<ul style="list-style-type: none"> <li>• Educate and encourage landowners to preserve, restore or increase tree and forest cover on private land</li> <li>• Create a forest mitigation fund where developers or landowners who remove trees, but whose site cannot accommodate replanting, can contribute payments in lieu of planting, and use those funds to plant, improve or maintain tree canopy and forest cover on public lands and rights-of-way.</li> </ul>

### Examples of Forest Management Programs:

Maryland Forest Conservation Act- Areas that are deforested by development must be partially reforested to:

- 25% of the pre-development forest for medium density residential development;
- 20% for high-density residential;
- 15% for commercial, industrial, or mixed use and
- 50% for agricultural and resource areas.

# Tools & Practices

## Woodland/Tree Canopy Protection

KEY ROLES	KEY RECOMMENDED ACTIONS
Stewardship Groups	<ul style="list-style-type: none"> <li>• Support forest preservation, and especially increased planting, throughout the community</li> <li>• Sponsor tree planting events, seedling giveaways, and adopt-a-forest programs</li> <li>• Work with governments and private landowners to designate planting sites.</li> <li>• Educate landowners, especially in commercial and residential areas, about the importance of letting forested areas “go natural”, letting volunteer understory trees, shrubs and vegetation take hold, and allowing leaves to remain to form new soil. Discourage the practice of removing fallen leaves and replacing with store-bought mulch. Let the trees mulch themselves.</li> </ul>
Residents, Property Owners and Property Managers	<ul style="list-style-type: none"> <li>• Retain and maintain forested areas, including tree canopy, understory and ground level vegetation.</li> <li>• Restore forested connections between segments of woodland to support wildlife habitat, establish greenways and improve forest function.</li> <li>• Do not rake leaves from woodlands.</li> <li>• Allow “volunteer” seedlings to grow.</li> <li>• Aim for at least 40% of property to be planted, to to naturally revert to woodland.</li> <li>• Plant native trees and understory vegetation.</li> </ul>
Developers	<ul style="list-style-type: none"> <li>• Design sites to include ample forest cover, preferably in areas where they can reduce surface water runoff.</li> <li>• Incorporate trees throughout parking areas to absorb water and shade vehicles. Surround “tree boxes” with pervious paving strips and fashion the boxes or curbs with ground-level holes to allow runoff from paved areas to enter the root system.</li> <li>• Resist the temptation to rake and mulch under trees – use lower level plantings and ground cover that requires minimal maintenance and reduces root disturbance</li> </ul>

Olmsted Falls’ Tree Preservation & Management (Chapter 1218) ordinance helps preserve and replant trees.

The ordinance organizes tree management into

- A. Natural Undisturbed Areas;
- B. Buffer Zones or Screening Areas and
- C. Wooded Areas within Buildable Property.

All new development must be designed to preserve healthy trees and woodlands.

Minimum standards-

- minimum of 40 caliper inches /acre (not including the natural undisturbed, buffer zones or wooded area within buildable property
- Newly planted trees have a minimum size of 2 caliper and maximum size of 6 caliper.

Springfield Township’s Tree Preservation Ordinance (Chapter 550.5) states existing woodlands shall be maintained and preserved. On residential and nonresidential development:

- A minimum of 50% of mature woodlands shall be preserved
- A minimum of 25% of young woodlands shall be preserved and
- Large, solitary trees (of a certain caliper), not in conflict with structures, shall be preserved to the extent practicable.

## WETLAND & STREAM MITIGATION IN BRANDYWINE CREEK WATERSHED

Wetlands, streams and natural riparian corridors provide important stormwater services to the Brandywine Creek Watershed. Maintaining the **quantity** and **quality** of these natural resources provides economical and environmental protection to the watershed communities.

Before anyone can impact a wetland or stream, they must obtain a Clean Water Act Section 401 water quality certification or Isolated Wetland permit from Ohio EPA and also must obtain a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers.

