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# **The Euclid Creek Watershed Planning Guide**

## **A Vision for the Watershed**



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PURPOSE AND ISSUES	PAGE 1–2
PHYSICAL ENVIRONMENT	PAGES 3–9
NATURAL ENVIRONMENT	PAGES 10–12
HUMAN INFLUENCE	PAGES 13–36
A VISION FOR THE FUTURE	PAGES 37–40
WATERSHED STRATEGIES	PAGES 41–70
LIVING IN HARMONY WITH EUCLID CREEK	PAGES 71–92
WHAT THE WATERSHED COULD LOOK LIKE	PAGES 93–97
THE DECISION MAKING PROCESS	PAGES 98–101
CONTINUED SUPPORT	PAGE 102
APPENDIX A - LISTING OF PLANT COMMUNITIES	PAGE 103
APPENDIX B - ODNR INVASIVE PLANT SPECIES	PAGES 104–108
APPENDIX C - ADDITIONAL HISTORICAL INFORMATION	PAGES 109–115
APPENDIX D - UNIV OF WISCONSIN CULVERT MANUAL	PAGES 116–123
APPENDIX E - OHIO COASTAL MANAGEMENT PROGRAM	PAGES 124–133
APPENDIX F - BALANCED GROWTH INITIATIVE	PAGES 134–137
APPENDIX G - TRAIL & BIKE FACILITIES GUIDELINES	PAGES 138–144
APPENDIX H - INCENTIVES FOR IMPROVEMENT	PAGES 145–146

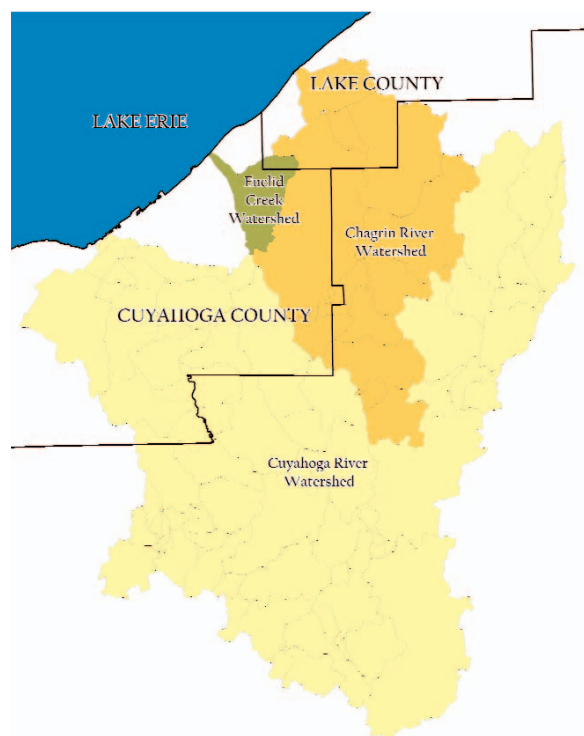


<b>Figure 1.0</b> Location of the Euclid Creek Watershed.....	p. 1	<b>Figure 5.5</b> Parking Lot Stormwater Retrofit Design.....	p. 53
<b>Figure 2.0</b> Main Branches of Euclid Creek.....	p. 3	<b>Figure 5.5.1</b> Stormwater Outfall Retrofit Design.....	p. 54
<b>Figure 2.1</b> Water Runoff Model.....	p. 3	<b>Figure 5.5.2</b> Alternative Parking Lot Design.....	p. 55
<b>Figure 2.2</b> Geological Formations.....	p. 5	<b>Figure 5.5.3</b> Elements of Bioretention Facility.....	p. 56
<b>Figure 2.3</b> Elevation.....	p. 6	<b>Figure 5.6</b> Trail/Bike Lane Connections.....	p. 62
<b>Figure 2.4</b> Soil Drainage.....	p. 7	<b>Figure 5.7</b> Euclid/Chagrin Parkway.....	p. 65
<b>Figure 2.5</b> Bedrock Topography.....	p. 9	<b>Figure 5.8</b> Park Distribution.....	p. 69
<b>Figure 3.0</b> Cultural Resources 1796–1851.....	p. 14	<b>Figure 6.0</b> Subwatersheds of Euclid Creek.....	p. 72
<b>Figure 3.0.1</b> Cultural Resources 1852–1895.....	p. 15	<b>Figure 6.1</b> Lake Plain – Nottingham Subwatershed Existing Conditions.....	p. 73
<b>Figure 3.0.2</b> Cultural Resources 1896–1921.....	p. 17	<b>Figure 6.1.1</b> Lake Plain – Nottingham Subwatershed Recommendations.....	p. 74
<b>Figure 3.0.3</b> Cultural Resources 1922–1961.....	p. 18	<b>Figure 6.2</b> Lower East Branch Subwatershed Existing Conditions.....	p. 77
<b>Figure 3.0.4</b> Cultural Resources 1962–2005.....	p. 19	<b>Figure 6.2.1</b> Lower East Branch Subwatershed Recommendations.....	p. 78
<b>Figure 3.1</b> Population Density by Census Block Group.....	p. 20	<b>Figure 6.3</b> Upper East Branch – Bishop Plateau Subwatershed Existing Conditions.....	p. 79
<b>Figure 3.2</b> Average Household Income.....	p. 21	<b>Figure 6.3.1</b> Upper East Branch – Bishop Plateau Subwatershed Recommendations.....	p. 80
<b>Figure 3.3</b> Education Level.....	p. 22	<b>Figure 6.4</b> Upper East Branch – Chagrin Plateau Subwatershed Existing Conditions.....	p. 82
<b>Figure 3.4</b> Land Use Information in Acres.....	p. 22	<b>Figure 6.4.1</b> Upper East Branch – Chagrin Plateau Subwatershed Recommendations.....	p. 83
<b>Figure 3.4.1</b> General Land Use.....	p. 23	<b>Figure 6.5</b> Metroparks – West Gorge Subwatershed Existing Conditions.....	p. 85
<b>Figure 3.5</b> Open Space and Undeveloped Land.....	p. 26	<b>Figure 6.5.1</b> Metroparks – West Gorge Subwatershed Recommendations.....	p. 86
<b>Figure 3.6</b> Flooding and Erosion.....	p. 27	<b>Figure 6.6</b> Anderson/Brainard Highlands Subwatershed Existing Conditions.....	p. 87
<b>Figure 3.6.1</b> Stream Dynamics.....	p. 28	<b>Figure 6.6.1</b> Anderson/Brainard Highlands Subwatershed Recommendations.....	p. 88
<b>Figure 3.6.2</b> Impervious Cover.....	p. 29	<b>Figure 6.7</b> Cedar/Mayfield Highlands Subwatershed Existing Conditions.....	p. 90
<b>Figure 3.6.3</b> Floodplain Cross Section.....	p. 30	<b>Figure 6.7.1</b> Cedar/Mayfield Highlands Subwatershed Recommendations.....	p. 91
<b>Figure 3.6.4</b> Stream Pattern.....	p. 30	<b>Figure 7.0</b> East 185th Street Interchange.....	p. 94
<b>Figure 3.7</b> Locations of Dams within Euclid Creek.....	p. 31	<b>Figure 7.1</b> Mayfair Site.....	p. 95
<b>Figure 3.8</b> Combined Sewer Outfalls and Septic Systems.....	p. 36	<b>Figure 7.2</b> Beachwood Place.....	p. 96
<b>Figure 4.0</b> Coastal Management Area.....	p. 37	<b>Figure 7.3</b> Lakeshore Boulevard Site Plan.....	p. 97
<b>Figure 4.1</b> Cuyahoga County Greenprint Trail Concept.....	p. 39		
<b>Figure 4.1.1</b> Cuyahoga County Greenspace Plan.....	p. 40		
<b>Figure 5.0</b> Land Use Recommendations within Euclid Creek.....	p. 42		
<b>Figure 5.1</b> Zoned Riparian Setback.....	p. 43		
<b>Figure 5.2</b> Brushmattressing Stream Restoration Practice.....	p. 44		
<b>Figure 5.2.1</b> Stormwater Basin Retrofits.....	p. 46		
<b>Figure 5.3</b> Low Impact Development Practices – Single Family Homes.....	p. 48		
<b>Figure 5.3.1</b> Low Impact Development Practices – Commercial Property.....	p. 49		
<b>Figure 5.3.2</b> Low Impact Development Practices – Multi-Family Property.....	p. 50		
<b>Figure 5.4</b> Conventional Site Design.....	p. 51		
<b>Figure 5.4.1</b> Conservation Site Design.....	p. 51		



Situated between the mighty Cuyahoga and the pristine Chagrin rivers lies a much smaller but equally valuable stream called the Euclid Creek. Although its neighboring rivers are much more famous, this relatively small watercourse has charm and beauty never before told. Located in eastern Cuyahoga and western Lake Counties, the Euclid Creek Watershed drains 24 square miles before it eventually makes its way into Lake Erie. **See Figure 1.0.**

**Figure 1.0** Location of the Euclid Creek Watershed



Due to its close proximity to downtown Cleveland, this area was one of the first to develop east of the city. As people began to settle in this region, the watershed quickly developed into the urban watershed it is today. Currently, the Euclid Creek Watershed is primarily residential with some clusters of industrial and commercial development throughout. In addition, there are several large expanses of land within the watershed including parks, an airport, and golf courses.

### Purpose of this Plan

Streams within urban watersheds are fundamentally different from streams within forested, rural or

agricultural watersheds. Stream dynamics are constantly adjusting in an effort to offset a change to the system. This delicate balance becomes much more complex as human influences are concentrated within the watershed. Thus, land use changes directly affect the overall health of the natural stream system.

This plan has been developed in cooperation with the Euclid Creek Watershed Council, the Friends of Euclid Creek, various county, state and regional agencies and officials, as well as community residents. The two main goals of this project are: 1) to improve the health of the creek and 2) to further integrate the waterway into the community fabric as an amenity that improves the quality of life. This document is intended to be used as a decision-making tool for each community as they seek to be a competitive, attractive place to live, work, and visit. The ideas set forth in this plan provide a vision of how the Euclid Creek Watershed could look in the future.

### Main Issues

The main problems of this watershed include flooding, water quality, and stream alteration. Flooding in this watershed is caused by the encroachment of housing in the floodplain and increased impervious surfaces. Water quality problems are associated with combined sewer overflows (CSOs), failing septic systems, and runoff from urban areas. Stream alteration, especially the loss of important headwaters, is due to incremental development and ease of alteration.

Open space protection is also very important as much of the land within the watershed has been developed. The last remaining natural areas are necessary to preserve the important ecological functions of the watershed as a whole. Land use and site development practices have a direct impact on the health of the stream.

Euclid Creek and other associated natural features are potential amenities for communities within the watershed. Past development practices often



overlooked these features, resulting in land use patterns that failed to capitalize on these assets. Water features, scenic views, and historic sites were often hidden or removed from the landscape; diminishing the natural character that distinguishes the Euclid Creek Watershed from other areas.

The following background information has been compiled to better understand the physical aspects of the watershed. These features are the foundation of the Euclid Creek Watershed; naturally shaping the stream over many, many years.

### Location of the Creek

The Euclid Creek is located 10 miles east of Downtown Cleveland. It drains 24 square miles and has 43 miles of stream segments. **See Figure 2.0.**

**Figure 2.0** Main Branches of Euclid Creek



### West Branch

The headwaters to the West Branch begin in Beachwood near Fairmount Boulevard and Cedar Road and in Pepper Pike near Belgrave Road. The creek then flows north through Lyndhurst and the eastern portion of South Euclid, to Euclid where it meets up with the East Branch in the Metroparks Euclid Creek Reservation.

### East Branch

The East Branch headwaters begin in Willoughby Hills near White Road and Highland Heights near Wilson Mills Road. This branch flows west along the Portage Escarpment to Euclid Creek Reservation. The majority of the East Branch is protected by

the steep topography as it runs through primarily private property to meet up with the West Branch. Approximately 55 acres of the East Branch Valley, west of Richmond Road, are owned by Cuyahoga County and the cities of Euclid and Richmond Heights.

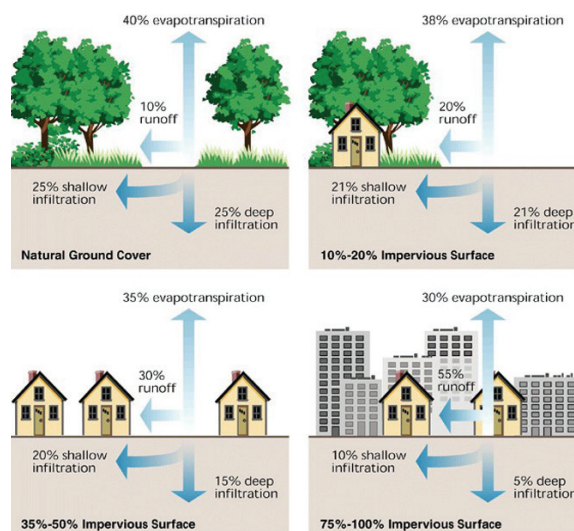
### Main Branch

The Main Branch flows from the Metroparks northward paralleling Dille and Nottingham Roads, through Wildwood Park, and empties into Lake Erie.

### Where Does The Water Come From?

The water entering into Euclid Creek comes from the land surrounding it (i.e., the watershed). When it rains, the water falling on the land does one of three things; 1) evaporates back in the atmosphere, 2) soaks into the ground and is taken up by the plants, or 3) runs off the land into the stream. **See Figure 2.1.**

**Figure 2.1** Water Runoff Model



*Water runoff increases as more hard surfaces are developed.*

**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG)

In an urbanized watershed, the majority of rainfall ends up running off the land. This is due to an extensive amount of hard surfaces, such as rooftops and parking lots. Runoff enters the stream in one of two ways: surface flow directly off the land, or via the storm sewers. Therefore, the surrounding land



use directly affects the quality and quantity of water entering a stream. As rainwater and snowmelt run across the land, they pick up pollutants, such as fertilizer, oil, sediment, etc. and deliver them directly to the stream.

### Groundwater

In addition to surface water, rain and snowmelt soak into the ground and eventually make their way to the stream, entering through the bed and banks. Groundwater flow is much slower than surface water flow because water absorbed into the groundwater reservoir is released gradually.

Because of the ground's slow absorption and release of water, the ground water system is a kind of regulator for flow in the stream. Flood peaks are lowered as water is absorbed into the ground. The water is then released over a period of hours, days, or weeks; long after the peak surface runoff has passed downstream. Some of the water from spring rains is released to the stream during the drier parts of the summer, maintaining flow in the stream, called base flow. This steady trickle during dry periods is critical to the health of the stream's aquatic environment.

### Climate<sup>1</sup>

No mountain ranges exist between Ohio and the polar regions. Because of this, no effective barrier prevents the southward spread of Arctic air from northern Canada. Similarly, warm tropical air masses move freely northward in the summer. Storm systems form along the boundary between major cold and warm air masses, and storm paths frequently cross the Ohio Valley and the Lower Great Lakes. The climate of Cuyahoga and Lake Counties is characterized by warm summers and cold winters, with average summer temperatures of 70 degrees Fahrenheit and average winter temperatures of 30 degrees Fahrenheit.

According to the NOAA Climate Diagnostics Center, precipitation for Cleveland, Ohio averages 36.6 inches

per year. Precipitation is generally well distributed throughout the year, with most occurring between April and September. There are, however, variations in the amount of rainfall throughout the watershed. At the lower elevations, near the lake, annual precipitation averages 36 to 38 inches while the higher elevations, at the headwaters, average 40 to 42 inches.

In spring, proximity to the lake prevents late freeze-outs, thereby extending the growing season. In winter it results in heavier snowfall over north-eastern Ohio. The average snowfall in the watershed varies from 60 to 70 inches near the lake to between 80 and 90 inches in the headwaters.

### Glacial History

Beginning 2 million years ago, glaciers advanced from the north. They enlarged existing river valleys to create the basins of the ancestral Great Lakes, gouging Lake Erie into the still rising edge of the Appalachian Mountains.

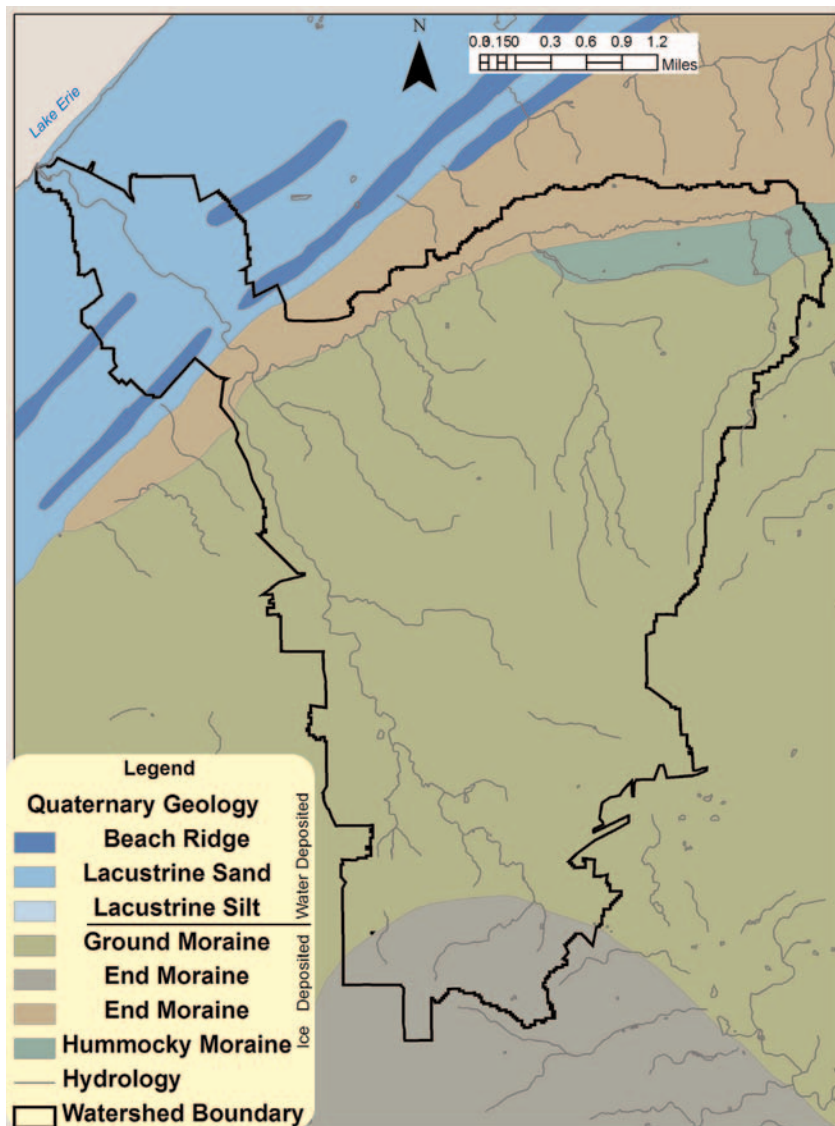
The present-day Euclid Creek is actually a fairly recent geologic phenomenon. It is the result of the advance and retreat of the last great glacial sheets which covered most of Ohio. These large Wisconsinian-era glaciers stretched south into Ohio from Canada around 24,000 years ago and made their final retreat about 12,000 years ago. **See Figure 2.2.**

When the glaciers finally retreated, they left a layer of glacial till on the surface of the topographic plateau. The Defiance Moraine at the headwaters in Beachwood and the Euclid Moraine along the escarpment at Euclid Avenue are two examples within the watershed. As the glaciers continued to retreat, the ancestor of Lake Erie carved a series of cliffs into the edge of the plateau region.

### Topography

The Euclid Creek watershed is made up of three distinct topographical areas. Each of these regions is further described below. **See Figure 2.3.**

<sup>1</sup> NOAA Climate Diagnostics Center – ODNR Hydrologic Atlas

**Figure 2.2** Geological Formations

**SOURCE:** Ohio Department of Natural Resources, Ohio Department of Geological Survey, 1999

### The Lake Plain

The mouth of Euclid Creek, as it empties into Lake Erie, is approximately 580 feet above sea level. The relatively flat land located between the lake and the escarpment is called the Lake Plain. This region is approximately two to three miles wide within the Euclid Creek Watershed. The land abruptly rises, forming a steep cliff. This cliff is fairly continuous, although it has been breached by stream valleys, such as Euclid Creek, that drain to Lake Erie.

### The Escarpment

The Portage Escarpment is the sloped transitional section of land that joins the Lake Plain with the higher grounds to the south and east. Just east of the Cuyahoga River Valley, the Escarpment rises rapidly from the Lake Plain at an elevation of about 700 feet and reaches over 1,100 feet in elevation at the Plateau. The escarpment consists of a patchy mantle of thin till or silty clay that is generally less than five feet thick, known as the Euclid Moraine. Due to a lack of glacial deposition and erosion, bedrock is exposed in many of the stream valleys.

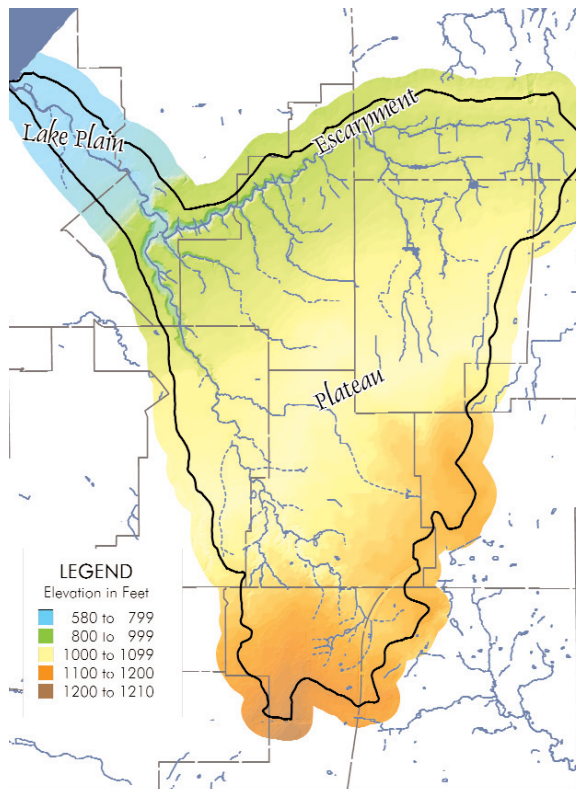
### The Plateau

The Plateau consists of the upper watershed, and the elevation ranges from about 1,000 feet to 1,250 feet. This area represents the northwest margin of the Appalachian Plateau. The highest hills on the Plateau are underlain by Sharon conglomerate. Elsewhere, the underlying formation is the shale of the Cuyahoga.

The valley of Euclid Creek is deeply incised, the stream has cut down to the bedrock in the Lake Plain, through the Escarpment, and into the Plateau. Its valley is just over 1/4 mile wide with a maximum relief of 120 feet.

The East Branch of Euclid Creek flows north until it encounters the Euclid Moraine, at which point it abruptly turns west and southwest. It is likely that this pronounced stream diversion was a response to blockage that occurred due to a stagnant ice margin.



**Figure 2.3** Elevation

*The elevation change from the headwaters of the Plateau to the mouth at the Lake Plain is approximately 600 feet.*

When the ice retreated, this diverted stream segment remained entrenched in the channel it now occupies.

### Soils<sup>2</sup>

The headwaters of the Euclid Creek collect water from the knolls and hillsides of Beachwood, Highland Heights, Pepper Pike, and Willoughby Hills. These hills were deposited as glacial till during the late Wisconsin age. Over time, these soils became the present-day soils of Ellsworth silt loam, Darien silt loam, and associated Urban Land complexes. These soils, with the exception of the Urban Land complex, are very deep, moderately well to somewhat poorly drained, and have a permeability that ranges from slow to moderately slow. The Urban Land complex are mapped areas covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

As these upper headwaters converge, the larger streams flow over the gently rolling to nearly level plateau in Lyndhurst, Mayfield Heights, Richmond Heights, and South Euclid. Soils found in this area consist of Allis silt loam, Hornell silt loam, Mahoning silt loam, Mitiwanga silt loam, and associated Urban Land complexes. These soils are moderately deep, poorly to somewhat poorly drained, and have a permeability that ranges from very slow to slow.

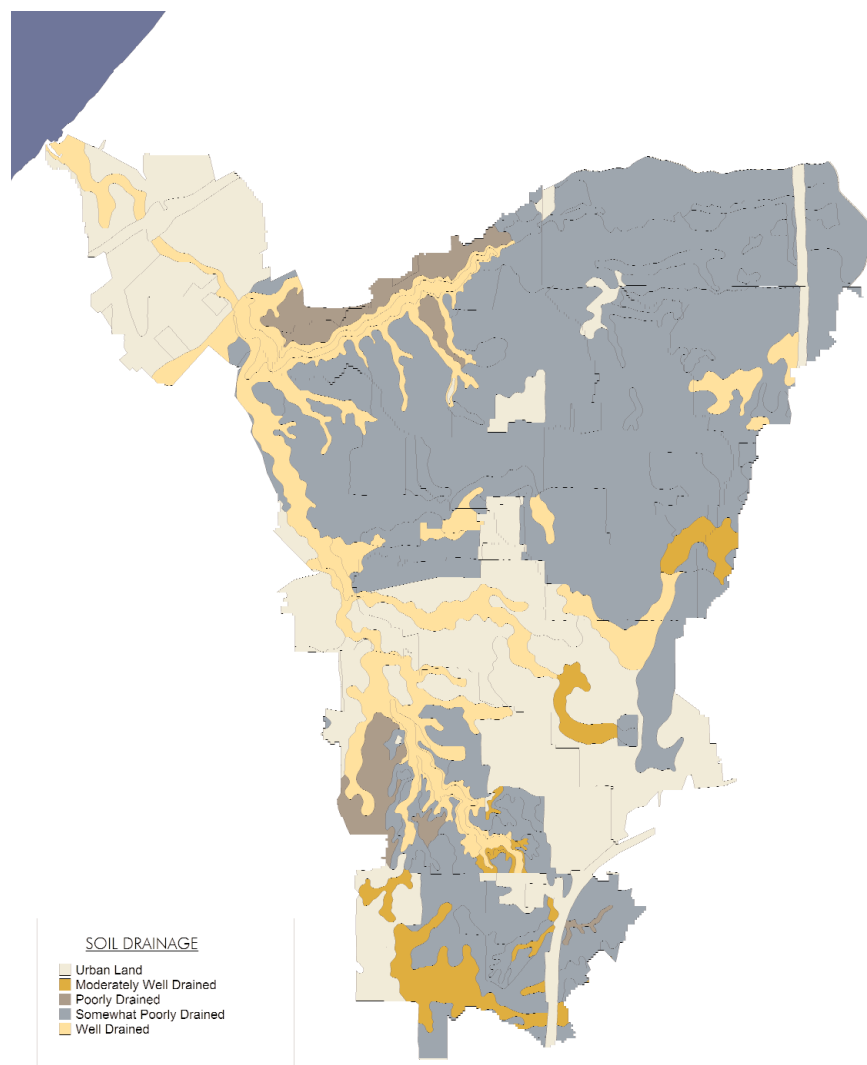
The Main Branch of Euclid Creek cuts through valleys deposited by glacial ice or outwash and into sedimentary rock, such as sandstone, shale and siltstone. It runs through Euclid, Richmond Heights, and South Euclid. The mapped soils in these areas include Brecksville silt loam, Loudonville silt loam, Tioga loam, and associated Urban Land complexes. These soils are well drained and have a permeability that ranges from moderately slow (Brecksville silt loam) to moderately rapid (Tioga).

The majority of soils present within the Euclid Creek Watershed are characterized as slowly and/or poorly drained. **See Figure 2.4.** These types of soil pose problems for land use, development, and the natural stream system. Clayey soils inhibit water from soaking into the ground, causing more water to run off the land.

### Geology (The Backbone of the Watershed)

The Euclid Creek Watershed offers a unique chance to observe the various layers of the Upper Devonian era rock formations which developed approximately 360 million years ago. Despite the young age of Euclid Creek, the river has downcut at a much faster rate than normal, revealing the shallow bedrock formations. The Euclid Creek Reservation of the Cleveland Metroparks offers the opportunity to see all of the various layers of this era in a rather short distance. **See Figure 2.5.**

<sup>2</sup>Soil Survey of Cuyahoga County, 1980 – Quaternary Geology of Ohio, 1999

**Figure 2.4** Soil Drainage

*Natural Drainage within the watershed is very limited due to soil type.*

**SOURCE:** USDA Soil Survey of Cuyahoga County, 1980; USDA Soil Survey of Lake County, 1991

These bedrock formations consist of (from bottom to top):

### The Chagrin Formation

This formation consists of primarily grey shale, with numerous siltstone beds of thin reddish-color rock layers interspersed throughout. The red color of the siltstone beds indicates high iron content, which results when the iron oxidizes. This layer does not contain a large quantity of fossils. It is believed that low dissolved oxygen content (anaerobic environment) is the reason for the lack of fossils within this formation.

<sup>3</sup> The Doan Brook Handbook, Laura Gooch – Joe Hannibal, Cleveland Museum of Natural History

### Cleveland Formation

At the Welsh Woods Picnic Area, within the Euclid Creek Reservation of the Metroparks, the boundary between the smooth Chagrin Formation and the blocky Cleveland Formation is quite noticeable. A thin layer of pyrite separates these two layers.

### Folds and Faults

Another exceptional feature of the Euclid Creek is the series of folds and faults that occur along the stream channel. Visible from the streambank are several joints, or breaks in the rock, that often control the stream channel. Also easily identified are stream anticlines, or upwardly flexed layers of rock (folds). These stream anticlines generally form where shale is the predominant layer exposed in the streambed.

As more and more of the top layers are eroded away by the stream, the pressure

pushing down on the shale becomes less and the pressure from the sides becomes greater. As a result, the wet shales swell and begin to move upward. As this stress becomes greater, a thrust fault (low angle fault) is produced. These processes of folding and faulting often create deeper pools of water within the stream.

### Bedford Formation<sup>3</sup>

The soft sediment formation of the Bedford Formation can be observed at the Quarry Picnic Area within the Euclid Creek Reservation of the Metroparks. Soft-sediment deformations,

round bulb-like structures that form near the bottom of the rock, are abundant in this area. This portion of the reservation, which was once a working quarry, was the longest running quarry in the Cleveland area. At the height of production, as many as five quarries were extracting Euclid Bluestone, a very fine-grained siltstone, found in abundance throughout this region. This stone was quite a desirable material because it was more dense than the typical Berea Sandstone. The east branch of the Euclid Creek has similar features, except at these higher elevations the Mississippian Era formations can be observed. The most distinct features include the black Orangeville shales and the red shale, which are present directly south of the Metroparks Reservation.

North of the Metroparks Euclid Creek Reservation is an area referred to as Mt. Baldy, where a collection of deep water marine sponge fossils have been discovered. Examination of these fossils will help to identify how long ago this area was covered by

water. It will also provide an indication of the type of environmental conditions that once existed within the ancient lake.



*One rock layer has been pushed or thrust over the lower layers of rock, a common feature of the faults present in Euclid Creek.*

**SOURCE:** Cleveland Museum of Natural History



*Euclid Bluestone Quarry, May 1916.*

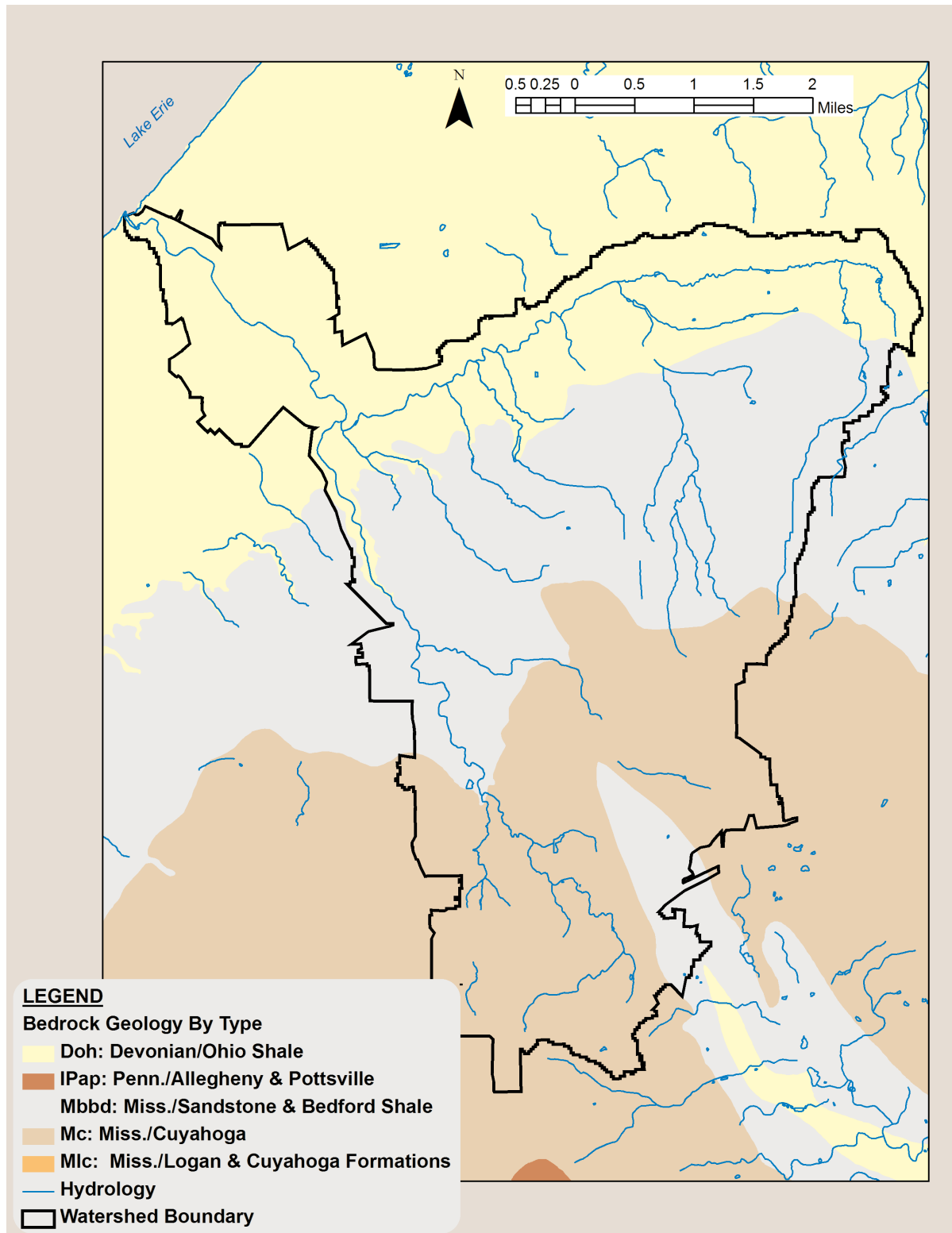
**SOURCE:** Case Western Reserve University



*Quarry of Bedford shale at Bluestone: red shale above, blue shale midway, and bluestone at base.*

**SOURCE:** Case Western Reserve University



**Figure 2.5** Bedrock Topography

**SOURCE:** Ohio Department of Natural Resources, Ohio Division of Geological Survey, 1999

## Vegetation

Historically, the Euclid Creek Watershed had a variety of natural communities. The eastern highlands were composed primarily of a beech-maple climax forest. Where swampy and poorly drained soils existed, smaller areas of the characteristic upland swamp forest occurred. These areas were dominated by the American elm, black ash, and red maple. In areas of dappled sunlight, black willow, heart-leaved willow, and pussy willow could be found.

The eastern section of the Lake Plain has a unique organization. A relatively flat surface caused many locations to be wet, swampy, marshy, and poorly drained. Pin oak once dominated large areas of this wet, flat land. At slightly higher elevations where the water table was lower, sugar maple, beech, tulip, shagbark hickory, and white ash appeared.

Areas along the shoreline of Lake Erie were dominated by American elm, black ash, and silver maple. On sandy ridges, which were once old beaches, white oak, red oak, black oak, sassafras, and chestnut were common. Streams that have cut through the lake cliff to Lake Erie have formed ravines or gullies. In such places, American elm, cottonwood, basswood, white ash, beech, and sugar maple occur. As better drainage is established, the beech-maple climax forest reasserted itself.

A comprehensive list of plant communities historically found in the Euclid Creek Watershed is included in Appendix A. This list was compiled by James K. Bissell, Curator of Botany, Cleveland Museum of Natural History.

The natural vegetation of the watershed has been extensively altered due to urbanization. The areas of steep topography along the East Branch and its tributaries have the most extensive amount of vegetation. Areas such as the Metroparks Euclid Creek Reservation and the Mayfield Country Club have dense natural vegetation. In addition, several stretches of streambank vegetation, especially on

privately owned large lots, have been preserved throughout the watershed. These areas help the stream maintain its natural functions. The vegetation helps to stabilize the banks and slow floodwaters; thus allowing moisture to soak into the ground. Certain types of vegetation also help to filter water and remove pollutants.

### Highland Heights Community Park

One area of significance in the watershed described in a study by the Cleveland Museum of Natural History is a property adjacent to Highland Heights Community Park. The study found that this land contains a rare 3.93 acre Palustrine Meadow. This land has considerable natural value, not only because it is a wetland, but also because it contains an unusual diversity of over 400 species of vascular plants. Many of these plants are rare and/or endangered in Ohio and/or Cuyahoga County.

The meadow is the sole locality in Ohio for *Solidago puberula* (Dusty goldenrod), supporting a population of about 50 to 100 clumps of this species. Also it is the sole locality in Cuyahoga County for *Hypericum gentianoides* (Orange-grass) and *Rhynchospora capitellata* (Beak-rush). The meadow also contains four species of club mosses and a rare hybrid of clubmosses unusual in the County: *Lycopodium clavatum*, *Lycopodium digitatum*, *Lycopodium hickeyi*, *Lycopodium tristachyum*, and *Lycopodium Xhabereri*. The meadow also contains *Juncus marginatus* (Rush) and the orchid species *Spiranthes cernua* (Nodding Ladies' tresses), two species uncommon in Cuyahoga County. In addition, the wooded swamp exhibits *Fraxinus nigra* (Black Ash), a wetland species that is rapidly disappearing from the County.

### Invasive Species<sup>\*</sup>

The ODNR Division of Natural Areas and Preserves has compiled a list of more than 60 plants that are currently impacting natural areas, parks and forests throughout the state. Some of the typical invasive non-native plants in this area include: bush honey-

<sup>\*</sup>The Native Forests of Cuyahoga County, Ohio – A.B. Williams, 1949, James K. Bissell, Curator of Botany, Cleveland Museum of Natural History

suckles, buckthorn, garlic mustard, purple looses-trife, common reed grass, reed canary grass, autumn and Russian olive, multiflora rose, Japanese honey-suckle, narrow-leaved cattail, Canada thistle, and tree-of-heaven (**see brochure in Appendix B for further descriptions**). The presence of these invasives and non-natives are no exception in Euclid Creek. The watershed has had a history of land disturbance which has created a breeding ground for the establishment of invasive and non-native species in its natural and built landscapes.

The areas most disturbed with invasives exist along the channelized portion of the creek, along the main branch, and where land alteration has occurred around the headwater tributaries. In addition, Wildwood State Park is also overgrown with invasive species.

## Wildlife

There are numerous types of wildlife found throughout the watershed. Typical backyard wildlife include Eastern Chipmunk, Cottontail Rabbit, Raccoon, Gray Squirrel, and White-tailed Deer. Each animal has its own unique habitat characteristics.

Near the shoreline, the American Toad and Box Turtle are abundant. In addition, types of birds include: Mourning Dove, Blue Jay, Chickadee, Robin, Red-wing Blackbird, Cardinal, Goldfinch, and Sparrow.

The wildlife listed above is only a handful of the many species present throughout the watershed. There is an abundance of backyard wildlife present, not only within the watershed, but also throughout North America. Due to urban sprawl, much of the vital habitat for these animals is disappearing.

### Bird Survey

In June 2003, the Friends of Euclid Creek together with the Kirtland Bird Club conducted a Nesting Bird Survey near the Euclid Creek Watershed. The survey found 150 species of birds covering many different landscapes including forest edges, urban areas, wetlands, woodlands, and successional areas.

The wetland areas in/near the watershed were the most abundant as far as types and quantity of species.

### Fish

The upper portions of Euclid Creek are the habitat for a variety of pollution-tolerant fish such as creek chubs, blacknose dace, and central stoneroller. The lower creek has a variety of species, including steelhead, that enter from Lake Erie. The lower stretch of Euclid Creek, from the East 185th Street Dam to the Lake, is used for recreational fishing by local anglers.

## Habitat

### Wetlands

It is estimated that the state of Ohio has lost approximately 90% of its original wetlands. The Euclid Creek Watershed is not an exception. The limited amount of wetlands remaining has resulted in a critical need to protect what remains. Only recently have we begun to understand the functions these natural resources provide.

Wetlands manage stormwater volume and energy. They absorb excess stormwater during flooding and supply streams with water during dry weather. Their thick vegetation helps to slow down the flow of water, recharging ground water, dissipating energy, and allowing for pollutant removal. They also provide important habitat for wildlife. There are a few areas within the watershed where wetlands have been identified; however, identification and quality assessments have not been made on many lands within the watershed.

### Nearshore

Nearshore habitat provides a critical interface between the lake and river systems. Typically, the nearshore area consists of the open Lake Erie waters to a depth of 10 meters, the shoreline, and the lake influenced area of the stream. The stream dynamics of Euclid Creek, in the area from the mouth upstream to just north of Lakeshore Boulevard, are greatly affected by the lake waves and activities.



Plants and other landscape characteristics within the nearshore zone can have a significant effect on the health and viability of fish populations within the lake and river. These nearshore areas comprise the presence of one third of the species found within Lake Erie waters. Effective nearshore habitat associated with the tributaries can help support valuable spawning locations upstream. These resources not only provide essential biological functions but also provide recreational uses that contribute to economic prosperity.

According to the ODNR Coastal Geology Division, the nearshore extent in the Euclid Creek shoreline area is 1.2 km (approximately 3,000 feet) outward from the shoreline to the 10 meter depth. Re-creating a healthy interface with the lake and nearshore habitat will increase healthy and diverse fish populations moving upstream in Euclid Creek.

## Who Settled Here?

Euclid Creek's headwaters (in Beachwood and Pepper Pike) lie on the Allegheny Plateau, some 700 feet above the lake. In descending to the Lake Erie basin, Euclid Creek has carved major gorges on its east and west branches. Numerous waterfalls and rapids give these areas great charm. Moreover, prehistoric Native Americans followed the gorge margins in migrating between basin and plateau. The sandy soils of the old beach ridges near the lake drained faster than the surrounding swamp lands, creating an easier travel route. In the early nineteenth century, Euro-American settlers appropriated the trail network as the basis for county roads.

## Five Historical Landscapes<sup>5</sup>

Building on the tumbling watercourses, the extensive prehistoric trail network, and pervasive industrial development, Euclid Creek watershed history is quite fluid. It is best seen as a series of historical landscapes wrought by successive changes in transportation. Advances in transport technology abruptly transformed the kinds of structures built and lives lived within the watershed. Each historical landscape is therefore defined by the motive power and road system that has beckoned residents and business to the watershed:

### Water and Wind, 1796–1851

In September 1796, Moses Cleaveland completed the initial Connecticut Western Reserve survey. It was a troubled month as most of the field crew threatened not to return in 1797. To solve the labor dispute, Cleaveland created a very large township just east of the capital settlement (Cleveland). The 41 “protesters” bought the township and dedicated it and its major watercourse to Euclid, the classical Greek mathematician. **See Figure 3.0.**

Three features drew settlers to Euclid Creek. First, waterfalls on the main and headwater branches provided power for numerous mill sites which processed wood and grain. Second, the Cleveland-Buffalo Road crossed Euclid Creek at a deep chasm.

Businesses catering to arrested travelers thus grew at Euclid Creek village. Third, with its lake access, the Euclid Creek estuary saw the earliest industrial development. By 1820, clay was being imported to establish a stoneware kiln and, by 1840, a significant boatyard was launching schooners of up to 400 tons.

### Steam and Rails, 1852–1895

In 1852 the CP&A Railroad gave Cleveland rail links with Chicago and New York City. Euclid Creek blue-stone became a prime export, and the watershed's tempered climate produced exportable table fruit and wine. These labor-intensive industries attracted a wave of northern European immigrants. In 1861, the Cleveland Catholic Diocese established St. Paul, its first parish east of Cleveland. Some immigrants were quite innovative and successful. For example, German born Louis F. Harms established the first winery in 1868. **See Figure 3.0.1.**



*Grape growing was prevalent along the lake and shipped by rail to market.*

**SOURCE:** Euclid Historical Society

After the Civil War, the CP&A gave wealthy Clevelanders a means to seek summer refuge along Lake Erie. Camp Gilbert was established at the mouth of Euclid Creek in 1867. The first significant advance in road transport came when the watershed passageways of Euclid and Mayfield Roads were “planked” during the 1870s.

<sup>5</sup> Roy Larick and Bob Gibbons Historical Research, 2004. Further Historical Information on Euclid Creek is available in Appendix C.

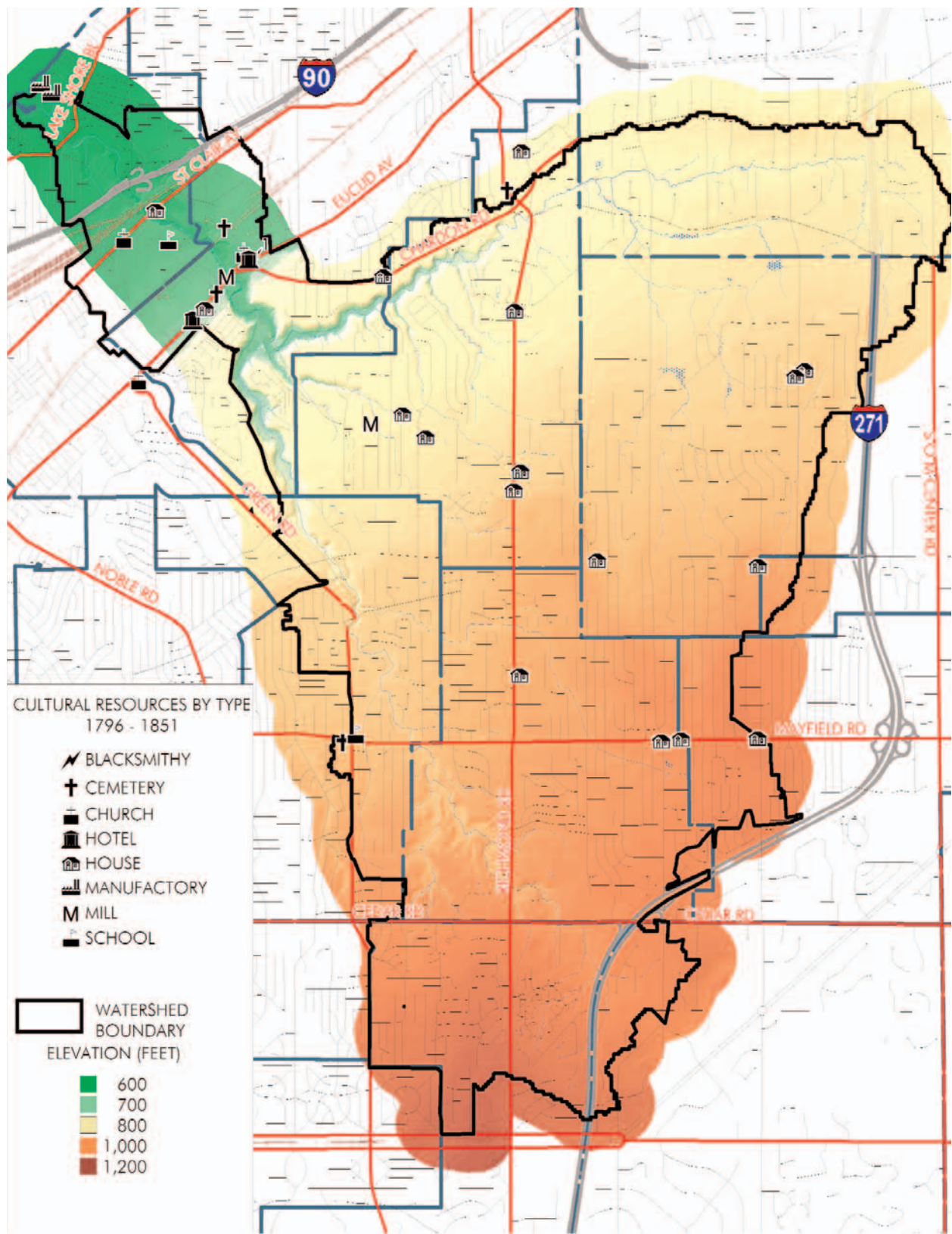
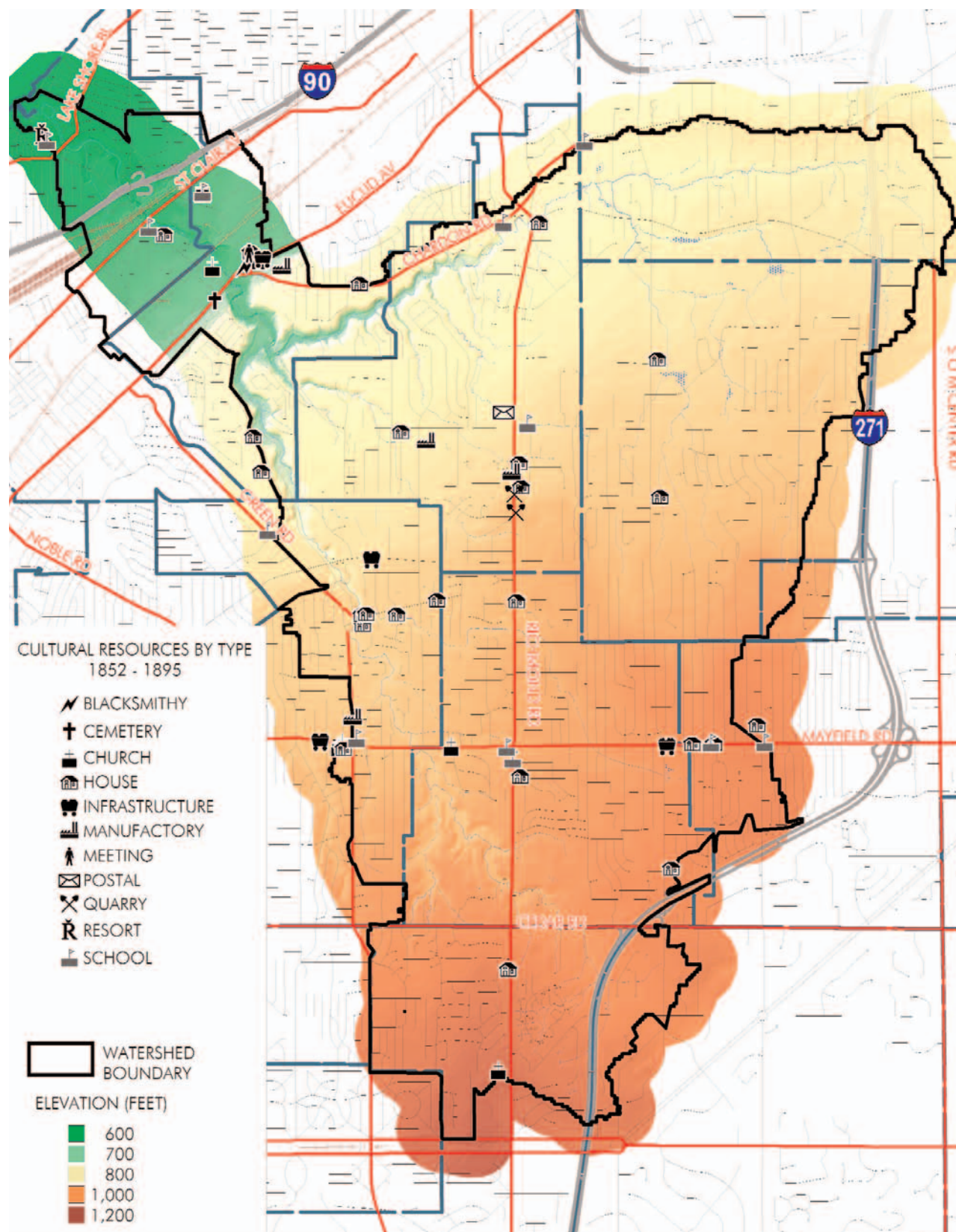
**Figure 3.0** Cultural Resources 1796–1851

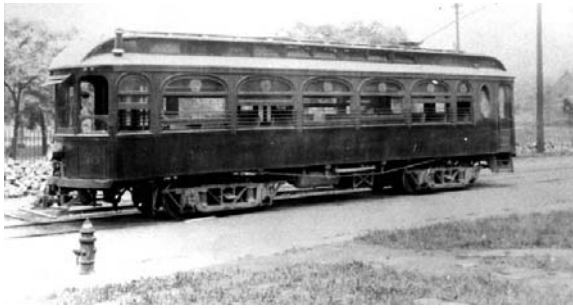


Figure 3.0.1 Cultural Resources 1852–1895



### Electrification, 1896–1921

Interurban railroads helped transform a relatively rural Euclid township into a number of trendy eastern suburbs. The watershed became the realm of both exclusive private estates and middle class resorts, the latter including the famed Euclid Beach amusement park. **See Figure 3.0.2.**



*The Interurban Railway was a major form of transportation within the watershed.*

**SOURCE:** The Cleveland and Eastern Interurban Historical Society & Museum

Electrification also brought manufacturing and burgeoning population to Euclid Creek. Nottingham Village seceded from Euclid Township in 1899. Euclid Village did likewise in 1903. As middle and working class Clevelanders moved into the township, infrastructure and educational facilities became over-stressed. In 1912 and 1913, large consolidated schools replaced numerous small schoolhouses throughout the watershed.

### Early Automobiles, 1922–1961

By the mid 1920s, the old Indian trails constituted an extensive road system. By putting in scores of residential streets, the watershed's new municipalities completed a truly dense transportation network. The stage was set for rapid development. **See Figure 3.0.3.**

Amidst the rush to create municipalities out of old Township lands in the late 1910s, the Cleveland Metropolitan Park Board purchased the west branch gorge lands to create the Euclid Creek Reservation. Cleveland's "Grand Canyon" is the most-used park in the three-county system.

World War II armament demands and the postwar consumer market brought the watershed's

manufacturing to a peak, as businesses concentrated along the railroad lines on the Lake Plain. War production grew out of Glen L. Martin's aircraft plant to include Aerol landing gear, Thompson engine valves, and Brush marine torpedoes. The late 1940s brought thousands of postwar bungalows to the watershed while the 1950s brought sprawling ranch house subdivisions and a new generation of specialized schools.

### Interstate Exurbia, 1962–2005

By 1960, local industrial production had peaked and the region began a slow, but steady decline in building. Ironically, industrial decline coincided with the arrival of the Interstate Highway System. I-90/Ohio Route 2 (1963) and I-271 (1965) quickly drew development to the watershed's east and south fringes. By the late 1990s the last rural tracts in eastern Cuyahoga and western Lake Counties had been fully built-out. **See Figure 3.0.4.**

Beyond housing, building in the new cities concentrated on three exurban forms dedicated toward retail consumption. In 1966, the DeBartolo Bros. built the Richmond Mall in Richmond Heights. In the 1970s, Beachwood Place Mall and La Place retail center rose in Beachwood. One of the more significant developments came to the City of Lyndhurst in 2003, when the former Bolton Estate, more recently the TRW Corporate Headquarters, was purchased by First Interstate Properties. In less than a year the land was cleared and turned into Legacy Village, Northeast Ohio's first and largest "lifestyle center."

