

## Appendix B: Big Creek Watershed Wetlands Analysis 2008

# **PRIORITIZING WETLAND RESTORATION POTENTIAL IN THE TRIBUTARIES OF THE CUYAHOGA RIVER AREA OF CONCERN (AOC)**

**CUYAHOGA RIVER  
COMMUNITY PLANNING  
ORGANIZATION**

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## INTRODUCTION

Many organizations and agencies in the region, when asked to identify wetland sites for conservation projects, focus primarily on opportunistic or “easy” sites. Opportunistic models lack the strategy to identify key wetland sites that provide optimal watershed benefits and tend to overlook long-term restoration potential of the site. With limited resources and funding for watershed protection, we need to be strategic in where and how we conserve our remaining wetlands.

Wetlands are complex and fascinating ecosystems that perform a variety of functions. Wetlands regulate water flow by detaining storm flows for short time periods. This reduces flood peaks and improves water quality by retaining or transforming excess nutrients and by trapping sediment and heavy metals. Wetlands also provide many other habitat and recreational benefits. However, not all wetlands perform all functions nor do they perform all functions equally well. The size and location of a wetland within a watershed determine its hydrologic and water-quality functions.

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

## GOALS & OBJECTIVES

### Goals

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

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

- 1) Watershed Performance- We identified key wetland sites based on a ranking system. The ranking system highlights wetland sites that are specifically important for managing water quality and quantity. Directing conservation efforts at these sites can help maximize the improvement of our stream resources.

We used GIS data to analyze several landscape variables on a watershed basis to help determine wetland performance. The size of a wetland, its location in the watershed, and other performance-based characteristics were considered. This kind of watershed analysis provides a means to prioritize conservation activities for organizations and agencies in the field of watershed protection.

The top wetland sites identified through the ranking system are then examined for restoration potential.

- 2) Restoration Potential- We analyzed land cover in the 50m buffer surrounding the key wetland sites. The intensity of land cover (measured in percent) surrounding a wetland affects restoration and enhancement options and influences the long-term effectiveness of projects. Many wetland functions are affected by land use activities; on the other hand these same functions can be enhanced or restored by addressing and minimizing the impacts from those same stressors. Restoration and enhancement options are examined in relation to land cover stressors. Options will be examined in the wetland itself and the land area or buffer around the wetland.

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

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

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

### Objectives

The objectives in this project included:

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

### Detailed Site Descriptions

Each selected wetland site has a detailed site description. Due to the multiple data sources used for this project some sites may have more detailed data than others, such as field visit observations.

The detailed site description includes:

- Map of Wetland- Orthophoto basemap with:
  - Wetland Boundary
  - Streams
  - Parcel Lines
  - Roads
- Wetland Classification- Hydrogeomorphic and/or Cowardin Class (based on plant community type)
- Size- acreage
- Ohio Rapid Assessment Method (ORAM) Score: Indicates wetland ecological condition: Category 3 (High), Category 2 (Medium), Category 1 (Low)
- Wetland Buffer Condition- Surrounding 50m Buffer (forest cover quantity)
  - Based on Forest Cover Condition Category
    - >75-100% Forest Cover- “High Quality
    - >50-75% Forest Cover- “Moderate Quality”
    - 25-50% Forest Cover-“Low Quality”
- Ownership- Public or Private
- Number of Parcels- An indication the of possible number of owners
- Impacts- Stressors identified during Field Visits (if available)
- Restoration Potential- Restoration, Enhancement or Preservation
- Cost Estimates- Estimated costs for restoration or enhancement options
- Latitude/Longitude- lat/long was established by calculating the centroid point of the wetland polygon
- Community- Local jurisdiction of the wetland site

### Classification

*Cowardin* wetland classifications identified in this study include palustrine emergent (PEM), these are marshes and wet meadows; palustrine scrub/shrub (PSS), which are wetlands dominated by shrubs and saplings; and palustrine forested (PFO), that include all forested wetlands.

Common species in the PEM (emergent) and PSS (scrub/shrub) wetlands include:

- *Cornus amomum* (silky dogwood)
- *Viburnum recognitum* (northern arrow-wood)
- *Rhamnus frangula* (European buckthorn)
- *Ulmus americana* (American elm)
- *Fraxinus pennsylvanica* (green ash)
- *Euthamia graminifolia* (fragrant flat-topped goldenrod)
- *Aster* spp. (asters)
- *Onoclea sensibilis* (sensitive fern)
- *Typha* spp. (cattails)

- *Leersia oryzoides* (rice cutgrass)

Common species found in the PFO (forested wetlands) include:

- *Ulmus americana* (American elm)
- *Fraxinus pennsylvanica* (green ash)
- *Acer rubrum* (red maple)
- *Glyceria striata* (fowl manna grass)
- *Rhamnus frangula* (European buckthorn)
- *Viburnum recognitum* (northern arrow-wood)
- *Carex* spp. (wetland sedges)

Hydrogeomorphic classification organizes wetlands based on hydrology and geomorphology.

1. Depression (Permanent inundation / Regular inundation / Seasonal inundation / Seasonal saturation)
  2. Impoundment (Beaver / Human)
  3. Riverine (Headwater / Mainstem / Channel)
  4. Slope (Headwater / Mainstem / Isolated / Fringing)
  5. Fringing (Reservoir / Natural lake)
  6. Bog (Strongly ombrotrophic / Moderately ombrotrophic / Weakly ombrotrophic)
- (Ombrotrophic ("cloud-fed") refers to soil or vegetation which receive all of their water and nutrients from precipitation, rather than from streams or springs.)