When a wetland or a stream is filled or impacted, typically from development, actions must be made to compensate for the loss.

**This compensation is termed *Mitigation*.**

These watershed impacts, however small, over time can cause watersheds to lose their capacity to manage stormwater. As a result, communities will experience more frequent flooding and erosion problems and costly repairs.

To minimize this loss, a compensatory mitigation project should be located close to the source of impact.

**This means that mitigation should stay within the Brandywine Creek Watershed.**

Mitigation can be in the form of:

- restoration
- creation
- enhancement, or
- preservation

### MITIGATION PROJECTS

The Cuyahoga River Community Planning Organization is currently developing mitigation projects for wetlands in Brandywine Creek and the rest of the Cuyahoga River Basin.

There are two overarching goals to the project:

1. Keep mitigation projects within the Brandywine Creek Watershed
2. Prioritize wetland mitigation opportunities

This will help direct efforts to key wetland sites that can help maximize stormwater management and nonpoint source pollution control.

The Cuyahoga Wetland Project will help identify the top 10 wetlands sites in each tributary watershed, including Brandywine Creek, that should be targeted for future protection.

A wetland scoring methodology will be developed to identify the key wetland sites.

The restoration potential of each site will be included along with a library of unit cost factors to develop reasonable cost estimates.

**Please note:** The Cuyahoga Valley National Park currently has eligible wetland and stream mitigation projects available. Contact Kevin Skerl at 330-650-5071 ext.4 for more information.

## TOOLS AND PRACTICES FOR WATERSHED MANAGEMENT

The watershed communities are working to more fully understand management tools and strategies that they could implement throughout the watershed. These management tools can help address a wide range of issues through planning measures, design standards, regulations, inter-community cooperation, funding etc.

Throughout the organizing process and discussions, the participants have grown to appreciate Low Impact Development (LID) practices which could be adopted in their own government operations and to encourage those strategies among property holders.

The table below presents a pallette of the tools and practices available to communities and property owners to more effectively control stormwater and manage growth. These tools and practices will be implemented through changes in land development codes, zoning regulations and design standards as well as operational practices by communities and individuals.

<b>TOOLS &amp; PRACTICES</b>
Maximum Impervious lot area
On-Site retention
Tree Mitigation
Forest Canopy/natural area conservation
Traffic Impact Study/Mitigation
Roadway (public land/right-of-way) stormwater BMP
Storm Drain flow reduction/filtration
Pervious paving
Parking lot minimum infiltration areas
Greenspace overlay to Master Plan
Master Plan updates
Conservation Development Zoning
In-Watershed Mitigation
Mitigation Bank
Model Operations for Communities to follow to educate public <ul style="list-style-type: none"> <li>• no mow areas</li> <li>• “mow high” areas</li> </ul>
Prohibition and removal of invasive species
Low impact development options in building/housing codes

## In Conclusion:

Continued support by the communities of Brandywine Creek and the Cuyahoga River RAP will be essential for ongoing improvement and stewardship within the watershed.

## Status and Recommendations

This Balanced Growth Plan is the product of strong collaboration among the Brandywine Creek communities with substantial and important support of the Cuyahoga River Remedial Action Program organization. There is general recognition that the map of the Brandywine Watershed would be very different had this effort been undertaken 30 years ago. The Plan is a set of strategies that capitalizes on the opportunities and benefits of balancing economic development and growth with protection of the environment. Particularly important derivative benefits of balanced growth are the goals of assuring a continuing and abundant supply of high quality fresh drinking water to Northeast Ohio communities whose source is Lake Erie, as well as protecting private and public property from stormwater damage.