## Current Demographics

### Population Density

According to the 2000 United States Census, there are approximately 67,250 people living within the Euclid Creek Watershed. The density of this population varies across the watershed. The population is most dense in Cleveland, Euclid, and the northern corner of Richmond Heights. Areas of slightly less density are located along the Lyndhurst-Mayfield Heights border, the northwestern portion of South Euclid, and the



Figure 3.0.2 Cultural Resources 1896–1921

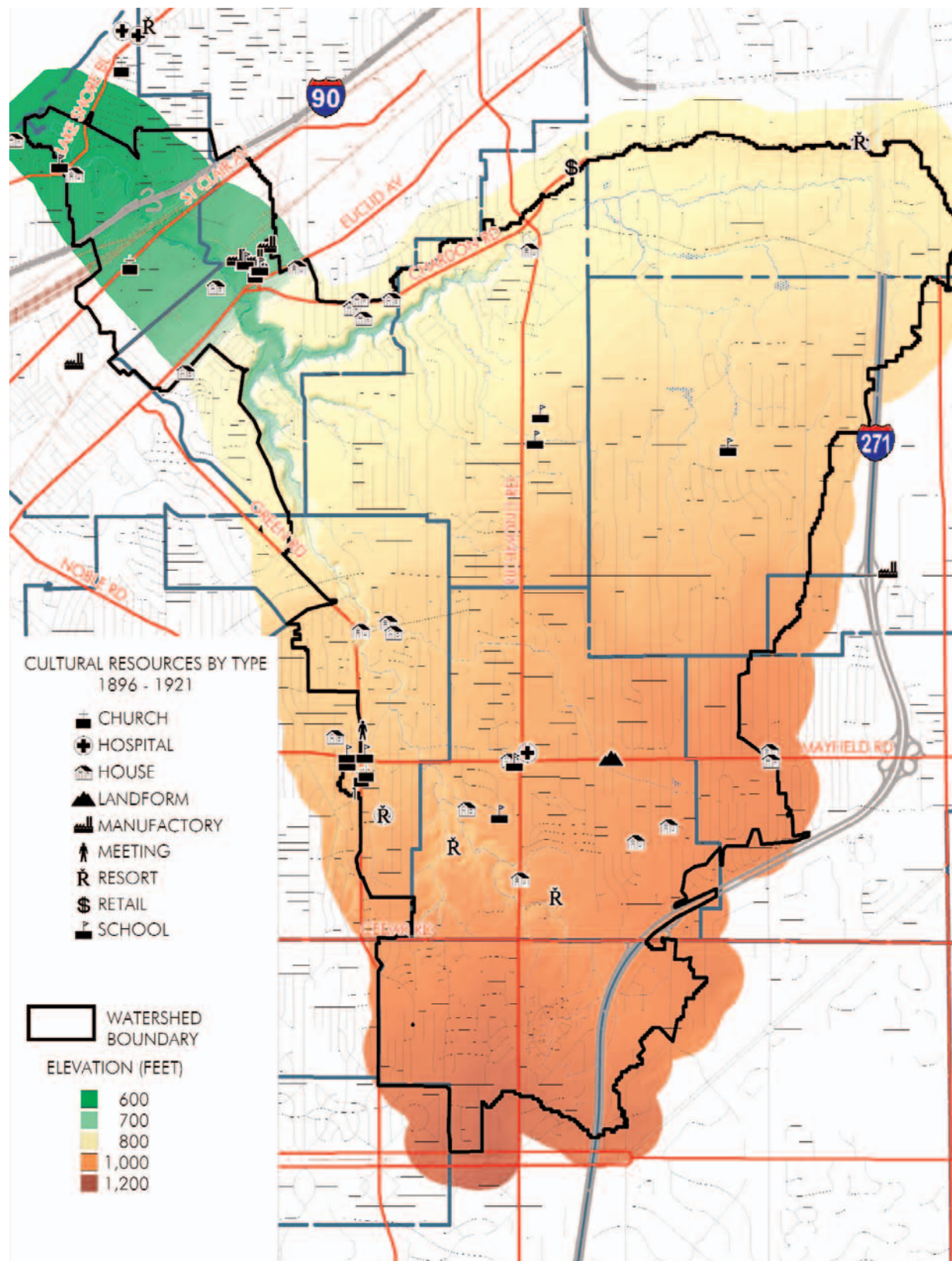




Figure 3.0.3 Cultural Resources 1922–1961

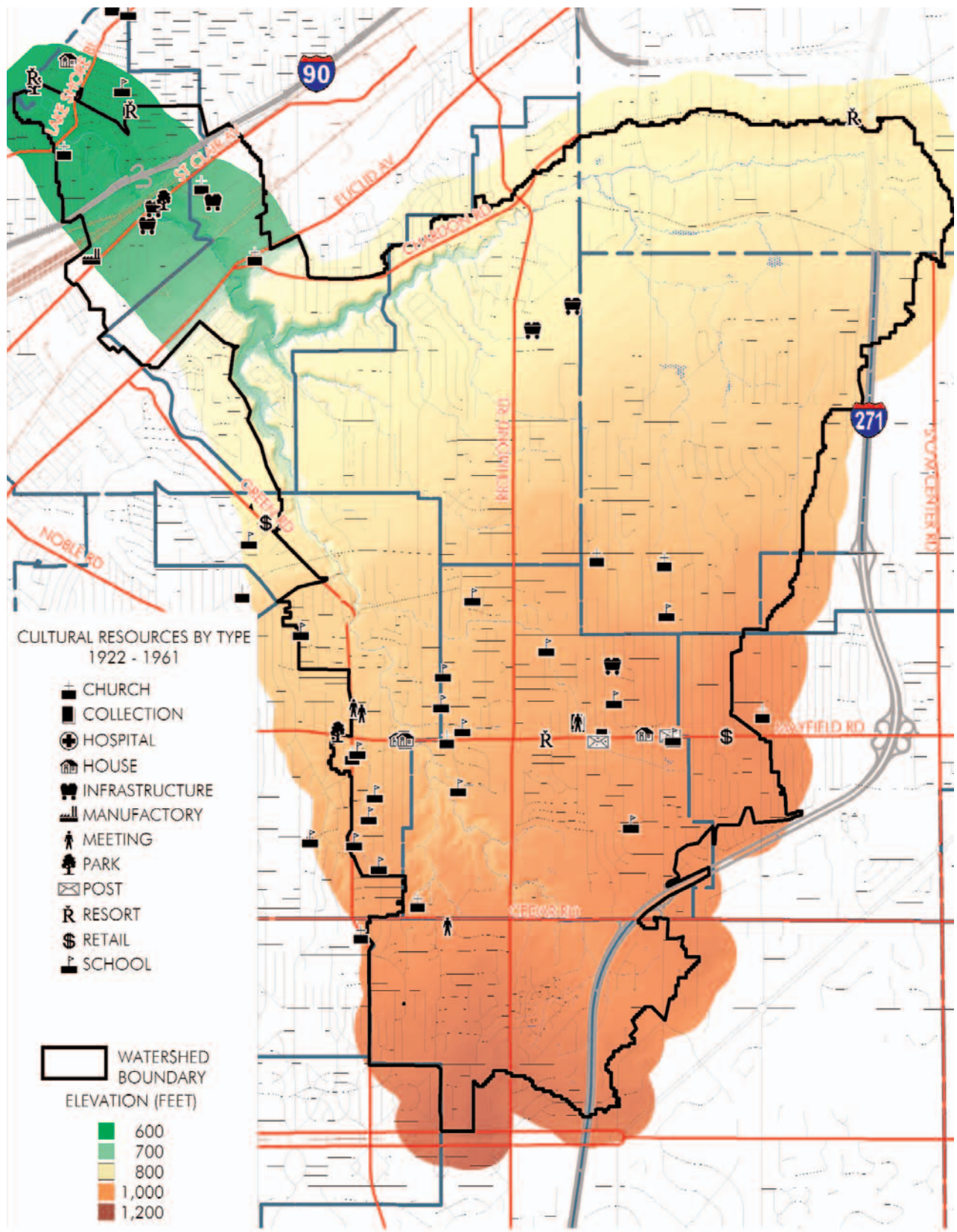
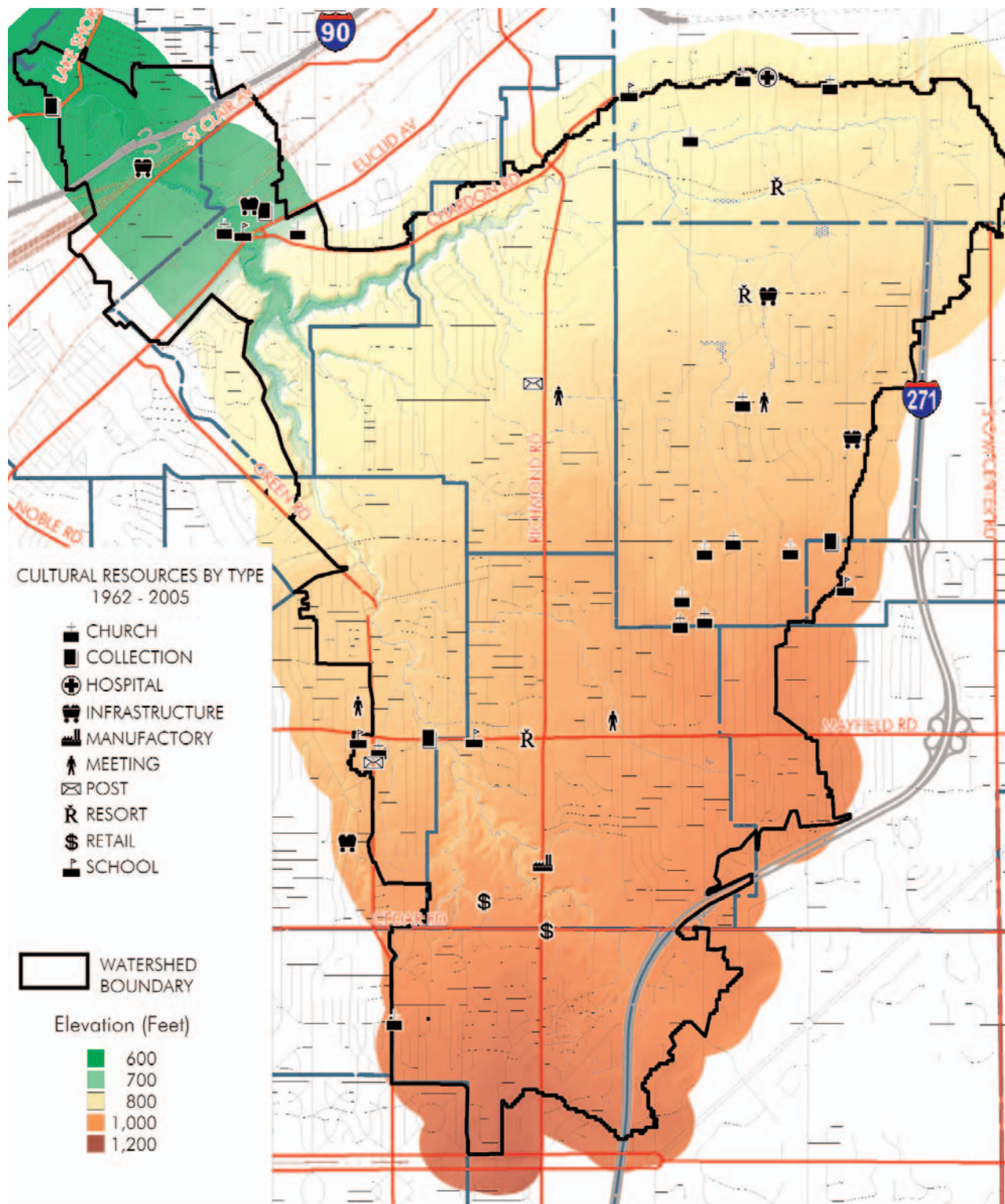


Figure 3.0.4 Cultural Resources 1962–2005

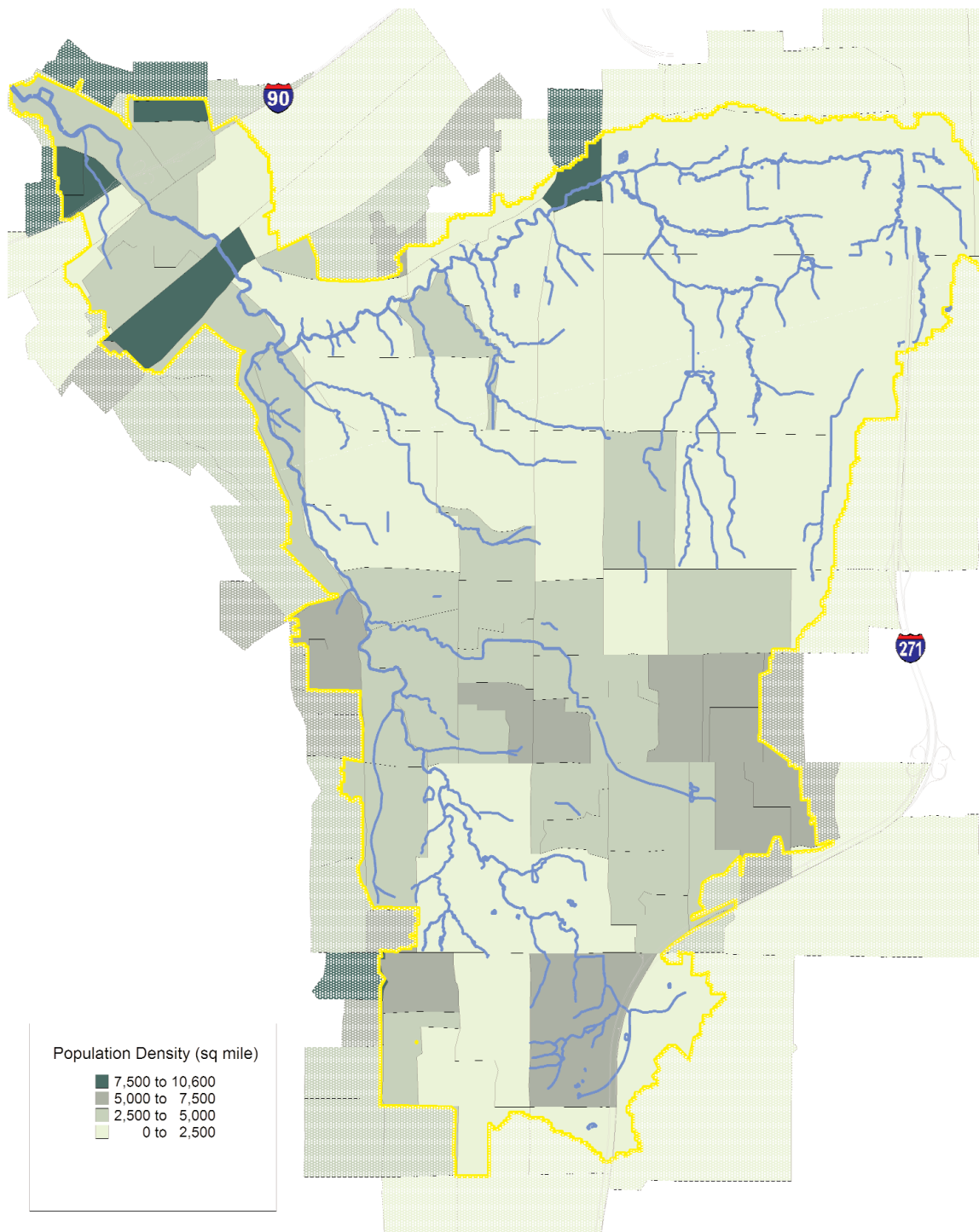




northeastern portion of Beachwood. The area around the East Branch of Euclid Creek in Richmond Heights, Highland Heights and Willoughby Hills

has the lowest densities. The distribution of population throughout the watershed can be seen in **Figure 3.1**.

**Figure 3.1** Population Density by Census Block Group



*Population is most dense in the northern portion of the watershed.*

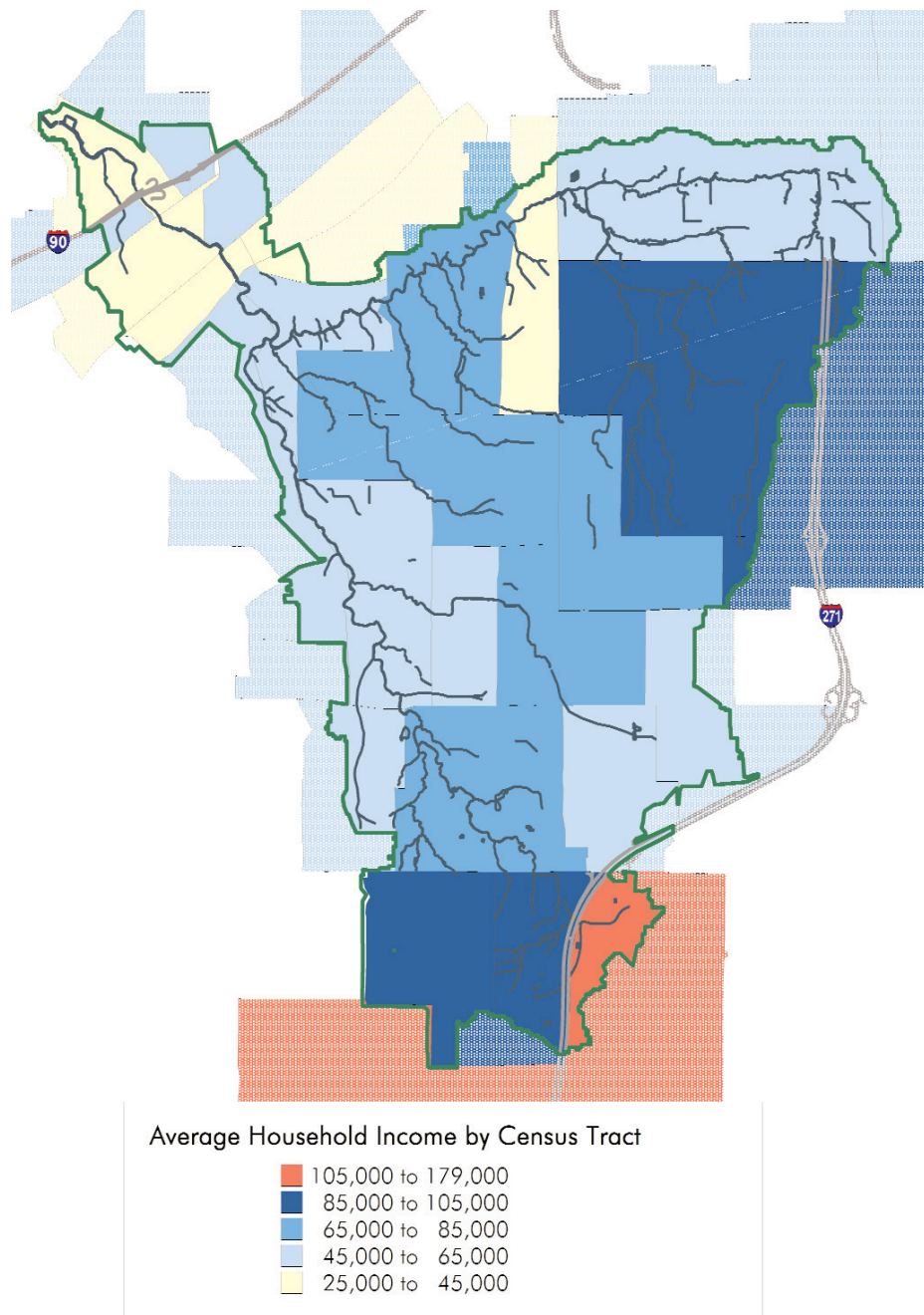
**SOURCE:** US Census Bureau, 2000 (block group data)

### Average Household Income

The average household income varies across the watershed. In the lower portion of the watershed (Cleveland and Euclid) the average household income is between \$25,000 and \$45,000. In the central portions of the watershed (Richmond

Heights and Lyndhurst) the average is \$65,000 to \$85,000, while in the headwaters (Highland Heights and Beachwood) average household income ranges from \$85,000 to \$105,000. The distribution of average household income across the watershed can be seen in **Figure 3.2**.

**Figure 3.2** Average Household Income



*Income levels are lowest in the northern portion of the watershed and highest in the headwaters.*

**SOURCE:** US Census Bureau, 2000 (block group data)



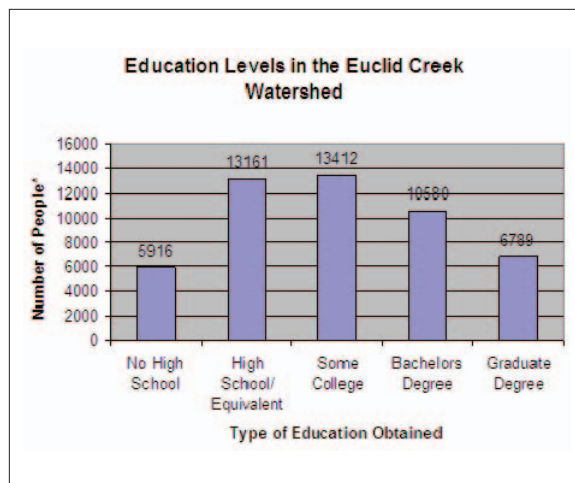
### Age of Population

Approximately 31% of all persons living in the watershed are 30 to 49 years old. Another 31% are 55 years plus. Persons 5 to 19 years old are the next largest age group, and comprise approximately 21% of the watershed population. These numbers are relatively consistent with the age population numbers across Cuyahoga and Lake Counties; however, the percentage of the population age 55 years plus living within the watershed is slightly higher.

### Education Level of Population

The education level of about one-half of the population age 25 years and over living in the watershed is primarily high school/high school equivalent and some college, while over one-third of the population have completed at least a bachelor's degree. See **Figure 3.3**.

**Figure 3.3** Education Level



•Persons age 25 and over for whom educational status has been determined.

**SOURCE:** US Census Bureau, 2000 (block group data)

### Land Use Patterns

Land use is directly connected to the overall health of the watershed. How land is developed and maintained has an impact on the waterway system, transportation system, and the general character of the community. **Figure 3.4** provides a brief description of some of the major land uses within the Euclid Creek Watershed.

**Figure 3.4** Land Use Information in Acres

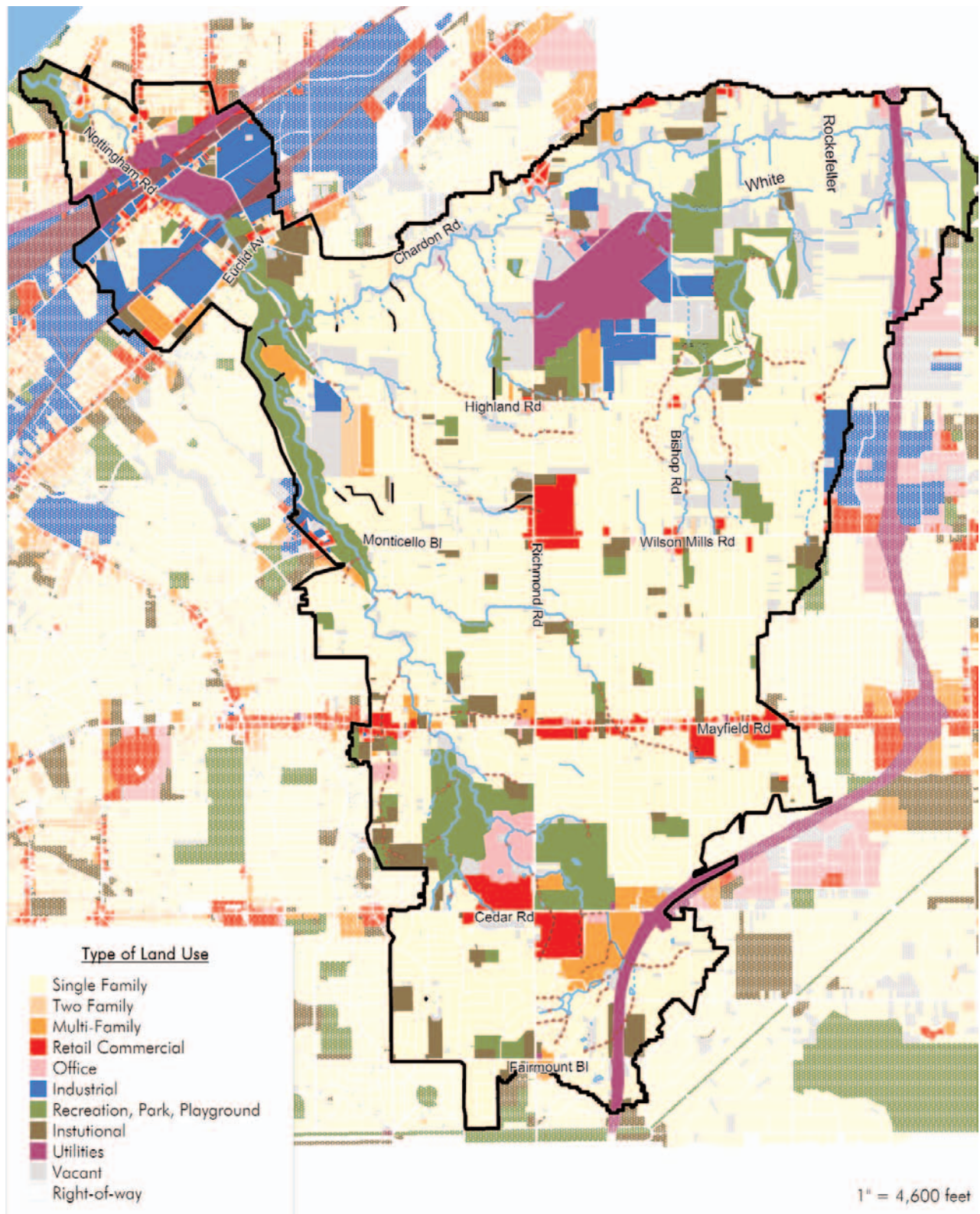
Land Use	Acres	% of Watershed
Commercial Office/Retail	649.9	4.0%
Industrial	539.3	3.0%
Institutional	635.8	4.0%
Protected Open Space	1403.1	9.3%
Residential Multi-Family	441.1	2.0%
Residential Single Family	7114.6	47.6%
Undeveloped Land	2199.0	14.0%
Utilities/Roads/Right-of-way	1904.8	12.7%

**SOURCE:** Cuyahoga Planning Commission, 2005; Cuyahoga County Auditor, 2005; Lake County Auditor, 2005

The largest land use within the watershed is single family residential. Despite the watershed's highly urbanized nature, undeveloped land is the second largest land use. The third largest land use is infrastructure (roads, highways, and utilities). See **Figure 3.4.1**.

During the period immediately following World War II, many communities sought to attract business, industrial, and residential growth for a number of reasons. Among these reasons was the thought that economic growth would raise the property tax base and generate increased revenues for local infrastructure, including schools, roads, and fire and police protection.

More recently, studies on the cost of community services for residential development have shown that the actual cost of services is substantially higher than tax revenues collected. Thus residential land is a net drain on local government budgets. Conversely, the cost of services for commercial/industrial land, as well as open space and agriculture, is substantially less than what a community collects; providing a greater benefit to local communities.

**Figure 3.4.1** General Land Use

**SOURCE:** Cuyahoga Planning Commission, 2005 Cuyahoga County Auditor, 2005 Lake County Auditor, 2005



## Preserving the Land

### Metroparks Euclid Creek Reservation<sup>6</sup>

Established in 1917, this park was the first jewel in the County's Emerald Necklace. The Reservation consists of 345 acres in Euclid, South Euclid, and Richmond Heights, and is essentially a narrow gorge through which Euclid Creek runs to Lake Erie. The steep side slopes rise, in some places, 100 feet or more above the bed of the creek. As the stream cuts through the rock, the valley widens, exposing in succession, Berea sandstone, Bedford shale and sandstone, Cleveland shale, and Chagrin Shale. Thickly wooded beech, oak, and hemlock trees, along with rare chestnut oaks, are present throughout the reservation.

At the southern end of the reservation is the location of the bluestone quarries. Once a booming industry, quarrying soon died with the development of concrete. Today the only remaining area where bluestone can be seen is the Quarry Picnic Area.



*Euclid Creek within the Metroparks Reservation.*

The original Cleveland Metroparks plan from 1916 also proposed incorporating the East Branch of Euclid Creek as an element of the countywide park



*Metroparks Plan from 1916*

**SOURCE:** Cleveland Metroparks

system and part of an open space connection to the Chagrin Valley. Subsequent to the original plan, the Euclid-Chagrin Parkway was platted to connect Euclid Creek Reservation to North Chagrin Reservation. Plans for the roadway were never realized. Later, sections of the right-of-way were vacated for development projects, such as the expansion of the Cuyahoga County Airport.

### Wildwood State Park

This park is part of the Cleveland Lakefront State Park System. As early as 1865, lands were set aside in Cleveland to be developed as recreation areas. In 1977, the City of Cleveland leased its four lakefront



*Euclid Creek within Wildwood State Park.*

<sup>6</sup>Cleveland Metroparks, Past and Present – Carol Miller, 1992

parks to the State of Ohio. The four parks became Cleveland Lakefront State Park in 1978. In 1982, the Euclid Beach area was added to the state park property. The Villa Angela area which was formerly a Catholic school, was acquired through two separate land purchases. The first 30 acres was bought by the City of Cleveland and turned over to the State in 1984. ODNR and the Cleveland Public Library purchased the remaining 13 acres in May 1991. While each area appears to be a separate park, they are administered through a single park office.

### Open Space/Undeveloped Land

In addition to the parks, there are several areas within the watershed that are currently unprotected open space or undeveloped land. These areas are primarily concentrated along the East Branch of Euclid Creek and in Lake County. Other large sites of open space include the land adjacent to the County Airport and Highland Heights Community Park, a number of golf courses and the grounds of the former TRW Headquarters (adjacent to Legacy Village). **Figure 3.5** identifies these areas. Many of these areas of open space are privately owned and several have been offered for sale for development.

Many forested areas fall adjacent to the stream, making them extremely important to the overall health and natural functions of the stream. Some of these natural stream functions include: minimizing flooding and erosion, filtering pollutants, allowing infiltration (minimizing runoff), and providing habitat. These natural functions benefit the community at no cost. Therefore, it is extremely important to preserve these critical areas and/or minimize the impacts to them.

### Changes to the Land

Timing is everything when it comes to the hydrology of the watershed. Hydrology is the study of how the water flows through the watershed. In a natural environment, rainwater does one of four things: 1.) infiltrates into the ground, 2.) evaporates back into the atmosphere, 3.) is taken up by existing vegetation, or 4.) runs off the land.

When we alter the natural landscape, we actually create more runoff and less infiltration. The storm sewers we place into the environment efficiently drain the water to the stream. As a result, larger quantities of water arrive at a point on the stream in less time. This adds additional stress to the system, altering the delicate balance, and causing erosion and flooding at places downstream of new land alterations.

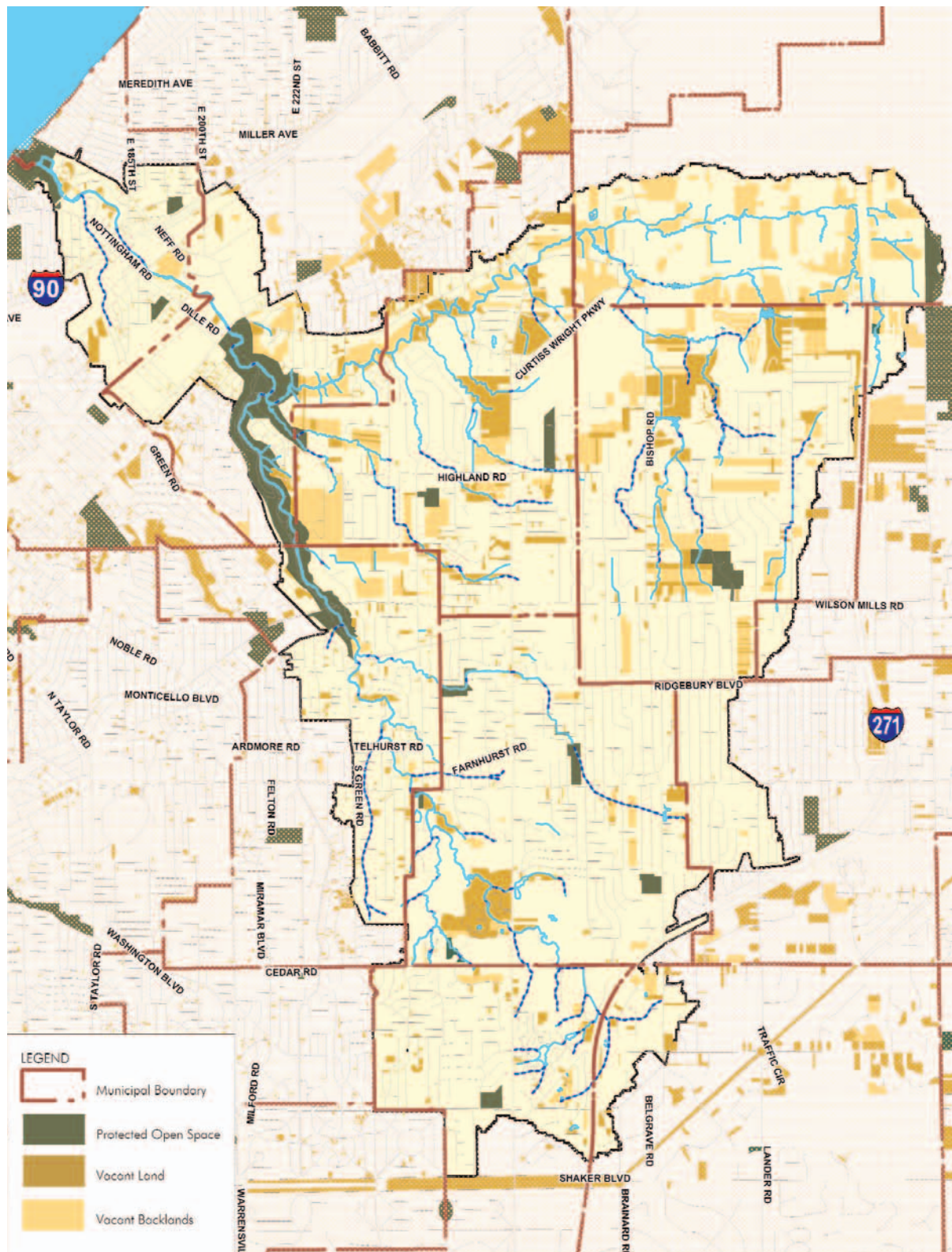
A study conducted by the Northeast Ohio Regional Sewer District found increased flooding and erosion in several communities in Cuyahoga County. Data collected in 1978 and in 1998 indicate a significant increase in the number of stormwater problems. These incidents increased from 147 in 1978 to 334 in 1998. **Figure 3.6** shows the locations of these stormwater problems, as reported by communities during the 1978 and the 1998 surveys. Approximately 50% of the 1998 stormwater problems involved two or more communities.

The Euclid Creek Watershed is highly developed; therefore, it has an extensive amount of impervious surface (e.g. hard landscape, such as parking lots and roof tops). As more and more structures are built in the floodplain, the amount and frequency of flooding also increases. As a result, runoff volumes are elevated, often causing significant changes to the natural stream channel. This also limits the amount of water able to soak into the ground, restricting the essential groundwater that helps to maintain low flow in the stream during the summer months.

### Impervious Cover

One distinct change in the natural stream process is the downcutting and widening that occurs as the stream struggles to reach equilibrium. A relatively slow process in the natural environment, this process is often accelerated by the volume and flow coming from the altered landscapes. As the stream downcuts, it becomes disconnected from its floodplain and can no longer provide critical natural functions. **See Figure 3.6.1.**

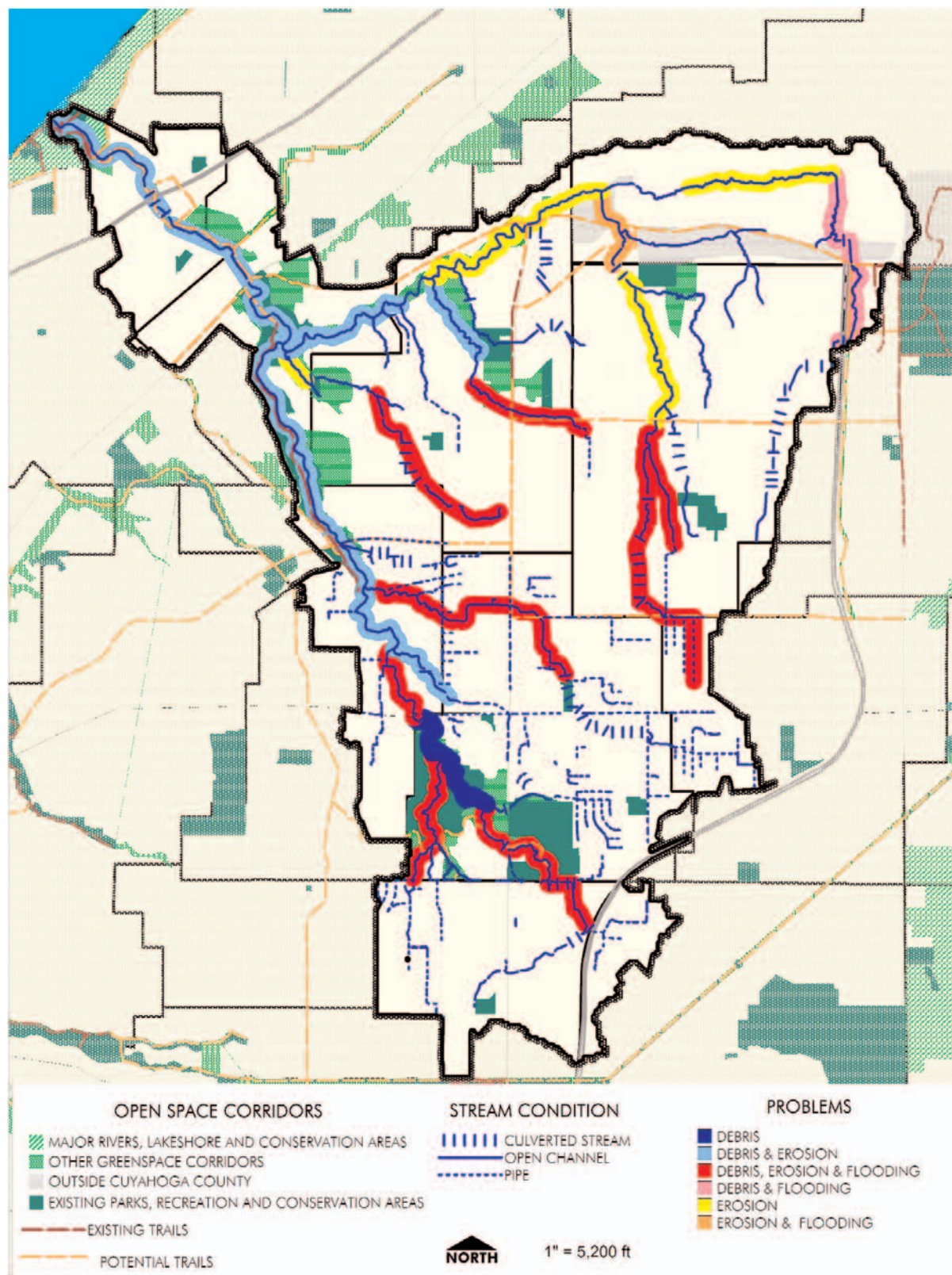


**Figure 3.5** Open Space and Undeveloped Land

*The headwaters of the East Branch drain the majority of vacant land in the watershed.*

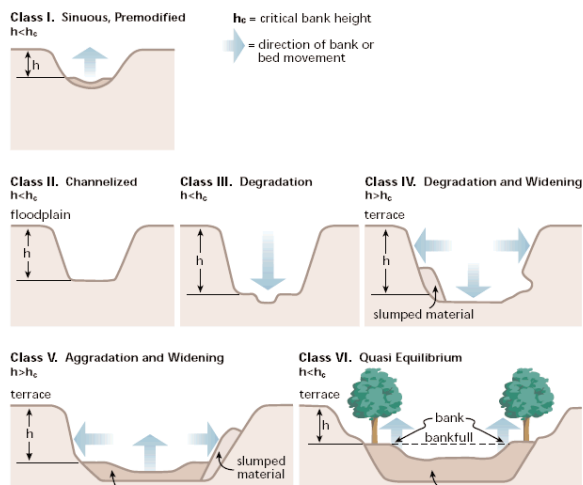
**SOURCE:** Cuyahoga Planning Commission, 2005 Cuyahoga County Auditor, 2005 Lake County Auditor, 2005



**Figure 3.6** Flooding and Erosion

Flooding and erosion areas as identified in NEORSR RIDE study.

**SOURCE:** Northeast Ohio Regional Sewer District Draft RIDE Study, 2005

**Figure 3.6.1** Stream Dynamics

*The dynamics of a stream as it attempts to reach equilibrium.*

**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG)

Studies conducted by the Center for Watershed Protection depict a correlation between impervious cover and stream degradation. They have also developed thresholds for stream function. Streams of high quality and stability correlate to approximately 0–10 % impervious cover. Degradation of streams, defined as flows that alter the stream geometry and begin channel erosion, typically occurs with 11–25% impervious surface. Any imperviousness over 25% is correlated to an unstable, disconnected stream.

The Northeast Ohio Regional Sewer District's RIDE Study Draft of 2004 provided an assessment of impervious cover within Euclid Creek. Their numbers give a very rough estimate of the hard surface component of the watershed. The NEORS did not directly measure the hard surfaces of the watershed. They developed an automated process based on land use and land cover data, as well as preliminary water modeling results, to generate their impervious cover values. In addition, each value was then manually adjusted to match the flow data.

**Figure 3.6.2** shows that the majority of the watershed is over 25% impervious. The less developed areas of the East Branch have lower concentrations of impervious cover. Further examination of land use is necessary to get a more accurate depiction of how these hard surfaces could be affecting natural stream function.

### Coastal Structures

The ODNR Coastal Geology Division conducted a study entitled “Nearshore Distribution of Shore Structures Along Ohio’s Lake Erie Shore and their Erosion Effectiveness and Biological Compatibility”. This study was completed in order to determine the effect shoreline structures have on erosion and biology. According to the study results, the structures located within Cuyahoga County are over 50% effective for limiting erosion and 45% non-effective for biological habitat. This is due mainly to the type/composition of structures typically used. In the Euclid Creek Watershed, break walls and revetments are present along the shoreline primarily to protect the beaches, marina, and private homes. These structures appear to be relatively good at minimizing the effects of erosion; however, they do not have features that provide biological habitat.

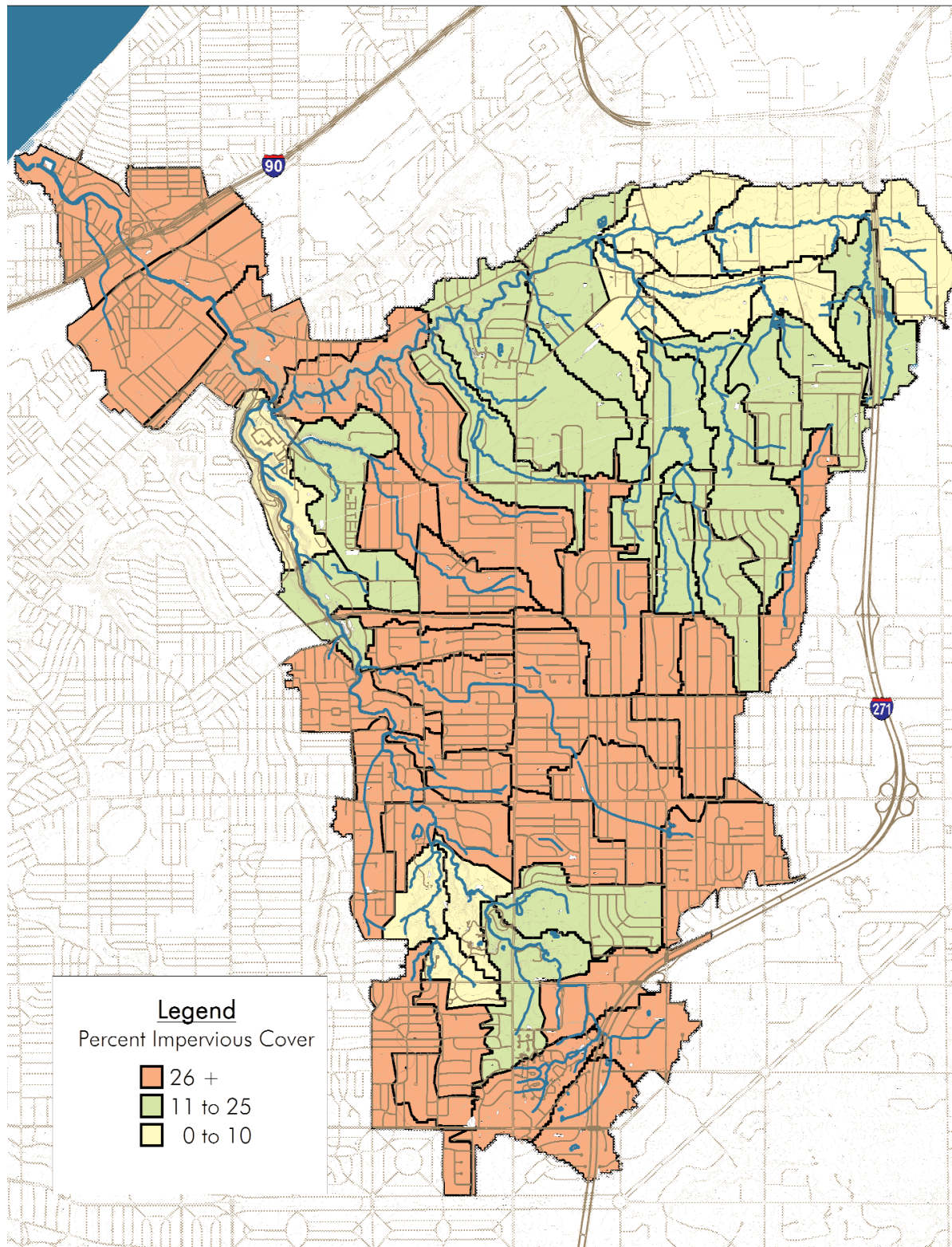
### Why is there flooding?

#### Floodplains

Floods are a natural process which help maintain the health of the river. Just as fire is essential in a forest or prairie, flooding is essential to the river ecosystem. **Figure 3.6.3** shows that natural stream channels have an associated adjacent land area called a floodplain. These adjacent areas are periodically inundated by flood waters and serve a variety of functions. These functions include:

- temporarily store water
- help to dissipate energy
- filter nutrients
- allow for infiltration
- provide important habitat
- create recreational opportunities

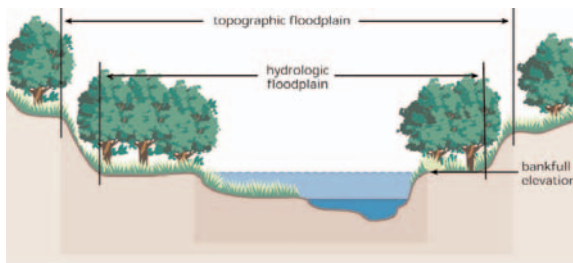


**Figure 3.6.2** Impervious Cover

*The amount of impervious cover is less in the headwaters of the East Branch; however, these areas are currently under great development pressure.*

**SOURCE:** Northeast Ohio Regional Sewer District Draft RIDE Study



**Figure 3.6.3** Floodplain Cross Section

*The cross section of a stream showing the adjacent floodplain area.*

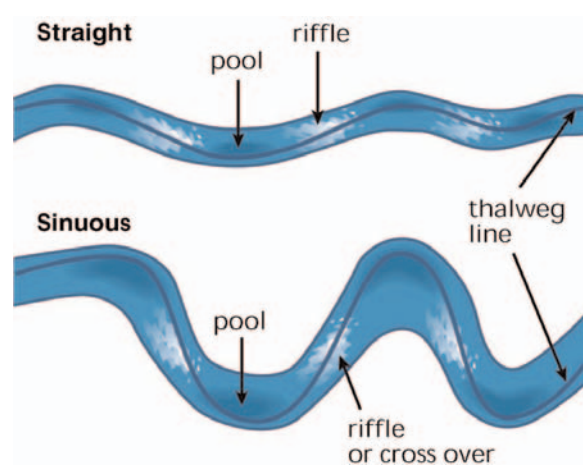
**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG)

Studies have shown that floodplain size is directly related to the overall health of a stream. The Federal Emergency Management Agency (FEMA) has been involved in management efforts for many years and has mapped many floodplain areas. However, unmapped headwater or intermittent streams have historically not been viewed as areas of importance. These areas are becoming increasingly more significant as a direct result of their elimination.

As more and more land is developed, building within the floodplain occurs more frequently. The result is heavier flooding downstream. Healthy floodplain areas create a vegetated transition zone between rivers and upland habitats, providing shelter, food, and migration corridors for river wildlife.

### Alterations to the Shape of the Stream

Often streams are moved and straightened as land is developed. This shortening of the stream length disrupts the hydrology and riffle-pool pattern critical for aquatic animal survival. **See Figure 3.6.4.** Many experts use the term *sewershed* when describing urban watersheds to emphasize that the urban stream no longer has many natural tributaries. These stream segments have largely been drained or filled and replaced by storm sewer connections. Euclid Creek, especially the headwaters, has been significantly altered from its natural shape.

**Figure 3.6.4** Stream Pattern

*Variations in the riffle-pool of a straight vs. a natural stream show the benefit of keeping a stream in its natural condition.*

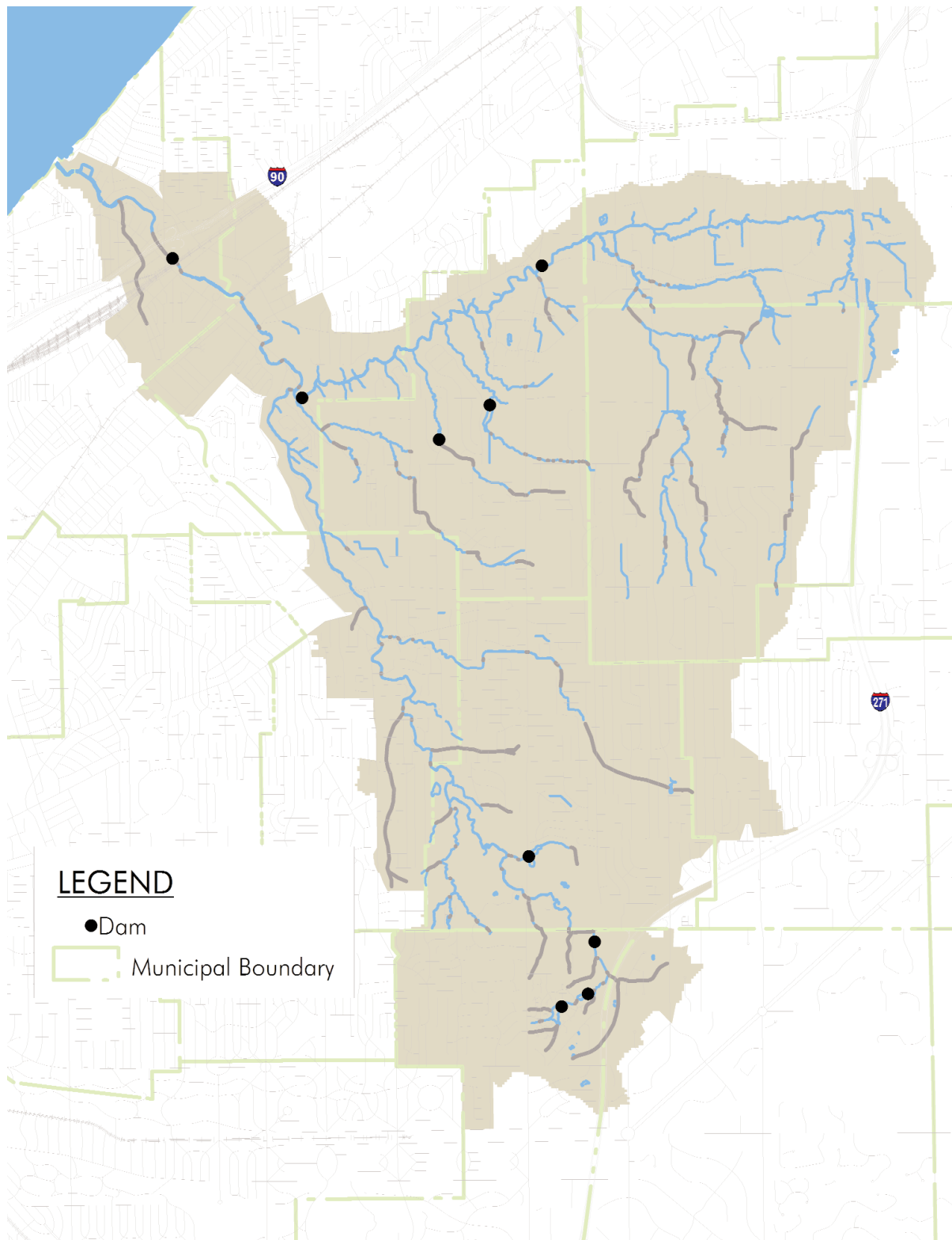
**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG)

### Dams & Lakes

Euclid Creek has many dams and inline lakes throughout the watershed. Once placed to help alleviate flooding or harness the streams' power (e.g., mills), dams are now recognized as barriers for aquatic life and stream natural function. There are nine dams located within Euclid Creek, with the largest located directly south of I-90, at the E. 185th Street Exit. **See Figure 3.7.**



*The dam located at the I-90 and East 185th Street Interchange limits water quality and fish passage.*

**Figure 3.7** Locations of Dams within Euclid Creek

Instream ponds were originally thought to have a positive effect on water quality; filtering pollutants and slowing floodwaters. In recent years, the negative secondary impacts from instream ponds have been realized. These lakes are formed by damming the river, which limits aquatic life and stream function.

The permanent pool of ponds absorbs heat during the summer, discharging warmer waters during storm and base flows. Ponds are excellent traps for silt, sand and gravel that comprise the typical bedload of a stream. This disrupts the flow of sediment through the river system, gradually causing the pond to fill in. In extreme cases, clean water below the pond picks up sediment from bed and banks, increasing erosion downstream. In addition, ponds filter the fine organic particles from the water column. This often results in a greater amount of aquatic insect shredders (consuming large organic particles) above the pond and a greater portion of collectors and scrapers (consuming fine organic particles) below it.

### Culverts

The area of the stream that is most affected by culverts is often the headwaters. Due to the small drainage area, intermittent flow, and shallow bed and banks, these headwater streams are easily altered. Culverts for roads and bridges are small in size and length; not a high cost item for the



*Culverts under I-90 confine the stream, increasing the velocity of the water and contributing to erosion and flooding downstream.*



*Army Corps of Engineers flood control project located south of Lakeshore Boulevard limits the natural functions of the stream.*

developer. Culverts have a negative impact on the stream corridor. They constrict the natural flow patterns and although they can be small impacts, have a cumulative effect that is extremely detrimental to the overall health of the stream. **Appendix D** has information on the design, installation, and maintenance of culverts that cause less of a restriction on the waterway system.



*These gabions along the East Branch are a common practice for stream stabilization; however, they contribute to erosion and flooding downstream.*

### Channelization

Walls, culverts, and gabions “hold the stream” in place, limiting the natural functions the stream can perform. In addition, the hydrology of the stream is also impacted. The “hard armoring” causes more energy in the stream system than the banks can hold, resulting in flooding and erosion downstream.



## Where Does Pollution Come From?

### Point & Non-Point Sources

Pollution in the Euclid Creek Watershed, as well as many urban watersheds, comes from a variety of sources. Although many people think of point source pollution (pollution that can be easily identified through an outlet pipe, such as an industrial plant or sewage treatment plant) as the primary source of water pollution, non-point source pollution (NPS) in reality is the larger problem. NPS comes from sources all over the watershed, and its points of origin can be very difficult to determine.

When it rains or when snow melts, the water washes away pollutants that have accumulated on roads, highways, sidewalks, and parking lots. These pollutants are carried away by water and washed directly into local streams and rivers through ditches and storm sewers. When left uncontrolled, these pollutants can cause stream habitat degradation, a loss of aesthetic value, and contamination of drinking water supplies.

For these reasons, urban watersheds are prone to water pollution. Concentrated activities coupled with hard surfaces cause urban land use to be a significant contributor to water pollution. Urban runoff can include: fertilizers from lawn care, erosion from soil disturbances and increased rate of flow, pet waste, trash, oil, paint, etc.

As authorized by the Federal Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. All of the eleven communities that make up Euclid Creek fall under this NPDES Phase II Storm Water Program. This program was designed to address pollutants associated with storm water runoff from urban areas. The Phase II program has six minimum control measures that each community must address. They are as follows:

- *Public Education and Outreach* – Distributing educational materials and performing outreach



*Stormwater advertisements showing impacts watershed residents have on the stream.*

**SOURCE:** Long Island Sound Study

to inform citizens about the impacts polluted stormwater runoff discharge can have on water quality.

- *Public Involvement and Participation* – Providing opportunities for citizens to participate in program development and implementation.
- *Illicit Discharge Detection and Elimination* – Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system.
- *Construction Site Runoff Control* – Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land.
- *Post Construction Runoff Control* – Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas.
- *Pollution Prevention and Good Housekeeping* – Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations.

When all six elements are implemented, the expected results are significant reductions of pollutants discharged into receiving waterbodies.

The water quality of Euclid Creek, along with many other streams in Northeast Ohio, is monitored by the Ohio EPA. Studies are conducted on a 5 year basis. Through this testing, parameters are set for the ideal stream conditions given use and location. The Ohio EPA has determined that the Euclid Creek is in non-attainment; ie., it does not meet the State Water Quality Standards. In addition, they have identified organic enrichment and flow alteration as the cause of impairment and attribute combined sewer overflows and urban runoff as the source of this impairment.

### **Water Quality in Lake Erie**

Euclid Creek is a direct tributary to Lake Erie. Pollution from this watershed contributes directly to the health of Lake Erie; including the two beaches of Villa Angela and Euclid State Park, located near the

mouth of Euclid Creek. Data from the Ohio EPA indicates that over the last five years, Villa Angela had been closed 60 percent of the recreation season and Euclid State Park has been closed 38 percent of the season due to high bacteria levels. This is primarily due to the combined sewer overflows that regularly discharge at the mouth of the creek.

### **Water Quality in the Stream**

Several groups have monitored, and continue to monitor the water quality in the Euclid Creek. Below is a brief description of the efforts in the watershed to date.

#### *Chemical and Biological Sampling*

The Cuyahoga County Board of Health monitors on an annual basis three permanent sites along the main stem of Euclid Creek. They test for several chemical parameters and biological parameters. The chemical parameters for 2003 indicated an overall good chemical water quality while the biological diversity varied between good (in the lower watershed) fair (in the Euclid Creek Reservation) and poor (in the highland headwaters).

In 2001, John Carroll University had studied several chemical and biological parameters for water quality. Their findings indicate that the water quality in Euclid Creek is good to fair throughout the watershed.

The Ohio EPA monitors four locations along the main stem of Euclid Creek and one site on the East Branch. These sites are monitored approximately every five years. They often supplement their data with the data collected by the Northeast Ohio Regional Sewer District. The Northeast Ohio Regional Sewer District samples four sites along the main stem and one site on the East Branch. Sampling is conducted approximately every two years. In addition, a total maximum daily report was prepared by the Ohio EPA in conjunction with this planning process. The draft report is currently in review process for local, state, and federal endorsement. The following conclusions have been developed within the draft plan:

*Bacteria* – Discharges from septic tanks, combined sewer overflows and urban runoff have been identified as possible sources.

*Phosphorous* – Current data indicate that phosphorous levels are above target goals.

*Aquatic Life* – Currently Euclid Creek does not meet aquatic life use standards. Ohio EPA data shows fish populations to be impacted more than the bugs (macroinvertebrates).

#### Habitat Evaluation

In addition, the Board of Health also conducted a Headwater Habitat Evaluation Inventory on seven headwater streams. Six of the seven streams were classified as high quality streams. The locations of these streams are as follows: Richmond Heights Police Department, Acacia County Club, Highland Heights Community Park, 1820 Stonelake Drive, Pet Cemetery on Wilson Mills Road, and the Richmond Heights Community Park.