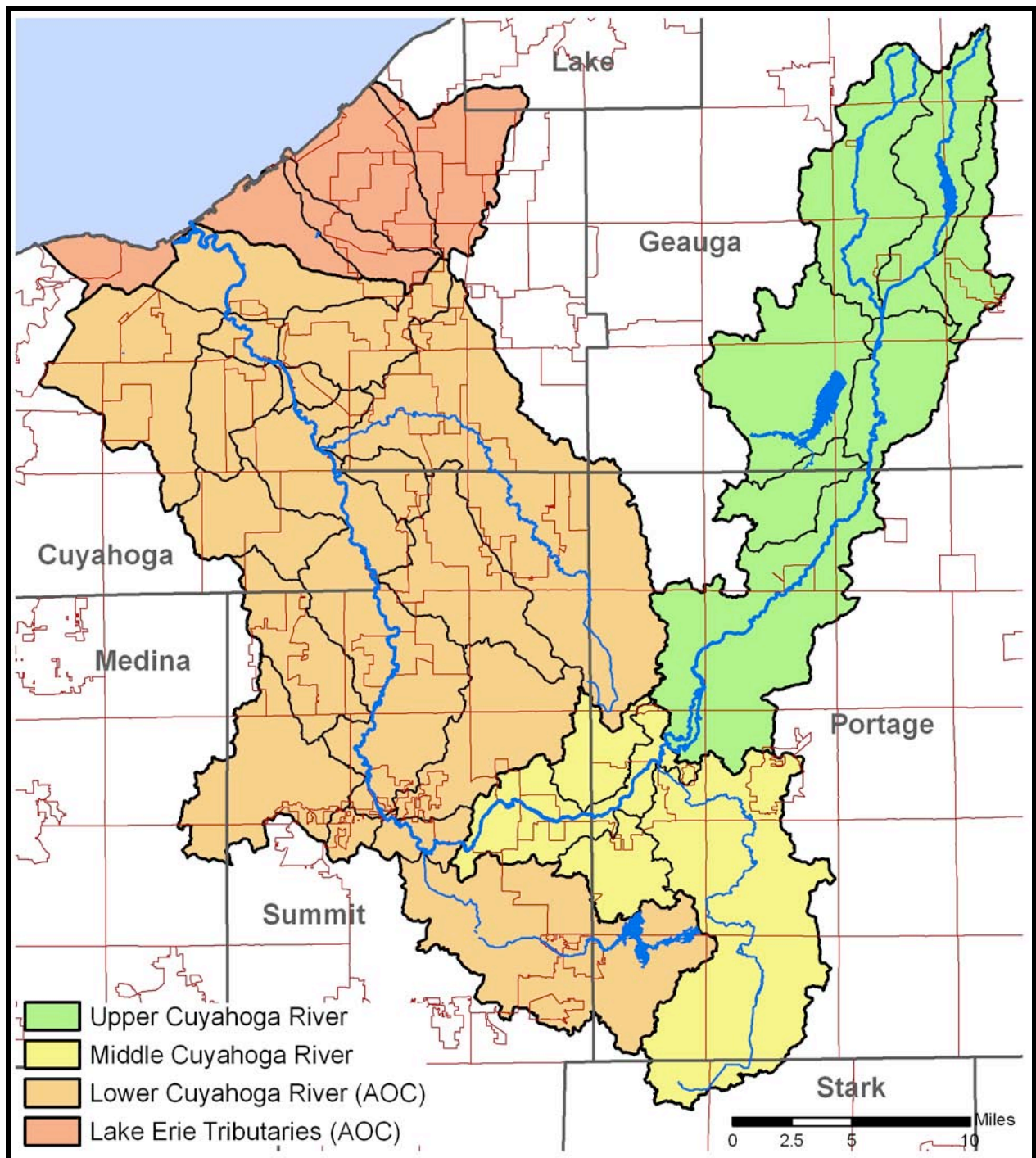
This model, developed for the Cuyahoga River, serves as an initial study that can be expanded and improved upon as newer data becomes available for each tributary watershed. Our model could be easily applied or adapted in different watershed settings and prove useful for other organizations and agencies. This study was undertaken to address the problems of stormwater quantity, water quality degradation and dwindling wetland habitat.

### **Study Area: Cuyahoga River Watershed & Area of Concern**

The U-shaped Cuyahoga River basin, located in northeast Ohio, drains 813 square miles and includes 1,220 stream miles spanning parts of 83 local jurisdictions and 6 counties.

The Cuyahoga River Watershed is organized into three sections: Upper River (Geauga and Portage Counties), Middle River (Portage and Summit Counties) and Lower River (Summit and Cuyahoga Counties). The Lower Cuyahoga River is part of the Area of Concern (AOC) designation. (See Map 1 on next page.)

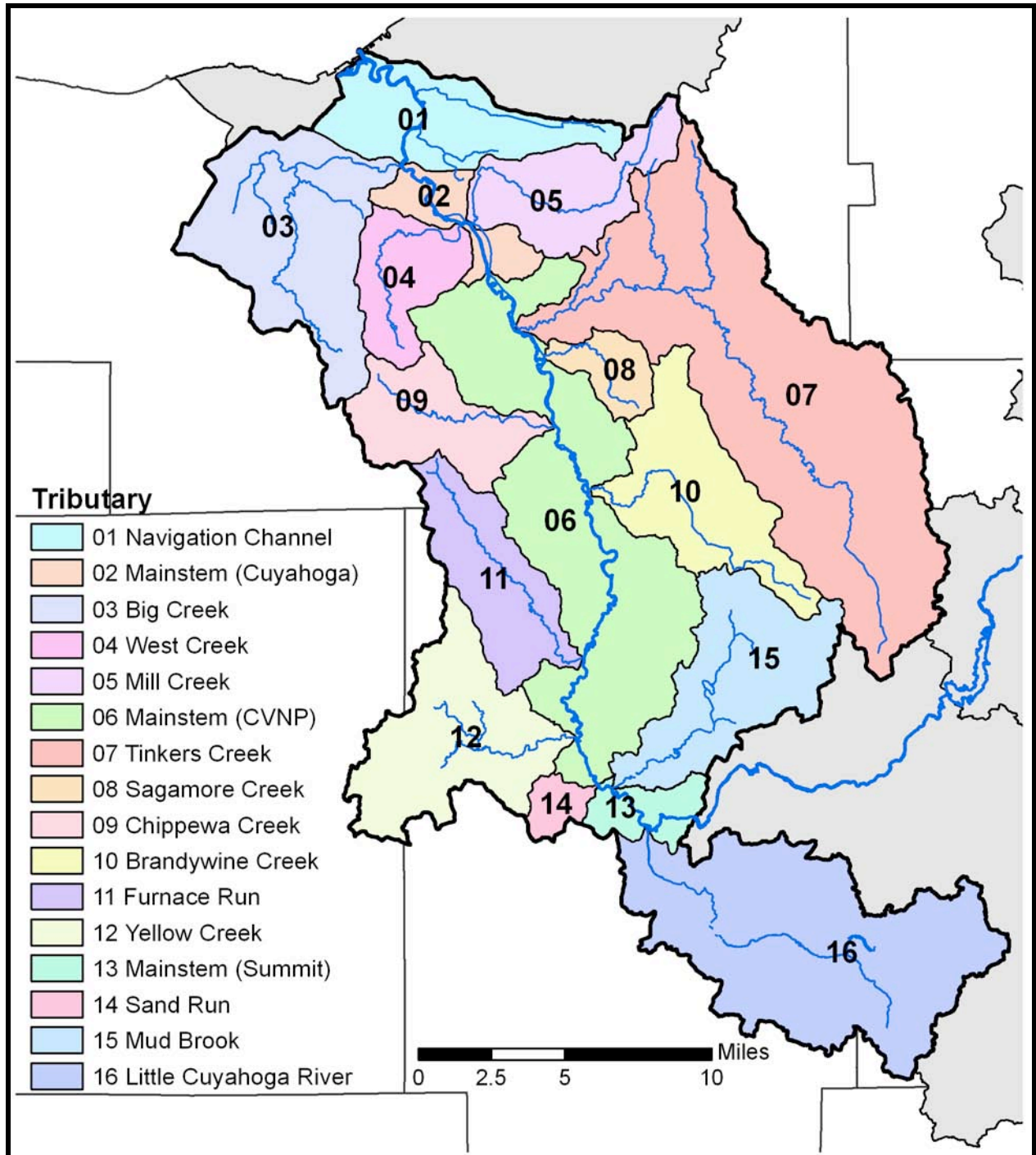
The river's headwaters originate in northeastern Geauga County and flow southwest to Akron. The river turns sharply to the northwest at the confluence with the Little Cuyahoga River in northern Akron, and then winds through the Cuyahoga Valley National Park before reaching the City of Cleveland and emptying into Lake Erie. The geo-political complexity of the watershed adds a unique dimension to achieving sustainable improvements in water quality.