A number of short term actions that member communities will consider have surfaced in the process of creating this plan:

- Incorporate the PCA / PDA map and watershed stewardship objectives into local comprehensive plans or similar documents that drive local codes and ordinances. Of course, each community should adhere to its established public comment and review practices.
- Update local ordinances and zoning codes as recommended in the Plan. Jurisdictions should work together on this task as appropriate, particularly where they share portions of targeted PCAs or PDAs.
- Continue to collaborate in the direction of uniform storm water codes throughout the watershed. This is to ensure that watershed protection and site development review processes are fair, consistent and apply evenly to all areas of the watershed as development and plan implementation moves forward.
- Revisit the watershed partnership structure and refresh it. As our watershed communities are gaining in their understanding of balanced growth and its complexities and opportunities, especially funding, a forum or organization will be needed to facilitate continuing community collaboration, education, coordinated action and updating of the Plan. It should also assist individual community initiatives that are undertaken to enhance the watershed improvement objectives. However, the organization needs to be cost effective requiring a critical mass enabling it to be successful, yet not so large as to be distant and unresponsive to local needs. Partnering with other watershed groups may be an option.

Other possibilities exist for community action, but they require additional time for community understanding and commitment:

- Explore developing a Transfer Development Rights / Purchase Development Rights / Density Transfer Program. As a long term goal, development rights programs should be considered as part of the tool box of options to achieve conservation and direct development away from sensitive areas.
- Develop a mitigation banking system for wetlands and streams. Should an unavoidable impact occur, a compensatory mitigation plan needs to be ready to keep these critical resources in the watershed.
- Identify needed restoration and enhancement sites in Brandywine Creek Watershed. Wetland sites in the watershed are currently being analyzed for restoration and enhancement potential. These wetland results, along with stream data, will be shared with the partnership and targeted for funding and remediation.

# Appendices

- A. Balanced Growth Incentives Fact Sheets Page 90
- B. Special Incentives Page 92
- C. Composite Watershed Map printed copy Page 99  
electronic copy; see separate .PDF file

## Ohio Balanced Growth Program

### Incentives

June 2012

[balancedgrowth.ohio.gov](http://balancedgrowth.ohio.gov)



#### Local Roles:

Local governments should be involved in the designation of Priority Areas. Once Priority Areas have been chosen, local governments should:

- Update existing land use plans using Priority Areas as guidance.
- If no land use plan exists, develop a plan that includes minimum standards and uses the Priority Areas as guidance.
- Adopt local ordinances/resolutions based on the guidance for Best Local Land Use Practices.
- Direct local capital expenditures to support Priority Areas, as existing roads and sewers are maintained or expanded.

#### State Roles:

If local governments can agree on areas where development is to be encouraged (PDAs), areas where conservation activities are to be promoted (PCAs), and areas where agriculture is to be preserved (PAAs), the State of Ohio will support those decisions by aligning state programs to support those decisions. The state will also:

- Provide for public education about Balanced Growth
- Review and endorse Watershed Balanced Growth Plans
- Provide technical support to watershed planning projects
- Continue to develop and maintain state incentives for watershed planning

#### Why Incentives?

To support and encourage watershed-based planning, the state has created an incentives package that is available to Watershed Planning Partnerships and their participating local jurisdictions with an endorsed plan.

#### Objectives of the State Incentives Package

The objectives of the state incentives package for Balanced Growth include:

- Promoting economically and environmentally sound watershed-based planning by local governments.
  - Providing incentives for development in locally determined Priority Development Areas.
  - Promoting redevelopment in locally determined Priority Development Areas.
  - Providing incentives to promote conservation activities in locally determined Priority Conservation Areas.
  - Preserving agricultural industry in Priority Agricultural Areas.
- The special incentives include specific grant and technical assistance programs that offer added consideration for projects that are within PCAs and PDAs.

#### Elements of the State Incentive Package

There are four elements of the state incentive package:

The **State Program Inventory** lists state programs and funding sources that support conservation in the Priority Conservation Areas, development or redevelopment in the Priority Development Areas, and agricultural industry in the Priority Agricultural Areas.