Most recently, the Cleveland Metroparks, in conjunction with the Ohio EPA, conducted a full Headwater Habitat Evaluation Inventory of all headwater streams in the Euclid Creek watershed. Of the 106 tributaries of Euclid Creek, 86 were accessible and fully evaluated. Preliminary results indicate that approximately 1/3 of these headwaters have good biology.

Overall, the sampling indicates bacteria, phosphorous, and habitat alteration is negatively affecting water quality in the watershed.

#### **CSOs, Sanitary Lines, Septic**

Combined sewer overflows (CSOs) are a major source of stream pollution in many older cities. Ironically, they are also society's early efforts to reduce stream pollution. Combined sewer lines carry both sanitary waste and stormwater drainage. CSOs are outlets that dump excess water from the sewers into streams and rivers, keeping the sewers from backing up into homes, business and streets

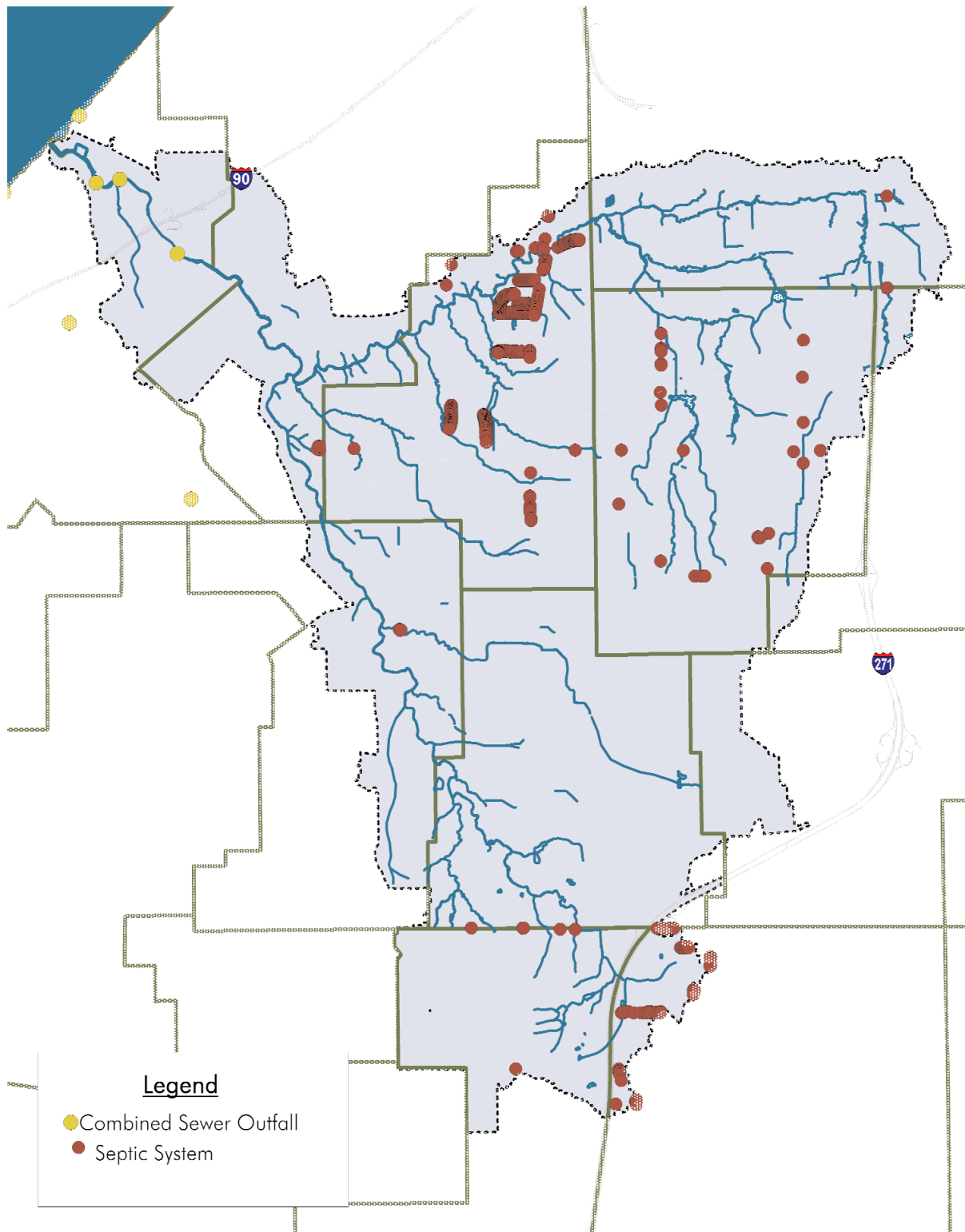
when it rains. While combined sewers have fallen into disfavor since World War II, they were once considered a major advance in improving public health and safety.

There are several combined sewer overflows present in the northern portion of the watershed, which are located in the City of Cleveland. **See Figure 3.8.** However, the Northeastern Ohio Regional Sewer District currently has a plan in place to develop larger storm sewers in this area, limiting the overflow to approximately 4 times a year, a number that will contribute considerably less pollution to the waterway than the current 50 times a year.

In addition, several communities throughout the watershed are in the process of expanding their sanitary sewers to incorporate areas originally serviced by septic systems. Providing sanitary sewers helps to eliminate the need of the homeowner to maintain their septic system, often resulting in failure and stream pollution. Therefore, these connections will help to ensure that wastewater is treated prior to reaching Euclid Creek and septic system failure will not be an issue in these areas of the watershed.

For more detailed information on the water quality and current conditions in the Euclid Creek Watershed, refer to the Euclid Creek Total Maximum Daily Load Report developed by the Ohio Environmental Protection Agency, available on their website at <http://www.epa.state.oh.us/dsw/tmdl/EuclidCreekTMDL.html>, and/or the Euclid Creek Watershed Action Plan developed by the Cuyahoga SWCD; available at their office.



**Figure 3.8** Combined Sewer Outfalls and Septic Systems

*Combined sewer outfalls are concentrated in the northern portion of the watershed, while septic systems are present along the East Branch and headwaters.*

**SOURCE:** Cuyahoga County Department of Health, 2004 and Lake County Health Department, 2004

The Euclid Creek Watershed is part of a much larger system: the Great Lakes. There are a variety of efforts at the local, state, national, and international level that are concerned with the health of this region. This watershed plan complements these regional projects and goals.

## Great Lakes/Lake Erie

Euclid Creek is part of the Lake Erie and Great Lakes ecosystems which comprise the largest freshwater system in the world. The Lake Erie basin, which encompasses portions of the United States and Canada, is the most populated and land-developed area of all of the Great Lakes. The basin, which is 30,140 square miles in size, is home to over 11 million people. Lake Erie is considered the most biologically productive of the Great Lakes in terms of diversity and abundance of fisheries and other species within its waters.

## Ohio Coastal Management Program

The lower portion of the watershed is within the designated Coastal Management Area as established by the federally approved Ohio Coastal Management Program. **See Figure 4.0.**

The Ohio Coastal Management Program sets forth the guidelines for wise use of Ohio's valuable coastal resources to ensure their continued benefit for this and future generations.

The goal of the Ohio Coastal Management Program is threefold:

- To preserve, protect, develop, restore and enhance Lake Erie's valuable resources,
- To manage coastal activities that affect the resources, and
- To foster the resources' sustainable use for the benefit of all Ohio citizens.

**Figure 4.0** Coastal Management Area



*Coastal Management Area of Euclid Creek.*

Networking between local, state, and federal entities is an important aspect of Ohio's Coastal Management Program which establishes policies concerning the protection of air, water, wildlife, rare and endangered species, wetlands, and natural areas. Ohio's Coastal Management Program also provides for the management of coastal erosion areas and the public trust property of Lake Erie. The Program has an advisory council and provides for grants to local communities, nonprofit organizations, and educational institutions for projects that enhance the coast.

The Coastal Program outlines standards for coastal development, redevelopment, and historic and cultural restoration. This is done with the goal of increasing the public's access to the coastal area for recreational purposes. In 2000, ODNr's Strategic Plan for Coastal Management identified Habitat Protection and Sustainable Development as its two highest priorities. **Appendix E** has an overview of the Coastal Management Program.

### Ohio Lake Erie Commission Watershed Balanced Growth Plans

This is a voluntary, incentive-based program for balanced growth in the Ohio Lake Erie basin. The planning framework includes:

- A focus on land use and development planning in the major river tributary watersheds of Lake Erie basin.
- The creation of Watershed Planning Partnerships composed of local governments, planning agencies, nonprofit organizations, and other parties in each watershed.
- The locally determined designation of Priority Conservation Areas and Priority Development Areas in each watershed.
- The development of suggested model regulations to help promote best local land use practices that minimize impacts on water quality.
- The alignment of state policies, incentives, and other resources to support watershed planning and implementation.

The framework also incorporates the "10 Guiding Principles" of the Lake Erie Protection and Restoration Plan. More information on the Balanced Growth Initiative is available in **Appendix F**.

### International Joint Commission Designated Area of Concern<sup>7</sup>

On April 15, 1972, Prime Minister Pierre Trudeau and President Richard Nixon met to sign the Great Lakes Water Quality Agreement. This Agreement committed Canada and the United States to control pollution in the Great Lakes. In 1978, a new Agreement was signed and the two countries pledged "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem." In 1987, the Protocol was signed, emphasizing the importance of human and aquatic ecosystem health. The Protocol introduced provisions to develop and implement Remedial Action Plans (RAPs) and Lakewide Management Plans (LaMPs). RAPs focused on the 43 geographic Areas of Concern, take an ecosystem approach, and draw upon broad local community involvement. LaMPs are designed to improve the environmental quality of the open waters of each of the Great Lakes, with a particular focus on Critical Pollutants. Under the terms of the Great Lakes Water Quality Agreement, the two federal Governments are expected to implement programs and report on their progress in restoring, preserving, and protecting the Great Lakes. The International Joint Commission (IJC) has been charged with reviewing and evaluating these programs and progress.

Of the 43 AOCs, 26 are located entirely within the United States, 12 are located wholly within Canada, and five are shared by both countries. Euclid Creek has been designated as part of the Cuyahoga Area of Concern (AOC). RAPs are being developed for each of these AOCs to address impairments to any one of 14 beneficial uses (e.g., restrictions on fish and wildlife consumption, dredging activities, and drinking water consumption) associated with these areas.

<sup>7</sup>USEPA (<http://www.epa.gov/glnpo/glwqa/>)



## Cuyahoga County Greenspace Plan

Over the past 50 years, economic development in Cuyahoga County has expanded outward from the urban core. In 1948, approximately 26 percent of the land in the county was developed. In comparison, 90 percent of the land was developed in 2002. Surprisingly, the population during both time periods was nearly the same—1.4 million. The trends indicate Cuyahoga County will soon be the first “built-out” county in the State.

Greenspace has much to offer: supporting native species, maintaining natural ecological processes, sustaining air and water resources, and increasing overall health and quality of life for communities. Quality natural resources within the county are becoming increasingly rare, which makes preserving remaining natural areas and rehabilitating low quality areas a priority. The ultimate goal is to integrate natural resource protection into the County’s pattern of development as both a core infrastructure system and as a community amenity.

The Cuyahoga County Greenspace Plan proposes a broad strategy for making natural areas a more integral part of daily life. Natural features such as the lake shoreline, river corridors, and hillsides are the backbone for the plan. Basic elements of the plan include the creation of a system of natural corridors, a countrywide trail system, the preservation of scenic views, and the protection and restoration of critical natural areas. The involvement of the public through education and private property stewardship is also a key element.

**See Figures 4.1 and 4.1.1.**

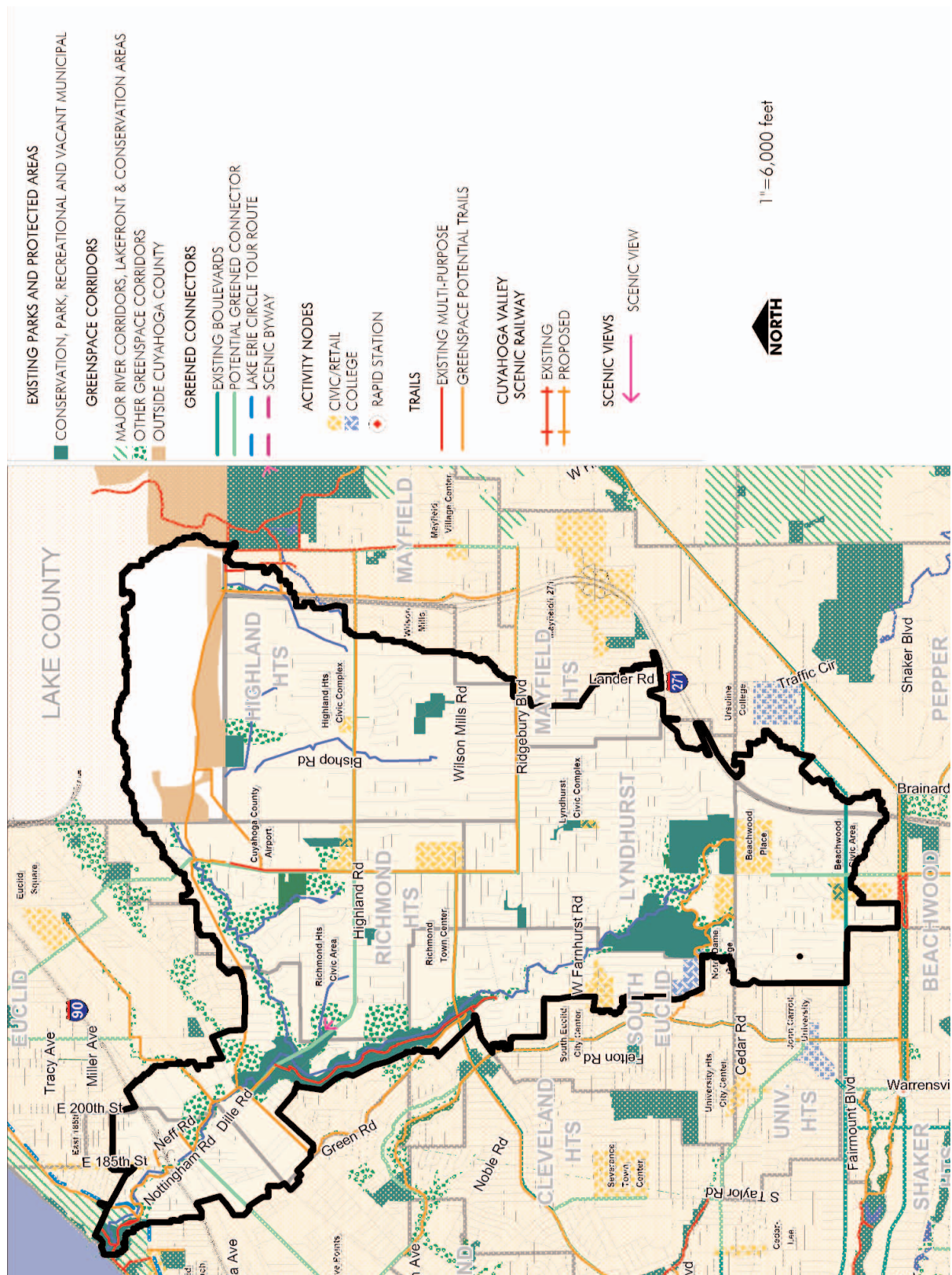
Other key concepts in the Greenspace Plan serve as the foundation for many recommendations in the Euclid Creek Watershed Planning Guide. Some of these concepts include restoration, better access, and sensitive development strategies of natural areas, improved connections between natural areas and other community centers, and development orientation toward natural areas.

**Figure 4.1** Cuyahoga County Greenprint Trail Concept



*Euclid Creek Watershed in relation to the County Greenprint Trail Plan.*

Figure 4.1.1 Cuyahoga County Greenspace Plan



Euclid Creek section of the Cuyahoga County Greenspace Plan.



## Lay of the Land

The overall concept of the Euclid Creek plan is a land-based strategy to protect, restore, and manage its water resources while maintaining and enhancing its economic viability. Land use decisions have a direct impact on the watershed as a whole. As we begin to make recommendations for the future, the various types of land use within the watershed have been categorized into four strategies (protection, restoration, future development/redevelopment, and best management practices) to assist community decision-makers on the best way to balance natural resources with economics. **See Figure 5.0.**

The majority of the recommended protection areas fall along the East Branch and relatively untouched stream segments in the headwaters. Restoration areas are primarily located in the headwaters, with the exception of a large segment highlighted on the Main Branch near the mouth. Development and redevelopment sites, although scattered throughout the watershed, are concentrated in Highland Heights and Willoughby Hills. Accordingly, the remaining areas of the watershed are recommended best management practice areas.

## Protection Areas

The recommended protection areas are primarily indicated along stream corridors throughout the watershed. These protection areas are critical natural resources that are essential to sustain the natural functions of Euclid Creek. Planning to protect these areas will provide natural services such as minimization of flooding, pollutant removal, infiltration, habitat, reduction of temperature, and streambank stability at no cost to communities. In addition, these areas also provide access points, aesthetic value, recreation opportunities, and unique character for the Euclid Creek Communities.

## Recommended Actions

Below is a list of tools that can be used in order to establish protection areas within the Euclid Creek Watershed. Some tools can be used in conjunction

with others. The watershed is a complex, dynamic system and protection areas, where appropriate, should be planned at a regional scale.

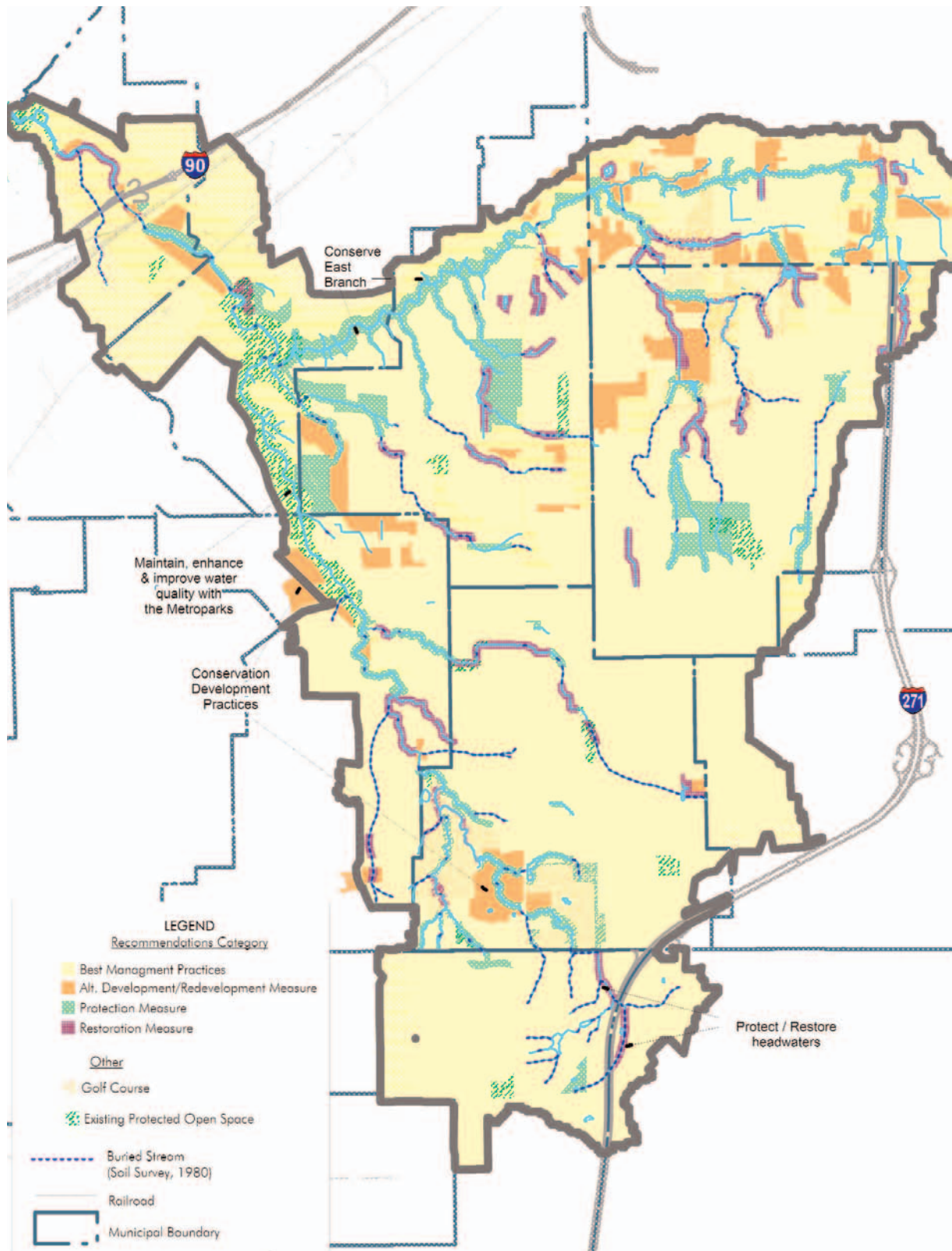
*Conservation Easements/Conservancy Area* – A conservation easement is a voluntary restriction placed by a landowner on the use of his or her property to protect resources such as wildlife habitat, agricultural lands, natural areas, scenic views, historic structures, or open spaces. The landowner retains title to the property, and the easement is donated to a qualified conservation organization, such as a land trust, or a government agency. Conservation easements are often used with new or redeveloped land proposals, allowing the land to become more of an amenity to the community and preserving critical natural resources.

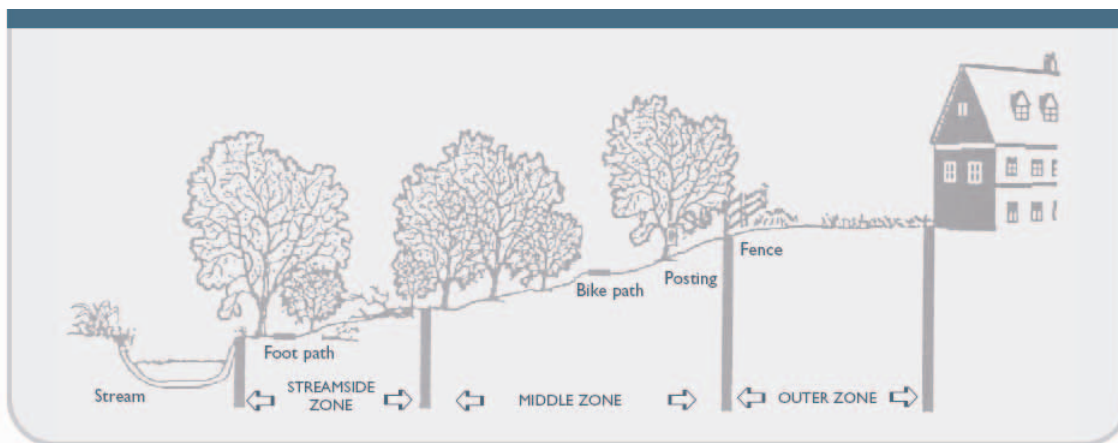
*Land Acquisition* – This method is exactly what it states: wisely choosing land that would be an amenity to the community in its current condition. Land acquisition can be used for a number of activities; adding to or developing a community park, protecting a critical natural resource, preserving a historical or scenic location, etc. This method usually involves the purchase of property.

*Riparian Setback Ordinance* – The riparian area is the area located directly adjacent to the stream. A setback ordinance works like all other lot setbacks (e.g. street setback, side yard setback, etc.). It is a somewhat flexible method of protecting the critical areas along the stream. The setbacks can be one fixed width, or zoned multiple widths depending on use. **See Figure 5.1.**

*Headwater Protection* – OEPA indicates headwaters are the networks of small streams that blanket the landscape of every watershed. Primary headwater streams generally drain less than one square mile. Over 80% of stream miles in Ohio are composed of these primary headwater streams. Therefore, the collective health and functionality of primary stream networks has profound influences on the quality and value of larger streams, rivers, and lakes.



**Figure 5.0** Land Use Recommendations within Euclid Creek

**Figure 5.1** Zoned Riparian Setback

*This stream setback is designed for protecting aquatic resources while providing flexibility for development. Each zone can have designated functions, width constraints, and management requirements.*

**SOURCE:** Connecticut Stormwater Manual, 2004, Center for Watershed Protection, 1998a (adapted from Welsh, 1991)

**Wetland Setback Ordinance** – A wetland, as defined by Cowardin et al. (1979) and adopted by the U.S. Fish and Wildlife Service, is as follows: Land where an excess of water is the dominant factor determining the nature of soil development and the types of animals and plant communities living at the soil surface. It spans a continuum of environments where terrestrial and aquatic systems integrate. Wetlands have three distinct features: (1) ground water (water table or zone of saturation) is at the surface or within the soil root zone during all or part of the growing season, (2) soils are hydric soils which are characterized by frequent, prolonged saturation and low oxygen content, leading to anaerobic chemical environments where reduced iron is present, (3) plants are adapted for growing in standing water or saturated soils, such as moss, sedges, reeds, cattail, etc. A setback ordinance would limit the amount of damage to these unique areas. It could be set up like any other setback, as indicated in the riparian setback ordinance above.

**Steep Slope Setback Ordinance** – Steep topography can often cause problems with safety, as well as development. A designed setback distance would ensure the integrity of the structures in close proximity. Again, this setback would work like others indicated above.

## Restoration Areas

Restoration areas are the locations within the watershed where the stream is highly modified or eroded and in need of rehabilitation. They include channelized and buried stream segments, stream-banks that lack vegetation, and ponds/dams that limit the natural stream functions. These areas were identified through field survey, public meetings, and assistance from community stakeholders. If restored, these critical areas will help to improve the overall health of the stream, as well as minimize problem areas in the future.

### Recommended Actions

Below is a list of tools that can be used to establish restoration areas within the Euclid Creek Watershed. Some tools can be used in conjunction with others.

**Wetland Mitigation Banks** – A wetlands mitigation bank is a wetland area that has been restored, created, enhanced, or preserved and set aside to compensate for future conversions of wetlands during development activities. A wetland bank may be created when a government agency, a corporation, or a nonprofit organization undertakes such activities under a formal agreement with a regulatory agency. The value of a bank is determined by quantifying the wetland values restored or created in terms of “credits.”

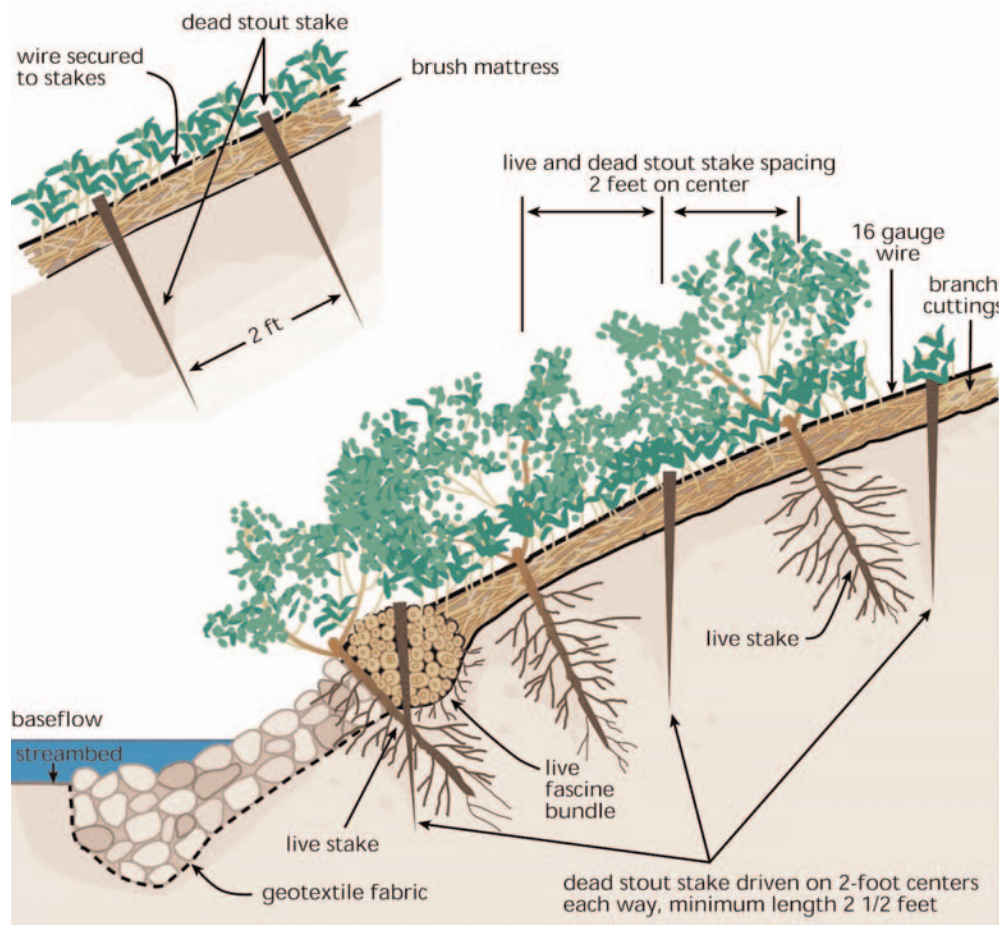
**Dam Removal** – Dams are proven to limit habitat and migration patterns for fish and other aquatic organisms. Removing such obstructions will help to restore the natural functions of the stream.

**Channel Restoration** – Often in an urban environment the channel has become significantly altered. Channels, especially headwaters, are re-aligned or straightened, culverted and hard armored. Channel restoration includes the re-establishment of natural features (physical and hydrological) such as the re-establishment of a meander (s-shaped) pattern, removal of hard armoring, use of bioengineering practices, re-establishment of floodplain, etc. **See Figure 5.2.**

**Retrofitting existing detention basins for water quality** – The majority of detention structures within the watershed are dry detention. These detention areas provide an opportunity to enhance water quality. By retrofitting existing detention with water quality features such as forebays, micropools, wetlands, etc., these structures can provide both water quantity and water quality features. **See Figure 5.2.1.**

**Daylighting Stream Channels** – Streams that have been buried underground can be restored or re-opened to the surface. Removing the piping and adding natural features to a stream will help to provide the necessary physical features that will enhance water quality and provide a habitat for many aquatic organisms.

**Figure 5.2** Brushmattressing Stream Restoration Practice



*This practice uses living plant materials to help control erosion, stabilize banks, and minimize flooding.*

**SOURCE:** Stream Corridor Restoration: Principles, Processes, and Practices, 1998 by the Federal Interagency Stream Restoration Working Group (FISRWG), Chapter 16 Engineering Handbook USDA-NRCS, 1997



**Removal of Invasive Species** – Established ecosystems have developed their own natural balance and controls over time. The plants and animals within those systems find this balance suitable for survival. Native species are an integral part of the web of life. Conversely, invasive plant species are non-native vegetation that have been introduced to an area and have out-competed the natural vegetation, upsetting the delicate balance of the ecosystem. Removal of

these invasive species will allow the natural vegetation to return to the area and help to redevelop biodiversity (**see brochure in Appendix B**).

**Tree Planting** – Providing native vegetation to areas without, or as an alternative to, grassed lawns will increase biodiversity and infiltration. Areas to consider include: streambanks, tree lawns, recreation areas, schools, libraries, public greens, etc.

**Buried Stream Before Daylighting**



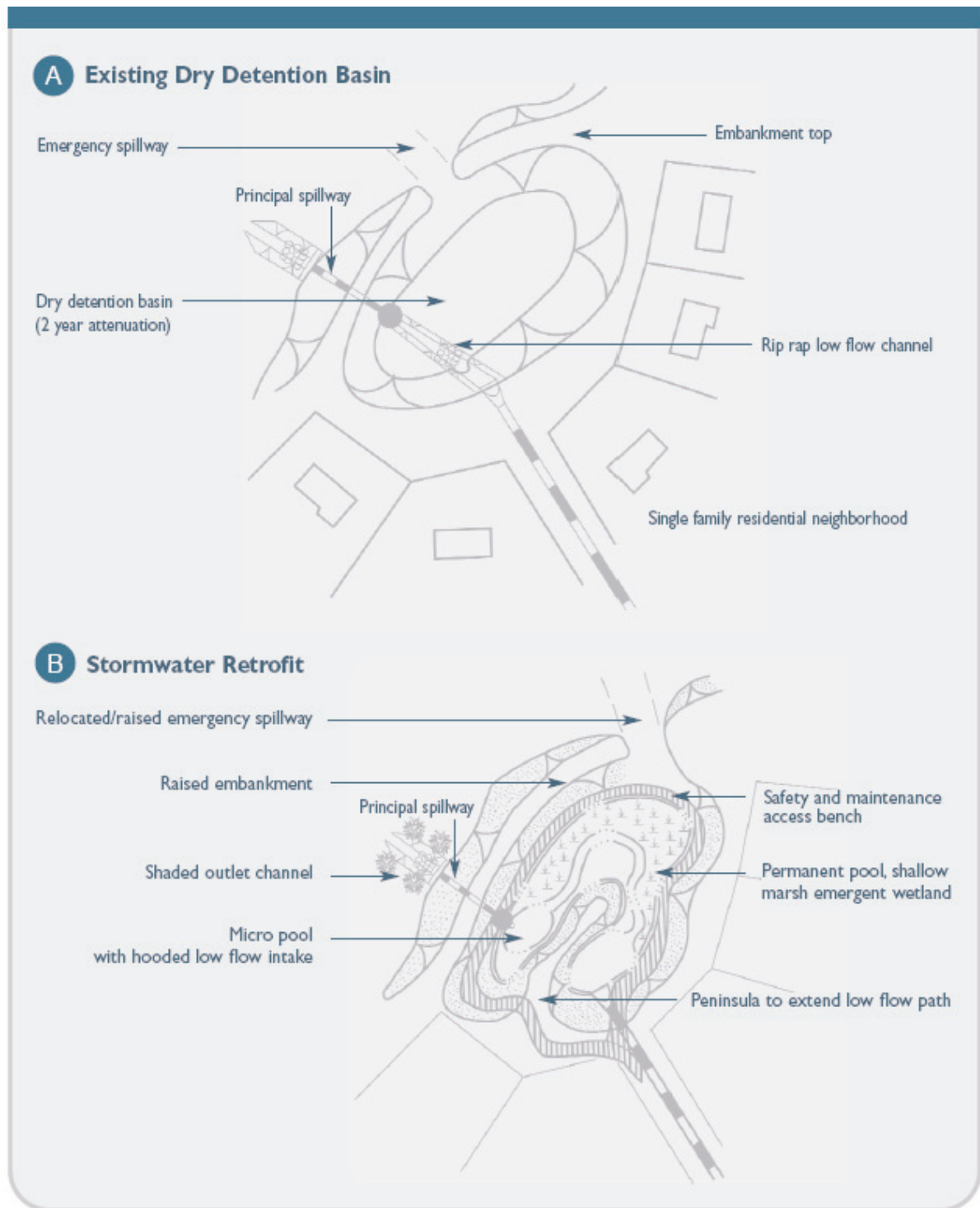
One option for restoring streams is daylighting, which removes a stream from a pipe or culvert and re-established the natural pattern and profile.

**SOURCE:** Biohabitats, Inc

**Stream After Daylighting**



**SOURCE:** Biohabitats, Inc

**Figure 5.2.1** Stormwater Basin Retrofits

*Dry Detention basins can be modified to become extended detention basins, wet ponds, or stormwater wetlands for enhanced pollutant removal.*

**SOURCE:** Connecticut Stormwater Manual, 2004, Claytor, Center for Watershed Protection, 2000

## Future Development/ Redevelopment Areas

Development/redevelopment areas are those properties likely to be developed within the next five years. Generally, redevelopment areas are located along the Main and West Branches of Euclid Creek, while new development is primarily located along the East Branch. Economic development is an important issue to many communities within the watershed. Development/redevelopment opportunities allow a community to be competitive; improving the tax base, and instilling new vitality to regions in danger of become obsolete. How economic development occurs can be controlled by each community.

Portions of the watershed that have been designated as future development/redevelopment areas will still contribute to changes in the water quality. Redevelopment areas in the City of Cleveland and the old Bluestone area, as well as new development in Highland Heights and Willoughby Hills, could have a negative effect on Euclid Creek. Therefore, it is important to create a balance between economics and the natural environment. The practices below will assist in limiting the effects of these new development/redevelopment areas on the water resources and the community as a whole.

### Recommended Actions

Below is a list of tools that can be used in future development areas within the Euclid Creek Watershed. These tools should be used with the protection and/or restoration measures described above. Some tools can be used in conjunction with others.

#### Low Impact Development

LID strategies take an ecosystem based approach, seeking to design the built environment to remain a functioning part of an ecosystem rather than exist apart from it. **See Figures 5.3, 5.3.1, and 5.3.2.** It provides technological tools to plan and engineer any type of urban site to maintain or restore a watershed's hydrologic and ecological functions.

The LID approach includes five basic tools:

- Encourage Conservation Measures
- Promote Impact Minimization Techniques such as Impervious Surface Reduction
- Provide for Strategic Runoff Timing by Slowing Flow Using the Landscape
- Use an Array of Integrated Management Practices to Reduce and Cleanse Runoff
- Advocate Pollution Prevention Measures to Reduce the Introduction of Pollutants to the Environment

#### Conservation Design

This LID strategy takes into account the natural landscape and ecology, maintaining the most valuable natural features and functions of the site, while still allowing development to occur. Listed below are some principles for conservation design (**see Figures 5.4 and 5.4.1**):

- Develop Flexible Lot Design Standards
- Protect and Create Natural Landscapes and Drainage Systems (e.g., riparian and wetland setbacks)
- Reduce Impervious Surface Areas (e.g., reduced parking lots/spaces, green roofs, landscape ordinances)
- Implement Sustainable Storm Water Management Techniques (e.g., bioretention, water quality ponds)

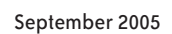
#### Development Policies and Codes

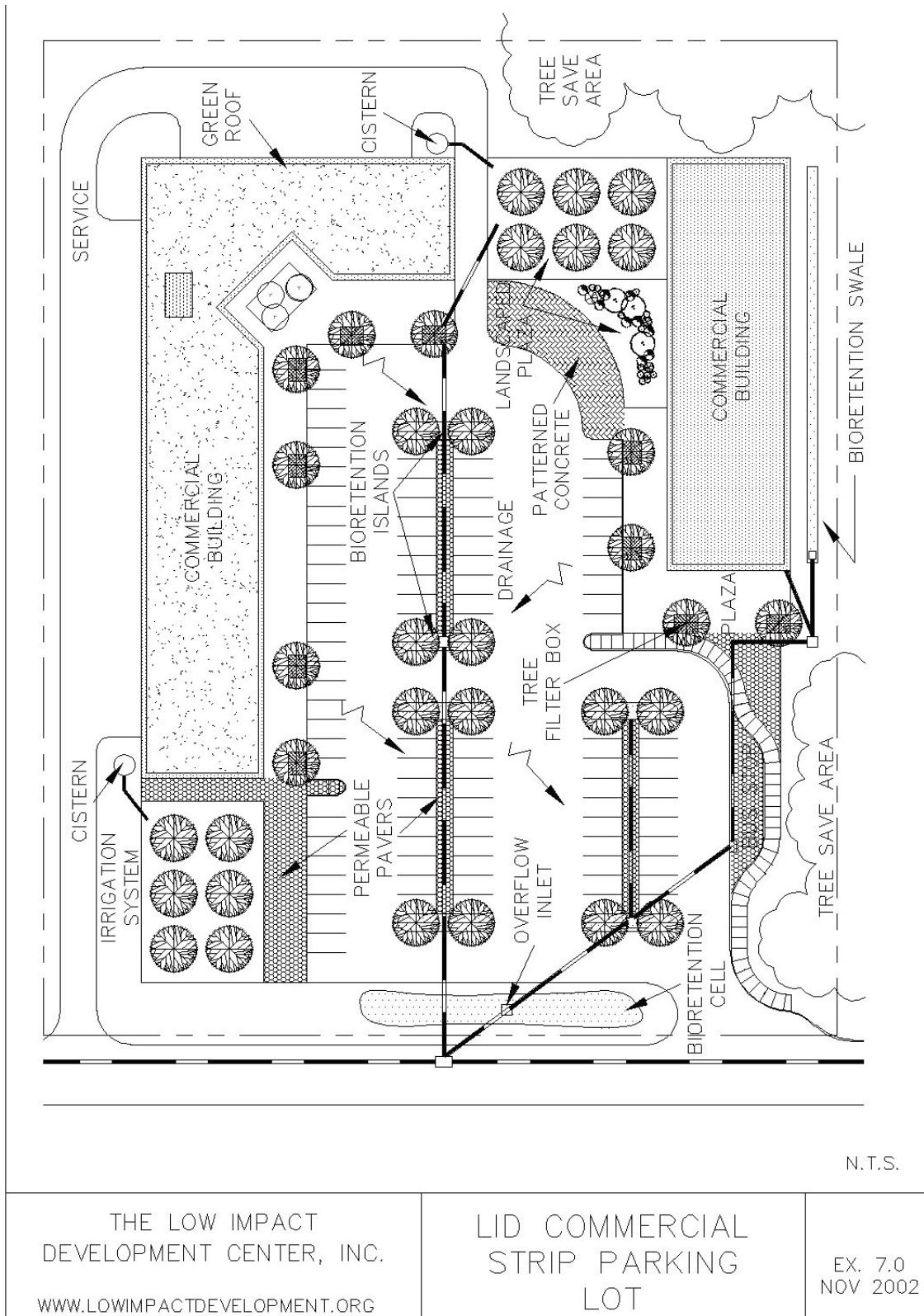
Zoning was first established in 1869 to prevent unhealthy and odorous industrial land uses from locating near residential areas. Likewise, building codes were established to regulate construction at the local level and protect safety, health and property. These types of policies and codes are often counter productive for the new development trends.

Zoning often prevents compact and mixed-use development and public works codes are based on serving the automobile rather than pedestrians. Local governments around the United States are beginning to realize that land use and building codes often prevent them from evolving into the

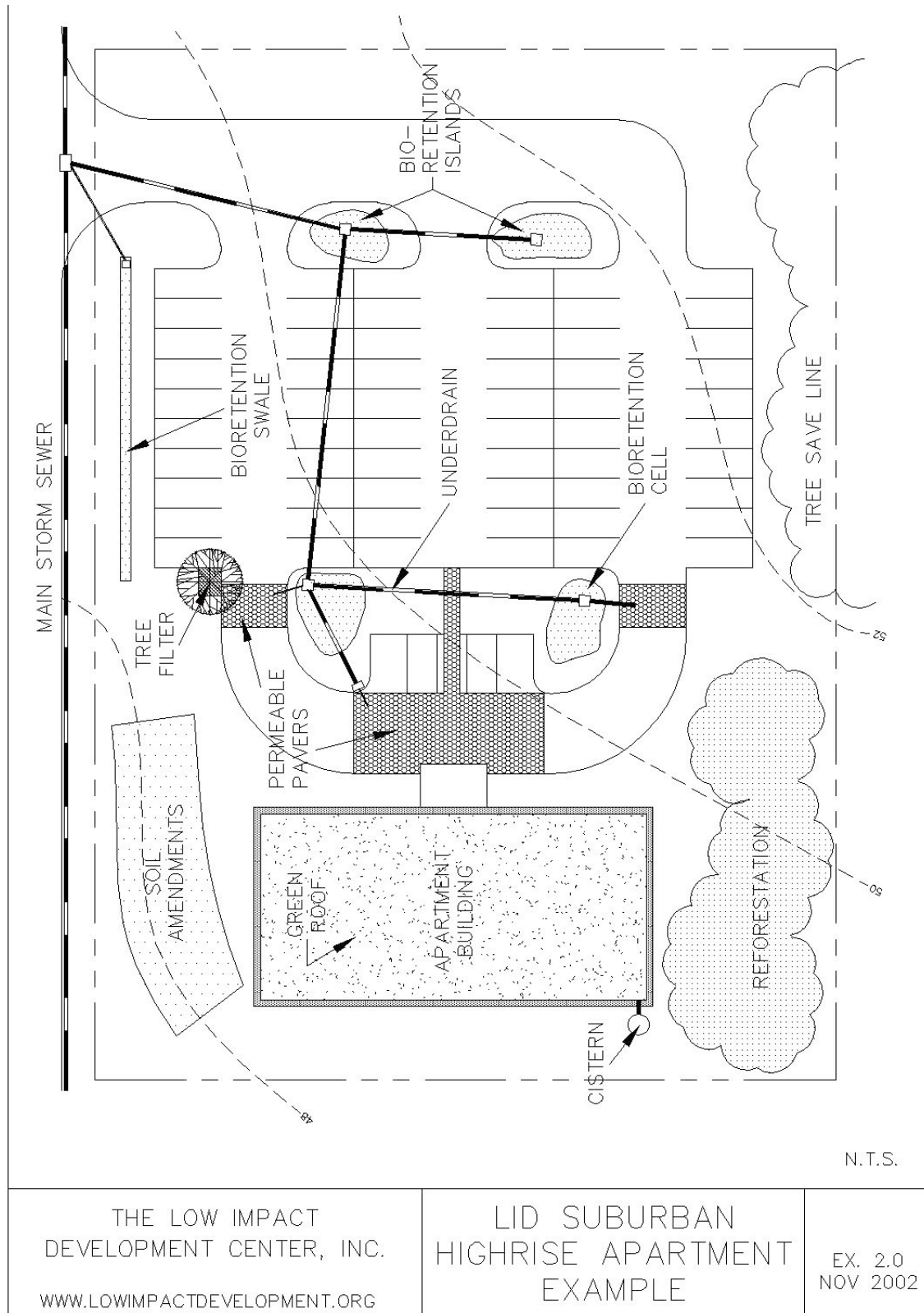


**SOURCE:** Low Impact Development Center



**Figure 5.3.1** Low Impact Development Practices – Commercial Property

**SOURCE:** Low Impact Development Center

**Figure 5.3.2** Low Impact Development Practices – Multi-Family Property

**SOURCE:** Low Impact Development Center



**Figure 5.4** Conventional Site Design

SOURCE: NOAA Coastal Services Center

**Figure 5.4.1** Conservation Site Design

*Alternative site design balances development and the preservation of natural resources.*

SOURCE: NOAA Coastal Services Center

kinds of communities their citizens want. Blanket zoning and prescriptive codes make it difficult to approve projects that incorporate unconventional land-use patterns, building forms, or technologies.

Designing for sustainability often challenges long-standing policies and codes; however, zoning ordinances hold new promise. More flexibility is needed in order to facilitate progress. The policies and codes a community adopts will allow them to obtain desired development projects. Example ordinances in cities throughout the United States include: green building certification requirements (e.g., LEED certification) for planned unit developments, green roof incentives in designated zones, water-conserving landscaping requirements for new development, and performance-based approaches to promote green building development. Below is a listing of what measures need to be in place at the local level to ensure sound, sustainable development patterns.

#### Land Compatible Design

Encourage developers to design sites to fit the topography, features, and soils of the natural landscape. On redevelopment sites, request that original features be restored (e.g., floodplain, native vegetation, etc.) and identify retrofit opportunities (e.g., parking lots, storm sewers, etc). Lots and buildings should be grouped to minimize negative impacts to natural, scenic, and cultural resources of the site. A typical design scenario would be to 1) identify potential conservation areas, 2) locate home/building sites, 3) design streets and trails, and 4) finally draw lot lines. In addition, the amount of land disturbance on the site should be limited.

*Natural area protection* – Protect natural areas such as: hydric soils, streams, lakes, wetlands, floodplains, steep slopes, significant wildlife habitats, remnant prairies, woodlands, farmland, and sensitive aquifers and their recharge areas. Ensure connection to existing and proposed trails and greenways. As a last resort, allow mitigation of areas where no other alternative is available.

*Lot Standards* – Eliminate minimum lot size requirements. Instead, regulate overall density of development. Incorporate a specific numerical or objective density standard into zoning regulations (e.g., gross density, net density, or density based on the net buildable area).

*Percentage of development in open space* – Look at the community plan to determine a reasonable set aside of development sites, either based on features of the site or mandated as a percentage of open space for all developments. If possible, open space should connect with existing or potential open space land on adjoining parcels.

*Natural Area Management* – Require clear specification of how natural areas will be managed and designate a legal entity responsible for maintenance for all natural areas. If necessary, a special service area designation should be established to ensure maintenance into the future.

*Building Setbacks* – Eliminate setback requirements for the interior of development sites while maintaining setback expectations on the perimeter. (Note: All interior setbacks should comply with existing building and fire code requirements).

*Protect Natural Landscape and Drainage Systems* – Preserve natural landscape through conscientious design practices and require the rehabilitation of natural landscape as land is redeveloped.

*Retrofit Opportunities* – Parking lots can be ideal for a wide range of retrofits including site planning and small-scale management to reduce impervious surfaces and promote infiltration, as well as a variety of larger end-of-pipe treatment practices. Swales, bioretention, constructed wetlands, and wet ponds can be used with parking as well as stormwater outfalls. These practices can serve as off-line devices where stormwater is routed for treatment before it enters the stream. **See Figures 5.5 and 5.5.1.**

#### *Sustainable Stormwater Management Techniques*

Encourage use of Best Management Practices in new site design. Use open space for stormwater maintenance, taking advantage of the no cost natural functions of these areas. Require new development to produce a plan that maximizes on-site infiltration and treatment of runoff.

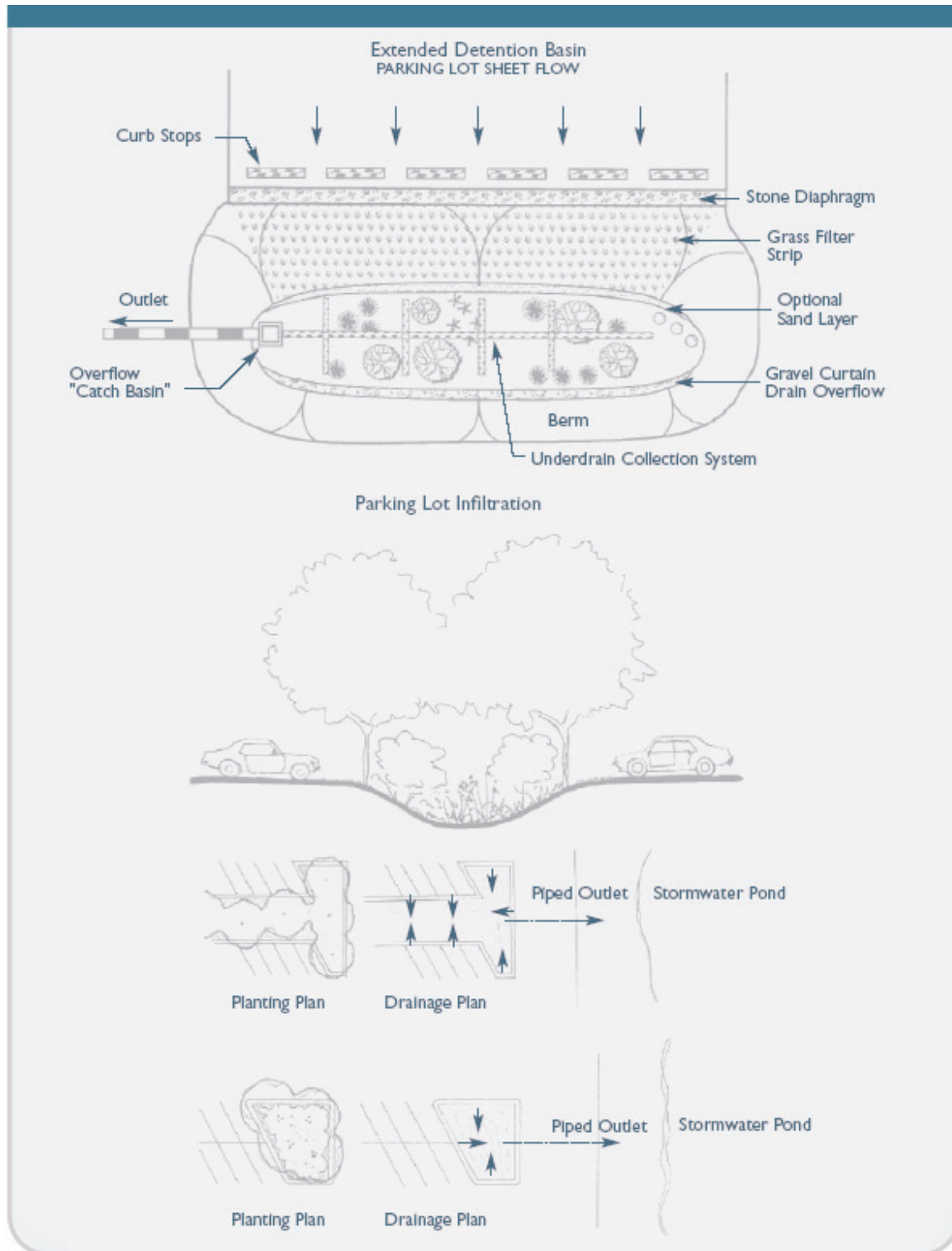
#### *Reduce Impervious Surface Areas*

Reducing the impervious cover in new developments can substantially improve on-site stormwater management, leading to improved water quality.

*Natural Landscaping* – Update landscaping ordinances to encourage the use of plant materials native to northeastern Ohio. Require natural landscaping in and around stormwater facilities, wetlands, lakes, and streams.

*Roadway Design* – Enact flexible standards for road length, width, right-of-way, and design. Require a minimum amount of paved surface areas while maintaining safe and sufficient support of travel lanes, on-street parking, and emergency and support vehicle access. Limit enclosed drainage curb and gutter systems. In addition, islands of cul-de-sacs should be depressed and designed to be used for stormwater storage.

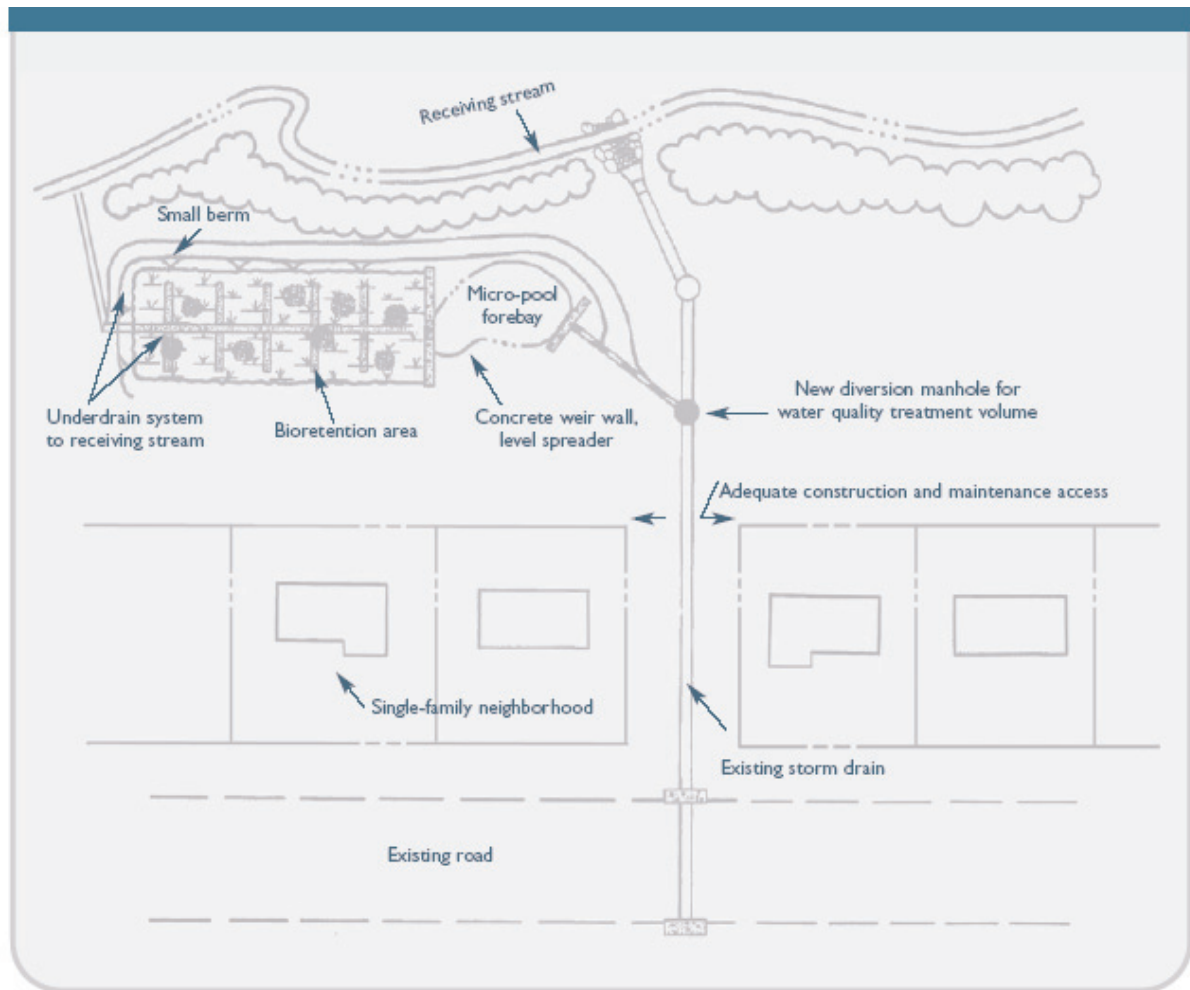
*Parking Lot Design* – Enact flexible standards for parking lot design in multi-family housing development, commercial, and business areas. Parking lot runoff should require stormwater treatment using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands. Reduce minimum parking requirements and/or set maximum parking ratios. Allow pervious materials for spillover parking, promote parking garages, and shared parking, where appropriate. In addition, promote pedestrian and public transportation. **See Figures 5.5.2 and 5.5.3.**

**Figure 5.5** Parking Lot Stormwater Retrofit Design

*Low impact development practices are well suited to existing developed areas because most of these practices use a small amount of land and are easily integrated into existing parking areas.*

**SOURCE:** Connecticut Stormwater Manual, 2004, Metropolitan Council, 2001 (adapted from VPWD, 2000) and NYDEC, 2001



**Figure 5.5.1** Stormwater Outfall Retrofit Design

An existing outfall can be retrofitted with an off-line device to treat stormwater before it enters the creek.