Map 1: Cuyahoga River Watershed and Lake Erie Tributaries

Land use patterns vary greatly throughout the Cuyahoga River Watershed. The Upper and Middle River are still relatively healthy with an abundance of wetlands and a State Scenic River designation. The health of the Upper River can be attributed to a low level of urban development and 19,000 acres the City of Akron has preserved for drinking water purposes. Organic and nutrient enrichment, flow and habitat alterations are cited as the primary pollutants or impacts in

these reaches, which restricts sections of the river from meeting Ohio EPA's water quality standards. The major sources of these impacts come from channelization, home sewage treatment systems, reservoirs and agriculture.



Map 2: Lower Cuyahoga River Watershed Tributaries within the Area of Concern



### Cuyahoga River Area of Concern (AOC)

The lower 50 miles of the Cuyahoga River and its tributary watersheds between the city of Akron and Cleveland are part of the Area of Concern. The Lower River is among the most densely populated and industrialized urban areas in the state. In 1985, the International Joint Commission identified the area from the Ohio Edison Dam to the mouth and the Lake Erie near-shore areas as one of 43 Areas of Concern on the Great Lakes. In 1988, a Remedial Action Plan (RAP) was formed to address pollution problems affecting the Lower River's beneficial use impairments. This includes concerns about the health and habitat of fish and other aquatic life, limited recreation and public access to the river and harbor areas and human health and socio-economic concerns. The primary pollutants or impacts that restrict the Lower River and its tributaries from meeting Ohio EPA's water quality standards include organic and nutrient enrichment, low dissolved oxygen, toxicity, sedimentation, and habitat degradation. Sources of these impacts include combined sewer overflows, urban development and stormwater runoff. Twenty-two miles of the Lower Cuyahoga River flow through the Cuyahoga Valley National Park, before entering the 5.6 mile Navigation Channel and discharging into Lake Erie.

### Wetland Resources in the Area of Concern

Recent studies have shown that wetland resources are scarce, the majority are small ( $\leq 1$  acre), privately held and are showing signs of stress from the surrounding development. All together, this presents many challenges from accessing property to addressing land use stressors in order for restoration to occur.

Mack et al (2007) found that the ecological condition of wetlands deteriorates from the Upper and Middle to the Lower Cuyahoga River watershed. There are two indicators of this trend: the number of high quality (Category 3) wetlands and the acreage of low quality wetlands.

The first indicator is a *decrease* in the number of high quality wetlands from Upper to Middle to Lower portions of the watershed. In the Upper watershed, in Geauga county, 49.3% of the wetlands were Category 3. While in the Middle watershed, in Portage and Summit counties, 18.5% and 19.6% of the wetlands were Category 3. The Lower Cuyahoga River Watershed (AOC) had merely 8.3% of its wetlands as Category 3.

The second indicator is the *increase* in acreage of lower quality Category 1 and Modified Category 2 wetlands from Upper to Middle to Lower portions of the watershed. Category 1 and Modified Category 2 combined represent 4.5% and 5.6% of wetland acres in the Upper and Middle portions of the watershed, respectively. While in the Lower Cuyahoga River Watershed (AOC) 19.3% of the wetland acres are Category 1 and Modified Category 2. The ecological conditions of wetlands in the Lower Cuyahoga River Watershed are due to the relatively small wetland sizes and fragmented landscapes within the AOC.

### Causes & Sources of Degradation

There is an inverse relationship between the quality of a wetland and the number of land use stressors. Category 3 and 2 wetlands have a lower number of hydrologic and habitat stressors compared to a higher number of stressors found at Category 1 and Modified Category 2 wetland sites. In the Cuyahoga River Watershed the most important hydrologic stressors related to condition were ditching, dikes, stormwater input, filling, and roads.

Habitat Stressors in the Cuyahoga River Watershed												
Region of Watershed	Mowing	Grazing	Clear Cutting	Select Cutting	Woody Debris Removal	Sedimentation	Toxic Pollutant	Shrub Removal	Aquatic Bed Removal	Farming	Nutrient Enrichment	Dredging
Upper River	32%	4%	4%	15%	5%	4%	1%	11%	0%	5%	4%	6%
Middle River	25%	4%	4%	10%	12%	16%	1%	12%	1%	14%	18%	8%
Lower River (AOC)	29%	2%	2%	16%	9%	13%	2%	11%	0%	13%	11%	9%

Hydrologic Stressors in the Cuyahoga River Watershed									
Region of Watershed	Ditching	Tiling	Dikes	Weirs	Stormwater Input	Point Source	Filling	Roads	Dredging
Upper River	33%	5%	12%	3%	10%	0%	18%	29%	3%
Middle River	27%	1%	4%	0%	6%	3%	31%	40%	6%
Lower River (AOC)	27%	7%	13%	2%	4%	2%	24%	38%	7%

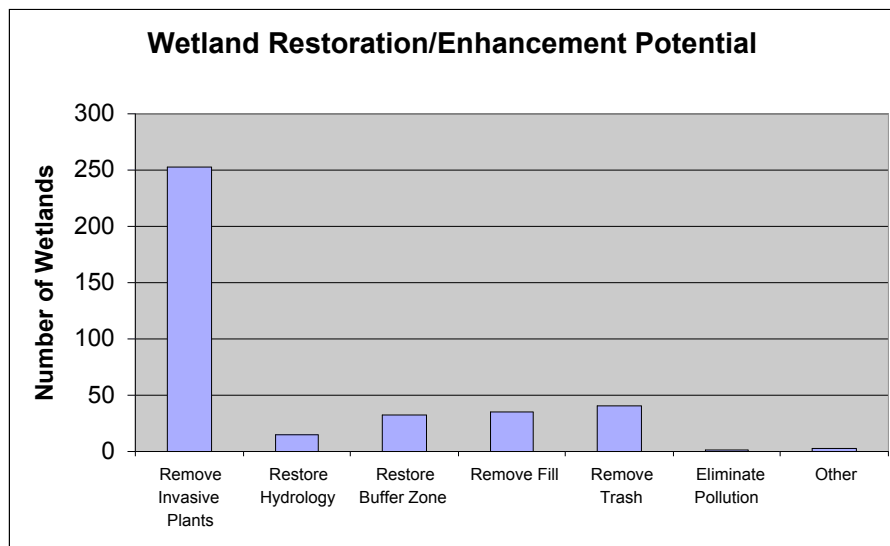
A 2002-03 field analysis of wetlands in the Lower Cuyahoga River showed adjacent land use as the most commonly noted impact. In most cases, this was the result of development on the adjacent land. Impacts associated with development of adjacent land include destruction of the buffer zone, isolation from adjacent natural areas, and runoff from lawns and impervious surfaces.