Local governments also may work with state agencies through the **State Assistance Work Group** – this group of state agency managers can assist participating local governments in identifying and obtaining technical and financial resources to support their planning efforts.

The State Assistance Work Group will develop methods to provide more advance **Predictability and Streamlining** for site related decisions in Priority Areas.

A list of **Financial and Technical Special Incentives** is provided in the Ohio Balanced Growth Strategy. The special incentives include specific grant and technical assistance programs that offer added consideration for projects that are within Priority Areas.



## Incentives



### The State Assistance Work Group

One of the state incentives for local governments is the opportunity to work with the State Assistance Work Group. The State Assistance Work Group is charged with assisting the Watershed Planning Partnerships and participating local governments in identifying technical and financial resources that can support Priority Development Areas, Priority Conservation Areas, and Priority Agricultural Areas.

The member agencies of the Ohio Lake Erie Commission and the Ohio Water Resources Council are represented, including the Ohio Departments of Natural Resources, Transportation, Agriculture, and Health, the Ohio Environmental Protection Agency, the Ohio Development Services Agency, the Ohio Water Development Authority, the Ohio Public Works Commission, and the Office of the Governor.

### What are the goals of the State Assistance Work Group?

- Help Watershed Planning Partnerships and individual local governments identify state programs that will support the Priority Areas.
- Provide the agencies with knowledge about each Balanced Growth Plan and the local development and conservation goals.
- Evaluate proposed new rules or rule revisions by the state agencies and provide comments that best incorporate balanced growth considerations. Review funding priorities to provide suggestions on how to be supportive of Balanced Growth.
- Identify any additional programmatic resources or policy changes that will help align state programs and policies with local goals.
- Guide the development of public information resources.

The **Financial and Technical State Incentives** consist of existing state programs that have implemented additional consideration (extra priority ranking, interest rate discounts, or special support) for local activities that will implement Priority Development Areas, Priority Agricultural Areas, or Priority Conservation Areas in Balanced Growth participating communities. These programs provide state incentives:

#### Ohio Environmental Protection Agency:

Section 208 Planning  
Clean Water Act Section 319 Implementation Grants

Water Pollution Ctrl Loan Fund  
Water Supply Revolving Loan Account

#### Ohio Development Services Agency:

Redevelopment Technical Assistance

#### Ohio Department of Transportation:

Transportation Review Advisory Council (TRAC) Funds

#### Ohio Lake Erie Commission:

Lake Erie Protection Fund

#### Ohio Water Development Authority:

Dam Safety Loan Program  
Community Assistance Loan Program  
Fresh Water Loan Group

#### Ohio Department of Natural Resources:

Coastal Mgmt Assistance Grant  
Watershed Coordinator Grant  
Market Development Grant  
Scrap Tire Grant  
Land & Water Cons. Fund  
Nature Works  
Streams & Storm Water Program  
Ohio Lake Erie and Scioto River Conservation Reserve Enhancement Program

Wetland Restoration Program  
National Flood Insurance Program Community Rating System  
Floodplain Management Technical Assistance Program  
Dam Safety Technical Assistance  
Statewide Geologic Mapping  
Recreation Harbor Evaluation Program

#### Ohio Department of Agriculture:

Clean Ohio Agricultural Easement Purchase Program  
Agricultural Security Area

The list of programs that include state incentives for local Balanced Growth actions changes frequently and may be added to or removed from this list at any time. For the most up to date and complete information, please contact the Ohio Balanced Growth Program directly. Also see the "Special State Incentives" list at <http://balancedgrowth.ohio.gov/Home/FactSheets.aspx>.