**SOURCE:** Connecticut Stormwater Manual, 2004, Claytor, Center for Watershed Protection, 2000

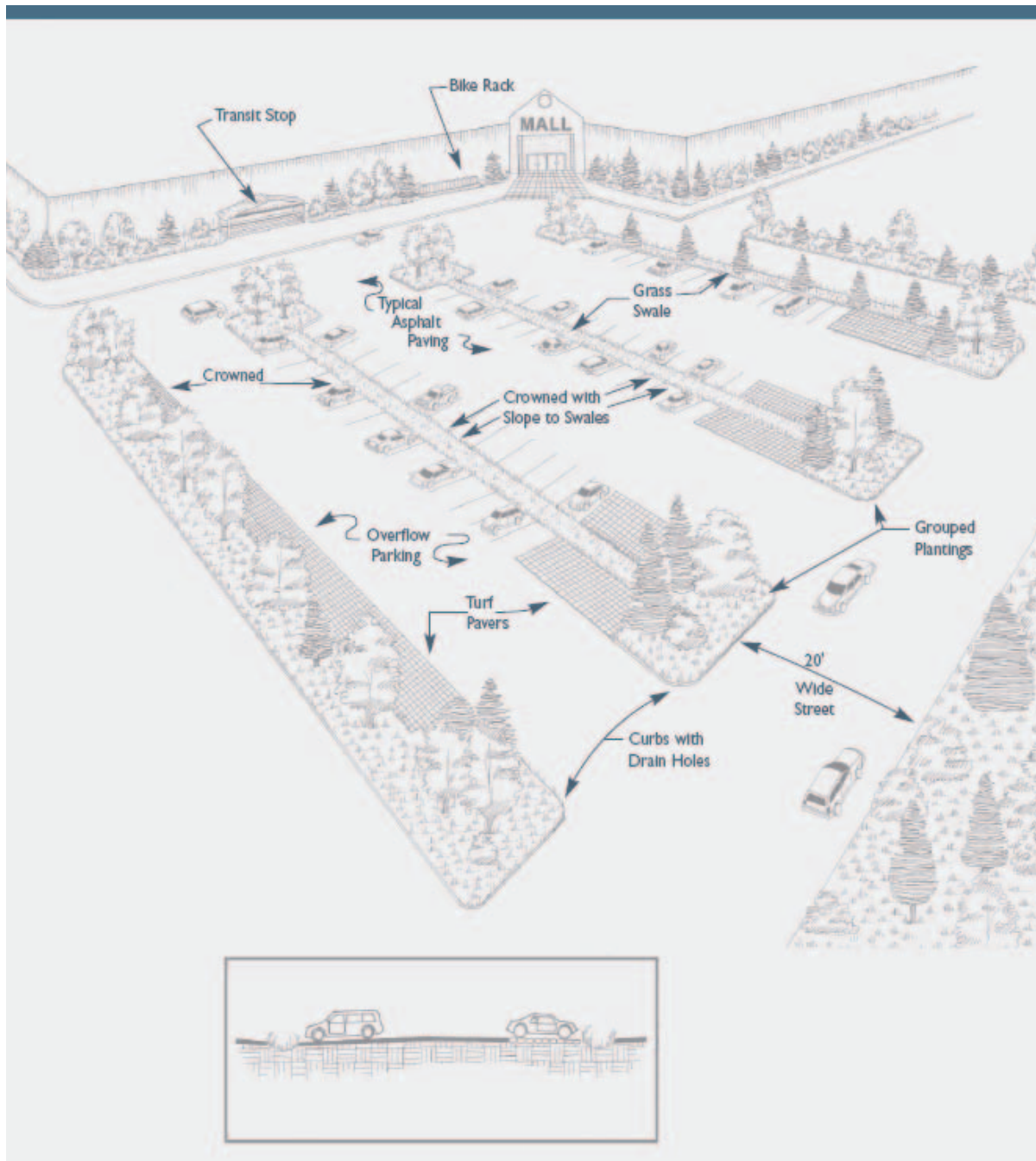
**Vegetated Swales** – Require that vegetated swales be used in street rights-of-way, parking lots, and other paved areas to convey and treat stormwater runoff.

**Walkways** – Establish flexible design standards for walkways. Encourage sidewalks on one side of the street. In less developed areas, replace sidewalks with a trail system using pervious material such as gravel, mulch, or wood chips.

**Driveway Design** – Update ordinances regarding driveway design by eliminating length and width requirements, encouraging minimum standards,

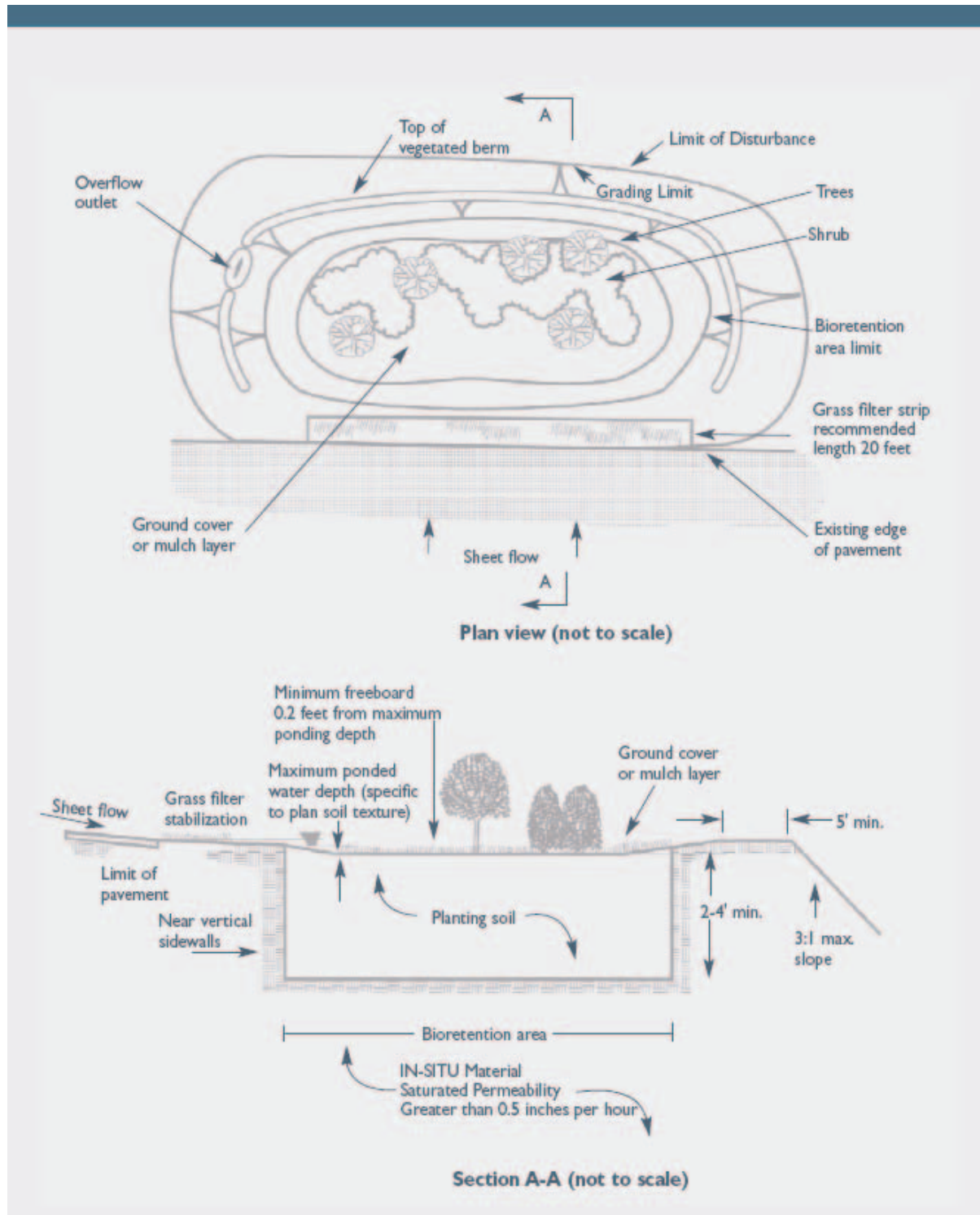
permitting alternative driveway surfaces, and allowing shared driveways that connect two or more homes together.

**Roof Runoff Management** – Require alternative roof runoff management techniques (practices that infiltrate, divert, or store runoff). Discourage discharge of rooftop runoff into storm sewers by allowing infiltration trenches or diversions to lawn/landscaping. Encourage green roof or extensive roof garden design, promote the use of rain barrels or cisterns, and require rooftop drainage to be shown on site engineering plans.

**Figure 5.5.2** Alternative Parking Lot Design

*This parking lot design helps to minimize the effect of impervious cover.*

**SOURCE:** Connecticut Stormwater Manual, 2004, Metropolitan Council, 2001 (adapted Robert W. Droll, ASLA, in Wells, 1994)

**Figure 5.5.3** Elements of Bioretention Facility

*Bioretention cells remove stormwater pollutants and slow stormwater runoff.*

**SOURCE:** Connecticut Stormwater Manual, 2004, Prince George's County Maryland, 1999



*Storm Sewer Outfall* – Require alternative designs related to storm sewer outfalls. Discourage the direct connection to a stream and encourage diversion through a storm water quality technique (practice that treats and stores water, allowing a slow release back into the stream).

*Design Incentives* – Establish a credit or bonus system to provide incentives to developers, designers, builders, etc. to implement better site design. Provide density bonuses and/or reduce impact fees. Create a list of design standards that will automatically get approval (e.g., disconnected rooftops, native vegetation used in revegetation of cleared areas, green roofs). Better site design can be incorporated into mixed-use developments that keep with the style of the neighborhood.

#### Sustainable Construction Practices

Demand for an understanding of green building and sustainable construction practices is on the rise. Green building practices make sense because they not only help the environment, but also improve the bottom line for owners and operators. Examples of these practices include, but are not limited to; green building certification programs, use of recycled and/or “greener” building material, and energy efficiency. Within the watershed, the new municipal center in the City of Beachwood uses the energy efficient method of geothermal heating and cooling.

#### **Benefits of Green Development<sup>a</sup>**

As discussed earlier in this report, development undertaken in an environmentally responsible manner not only has a number of benefits from a “green infrastructure” perspective; it also provides aesthetic amenities that increase the quality of life and competitiveness within the community. In addition, there are many economic benefits to these types of sustainable building practices that entice development to a community.

*Reduced Capital Costs* - Green development can reduce capital costs in a number of ways. Costs to

infrastructure, such as storm sewers, can be lowered by relying on the land’s natural features, while mechanical systems can be downsized or even eliminated through smart energy design. In addition, approvals can be expedited if opposition to a project is reduced. Finally, faster approvals reduce carrying costs.

- *Village Homes Subdivision, Davis, California* – The developer saved \$800 per lot in a 240 unit subdivision using natural swales for storm water infiltration in place of an expensive storm sewer system. The savings was put into landscaping for common areas and other amenities. Properties in Village Homes subdivision command a substantially higher price, \$10 to \$25 more per square foot, than those of surround subdivisions, and homes sell faster when they come onto the market.
- *Prairie Crossing, Chicago, Illinois* – A 667 acre residential development was designed to reduce the environmental impacts of infrastructure. This resulted in a savings of \$1.4 million, or \$4,400 per lot. This was accomplished by designing streets that are 8 to 12 feet narrower than normal, by minimizing impervious concrete sidewalks, and by using vegetated swales and detention basins for storm water infiltration rather than conventional storm sewer systems.

*Reduced Operation Costs* - These projects have far lower operating costs than conventional projects as a result of their greater emphasis on resource efficiency. Savings are usually easiest to quantify with energy, but can also be realized through reduced water demand, lower maintenance requirements, and a reduction in waste generation.

- *Denver Dry Goods* – By incorporating energy-efficient measures, this company is saving at least \$75,000 per year in operating expenses, thus increasing the building’s value by \$750,000 when capitalized.

<sup>a</sup>Green Development: Integrating Ecology and Real Estate – RMI, 1998

*Marketing Benefits, Free Press, and Product Differentiation* – Developers of green development projects have derived enormous marketing benefits from their attention to environmental and community issues. Free press and product differentiation have proven to be rewards for practicing green development.

- **Inn of Anasazi, Santa Fe, New Mexico** – This hotel showcases energy- and resource-saving technology as well as local Native American cultural design. As a result, this company has reaped free and unsolicited coverage from such major publications as *Food and Wine*, *Traveler*, and *Travel and Leisure*. This coverage increased business with travel agencies and individual travelers by about 20 percent over the Inn's projections.
- **2211 West Fourth, Vancouver, British Columbia** – This project marketed its green features as an important amenity of the development. Prior to completion, 100 percent of the retail space, 85 percent of the office space, and 85 percent of the residential space had signed contracts. The developer's 12.3 percent return on investment was one-third higher than that of conventional retail/office space projects in the same market.

*Valuation Premiums and Absorption Rates* – In some markets, buyers will pay substantial premiums to be part of a development with identified green features.

*Streamlined Approvals* – Gaining early respect and support from a community can greatly speed up approvals for a project; saving time and money.

*Reduced Liability Risk* – Green developments are sometimes able to reduce the risks of litigation, liability, and even disasters, such as fires and floods. Lower insurance and/or workers' compensation policy premiums could potentially result from better air quality in buildings. In addition, some insurance companies are willing to offer lower premiums for buildings with high-mass walls because they reduce the risk of fire.



*Rain gardens are a landscape tool used to improve water quality by collecting water runoff, storing it, and allowing it to be filtered and slowly absorbed by the soil.*

**SOURCE:** University of Wisconsin Extension Website

- The Federal Emergency Management Agency gave all buildings in unincorporated areas of Charleston County, South Carolina a 5 percent premium reduction on flood insurance, based on the voluntary efforts of the developers to improve the county's flood management capabilities. The Dewees Island Project used porous roadway surfaces and low-maintenance native vegetation in their project design; saving the developers 60 percent in land development and infrastructure costs.



*The greenroof on Chicago City Hall helps to minimize the effect of impervious cover.*

**SOURCE:** City of Chicago Website

*Health and Productivity* – Recent studies have shown that improved office lighting, heating, and cooling—measures typically undertaken for energy savings—can make workers more comfortable and productive.

- At a U.S. Post Office mail-processing center in Reno, Nevada, a \$300,000 retrofit was carried out to improve energy efficiency. These renovations were expected to produce energy and maintenance savings; however, it turned out that improvements in employee productivity dwarfed the energy savings. With new energy-efficient lighting, postal workers' output at the mail-sorting machines increased by 6 percent, while sorting errors dropped to 1 per 1,000—a rate lower than that of any post office in the western United States.

*Staying Ahead of Regulations* – Complying with regulations is expensive. Since it is almost always more expensive to comply with regulations after the fact, those who stay ahead of future environmental regulations are likely to benefit down the road.

- Detroit spent its dollars fighting fuel efficiency standards, while German and Japanese manufacturers embraced the new ideas and soon had a competitive advantage, dominating the market for several years.

*New Business Opportunities* – Many of the pioneering green developers are finding that their emphasis on protecting the environment and supporting local cultures is opening new doors.

- Eco-resort developer Stanley Selengut has received numerous business opportunities as a result of his environmentally sensitive development work. He has been offered resort properties all over the world that others salivate over.

## Best Management Practices of Existing Development Areas

Appropriate best management practices help to limit pollution, minimize flooding, and allow for natural restoration within the watershed.

It is recommended that these practices be applied to developed areas within the watershed where no significant changes are anticipated to occur for at least the next 10 years. The practices outlined can be used to address a variety of land uses.

### Recommended Actions

Below is a list of tools that can be used in existing development areas within the Euclid Creek Watershed. Some tools can be used in conjunction with others.

*Storm Water Management* – These practices are alternatives to the long standing storm water controls of the past. These practices help to promote infiltration and minimize runoff. Often the best choice for managing stormwater is the use of a series of natural treatment practices, which address rain as soon as it falls on the ground. This series of stormwater practices can be called a Stormwater Treatment Train (STT). STTs can help disperse stormwater by more closely replicating natural hydrology. Example practices include rain barrels, green roofs, bioretention areas, constructed wetlands, and native landscaping.

*Pollution Prevention* – These practices help to limit the amount of pollution produced on an existing property. They also help owners and operators become more efficient, saving time and money. Example practices include Audubon Certification within Golf Courses, ISO 14000 Environmental Management Systems Integration, and integrated pest management.

*Audubon Cooperative Sanctuary Program for Golf* – There are an estimated 16,000 golf courses in the United States. The ACSP is designed to help a golf course take stock of environmental resources, identify any potential problems, and then develop a plan that fits its unique setting, goals, staff, budget, and available time.

Audubon International provides information to help golf courses with Environmental Planning, Wildlife



Habitat Management, Chemical Use Reduction and Safety, Water Conservation, Water Quality Management, and Outreach Education.

*ISO 14000 Environmental Management System (EMS)* – ISO 14000 is a series of international standards on environmental management. It provides a framework for the development of an environmental management system and the supporting audit program.

ISO 14001 is an internationally accepted specification for an EMS. It specifies requirements for establishing an environmental policy, determining environmental aspects and impacts of products/activities/services, planning environmental objectives and measurable targets, implementation and operation of programs to meet objectives and targets, checking and corrective action, and management review.

Other standards in the series are actually guidelines; many to help you achieve registration to ISO 14001. These include the following:

- ISO 14004 provides guidance on the development and implementation of environmental management systems
- ISO 14010 provides general principles of environmental auditing (now superseded by ISO 19011)
- ISO 14011 provides specific guidance on auditing an environmental management system (now superseded by ISO 19011)
- ISO 14012 provides guidance on qualification criteria for environmental auditors and lead auditors (now superseded by ISO 19011)
- ISO 14013/5 provides audit program review and assessment material
- ISO 14020+ labeling issues
- ISO 14030+ provides guidance on performance targets and monitoring within an Environmental Management System
- ISO 14040+ covers life cycle issues

*Sustainable Landscape Practices* – Millions of dollars are spent each year designing, implementing, and maintaining urban landscapes. Encouraging

practices such as natural landscaping, organic fertilizing, integrated pest management, etc., will improve the environment by conserving resources and reducing chemical applications. A sustainable landscape will also reduce labor inputs making it less expensive to implement and maintain.

*Municipal Good Housekeeping* – Developing a program to prevent or reduce pollutant runoff from municipal operations will not only help to improve water quality, but will also help with overall efficiency. Aspects of the program could include: training of employees on pollution prevention measures, regular street sweeping, reducing the use of pesticides and street salt, frequent catch-basin cleaning, and maintaining greenspace on institutional properties.

*Illicit Discharge Detection* – Developing a plan to detect and eliminate illicit discharges to the storm sewer system is important for water quality, as well as public health and safety. Various aspects of the program could include: mapping locations of storm sewers and outfalls; educating the community about hazards associated with illicit discharges and improper disposal of waste; and inspecting, detecting, and tracing the sources of storm sewers.

*Public Education* – This practice should be used in all aspects of watershed protection; however, it is most essential in areas of existing development. Changing a person's behavior is often very challenging. Educating landowners, especially riparian landowners, on how they directly affect the natural resources is a key aspect in watershed protection. Fostering stewardship is also very important. Therefore, it is imperative for a community to provide information and opportunities for community residents to be able to educate themselves on issues such as storm water pollution, green building, and natural landscaping. Some hands on projects could include: stream signage, community gardens, and watershed fair.

*School Curriculum/Land Labs* – Public education also involves the school systems. There are

numerous public and private schools within the watershed; several with Euclid Creek crossing their property. This affords a great opportunity to develop a curriculum based on the creek and construct a land lab that would give students memorable, hands-on experiences.

## Making Connections

Euclid Creek, its geology and topography, were large influences in the early settlement of the watershed. As the watershed has become more urbanized, these attributes have become forgotten assets of the local communities. The original settlers relied on these features as natural transportation corridors, sources of drinking water, and suppliers of power and building materials to make their quality of life better. Today these features can still be a source for improving the desirability of, and quality of life for, municipalities within the watershed. Highlighting and better integrating the creek and related open spaces into the fabric of the community offers many advantages. In addition to the health benefits afforded to the general public restoring the creek, will provide improved recreational and exercise opportunities, enhanced scenic views, greater aesthetic beauty, and the ability to better connect to the area's cultural heritage.

There are a few places within the watershed, such as the Euclid Creek Reservation and Wildwood State Park, where residents have the opportunity to make the outdoor environment part of their daily experience. There are also a number of local historical societies that have documented many of the stories of the area's history. These locations are limited, however, and are not always convenient or easily accessible for residents. Integrating the cultural and natural history of the watershed more fully into the built community will create a greater sense of place for area residents by exposing them to this material on a regular basis.

Communities in the Euclid Creek watershed have civic complexes, recreation centers, historic districts, and other cultural or educational institutions which are central to community life and important to

forming and maintaining the area's image. Linking these existing natural, recreational, and cultural assets with new interpretive opportunities, as well as developing more attractive, walkable, and bikable routes can encourage residents to explore their immediate and surrounding neighborhoods.

**Figure 5.6** shows opportunities for developing walking and biking routes that connect major community centers within the watershed to one another and to the rest of Greater Cleveland.

## Connecting Euclid Creek to the Rest of the Region

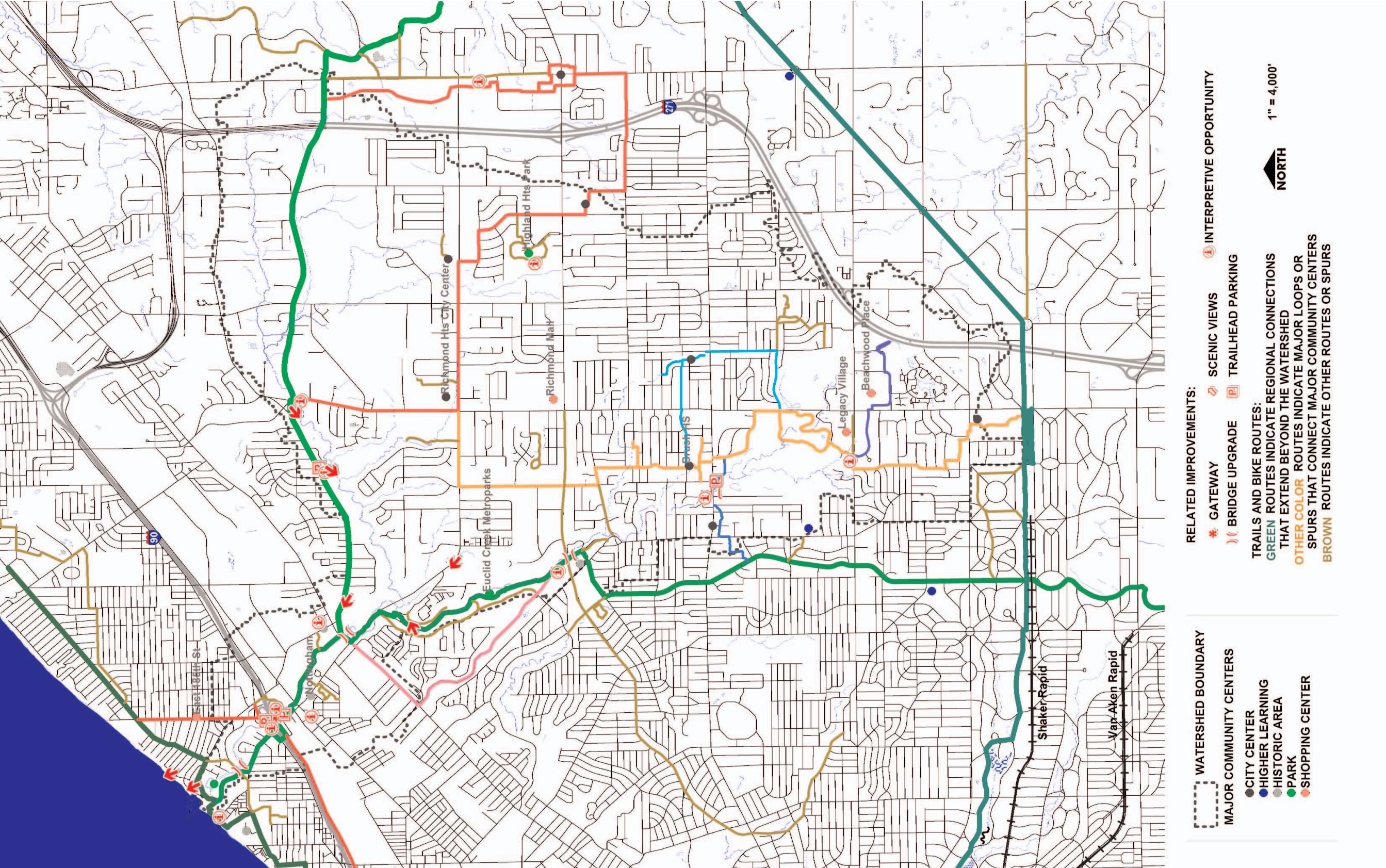
In the Cuyahoga County Planning Commission's Greenspace Plan, a framework for a system of trail routes that would serve all of Cuyahoga County has been laid-out. The plan was conceived as a system of concentric loops around, and spokes emanating from, Downtown Cleveland (**see Figure 4.1**). A number of these regional corridors pass near and through the Euclid Creek Watershed, and set the larger context for a local system of routes.

### First Ring Loop – Connecting Euclid Creek to Lake Erie and the Towpath Trail

Much of the development in Cleveland's older suburbs was built during the construction boom in the decades following World War II. Euclid Creek Reservation was acquired in 1917 by the Metroparks at a time when the watershed was considered rural countryside. After World War II, the focus was on providing enough housing for the returning soldiers and their growing families. Protection of large areas of open space was not a priority on the development agenda. Natural features, such as the waterways that traversed the landscape, were seen as items to build over or to control in order to provide the maximum development area, rather than features to integrate into the community's development pattern. Restoring greenways of open space and improving public access along waterways such as Euclid Creek and Mill Creek was identified in Cuyahoga County's Greenspace Plan as one strategy for making Cleveland's "First Ring Suburbs" competitive again in the marketplace. Development of this "First Ring Loop"



Figure 5.6 Trail/Bike Lane Connections



Trails help to connect various watershed resources including parks, libraries, schools, and businesses.



offers the potential for linking communities in the watershed to Lake Erie and the Lakefront Bikeway to the north and to the Towpath Trail in the Cuyahoga Valley, via the Mill Creek watershed, to the south. Because of the density and pattern of development in these older suburbs, a portion of the route would necessarily include trails or bike lanes within existing public rights-of-way.

### Connecting Euclid Creek Communities to the Lake

Euclid Creek flows into Lake Erie, but the northern border of Euclid Creek Reservation ends at Euclid Avenue, 1.5 miles southeast of Wildwood State Park. Located between is the City of Cleveland's Collinwood neighborhood, which includes historic centers such as Euclid and Nottingham Villages, and the East 185th Street commercial district, also known as Old World Plaza. Near the mouth of Euclid Creek are Wildwood and Euclid Beach State Parks, as well as the City of Cleveland's Lakefront Bikeway route which stretches along the city's shoreline west toward Downtown Cleveland. The Lakefront Bikeway, is also part of the Adventure Cycling Association's "Northern Tier" bike route that extends from Puget Sound in Washington State to Bar Harbor, Maine.

Existing trails in the Reservation provide access between communities in the plateau area and those on the plain that borders the lake. North of Euclid Avenue, the Euclid City Schools' Euclid Central Middle School and the City of Cleveland's Nottingham Water Plant border nearly 3/4 mile of the eastern bank of the creek. Partnering with these institutions could provide an opportunity for trail development in this area.

Creek restoration and trail development in the vicinity of the East 185th Street/I-90 interchange would create greenspace amenities for the community, as well as attract new quality development. The East 185th Street interchange should be designed as a gateway to the Euclid Creek watershed. The area should include trailhead and interpretive facilities that orient visitors and residents. These restoration and redevelopment projects could also be designed

to provide better trail connections to the north and south of the freeway and rail lines than the current development patterns allow. Coordinated signage that creates identity and provides direction should be installed. A detailed drawing of this interchange can be found in the *What the Watershed Could Look Like* section of this report. Both the Euclid Historical Society and the Nottingham Historical Society are located between St. Clair and Euclid Avenues less than a quarter mile away from Euclid Creek. These facilities operate on limited hours, therefore, exterior displays or kiosks could tell the important stories of the history of the area. The natural transportation route of the Lake Plain, and the early commerce and industry that resulted because of it, is a major story to highlight.

A number of other stories could be raised to a higher prominence through the addition of displays near the lake at Wildwood Park. The mouth of Euclid Creek housed an early shipbuilding operation, which was one of the earliest industries in the area. Later, the lakefront became a draw for the development of resorts and cottages for those seeking an escape from the city. The climate differences (i.e., lake effect) between the mouth of the creek and the plateau could also be highlighted. For example, the longer growing season along the lake coupled with the sandy soils of the lake plain, made the lakefront communities a good location for numerous vineyards. The location of the lake in relation to the higher elevations of the headwaters results in higher snow accumulation. As a result, those communities are part of the western edge of the snowbelt.



Lakeshore Boulevard Bridge over Euclid Creek.

The bridges at Lakeshore Boulevard and Euclid Avenue should be upgraded with wall and lighting improvements to highlight the creek as a feature in the community, improve their aesthetic appearance, and create a more attractive trail route.



*Decorative wall and lighting improvements to bridges can highlight crossing of the creek.*

### Connecting Euclid Creek to Mill Creek and the Towpath Trail

To the south of the Euclid Creek watershed and its headwaters near Shaker Boulevard is the Mill Creek watershed. The Cleveland Metroparks' original 1916 master plan proposed a protected open space corridor along Euclid Creek south to about the area of Shaker Boulevard. A trail connection to Mill Creek creates the possibility of an eventual connection to the Towpath Trail in the Cuyahoga Valley. Almost four miles of trail exists, or is planned, between the Towpath Trail and Garfield Park Reservation in Garfield Heights. Further east, toward the headwaters of Mill Creek, large open spaces like Kerruish Park in Cleveland, the Warrensville Heights municipal complex, and Highland Golf Course in Highland Hills could be connected with a trail that approaches the headwaters of Euclid Creek.

South Belvoir Boulevard, a mainly residential road which runs past John Carroll University and close to Notre Dame Academy, is already signed as a bike route and holds the greatest promise for developing the First Ring Loop connection to Mill Creek. There is a 20 to 30 foot wide median that runs down the center of the street south of Bluestone Road to Shaker Boulevard. Its route winds in a north to south direction, following the topography of a former creek valley. This route could be improved to encourage use by a wider range of bicyclists by developing a trail

through the center median that would separate riders from vehicular traffic. If future major reconstruction of the road is undertaken, the potential for reducing the width of the roadway and widening the median should be explored. Reducing traffic volumes along the street, and creating a stronger parkway experience, would be goals for undertaking those changes. The Big Creek Parkway, which runs from Parma Heights to Strongsville, is a local example that South Belvoir Boulevard could emulate.



*Big Creek Parkway could serve as a model for improvements to South Belvoir that would accommodate an all purpose trail.*

### Chagrin Valley Connection – Tying to the Emerald Necklace

Connecting Euclid Creek to the Chagrin Valley has been envisioned since the first Metroparks' master plan in 1916. At that time, the East Branch of Euclid Creek and a nearby tributary to the Chagrin River were identified as a potential corridor for open space protection as part of the Metroparks' system. Those areas have not become part of today's park system. As recently as the late 1960's an 80 foot wide public right-of-way was platted to connect Euclid Creek Reservation and North Chagrin Reservation. **See Figure 5.7.**

A small section of the "Euclid-Chagrin Parkway" was built in Richmond Heights but starting with the expansion of the Cuyahoga County Airport, portions of the right-of way were vacated for other development and the potential connection was never realized. The opportunities that those past plans identified are no longer feasible, but the idea

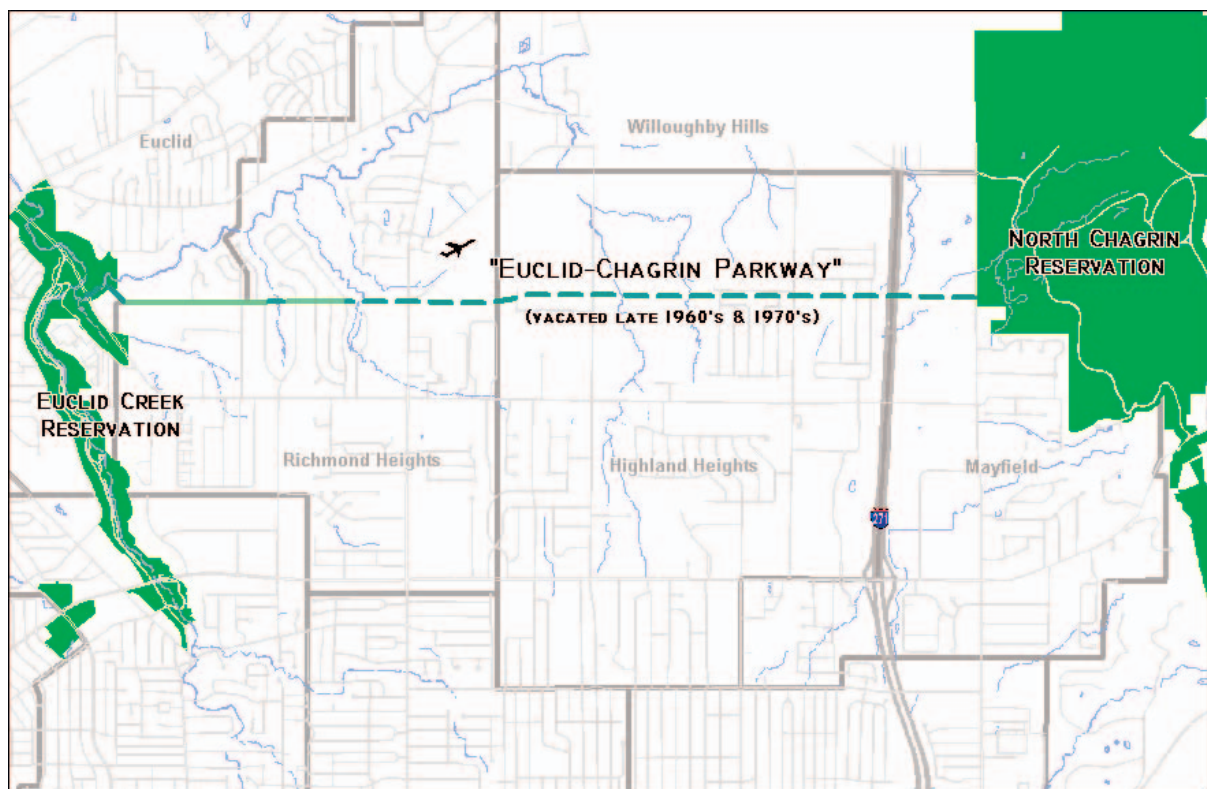
of creating a more formalized bike route between the North Chagrin Reservation and the Euclid Creek area is still a desirable goal and would serve in the completion of a trail loop around Cuyahoga County. The best opportunity to make this connection would be an on-road route via White and Chardon Roads. East of Richmond Road, White Road has no sidewalks. Creating five foot wide marked bike lanes on either side of the road would also serve a function for residents wishing for a safer way to walk along the road.

West of Richmond Road, Chardon Road has sidewalks on both sides of the street and a variable right-of-way width that limits the potential to separate bikes and vehicular traffic. This section of the road should be signed for bikes and designated as a priority for tree plantings to promote its attractiveness as a bike route. Where Chardon Road traverses the hillside near Euclid Avenue, the

widening of the walkway on the south side of the road would provide an opportunity to separate bike from vehicular traffic. The property along this section of the roadway is owned by the Metroparks and the Catholic Church. Great views of Lake Erie and the lake plain are visible from this hillside, therefore a viewing area to the side of the route would be a desirable feature.

While not providing access to the East Branch Valley, which is proposed to be protected, this route does offer several locations with views of the East Branch and the opportunity to provide interpretive displays. The intersection of Richmond, White and Chardon Roads was the location of an old mill and schoolhouse, and offers views into the upper part of the valley. Just to the west of Edgemont Drive, there is publicly owned, undeveloped property that offers good views down into the East Branch Valley. A small parking area and loop path at the top of the

**Figure 5.7** Euclid Chagrin Parkway



*A parkway to connect Euclid Creek and North Chagrin Reservation had been planned in the past.*



hillside would make the views more accessible. This site would be a good location to tell the story of the unique geology and geography of the area. Chardon Road traverses along the Euclid Moraine, which is a remnant of the area's glacial history and a major factor in Euclid Creek's course. It is also part of the Portage Escarpment which delineates the transition between the Allegheny Plateau to the south and east, and the Plains to the north and west.



*View of East Branch Valley from Chardon Road.*

### **University-Heights Spoke – University Circle and Downtown**

At the southern headwaters of Euclid Creek is the right-of-way of Shaker Boulevard. The Shaker Rapid Transit line begins at the Green Road station and heads west toward Downtown Cleveland. The median of Shaker Boulevard has ample room for construction of a trail that would also complement this public transportation line. In the vicinity of the Shaker Lakes, the route would veer north past that greenspace, continue west toward University Circle and eventually, Downtown Cleveland. Toward the east, the route could use the Gates Mills Boulevard median, pass Ursuline College and eventually wind its way down to the Chagrin Valley in the vicinity of Gates Mills Historic Town Center. The City of Beachwood has already developed trails through a portion of the Shaker Boulevard median with the construction of Beachwood City Park just west of Richmond Road.

### **Making Connections within the Watershed**

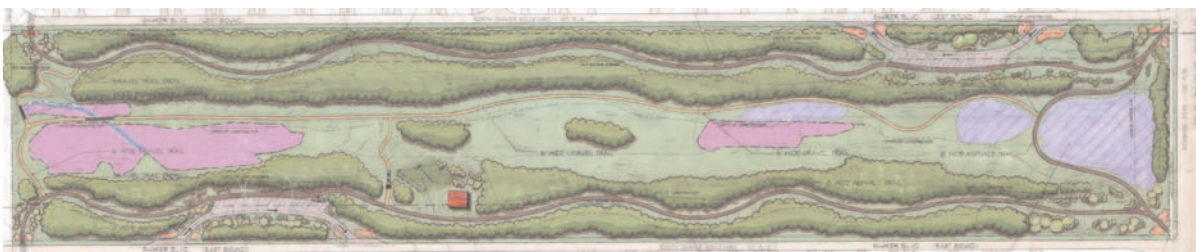
Within the Euclid Creek Watershed there is the opportunity to develop a number of walking/biking routes that connect community activity centers and strengthen the area's sense of place. Because the watershed is very urban, the routes will necessarily be a mix of on-road and off-road segments. Those on-road segments should be priority areas for rights-of-way improvements such as planting new street trees, highlighting historic sites, installing signage, and replacing sewer grates with those complementary to bicycles. Off-road segments may include the creation of short segments of new trails, coordination with civic, educational, and religious institutions to upgrade existing trails/walkways on their properties which can be incorporated into the routes.

#### **Quarry Rail Loop**

One of the early industries in the watershed was the quarrying of bluestone, which took place in the vicinity of Monticello Boulevard, near the Euclid Creek Reservation. In order to move the mined material to the main railroads located at the base of the Euclid Escarpment, a spur rail line was constructed from the main rail lines to the quarries. The rail line closed years ago, but parcel maps of the area show the long narrow corridor that the railroad once occupied. A trail along this corridor would serve the residents of the neighborhoods that surround it and would also provide an ideal opportunity for highlighting an important role that the quarries played in the watershed's history. Development of the trail could also serve as an amenity for redevelopment of the industrial district near the southern end of this corridor. At the base of the hillside, bike lanes on Euclid Avenue could connect the Quarry Trail to the Euclid Creek Reservation at Highland Road.

#### **West Branch Connector**

The West Branch Connector would link a number of community centers along the West Branch of Euclid Creek. It would incorporate a mix of on-street routes with an upgrading of existing walkways/trails on, or



*Beachwood Park, located in Shaker Boulevard median, is an example of open space that serves as an amenity to the local community.*

**SOURCE:** Schmidt, Copeland, Parker, Stevens

along, institutional properties. Examples of improvements along this route include:

- Strengthening Beachwood's parks, schools, library and civic complex through a more coordinated and formal pedestrian spine that unifies the institutions by creating a more unified civic district.
- Creating a bike route along the western edge of Legacy Village.
- Incorporating the existing trail system on the former TRW property into any new development for that site and making those trails open to the public.
- Widening walks and planting trees at Brush High School, Memorial Jr. High School, and Southlyn Elementary School.
- Using Blossom House on Cedar Road as a facility to tell the story of the many institutions, resorts, and estates that once populated this part of the community.

**Figure 5.8, Park Distribution,** shows the distribution of parks within the watershed. Except for the Metroparks and State Parks, most municipal parks are relatively small and much of the space is occupied by active recreation. Mayfield and Acacia Country Clubs are important pieces of open space within the southern headwaters of the watershed. At 208, and 172 acres respectively, Mayfield and Acacia present opportunities to preserve large areas of open space lacking elsewhere in the surrounding communities. Should the owners ever decide to cease operation of the golf courses, these sites should be targeted for open space preservation and public use. Trails that would link to the neighborhood system could be part of the future

improvements, as could enhancements that address stormwater management.



*The corridor of the rail spur that served the Bluestone quarries is proposed for a trail to serve the adjacent neighborhoods.*

### East Branch Loop

The East Branch Loop would connect a number of parks, schools, and civic centers near headwaters of the East Branch of Euclid Creek. Development of this route would include:

- Incorporating the Village of Mayfield's, comprehensive plan for a trail and greenway system that would extend from White Road to the Village Center at Wilson Mills and SOM Center Roads.
- Extending the trail along the east side of Richmond





Existing walkways could be upgraded to create a strong connection between community facilities in Beachwood.

Road at the Cuyahoga County Airport north to White Road and south to the school and municipal center in Richmond Heights.

- Creating marked bike lanes along Highland Road between the Richmond Heights and Highland Heights municipal centers.
- Expanding walking paths at Highland Heights Park, if additional land is protected west of the existing park.
- Widening and planting trees along paths on Mayfield High School property.

The Mayfield Township Historical Society is located along this route on SOM Center Road. Also on this route in Highland Heights, a number of rare plant species have been found near the Highland Heights Park. This provides an opportunity to not only tell the story of those species, but to use this site as an interpretive opportunity to educate the populace about the native vegetation of the area. One example of this would be the Beech-Sugar Maple association, which was the climax forest of the eastern highlands in Cuyahoga County. A major community facility whose story could be highlighted along this route is that of the Cuyahoga County Airport. The airport

property, which is also home to the Cleveland Cricket Club, already includes a trail that parallels Richmond Road along the airport's western end.

## Local Connections

### Beachwood Place Spur

Beachwood Place is a major shopping destination within the watershed. There is also a concentration of adjacent residential units, especially to the east and the south. There is a strong automobile orientation to the layout of the properties, which should be adjusted to make this location a more pedestrian and bike friendly area. Enhancements can include:

- Developing exposed portions of the creek as amenities for surrounding residential properties by undertaking restoration projects with walkways and viewing areas.
- Redesigning and revitalizing underused portions of residential sites east of the mall to include more greenspace with trail connections.
- Redesigning portions of the parking area at Beachwood Place to reduce the impacts of storm water runoff and create a more defined walking route (see drawing in the *What the Watershed Could Look Like* section of this report).
- Designating Community Drive through the Blossom Subdivision Historic District as part of the bike route.

### Lyndhurst Spur

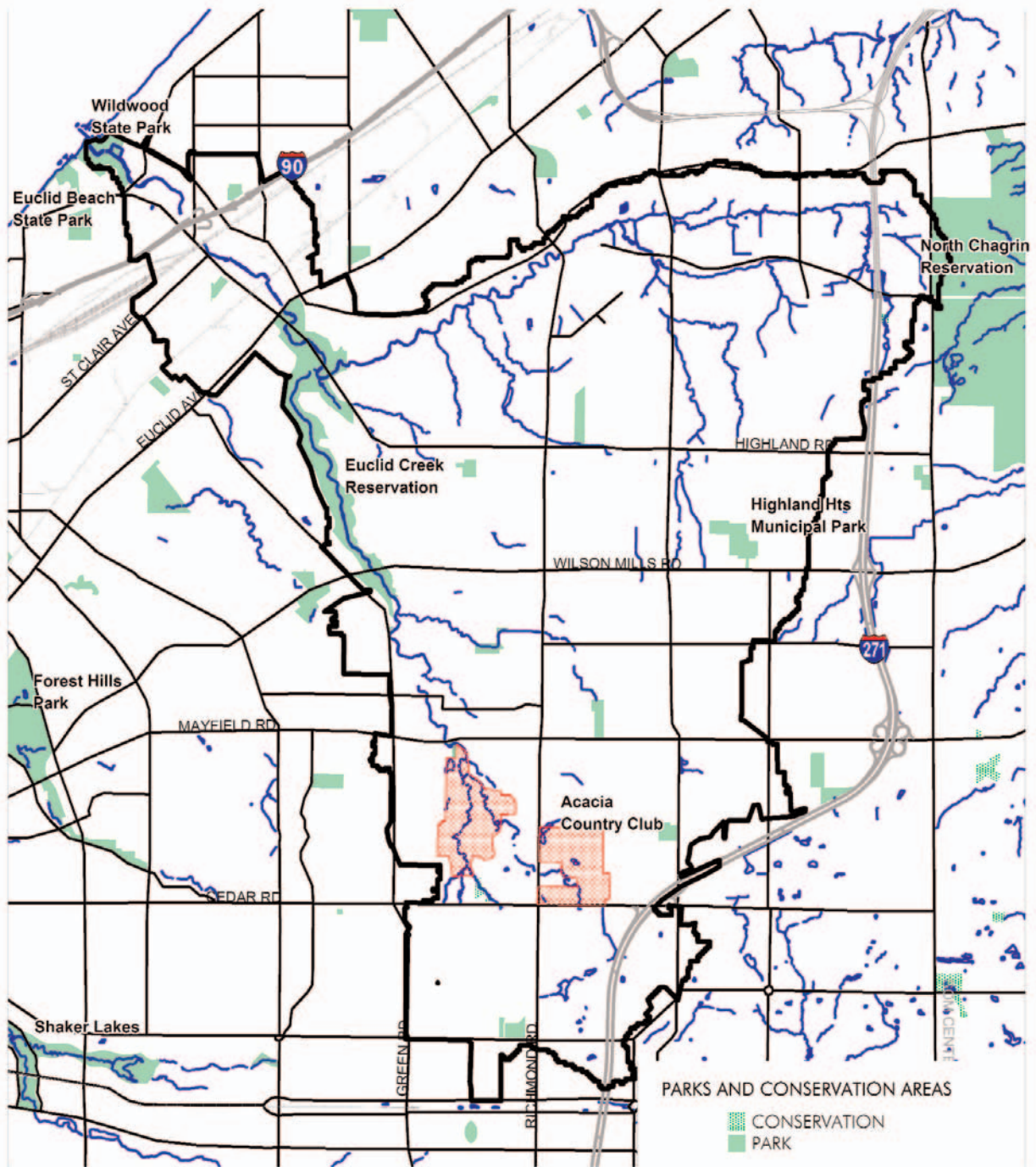
This route would be primarily an on-road route that would connect the Lyndhurst municipal complex to the TRW/Legacy Village area and to Brush High School, which are on the West Branch Connector route. Improvements would include:

- Signing the route and making it a priority for street maintenance and the planting of canopy trees.
- Developing a walking path along a creek tributary on municipal property from Spencer Road to the municipal complex recreation area.

### South Euclid Connector

The center of South Euclid is located between the proposed routes of the First Ring Loop and the West Branch Connector. A number of ballfields, the South

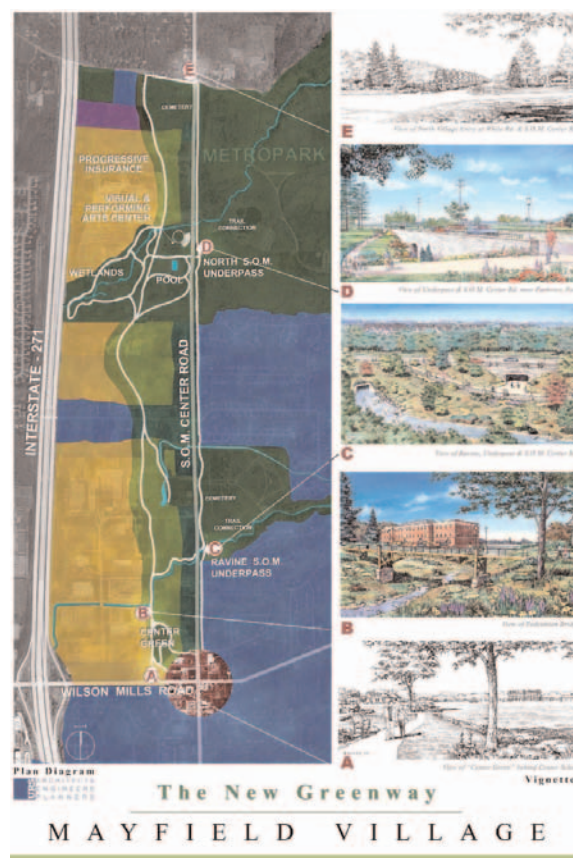


**Figure 5.8** Park Distribution

*The map shows the lack of large, publicly accessible open space in the watershed. Mayfield and/or Acacia Country Clubs, should operations ever cease, could serve such a function near the northern headwaters.*

Euclid/Lyndhurst Branch of the Cuyahoga County Public Library, and the South Euclid Historical Society are located in this area. A mix of improvements on public and institutional properties, as well as improvements along a few short segments of public streets would be required. Actions would include:

- Improving/developing paths that provide access to ball fields and can be incorporated into the route.
- Undertaking a restoration project on the segment of creek behind the Library. This area would also serve as an educational venue and would include a path to provide public access.
- Improving the Mayfield Road crossing over the creek with decorative wall and lighting elements.
- Installing outdoor exhibits at the library site to tell the story of the transportation improvements that made Mayfield Road the major transportation route in this part of the watershed. Information could include the planking of the road, the later construction of the Cleveland and Chardon Electric Railroad interurban line, the relationship between transportation improvements and the subsequent development of public, educational, and retail buildings along Mayfield Road.



*Connecting local greenway plans throughout the watershed will enhance communities, making them more desirable places to live.*

**SOURCE:** Village of Mayfield

**Appendix G** includes information on the design and maintenance considerations for bicycling infrastructure.



*Potential trail connections in South Euclid linking community facilities.*



Land use within the watershed directly affects the overall health and sustainability of the creek and its communities. A series of recommendations have been developed to assist communities in taking steps to improve the watershed as a whole. These recommendations are provided as examples of what can be done within the watershed and along Euclid Creek. The prioritization and further analysis of these recommendations will help lead to tangible improvements in the watershed.

### General Recommendations

The following recommendations apply to the entire watershed.

- Preserve publicly and privately owned greenspace, especially where a stream crosses through property.
- Identify wetland sites for mitigation, especially along coastline and watercourse.
- Reduce impervious surfaces throughout the watershed.
- Encourage low impact development practices on new development and redevelopment projects.
- Introduce riparian stewardship practices to appropriate property owners.
- Encourage residential property owners to establish stormwater management controls.
- Highlight scenic views and historical sites within the watershed.
- Make connections between existing community parks, open space, and community centers via trails or bikeways.

In order to better understand the effects of land use on the Creek, the Watershed was divided into seven smaller subwatersheds. Below is a description of the existing conditions of each subwatershed, and specific goals for the future. The numbered lists of recommendations relate to the numbers on the corresponding recommendations maps. **See Figure 6.0.**

### Lake Plain – Nottingham Subwatershed

#### Description

This subwatershed encompasses approximately 1,592 acres of land and 3 miles of stream. It has an

estimated impervious surface above 25 percent and contains some of the earliest development in the watershed. This segment begins at the northern end of the Cleveland Metroparks Euclid Reservation, continues north parallel to Dille/Nottingham Road until it reaches Wildwood State Park, where it eventually empties into Lake Erie. **See Figure 6.1.**

With the exception of the parks, this stream travels through a primarily urban landscape. The stream runs through an industrial segment between Euclid Avenue north to St. Clair. This segment has an intact riparian corridor; however, dumping is prevalent in this area. Due to the development of the railroads, and eventually the interstate routes, industrial operation intensified in this vicinity. One significant property owner within this stretch is the Nottingham Water Treatment Plant.

Farther downstream, the Euclid Creek enters a large dam/spillway. This dam was originally built when I-90 was placed to help alleviate downstream flooding. As the stream exits this structure, it travels into three culvert pipes located under I-90. A few hundred yards downstream, an Army Corps of Engineers Project in 1988 lined the streambanks with concrete to create a levee. Homes in this area were regularly flooded until this project was put in place. From here, the stream travels under Lakeshore Boulevard, and through Wildwood State Park, to Lake Erie. In addition, the Army Corps of Engineers, as part of their project in 1988, straightened the stream within Wildwood to help alleviate the upstream flooding problems. The stream's original pattern became the present oxbow within Wildwood.

#### Recommendations: (See Figure 6.1.1)

##### Protection Measures:

1. Preserve the Humphrey House and remaining Euclid Beach nostalgia, include interpretive signage; make a destination place.
2. Conserve riparian corridor along Euclid Creek and establish a trail and/or greenway connection from the Metroparks Euclid Reservation to Wildwood State Park.