Another commonly noted impact is addition of fill. The old fill occurs mostly in small, isolated areas. The fill consists of subsoil, concrete, block, brick, and household debris. Some of the filled areas may contain hazardous waste or other unknown materials; on-site testing would be required to determine actual contents. In most areas, the extent and thickness of the fill is difficult to determine because of its age. New fill is in many cases associated with recent development projects.

Scattered debris, such as bottles, cans, tires, furniture, appliances, and car parts, is common within the wetlands, particularly the floodplain areas where these items are deposited by flood waters. Household dumps ranging in age from around 1880 to the present were found throughout the study area. These dumps tend to occur near old house sites, in ravines, and along roadsides. Dumping was noted where relatively large areas of household debris appear to have impacted the wetlands.

Drainage ditching and drainage tiling were observed in some areas. The ditches and tiles are old, and, in most cases, are only partially functioning to drain wetlands. Most of the ditches and tiles were associated with former agricultural fields. It is likely that tiles exist in more areas than

noted. Tiled areas are not easy to identify without a more detailed study. Table 6 provides a summary of wetlands impacts identified in the field (Cuyahoga River RAP 2003).



#### The Cuyahoga River AOC- Priority Area for Wetland Mitigation

The current mitigation rules do not adequately address the inequity of mitigation that occurs in the Cuyahoga River Watershed. A recent study shows that the Cuyahoga River Watershed has experienced a net loss of wetland acres due to the exportation to mitigation banks located outside the watershed. Furthermore, the majority of projects (67%) that restored or created wetlands independently (not a wetland bank) inside the watershed were not successful at meeting permit requirements (Kettlewell et al. 2008).

Mitigation has evolved into a barter system where the scales are tipped in favor of higher quality, rural watersheds; leaving the move heavily degraded urban watersheds at a disadvantage. Mitigation rules require that restoration projects must be available for a developer to mitigate. However, eligible projects that do exist in the Cuyahoga River AOC sub- watersheds are generally:

- 1) Very expensive, and
- 2) Above and beyond the requirements a typical developer would need to compensate for their impacts.

This in addition to the cheaper property values that exist outside the AOC makes it more economical for developers to perform mitigation outside the Cuyahoga River Watershed and therefore, far removed from the initial impact. The AOC needs to be a Priority Area for Compensatory Mitigation. We must have a net gain in high quality habitat to help improve watershed resources and move toward delisting.

This project identifies mitigation projects for each tributary watershed in the Lower Cuyahoga River Watershed, making in-kind mitigation within in the HUC-12 unit possible.

## METHODS OF ANALYSIS

### **Phase I- Collect, Analyze & Integrate Existing Wetland Data**

#### Summary of Wetland Data Sources

Each of the files listed below exists as a separate GIS polygon file.

1. Ohio EPA & Cuyahoga River RAP ORAM Analysis Summer 2005
  - Actually two projects completed together:
    - Ohio EPA project covers the entire Cuyahoga River Watershed
    - RAP project is a more in-depth analysis of three tributaries to the Cuyahoga River
2. Cuyahoga River RAP & Davey Resource Group Study 2001-03
  - Interpretation of aerial photos (1993-Cuyahoga County Engineer) & field work December 2002–April 2003
  - Covers only the Cuyahoga County portion of the Cuyahoga River Watershed
3. Cleveland Metroparks ORAM analysis Summer 2005 & 2006
  - Covers park reservations in Cuyahoga County portion of the Cuyahoga River Watershed
  - Follows same protocols as Ohio EPA & Cuyahoga River RAP ORAM project
4. Davey Resource Group Summit County Wetlands Project 2000
  - Interpretation of orthophotos photos (2000-Summit County Engineer)
5. Portage County Natural Resource Inventory compiled by Davey Resource Group, Inc
  - Interpretation of aerial photos (ASMAT 2000) & field work in 2004 & 2005
6. Cuyahoga Valley National Park Wetlands Inventory (covered in Summit County file)
7. Metroparks Serving Summit County Wetlands Project (covered in Summit Co. file)

In order to produce the best quality model for each tributary watershed, each data source, or GIS file, was divided into tributary watershed files, and then each set of tributary watershed files was combined and then updated to the 2006 orthophotos provided by Ohio DNR. In areas where wetland boundaries overlapped, ORAM boundaries were kept and others were edited.

## **Phase II- Developing the Cuyahoga River Wetlands Model Ranking System**

The basic premise of the Cuyahoga River Wetland Model is to numerically evaluate conservation alternatives by developing a set of criteria that can be used to judge each wetland. Each criterion was assigned either a positive or negative point range that reflects its importance to the function or dysfunction of the wetland within the tributary watershed. Each wetland earns numerical scores that depend on how well the wetland meets that particular criterion. The positive and negative points are each summed separately for each wetland. For the purpose of this project, the numeric totals for each potential conservation site were compared with all other sites within the tributary watershed and then a rank order was assigned. The rationale for the scoring system was to equate high positive scores with the most important wetland sites, while keeping separate negative scores that indicate the amount of stressors for each wetland.

The model is broken into two categories:

Positive Attributes looked at specific criteria that were both useful in evaluating a wetland's ecological importance and were supported in scientific literature. We used a Geographic Information System (GIS) to analyze several landscape variables on a watershed basis as indicators of wetland performance. Three of the variable pertained to the wetland itself: wetland size, proximity to riparian corridor, and proximity to mapped flood zones. Two other variables pertained to the 50m buffer surrounding the wetland: the amount of area of other wetlands within the buffer, and the overall quality of the buffer based on the percent of forest cover area in the buffer.

The top wetland sites identified through the ranking system are then examined for Stressor Attributes which helps identify restoration potential.

Stressor Attributes included the wetland's proximity to roadways and three types of land cover in the 50m buffer surrounding the wetland sites. The percent of urban, residential and agricultural land covers were analyzed, since the intensity of these land uses surrounding a wetland affects restoration and enhancement options and influences the long-term effectiveness of the project.

Additional options for restoration and enhancement are gathered from either field analysis data or aerial photography. Not all wetland sites in the study area have field data. However, when available, field data is the primary source for guiding conservation options. Orthophotography (2005), supporting literature and best professional judgment will guide conservation options for wetland sites lacking field data.