Water Resources Council  
Lake Erie Commission

OWRC: 614.644.2033

OLEC: 419.357.2775

[dnr.ohio.gov/OWRC/](http://dnr.ohio.gov/OWRC/)

[lakeerie.ohio.gov](http://lakeerie.ohio.gov)

**Special Incentives:** These are the 26 state programs that include special consideration for Balanced Growth participating communities. A Balanced Growth participating community is one that has passed a resolution of support for a Watershed Balanced Growth Plan that has been endorsed by the state. Underline indicates general category of targeted applicants (see program details for specific eligibility requirements).

More information about each program, including contact information, is available in the complete Inventory of State Programs, Appendix C of the Ohio Balanced Growth Strategy (posted online at <http://balancedgrowth.ohio.gov/BalancedGrowthStrategy.aspx>).

Program	Type	Agency	Purpose	Incentives
Clean Ohio Agricultural Easement Purchase Program PAA/PCA	Grant	ODA	Allows <u>counties, townships, and land trusts</u> to apply to ODA on behalf of farmers for the purchase of agricultural easements that preserve productive farmland for future generations.	Applicants receive up to 3 points for the plan in a participating BG community, and up to 5 points for projects in a participating BG community located in a PCA or PAA in the Tier I part of the review (out of 100 pts). Applicants may receive additional points in Tier II essay question about planning (up to 10 pts of 50 pts)(150 pts total).
Agricultural Security Area PAA/PCA	Tax Credit	ODA	ASAs promote agricultural retention by creating special areas in which agriculture is encouraged and protected. ASAs provide certain benefits to communities and <u>farmers</u> , including protection from non-agricultural development, ensuring a critical mass of land to help keep farming viable, and possible tax benefits for investing in new real agricultural property.	Counties with participating communities may be able to implement local incentives for the ASA in support of PAAs. The ODA Office of Farmland Preservation can assist counties in marketing and/or enrolling properties that support PAAs.
Clean Water Act Section 319 Implementation Grants PCA	Grant	OEPA	Provides financial assistance to <u>local soil and water conservation districts, local watershed groups, local governments and others</u> to implement watershed management actions designed to eliminate impaired waters and reduce nonpoint source pollution in Ohio.	Balanced Growth communities can receive up to two additional points out of a possible 62 on review criteria for proposed projects.

Program	Type	Agency	Purpose	Incentives
Water Pollution Control Loan Fund PCA/PDA	Loan	OEPA	Provides low-cost financing and technical assistance to <u>local governments</u> for the planning, design and construction of wastewater facilities improvements, and for the control of nonpoint source pollution of surface and ground waters.	<p>A new loan interest rate discount of 0.1 percent will be available for certain projects that implement a qualifying sustainable growth plan. (See 2012 WPCLF Program Management Plan page 65)</p> <p>The sponsor project for a WRRSP project will not receive the qualifying sustainable growth plan discount solely because it may be sponsoring a qualifying sustainable growth plan WRRSP project. However, if the sponsor project itself should also qualify on its own merits as implementing the qualifying sustainable growth plan, then it would qualify for both the WRRSP discount and the qualifying sustainable growth plan discount. (See 2012 WPCLF Program Management Plan page 66).</p>
Water Supply Revolving Loan Account PDA	Loan	OEPA	Provides low interest loans to <u>eligible public water systems</u> to fund improvements to eliminate public health threats and ensure compliance with federal and state drinking water laws and regulations.	A Balanced Growth Plan may qualify as an Endorsed Protection Plan in the Bonus Points for Effective Management section of the project rankings (up to 5 points). See Final DWAF PY 2013 Program Management and Intended Use Plan, Appendix D, Page 32.