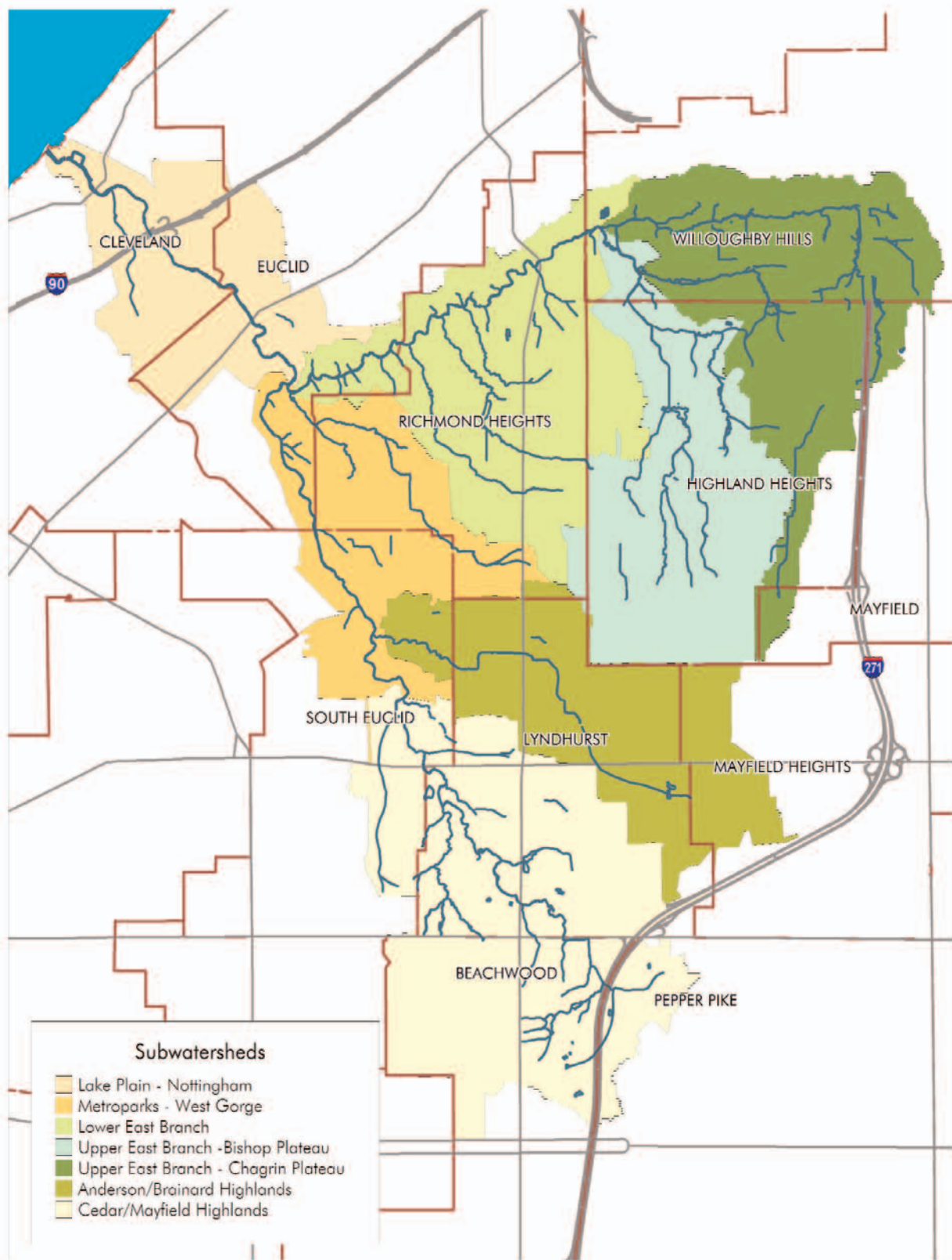
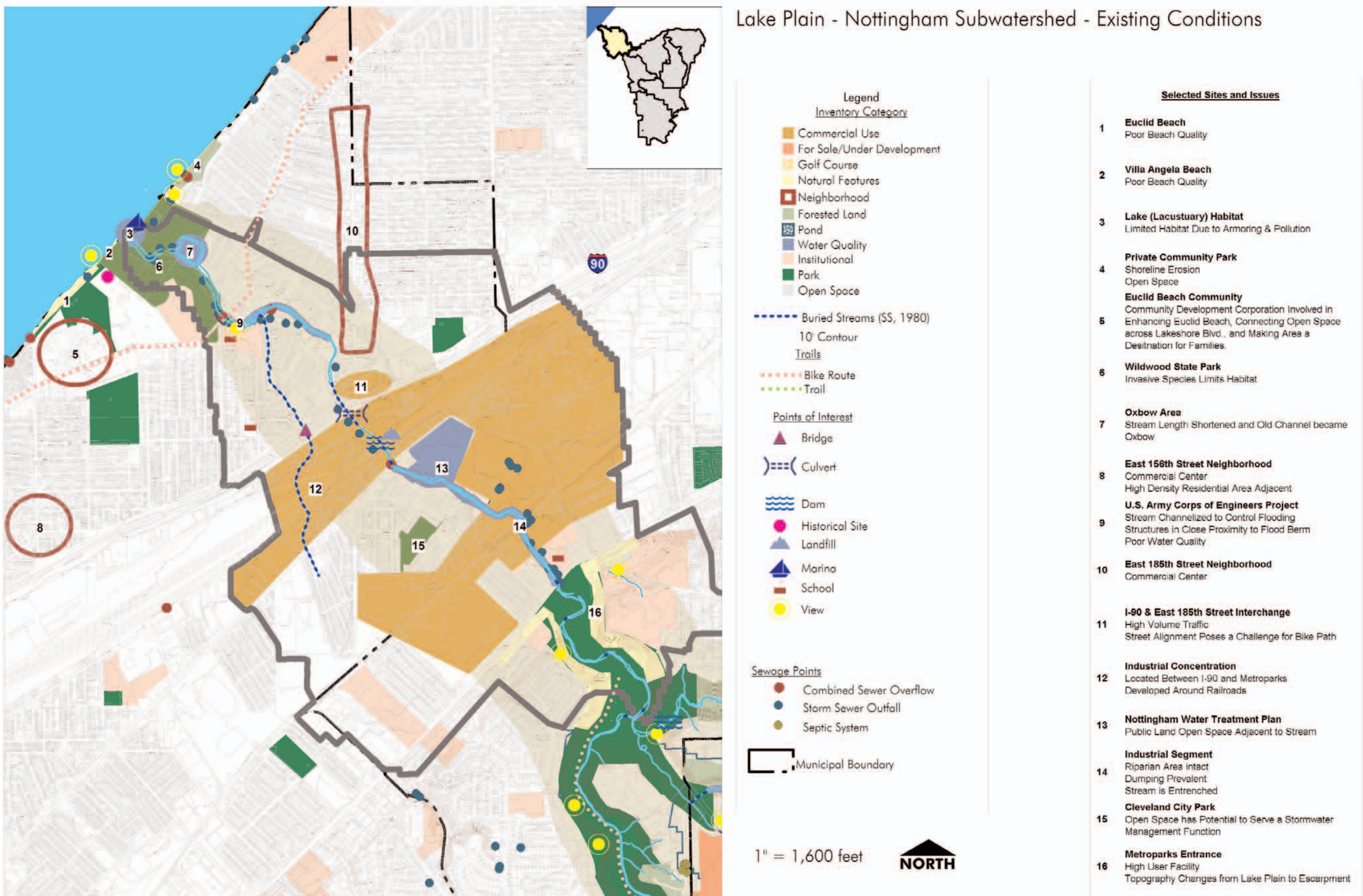
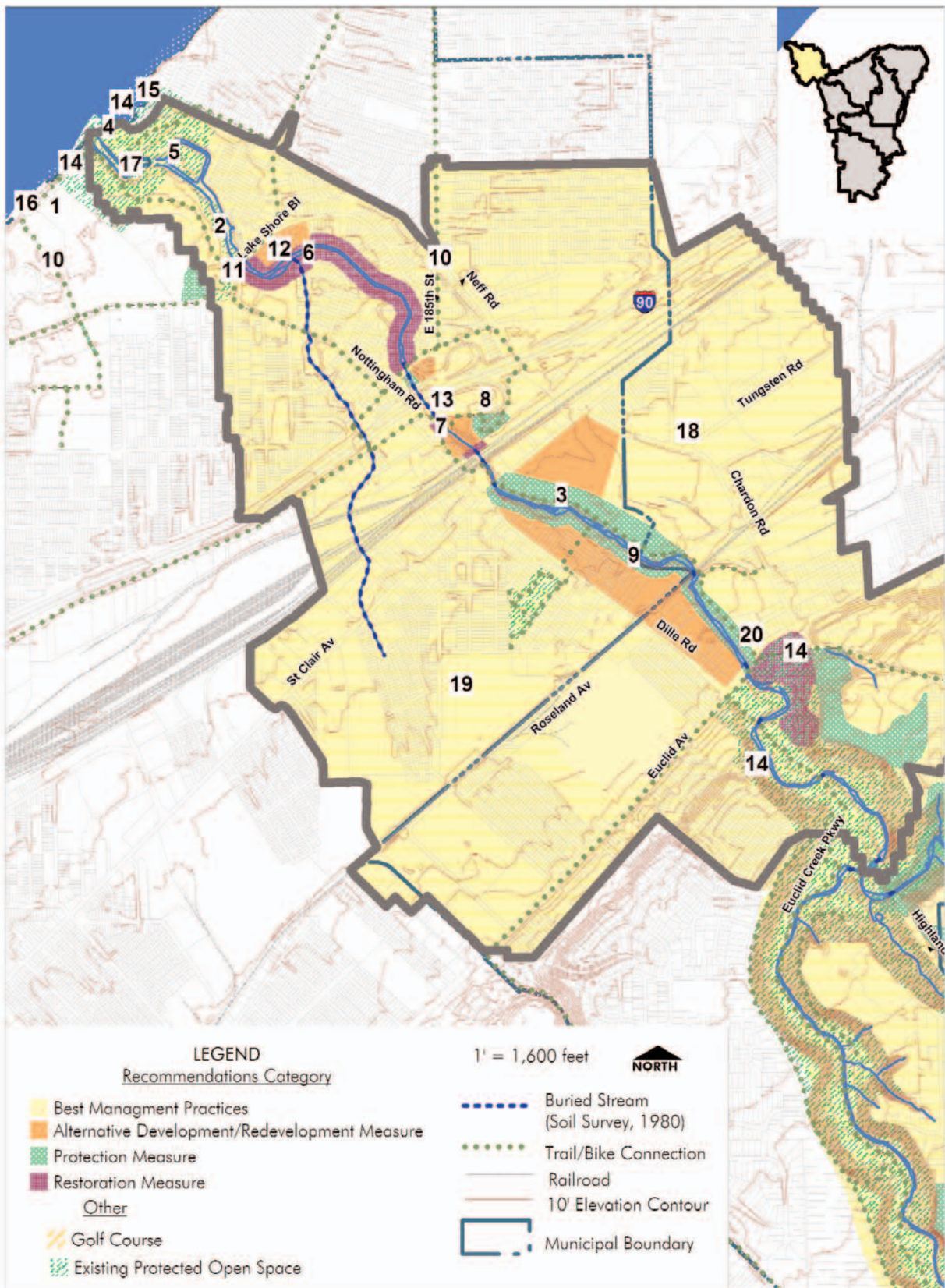
**Figure 6.0** Subwatersheds of Euclid Creek



Figure 6.1 Lake Plain – Nottingham Subwatershed Existing Conditions





**Figure 6.1.1** Lake Plain – Nottingham Subwatershed Recommendations



3. Assess and set aside land on Nottingham Water Treatment Plant Property to enhance/recreate natural floodplain.

#### Restoration Measures:

4. Examine the potential opportunities to integrate natural conditions into shoreline structures to promote and re-introduce biological communities.
5. Enhance the Coastal Management Area, especially within Wildwood State Park. Expand nature and tourism programs, promote educational efforts on the coastal and riverine interface, manage and eliminate invasive species, and use oxbow for coastal wetlands restoration.
6. Assess and eliminate hard armoring of Army Corp of Engineers' Project and restore stream's natural functions.
7. Assess and eliminate dam/spillway at East 185th Street and enhance on/off ramp areas (including landfill/dumping ground) to become more environmentally friendly gateway to the Euclid Creek Watershed.
8. Use I-90 cloverleaf for stormwater quality/management using native vegetation.
9. Enhance riparian corridors along industrial stretch from Euclid Avenue to St. Clair.

#### Future Development/Redevelopment Measures:

10. Make connections via new and existing trails to the commercial centers/communities of East 185th Street, Euclid Beach, and East 156th Street.
11. Upgrade walls and lighting of Lakeshore Boulevard Bridge over Euclid Creek; ensure minimal impact to stream system.
12. Encourage redevelopment in areas such as Nottingham Drive, apartments on Lakeshore Blvd. near Wildwood and Humphrey House and orient development toward the stream.
13. Redevelop land near the East 185th Street interchange as a gateway to Euclid Creek (e.g., signage, interpretive center, bike/trail hub, etc). Foster new businesses (e.g., bike rental, outdoor sports, restaurants, etc.) in this area that are supported by the greenspace.
14. Highlight views at the Lakeshore and entrance to Euclid Creek Reservation.

#### Best Management Practice Measures:

15. Work with the Regional Sewer District to eliminate/minimize the number of combined sewer overflows in or near the watershed.
16. Assess and eliminate bacterial pollution at Euclid Beach State Park and Villa Angela Beach.
17. Use Wildwood State Park (and other public properties) as a demonstration site for practices that reduce stormwater runoff and treat pollution (e.g., green parking, biofilters, etc.)
18. Interpret the industrial history and its significance in this portion of the watershed.
19. Evaluate Industrial Environmental Management Systems and ensure operations eliminate and/or minimize water pollution.
20. Develop school education curriculum, including land lab, based on Euclid Creek. One possible location is the Euclid Central School property directly adjacent to Euclid Creek.

## Lower East Branch Subwatershed

### Description

This subwatershed encompasses approximately 2,320 acres of land and 7.8 miles of stream. The estimated impervious surface is above 25 percent in the west and between 11 and 25 percent in the east. The subwatershed is primarily single-family residential. The tributaries of the western side of this subwatershed drain land from Richmond Mall northward; while the eastern side of the subwatershed drains the majority of the land owned by the Cuyahoga County Airport. **See Figure 6.2.**

The East Branch of Euclid Creek travels through steep terrain as it runs east to west, eventually meeting up with the Main Branch within the Euclid Creek Reservation. This deep valley has limited development, which has helped to preserve some of the natural functions of the stream. The beauty and uniqueness of this area was recognized in 1916 when it was identified as an area of preservation in the original Metroparks master plan.

The land located south of the airport is under development pressure. Using development practices that protect natural features will help minimize the effects of developing this portion of the watershed.

**Recommendations: (See Figure 6.2.1.)**Protection Measures:

1. Protect the current wooded conditions of the riparian corridor and steep slopes along the East Branch Escarpment from the Cuyahoga County line, west to the Main Branch.
2. Protect segments of headwater streams that have steep slopes and an intact riparian corridor.

Restoration Measures:

3. Enhance riparian corridor of segments north of Airport (e.g., plant trees/shrubs, eliminate hard armoring, develop floodplain); where appropriate re-establish natural stream pattern.
4. Retrofit detention basin at Richmond Bluffs for stormwater quality (e.g., forebay, wetland bench, etc.).
5. Remove dam and restore stream's natural pattern at the old Mayfair Club site to enhance water quality.
6. Examine the potential opportunities at Richmond Mall to install storm water management practices (e.g., bioswales, pervious pavement, etc.).

Future Development/Redevelopment Measures:

7. Create public open space west of Edgemont Drive at top of valley by installing a small parking lot and walking trail. Highlight views of East Branch Valley.
8. Redevelop land located at the Chardon Road/Chardon View/White Road intersection as a bike/trail hub and foster new businesses in this area that are supported by the greenspace (e.g., bike rental, outdoor sports, restaurants, etc.). Highlight views of Euclid Creek.
9. Use Stratford Place condominium development off Chardon Road in Willoughby Hills as an example for development/redevelopment throughout the watershed.
10. Make connections between existing community parks, open space, and community centers via trails or bikeways. Example: Connect to the Chagrin Valley via Chardon and White Roads.
11. As land is developed south of the Cuyahoga County Airport, ensure the use of low impact development practices that design with the natural features in mind.

Best Management Practice Measures:

12. Encourage Cuyahoga County Airport to develop an operation and maintenance plan that eliminates and/or minimizes water pollution.
13. Develop school education curriculum with Richmond Heights Schools, including land lab, based on Euclid Creek.

**Upper East Branch – Bishop Plateau Subwatershed****Description**

This subwatershed encompasses approximately 2,096 acres of land and 6.3 miles of stream. It has an estimated impervious surface cover of primarily 11 to 25 percent; although the northern portion is 0 to 10 percent and the southwestern end is above 25 percent. The headwaters of this subwatershed begin at Wilson Mills Road, and traverse north to the main stem of the East Branch. Several areas have been buried underground, greatly limiting water quality. This subwatershed also contains some of the property south and east of the Cuyahoga County Airport. In addition, the majority of StoneWater Golf Club is located in the northern portion of this subwatershed.

**See Figure 6.3.**

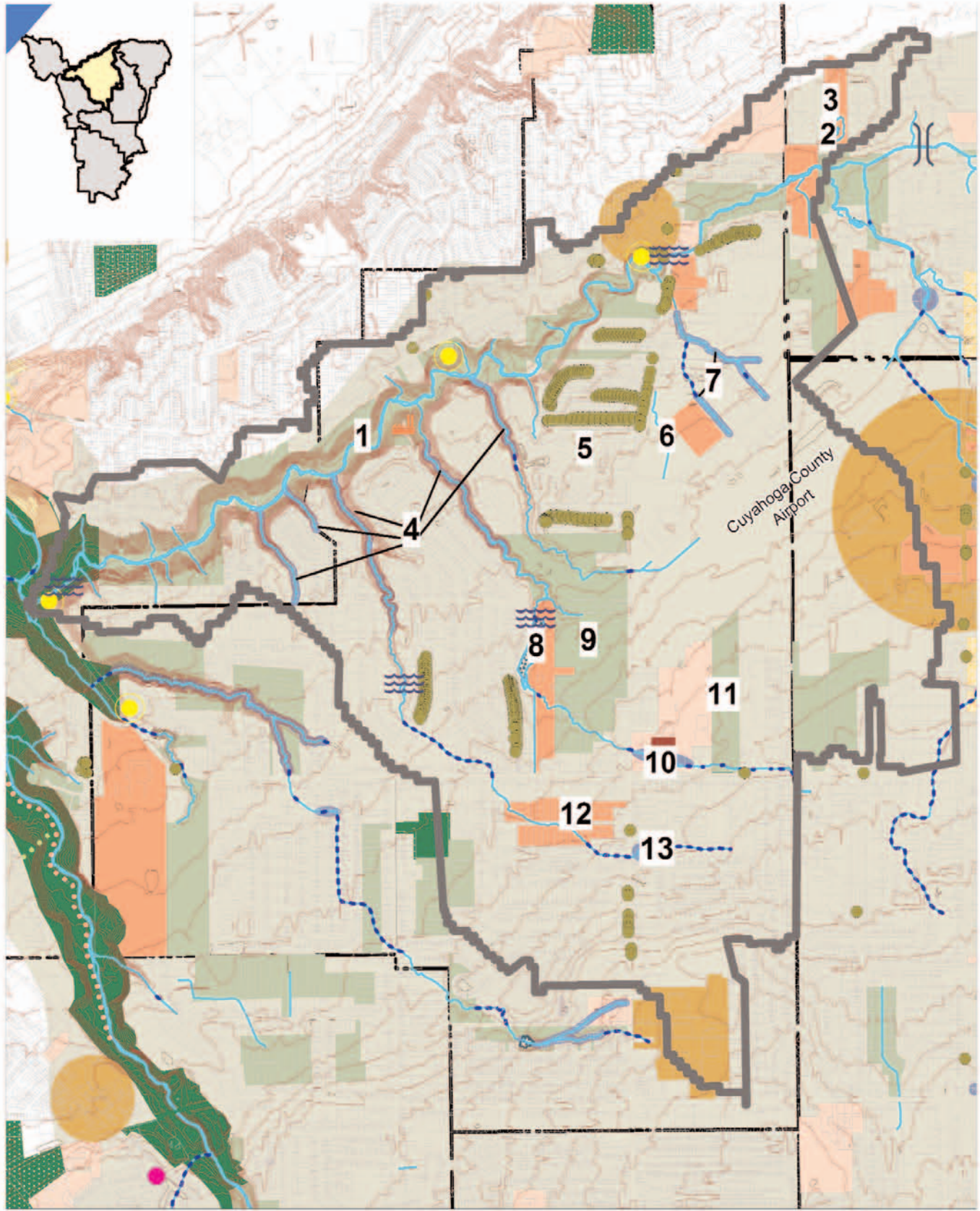
This watershed also contains the Highland Heights Community Park. The large area of undeveloped land north and east of this park is currently owned by the Mayfield School System. This land has considerable natural value, not only because it contains the headwaters of Euclid Creek, but also because it is the home of a diverse species of plants. Many of these plants are rare or endangered in Ohio and/or in Cuyahoga County.

**Recommendations: (See Figure 6.3.1.)**Protection Measures:

1. Preserve floodplain area present on stream segment south of White Road.
2. Protect stream corridor south of the Airport Greens Golf Course.
3. Protect the land adjacent to Highland Heights Community Park.
4. Maintain and enhance existing wetlands located north of Wilson Mills Road.



Figure 6.2 Lower East Branch Subwatershed Existing Conditions



Lower East Branch Subwatershed - Existing Conditions

Legend	
Inventory Category	
	Commercial Use
	Future Development
	Golf Course
	Natural Features
	Neighborhood
	Forested Land
	Pond
	Water Quality
	Institutional
	Park
	Open Space
	Buried Streams (SS, 1980)
	10' Contour
Trails	
	Bike Route
	Trail
Points of Interest	
	Bridge
	Culvert
	Dam
	Historical Site
	Landfill
	Marina
	School
	Sewage Treatment Plant
	View
Sewage Points	
	Storm Sewer Outfall
	Septic System
	Municipal Boundary

Selected Sites and Issues	
<b>Steep Slope Open Space</b>	
1	Wooded Vacant & Backlands East Branch Mainstem in Good Condition Protected by Topography
2	<b>Detention Basin/Pond (Near Apartments)</b> Potential to Serve a Water Quality Function
3	<b>Future Development (East of Apartments)</b> Vacant Land to Be Developed
<b>Stream Segments</b>	
4	Steep Slopes Stream Intact
5	<b>Detention Basin/Pond (off Richmond)</b> Potential to Serve a Water Quality Function
6	<b>Drainage Swale</b> Limited Riparian Area
7	<b>Stream Segment</b> Limited Riparian Area
<b>Inline Pond</b>	
8	Stream has Been Damed to Make Pond Filling in Due to Upstream Erosion
<b>Airport Open Space</b>	
9	Airport Buffer & Private Properties Streams have Good Physical Habitat
10	<b>Rip Rap on Stream Banks</b> Limited Floodplain Area
11	<b>Open Space Richmond Heights City Park</b> Potential to Serve a Stormwater Function
<b>Future Development (Off Richmond)</b>	
12	Wooded Vacant Land Development in Progress Stream Alteration
13	<b>Stream Segment</b> Concrete Lined Channel



Figure 6.2.1 Lower East Branch Subwatershed Recommendations

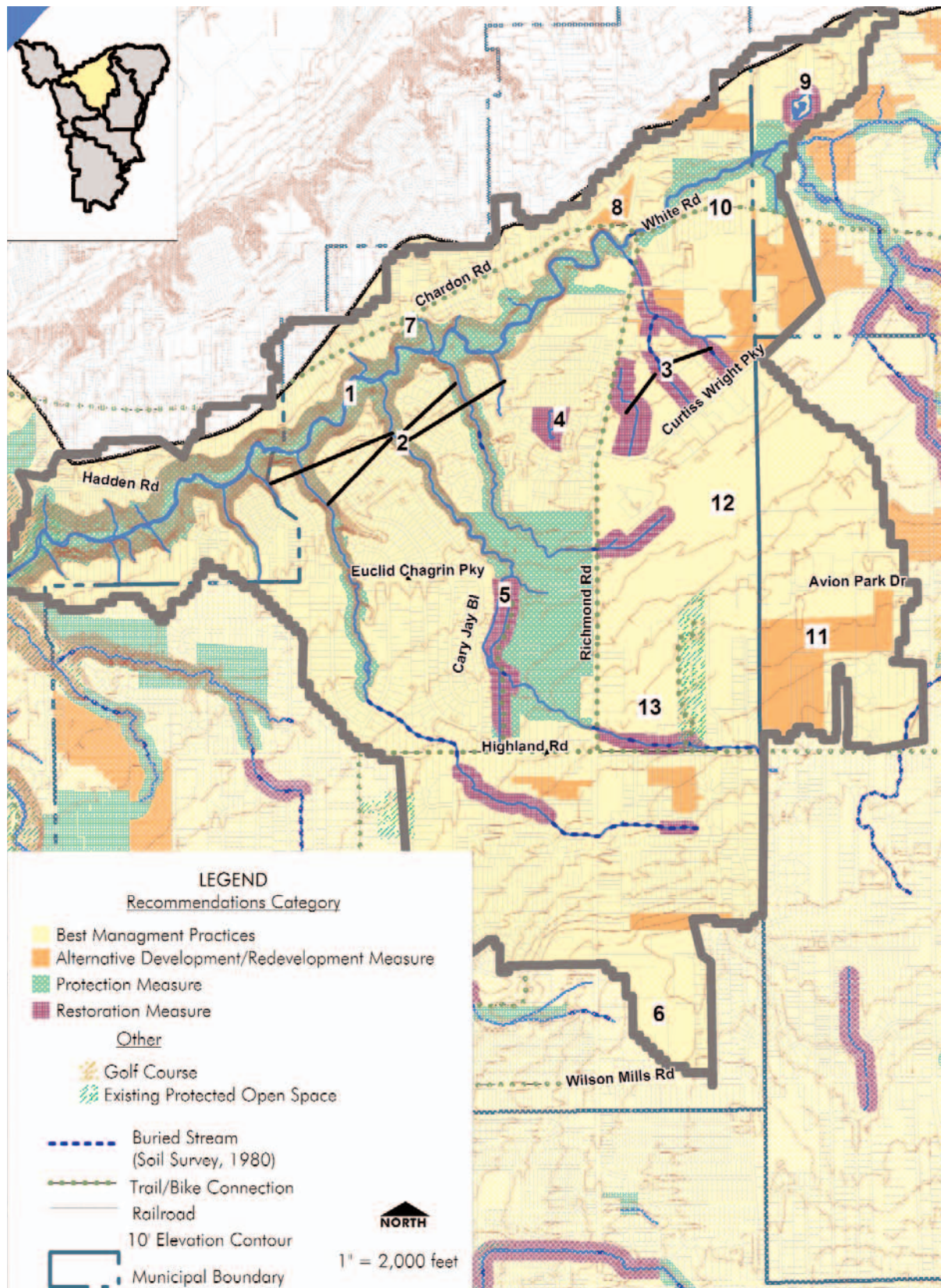
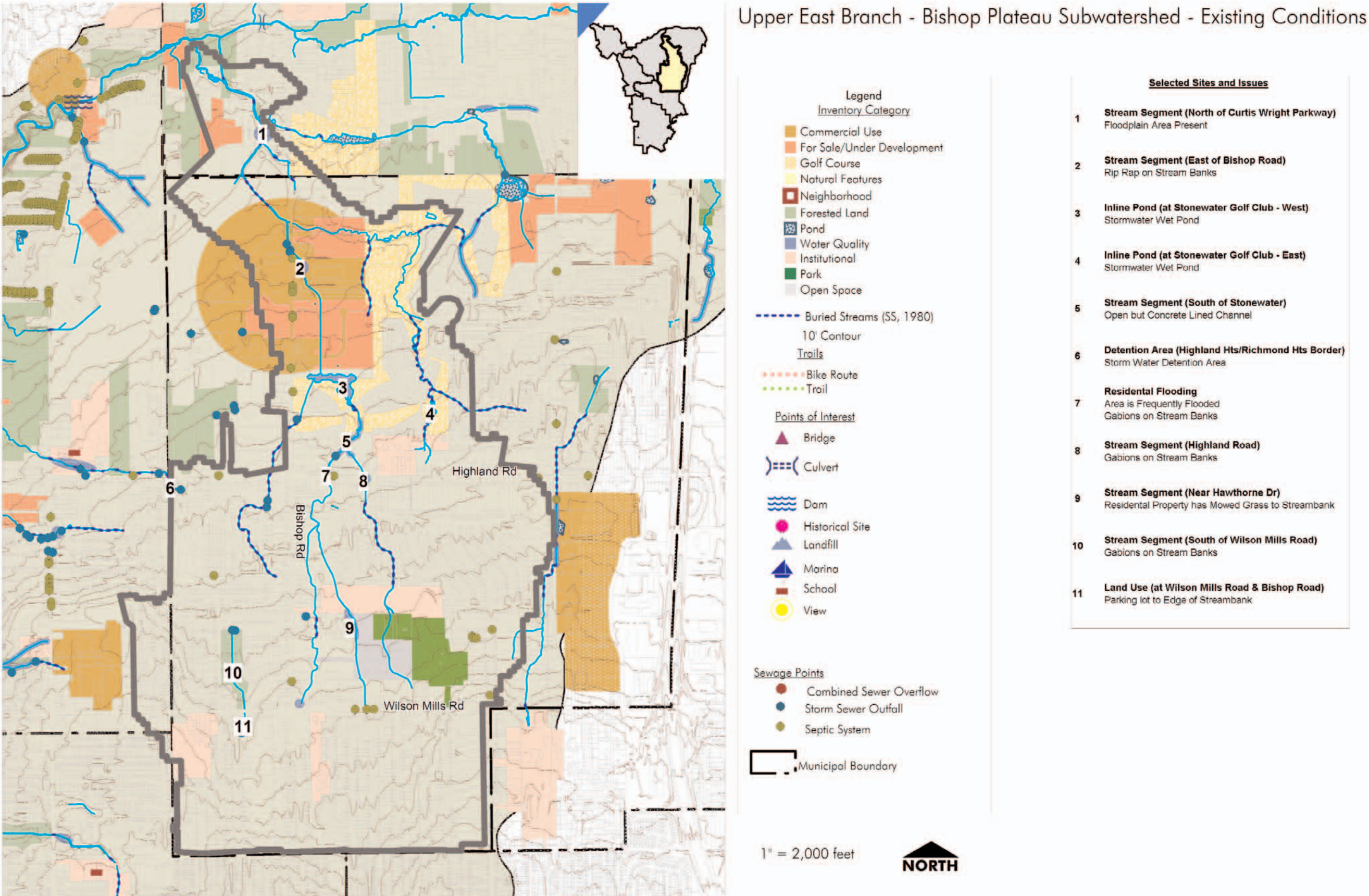
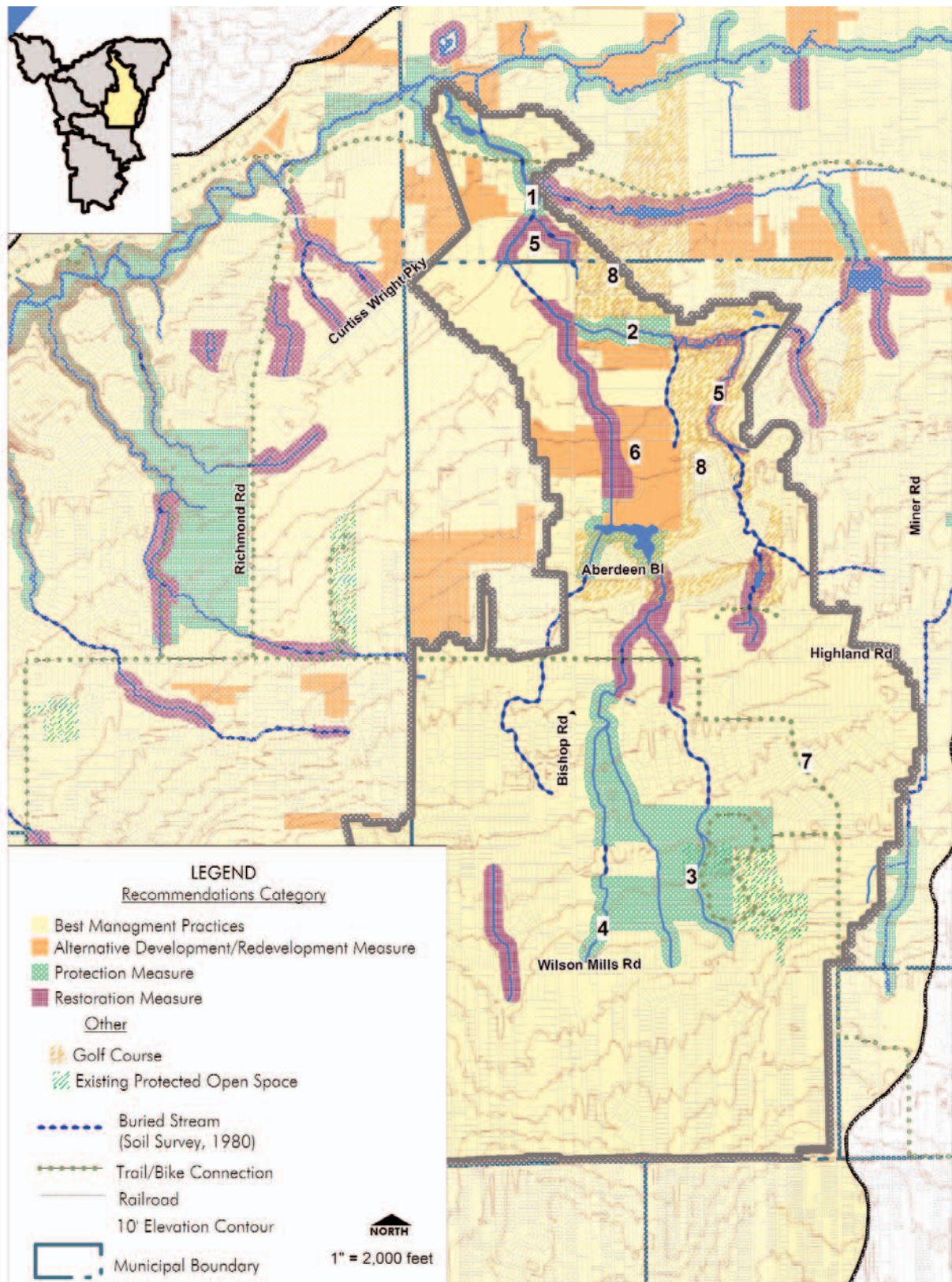




Figure 6.3 Upper East Branch – Bishop Plateau Subwatershed Existing Conditions





**Figure 6.3.1** Upper East Branch – Bishop Plateau Subwatershed Recommendations



Restoration Measures:

5. Enhance riparian corridors at StoneWater Golf Club and segment parallel to Bishop Road (e.g., plant trees, eliminate hard armoring, develop floodplain); where appropriate, re-establish natural stream pattern.

Future Development/Redevelopment Measures:

6. Ensure the use of low impact development practices designed with the natural features in mind, as land is developed south of Cuyahoga County Airport.
7. Make connections between existing community parks, open space, and community centers via trails or bikeways. Example: Connect Highland Heights Community Center to Highland Heights Park, Mayfield High School, the Public Library, and Mayfield Village Center.

Best Management Practice Measures:

8. Encourage sustainable resource management programs on golf courses (e.g., Audubon Cooperative Sanctuary Program for Golf Courses).

## Upper East Branch – Chagrin Plateau Subwatershed

**Description**

This subwatershed encompasses approximately 2,309 acres of land and 5.3 miles of stream. It has an estimated impervious surface of 0 to 10 percent in the north and 11 to 25 percent in the south.

The landscape is primarily suburban, residential development, with two golf courses (Airport Greens and StoneWater). Until recently, development has been slow to reach this area; therefore, there are large lots and several relatively undisturbed areas which are ideal for natural resource protection. The southern end of the subwatershed contains some light industrial property. In addition, there are several inline ponds and detention basins throughout the watershed that could be retrofitted to serve a water quality purpose. **See Figure 6.4.**

**Recommendations: (See Figure 6.4.1.)**Protection Measures:

1. Protect stream corridor located behind residential properties north of White Road.

Restoration Measures:

2. Enhance riparian corridors on and near StoneWater and Airport Greens Golf Courses (e.g., plant trees, eliminate hard armoring, develop floodplain); where appropriate, re-establish natural stream pattern.
3. Retrofit large detention basin located south of White Road near StoneWater to serve a water quality function (e.g., forebay, wetland bench, etc).
4. Identify opportunities on Progressive Insurance property to enhance stream and retrofit detention basins for water quality.

Future Development/Redevelopment Measures:

5. Ensure the use of low impact development practices designed with the natural features in mind, as land is developed in Willoughby Hills.
6. Create bike lanes along White Road as part of a connection between Euclid Reservation and North Chagrin Reservation.

Best Management Practice Measures:

7. Encourage sustainable resource management programs on golf courses (e.g. Audubon Cooperative Sanctuary Program for Golf Courses).
8. Develop school education curriculum with Mayfield High School, including land lab, based on Euclid Creek.

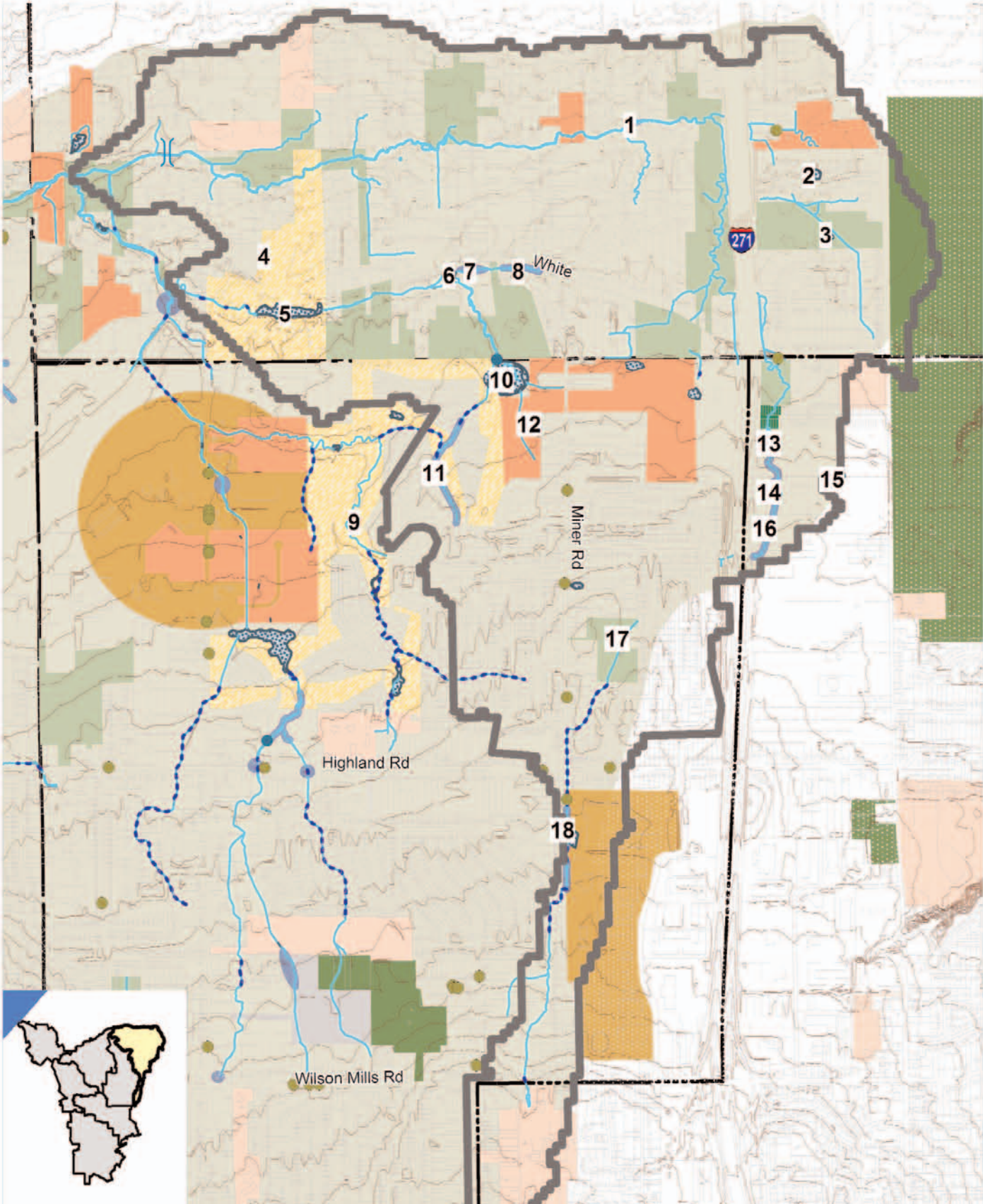
## Metroparks – West Gorge Subwatershed

**Description**

This subwatershed encompasses approximately 1,621 acres of land and 6.8 miles of stream. It has an estimated impervious surface cover of 0 to 10 percent in the west, and 11 to 25 percent in the east, with portions of residential land that are above 25 percent. The headwaters begin at Richmond Road and head northwest to the northern end of Euclid Reservation. The southern end of the subwatershed begins just south of the Anderson/South Green intersection. Euclid Creek then travels north through the Metroparks Euclid Creek Reservation, where it eventually meets up with the East Branch. **See Figure 6.5.**



Figure 6.4 Upper East Branch – Chagrin Plateau Subwatershed Existing Conditions



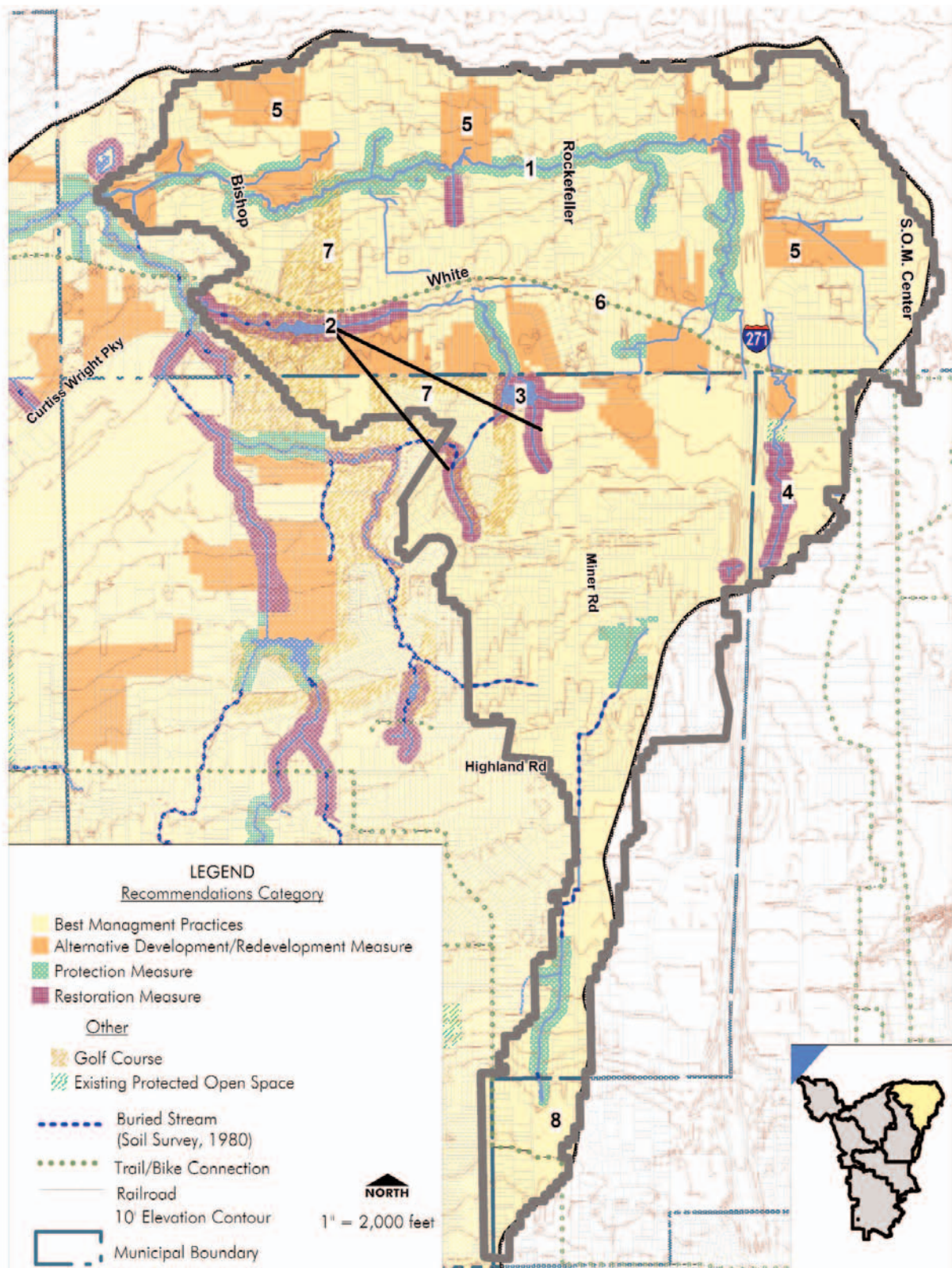
### Upper East Branch - Chagrin Plateau Subwatershed Existing Conditions

- Legend**  
Inventory Category
- Commercial Use
  - For Sale/Under Development
  - Golf Course
  - Natural Features
  - Neighborhood
  - Forested Land
  - Pond
  - Water Quality
  - Institutional
  - Park
  - Open Space
- Trails
- Bike Route
  - Trail
- Points of Interest
- Bridge
  - Culvert
  - Dam
  - Historical Site
  - Landfill
  - Marina
  - School
  - View
- Sewage Points
- Combined Sewer Overflow
  - Storm Sewer Outfall
  - Septic System
- Municipal Boundary

#### Selected Sites and Issues

- Stream Segment (West of Lamplight)**  
Gabions on Both Banks of Stream
- Pond (On Rosewood Trail)**  
Pond Located on Residential Properties
- Pond (On Wooded Property off SOM Center Road)**  
Pond Located Adjacent to Stream on Wooded Property
- Airport Greens Golf Course**  
Mowing to Stream  
Potential Water Quality Contributions
- Inline Pond (On Airport Greens Golf Course)**  
Placed for Aesthetics
- Inline Pond (South of White Road)**  
Pond Located on Residential Properties
- Stream Segment (South of White Road)**  
Some Vegetation Present on Stream Banks
- Stream Segment (South of White Road)**  
Located on Residential Property  
Mowed to Edge of Stream
- StoneWater Golf Club**  
Mowing to Stream  
Potential Water Quality Contributions
- Detention Basin (South of Highland Road)**  
Storm Water Wet Pond
- Stream Segment (Through StoneWater Golf)**  
Mowed to Edge of Stream
- Conservation Easement (Progressive Property)**  
Easement held by the Cuyahoga County Soil and Water Conservation District
- Inline Pond (on Progressive Property - North)**  
Storm Water Wet Pond
- Inline Pond (on Progressive Property -South)**  
Storm Water Wet Pond
- Pond (Industrial Property in Mayfield Heights)**  
Storm Water Wet Pond
- Stream Segment (on Property South of Progressive)**  
Mowed to Stream
- Pond (on Vacant Land East of Minner Road)**  
Pond Located Adjacent to Stream on Wooded Property
- Stream Segment (Located on Phillips Property)**  
Straightened and Mowed to Stream Edge



**Figure 6.4.1** Upper East Branch – Chagrin Plateau Subwatershed Recommendations



Within the Metroparks Euclid Creek Reservation, the stream cuts deeply through the surface geology to the bedrock. The stretch of stream that runs through the Reservation shows several bedrock layers in a relatively short distance. At the southern end of the Reservation are the remains of one of several stone quarries located within the watershed and the surrounding area. The product called bluestone was unique to this area, and these quarries were once a major employer for residents in the watershed.

**Recommendations: (See Figure 6.5.1.)**

Protection Measures:

1. Protect stream corridor located behind residential properties north of Highland Road and south of Anderson Road.
2. Examine opportunities to expand and enhance the Metroparks Euclid Creek Reservation.

Restoration Measures:

3. Assess and eliminate the dam located under Highland Road on the East Branch.
4. Restore stream segment along the Quarry Rail trail project.
5. Enhance riparian corridors south of Highland Road and east of Trebisky (e.g., plant trees, eliminate hard armoring, develop floodplain), where appropriate, re-establish natural stream pattern.

Future Development/Redevelopment Measures:

6. Highlight the views from the steep slopes of the valley along Glenridge Road (e.g., pictures on displays, lookout points, virtual tour of the watershed, etc.).
7. Ensure redevelopment of former GE Property, at the top of Highland Road hill, uses low impact development practices and includes community amenities (e.g., Access to lake, valley views, trail connections to Metroparks, etc.)
8. Connect bike lane along Trebisky to destinations within the watershed.
9. Make connections between existing community parks, open space, and community centers via trails or bikeways, especially to Metroparks Euclid Creek Reservation. Example: Connect

the Quarry Rail trail project to the trail along Glenridge Road and to the Euclid Creek Reservation.

10. Connect the old bluestone area (industrial area on Monticello, west of the Metroparks Euclid Creek Reservation) to the creek by encouraging clean-up of idle property and development of businesses orientated toward the creek. South of Monticello, encourage residential development that is oriented toward the creek.
11. Improve wall and lighting amenities on Monticello Road Bridge over Euclid Creek; ensure minimal impact to stream system.
12. Interpret important geological formations as well as the history of the quarry industry in this area.

## Anderson/Brainard Highlands Subwatershed

**Description**

This subwatershed encompasses approximately 1,928 acres of land and 3.1 miles of stream. It has an estimated impervious surface above 25 percent. Headwaters of this subwatershed begin just east of Brainard Road. The stream is buried underground from this point until it reaches the northern end of the Lyndhurst Community Park. It remains above ground for a short period of time until it reaches Ridgebury School, at which point it becomes buried again. The stream remains open and heads west to meet up with the main stem of Euclid Creek at Anderson and Green. **See Figure 6.6.**

This subwatershed also contains a portion of Mayfield Road. This road was subject to a number of transportation improvements, such as planking and later, the construction of an interurban rail line that made it a major transportation route. As a result, Mayfield Road has become a major center of activity in this watershed. This subwatershed is primarily residential, with most of the retail present along Mayfield Road.

**Recommendations: (See Figure 6.6.1.)**

Protection Measures:

1. Preserve land adjacent (east and west) to Schaeffer Park.

Figure 6.5 Metroparks – West Gorge Subwatershed Existing Conditions

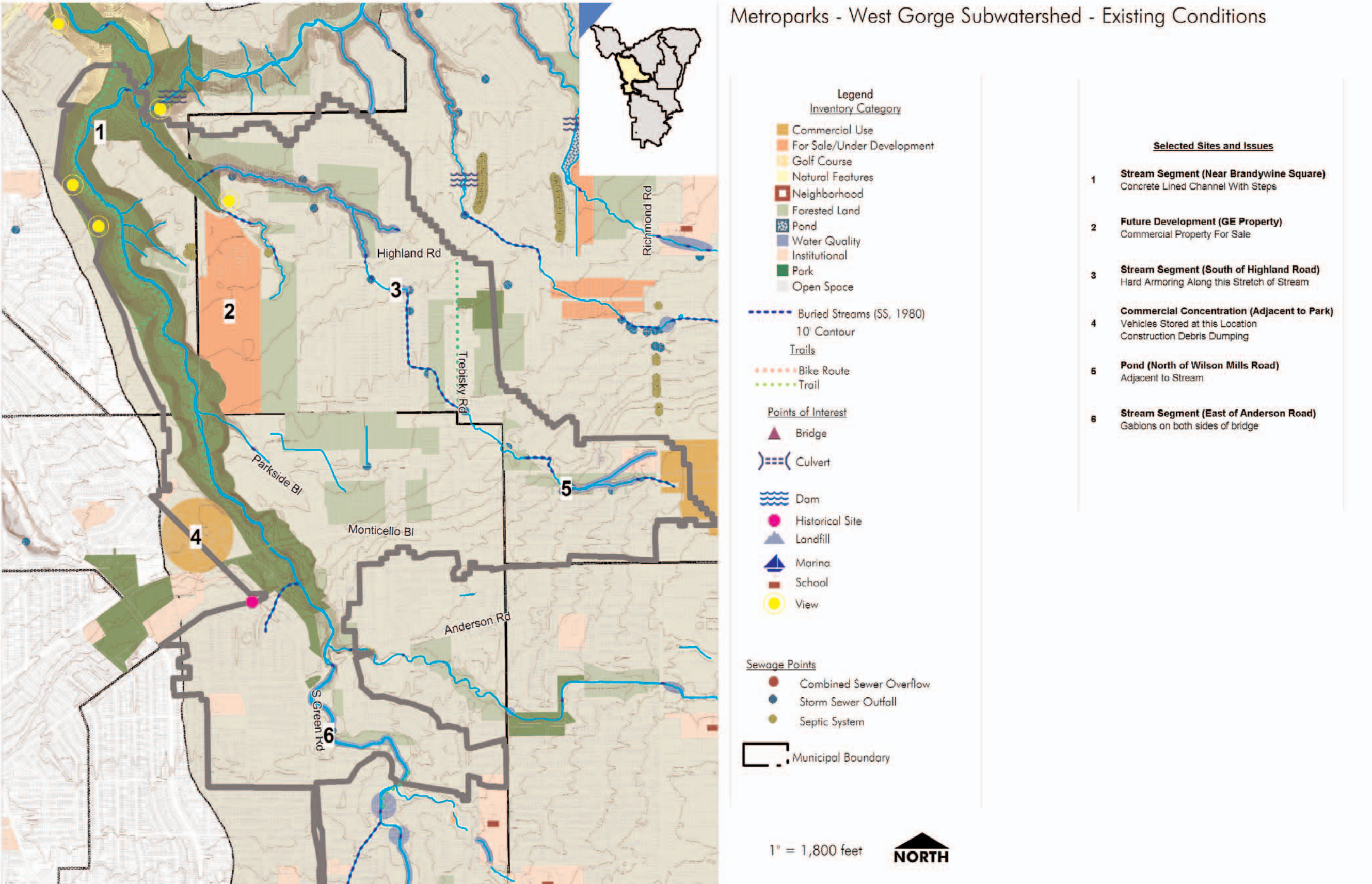




Figure 6.5.1 Metroparks – West Gorge Subwatershed Recommendations

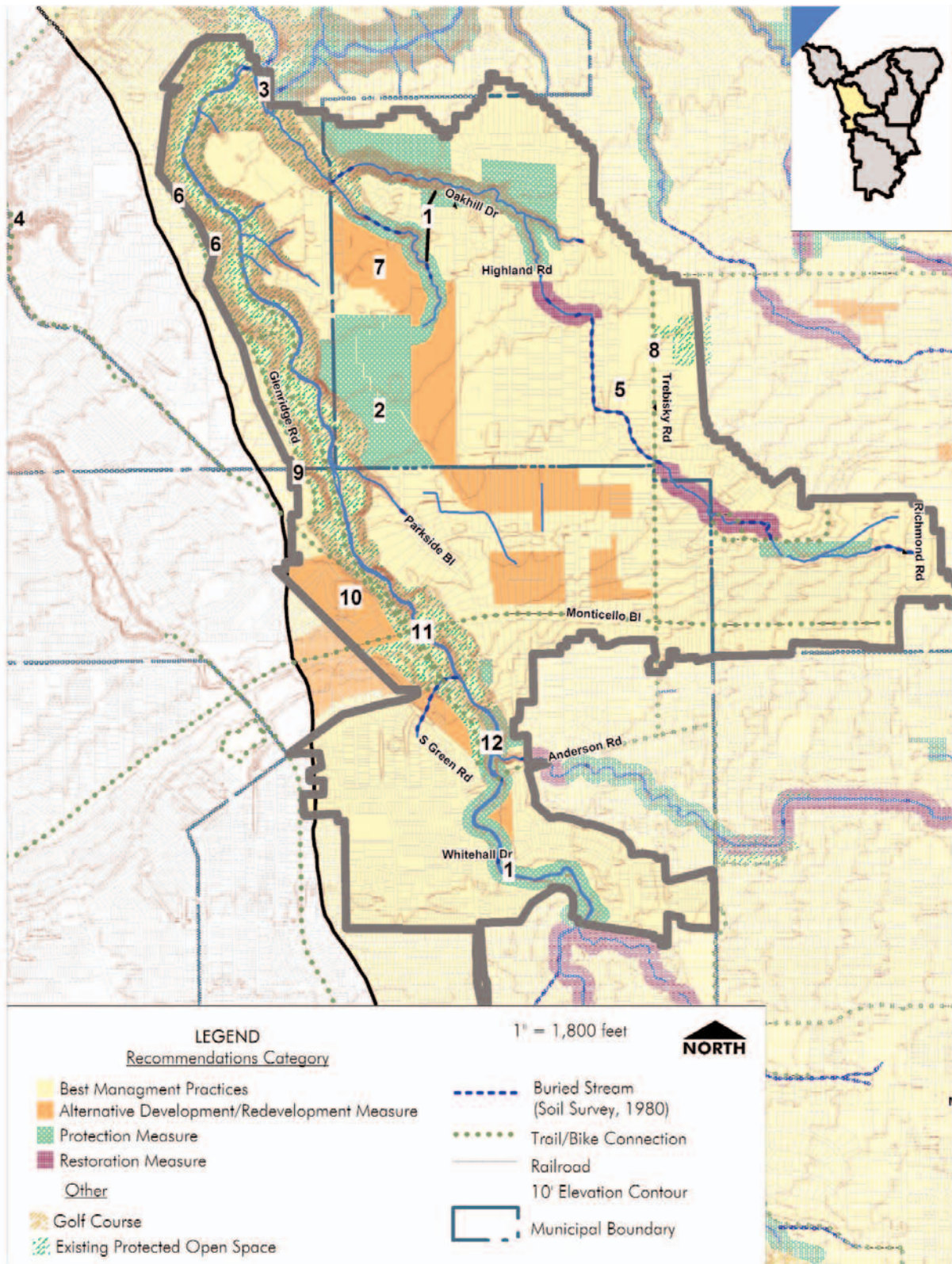




Figure 6.6 Anderson/Brainard Highlands Subwatershed Existing Conditions

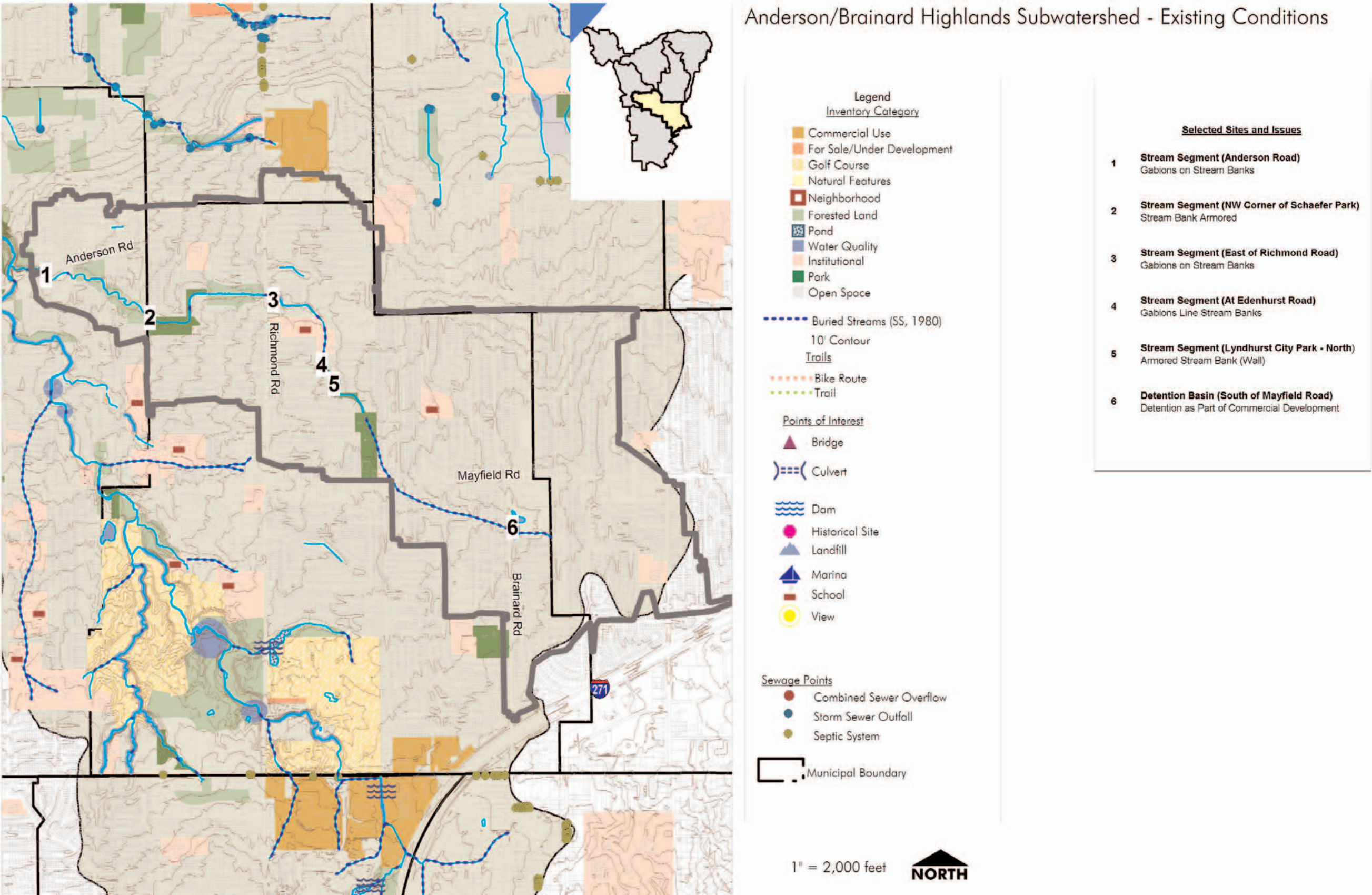
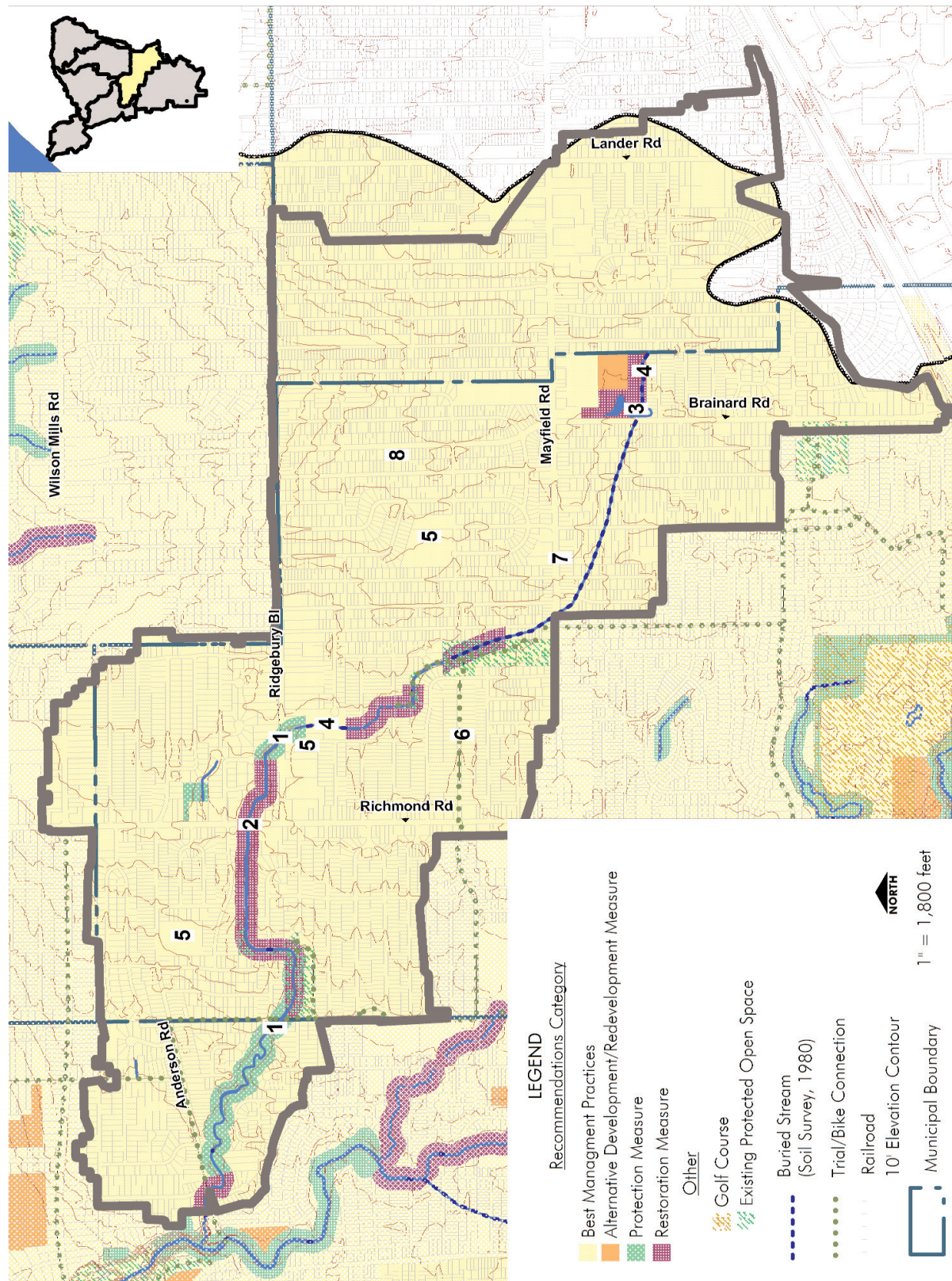




Figure 6.6.1 Anderson/Brainard Highlands Subwatershed Recommendations





**Restoration Measures:**

2. Enhance riparian corridors located on the backs of residential properties, east and west of Richmond Road (e.g., plant trees, eliminate hard armoring, develop floodplain), where appropriate, re-establish natural stream pattern.
3. Retrofit detention basin off Brainard Road with stormwater quality features (e.g., forebay, wetland bench, etc).
4. Examine the possibility of daylighting the stream on property off of Brainard Road and at Ridgebury School.