## MODEL RANKING SYSTEM

CUYAHOGA RIVER WETLANDS MODEL			
POSITIVE ATTRIBUTES (+)		STRESSORS (-)	
Wetland Size Groups	Points	LAND COVER	
<.5 acre	0	<b>Urban Area in 50m Buffer</b>	<b>Points</b>
>.5-1 acre	1	>75% thru 100%	-7
>1 thru 5 acres	2	>50% thru 75%	-6
>5 thru 10 acres	3	25% thru 50%	-5
>10 thru 20 acres	4	<b>Residential Area in Buffer</b>	<b>Points</b>
> 20 thru 100 acres	5	>75% thru 100%	-6
>100 thru 150 acres	6	>50% thru 75%	-5
>150 thru 200 acres	7	25% thru 50%	-4
>200 thru 250 acres	8	<b>Agriculture Area in Buffer</b>	<b>Points</b>
>250 thru 300 acres	9	>75% thru 100%	-3
>300 acres	10	>50% thru 75%	-2
<b>Wetland's Proximity to Riparian Setback</b>	<b>Points</b>	25% thru 50%	-1
Beyond 100m	0	<b>Wetland's Proximity to Roadways</b>	<b>Points</b>
75m thru 100m	1	0m thru 25m	-6
50m up to 75m	2	25m thru 50m	-5
25m up to 50m	3	50m thru 75m	-4
0m up to 25m	4	75m thru 100m	-3
Intersect with	5	100m thru 125m	-2
Fully within	6	125m thru 150m	-1
<b>Wetland's Proximity to Flood Zones</b>	<b>Points</b>	>150m	0
None	0		
Intersect with	1		
Fully within	2		
<b>Forests in Buffer of Wetland</b>			
>75% thru 100%	5		
>50% thru 75%	4		
25% thru 50%	3		
<b>Other Wetland Area in Buffer</b>	<b>Points</b>		
61% thru 100%	3		
26% thru 60%	2		
4% thru 25%	1		

## Rationale for the Cuyahoga Model

**Size (*Wetland Size*)**- Larger wetlands are better protected from the negative impact of external inputs. This is due to the greater distance between the core habitat and input sources, and larger areas of vegetation that can act as sediment and nutrient sinks.

**Hydrology (*Proximity to Riparian Corridor and/or Flood Zone*)**- For the purpose of this project, we identified wetlands associated with the riparian corridor and 100 year flood zone. In most cases these wetlands could be classified as riverine wetlands. “Riverine” refers to a class of wetlands that has a floodplain or riparian geomorphic setting with a dominant water source being over bank flow. These types of wetlands are especially valuable in their ability to absorb stormwater and slow the discharge of stormwater downstream (Krieger 2001). An urban wetlands study (Mack et al. 2007) found that riverine wetlands were clearly valuable in desynchronizing stream flood events (ie. capturing and slowly releasing precipitation). Desynchronizing helps to alleviate large peak flows in streams, which minimizes flooding and erosion downstream.

**Vegetative Cover (*Forest Cover in Wetland Buffer*)**- Houlahan et al. (2006) found a relationship between forest cover and exotic plant species richness, suggesting that loss of forest cover facilitates the infiltration of exotic plant species. The amount of natural vegetation adjacent to a wetland affects the quantity and quality of surface runoff in a wetland, particularly nutrient and sediment loads. In Wardrop et al. (2007) they developed a landcover condition category for forest cover surrounding wetlands. We adapted their category table for this project and rated forested cover by “High, Moderate and Low” quality.

**Wetland Connectivity (*Other Wetlands within Buffer*)**- Fenessey, Sullivan 2008 found a correlation between predicting ecological condition of a wetland and the presence of other wetlands located with the surrounding 50m buffer. This “wetland connectivity” is quite possibly functioning as a complex of wetlands, providing a buffering effect from upland stressors and enhancing watershed benefits.

## Stressors

**Land Cover**- Research shows that surrounding land-use affects ecological condition of a wetland. The condition of a wetland declines significantly as the surrounding land use changes from natural to urban. This is demonstrated by the change of wetland conditions from the Upper to the Lower Cuyahoga River Watershed. Research by Fennessy & Sullivan (2008) examines this issue by analyzing land-uses within different size buffers (30m 50m, 100m, 500m, 1000m) around the wetlands. Results show that land use characteristics in the 30m and 50m buffers had the strongest correlation with ecological condition of a wetland. This indicates that preservation of the buffer areas around wetlands can offer substantial protection and dramatically increase their conservation value.

For the purpose of the project, the land cover scoring coefficients were adapted from the Landscape Development Intensity (LDI) index. LDI integrates the impacts of human land use on a given site (Brown and Vivas 2005).

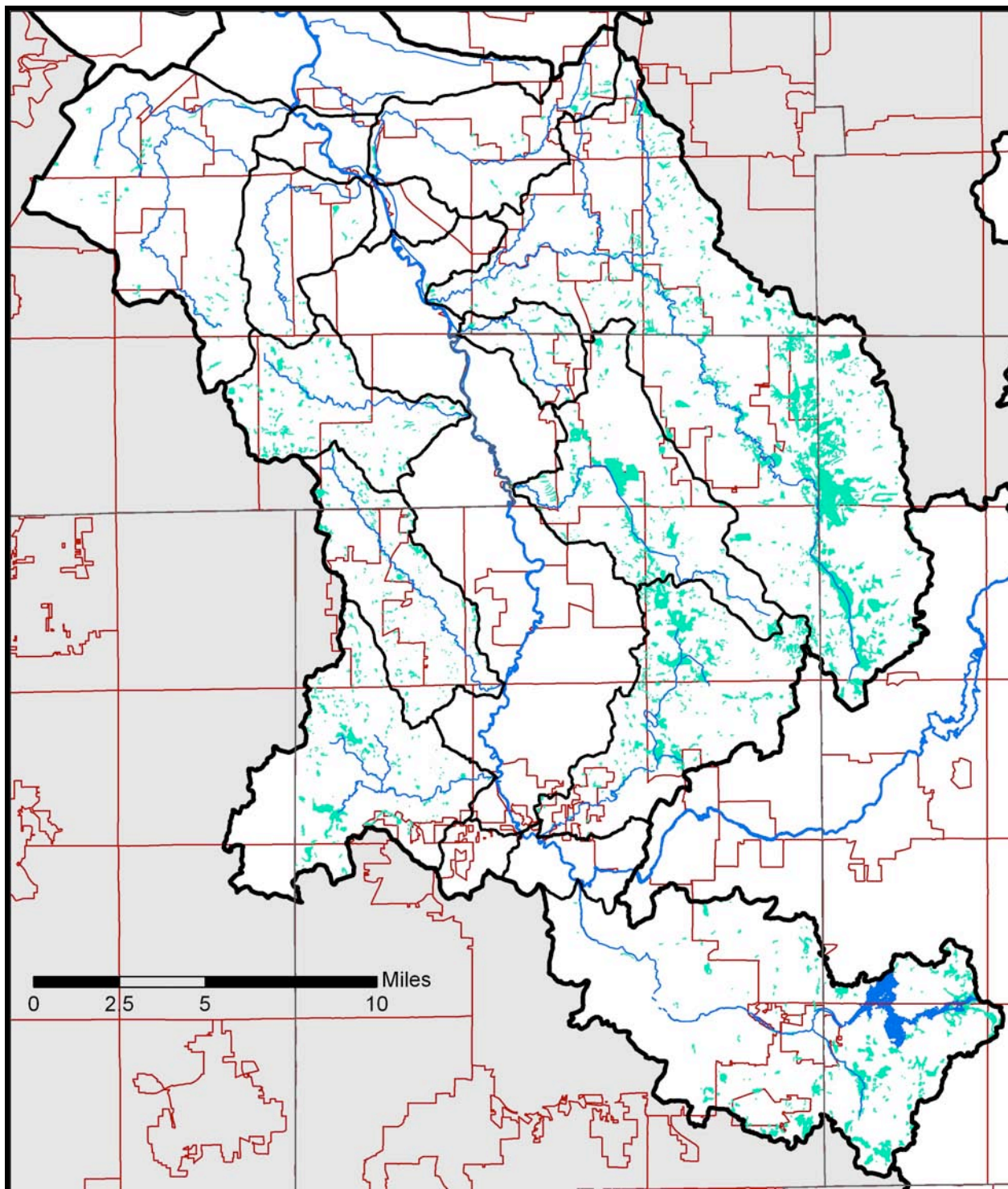
**Distance to Roadways-** Proximity of wetlands to road systems is correlated with higher levels of polluted runoff, and poorer water and sediment quality. There is evidence that wetlands located downstream of a road system are at an increased risk of receiving sodium, potassium and nitrate pollutants (Houlahan and Scott 2004). These pollutant loadings result from road salt applications and soil erosion due to increased stormwater runoff. The ranking model provides a range of negative scores based on a wetland's distance to a roadway. The closer a wetland is to a roadway, the higher the risk of impacts from polluted runoff and therefore the more negative the score.