# Brandywine Creek

Program	Type	Agency	Purpose	Incentives
Section 208 Planning (State Water Quality Management Plan) PCA/PDA	Regulatory	OEPA	Meets requirements in federal regulations; applies knowledge of the water quality problems and threats in a region in developing plans that identify what steps will be taken, by what entities and by when to help improve and maintain good water quality. Provides a mechanism for <u>local communities</u> to strengthen local land use and sewer infrastructure planning; OEPA review of wastewater discharge permits and sewer PTIs in PDAs.	BG participating communities may request that areawide agencies in charge of local 208 plans incorporate features from the local BG plans. "Specific prescriptions" regarding wastewater treatment and disposal options would be binding upon OEPA in permitting actions; permits must be consistent with approved 208 plans.
Ohio Coastal Management Assistance Grant Program PCA/PDA Planning	Grant	ODNR	Provides financial assistance to <u>local governments, state agencies, non-profits and educational institutions</u> for projects that preserve, protect and enhance Lake Erie coastal resources and/or support their sustainable use. Program only available in Lake Erie watershed.	Balanced Growth communities can receive up to six additional points out of a possible 140 on review criteria for proposed projects.
Watershed Coordinator Grant Program PCA	Grant	ODNR, OEPA	Provides <u>non-profits and local governments</u> with four year grants to employ watershed coordinators to plan nonpoint source pollution programs via stakeholder compiled watershed action plans.	No additional points. However, a successful balanced growth plan would reflect well in the application process.
Market Development Grant PDA	Grant	ODNR	Provides grant funds to <u>Ohio businesses and non-profit organizations</u> for costs associated with the development of Ohio markets for recycled or recyclable materials.	Balanced Growth participants should indicate how a proposed market development project relates to BG, thereby strengthening the application.

Program	Type	Agency	Purpose	Incentives
Scrap Tire Grant PDA	Grant	ODNR	Provides grant funds to <u>Ohio businesses and educational institutions</u> for costs associated with the development of markets for scrap tires or scrap tire material.	Balanced Growth participants should indicate how a proposed scrap tire project relates to BG, thereby strengthening the application.
Land & Water Conservation Fund PCA	Grant	ODNR	Provides financial assistance to <u>local governments</u> to acquire and/or development properties for outdoor recreation.	Balanced Growth communities can receive up to 10 additional points out of a possible 145 on review criteria for proposed projects.
Nature Works PCA	Grant	ODNR	Provides financial assistance to <u>local governments</u> to acquire and/or development properties for outdoor recreation.	Balanced Growth communities can receive up to 10 additional points out of a possible 150 on review criteria for proposed projects.
Streams & Storm Water Program PCA/PDA Planning	Tech. Assist.	ODNR	Provides technical assistance to <u>local government, business and individuals</u> in the areas of site development, storm water management, stream mitigation, rehabilitation and restoration (mitigation review and design assistance).	Prioritize staff resources toward watersheds with endorsed Watershed Balanced Growth Plans.
Statewide Geologic Mapping Program PCA/PDA Planning	Tech. Assist.	ODNR	Performs the necessary field, laboratory and administrative tasks to map and make public reports on the geology and mineral resources of each county in Ohio.	Technical (geological) information in support of Balanced Growth Plan, including special studies that may be requested by WPPs.
Recreation Harbor Evaluation Program PDA	Grant	ODNR	Provides financial assistance to <u>local political subdivisions</u> on the Ohio River and Lake Erie and its tributaries to address dredging needs for recreational boating harbors and channels.	Balanced Growth communities can receive up to 15 additional points out of a possible 115 on review criteria for proposed projects.