**Future Development/Redevelopment Measures:**

5. Use low impact development practices for school board properties if they are ever redeveloped (e.g., Anderson and Ridgebury).
6. Make connections between existing community parks, open space, and community centers via trails or bikeways. Example: Connect Lyndhurst City Center to Brush High School, and eventually to Legacy Village and Beachwood Place.
7. Redesign Mayfield Road streetscape (e.g., plant trees/bushes along street, reduce impervious surfaces, make pedestrian-friendly areas, develop small parks/gathering areas, etc.) to allow this area to be a destination place for both pedestrians and automobiles in the watershed.

**Best Management Practice Measures:**

8. Encourage residential property owners to establish stormwater management controls (e.g., rain barrels or rain gardens, etc.)

## Cedar/Mayfield Highlands Subwatershed

**Description**

This subwatershed encompasses approximately 3,528 acres of land and 6 miles of stream. It has an estimated impervious surface above 25 percent, except at Mayfield Country Club, which falls in the 0 to 10 percent range, and the Acacia Golf Course and surrounding residential property, which is between 11 to 25 percent. The headwaters begin just north of Fairmount Boulevard; however, almost all of these small tributaries are buried underground until just

north of Cedar Road. There is a stream restoration project currently in progress on the northern end of the former TRW property as part of mitigation for Legacy Village. A tributary is also buried through the institutional properties of Regina High School and Greenview Upper Elementary School. The topography of this area is relatively flat, with the exception of the Mayfield Country Club property. A high density of development has occurred in these headwaters due to the close proximity of the I-271 interchange at Cedar Road. **See Figure 6.7.**

**Recommendations:****Protection Measures: (See Figure 6.7.1.)**

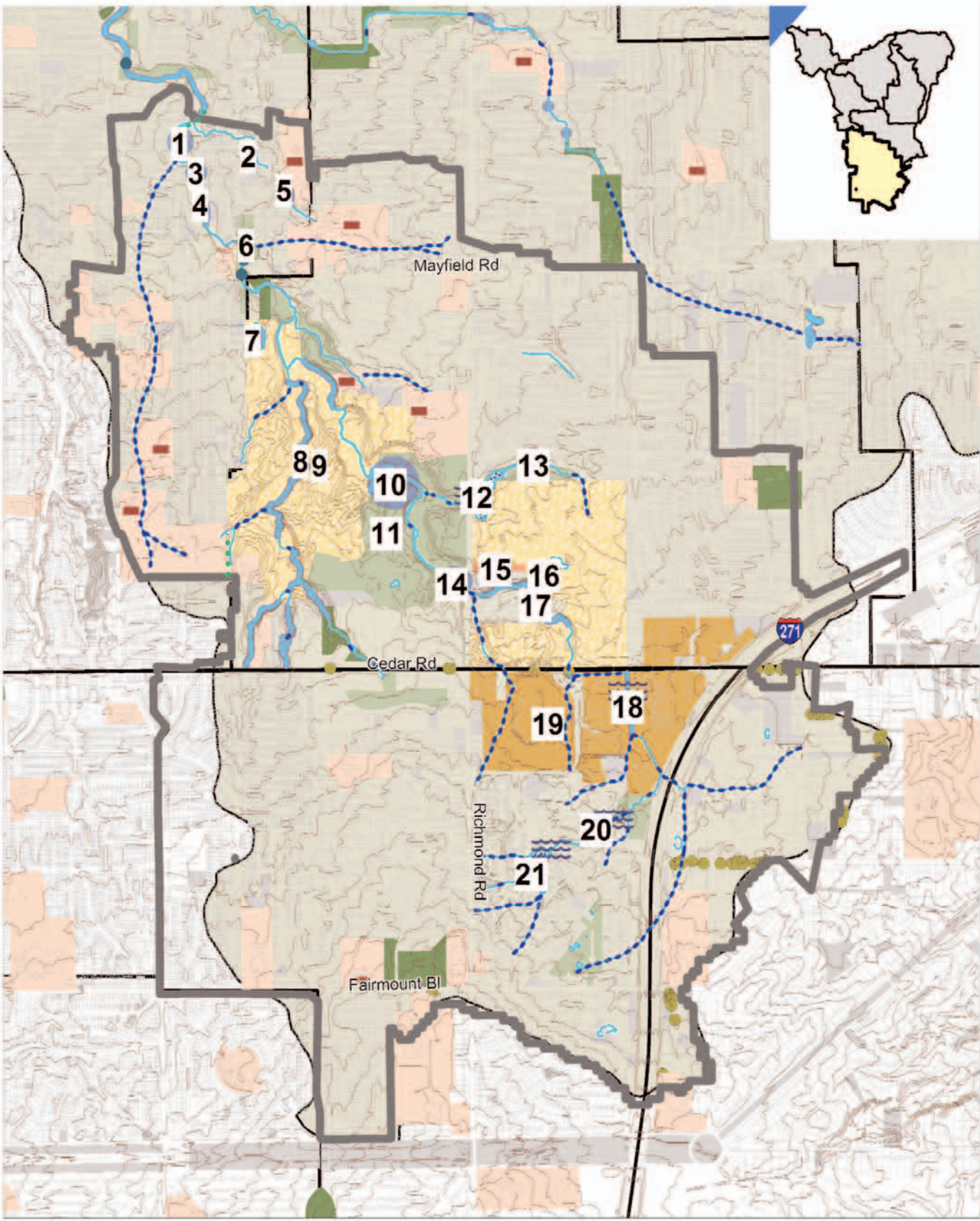
1. Maintain floodplain on stream segment south of Mayfield Road.
2. Preserve open space in neighborhood developments, especially where stream crosses property.
3. Protect stream corridor within and around Mayfield Country Club and Acacia Golf Course.
4. If Mayfield or Acacia Country Clubs cease operations, then these areas should be protected as open space due to their large size (208 acres and 172 respectively). These properties have the ideal location for a park: unique topography, existing trails nearby, and compatible surrounding land use (smaller municipal and private open space).

**Restoration Measures:**

5. Enhance riparian corridors within Mayfield Country Club and Acacia Golf Course, stream segments adjacent to Interstate 271, and on residential and school property north of Mayfield Road (e.g., plant trees, eliminate hard armoring, develop floodplain).
6. Consider the feasibility of daylighting the stretch of Euclid Creek on the Regina High School and Greenview Upper Elementary School properties. This could become a demonstration site as well as an opportunity to enhance the science curriculum.
7. Encourage infiltration and other stormwater management practices (e.g., green roofs, bioswales, etc.) in highly impervious areas near Beachwood Place and Legacy Village.



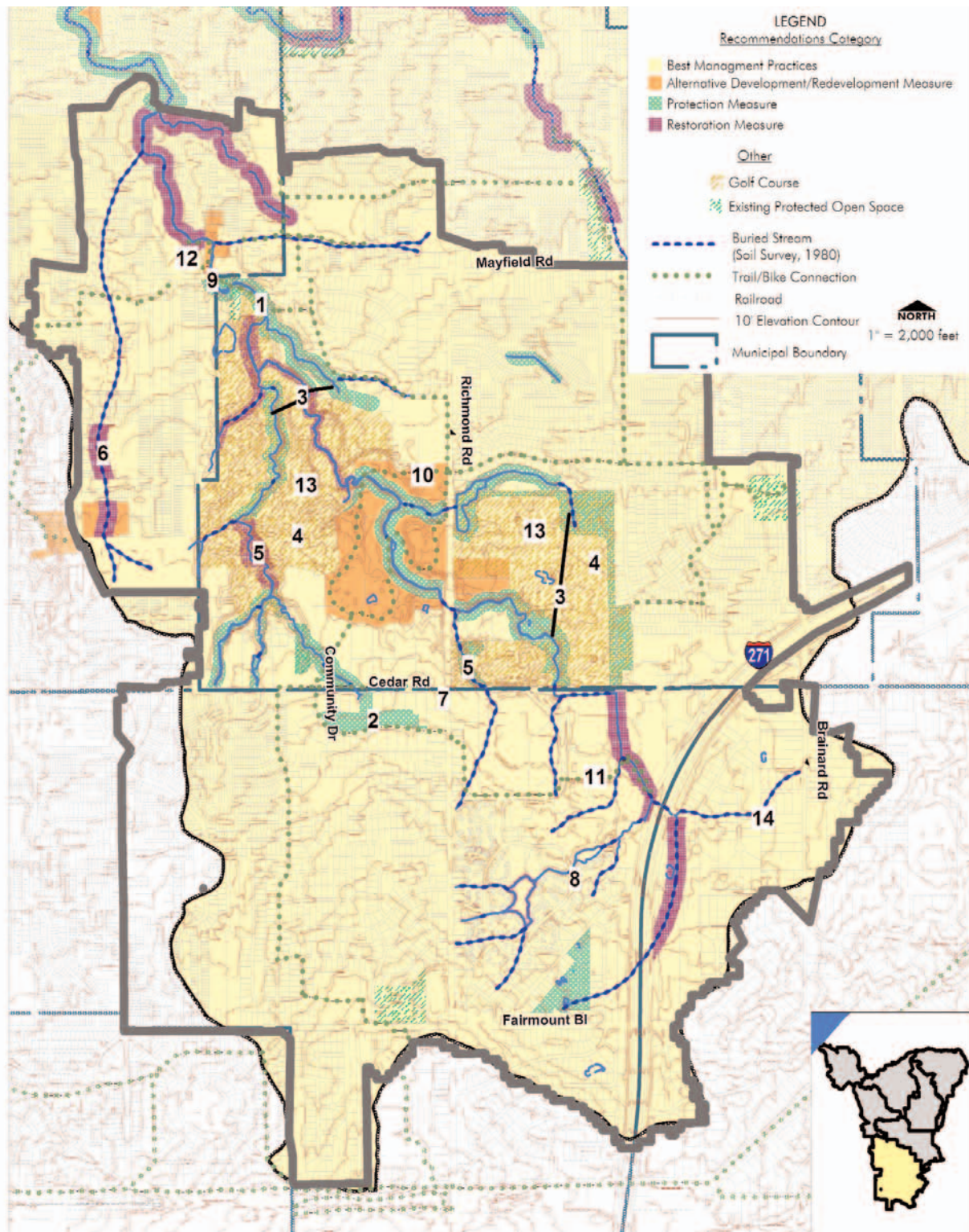
Figure 6.7 Cedar/Mayfield Highlands Subwatershed Existing Conditions



Cedar/Mayfield Highlands Subwatershed - Existing Conditions





**Figure 6.7.1** Cedar/Mayfield Highlands Subwatershed Recommendations

8. Determine possibility of removing the low head dams within the upper reaches of the subwatershed.

*Future Development/Redevelopment Measures:*

9. Improve lighting and wall amenities on Mayfield Road Bridge over Euclid Creek; ensure minimal impact to stream system.
10. Make connections between existing community parks, open space, and community centers via trails or bikeways. Example: Connect the existing trails on the TRW property north to South Euclid City Center and south to Legacy Village and Beachwood Place.
11. Design pedestrian walks that connect high density residential area east of Beachwood Place to retail properties.

*Best Management Practice Measures:*

12. Utilize the close proximity of the South Euclid-Lyndhurst Library to the creek; interpret the historical and environmental aspects of the watershed to library patrons.
13. Encourage sustainable resource management programs on golf courses (e.g., Audubon Cooperative Sanctuary Program for Golf Courses).
14. Reduce/eliminate failing septic systems in Pepper Pike area.



More detailed plans have been developed for a select number of sites in the watershed in order to demonstrate the applicability of many of the recommendations in the plan. The drawings help illustrate a vision for future improvements and practices that are appropriate for many sites in the watershed.

### East 185th Street

The interchange of I-90 and East 185th Street has great potential as the gateway to the watershed. The ease of access for thousands of visitors for shopping, dining and recreation is an unrealized asset. This area affords the opportunity to market Euclid Creek as an amenity to the community; whether a person is visiting, working or living in the watershed. The following sketch is one depiction of how this area might look in the future. Several ideas have been highlighted to show recreational opportunities, economic development, quality of life benefits, social resources, and sustainable land management. **See Figure 7.0.**

### Mayfair Site

This site is located off Cary Jay Boulevard in Richmond Heights. When the property was developed, a dam was placed within the stream to create a pond. This rendering shows how the site might look if the dam was removed and the stream's natural pattern was restored. Once rehabilitated, this headwater stream will naturally provide several important functions (e.g. sediment control, nutrient control, flood control, habitat, and water and food supply). **See Figure 7.1.**

### Beachwood Place

Beachwood Place and its surrounding properties primarily consist of impervious surface. This land has been significantly altered from its natural state. The following drawing shows alternative land management strategies such as porous pavement, bioswales, green roofs, etc. These practices promote the absorption of water by soil which helps to minimize the amount of runoff from the site. Improved pedestrian connections between

Beachwood Place and the surrounding residential communities will also create an environment that will encourage more walking and bike riding.

**See Figure 7.2.**

### Lakeshore Boulevard

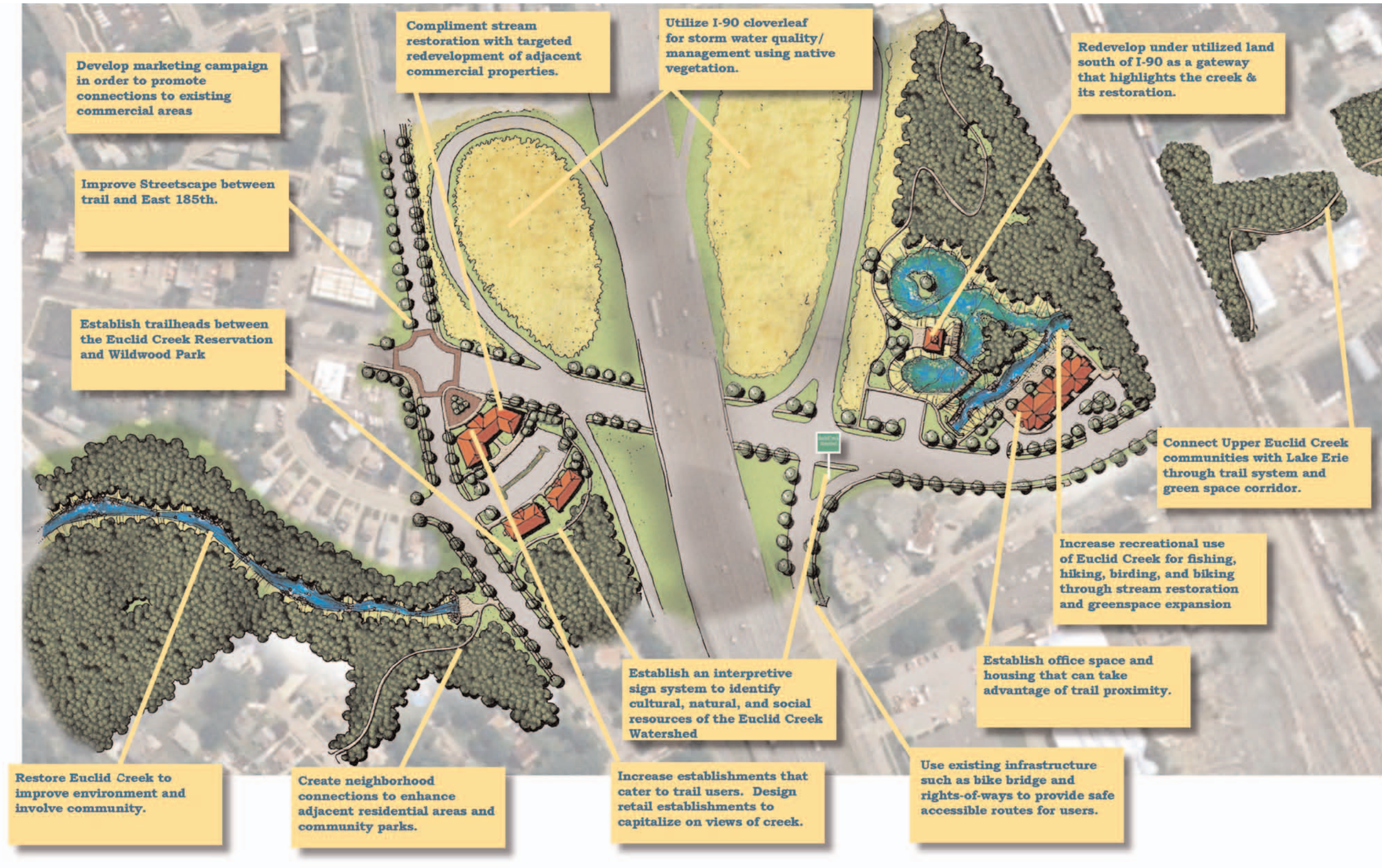
Euclid Creek is an amenity that can add value to development or redevelopment projects. Orienting buildings to take advantage of the views of the creek and providing public access along the creek will increase the desirability of the project as well as the larger neighborhood. The benefits are increased when restoration of the creek is part of the larger plan. The site plan shows how a section of Lakeshore Boulevard, consisting of a few small apartment buildings with parking lots sited along the creek, could be redeveloped with townhouses.

**See Figure 7.3.**

Euclid Creek is worth preserving and restoring. Although considered an urban watershed, the Euclid Creek Watershed has the potential to conquer the typical urban versus natural resource battle using many of the techniques discussed in this document. Working collaboratively, each community can help make this watershed a destination as well as increase the overall quality of life of its residents.



Figure 7.0 East 185th Street Interchange

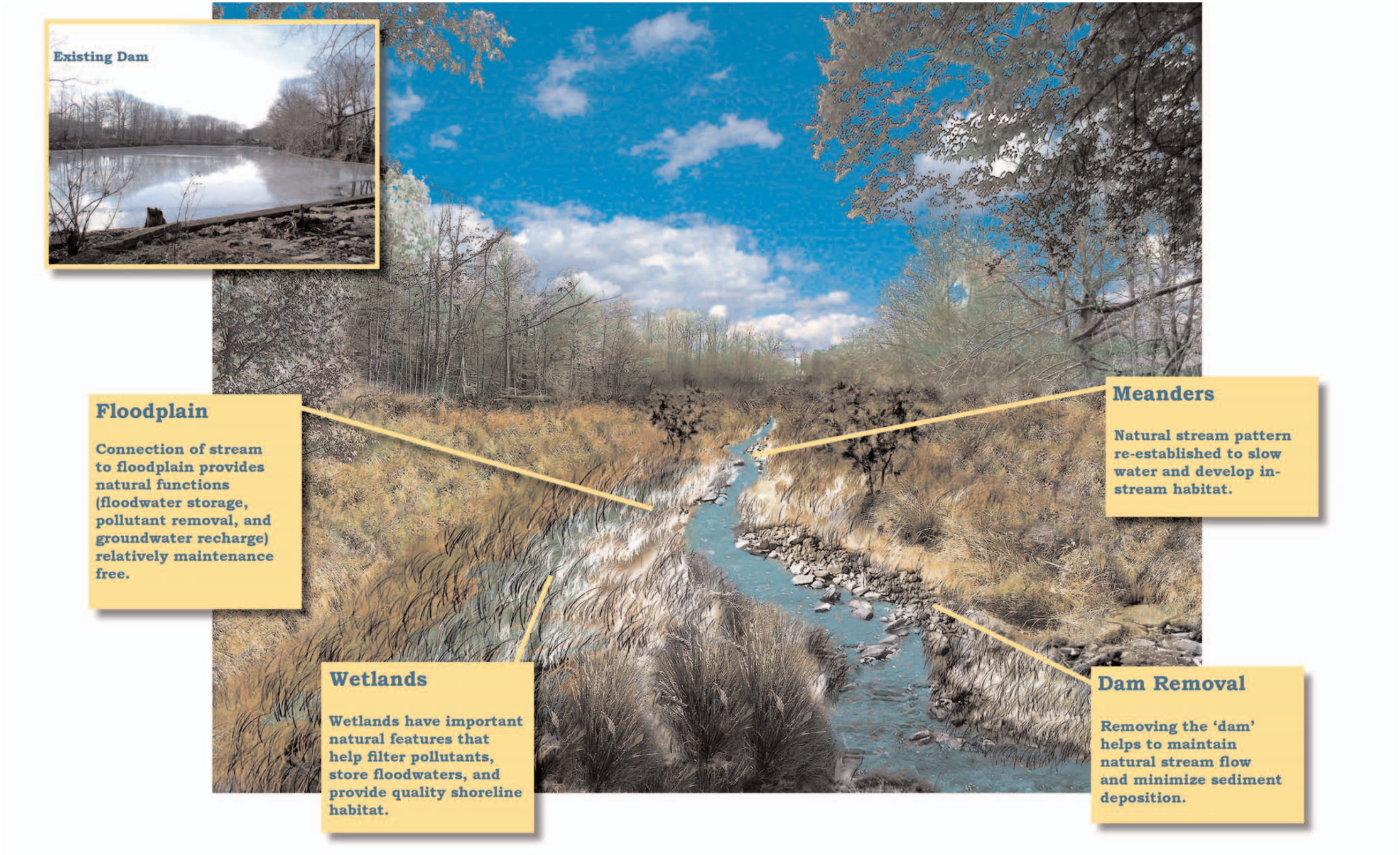


Recommendations for improving the East 185th Street/I-90 Interchange as a gateway to the Euclid Creek Watershed.

SOURCE: Kerr-Boron Associates, Inc



Figure 7.1 Mayfair Site

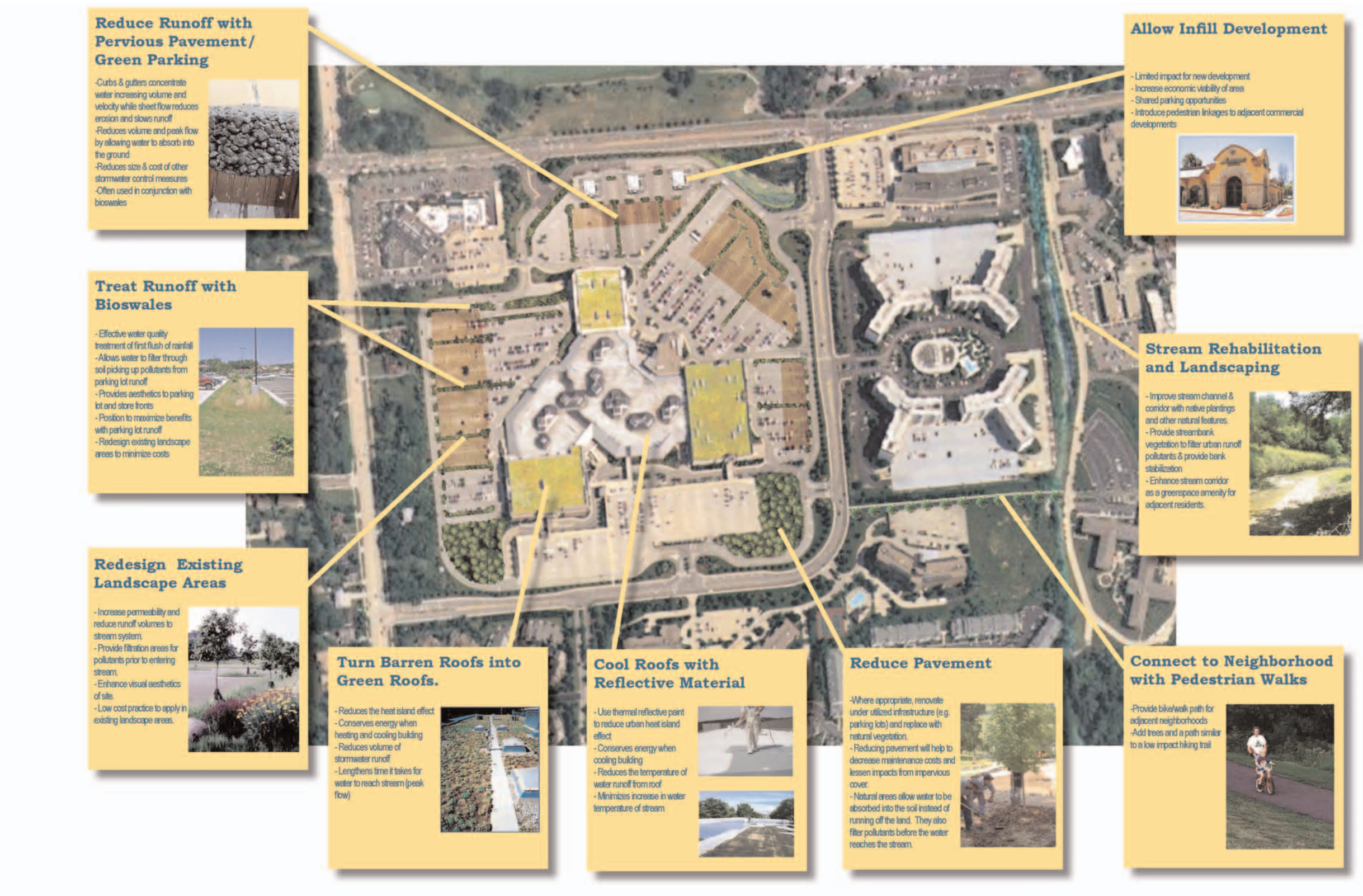


Recommendations for environmental restoration at the former Mayfair Club site.

SOURCE: Kerr-Boron Associates, Inc



Figure 7.2 Beachwood Place

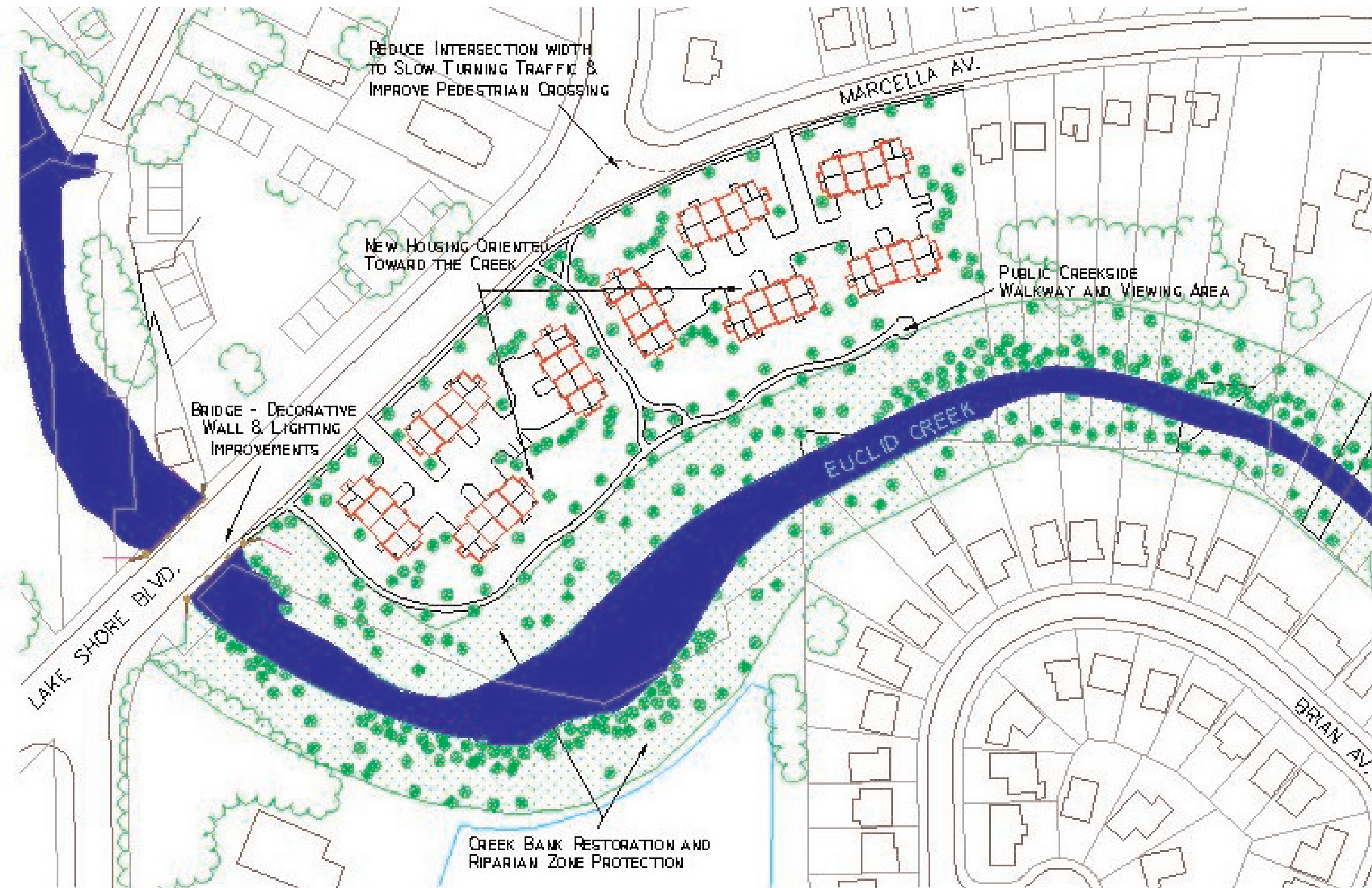


Recommendations for making Beachwood Place more environmentally and pedestrian friendly.

SOURCE: Kerr-Boron Associates, Inc



Figure 7.3 Lakeshore Boulevard Site Plan



Example of redevelopment that takes advantage of creekside location.

### Prioritizing

Prioritizing the various recommendations listed previously is a critical next step. The complexity of watershed-scale strategies often results in a number of varying approaches as technical, economic, and policy considerations are debated. Cleveland State University Center for Environmental Science, Technology and Policy has offered to assist the Euclid Creek Watershed Council in a decision-making process. They will develop a computer model which will optimize the selection and allocation of best management practices throughout the watershed. This project will help to identify both the technically efficient choices to improve water quality as well as the institutional mechanisms for cost allocation and financing for any watershed strategy. As part of this effort, the Watershed Council has the opportunity to serve as an example of cooperative, watershed-based water quality management for all urban watersheds in Northeastern Ohio.

### Developing a Strategy

In order to help facilitate the process mentioned previously, the following goals have been identified in the following table. Several activities for each goal have been developed as possible steps to take in implementing the recommendations of this plan. Resources such as partnering agencies and/or grant programs have been highlighted. Appendix H has further information on maximizing dollars spent within the watershed. In addition, targets for each of these goals are mentioned to help develop a system of checks and balances. These tables can be used as the Watershed Council begins to make decisions on the best management practices to be implemented throughout the watershed,



Goal	Activities	Time Frame	Resources	Targets
<b>Protection Measures</b>				
Conservation Easements	<ul style="list-style-type: none"> <li>-Mapping to identify property owners</li> <li>-Educate property owners and public officials</li> <li>-Develop a program to assess and maintain easements</li> <li>-Provide incentives to landowners</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•Cuyahoga Soil and Water Conservation District (SWCD)</li> <li>•National Resource Conservation Service</li> <li>•Northeast Ohio Land Conservancy</li> <li>•All Euclid Creek Communities</li> </ul>	Number of materials sent to property owners  Number of acres established as an easement
Land Acquisition	<ul style="list-style-type: none"> <li>-Identify priority properties with Euclid Creek Communities and Friends of Euclid Creek</li> <li>-Develop a program to access property</li> <li>-Identify long term maintenance</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•Trust for Public Land</li> <li>•Friends of Euclid Creek</li> <li>•All Euclid Creek Communities</li> <li>•Cuyahoga SWCD</li> <li>•Cleveland Metroparks</li> <li>•Clean Ohio Fund</li> <li>•ODNR Coastal Management Program</li> </ul>	Number of acres acquired
Riparian, Wetland, & Steep Slope Setbacks	<ul style="list-style-type: none"> <li>-Educate communities about importance of these areas</li> <li>-Map setbacks</li> <li>-Develop and adopt ordinances</li> </ul>	Completion by 2008	<ul style="list-style-type: none"> <li>•Cuyahoga SWCD</li> <li>•All Euclid Creek Communities</li> <li>•Cuyahoga County Planning Commission</li> <li>•Local Law Directors</li> <li>•Northeast Ohio Areawide Coordinating Agency Model Ordinances</li> </ul>	Number of communities adopting ordinances  Number of miles/acres protected
<b>Restoration Measures</b>				
Wetland/Stream Mitigation Banks	<ul style="list-style-type: none"> <li>-Identify wetland/ stream protection and restoration areas</li> <li>-Develop a program for wetland and stream banking</li> <li>-Promote to developers and property owners</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•Ohio Environmental Protection Agency (OEPA)</li> <li>•Lake Erie Protection Fund</li> <li>•All Euclid Creek Communities</li> <li>•Cuyahoga SWCD</li> <li>•Cuyahoga RAP</li> <li>•Northeast Ohio Regional Sewer District (NEORS)</li> </ul>	Number of acres/miles protected or restored
Dam Removal	<ul style="list-style-type: none"> <li>-Assess for feasibility of design and construction for removal</li> </ul>	Begin 2005	<ul style="list-style-type: none"> <li>•Lake Erie Protection Fund</li> <li>•319 Funding</li> <li>•Great Lakes National Program Office</li> <li>•ODNR Coastal Management Program</li> <li>•United States Army Corps of Engineers</li> </ul>	Number of dams removed  Diversity of fish population
Channel Restoration	<ul style="list-style-type: none"> <li>-Identify areas in need of restoration</li> <li>-Develop a program for restoration (focus on headwaters)</li> <li>-Determine appropriate practice for rehabilitation</li> </ul>	Begin 2005	<ul style="list-style-type: none"> <li>•United States Environmental Protection Agency (USEPA)</li> <li>•OEPA</li> <li>•Cuyahoga SWCD</li> <li>•Local Universities</li> <li>•All Euclid Creek Communities</li> <li>•NEORS</li> </ul>	Number of miles restored
Detention Basin Retrofits	<ul style="list-style-type: none"> <li>-Identify detention basins in watershed</li> <li>-Assess feasibility of retrofit</li> <li>-Develop a demonstration project</li> <li>-Sample water before and after to see results</li> </ul>	Begin 2005	<ul style="list-style-type: none"> <li>•USEPA</li> <li>•OEPA</li> <li>•All Euclid Creek Communities</li> <li>•Cuyahoga SWCD</li> <li>•NEORS</li> </ul>	Number of ponds retrofitted  Results of water sampling

Goal	Activities	Time Frame	Resources	Targets
<b>Restoration Measures</b>				
Daylighting Stream Channels	-Assess feasibility and benefit of daylighting stream -Develop a demonstration project	Begin 2006	•USEPA •OEPA •All Euclid Creek Communities •Cuyahoga SWCD •NEORS	Number of miles daylighted  Diversity of fish/bug populations
Invasive Species Removal & Tree Planting	-Identify areas of invasive species -Use Wildwood State Park as a demonstration project -Plant native vegetation as needed	Begin 2005	•All Euclid Creek Communities •Cuyahoga SWCD •Wild Ones •Friends of Euclid Creek	Re-growth of natural vegetation
<b>Future Development/ Redevelopment Measures</b>				
Low Impact Development & Conservation Design	-Educate public officials and developers on LID practices (create guidance material/document) -Update ordinances to accommodate practices	On-going	•All Euclid Creek Communities •Cuyahoga SWCD •Cuyahoga County Planning Commission •OEPA	Number of sites using LID practices
Green Building	-Educate developers and contractors on green building practices -Update codes and ordinances to accommodate techniques -Develop a demonstration site	On-going	•All Euclid Creek Communities •Cuyahoga SWCD •USEPA •Green Building Coalition •United States Green Building Council	Number of sites using green building practices
<b>Best Management Practice Measures</b>				
Storm Water Management Best Management Practices	-Educate property owners and public officials on the various types of BMPs -Encourage use in new construction and redevelopment as part of compliance with the Phase II Program -Use CSU model to help determine appropriate and cost effective practices to benefit entire watershed	Begin 2005	•All Euclid Creek Communities •Cuyahoga SWCD •Cuyahoga County Planning Commission •OEPA •Cleveland State University	Number of stormwater practices in place  Results of water quality sampling
Pollution Prevention BMPs	-Educate the public on various maintenance practices to reduce pollution -Examine use of Audubon Certification Program -Introduce the use of ISO 14000 standards -Create demonstration projects -Encourage sustainable landscaping practices	On-going	•All Euclid Creek Communities •Cuyahoga SWCD •OEPA •Local Universities •Golf Courses •Airport •Industrial Businesses •Commercial Office Centers •Residential Property Owners	Number of sites using alternative practices  Results of water quality sampling
Illicit Discharges	-Remove/Address Failing Systems -Monitor pump stations and NPDES sites -Eliminate/Minimize CSOs -Develop a program to identify and eliminate other illicit discharges	Begin 2005	All Euclid Creek Communities OEPA Cuyahoga SWCD Cuyahoga County Board of Health NEORS	Program established  Number of reports addressed



Goal	Activities	Time Frame	Resources	Targets
Public Education	<ul style="list-style-type: none"> <li>-Continue Euclid Creek PIPE Committee</li> <li>-Develop a K-12 Education Program (hands on activities – utilize Wildwood and Euclid Reservation, develop land labs, etc.)</li> <li>-Establish a volunteer program for stewardship and monitoring</li> <li>-Develop workshops, displays, and informative articles to educate public and public officials</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•All Euclid Creek Communities</li> <li>•School Districts</li> <li>•OEPA</li> <li>•USEPA</li> <li>•ODNR</li> <li>•Ohio Environmental Education Fund</li> <li>•Ohio State University Extension</li> <li>•Foundations</li> <li>•Wild Ones</li> <li>•Environmental Clubs</li> <li>•Community Service Groups</li> <li>•Northeast Ohio Sierra Club</li> <li>•Recycling Committees</li> </ul>	<p>Programs established</p> <p>Number of people involved in volunteer program</p> <p>Number of workshops held</p>
<b>Connections</b>				
Trails/Bikeways	<ul style="list-style-type: none"> <li>- Analyze roadways for potential of restriping for bike lanes or bikeway signs</li> <li>- Work with local institutions to upgrade paths on their properties</li> <li>- Incorporate bike lanes/bridge improvements in capital improvement plans for roadways/sewer work</li> <li>- Incorporate trails where appropriate in greenspace restoration and expansion plans</li> <li>- Incorporate trails/paths as part of design of development/ redevelopment plans</li> <li>- Develop bikeway parking on selected municipal properties or as part of gateway redevelopment proposal</li> <li>- Develop brochure of biking/walking routes in the watershed w/highlights</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•County and Municipal Engineering and Planning Departments</li> <li>•Metroparks and Municipal Parks Departments</li> <li>•NOACA</li> <li>•Local Institutions</li> <li>•Local and Federal Transportation Funds</li> <li>•State and Local Trail and Greenspace Funds</li> <li>•Capital Improvement Budgets</li> <li>•Local and National Foundations</li> </ul>	<p>Development of more detailed redevelopment plans along sections of proposed trail routes</p> <p>Number of miles of new trails or bike lanes</p> <p>Number of trees planted along proposed bike routes</p> <p>Number of bike racks installed on public property or within rights-of-way</p> <p>Number of bike route brochures produced and distributed</p>
Scenic Views	<ul style="list-style-type: none"> <li>-Incorporate publicly accessible view locations on private developments through local design review/zoning procedures or tied to financial assistance</li> <li>-Incorporate scenic overlooks into capital plans for municipal/park owned properties</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•Local Planning and Architectural Review Boards</li> <li>•Metroparks and Local Communities</li> </ul>	<p>Hillside ordinances adopted which incorporate view protection requirements</p> <p>Number of overlooks established as part of park improvements</p>
Historic / Natural	<ul style="list-style-type: none"> <li>-Begin local initiatives to save selected structures that may serve as interpretive locations in the watershed</li> <li>-Develop signage system highlighting special historic/natural sites</li> <li>-Work with local historic societies to develop exterior exhibits at their facilities and at selected sites along trail routes</li> <li>-Develop brochure or book with stories of the human and natural history of the watershed with maps tying them to locations</li> </ul>	On-going	<ul style="list-style-type: none"> <li>•Local Historic Societies</li> <li>•State Historic Preservation Office</li> <li>•Cleveland Museum of Natural History</li> <li>•Cleveland Metroparks</li> <li>•All Euclid Creek Communities</li> </ul>	<p>Rehabilitate as interpretive/community center:</p> <ul style="list-style-type: none"> <li>- Humphrey Mansion</li> <li>- Blossom House</li> </ul> <p>Number of outdoor interpretive displays with natural and historical information</p> <p>Number of buildings/sites with plaques identifying them with local historical or natural significance</p>

The continued support of watershed efforts through the Euclid Creek Watershed Council and the Friends of Euclid Creek will be necessary for the future work within the watershed. Evaluating the recommendations and choosing the appropriate practices that will benefit the watershed as a whole is a challenge. Working with Cleveland State University to help prioritize and determine the practices that will fit the water quality, community economics, and local politics allows the “best fit” for the watershed. However, the implementation of various plan details will need periodic review and revision as plans become reality.



**Euclid Creek Watershed Plants  
found historically within different natural  
communities in the watershed**

*List compiled by James K. Bissell, Curator of Botany,  
Cleveland Museum of Natural History*

The beach at the mouth of Euclid Creek would have been similar to that found at Arcola Creek. The sandy beach shelf would contain sandbar willow, switch grass (*Panicum virgatum*), Canada wild rye (*Elymus canadensis*), sea rocket, purple sand grass, evening primroses, and common milkweed.

The Marsh directly behind the beach would have been dominated by greater bur-reed (*Sparganium eurycarpum*), soft stem bulrush, common arrowhead, water smartweed, swamp rose mallow, pink smartweed, yellow water lily, pickerel weed, arrow arum, and blue flag (*Iris virginica*).

Inland from the non-persistent greater bur-reed marsh, Mixed Shrub Swamp dominated by buttonbush, silky dogwood, northern arrow-wood viburnum, swamp rose, heart-leaf willow, pussy willow, black willow and meadowsweet were present along the shallow-water shoreline of Euclid Creek Riverine Marsh.

Silver Maple-Red Ash-American Elm-Black Walnut Floodplain Forest covered the low floodplain terraces along lower Euclid Creek. Other trees present within the floodplain forest were American sycamore, bitternut hickory, eastern cottonwood, box-elder, and black willow.

Bluff rims along both the lake bluff and valley wall bluffs at Euclid Creek would include a great diversity of understory species, such as wreath goldenrod, white snakeroot, heartleaf aster, and zigzag aster. The area would have been an Oak Chestnut Forest, dominated by flowering dogwood, pignut hickory, hop hornbeam, shagbark hickory, red, black and white oaks and American chestnut.

Higher terraces and lower valley slopes of the lower section of Euclid Creek Valley would have been covered by Mixed Mesophytic Forest with several dominants, including sugar maple, American beech, red maple, tulip, red oak, black cherry, white ash, basswood, cucumber magnolia, American elm, red elm, pawpaw, bitternut hickory, and shagbark hickory.

### Bush Honeysuckles

*Lonicera maackii*, *L. tatarica*, *L. morrowii*  
Amur, Tatarian, Morrow honeysuckle

**Description:** These upright shrubs can grow 6-15 feet in height. Each have dark green, egg-shaped leaves. The tubular flowers are white on the Amur and the Morrow (changing to yellow with age), and pink on the Tatarian honeysuckle. Berries range from red to orange, occasionally yellow, and are eaten and dispersed by birds.



John Watts

Amur honeysuckle in fruit

**Habitat:** The bush honeysuckles inhabit abandoned fields, roadsides, woodlands, and edges of marshes. Morrow is currently a problem in northern Ohio; Amur is found mostly in southwestern Ohio, and Tatarian is widespread in Ohio.

**Management:** The best control method is to cut and treat stumps with systemic herbicide. Sprouts from cut stems may be treated with a foliar application of systemic herbicide. Young shrubs are easy to pull or dig up. Be aware there is a native bush honeysuckle (*Dierilla lonicera*) in Ohio.

#### Native Alternatives:

Nine-bark (*Physocarpus opulifolius*), dogwoods (*Cornus racemosa*, *C. amomum*), northern arrowwood (*Viburnum dentatum*), winterberry (*Ilex verticillata*), chokeberry (*Aronia prunifolia*, *A. melanocarpa*), and spicebush (*Lindera benzoin*)



Division photo







Tatarian honeysuckle



Division photo

Morrow honeysuckle

### What You Can Do To Help:

-  Spread the word about the threats of invasive plants in Ohio and the benefits provided by native plant communities.
-  Familiarize yourself with the invasive plants in your area and report infestations to the nearest land-managing agency or extension service.
-  Be careful not to gather and transport unidentified seeds which may spread invasive plants.
-  Volunteer with your local land-managing agency (parks, nature preserves, hiking trails) to help control invasive plants.
-  Plant native or non-invasive plants in your yard and garden; eradicate invasive plants on your property.
-  Encourage nurseries to avoid invasive non-native plants and stock alternative native or non-invasive plant species.

### For More Information, Contact:

Ohio Department of Natural Resources  
Division of Natural Areas & Preserves  
1889 Fountain Square Court  
Columbus, Ohio 43224  
614/265-6453



The Nature Conservancy  
6375 Riverside Drive  
Dublin, Ohio 43017  
614/717-2770

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## FIGHTING INVASIVE PLANTS IN OHIO



Division photo

Garlic mustard

Purple loosestrife

Tim Daniel



## Ohio's Most Invasive Plants

Of the approximately 3,000 species of plants known to occur in the wild in Ohio, about 75 percent are native or occurred in Ohio before the time of substantial European settlement, about 1750. The other 25 percent, between 700-800 species, are not native to Ohio, having been introduced from other states or countries. Most of these species never stray far from where they are introduced (gardens, urban areas, agricultural fields), yet some become very invasive and displace native plants in woodlands, wetlands, prairies, and other natural areas. Non-native plants have been introduced for erosion control, horticulture, forage crops, medicinal use, and wildlife foods as well as simply by accident.

Sometimes we plant invasive non-native plants for landscaping or wildlife habitat without realizing the problems they may cause when they escape into natural areas. Without natural predators or controls, invasive non-native plants are able to spread quickly and force out native plants. In Ohio, several invasive plants are invading woodlands and displacing native spring wildflowers. Other invasive plants are impacting our wetlands by creating monocultures. Native plant diversity is important for wildlife habitat as many animals depend on a variety of native plants for food and cover.

This brochure describes 10 of the most invasive non-native plant species in Ohio with information about their appearance, habitat, possible controls, and native species which can be used as alternatives in garden or wildlife plantings. Be aware that management of these invasive species is difficult and complex; obtain more detailed information before using controls such as herbicides.



Japanese knotweed

Jim Stahl

## Japanese Honeysuckle

*Lonicera japonica*

**Description:** Japanese honeysuckle is a woody semi-evergreen vine with opposite, oval leaves. The flowers grow in pairs, are white to yellow, and very fragrant. Fruits, also in pairs, are purple to black berries. This vine climbs and drapes over native vegetation, forming dense patches.

**Habitat:** Japanese honeysuckle thrives in disturbed habitats, such as roadsides, trails, fencerows, abandoned fields, and forest edges, primarily in southern Ohio. Disturbances, such as logging, road building, floods, and windstorms, create an opportunity for this vine to invade native plant communities.

**Management:** Burning in combination with systemic herbicide application may be an effective control method. Herbicides can be applied to the leaves when native plants are dormant. Be aware there are native climbing honeysuckles in Ohio, such as wild honeysuckle (*Lonicera dioica*).

**Native Alternatives:** Virginia creeper (*Parthenocissus quinquefolia*), wild honeysuckle (*Lonicera dioica*), and virgin's bower (*Clematis virginiana*)



Japanese honeysuckle

Division photo



Autumn olive

Division photo

## Japanese Knotweed

*Polygonum cuspidatum*

**Description:** This shrub-like herb grows up to 10 feet tall. Stems are smooth and the pointed leaves vary from broadly oval to almost triangular. Flowers are greenish-white and very small. The seeds are dispersed by wind. Once established, the plants spread by a system of underground stems reaching 60 feet.

**Habitat:** Japanese knotweed can grow in a wide variety of habitats. It is found in open areas, such as roadsides, streambanks, and woodland edges, primarily in eastern Ohio. It spreads quickly and forms dense thickets.

**Management:** Knotweed is very difficult to control. Leaves may be sprayed or stems cut and treated with systemic herbicide.

**Native Alternatives:** Japanese knotweed is not generally planted, however consider using northern arrowwood (*Viburnum dentatum*), black haw (*Viburnum prunifolium*), dogwoods (*Cornus racemosa*, *C. amomum*), and chokeberry (*Aronia prunifolia*, *A. melanocarpa*)

## Autumn-olive

*Elaeagnus umbellata*

**Description:** Autumn-olive is a fast-growing shrub or small tree reaching up to 20 feet tall. Its leaves are small and oval, dark green on the upper surface and silvery below. Small coppery dots occur on stems and leaves. This shrub has light yellow, aromatic flowers and produces large quantities of small, round red fruits that are readily eaten and spread by birds.

**Habitat:** Autumn-olive can survive in very poor soils because of its nitrogen-fixing root nodules. It grows in disturbed areas, roadsides, pastures, and fields throughout Ohio.

**Management:** Stems may be cut and treated with systemic herbicide. Resprouting will occur, so follow-up control is necessary. A combination of hand-pulling, digging and herbicide treatments is usually necessary.

**Native Alternatives:** Black haw (*Viburnum prunifolium*), dogwoods (*Cornus racemosa*, *C. amomum*), paw-paw (*Asimina triloba*), and spicebush (*Lindera benzoin*)



### Reed Canary Grass

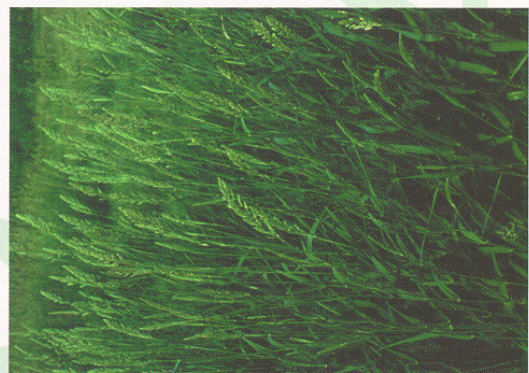
*Phalaris arundinacea*

**Description:** This large, coarse grass reaches 2-5 feet tall. The hairless stems gradually taper to flat and rough leaf blades 3-10 inches long. The flowers occur in dense clusters and are green to purple, changing to beige and becoming more open over time. The plant spreads aggressively both by seed and by forming a thick system of underground stems (rhizomes).

**Habitat:** This grass occurs in wetlands, such as marshes, wet prairies, meadows, fens, stream banks, and seasonally wet areas throughout Ohio. Reed canary grass has been planted widely for forage and erosion control. Native strains possibly occur, however introduced strains are thought to be more invasive. There is no reliable method to visually tell the two strains apart.

**Management:** A combination of burning or mowing with systemic herbicides is the best method of control; grass-specific herbicides applied with wick applicators are recommended in areas where native plants occur.

**Native Alternatives:** Prairie cord grass (*Spartina pectinata*), Canada bluejoint (*Calamagrostis canadensis*), and Indian grass (*Sorghastrum nutans*)



Reed canary grass

John Watts



Garlic mustard

Division photo



Garlic mustard

Division photo

### Garlic Mustard

*Alliaria petiolata*

**Description:** Garlic mustard is a biennial herb; it begins as a rosette of leaves in the first year, overwinters as a green rosette of leaves, flowers, and fruits in the second year, and then dies. First-year rosettes consist of kidney-shaped, garlic-smelling leaves; the second-year plant grows a stem up to 4 feet tall with triangular, sharply-toothed leaves. The small, four-petaled flowers are white and grow in clusters at the top of the stem. Garlic mustard produces large quantities of seeds which can remain viable for seven years or more.

**Habitat:** This woodland plant prefers some shade but is occasionally found in full sun. It invades upland and floodplain forests, savannas, yards, streams, trails, and roadsides throughout Ohio.

**Management:** Repeated prescribed burns in oak forests may be effective. Light infestations of garlic mustard can be hand pulled before or at flowering time. Plants should be removed from the site after pulling as the seeds may continue to mature. Systemic herbicides can be applied to the rosettes in early spring or late fall.

**Native Alternatives:** Garlic mustard is not generally planted, however consider using white baneberry (*Actaea pachyphloia*), columbine (*Aquilegia canadensis*), blue phlox (*Phlox divaricata*), and black cohosh (*Cimicifuga racemosa*)

### Multiflora Rose

*Rosa multiflora*

**Description:** Multiflora rose is a dense spreading shrub with widely arching canes and stiff, curved thorns. This shrub grows up to 15 feet tall with alternate, compound leaves of 7-9 oval leaflets.

Multiflora rose has numerous white flowers that produce clusters of small, red fruits. The fruits (called hips) are eaten by birds and mammals which help disperse the seeds. An individual plant can produce up to 500,000 seeds per year.

**Habitat:** Multiflora rose was formerly planted as a "living fence" to control livestock, stabilize soil and create barriers for roadways. It has also been planted as a wildlife cover and food source. This rose occurs in a wide range of habitats throughout Ohio, but prefers sunny areas with well-drained soils.

**Management:** A long-term management program of mowing or cutting and treating stems with systemic herbicide several times during the growing season is recommended. Digging or hand-pulling small shrubs may also be effective.

**Native Alternatives:** Pasture rose (*Rosa carolina*), swamp rose (*Rosa palustris*), stepple bush (*Spiraea tomentosa*), meadowsweet (*Spiraea alba*), and prairie rose (*Rosa setigera*)



Multiflora rose

Division photo



## Buckthorns

*Rhamnus frangula*, *R. cathartica*

Glossy (or Shining), European (or Common) buckthorn

**Description:** Buckthorns are tall shrubs or small trees that grow up to 20 feet tall. The smooth, gray to brown bark is distinctively spotted. Glossy buckthorn has shiny leaves with smooth edges. It has solitary red to purple berry-like fruits. European buckthorn has black fruits and dull green smooth leaves. Both species are abundant seed producers.