## **RESULTS & SELECTION OF WETLAND SITES**

The study identified a total of 3,007 wetlands covering 9,710 acres within the tributary watersheds of the Cuyahoga River Area of Concern. All of the wetlands were analyzed within the context of their individual tributary watershed. Together, the top wetlands of each tributary watershed received further examination. These wetlands are highlighted in this report. 2459 acres of wetlands or 25.3% of total AOC tributary wetlands as part of the wetland analysis.

<b>Wetlands Summary- Cuyahoga River Area of Concern (AOC)</b>	
<b>Total Number of Wetlands</b>	3,007
<b>Total Acres of Wetlands</b>	9,710
<b>Average Wetland Size (acres)</b>	2.4
<b>Average Wetland Buffer Condition (Percent Forest Cover)</b>	Low Quality (25- 50%)
<b>All Top Selected Wetlands Total Acres (160 total)</b>	<b>2473</b>
<b>All Top Selected Wetlands Average Size (acres)</b>	22.3
<b>All Top Selected Wetlands Average Buffer Condition (Percent Forest Cover)</b>	High Quality (>75-100%)
<b>Total Restoration Potential Costs</b>	\$17,522,144





Map 3: Wetlands in the Tributaries of the Lower Cuyahoga River Watershed Area of Concern

## BIG CREEK

### **General Watershed Characteristics**

Big Creek, in northeast Ohio, is the third largest tributary in the Lower Cuyahoga River Watershed. This urban watershed has some of the highest population densities in the region. Big Creek's original drainage patterns and riparian zones have been altered and fragmented as a result of channelization, spillway structures, culverts, and changing land-use. This has increased flow volumes and polluted runoff, decreased diversity and livability of habitat, and limited the potential for stream recovery.

**Location:** Northeast Ohio, Cuyahoga County and drains the communities of: Cleveland, Brooklyn, Linndale, Brook Park, Parma, Parma Heights and North Royalton

### **Characteristics:**

Drainage: 38 square miles

Length: mainstem is 12 miles.

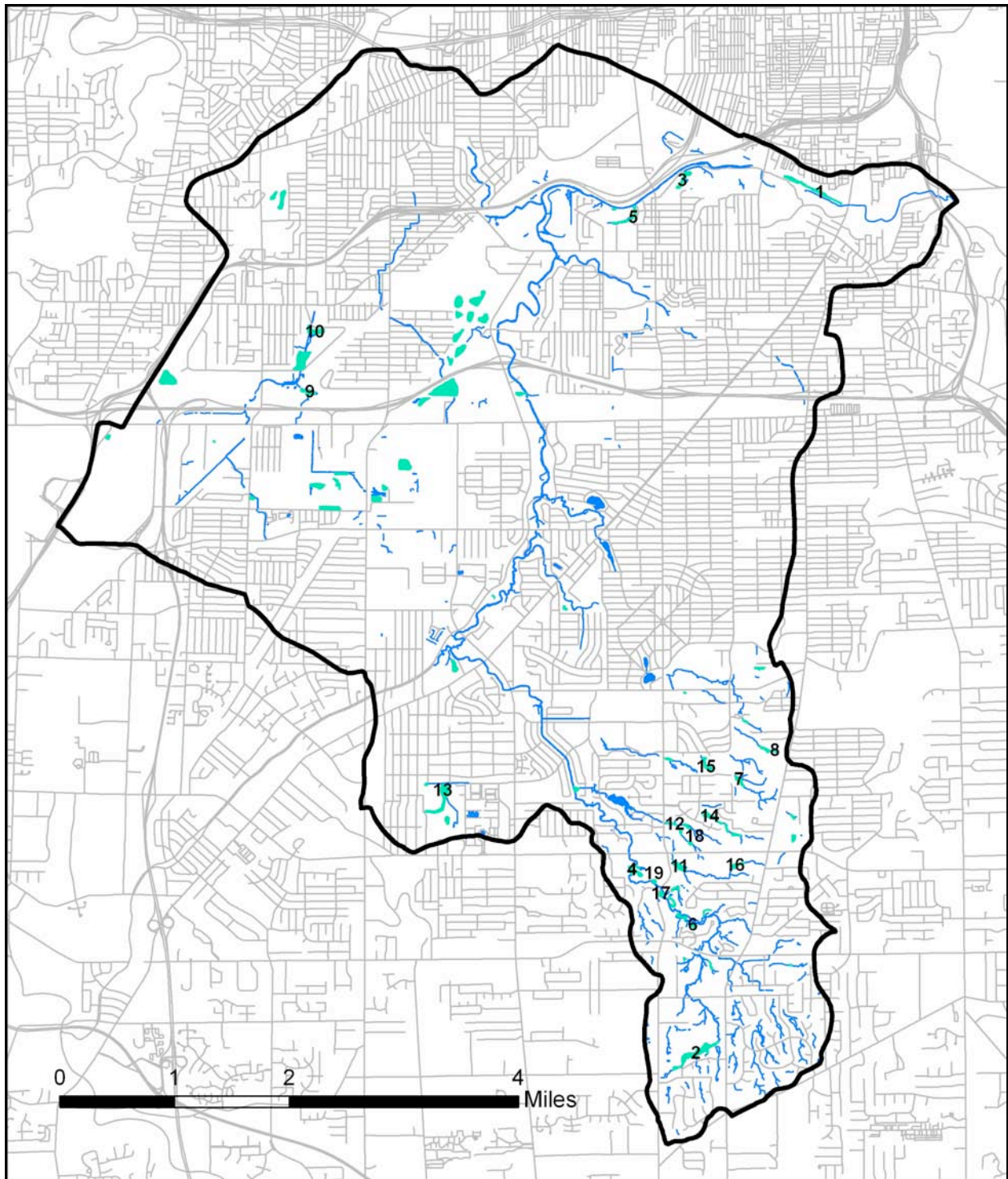
Gradient: creek drops an average of 23ft/mile.