# Brandywine Creek

Program	Type	Agency	Purpose	Incentives
Ohio Lake Erie Conservation Reserve Enhancement Program (CREP) and Scioto River Watershed CREP PAA/PCA	Grant	ODNR	Improves water quality by reducing sediment pollution and field runoff through the installation of filter strips, riparian buffers, wetland, hardwood trees, wildlife habitat and field windbreaks by <u>farmers</u> .	Prioritize some remaining state matching funds and in-kind staff assistance for Balanced Growth communities.
National Flood Insurance Program Community Rating System PCA	Insurance Discount	ODNR	Provides subsidized flood insurance in <u>local communities</u> that adopt and enforce flood damage reduction regulations. Also, communities participating in the NFIP have access to all aspects of disaster assistance. The CRS rewards those communities that are doing more than the minimum National Flood Insurance Program requirements to help their residents prevent or reduce flood losses.	Balanced Growth communities are, by definition, likely to be performing land use planning activities to forward sustainable development practices. Communities participating in CRS can apply for points based on BG planning activities to achieve discounted flood insurance premiums.
Floodplain Mgmt. Tech Asst. Program PCA Planning	Tech. Assist.	ODNR	Provides technical and planning assistance to <u>local governments</u> in order to reduce flood loss and preserve natural benefit and function of floodplain resources in Ohio.	NFIP participation and local adopted floodplain management regulations gives communities eligibility for state and federal disaster relief funds. Additionally, NFIP participating communities with FEMA-approved hazard mitigation plans are eligible for an array of pre- and post-disaster mitigation funds. BG plans may support these requirements.
Dam Safety Technical Assistance PCA/PDA Planning	Tech. Assist.	ODNR	Provides technical assistance to <u>local communities</u> about the location and extent of dam failure inundation areas.	Inclusion of strategies and actions to address dam failure risk in Balanced Growth Plans can easily be incorporated into mitigation plans.

Program	Type	Agency	Purpose	Incentives
Clean Ohio Revitalization Fund PDA	Grant	ODSA	Once a site has been designated a brownfield, the Clean Ohio Revitalization Fund can provide grant money to <u>local governments</u> for various activities, including Asbestos Surveys, Phase II Environmental Assessments, demolition, removal of contaminated soil and groundwater, and a host of other remediation strategies.	This program is undergoing significant changes: Balanced Growth incentives are TBD
Office of Redevelopment Technical Assistance	Tech. Assist.	ODSA	The Office is able to provide assistance in several ways:  Helping to identify the most appropriate technical and financial resources that can support PCAs and PDAs identified in your plan;  Providing guidance on identifying other sources of support and on how to best utilize those sources;  Simplifying your interaction with the ODSA by providing a knowledgeable, central contact; and  Keeping you informed of the latest program and policy updates that may affect implementation of your plan.	Prioritize staff resources toward watersheds with endorsed Watershed Balanced Growth Plans.
Lake Erie Protection Fund PCA/PDA Planning	Grant	OLEC	Provides funds to <u>non-profits or units of government (local, state, or federal, including universities)</u> for research that will benefit Lake Erie or to supplement state commitments to policies and programs pertaining to water quality and resource protection in the Lake Erie watershed.	Funding is reserved for one Balanced Growth project per year of up to \$15,000; additional Balanced Growth projects will receive priority consideration in funding decisions.

# Brandywine Creek

Program	Type	Agency	Purpose	Incentives
Dam Safety Loan Program PDA	Loan	OWDA	Provides below market rate loans to <u>local governments</u> to protect dam structures.	Additional ½ percentage point discount on loans to BG participating communities.
Fresh Water Loan Group PDA	Loan	OWDA	Provides market rate loans to <u>local governments</u> that are making improvements to their drinking water treatment, wastewater treatment or storm water treatment systems.	Additional ½ percentage point discount on loans to BG participating communities.
Community Assistance Loan Program PDA	Loan	OWDA	Provides below market rate loans to <u>local governments</u> that are making improvements to their drinking water treatment or wastewater treatment systems.	Additional ½ percentage point discount on loans to BG participating communities.
Transportation Review Advisory Council (TRAC) Funds PDA	State Expenditure (projects chosen competitively)	ODOT	Selects the major new capacity projects to be constructed in a six-year period. Major new capacity projects are those which cost ODOT more than \$5 million and does one or more of the following: increase mobility, provide connectivity, increase the accessibility of a region for economic development, increase the capacity of a transportation facility, or reduce congestion.	No additional points. However, a successful balanced growth plan would reflect well in the project consideration process under the new guidelines for the program.

January 7, 2013