**Habitat:** Glossy buckthorn usually occurs in wetlands, such as fens or bogs, but it is also found in forests, fencerows, edges, prairies, and old fields. European buckthorn occurs in a range of upland habitats, such as forests, woodland edges, fencerows, prairies, and old fields. Both species are most prevalent in central and northern Ohio.

**Management:** Cutting and treating stumps with systemic herbicide is the best method of control. Buckthorns are very difficult to control due to vigorous resprouting and a large seedbank.

**Native Alternatives:** Winterberry (*Ilex verticillata*), dogwoods (*Cornus racemosa*, *C. amomum*), white cedar (*Thuja occidentalis*), and Carolina buckthorn (*Rhamnus caroliniana*)



European buckthorn

Division photo



Glossy buckthorn

Division photo



Purple loosestrife

Division photo

## Purple Loosestrife

*Lythrum salicaria*

**Description:** This popular garden flower grows 3-7 feet tall and has a dense bushy growth of 1-50 stems. Long spikes of flowers are purple to magenta; linear-shaped leaves grow opposite along the square stems. Purple loosestrife spreads aggressively by underground stems (rhizomes) and can produce as much as a million seeds per plant. Supposedly sterile strains of *L. virgatum* will outcross with this plant and produce seeds.

**Habitat:** Purple loosestrife grows in a variety of wetland habitats including marshes, river banks, ditches, wet meadows, and edges of water bodies, primarily in northern Ohio. Loosestrife can invade both natural and disturbed wetlands, replacing native vegetation with nearly pure stands of loosestrife.

**Management:** Small stands of purple loosestrife can be controlled by hand-pulling, digging, or applying systemic herbicides to the foliage. Herbicides may be used to control large populations. Biological controls using insects are being researched in Ohio and other states and may be helpful in reducing infestations.

**Native Alternatives:** Spiked blazing-star (*Liatris spicata*), blue lobelia (*Lobelia siphilitica*), cardinal flower (*Lobelia cardinalis*), rose mallow (*Hibiscus moscheutos*), and blue flag iris (*Iris versicolor*)

## Common Reed Grass

*Phragmites australis*

**Description:** Common reed, or Phragmites, is a grass that reaches up to 15 feet in height. The leaves are smooth, stiff and wide with coarse hollow stems. The big, plume-like flower head is grayish-purple when in fruit. Common reed spreads mostly vegetatively forming huge colonies by sprouting new shoots through underground stems (rhizomes).

**Habitat:** Common reed grows in open wetland habitats and ditches primarily in northern Ohio. It occurs in still water areas of marshes, lake shores, riverbanks, and disturbed or polluted soils, often creating pure stands. It is possible that both native and non-native strains occur. Some populations are more invasive than others and may be non-native, however there is no reliable method to visually tell the two apart.

**Management:** Long-term management is necessary for control of this persistent plant. Cutting and/or treating stems with systemic herbicides is generally the most effective method; grass-specific herbicides are recommended in areas where native plants occur.

**Native Alternatives:** Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), prairie cord grass (*Spartina pectinata*), and Canada bluejoint (*Calamagrostis canadensis*)



Common reed

Division photo



## ODNR Invasive Species List

**Targeted Species (13)**

<a href="#"><u>Garlic mustard (<i>Alliaria petiolata</i>)</u></a>	<a href="#"><u>Reed canary grass (<i>Phalaris arundinacea</i>)</u></a>
<a href="#"><u>Autumn olive (<i>Elaeagnus umbellata</i>)</u></a>	<a href="#"><u>Reed grass (<i>Phragmites australis</i>)</u></a>
<a href="#"><u>Japanese honeysuckle (<i>Lonicera japonica</i>)</u></a>	<a href="#"><u>Japanese knotweed (<i>Polygonum cuspidatum</i>)</u></a>
<a href="#"><u>Amur honeysuckle (<i>Lonicera maackii</i>)</u></a>	<a href="#"><u>European buckthorn (<i>Rhamnus cathartica</i>)</u></a>
<a href="#"><u>Morrow honeysuckle (<i>Lonicera morrowii</i>)</u></a>	<a href="#"><u>Glossy buckthorn (<i>Rhamnus frangula</i>)</u></a>
<a href="#"><u>Tatarian honeysuckle (<i>Lonicera tatarica</i>)</u></a>	<a href="#"><u>Multiflora rose (<i>Rosa multiflora</i>)</u></a>
<a href="#"><u>Purple loosestrife (<i>Lythrum salicaria</i>)</u></a>	

**Well-established Species (38)**

<a href="#"><u>Quack grass (<i>Agropyron repens</i>)</u></a>	<a href="#"><u>Meadow fescue (<i>Festuca pratensis</i>)</u></a>
<a href="#"><u>Tree-of-heaven (<i>Ailanthus altissima</i>)</u></a>	<a href="#"><u>Day-lily (<i>Heimerocallis fulva</i>)</u></a>
<a href="#"><u>Japanese barberry (<i>Berberis thunbergii</i>)</u></a>	<a href="#"><u>Dame's rocket (<i>Hesperis matronalis</i>)</u></a>
<a href="#"><u>Smooth brome (<i>Bromus inermis</i>)</u></a>	<a href="#"><u>Yellow flag (<i>Iris pseudacorus</i>)</u></a>
<a href="#"><u>Flowering-rush (<i>Butomus umbellatus</i>)</u></a>	<a href="#"><u>Common privet (<i>Ligustrum vulgare</i>)</u></a>
<a href="#"><u>Asian bittersweet (<i>Celastrus orbiculatus</i>)</u></a>	<a href="#"><u>Moneywort (<i>Lysimachia nummularia</i>)</u></a>
<a href="#"><u>Canada thistle (<i>Cirsium arvense</i>)</u></a>	<a href="#"><u>White sweet-clover (<i>Melilotus alba</i>)</u></a>
<a href="#"><u>Poison hemlock (<i>Conium maculatum</i>)</u></a>	<a href="#"><u>Yellow sweet-clover (<i>Melilotus officinalis</i>)</u></a>
<a href="#"><u>Field bindweed (<i>Convolvulus arvensis</i>)</u></a>	<a href="#"><u>Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)</u></a>
<a href="#"><u>Crown-vetch (<i>Coronilla varia</i>)</u></a>	<a href="#"><u>Lesser naiad (<i>Najas minor</i>)</u></a>
<a href="#"><u>Queen Anne's lace (<i>Daucus carota</i>)</u></a>	<a href="#"><u>Water-cress (<i>Nasturtium officinale</i>)</u></a>
<a href="#"><u>Air-potato (<i>Dioscorea batatas</i>)</u></a>	<a href="#"><u>Curly pondweed (<i>Potamogeton crispus</i>)</u></a>
<a href="#"><u>Cut-leaved teasel (<i>Dipsacus laciniatus</i>)</u></a>	<a href="#"><u>Lesser celandine (<i>Ranunculus ficaria</i>)</u></a>
<a href="#"><u>Common teasel (<i>Dipsacus sylvestris</i>)</u></a>	<a href="#"><u>Bouncing Bet (<i>Saponaria officinalis</i>)</u></a>
<a href="#"><u>Russian olive (<i>Elaeagnus angustifolia</i>)</u></a>	<a href="#"><u>Johnson grass (<i>Sorghum halepense</i>)</u></a>
<a href="#"><u>Hairy willow-herb (<i>Epilobium hirsutum</i>)</u></a>	<a href="#"><u>Narrow-leaved cattail (<i>Typha angustifolia</i>)</u></a>
<a href="#"><u>Small-flowered hairy willow-herb (<i>Epilobium parviflorum</i>)</u></a>	<a href="#"><u>Hybrid cattail (<i>Typha X glauca</i>)</u></a>
<a href="#"><u>Winged euonymus (<i>Euonymus alatus</i>)</u></a>	<a href="#"><u>European cranberry-bush (<i>Viburnum opulus var. opulus</i>)</u></a>
<a href="#"><u>Wintercreeper (<i>Euonymus fortunei</i>)</u></a>	<a href="#"><u>Periwinkle (<i>Vinca minor</i>)</u></a>

**Watch List Species (14)**

<a href="#"><u>Porcelain-berry (<i>Ampelopsis brevipedunculata</i>)</u></a>	<a href="#"><u>Chinese silvergrass (<i>Miscanthus sinensis</i>)</u></a>
<a href="#"><u>Nodding thistle (<i>Carduus nutans</i>)</u></a>	<a href="#"><u>Star-of-Bethlehem (<i>Ornithogalum umbellatum</i>)</u></a>
<a href="#"><u>Spotted knapweed (<i>Centaurea maculosa</i>)</u></a>	<a href="#"><u>Mile-a-Minute (<i>Polygonum perfoliatum</i>)</u></a>
<a href="#"><u>Leafy spurge (<i>Euphorbia esula</i>)</u></a>	<a href="#"><u>Giant knotweed (<i>Polygonum sachalinense</i>)</u></a>
<a href="#"><u>Border privet (<i>Ligustrum obtusifolium</i>)</u></a>	<a href="#"><u>Kudzu (<i>Pueraria lobata</i>)</u></a>
<a href="#"><u>Showy pink honeysuckle (<i>Lonicera X bella</i>)</u></a>	<a href="#"><u>Dog rose (<i>Rosa canina</i>)</u></a>
<a href="#"><u>Nepalgrass (<i>Microstegium vimineum</i>)</u></a>	<a href="#"><u>Black swallow-wort (<i>Vincetoxicum nigrum</i>)</u></a>

## Ohio Department of Agriculture Noxious Weeds List

Wild Mustard	<i>Brassica kaber var. pinnatifida</i>
Musk Thistle (Nodding Thistle)	<i>Carduus nutans</i>
Oxeye Daisy	<i>Leucanthemum vulgare</i>
Canada Thistle	<i>Cirsium arvense</i>
Poison Hemlock	<i>Conium maculatum</i>
Wild Carrot (Queen Annes Lace)	<i>Daucus carota</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Wild Parsnip	<i>Pastinaca sativa</i>
Mile-a-Minute Weed	<i>Polygonum perfoliatum</i>
Russian Thistle	<i>Salsola iberica</i>
Cressleaf Groundsel	<i>Senecio glabellus</i>
Shattercane	<i>Sorghum bicolor</i>
Johnsongrass	<i>Sorghum halepense</i>
Grapevines (abandoned)	<i>Vitis spp.</i>



## Community Histories

The early history of each of the Euclid Creek Communities dates back to the establishment of the Western Reserve. In 1786, the State of Connecticut gave up its claims to Western lands of the United States, except for a portion of northeastern Ohio known as the Connecticut Western Reserve. Later, the land was sold to the Connecticut Land Company, which surveyed and settled the region, but the name Western Reserve continued to be used to describe the northeastern section of Ohio.

### Beachwood

One of the original townships of the Western Reserve was Warrensville. From this township came seven cities and villages, including Beachwood. The village of Beachwood was originally inhabited by merchants, tradesman, and farmers. Today it is primarily a residential community with many civic, cultural, service, and business organizations. For example, Beachwood is the home of the Cleveland College of Jewish Studies.

### Cleveland

#### Collinwood

The villages of Collinwood and Nottingham were annexed to the City of Cleveland in 1910 and 1912, respectively. This area was originally settled by farmers who planted numerous vineyards. By the 1870s, it had become the largest shipping point for grapes in the nation.

By the 1890s, the railroad yards were the basis for the areas' economic activity and growth. During World War I, many Irish, Italian, and Slovenian immigrants settled in this area. There was also a small population of African Americans who worked on the rail cars. Persons of Slovenian heritage settled north of the tracks, while persons of Italian heritage settled south of the tracks. During World War II, this area was one of the heaviest industrial areas in the world and was considered an international center for heavy manufacturing.

In the decades after WWII, the rise of freeways, and the movement of heavy industry out of the northeast and Midwest resulted in the abandonment of many rail-oriented industrial properties in Collinwood.

In 2000, the population in South Collinwood was approximately three-fourths African American and one-fourth Caucasian. The population is still quite segregated, with most African Americans living west of East 152nd Street and most Caucasians living east of East 152nd Street.

#### Euclid-Green

This neighborhood of Cleveland was originally part of the Village of Euclid. The hillside (a beach ridge) divides the neighborhood into two distinct sections. The top of this hill developed into the city's most suburban-like neighborhood, with winding streets and rolling hills in some areas. The non-white population climbed from approximately 2% in 1970 to 93% in 2000.

### Euclid

The township of Euclid was one of the first communities to be established in the Western Reserve. In the early years, the community consisted primarily of farmers growing wheat and table grapes. A short time later, the first industries included saltworks, sawmills, gristmills, and ship building.

In 1850, several railroad companies built tracks through Euclid, bringing various ethnic groups along with it. The Slovenian population was predominant in this area. Additionally, at the end of the nineteenth century, several companies began quarrying "bluestone." Bluestone is the lowest level of shale in the eastern Cuyahoga County, a 20 foot thick formation of hard blue-grey shale. In no time, Euclid became one of Cuyahoga County's major industrial cities.

### Highland Heights

Highland Heights was originally part of Mayfield Township and became a village in 1920 when the township was split into four communities. Settlement began in 1805 and was slow until the development of a plank road (1877) and the interurban railway (1899).

Slow growth allowed the city to maintain its residential character and provide 40 acres of parklands for recreational activities. Several major industrial computer and textile businesses are also present in the city.

### Lyndhurst

Lyndhurst was originally part of Euclid Township and became the village of Euclidville in 1917. It was renamed Lyndhurst in a high school contest in 1920 after Lyndhurst, New Jersey. Prior to World War I, this area was primarily settled by German immigrants as a farming town. Major growth took place after World War II. Lyndhurst is primarily residential with several retail businesses, including Legacy Village Shopping Center.

### Mayfield Heights and Mayfield Village

These cities were originally part of Mayfield Township, which was formed in 1819. Both were primarily farming, dairy, and orchard growing communities. Additionally, several mills were established throughout the area. In 1899, the Interurban car was a major form of transportation to Cleveland from this area.

In 1920, the township split into four villages; one being Mayfield Village. Although surrounded by business and industry, this community has maintained a residential character. Mayfield Village has many recreational facilities, including a golf course, a pool, and several parks. Additionally, the city has a Wetlands Preserve with a one-mile circular path.

In 1925, the southern part of Mayfield Village formed a separate unit and became Mayfield Heights. In Mayfield Heights, some of the city's first homes still stand as a reminder of its early history. The city has little industry, with the two largest employers being Hillcrest Hospital and the Mayfield Board of Education.

### Pepper Pike

Pepper Pike was originally part of Orange Township. It became a village in 1924; however, it did not become a city until 1970. For the first 100 years, this area was primarily agricultural. In the late 1880s, cheese making became the primary industry. Upper-middle income families have been attracted to this area because of its rural character, which residents have historically tried to preserve. Pepper Pike is home to Ursuline College.

### Richmond Heights

Richmond Heights was the last portion of Euclid Township to be incorporated as a village. It was originally called the village of Claribel in 1917, and one year later became Richmond Heights. Primarily vineyards and fruit orchards. There were also several types of industry that supported farming. Strangely enough, one of the major industries was charcoal pits. The charcoal produced here provided fuel for the iron industry in Cleveland. Richmond Heights was also known for its large variety of churches throughout the community.

In the late 1920s, 274 acres of land on Richmond Road was purchased by Curtiss-Wright, Inc. They built a hangar and began to develop the land as an airport. The County Commissioners eventually purchased this land and the present day Cuyahoga County Airport was opened in May of 1950.

Also in the 1920s, the Italian-American Club purchased a large parcel of land on Highland Road for picnics and outings. This property became known as the Ohio Villa. At one time, this area was considered the largest gambling establishment between New York and Chicago.



### South Euclid

South Euclid, which was originally part of Euclid Township, became a village in 1917. During the 19th century, the predominant occupation was farming. There was also a small portion of businesses located in this area that supported this industry. Following the Civil War, the grain fields were soon replaced by vineyards. In 1867, the first quarry opened along Euclid Creek. Quarrying became the major industry of this area.

Fishing in Euclid Creek was a common past time in the 1920s, until the creek became too polluted to support fish. Increased impervious areas caused more runoff and more frequent flooding. Improper or incorrect sewer connections were identified by house to house surveys in the 1950s. In 1957, a bond issue was passed to correct drainage defects and flooding. After several years of court actions, the Langerdale retention basin was finally completed in 1966. All this helped to restore the fish population in Euclid Creek. In 1969, flooding was still a concern, as “the worst deluge in 15 years” occurred.

In 1941, South Euclid became a city. The predominant ethnic groups of this area were Jewish and Italian. Several shopping centers and light industry were developed in this area following World War II. Currently the city is 98% developed, with 40 acres dedicated to city parks.

### Willoughby Hills

A fur trader outpost was set up in this area in 1754; however, the first permanent settler did not arrive until 1797. The mouth of the river was inhabited by a tribe of the Iroquois Nation and the land to the south was their hunting grounds.

Willoughby Hills was originally part of Chagrin Township and became a village in 1815. This city was named in honor of Dr. Westal Willoughby. In 1834, Dr. Willoughby headed a new medical university called Willoughby University of Lake Erie. Friction between faculty members caused

several of them to leave and start a new college in Cleveland in 1843. The competition was too strong, and in 1847, Willoughby Medical College was moved to Columbus.

# Euclid Creek Watershed Landmarks

Information provided by local historians Roy Larick and Bob Gibbons

Builder	Place Name	Type 1	Type 2	Exact	Current way	Built	HL	Municipality	Status	LID
Brewer, William	William Brewer	blacksmithy		21055	Euclid Avenue		1	Euclid	demo	1
	cemetery	cemetery	family	218	Richmond Road	1817	1	Richmond Hts.	demo	2
Euclid Society of Baptists	Euclid Baptist Society	cemetery	church	1400	Chardon Road	1825	1	Euclid	demo	3
Kellog, John	Kellog Cemetery	cemetery	family	4420	Mayfield Road	1831	1	S. Euclid	stand	4
Crosier, John	Crosier Cemetery	cemetery	family	20350	Euclid Avenue	1820	1	Euclid	demo	5
Euclid Society of Baptists	Euclid Baptist Society	church		1565	Chardon Road	1821	1	Euclid	demo	6
Euclid Methodist Meeting	Euclid Methodist meeting house	church		18355	St Clair Avenue	1828	1	Nottingham Village	demo	7
Euclid Creek Methodist Meeting	Euclid Creek Methodist Church	church		18400	Euclid Avenue	1829	1	Euclid	reloc	8
Condit, Paul P.	Farmers' Inn	hotel		19901	Euclid Avenue	1814	1	Euclid	demo	9
Farr, Abraham	Euclid House	hotel		21051	Euclid Avenue	1815	1	Euclid	demo	10
Robbins, William Sr.	William Robbins house	house		562	Richmond Road	1794	1	Richmond Hts.	demo	11
Goodman, Iliasa	Iliasa Goodman house	house		164	Brush Road	1830	1	Richmond Hts.	stand	12
Richmond, Levi	Swetland Estate	house		338	Richmond Road	1842	1	Richmond Hts.	stand	13
Mapes, Rufus	Rufus Mapes house	house		447	Miner Road	1830	1	Highland Hts	stand	14
Williams, Daniel	Daniel Williams house	house		462	Miner Road	1850	1	Highland Hts	stand	15
		house		475	Trebisky Road	1840	1	Richmond Hts.	stand	16
Stevenson, John	John Stevenson house	house		507	Richmond Road	1828	1	Richmond Hts.	stand	17
Robbins, Samuel/Sidney	Samuel Robbins house	house		562	Richmond Road	1837	1	Richmond Hts.	demo	18
Pinney, A.	A. Pinney house	house		822	Lander Road	1850	1	Highland Hts	stand	19
Quail, John	John Quail house	house		1213	Richmond Road		1	Lyndhurst		20
Parker, Percy	Percy Parker house	house		5384	Wilson Mills Rd.	1850	1	Highland Hts	demo	21
Rudd, Horace H. & Dorcas	Horace Rudd house	house		5616	Mayfield Road	1834	1	MayLynd	demo	22
Brainard,	Brainard house	house		5687	Mayfield Road	1840	1	MayLynd	demo	23
Akins, Horton P.	Horton P. Akins house	house		5990	Mayfield Road	1849	1	Mayfield Heights	demo	24
Whiting, George R.	Whiting's Corners	house		5991	Lander Road	1831	1	Mayfield Heights	demo	25
Voorhees, Abraham	Voorhees house	house	farm	19102	St. Clair	1825	1	Nottingham Village	demo	26
Dille, David	Euclid Creek Village	house		20100	Euclid Avenue	1832	1	Euclid	demo	27
Pelton, Jonathan	Jonathan Pelton house	house		24091	Chardon Road	1825	1	Euclid	stand	28
Richmond, Elihu	Elihu Richmond house	house		25625	Highland Road	1815	1	Richmond Hts.	stand	29
Marsilliot, Jacob & Leonard	Euclid Pottery	manufactory	pottery	16801	East Park Drive	1820	1	Nottingham Village	stand	30
Treat, Captain William	Treat Boatyard	manufactory		17100	Neff Road	1836	1	Nottingham Village	demo	31
Coleman, William	Coleman's mill	mill	grist	20501	Euclid Avenue	1818	1	Euclid	demo	32
Koch, Tom	Richmond	mill	saw	25217	Highland Road		1	Richmond Hts.	stand	33
Euclid Township	PSD 7 South Euclid (1st)	school	grammar	4461	Mayfield Road	1845	1	S. Euclid	demo	34
Euclid Township	PSD 4 Depot	school	grammar	19200	Nottingham Rd.		1	Nottingham Village	stand	35
	Hermle, George	blacksmithy		20971	Euclid Avenue		2	Euclid	demo	1
Cleveland Catholic Diocese	St. Paul Cemetery	cemetery	church	1231	Chardon Road	1871	2	Euclid	stand	2
St. John Lutheran	St. John Cemetery	cemetery	church	4386	Mayfield Road	1862	2	S. Euclid	stand	3
Euclid Township	Euclid Cemetery	cemetery	township	20300	Euclid Avenue	1864	2	Euclid	stand	4
Cleveland Catholic Diocese	St. Paul Church	church		1231	Chardon Road	1868	2	Euclid	stand	5
	Baptist split	church		1501	Dille Road	1858	2	Euclid	demo	6
St. John Lutheran	St. John Church (2nd)	church	Lutheran	4386	Mayfield Road	1862	2	S. Euclid	stand	7
Methodist Conference	South Euclid Methodist Church	church	Methodist	4421	Mayfield Road	1883	2	S. Euclid	demo	8
St. John Lutheran	St. John Church (1st)	church	Lutheran	4821	Mayfield Road	1853	2	S. Euclid	stand	9
Euclid Creek Methodist Meeting	Euclid Creek Methodist Church	church		21191	Euclid Avenue	1858	2	Euclid	reloc	10
	Centenary Methodist Church	church		25501	Fairmount Blvd.	1870	2	Beachwood	demo	11
Hager, John	John Hager house	house		417	Bishop Road	1853	2	Highland Hts	stand	12
Stevenson, Everett	Everett Stevenson house	house		495	Richmond Road		2	Richmond Hts.	stand	13
Stevenson, Staple	Staple Stevenson house	house		529	Richmond Road	1890	2	Richmond Hts.	stand	14
Riedel, Philip	Philip Riedel house	house		681	Bishop Road	1853	2	Highland Hts	stand	15
Spencer, George	George Spencer house	house		933	Richmond Road	1855	2	Lyndhurst	stand	16
		house		1414	Lander Road		2	Mayfield Heights	stand	17
	Roy Dremman house	house		1579	Richmond Road	1855	2	Lyndhurst	stand	18
Asahel, Jerome	Jerome Asahel house	house		1927	Brainard Road	1865	2	Lyndhurst	stand	19
Childs, Henry B.?	Henry Childs house	house		2266	Glenridge Road	1878	2	Euclid	stand	20
Kerruish & Cowley		house		2270	Richmond Road	1885	2	Beachwood	stand	21
Welch, Sardius	Sardius Welch house	house		2440	Glenridge Road	1854	2	Euclid	stand	22
Wishmyer, H.	H. Wishmyer house	house		4418	Mayfield Road	1870	2	S. Euclid	stand	23
		house		4500	Anderson Road		2	Bluestone	stand	24
McFarland, Margaret/Anderson, H.D.	Anderson house	house		4501	Anderson Road	1880	2	Bluestone	stand	25
Burton, Randall E./Maxwell, Isabella		house		4511	Anderson Road	1880	2	Bluestone	stand	26
		house		4630	Anderson Road		2	Bluestone	stand	27
Whigam, John P./Oliver H.	John P. Whigam house	house		4765	Anderson Road	1870	2	Bluestone	stand	28
Akins, Horton P.	Horton P. Akins house	house		5737	Mayfield Road	1890	2	Mayfield Heights	stand	29
Hauschild, E.A.	Hauschild house	house		5817	Mayfield Road		2	Mayfield Heights	demo	30
		house		19101	Nottingham Rd.	1870	2	Nottingham Village	stand	31
Gorham,	Euclid Creek Village	house		21100	North Street	1852	2	Euclid	stand	32
Nevill, Mary	Mary Nevill house	house		23515	Chardon Road	1875	2	Euclid	stand	33
Trebisky	Trebisky house	house		25618	Highland Road	1875	2	Richmond Hts.	stand	34
Keyerleber, Frederick	Frederick Keyerleber house	house		26220	White Road	1880	2	Richmond Hts.	stand	35



## Additional Historical Info.xls

Page 2

McFarland, Duncan	Duncan McFarland quarry pillars	infrastructure	pillars	4508 Monticello Road	1874	2 Bluestone	stand	36
East Cleveland & Mayfield Plant	Mayfield Plank Road East toll gate	infrastructure	road	5630 Mayfield Road	1877	2 MayLynd	reloc	37
	Euclid Plank Road toll gate	infrastructure	road	21221 Euclid Avenue		2 Euclid	demo	38
	Mayfield Plank Road toll gate	infrastructure	road	4330? Mayfield Road	1903	2 S. Euclid	demo	39
	barn	manufactory	barn	475 Trebisky Road		2 Richmond Hts.	stand	40
Robbins, William Jr.	Robbins cheese factory	manufactory		506 Richmond Road		2 Richmond Hts.	demo	41
Prasse, Henry	Prasse Baskets	manufactory		1360 S. Green Road	1880	2 S. Euclid	demo	42
Harms, Louis F.	Harms Winery chalet cornerstone	manufactory	wine	21231 Chardon Road	1876	2 Euclid	stand	43
Euclid Township	Euclid Township Hall	meeting	town hall	21080 North Street	1894	2 Euclid	demo	44
Shaw, Arthur E.	Claribel Post Office	post		444 Richmond Road	1889	2 Richmond Hts.	demo	45
Robbins, William Sr.	Robbins quarry	quarry		562 Richmond Road		2 Richmond Hts.	demo	46
Berg, John/Rudolph	Berg Quarry	quarry		575 Richmond Road	1890	2 Richmond Hts.	demo	47
Gilbert, George	Camp Gilbert	resort	hotel	17109 Lake Shore Blvd	1870	2 Nottingham Village	demo	48
Euclid Township	PSD 11 Bluestone (1st)	school	grammar	375 S. Green Road	1877	2 Bluestone	stand	49
Euclid Township	PSD 11 Bluestone (2nd)	school	grammar	375 S. Green Road	1897	2 Bluestone	stand	50
Euclid Township	PSD 9 (1st) Richmond Settlement	school	grammar	457 Richmond Road	1858	2 Richmond Hts.	demo	51
Cleveland Catholic Diocese	St. Paul School	school	elementary	1231 Chardon Road	1868	2 Euclid	stand	52
Euclid Township	PSD 8 Euclidville present location	school	grammar	1526 Richmond Road	1866	2 Lyndhurst	stand	53
Euclid Township	PSD 7 South Euclid (2nd)	school	grammar	4461 Mayfield Road	1865	2 S. Euclid	demo	54
Euclid Township	PSD 8 Euclidville original location	school	grammar	5044 Mayfield Road	1866	2 Lyndhurst	reloc	55
		school		5811 Mayfield Road		2 Mayfield Heights	demo	56
	Mayfield Academy	school	private	6005 Mayfield Road	1856	2 Mayfield Heights	demo	57
Ursuline Sisters	Villa Angela Academy	school	high	17109 Lake Shore Blvd	? 1878	2 Nottingham Village	demo	58
Euclid Township	PSD 4 Nottingham	school	grammar	18850 Nottingham Rd.		2 Nottingham Village	stand	59
Euclid Township	PSD 6 (2nd) "Beechnut"	school	grammar	25800 Chardon Road	1888	2 Richmond Hts.	stand	60
Euclid Township	PSD 6 (1st)	school	grammar	26906 Chardon Road	1873	2 Richmond Hts.	stand	61
Methodist Conference	South Euclid Methodist Church	church	Methodist	1534 South Green Road	1914	3 S. Euclid	demo	1
Euclid Society of Baptists	Euclid Baptist Society	church		1565 Chardon Road	1893	3 Euclid	demo	2
Euclid Society of Baptists	Euclid Baptist Society	church		1565 Chardon Road	? 1950	3 Euclid	stand	3
St. John Lutheran	St. John Church (3rd)	church	Lutheran	4386 Mayfield Road	1894	3 S. Euclid	stand	4
Cleveland Catholic Diocese	St. Gregory-the-Great Church	church	Roman	4478 Rushton Road	1922	3 S. Euclid	stand	5
	Beachland Presbyterian Church	church		18100 Canterbury Rd.		3 Nottingham Village	stand	6
Methodist Cleveland Conference	Nottingham Methodist Church	church		18316 St Clair Avenue	1894	3 Nottingham Village	stand	7
Rainbow Hospital for Crippled C	Rainbow Cottage	hospital		1435 Richmond Road	1900	3 Lyndhurst	demo	8
Rainbow Circle	Rainbow Hospital	hospital		4536 Rainbow Road	1905	3 S. Euclid	demo	9
Rainbow Circle	Rainbow Hospital	hospital		4536 Rainbow Road	1913	3 S. Euclid	demo	10
Cunningham, Orval J.	Cunningham Sanitarium admin	hospital		18485 Lake Shore Blvd		3 Nottingham Village	stand	11
Cunningham, Orval J.	Cunningham Sanitarium chamber	hospital		18495 Lake Shore Blvd		3 Nottingham Village	demo	12
Humphrey,	Humphrey house	house	estate	1 Virginia Avenue		3 Nottingham Village	stand	13
Phypers, George	George Phypers Estate	house	estate	264 Richmond Road	1919	3 Richmond Hts.	stand	14
		house		943 Stuart Drive		3 S. Euclid	stand	15
		house		1002 E. Green Road		3 Bluestone	stand	16
		house		1382 Sheffield Road		3 S. Euclid	stand	17
		house		1445 Dille Road	1900	3 Euclid	stand	18
Bennett, Alfred R.	Alfred R. Bennett house	house		1481 Lander Road	1893	3 Mayfield Heights	stand	19
Coltran	Euclid Creek Village	house		1484 Chardon Road	1895	3 Euclid	stand	20
Brainard, Harry	Mayfield Plank Road East toll gate	house		1720 Brainard Road	1915	3 MayLynd	stand	21
Neer, A.	A. Neer house	house		1783 Sunview Road	1923	3 MayLynd	stand	22
Bolton, Frances & Chester	Franchester Farms	house	estate	1900 Richmond Road	1917	3 Lyndhurst	stand	23
		house		4584 Anderson Road		3 Bluestone	stand	24
Arter		house	estate	4982 Clubside Road		3 Lyndhurst	stand	25
Ford, Horatio	Horatio Ford estate	house	estate	5031 Mayfield Road	1913	3 Lyndhurst	demo	26
Linnert, Fred & Christine	Fred Linnert house	house		6010 Mayfield Road	1894	3 Mayfield Heights	stand	27
Thomas, R. & Annie	Green View	house	estate	17403 Nottingham Rd.		3 Nottingham Village	demo	28
Quail, F.A.	Rose-Mary Home	house		19350 Euclid Avenue	1910	3 Euclid	stand	29
Euclid Township	PSD 1 superintendent's cottage	house		21105 North Street	1894	3 Euclid	stand	30
Brewer, Nelson J.	Nelson Brewer house	house		21900 Euclid Avenue		3 Euclid	stand	31
		house		23100 Chardon Road	1906	3 Euclid	stand	32
Maxwell	Maxwell house	house		23351 Chardon Road		3 Euclid	stand	33
Mason, S.R.	S.R. Mason house	house		23430 Chardon Road	1898	3 Euclid	stand	34
		house		24001 Chardon Road		3 Euclid	stand	35
		house		32200 Chardon Road		3 Willoughby Hills	stand	36
Teachout	Brueggemyer's Hill	landform		5401 Mayfield Road	1900	3 MayLynd	demo	37
Ajax	Teachout Mfg.	manufactory		1410 Chardon Road	1898	3 Euclid	stand	38
Chandler	Ajax Mfg.	manufactory		1441 Chardon Road	1924	3 Euclid	stand	39
White	Chandler Mfg.	manufactory		1491 Chardon Road		3 Euclid	stand	40
Martin, Glen L.	White's Sugar House	manufactory		6439 Wilson Mills Road		3 Richmond Hts.	demo	41
Euclid Township	Glenn L. Martin Aircraft	manufactory	aviation	16800-17000 St Clair Ave	1918	3 Nottingham Village	stand	42
	Township Hall	meeting	town hall	1349 S. Green Road	1899	3 S. Euclid	demo	43
	Mayfield Country Club	resort	club	1545 Sheridan Road	1910	3 Lyndhurst	stand	44
Novak	Novak Villa	resort	club	4536 Rainbow Road	? 1895	3 S. Euclid	demo	45
Humphrey,	Euclid Beach Park	resort	amusement	16001 Lake Shore Blvd		3 Nottingham Village	demo	46



Additional Historical Info.xls

Page 3

Frissell, Walter	Frissell's-on-the-Lake	resort	hotel	18701 Lake Shore Blvd	1895	3 Nottingham Village	demo	47
	Acacia Country Club	resort	club	26899 Cedar Road	1924	3 Lyndhurst	stand	48
	Mounds Club	resort	night club	32200 Chardon Road		3 Willoughby Hills	stand	49
White	White's Fruit Farm	retail		27127 Chardon Road		3 Richmond Hts.	demo	50
Village of Richmond Hts.	Richmond Heights School	school	combined	447 Richmond Road	1924	3 Richmond Hts.	stand	51
Euclid Township	PSD 9 (2nd) Maple Grove "Claribel"	school	grammar	457 Richmond Road	1899	3 Richmond Hts.	demo	52
Euclid Village Board of Education	Central High School	school	high	1500 Chardon Road	1913	3 Euclid	demo	53
St. John Lutheran	St. John School	school		4386 Mayfield Road	1927	3 S. Euclid	demo	54
SE-L School System	Victory Park School	school	elementary	4401 Mayfield Road	1921	3 S. Euclid	demo	55
Euclid Township	South Euclid High School	school	high	4461 Mayfield Road	1912	3 S. Euclid	demo	56
Hawken School	Bolton Hall	school	high	5000 Clubside Road	1921	3 Lyndhurst	stand	57
SE-L Board of Education	Lynhurst Village School	school		5044 Mayfield Road	1921	3 Lyndhurst	stand	58
Riedel School	Riedel school	school	grammar	5826 Highland Road	1900	3 Highland Hts	demo	59
Ursuline Sisters	St. Joseph Seminary	school	seminary	17109 Lake Shore Blvd		3 Nottingham Village	demo	60
Euclid Township	PSD 1 central grammar	school	grammar	21105 North Street	1894	3 Euclid	stand	61
Euclid Township	PSD 1 central high	school	high	21129 North Street	1894	3 Euclid	stand	62
Cleveland Catholic Diocese	St. Paul Church	church		1231 Chardon Road	1949	4 Euclid	stand	1
	Hillcrest Church	church	EUB	1401 Lander Road	1955	4 Mayfield Heights	stand	2
Methodist Conference, Painesville	South Euclid Methodist Church	church	Methodist	1534 South Green Road	1957	4 S. Euclid	stand	3
Temple Emanu El	Temple Emanu El	church	temple	2200 S. Green Road	1954	4 S. Euclid	stand	4
	Church of the Master	church	Baptist	4050 Monticello Blvd.	1952	4 S. Euclid	stand	5
Cleveland Catholic Diocese	St. Paschal Babylon Roman Catholic	church		5384 Wilson Mills Rd.	1955	4 Highland Hts	stand	6
	Faith United Brethren Church	church		5632 Wilson Mills Rd.		4 Highland Hts	demo	7
Cleveland Catholic Diocese	St. Clare Church	church	Roman	5659 Mayfield Road	1944	4 MayLynd	demo	8
Cleveland Catholic Diocese	St. Clare Church	church	Roman	5660 Mayfield Road	1944	4 MayLynd	demo	9
	St. John Lutheran Church	church		17403 Nottingham Rd.		4 Nottingham Village	stand	10
Cleveland Catholic Diocese	St. Joseph Christian Life Center	church		18485 Lake Shore Blvd	1943	4 Nottingham Village	stand	11
Sisters of the Good Shepard	Convent	church	convent	21100 Euclid Avenue	1925	4 Euclid	stand	12
Sisters of the Good Shepard	Our Lady of Lourdes Grotto/Shrine	church	shrine	21100 Euclid Avenue	1925	4 Euclid	stand	13
	Church of the Good Shepherd	church	Episcopal	23599 Cedar Road	1959	4 S. Euclid	stand	14
	First Church of Christ Scientist	church		4807 Mayfield Road		4 Lyndhurst	stand	15
City of South Euclid	South Euclid Public Library	collection	library	4645 Mayfield Road	1952	4 S. Euclid	stand	16
Village of Lyndhurst	Lyndhurst Library (1st)	collection	library	5301 Mayfield Road	1948	4 Lyndhurst	stand	17
Village of Lyndhurst	Lyndhurst Library (2nd)	collection	library	5401 Mayfield Road	1948	4 MayLynd	stand	18
	Euclid Hospital	hospital		18901 Lake Shore Blvd	1950	4 Nottingham Village	stand	19
Telling, William E.	Telling gate house	house	gate	4629 Mayfield Road	1928	4 S. Euclid	stand	20
Telling, William E.	Telling house	house	estate	4645 Mayfield Road	1928	4 S. Euclid	stand	21
		house		5555 Mayfield Road	1930	4 MayLynd	stand	22
		house		17404 Schenely Rd	1931	4 Nottingham Village	stand	23
Curtiss, Glenn L.	Curtiss-Wright hanger	infrastructure	aviation	355 Richmond Road	1929	4 Richmond Hts.	stand	24
Cole, Kenneth	Cole Airfield/Mayfair Air Service	infrastructure	aviation	1200 Blanchester Rd.	1927	4 MayLynd	demo	25
Cleveland Water Dept.	Nottingham Purification Plant	infrastructure	water purification	1300 Chardon Road	1951	4 Euclid	stand	26
Ohio Bell Telephone Co	Kenmore Exchange	infrastructure	telephone	18900 Nottingham Rd	1925	4 Nottingham Village	stand	27
City of Cleveland	Nottingham Fire House	infrastructure	firehouse	19090 St. Clair Avenue		4 Nottingham Village	stand	28
Cuyahoga County Commission	Cuyahoga County Airport	infrastructure	aviation	26380 Curtiss Wright Parkw	1950	4 Richmond Hts.	stand	29
Cleve Freight Lines Inc	Eaton Stamping Division	manufacture		17877 St Clair Ave	1925	4 Nottingham Village	stand	30
City of South Euclid	South Euclid Municipal Center	meeting	city hall	1349 S. Green Road	1954	4 S. Euclid	stand	31
American Legion, Post 308	Memorial Hall	meeting		4500 Laurel Road	1938	4 S. Euclid	demo	32
Village of Lyndhurst	Lyndhurst Village Hall	meeting	village hall	5301 Mayfield Road	1925	4 Lyndhurst	demo	33
Hangar Recreation Assn.	Blossom Recreation Building	meeting		24400 Cedar Road	1930	4 Beachwood	stand	34
City of South Euclid	Victory Park	park	war memorial	4401 Mayfield Road	1949	4 S. Euclid	demo	35
Ohio Department of Natural Resources	Wildwood Marina	park	marina	16975 Wildwood Drive	1950	4 Nottingham Village	stand	36
Ohio Department of Natural Resources	Wildwood State Park	park	waterfront	16975 Wildwood Drive	1950	4 Nottingham Village	stand	37
Ohio Department of Natural Resources	Euclid Beach State Park	park	waterfront	16975 Wildwood Drive	1950	4 Nottingham Village	stand	38
City of Cleveland	Euclid Creek Park	park		19170 St. Clair Avenue		4 Nottingham Village	stand	39
USPS	Lyndhurst Post Office (2nd)	post		5380 Mayfield Road	1937	4 MayLynd	stand	40
USPS	Lyndhurst Post Office (3rd)	post		5647 Mayfield Road	1948	4 MayLynd	stand	41
	Richmond Theater	resort	movie theater	5190 Mayfield Road	1948	4 Lyndhurst	closed	42
	Wildwood Yacht Club	resort	yacht club	16800 Neff Road	1950	4 Nottingham Village	stand	43
Santagata, Carl/Verdone, Anthony	La-Vera Party Center	resort	party center	32200 Chardon Road	1952	4 Willoughby Hills	stand	44
	Lasalle Theatre	resort	theater	823 East 185th St	1927	4 Nottingham Village	stand	45
	Glengate Shopping Center	retail	strip mall	367 S. Green Road	1958	4 Bluestone	stand	46
Yafanaro	Veedol Gas Station	retail	gas station	5851 Mayfield Road	1930	4 Mayfield Heights	demo	47
Mayfield Twp. Board of Education	Millridge Elementary School	school	elementary	962 Millridge Road	1960	4 Highland Hts	stand	48
SE-L City Schools	Adrian Elementary School	school	elementary	1071 Homestead Road	1953	4 S. Euclid	stand	49
SE-L School System	Ridgebury Elementary School	school	elementary	1111 Alvey Road	1959	4 Lyndhurst	stand	50
SE-L Board of Education	Memorial Junior High School	school	jr high	1250 Professor Road	1949	4 Lyndhurst	stand	51
SE-L City Schools	Southlyn Elementary School	school	elementary	1340 Professor Road	1955	4 S. Euclid	stand	52
SE-L School System	Greenview Junior High School	school	jr high	1825 S. Green Road	1958	4 S. Euclid	stand	53
Sisters of Notre Dame	Regina High School	school	high	1857 S. Green Road	1953	4 S. Euclid	stand	54
SE-L City Schools	Lowden Elementary School	school	elementary	4106 Lowden Road	1954	4 S. Euclid	stand	55
SE-L City Schools	Rowland Elementary School	school	elementary	4300 Bayard Road	1949	4 S. Euclid	stand	56



## Additional Historical Info.xls

Page 4

Cleveland Catholic Diocese	St. Gregory School	school		4478 Rushton Road	1950	4 S. Euclid	stand	57
Rainbow Circle	Bingham Elementary	school	elementary	4536 Rainbow Road	1924	4 S. Euclid	stand	58
Sisters of Notre Dame	Notre Dame College	school	college	4545 College Road	1928	4 S. Euclid	stand	59
SE-L School System	Charles F. Brush High School	school	high	4878 Glenlyn Road	1926	4 Lyndhurst	stand	60
SE-L City Schools	Ratner School	school	elementary	4900 Anderson Road	1952	4 S. Euclid	stand	61
	Julie Billiart School	school		4982 Clubside Road	1953	4 Lyndhurst	stand	62
SE-L City Schools	Chester C. Bolton Elementary	school	elementary	5443 Rae Road	1950	4 MayLynd	stand	63
SE-L City Schools	Sunview Elementary School	school	elementary	5520 Meadow Wood Blvd.	1954	4 MayLynd	stand	64
St. Clare Church	St. Clare School	school		5659 Mayfield Road	1949	4 MayLynd	stand	65
	Oliver Hazard Perry School	school	elementary	18400 Schenely Rd	1927	4 Nottingham Village	stand	66
Marist Brothers	St. Joseph High School	school	high	18495 Lake Shore Blvd		4 Nottingham Village	stand	67
	St. John Lutheran Church	church		1000 Ford Road	1963	5 Highland Hts	stand	1
Reorganized Church of Jesus Christ of Latter Day Saints	Community Christian Church	church		1076 Ford Road	1959	5 Highland Hts	stand	2
	Young Israel of Cleveland	church	temple	1501 Dille Road		5 Euclid	stand	3
Young Israel	Nottingham Baptist Church	church		2463 S. Green Road		5 S. Euclid	stand	4
	St. Gregory-the-Great Church	church	Roman	2921 Bishop Road		5 Willoughby Hills	stand	5
Cleveland Catholic Diocese	Hillcrest Baptist Church	church		4478 Rushton Road	1961	5 S. Euclid	stand	6
	Highland Sixth United Presbyterian Church	church		5631 Ridgebury Blvd.	1960	5 Highland Hts	stand	7
	New Apostolic Church	church		5632 Wilson Mills Rd.	1964	5 Highland Hts	stand	8
	Lutheran Church of the Holy Nativity	church		5735 Wilson Mills Rd.	1969	5 Highland Hts	stand	9
	Cleveland First Church of the Nazarene	church		5775 Highland Road	1961	5 Highland Hts	stand	10
Sisters of the Most Holy Trinity	Holy Trinity Convent	church	convent	5942 Wilson Mills Rd.	1967	5 Highland Hts	stand	11
	Calvary Assembly of God	church		21281 Chardon Road	1960	5 Euclid	stand	12
	First Covenant Church	church		28870 Chardon Road		5 Willoughby Hills	stand	13
	Methodist Church	church		29400 Chardon Road		5 Willoughby Hills	stand	14
City of South Euclid	South Euclid Historical Museum	collection	museum	34201 Eddy Road		5 Willoughby Hills	stand	15
Cuyahoga County Commission	Mayfield Regional Library	collection	library	4645 Mayfield Road	2000	5 S. Euclid	stand	16
Cleveland Public Library	Nottingham Branch Library	collection	library	6080 Wilson Mills Rd.	1971	5 Mayfield Heights	stand	17
Euclid, City of	Euclid Historical Museum	collection	museum	17109 Lake Shore Blvd		5 Nottingham Village	stand	18
Cleveland Clinic	Willoughby Hills Rehabilitation Center	hospital		21129 North Street	1984	5 Euclid	stand	19
	Alpha Park	infrastructure	business	29017 Chardon Road		5 Willoughby Hills	stand	20
City of Euclid	Euclid Fire House 2	infrastructure	firehouse	1 Alpha Park	1977	5 Highland Hts	stand	21
City of South Euclid	Langerdale Retention Basin	infrastructure	reservoir	1500 Chardon Road	2001	5 Euclid	stand	22
	Aberdeen Office Park and Estates	infrastructure	housing	1900 Langerdale Blvd.	1966	5 S. Euclid	stand	23
Ohio Department of Transportation	I-90 dam "Fruitlands" fishing hole	infrastructure	dam	5891 Aberdeen Blvd.	1997	5 Highland Hts	stand	24
TRW, Inc.	TRW Corporate Headquarters	manufactory	office	18501 Nottingham Rd.	1961	5 Nottingham Village	stand	25
City of Richmond Heights	Richmond Heights City Hall	meeting		1900 Richmond Road		5 Lyndhurst	demo	26
City of South Euclid	South Euclid Community Center	meeting		457 Richmond Road	1963	5 Richmond Hts.	stand	27
City of Lyndhurst	Lyndhurst City Hall	meeting	city hall	1370 Victory Drive		5 S. Euclid	stand	28
City of Highland Heights	Highland Heights City Hall	meeting	city hall	5301 Mayfield Road	1974	5 Lyndhurst	stand	29
City of Highland Heights	Highland Heights Fire/Police Depts.	meeting	firehouse	5827 Highland Road		5 Highland Hts	stand	30
U.S. Postal Service	Richmond Heights Post Office	post		5827 Highland Road		5 Highland Hts	stand	31
USPS	South Euclid Post Office	post		444 Richmond Road	1967	5 Richmond Hts.	stand	32
	Stonewater Golf Club	resort	golf club	1568 South Green Road		5 S. Euclid	stand	33
YMCA	Hillcrest YMCA	resort	YMCA	1 Club Drive	? 1990	5 Highland Hts	stand	34
	Airport Greens Golf Course	resort	golf club	5000 Mayfield Road	1955	5 Lyndhurst	stand	35
	Legacy Village	retail		28980 White Road		5 Willoughby Hills	stand	36
	Beachwood Place Mall	retail	mall	24449 Cedar Road	2003	5 Lyndhurst	stand	37
St. John Lutheran	St. John School	school		26300 Cedar Road	? 1970	5 Beachwood	stand	38
SE-L School System	Arc Tech	school		4386 Mayfield Road	1966	5 S. Euclid	stand	39
Mayfield Twp. Board of Education	Mayfield High School (2nd)	school	high	4807 Mayfield Road		5 Lyndhurst	stand	40
Euclid City Board of Education	Central Middle School	school	jr high	6116 Wilson Mills Rd.		5 Mayfield Heights	stand	41
	Bryant and Stratton College	school	college	20701 Euclid Avenue	1965	5 Euclid	stand	42
				27557 Chardon Road		5 Willoughby Hills	stand	43

# Fish Friendly Culverts

Proper design, installation,  
and maintenance can protect  
both roadways and fish





**D**id you know that culverts—those large, pipes that are necessary for access over streams—can cause major problems for fish and other aquatic animals? Improperly installed or poorly maintained culverts can pose a serious threat to these animals by disrupting their habitat and spawning success. However, proper design, installation, and maintenance can protect both roadways and fish.

### Sizing and Slope of Culverts

Spawning fish frequently begin their migration at a time of year when there is high water flow in streams. Properly sized and placed culverts are important to accommodate water velocities and flows necessary for fish to swim through the culvert. Selecting culvert diameters to match the width of the stream at an average point is a basic first step. Stream widths should be measured at the top of the banks as this may best represent the stream size during normal high water or bank-full conditions.

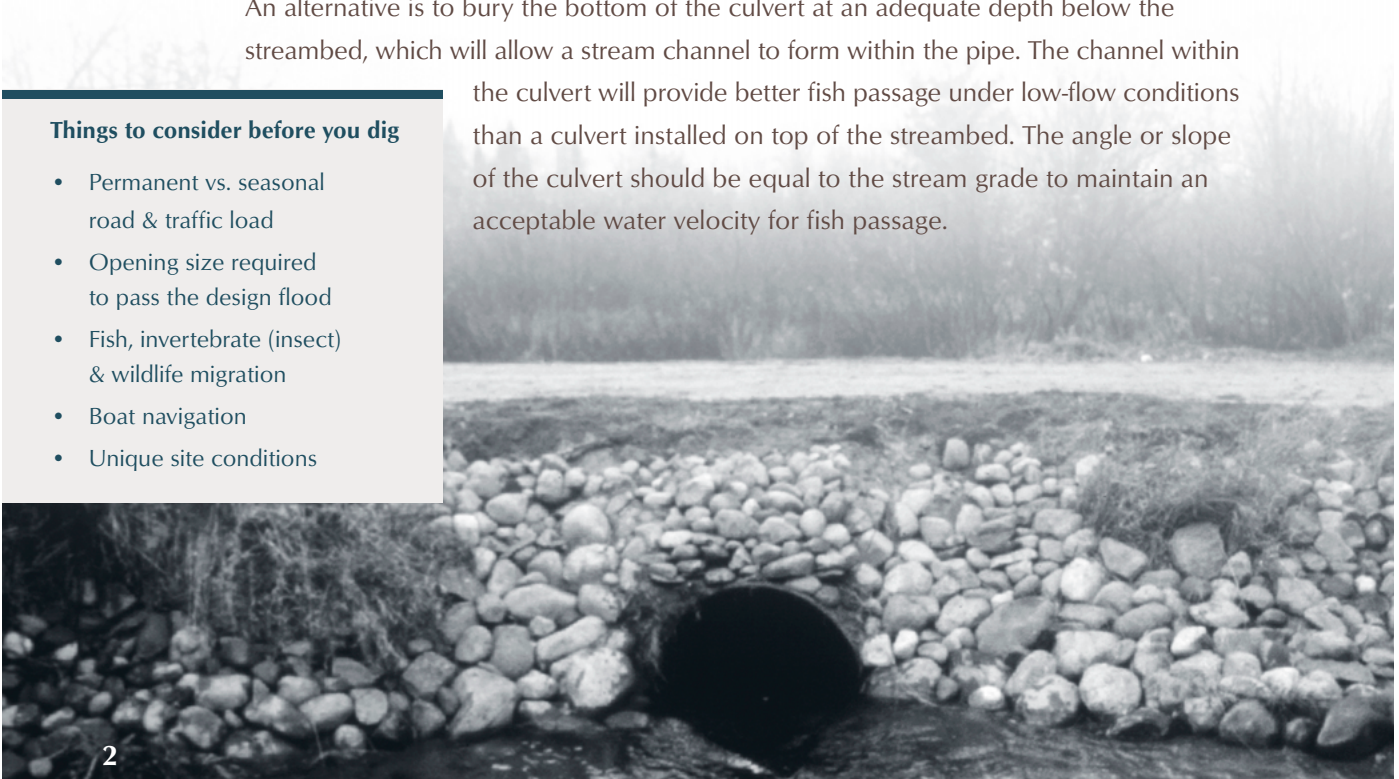
Several concerns should be addressed when determining the most appropriate size and position of culverts. The culvert should be sufficiently sized to allow for water depth, volume (flow) and velocity levels that will permit fish passage through the culverts. Special care is needed when installing larger culverts on streams that have low seasonal flow.

Bottomless, arched culverts placed over existing stream beds are the preferred option.

An alternative is to bury the bottom of the culvert at an adequate depth below the streambed, which will allow a stream channel to form within the pipe. The channel within the culvert will provide better fish passage under low-flow conditions than a culvert installed on top of the streambed. The angle or slope of the culvert should be equal to the stream grade to maintain an acceptable water velocity for fish passage.

#### Things to consider before you dig

- Permanent vs. seasonal road & traffic load
- Opening size required to pass the design flood
- Fish, invertebrate (insect) & wildlife migration
- Boat navigation
- Unique site conditions



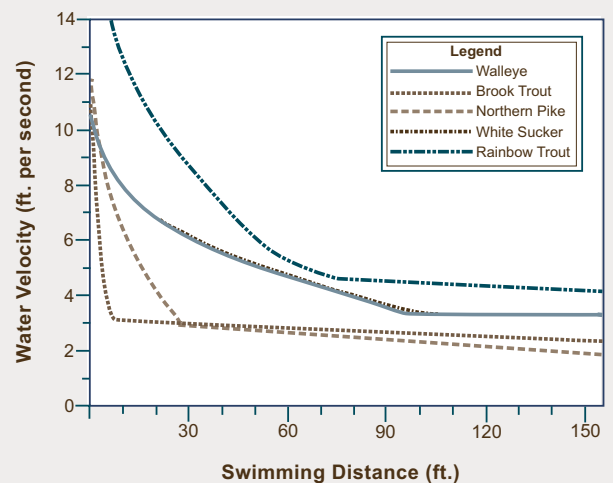
## Water Velocity and Depth

While fish can swim with amazing bursts of speed, they may be unable to sustain this speed in high velocity waters throughout the entire length of a culvert. Swimming speeds vary with the species, size, and life stage of fish. Where fish are a concern, the velocity of water in the culvert (feet per second) should be based on the slowest sustained swimming speed for the fish in the stream (see figure 1).

Keep in mind that in situations where fish passage is not a major concern, other aquatic species may use the culvert and will need to rely on natural streambed sediments in the culvert to aid their movement. Other species of concern include vertebrates (such as mink, frogs, turtles) and invertebrates (such as insects, crayfish, snails).

Another consideration is minimum water depth during low-flow dry periods. The depth must be adequate for fish to be completely immersed and not scraping bottom. Depending on the stream, fish may migrate during summer heat in search of cooler waters with higher oxygen levels. Improper culvert design and placement can impact downstream migration as well. Shallow culvert water can create a bottleneck, affecting an entire section of stream. A six-inch minimum water depth is recommended.

**Figure 1. Limiting flow velocity for fish**



Fish, similar to human runners, can log higher speeds over short distances easier than they can in a long distance marathon.

Figure 1 shows a relationship between water speed (velocity) and fish swimming distance. As water velocity increases, fish are only able to swim for short distances. In a 50-to-100-foot culvert, for example, the limiting flow velocity for walleye and northern pike drops to less than 3.3 ft/sec.

This fact sheet outlines issues to consider when installing culverts in streams. For additional site-specific information, such as species of fish present, locations of spawning areas, and design considerations, consult a Department of Natural Resources Transportation Liaison in your area.

A stream is considered navigable under Wisconsin law if it has a defined bed & banks and regularly recurring periods when it is possible to float a canoe or small recreational craft. Wisconsin requires that culvert installation (new or replacement) on navigable streams be approved under a state Department of Transportation administrative code (Trans 207). Your local DNR Transportation Liaison can assist you with this approval process.



### Timing Culvert Installation

In order to minimize stream sedimentation, flow interruption, and disturbance of fish during sensitive seasons, carefully consider the time and duration of culvert installation or repair. Scheduling projects so that they don't coincide with fish migrations, spawning, and egg incubation periods minimizes negative impacts on fish and avoids installation problems associated with high-water seasons. **Figure 2** is a generalized time frame for fish spawning and development in Wisconsin, although these spawning times do not necessarily include migration times. It is important for regulatory and project sponsors to consult with local fish or water resources biologists in order to plan for the best times to avoid fish mating and migration activities in a particular stream.