Land Cover Characteristics (2001)	Percent of Drainage Area
Urban	52.06
Agriculture & Open Urban	31.78
Shrub & Scrub land	3.49
Wooded	13.91
Barren & Unclassified	1.00
Streams & Surface Water	.21

Wetlands Summary- Big Creek Watershed	
Number of Wetlands	74
Total Acres	137.52 acres
Average Size	1.86 acres
Average Wetland Buffer Condition (FC)	Low Quality (25-50%)
Top Ten Wetland Acres	28.20 acres
Top Ten Average Size	2.82 acres
Top Ten Average Wetland Buffer Condition (FC)	High Quality (>75-100%)
Total Restoration Potential Costs	\$1,801,406

### **Big Creek Wetland Results**

A total of 137.5 acres of wetlands were identified in the Big Creek Watershed. Through our analysis we picked the top 10 wetlands. These 10 sites equal 28 acres, or nearly 20% of the total wetland acreage in the watershed. Of the selected wetlands, sizes ranged from 9 acres to 0.75 acres.



**Big Creek Watershed Locator Map for Ranked Wetlands**  
(Map shows top 19 of 74 identified wetlands.)

## **Big Creek Watershed Wetland Maps**

Big Creek Watershed Locator Map for Ranked Wetlands

Big Creek Wetland Ranked #1: RAP_BC97	Scale: 1:5,000
Big Creek Wetland Ranked #2: RAP_BC501	Scale: 1:5,000
Big Creek Wetland Ranked #3: RAP_BC529	Scale: 1:5,000
Big Creek Wetland Ranked #4: RAP_BC544	Scale: 1:5,000
Big Creek Wetland Ranked #5: RAP_BC528	Scale: 1:5,000
Big Creek Wetland Ranked #6: RAP_BC229	Scale: 1:5,000
Big Creek Wetland Ranked #7: RAP_BC224	Scale: 1:5,000
Big Creek Wetland Ranked #8: RAP_BC9	Scale: 1:5,000
Big Creek Wetland Ranked #9: RAP_BC677	Scale: 1:5,000
Big Creek Wetland Ranked #10: RAP_BC521	Scale: 1:5,000

BIG CREEK WETLAND ID# RAP_BC97 Ranked No. 1	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	3.33
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings*
Ownership (Public or Private)	Private
Number of Parcels	4 Parcels / 2 Owners
Cost Estimates	\$12,648
Location (Lat/Long)	41.447197326681 / -81.707625155485
Community	Cleveland

\* Extrapolated Restoration Potential

Wetland BC97 is a 3-acre forested wetland on the lower mainstem of Big Creek, just upstream from the confluence with the Cuyahoga River. Notable features include a moderate forested buffer, neighboring wetland to the west and the connection with Big Creek's riparian corridor and floodplain. Wetland BC97 is located in the city of Cleveland. Ownership complexity is fairly easy with 4 parcels and 2 property owners. B & O Railroads owns 3 out of the 4 parcels.

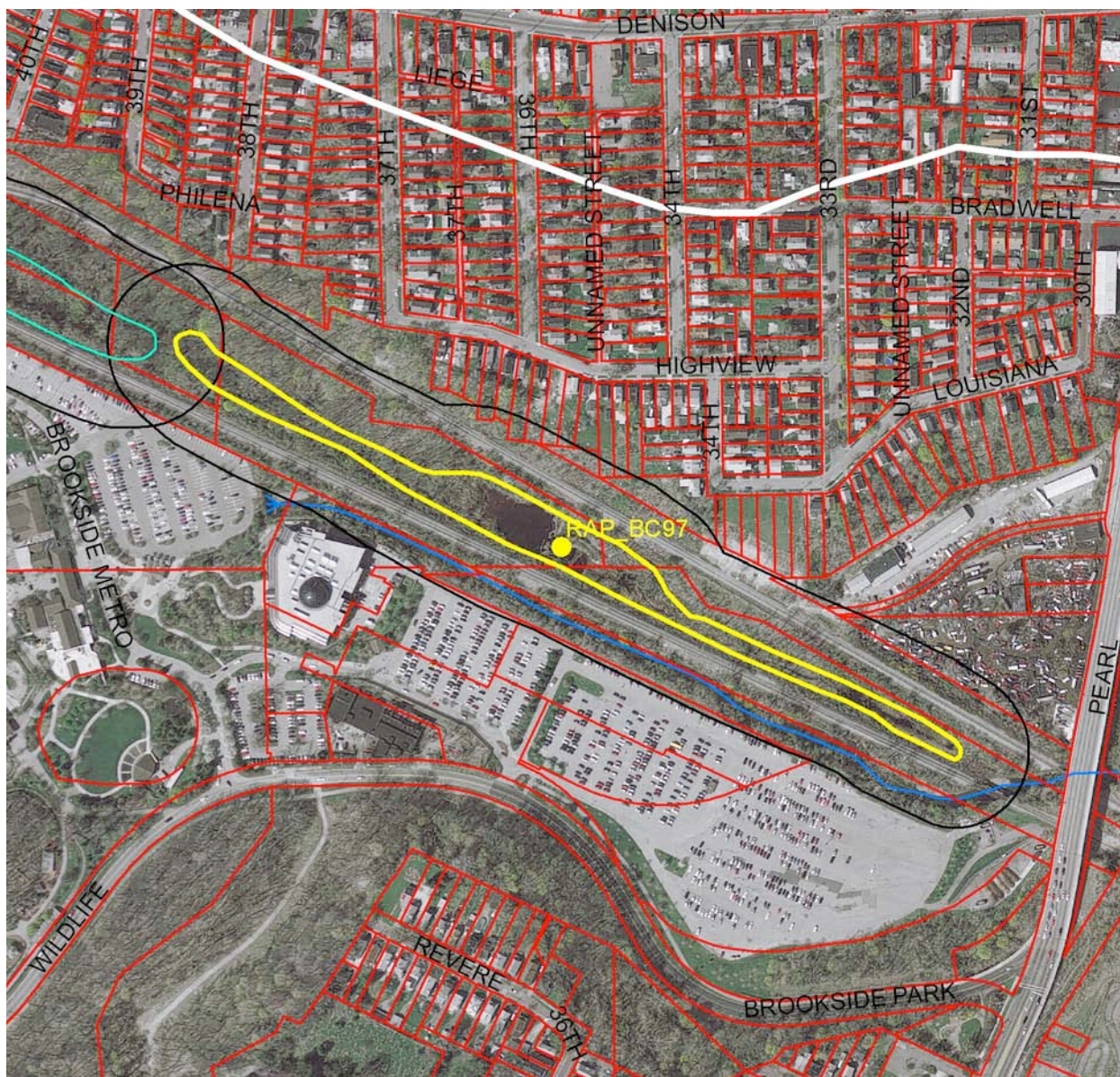
Wetland BC97 is most likely a moderate to moderately low quality wetland. This is due to the intensity of land use in the surrounding urban watershed. Further investigation may show that BC97 and its neighboring wetland are part one large wetland system.