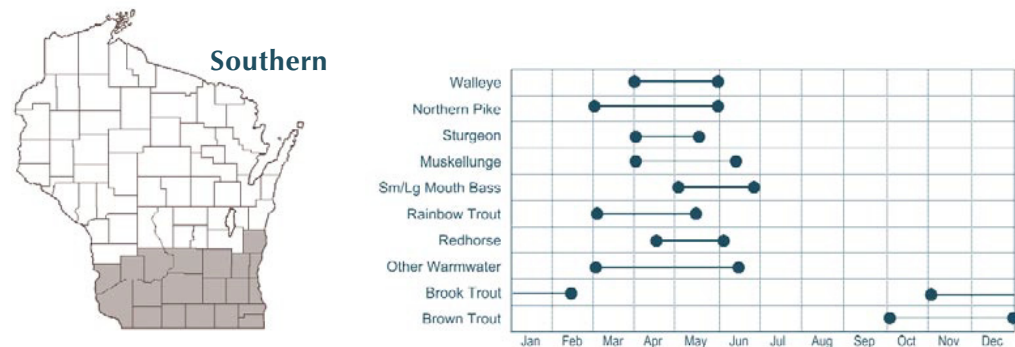
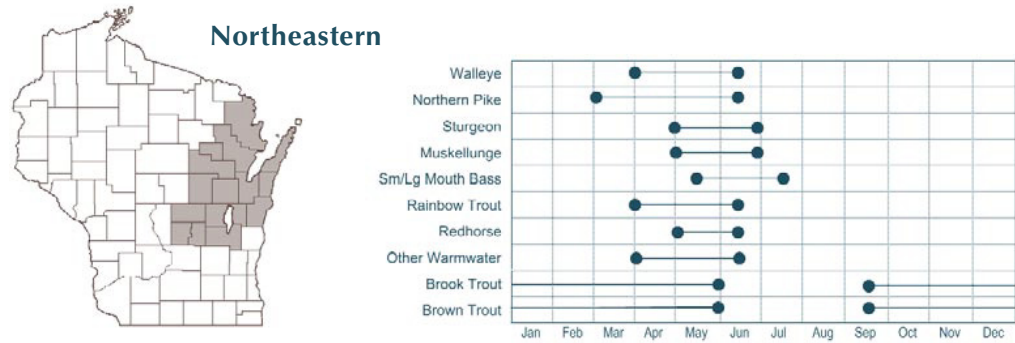
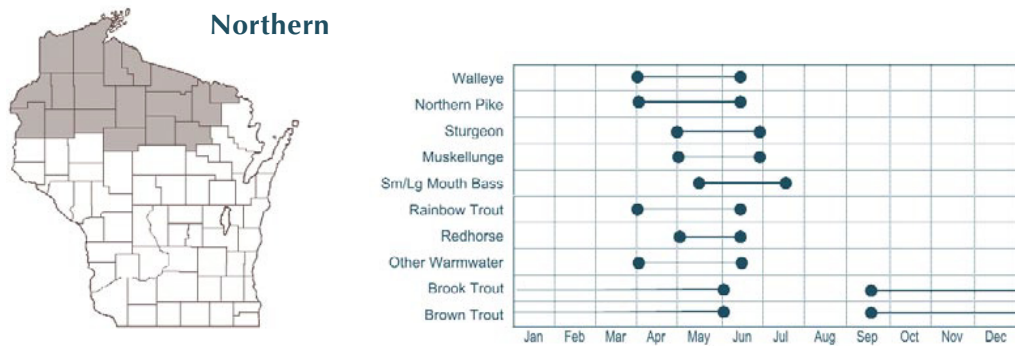
Adequate site preparation is important for avoiding delays and preventing erosion once the site is exposed. Prompt installation and immediate attention to soil stabilization avoids prolonged stream disturbance and continuous maintenance problems. Installing appropriate erosion and sediment controls on disturbed soils before site work is finished can reduce long-term costs. Preventing erosion, by vegetating the site with seed and mulch, is often easier than trying to control moving soil.

Completing work prior to mid-September generally allows time for seed to germinate and stabilize disturbed soils. Avoid leaving soils exposed over the winter months, as melting snow and heavy spring rains can easily erode unprotected soil. When soil enters streams, the suspended soil particles can negatively impact fish feeding, create abrasions on fish gills (leading to infection), and ultimately fill in the gravel areas needed for spawning. Eroded soils can also contribute to lower dissolved oxygen levels, smother aquatic plants, increase water temperature and even change the shape of the stream channel. In the end, it is much better to prevent erosion than try to repair the damage after it has occurred.

### Single vs. Multiple Culverts

In many cases either one large culvert or several smaller culverts can be used to channel stream flow under a road. One large culvert is generally preferred on most stream crossings, but may not be the best choice on a stream with a wide range of stream flows. Single large culverts aid in reducing debris blockage, provide for better fish and wildlife passage, and reduce flow velocities for better fish passage. Burying larger culverts deeper in the streambed can also allow for fish passage because a smaller, low-flow channel will become established within the culvert. If multiple culverts are used, one should be placed lower than the others to hold low-flow water to provide adequate fish passage during low-flow periods.

Figure 2. Average time for fish spawning



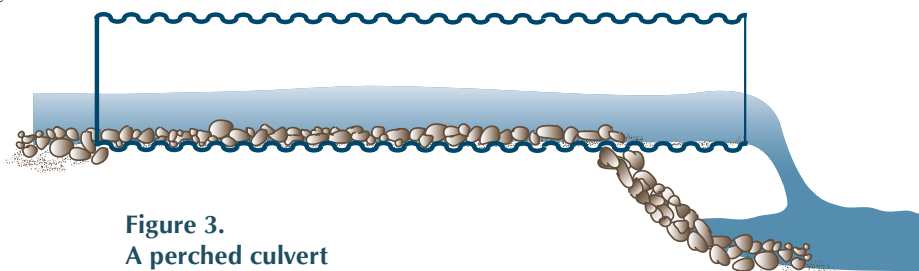


### Culvert Placement

Installing a culvert on top of the existing streambed or installing undersized culverts can cause problems for fish as well as for the culvert itself. In these situations, water often begins to flow below the culvert and cause piping. Piping simply means that flowing water will carry away the soil from below and around the culvert, increasing the chance of a washout. Another problem from this type of installation results when the outlet becomes perched above the level of the stream.



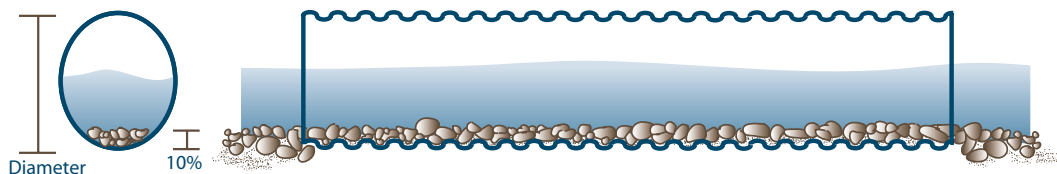
Perched culverts are a serious barrier to fish and wildlife movement (see Figure 3).



**Figure 3.**  
A perched culvert

Setting the culvert bottom at least 6 inches (or 10-20% of the culvert diameter, whichever is greater) below the stream bed elevation will allow for better fish passage and help reduce the risk of piping. Deeper placement may be necessary on certain high-gradient streams to allow sediment to reach equilibrium inside the pipe and establish a more “natural” slope.

A “normal” streambed, (see Figure 4), has a slope of 0.5% or less (<6 inch vertical drop in 100 feet distance), fine substrate materials (eg. clay-sand), and a meandering pathway. Water in a stream with a minimal slope would appear calm with no surface ripples. Streams that do not meet these criteria will likely need an engineering analysis to determine correct culvert placement.



**Figure 4.**  
Normal culvert installation

## Other Options

In most fish passage situations, corrugated metal culverts are preferred over smooth bottom culverts with shallow water conditions. In addition to providing structural strength to the culvert, the corrugated surface slows down water velocity, making it more fish-friendly. However, there are other options.

When fish and wildlife are major concerns, biologists prefer structures that pose the least risk to migration. Open-bottom culverts preserve the natural creek substrate and do not disturb the streambed (see Figure 5). Common shapes include semicircular arch, elliptical arch, and concrete box culverts. These types of structures must be supported on footings located on both sides of the crossings. On gravel roads, footings may be a simple steel plate, but on paved surfaces, a concrete footing may be required. However, open bottom pipes have their own problems. Installation requires the creation of a bypass or similar arrangement during construction of footings. In addition, bottomless structures are 30% to 50% more expensive than a round or oval pipe. On certain high-value streams, bridges are the preferred option. Depending on the size of existing culverts, Department of Transportation (DOT) funding may be available to help pay for replacement bridges.

Keep in mind that many other types of wildlife travel through culverts as well. The state of Wisconsin requires that the habitat needs of endangered species are considered during culvert installation and replacement. Your DNR Transportation Liaison can help you with meet these requirements.

**Figure 5.**  
**An open-bottom culvert**



## A Final Thought

Do not underestimate the effect of a culvert crossing. While culverts only cover small sections of any stream, their influence on fish and other aquatic species can be immense, especially when you consider the cumulative effects of many road crossings. Proper planning, design, and installation can protect roads while providing year-round fish passage and preserving healthy streams.



## Sources of Assistance

Sizing and placing culverts correctly can be complicated. Understanding local stream history, watershed conditions, storm intensity and frequency, and the life cycle requirements of fish often require the assistance of engineers and biologists. Human safety issues such as backwater elevations, maximum velocities, and road overtopping frequency also must be weighed at the design stage. Hiring a professional engineer to coordinate the design may be money well spent. Determine local sources of assistance and do not hesitate to ask for help. Consider contacting the following:

- County Land and Water Conservation Department
- County Highway Department
- Department of Natural Resources Transportation Liaison
- Department of Transportation
- U.S. Army Corps of Engineers (if wetlands are affected)
- U.S.D.A National Forest Service
- U.S.D.A. Natural Resources Conservation Service

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The Ohio Coastal Management Program Document is currently being revised. Please visit [www.ohiodnr.com/coastal](http://www.ohiodnr.com/coastal) for future updates.

## PART I OVERVIEW

### A. Summary of the Ohio Coastal Management Program

The State of Ohio has developed the Ohio Coastal Management Program (OCMP) describing current state coastal legislation and management policies. With the exception of implementation of Ohio's new coastal erosion program mandated by O.R.C. 1506.06-.09 and amendments to Ohio's Coastal Management Act, the OCMP proposes no new state programs, regulations, or laws. It is based on an approach termed "networking," which is a framework and process for linking existing state programs, agencies, and laws into a system that will meet Federal requirements for an effective state coastal management program.

Part II of this document describes the laws, regulations, and programs that are the basis of the OCMP. Chapter 5 includes 41 policy statements and authorities, which set forth the goals of coastal management in Ohio, and various policies and authorities embodied in statute and regulations.

In 1988, the Ohio legislature enacted the Ohio Coastal Management Act, S.B. 70 (O.R.C. Chapter 1506) which provides a comprehensive framework for the OCMP and requires the Ohio Department of Natural Resources (ODNR) to identify and manage Lake Erie coastal erosion areas, implement the Lake Erie Access Plan, and administer the leasing of state submerged land. As a result, having significantly enhanced its management capability and having completed most of the development of the coastal erosion program, the state now seeks Federal approval of its program. This summary briefly describes the key aspects of the program and the benefits of participation in the Federal CZM program.

#### 1. Program Authorities and Organization

The OCMP is a "networked" program made up of several Ohio natural resource protection and hazard management programs. The lead agency for implementing the program, as prescribed by the Ohio Coastal Management Act, is the ODNR. Within ODNR the Division of Real Estate and Land Management (REALM) has the lead for coordinating the programs of ODNR and other state agencies into a comprehensive CZM program. The organizational structure of the program and specific means of coordinating the various agencies included in the program are discussed in Chapter 4 of Part II.

State laws and regulations included in the OCMP are summarized in policy statements which are organized into nine issues listed below. Detailed descriptions of each policy, its underlying authority and implementation process are provided in Chapter 5 of Part II of this document.

#### Coastal Erosion and Flooding

The Ohio DNR is responsible for implementing a comprehensive coastal erosion and flood plain management program with the elements listed below. The ODNR is currently completing development of the erosion management program pursuant to changes to Chapter 1506 enacted in May 1994. This program is described in detail in Management Policies, Chapter 5 of Part II



of this document. Maps delineating Lake Erie coastal erosion areas are currently available for public review. State statutory authorities require the DNR to:

- Delineate 30 year coastal erosion areas;
- Enforce rules regulating new structures in coastal erosion areas;
- Allow local authorities to adopt erosion area management regulations in compliance with state policies;
- Administer a permit system for erosion control structures;
- Provide technical assistance for erosion control projects and permit process standardization;
- Coordinate with the Army Corps of Engineers as provided for in the Rivers and Harbors Act of 1899;
- Enforce compliance by local governments with the National Flood Insurance Program (NFIP);
- Require that state agencies, in licensing and permitting, mandate compliance with the NFIP when their regulatory jurisdiction preempts local regulations, and prohibit financial disaster assistance within noncompliant counties and municipalities; and
- Regulate design and construction of dams, dikes and levees.

#### Water Quality

The Ohio Environmental Protection Agency (Ohio EPA) is responsible for implementing the state's water quality program. The objectives of this program are to:

- Assure attainment of State Water Quality Standards;
- Provide financial support for research and pollution abatement projects;
- Promote soil and water conservation and prevention of agricultural and urban sediment pollution in cooperation with ODNR; and
- Implement the Ohio Nonpoint Source Management program in cooperation with ODNR through a broad matrix of authorities.

#### Wetlands and other Ecologically Sensitive Resources

The ODNR and Ohio EPA share authority for protecting Ohio's coastal wetlands and other ecologically sensitive resources. The Ohio EPA regulates certain activities in wetlands through its state water quality laws, particularly through certification of federally-permitted and licensed activities pursuant to section 401 of the Clean Water Act. Ohio EPA's certification process includes a sequenced review which requires projects to avoid, minimize, and mitigate for any loss of wetlands. The ODNR also has authority to acquire, manage, and restore coastal wetlands. The programs require the state to:

- Regulate wetland development activities through section 401 certification of compliance with the State's water quality standards, including the antidegradation policy;
- Develop and maintain a statewide wetlands inventory and data base;
- Acquire, protect and restore coastal wetlands;
- Protect habitat of rare and endangered species;

- Restrict the taking and possession of threatened native animal species; and
- Restrict the taking, removal, transportation and sale of endangered or threatened native plant species.

#### Ports and Shoreline Development

The ODNR has broad authority to protect the public trust in Lake Erie waters and underlying lands through the submerged lands leasing program, submerged lands preserves, and permits for salvage and recovery of submerged abandoned property.

#### Recreation and Cultural Resources

The ODNR is responsible for implementing a comprehensive plan to improve public access to Lake Erie's shoreline and waters through the following principal programs:

- Protect public access rights through the submerged lands leasing program;
- Provide for public access within the state nature preserve system, state parks system and state wildlife areas;
- Prepare, maintain and update a Lake Erie public access facilities inventory; assess needs and prepare plans and policy recommendations to increase public access;
- Provide grants for public access improvements;
- Protect historically and archaeologically significant resources and abandoned submerged property;
- Regulate watercraft safety; and
- Require licensure of hunters, trappers and anglers and provide hunter and trapper education.

#### Fish and Wildlife Management

The ODNR is responsible for management of all commercial and non-commercial taking of fish and wildlife as well as the protection of non-game and endangered species. The ODNR is required to:

- Regulate the taking of fish and wildlife;
- Protect all wildlife including nongame and endangered species;
- Investigate water pollution, fish kills and stream litter; and
- Protect fish habitat.

#### Environmental Quality

The Ohio EPA implements a broad range of air quality, solid waste, and hazardous waste programs to protect Ohio's natural resources so as to:

- Attain and maintain National Ambient Air Quality Standards;
- Regulate hazardous, solid and infectious waste facilities;



- Enforce requirements of the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); and
- Establish long range solid and hazardous waste management plans and hazardous waste pollution prevention plans.

The Ohio Department of Health regulates marina construction. ODNR, Ohio EPA and other state and local law enforcement officers prohibit the dumping of litter.

#### Energy and Mineral Resources

The ODNR implements management programs regarding oil and gas, and mineral development for Lake Erie as well as surface mining, while the Ohio Power Siting Board is responsible for the coordinated review of major energy facilities. Key authorities:

- Require certification of major utility facilities;
- Require 10-year demand, resource and site inventory forecasts for energy generation and transmission activities;
- Regulate oil and gas extraction;
- Regulate removal of minerals and other substances from Lake Erie and from under its lake bed; and
- Regulate permit issuance for surface mining.

#### Water Quantity

The ODNR implements several authorities that affect the withdrawal of waters from Lake Erie. These programs:

- Regulate water diversions from Lake Erie;
- Require large facilities to register capacity and submit annual withdrawal reports; and
- Develop a long-term water resources plan for the Lake Erie basin.

## 2. Boundary

The Ohio coastal area includes all of the waters of Lake Erie to the international boundary with Canada, the islands in the lake, the bed of the lake, and adjacent shorelands within Ohio. The inland coastal management boundary of the Ohio coastal area, which is described in Chapter 3 of Part II, includes all shorelands subject to erosion or flooding, estuarine areas and wetlands, and other areas the use of which may directly and significantly affect Lake Erie waters. The inland extent of the boundary varies based on the biogeographic features of the area. For example, the boundary extends inland approximately 16 miles along the Maumee River while in urban areas, the coastal boundary generally is less than a half mile from the shore. The inland boundary was developed based on substantial public input.

### 3. Geographic Areas of Particular Concern

The OCMP, based on a public participation process, has designated the following area as geographic areas of particular concern: critical fish habitat, ports and harbors, state nature preserves and wildlife areas, coastal erosion and flood hazard areas, public parks and access areas, wetlands, historic and archeological sites and those portions of Areas of Concern designated by the International Joint Commission that lie within the proposed OCMP management boundary. Seven specific areas are identified as Areas for Preservation and Restoration - these are primarily state nature preserves of exceptional value. The APR designation helps guide resource managers to restore or preserve the specific ecological, historic, or aesthetic values of these areas. These areas and a process for future designation of special management areas are described in Chapter 6 of Part II.

### 4. Other Special Planning Requirements of the CZMA

The CZMA requires that states specifically address the issue of shoreline erosion, shorefront access, and energy facility siting as part of program development. The OCMP responses to these requirements are found in Chapters 8, 9, and 10 of Part II.



## **B. Changes the Program Will Make**

Existing state authorities will be used to implement and enforce the Ohio Coastal Management Program. The program will result in changes in the way coastal resources are managed in the state by requiring the ODNR to monitor all state actions which could affect coastal resources, and to resolve conflicts between state agency decisions and the provisions of the OCMP. The program will also enhance implementation of core programs addressing hazards, wetlands, and access.

Ohio's objective in developing a coastal management program is to establish a comprehensive, coordinated approach for the protection, preservation and orderly development of the state's coastal resources. Specific management activities, including the operation of Ohio's core regulatory programs, are conducted by a variety of individual agencies. This collection of individual activities is tied together into a comprehensive program or "network" by Ohio's coastal management law, O.R.C. 1506.03, which requires that all state agency projects and permits be consistent with the OCMP.

The Coastal Management section of the ODNR's Division of Real Estate and Land Management, is the lead entity for reviewing state and Federal agency actions to ensure consistency with the OCMP. Chapter 4 of Part II of the document describes the procedures that REALM will use to implement state consistency requirements. These procedures include draft Memoranda of Understanding (MOU) between ODNR and several other state agencies. These MOUs, which will be finalized before program approval, provide that disagreements between agencies that cannot be resolved at the agency level will be referred to the governor for resolution. In addition, section 307 of the CZMA requires that Federal agency actions be consistent with the OCMP, once it is approved by OCRM. Chapter 7 of Part II describes how Ohio will implement the federal consistency provisions of the CZMA.

The CZMA provides incentives and a national direction to assist states in addressing coastal issues and problems. The following are the principal anticipated effects of Federal program approval:

- Federal section 306 grants estimated to total \$800,000 annually will be made to Ohio to assist in program implementation activities by the state and local entities; and
- State implementation of the Federal consistency provisions of the CZMA will ensure that Federal activities, federally licensed and permitted activities, and Federal assistance to state and local governments are consistent with the OCMP.

A more detailed description of the effects of federal approval of the OCMP is provided in Part III of this document.

### C. The Federal Coastal Zone Management Act

In response to intense pressure on coastal resources, and because of the importance of coastal areas of the United States, Congress passed the Coastal Zone Management Act of 1972 as amended [CZMA], (16 USC 1451). The CZMA authorizes a Federal program to encourage coastal states and territories to develop comprehensive coastal management programs. The CZMA has been reauthorized on several occasions, most recently in 1996 with the enactment of the Coastal Zone Protection Act of 1996 (P.L. 104-150). The program is administered by the Secretary of Commerce, who in turn has delegated this responsibility to the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service (NOS). Currently, 30 states and territories have coastal programs approved by the Assistant Administrator of the National Ocean Service.

The CZMA affirms the national interest in the effective protection and careful development of the coastal zone by providing assistance and encouragement to coastal states to voluntarily develop and implement management programs for their coastal areas. The CZMA authorizes financial assistance grants under section 305 for program development and section 306 for program implementation to provide coastal states and territories with the means for achieving these objectives. The Section 305 program development section was re-authorized by Congress in the 1990 amendments to the CZMA (P.L. 101-508, November 5, 1990) and in the 1996 amendments to the CZMA (P.L. 104-150, June 3, 1996). OCRM awarded the ODNR a section 305 grant of \$135,000 on October 1, 1992 to complete development of the OCMP, with subsequent grants of \$138,000 in 1993 and \$100,000 in 1995.

Sections 305, 306, and 307 of the CZMA and implementing regulations published on June 28, 1996, as codified at 15 CFR Part 923, provide the requirements and procedures for state management program development and Federal approval. In summary, the requirements for program approval are that a state develop a management program that among other things:

1. Identifies and evaluates those coastal resources recognized in the Act that require management or protection by the state or territorial government;
2. Re-examines existing policies or develops new policies to manage these resources. These policies must be specific, comprehensive, and enforceable, and must provide an adequate degree of predictability as to how coastal resources will be managed;
3. Determines specific uses and special geographic areas that are to be subject to the management program, based on the nature of identified coastal concerns. Uses and areas subject to management should be based on resource capability and suitability analyses and socio-economic considerations;
4. Identifies the inland and seaward areas subject to the management program;
5. Provides for consideration of the national interest in planning for the siting of facilities; and



6. Includes sufficient legal authorities and organizational structure to implement the program and to ensure conformance to it.

In arriving at these substantive aspects of the management program, states are obligated to follow an open process which involves providing information to and considering the interests of the general public, interest groups, local governments, and regional, state, interstate, and federal agencies.

Section 303 of the CZMA provides guidance on specific national objectives that warrant full consideration during the implementation of approved state coastal management programs.

Section 305 of the CZMA authorized four annual grants to states desiring to develop a coastal management program. After its management program receives federal approval, the state is then eligible for annual grants under section 306 to implement the program. Section 306A of the CZMA also provides that states may use a portion of their section 306 awards for low cost construction projects that result in the preservation of important natural areas, improved public access, or renewal of urban waterfronts.

Section 307 contains the Federal consistency provisions of the CZMA to ensure that Federal actions are consistent with the state's federally approved management program. Paragraphs (1) and (2) of section 307(c) require that Federal activities and development projects in or directly affecting the coastal zone be consistent to the maximum extent practicable with a federally approved state management program. Subparagraphs (A) and (B) of section 307(c) require that federally licensed and permitted activities affecting the coastal zone also are consistent with federally approved state management programs. Section 307(d) requires Federal assistance to state and local governments for projects affecting the coastal zone to be consistent with federally approved state management programs. Federal regulations implementing section 307 are found at 15 C.F.R. Part 930.

Section 309 establishes a coastal enhancement grant program. This section provides that a portion of section 306 funds is available to states to develop program changes which strengthen their CZM program's ability to address particular coastal issues. State efforts to seek such improvements are meant to focus on priorities based on a self-assessment of the nine objectives listed in section 309. These objectives include, among others, stronger wetland protection, improved management of coastal hazards and additional public access.

Section 312 directs the Secretary to evaluate the performance of state coastal management programs on a continuing basis. OCRM formally reviews the implementation of each state program on a three year cycle.

Section 315 establishes a National Estuarine Research Reserve System to preserve representative estuarine areas for long-term scientific and educational purposes. The Old Woman Creek National Estuarine Research Reserve, located east of Huron, Ohio, was designated in 1980.

The Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) established a new Coastal Nonpoint Pollution Control Program (CNPC), in addition to updating the CZMA. The State of Ohio has agreed to submit its updated Nonpoint Source Management Program as the basis for an approvable CNPC to NOAA and U.S. EPA within 30 months of program approval

(see Appendix J). After Ohio submits its coastal nonpoint program, NOAA and EPA will make a final determination regarding its compliance with section 6217.

**D. Cross Reference to Program Requirements**

<u>How the Ohio Coastal Management Program Meets the Requirements of the Coastal Zone Management Act:</u>			
<u>CZMA Section</u>	<u>Requirements</u>	<u>CZMA Approval Regulations</u> (15 C.F.R. Section)	<u>Program Document</u>
306(d)(1)	Full participation/program adequacy.....	923.3	Full document
306(d)(2)(A)	Boundaries.....	923.31 - 923.34	Ch. 3, App. A,B
306(d)(2)(B)	Uses subject to management...	923.11	Ch. 4, 5
306(d)(2)(C)	Areas of particular concern.....	923.21, 923.22	Ch. 6
306(d)(2)(D)	Means of control.....	923.41	Ch. 4, 5
306(d)(2)(E)	Guidelines on priorities of uses...	923.21	Ch. 6
306(d)(2)(F)	Organizational structure.....	923.46	Ch. 4
306(d)(2)(G)	Shorefront planning process.....	923.24	Ch. 9
306(d)(2)(H)	Energy facility planning process...	923.13	Ch. 10
306(d)(2)(I)	Erosion planning process.....	923.25	Ch. 8
306(d)(3)(A)	Plan Coordination.....	923.56	Ch. 4, App. Q
306(d)(3)(B)	Continuing consultation mechanisms.....	923.57	Ch. 4, App. Q
306(d)(4)	Public Hearings.....	923.58	Ch. 2, App. Q
306(d)(5)	Gubernatorial review and approval	923.48	Part II (Gubernatorial Letter)
306(d)(6)	Designation of recipient agency....	923.47	Ch. 4
306(d)(7)	Organization.....	923.46	Ch. 4
306(d)(8)	Adequate consideration of national interests.....	923.52	Ch. 10, App. Q



306(d)(9)	Areas for preservation/restoration...	923.22	Ch. 6
306(d)(10)(A)	Administer regulations; control development; resolve conflicts.....	923.41	Ch. 4
306(d)(10)(B)	Powers of acquisition, if necessary	923.41	Ch. 5, 9, App.Q
306(d)(11)	Techniques of control.....	923.41 - 923.4	Ch. 4
306(d)(12)	Uses of regional benefit.....	923.12	App. Q
306(d)(13)	Inventory and designation of coastal resources of national significance and enforceable policies to protect such resources.....	No Regulations	Ch. 6
306(d)(14)	Public participation in permitting consistency and other similar decisions.....	No Regulations	Ch. 4, 7, App.Q
306(d)(15)	State agency adherence to program	No Regulations	Ch. 4
306(d)(16)	Enforceable policies to implement Coastal Nonpoint Source Program required by CZARA 6217.....	6217 Guidance issued Jan. 1993	Ch. 4, App. J
307(b)	Consideration of Federal agency views.....	923.51	App. Q
307(c)&(d)	Federal consistency procedures	923.53	Ch. 7
307(f)	Incorporation of Federal air and water quality standards.....	923.45	Ch. 5, App. Q

*The purpose of this educational package is to assist Ohio citizens to participate in the public policy process related to land use and development. The program provides background information to raise citizen awareness of land use and development realities and to help individuals and communities evaluate options. The bottom line is encouraging citizen participation in the public policy decisions that will be made in Ohio about land use and development. This chapter and the accompanying set of slides is meant to supplement the introductory chapter and slide set: **Sustaining Growth and Development -- Issue Education for Public Decision.***

### **Linking Land Use and Lake Erie:**

A Planning Framework for Achieving Balanced Growth  
in the Ohio Lake Erie Watershed

*Attaining a living equilibrium between a strong, diversified economy  
and a healthy Lake Erie ecosystem.*

Report and Recommendations of the Ohio Lake Erie  
Balanced Growth Blue Ribbon Task Force,

*Adopted, April 2004 by*  
Ohio Lake Erie Commission  
<http://www.epa.state.oh.us/oleo/>

(Edited summary for educational presentation by Joe Konen, Ohio State University Extension)

Overall, balanced growth is in the long-term interest of Ohio. By linking land-use planning with the health of watersheds, other important objectives related to economic competitiveness and quality of life, will be promoted:

- Sustaining natural systems in the Lake Erie basin, as well as restoring what has been degraded.
- Encouraging the reuse and redevelopment of urban lands.

Other important objectives:

- Maximizing the efficient use of infrastructure.
- Conserving farmland.
- Providing open space and recreational opportunities.
- Promoting compact development patterns that build on the unique qualities of communities.
- Helping local governments plan for economic development opportunities and streamlined decision-making processes.
- Promoting greater transportation choices for communities.
- Providing consistency and predictability for private and public development decisions, thus enabling more cost-effective development

The Connection:

- Balanced growth includes revitalizing urbanized areas, promoting efficient development, and protecting natural areas all of which are quality-of-life strategies that are key to the retention and attraction of an educated workforce.



- In addition, clean freshwater in Lake Erie is in itself an attraction for many people.

### **10 Guiding Principles for a Sustainable Lake Erie Watershed:**

Activities in the Ohio Lake Erie watershed should:

1. Maximize investment in existing core urban areas, transportation, and infrastructure networks to enhance the economic vitality of existing communities.
2. Minimize the conversion of green space and the loss of critical habitat areas, farmland, forest and open spaces.
3. Limit any net increase in the loading of pollutants or transfer of pollution leading from one medium to another.
4. To the extent feasible, protect and restore the natural hydrology of the watershed and flow characteristics of its streams, tributaries, and wetlands.
5. Restore the physical habitat and chemical water quality of the watershed to protect and restore diverse and thriving plant communities and preserve rare and endangered species.
6. Encourage the inclusion of all economic and environmental factors into cost / benefit accounting in land use and development decisions.
7. Avoid development decisions that shift economic benefits or environmental burdens from one location to the other.
8. Establish and maintain a safe, efficient, and accessible transportation system that integrates highway, rail, air, transit, water, and pedestrian networks to foster economic growth and personal travel.
9. Encourage that all new development and redevelopment initiatives address the need to protect and preserve access to historic, cultural, and scenic resources.
10. Promote public access to and enjoyment of our natural resources for all Ohioans.

■ From the *Lake Erie Protection & Restoration Plan*, 2000

### **Watershed Balanced Growth Plans:**

A Watershed Balanced Growth Plan is a framework for coordinated, regional decision-making about how growth and conservation should be promoted by local and state policies and investments in the context of watersheds. A voluntary process will bring local governments together within watersheds to create Watershed Balanced Growth Plans. The state should offer incentives for participation.

Ohio is a home-rule state. There is substantial support for control of land-use decisions at the local level of government. However, some of the most pressing issues often have a larger regional dimension, e.g., economic development, housing supply, transportation, environmental quality. By transcending local political fragmentation and collaborating at a larger geographic scale, more effective local solutions can be realized.

**Watershed Planning Partnerships:**

Watershed Balanced Growth Plans will be developed by Watershed Planning Partnerships composed of:

- representatives of local governments,
- planning agencies,
- councils of governments,
- special purpose authorities (such as metropolitan planning organizations, sewer districts, or transit authorities),
- non-governmental organizations (such as watershed organizations, chambers of commerce, or land trusts).

State agency representatives will assist Watershed Planning Partnerships with coordination, state-level input, and other advice. The partnerships can contract with existing planning agencies, universities, nonprofit organizations, or private consultants for staff support

Watershed Planning is presently an active model in the region. 28 watersheds in Ohio have watershed coordinators funded through Section 319 of the Clean Water Act. Ohio has four Remedial Action Plans (RAPs) focusing on restoring polluted areas around the Great Lakes as part the of U.S.-Canadian effort.

**Unique Features of WBGPs:**

Watershed Balanced Growth Plans will not replace the comprehensive plans that many communities create, although they may augment such plans. They will be limited to the designation of two primary features:

- “Priority Conservation Areas”
- “Priority Development Areas.”

**Priority Conservation Areas (PCAs)**

Priority Conservation Areas (PCAs) are locally designated areas targeted for protection and restoration. They may be critically important ecological, recreational, heritage, agricultural, and/or public access areas that are significant for their contribution to Lake Erie water quality and the region’s general quality of life.

**Priority Development Areas (PDAs)**

Priority Development Areas (PDAs) are locally designated areas where growth and/or redevelopment is to be especially encouraged in order to:

- maximize development potential,
- maximize the efficient use of infrastructure,
- promote the revitalization of existing cities and towns,
- contribute to the restoration of Lake Erie.



Key to this program's success are state policies, programs, and incentives to support the implementation of locally designated PCAs and PDAs. State agencies will be asked to look for opportunities to support locally designated areas. Potential state incentives:

- The Clean Ohio Fund could offer special incentives for brownfield redevelopment projects in Priority Development Areas and encourage the local councils that select open space projects to give special consideration to projects in Priority Conservation Areas.
- The Ohio EPA could utilize the Water Pollution Control Loan fund and Water Resource Restoration Sponsor Program to support the PDA and PCA designations.

**Sustaining the progress:**

Watershed Planning Partnerships will continue to function after their plans are complete and that they will:

- Promote and monitor plan implementation.
- Provide guidance and assistance to local communities.
- Advise the Lake Erie Commission of significant problems/issues arising during implementation.

**The Lake Erie Commission's ongoing role:**

- Monitor the implementation of watershed plans and study unresolved issues.
- Track progress toward Balanced Growth and Lake Erie restoration goals
- Develop performance standards to measure such progress.
- Support the state's technical advisory committee.
- Recognize successes and innovative projects through an Awards program.
- Coordinate outreach and public education about balanced growth.

To develop a consistent and aesthetically pleasing trail and open space system, design guidelines have been formulated. These guidelines will assist in determining the appearance and approach to the design and engineering of the trail system.

### Goals

Design the Euclid Creek trail and bike route system to:

- illustrate its natural resources.
- provide an integrated experience for the user through sustainable design principles and a holistic design approach.
- provide a model for the community and region for future trail and facility design.

Use Sustainable Design Principles to:

- Provide a place for humanity and nature to co-exist.
- Accept responsibility for the consequences of design decisions.
- Create objects of long-term value.
- Eliminate the concept of waste.
- Rely on natural energy flows.
- Treat nature as a model, not an inconvenience to be controlled.

**SOURCE:** Guiding Principles of Sustainable Design  
National Park Service, 1993

The following sections highlight key elements of the trail system, as well as their design components.

### Building Materials

The purpose of selecting materials that are considered “green” products is to maximize the long-term efficiency of a facility and minimize harmful environmental and human health impacts. There are various definitions of “green” products. For example, the National Park Service uses the following parameters. Every material does not necessarily meet every classification, however the overall goal is to consider the entire life cycle of a material and make decisions that include environmental factors:

- Sustainable – Made of materials that are renewable and that are harvested in a sustainable manner.

- Non-toxic – Does not emit toxic gases, or is not made of hazardous substances.
- Conserves – Uses materials that are byproducts of other production processes, or uses less material overall to perform a particular function.
- Recycled – Uses recycled materials.
- Energy Efficient – Uses less energy/water than other products performing the same function.
- Biodegradable – Compostable, or breaks down, under natural conditions, into innocuous particles.
- Recyclable/Reusable – Can be reprocessed for its original use again, or reused for another use.
- Longevity – Has an exceptionally long life-expectancy compared to other products performing the same function.

**SOURCE:** Environmentally responsible Building Products,  
National Park Service, 1992

### Surface Alternatives

**Asphalt** – Asphalt is a reliable, sturdy, paving surface for a trail, and it is a cost effective approach for a low maintenance trail surface. The drawbacks of this material however, are that it is a non-porous surface, and it contains chemicals that may impact the surrounding wetlands and water quality. Use Locally: Cleveland Metroparks.

**Crushed Limestone** – Crushed limestone provides a porous surface without the issues of chemical implications. There may be maintenance concerns with the use of this material in areas subject to flooding. In addition, crushed limestone should be used only in situations where slopes are 5% or less. In areas with greater slopes, the limestone screenings migrate. Use Locally: Cuyahoga Valley National Park.

**Crushed Limestone with Stone Chip-and-Seal Surface** – In areas prone to flooding and steep slopes, an alternative is an asphalt base covered with a stone chip-and-seal surface. This alternative performs well when flooded, and the stone surface has an appearance similar to that of a crushed limestone trail. Use Locally: Cuyahoga Valley National Park.



**Road Oyl/Resin Pavement** – This is a non-porous surface similar to asphalt, but uses pine resin as the binder material, providing a solid surface without the environmental implications of asphalt. It has been used across the country on various trail projects, including cold climates. Proper mix and application of this surface is paramount to its success. Use: Lake Newman Trail, Chequamegon-Nicolet National Forest, Wisconsin.

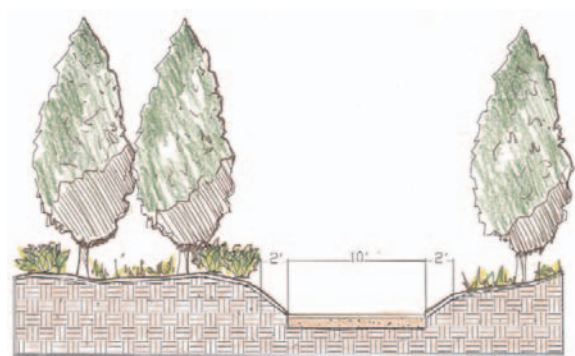


**Other Porous Paving** – Other porous paving options, such as a demonstration project at Walden Pond State Reservation in Massachusetts (<http://www.millermicro.com/porpave.html>) are potential alternatives in the future. The technologies of these surfaces are still evolving. One problem identified in past projects is the clogging of the porous surface with sediment, thus raising maintenance costs.

**Mulch** – The use of mulch (wood chips) is only recommended for neighborhood connections. This material will require regular maintenance due to its continual biodegrading and use on slopes.

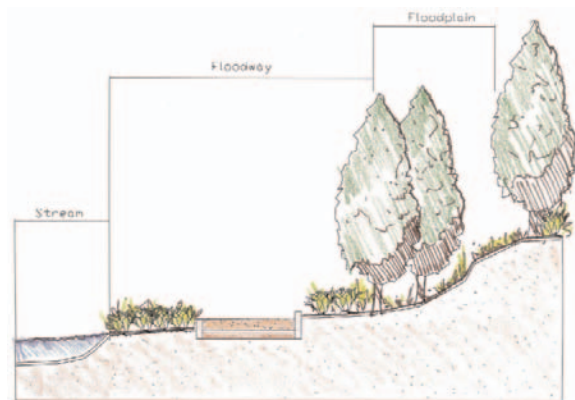
The user groups that are desired on the trail may also influence the choice of surface material. For example, walkers and bicyclists can use a variety of surfaces; however, in-line skaters can not efficiently use crushed limestone or mulch surfaces.

### Width Considerations



The width of the trail should safely accommodate two-way use. The typical width used locally is eight or ten feet. Generally, there is also at least a two-foot wide shoulder on both sides of the trail that is free of obstacles and hazards. For example, depending on conditions such as sun or dense shade, the shoulder could be mown grass or the typical forest ground covering.

Other issues also need to be taken into account when determining the appropriate width of the trail. For example, some funding sources may require a specific standard width, but other considerations include the location and width of the trail in relation to its impact on Euclid Creek's hydrologic function, erosion and slope stability, and fragile plant and animal habitats.



The American Association of State Highway and Transportation Officials (AASHTO) have developed the "Guide for the Development of Bicycle Facilities" which presents standards and criteria that should be used for roadways with bicycle improvements.

General recommendations for minimum bike lane widths are four to five feet width for one-way bicycle traffic.

Roadways are an important part of bicycling infrastructure and need to be designed, maintained, and operated so that bicyclists can use them safely and comfortably. Drainage grates, railroad tracks, potholes, utility covers, gravel, wet leaves, pavement joints, and many other surface irregularities can pose problems to bicyclists. Below is a listing of various types of bike infrastructure.

### **Paved Shoulders**

The AASHTO Guide for the Development of Bicycle Facilities notes that in more rural areas, “adding or improving paved shoulders often can be the best way to accommodate bicyclists.”

### **Critical Dimensions:**

- Less than four feet (1.2m): any additional width of paved shoulder is better than none at all, but at less than four feet, a shoulder should not be designated or marked as a bicycle facility.
- Four feet (1.2m): minimum width to accommodate bicycle travel measurement. Must be of useable width and should NOT include the gutter pan or any area treated with rumble strips.
- Five feet (1.5m) or more: minimum width recommended from the face of a guardrail, curb or other barrier.

Widths should be increased with higher bicycle usage, motor vehicle speeds above 50mi/hr, and/or a higher percentage of truck and bus traffic. Further guidance on the appropriate width of shoulders to accommodate bicyclists on roadways in these situations can be found in FHWA's Selecting Roadway Design Treatments to Accommodate Bicyclists.

### **Wide Outside Lanes**

In urban areas, paved shoulders are not normally provided on major roads. A wider outside (or curbside) lane allows a motorist to safely pass a cyclist while remaining in the same lane. This can be a significant benefit and improvement for cyclists.

### **Critical Dimensions:**

- 14 feet (4.2m): recommended width for wide outside lane; measurement should be from the edge line or joint of the gutter pan to the lane line
- 15 feet (4.5m): preferred where extra space is required for maneuvering (e.g., on steep grades) or to keep clear of on-street parking or other obstacles.

Continuous stretches of lane 15 feet or wider may encourage the undesirable operation of two motor vehicles in one lane. Where this much width is available, consideration should be given to striping bike lanes or shoulders.

### **Signed Shared Roadways**

In areas where automobiles and bikes share the roadways, it is important to sign the preferred bike route. A number of factors should be considered:

- the route provides through and direct travel.
- the route connects discontinuous segments of shared use paths or bike lanes.
- bicyclists are given greater priority on the signed route than on the alternate route.
- street parking has been removed or limited to provide more width.
- a smooth surface has been provided.
- regular street sweeping and maintenance is assured.
- wider curb lanes are provided compare to parallel roads.
- shoulders are at least four feet wide.

The AASHTO Guide recommends signing a shared roadway every 1/4 mile (500m) and at every turn (both to mark the turn and to confirm that the rider has made the correct turn).

### **Bike Lanes**

Bike lanes are defined as “a portion of the roadway which has been designated by striping, signing and pavement marking for the preferential or exclusive use by bicyclists.”



**Critical Dimensions:****Bicycle lane width:**

- Four feet (1.2m): minimum width of bike lane on roadways with no curb and gutter.
- Five feet (1.5m): minimum width of bike lane when adjacent to parking, from the face of the curb or guardrail.
- 11 feet (3.3m): shared bike lane and parking area, no curb face.
- 12 feet (3.6m): shared bike lane and parking area with a curb face.

**Bicycle lane stripe width:**

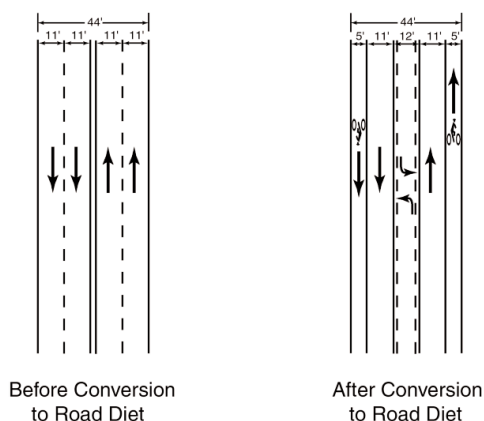
- Six-inch (150mm): solid white line separating bike lane from motor vehicle lane (maybe raised to eight-inches (200mm) for emphasis).
- Four-inch (100mm): optional solid white line separating the bike lane from parking spaces.

Innovative bike lane designs include: counter-flow bike lanes, colored bike lanes, and shared bike and bus lanes.

Restriping roads to accommodate other uses, like bicycles, is known as a “road diet”. The following graphic and pictures show examples of how a road diet may look.

**Shared-Use Paths**

Shared-use paths (often called trails and bike paths) for bicyclists and walkers sprang up in communities across the nation in the 1990s.



**SOURCE:** John LaPlante & Michael Ronkin

Important principles of planning and design for shared-use paths include:

- They are in addition, and complementary to, the roadway network. They are not a substitute for providing access to streets and highways. They need to be connected to the transportation system.
- They function best when they are in their own right-of-way.
- They have a wide variety of users, and must be designed to accommodate bi-directional mixed use.
- Intersections between shared-use paths and roadways are the greatest challenge when designing bike paths. Adequate sight and stopping distances should be considered.

**SOURCE:** [bicyclinginfo.org](http://bicyclinginfo.org): Pedestrian and Bicycling Information Center, 2005

**Maintenance/Emergency Vehicle Access**

Ample access for maintenance and emergency vehicles can be provided with an eight- or ten-foot wide trail with shoulders. If a bridge will be needed for vehicle access, it will need to have a width equal to the trail plus shoulders. If a bridge will not be needed for vehicle access, its width can be more

flexible to fit the situation. If a portion of a trail can not be accessed directly, an access plan is needed in order to locate access points in proximity to the trail.

### Traffic Calming

Well designed and implemented traffic calming measures (speed bumps, twists and turns, brick or paving blocks, etc) can have a number of beneficial impacts for bicyclists and pedestrians. In certain situations, traffic calming techniques may be used to reduce the number of motor vehicles traveling along particular streets, and can increase the number of bicyclists. These techniques can also be used to provide better roadway conditions for bicyclists.

**SOURCE:** [bicyclinginfo.org](http://bicyclinginfo.org); Pedestrian and Bicycling Information Center, 2005

### Parking Areas

Parking areas should provide ample space for visitors to park and unload bicycles, strollers, etc., in a safe and easily accessible manner to a trail. The circulation pattern of a parking area should be easy for drivers to follow and find the ingress and egress routes.

To minimize the amount of pavement, the parking area should be designed for parking stalls nine feet by eighteen feet in size, with isles either twelve feet wide, for one-way use, or twenty feet wide for two-way use. Final decisions on these dimensions may require a variance from local off-street parking standards.

Although asphalt may be essential for high demand parking areas, porous pavement applications, such as gravel, pavers, “grasscrete,” or grass should be considered for overflow areas and lightly used areas to limit impervious surface cover for the watershed.

Other things to consider:

### Bike Parking

Bike parking needs to be visible, accessible, easy to use, convenient, and plentiful. Once you have determined which stores, schools, or street corners need bike racks, the next step is to find the perfect location so that it is clearly visible, accessible, and

yet doesn’t interfere with pedestrians or vending machines or whatever else is also on the street corner.

The type of rack is also important. Bike racks should have the following:

- support the frame of the bicycle and not just one wheel.
- allow the frame and one wheel to be locked to the rack when both wheels are left on the bike.
- allow the frame and both wheels to be locked to the rack if the front wheel is removed.
- allow the use of either a cable or U-shaped lock.
- be securely anchored.
- be usable by bikes with no kickstand.
- be usable by bikes with water bottle cages.
- be usable by a wide variety of sizes and types of bicycle.

### Short-Term Parking

Short-term bicycle parking is usually defined as being two hours or less. It is recommended that racks be within 50 feet of the main entrance to the building, or entrances that are frequently used by cyclists. Other important factors are:

- well distributed (i.e., it’s better to have four or five racks spread out along one city block rather than a group of four or five racks mid-block).
- visible to the cyclist.
- in areas of high pedestrian activity, to discourage would-be thieves.

### Long-Term Parking

Long-term parking usually suggests that the bicyclist is leaving the bike all day, overnight, or even for a longer duration.

#### Long-Term Parking Options Include:

- Lockers, individual lockers for one or two bicycles.
- Racks in an enclosed, lockable room.
- Racks in an area that is monitored by security cameras or guards (within 100 feet).
- Racks or lockers in an area always visible to employees.



A growing number of communities are supporting the development of centrally-located secure bicycle parking garages that also offer bike rentals and repairs, easy links to transit, showers and lockers, and a variety of other services.

### Spacing and Siting Standards

Perfectly good racks that are poorly installed will simply not be well used. When designing, consider spacing from walls and other objects.

**SOURCE:** [bicyclinginfo.org](http://bicyclinginfo.org); Pedestrian and Bicycling Information Center, 2005

### Boardwalks/Bridge Structures

Boardwalks are recommended in areas that have fragile plant communities, wetland areas, and areas prone to major flooding events. Boardwalk materials include wood or plastic. Non-pressure treated wood can provide a sturdy boardwalk surface, but may not provide the longevity of other materials and may require more maintenance over time. Recycled plastic products can provide an environmentally friendly alternative for a boardwalk and may create less maintenance demands; however following the recommendations of the manufacturer concerning design and installation is important in order to prevent the plastic decking from warping over time.

Bridge structures can vary in type due to terrain and purpose. Once the uses and location of the bridge are established, the design considerations can be determined. Trail bridges need to be assessed on an individual basis on structure selection to determine use and access requirements. For example, pre-fabricated bridges can be built of wood, steel, concrete, or plastic, and bridge manufacturers can provide assistance with engineering and design issues.

Where terrain is very limited due to steep slopes, a cantilever bridge may be an option. These structures incorporate a bridge anchored to a retaining wall system, along with slope stability measures. This is a costly design feature, and all trail route alternatives should be analyzed before proceeding with this option.

### Picnic Pavilions/ Other Elements

Picnic pavilions, as well as other site elements such as trash receptacles, benches, and signage, should be made of environmentally responsible materials, outlined in the guidelines, and be low maintenance. Consultation with a landscape architect is recommended to determine the location, style, and construction of these elements and ensure that they meet the needs of visitors and address maintenance/safety issues.

Bollards are designed and used to assist in separating vehicle and trail users, as well as restrict motorized access onto the trail. A variety of bollard types are currently being used. For example, collapsible bollards prevent trail access by vehicles, but provide access in emergency situations for security or medical vehicles or repair trucks. The installation of these bollards should be considered at access points of a trail or roadway intersections, and should be determined in the final design phase of the trail layout. The materials and appearance of the bollards should reflect the design theme for the watershed and its trail elements.

### Accessibility Guidelines

It is recommended that the trails and trail facilities meet ADA (Americans with Disabilities Act) guidelines to provide access to people of all abilities and ages to this resource. These guidelines set forth parameters for trail grades, railing requirements, building features, and other considerations for park development. More information on trails and accessibility can be found at the National Center for Accessibility website at <http://www.ncaonline.org/trails/>.

### Landscaping

Additional landscaping to trail areas should be designed to reflect the surrounding natural resources in plant selection and layout. The amount of landscaping will need to be determined on a project basis, and will vary along the trail routes. Determination of landscaping needs should be assessed by a landscape architect, natural resource specialist, and stream specialist to ensure

proper plants and techniques will be used to ensure stream protection, habitat restoration, and aesthetic quality. The plants should be native and non-invasive, low maintenance, water efficient, and provide an appealing appearance. Plants should be selected by a certified nurseryman and the use of B&B plants (balled and burlapped) or bareroot plants is recommended.

### Signage

Signage serves as a tool to provide directional and safety information. The design and material used for these signs should be consistent, easy to read, and attractive. Signs can include small directional signs for facilities, as well as provide directions to local establishments. Signage can also be included as part of information kiosks that display park maps and amenity locations. A graphic artist and sign fabricator should be part of the team that develops signage.

### Interpretive Exhibits

Euclid Creek has opportunities to tell users the stories of the watershed through wayside exhibits or other media. The development of a comprehensive interpretive plan will assist in outlining an interpretive approach for the entire watershed and its resources. Once this approach is determined, the design, materials, and layout can be considered.

### Exhibit Type

A wayside exhibit should display a graphic or description of an area in a simple and cost effective manner. The three factors to determine as part of exhibit creation are panel imaging, panel design, and the exhibit base.

**Panel Imaging** – Porcelain enamel is the preferred material for outdoor exhibits. It withstands weather and vandalism and is low maintenance.

**Panel Design** – The design of the panel should be determined by an experienced exhibit specialist, using the findings of this document and the recommendation of the interpretive plan. Typically, a wayside panel is 36 inches by 24 inches and is the

general size recommended for this project. To increase interest, the panel should include visuals in addition to text.

**Exhibit Base** – There are varying types of bases that can reinforce the design theme of the park. The National Park Service has a number of bases they use as project standards, and it is recommended that these examples be used as a starting point.

### Accessibility

Assess the visual, mobility, and other physical impairments of visitors, as it relates to the display design.

- Place exhibits at accessible pullouts, viewpoints, parking areas, and trailheads.
- Install exhibits at a height and angle favorable for viewing by most visitors.

Use a recommended height of 32 inches from the bottom edge of the exhibit to the finished grade.

- Ensure that the typeface is legible in terms of size, and design.
- Present the text and visuals in colors that are easy to read and visually pleasing.

It is recommended that an experienced interpretive specialist, exhibit designer, and sign fabricator be part team creating wayside exhibits and other media.

**SOURCE:** [bicyclinginfo.org](http://bicyclinginfo.org); Pedestrian and Bicycling Information Center, 2005



*319 Programs* – Under the Clean Water Act, the EPA was directed to control water pollution from point and nonpoint source pollution. As a result, funding was appropriated to support the Ohio Nonpoint Source Management Program, which protects and/or corrects problems associated with nonpoint source pollution and water resources.

*Ohio Environmental Education Funds* – Established to enhance public awareness of environmental quality issues. OEEF has general grants of \$5,000 to \$50,000 and mini-grants of \$500 to \$5,000, with two rounds per year. The OEEF supports a variety of environmental education projects through the issuance of grants, and encourages submission of pollution prevention proposals.

*State Revolving Loan Fund* – Ohio EPA's Division of Environmental and Financial Assistance, working through the State Revolving Loan Fund and Water Pollution Control Loan Fund, can provide communities with low-interest financing for nonpoint source pollution control projects.

*Education Grants for Nonpoint Pollution Prevention* – This program integrates nonpoint source education into existing organizations to strengthen collaborative partnerships between school districts and other community groups.

*Citizen Action Mini-Grant Program* – Provides small grants to initiate local projects and activities that improve water quality and reduce nonpoint sources of pollution.

*Clean Ohio Fund* – In November 2000, Ohio voters approved Issue 1, a constitutional amendment authorizing up to \$400 million in state bonds. Half to be used for parks and open space, and half to be spent on brownfield redevelopment.

*Brownfields Redevelopment* – Currently Clean Ohio Funds are available for projects that revitalize urban areas through the redevelopment of industrial properties. In order to qualify, a site must be contaminated, and each project must focus on both

economic and environmental improvements. Brownfields redevelopment projects that create and preserve green space are encouraged.

*Public Health* – These projects involve the decontamination of sites that have no economic development opportunity and are therefore, ineligible for Brownfield Redevelopment funding.

*Stream and Watershed Protection and Restoration* – This program assists local communities, watershed groups, and occasionally state agencies in protecting and restoring streams and riparian areas. Projects of land acquisition would be given priority.

*Recreational Trails* – Local governments, alone or partnered with non-profit organizations or state agencies, can apply for grants for projects, including constructing recreational trails, acquiring land, and restoring trails. Twenty-five percent matching funds are required, but ODNR assistance may be available, if that goal is not possible.

*Green Space Preservation* – Any Ohio political subdivision able to own or operate a park or a recreational or conservation area would be eligible to either acquire or enhance green space. Twenty-five percent matching funds will be required.

*Nature Works* – In November 1993, voters approved a measure creating the Ohio Parks and Natural Resources Fund. Funds are used to improve and maintain parks and natural resources, as well as fund community parks and recreation projects, through grants to communities. A twenty-five percent match is required and all projects must be finished within two years.

*Ohio Department of Natural Resources* – Several programs exist for the purchase of wetlands, nature preserves, and other significant wildlife habitat areas.

*Ohio Coastal Management Grants* – These funds are awarded to help preserve, protect, and enhance Ohio's Lake Erie coastal resources. A minimum of 50

percent match is required. The Coastal Management Assistance Grant program is a reimbursement grant program whereby the project sponsor is expected to make the initial outlays for the project and then request reimbursement from OCM.

*Water Resource Restoration Sponsor Program* – This program allows communities to add projects protective of water resources to approved Water Pollution Control Loan Funds. The WPCLF program traditionally has loaned money for municipal wastewater treatment projects.

*National Fish and Wildlife Challenge Grants* – Grants are awarded to projects that address priority actions promoting fish and wildlife conservation and the habitats on which they depend, work proactively to involve other conservation and community interests, leverage available funding, and evaluate project outcomes.

*Recreational Trails Program* – This program is an assistance program of the Department of Transportation's Federal Highway Administration. Federal transportation funds benefit recreation by making funds available to States to develop and maintain recreation trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Funding comes from the Federal Highway Trust Fund, and represents a portion of the motor fuel excise tax collected from non-highway recreational fuel use: fuel used for off-highway recreation by snowmobiles, all-terrain vehicles, off-highway motorcycles, and off-highway light trucks.

*Lake Erie Protection Fund* – There are 84 strategic actions listed in the Lake Erie Protection & Restoration Plan. These actions are designed to improve environmental, recreational, and economic resources within Ohio's Lake Erie basin. The Lake Erie Protection Fund helps to implement this plan.

*Capital Improvements* – Piggy-backing on proposed projects of Federal and State Departments of Transportation, as well as local community infrastructure (e.g., bridges, road resurfacing or

expansion, culvert installation, etc.), will help to reach several goals at one time. Projects to consider are stream rehabilitation, bike lane formation, bridge enhancement, etc.

*Foundations and Endowments* – It is important to remember that there are a number of foundations that provide money for natural resource management and other environmental projects. Often these types of organizations have broader goals, which may allow for a wider variety of projects. Smaller grants can also serve as supplements when applying for larger grants.

*Partnerships within the Watershed* – The recommendations for the watershed provide the opportunity for communities to form partnerships in order to complete projects; especially the trails/greenways. For example, developing the East Branch Loop would involve the collaboration of the communities of Richmond Heights, Highland Heights, Mayfield Heights, the Village of Mayfield, and Willoughby Hills.