Next steps include a more detailed site assessment of this wetland. The site assessment should include completion of an ORAM and Penn State Stressor Checklist. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. This site is landlocked and further development in this area is unlikely. This site should be targeted for a conservation easement and invasive species removal. Wetland and riparian plantings should be native, but also tolerant of urban conditions.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Detailed Sight Assessment	\$720	1	\$720
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$660	0.8acres	\$528
Riparian / Wetland Plantings	\$8,000	0.8acres	\$6,400
Conservation Easement	???	3.3acres	???
<b>TOTAL</b>			<b>\$12,648</b>





Big Creek Wetland Ranked #1: RAP\_BC97

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

BIG CREEK WETLAND ID# RAP_BC501 Ranked No. 2	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested & Shrub/Scrub Wetland (PFO) (PSS)
Size (acres)	9.59
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	New Fill Adjacent Land Use
Restoration Potential	Remove Invasive Plants Seeding/Wetland Planting Restore Buffer Zone
Ownership (Public or Private)	Private
Number of Parcels	12 Parcels / 12 Property Owners
Cost Estimates	\$36,308
Location (Lat/Long)	41.338571793973 / -81.729672609727
Community	North Royalton

Wetland BC501 is a nice 9-acre forested and shrub/scrub wetland located in the headwaters of the Big Creek Watershed. Notable features include a headwater stream, forested buffer zone along the north perimeter and the connection with the riparian corridor and floodplain. Wetland BC501 is located in the city of North Royalton. Ownership complexity is relatively high with 12 parcels and approximately 12 property owners.

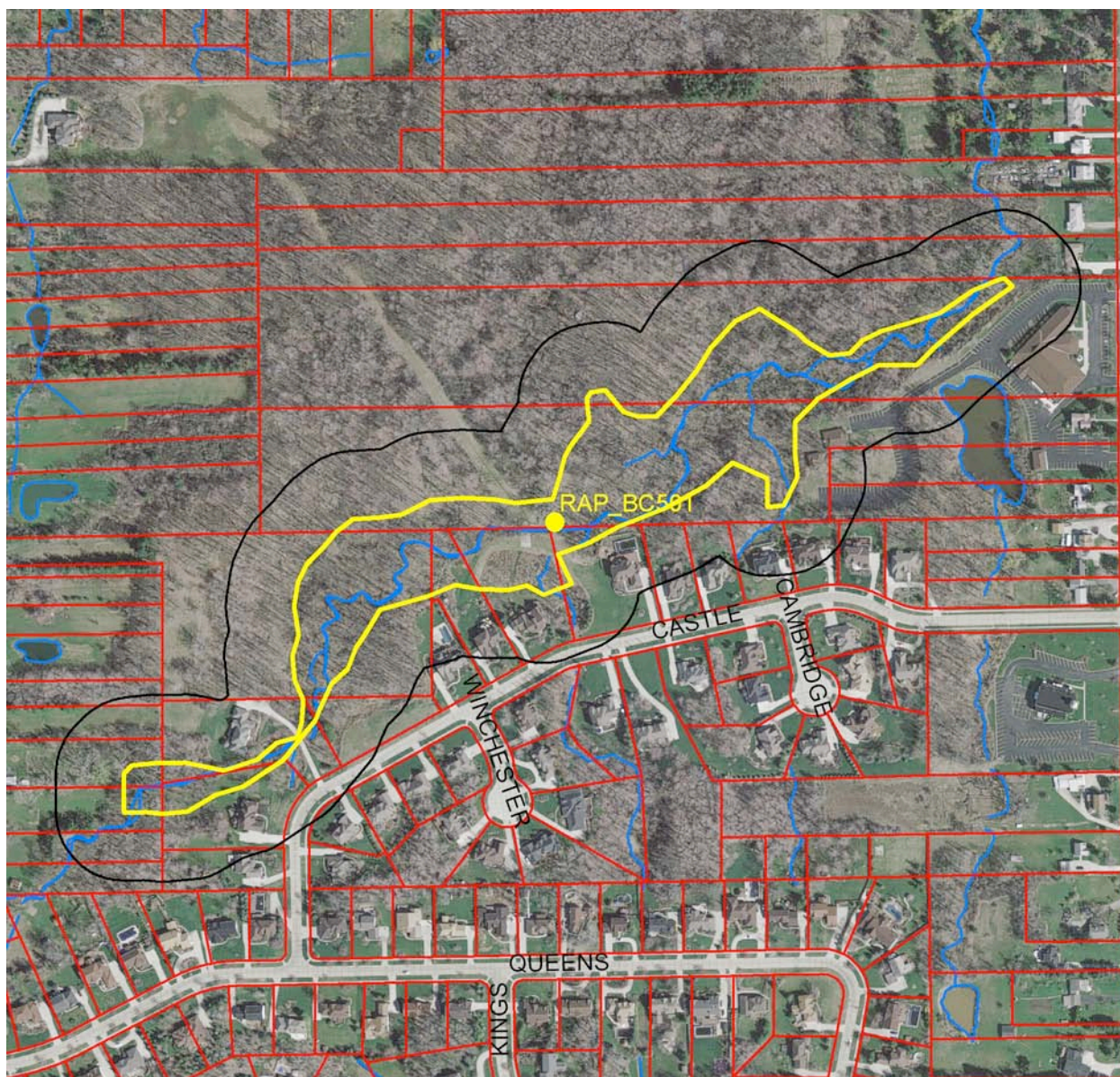
Wetland BC501 is most likely a moderate quality wetland. This is due to the urban nature of the watershed, the relatively light residential land use surrounding the site and the moderate quality forested buffer. Sources of water include precipitation, seasonal surface water and groundwater.

This site has been field visited in a 2003 RAP funded project. Field notes indicate new fill and adjacent land use (i.e. residential development) were impacts on-site. A future enhancement project should include, targeting the sparse amounts of invasive plants (Glossy Buckthorn, Narrow Leafed Cattail) and restoring the buffer zone along the southern perimeter. This site should also be targeted for conservation easements on the developed parcels.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$220	1.4acres	\$308
Seeding / Wetland Plantings	\$5,000	1.4acres	\$7,000
Riparian Planting/ Buffer Zone	\$8,000	3acres	\$24,000
Conservation Easement	???	3.3acres	???
<b>TOTAL</b>			<b>\$36,308</b>





Big Creek Wetland Ranked #2: RAP\_BC501

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83



BIG CREEK WETLAND ID# RAP_BC529 Ranked No. 3	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	2.15
Wetland Buffer Condition	Moderate to High Quality
Impacts (Field Assessments)	None
Restoration Potential	Remove Invasive Plants Riparian/Wetland Planting
Ownership (Public or Private)	Public & Private
Number of Parcels	4 Parcels / 3 Property Owners
Cost Estimates	\$9,330
Location (Lat/Long)	41.44888022871 / -81.730643155097
Community	Cleveland

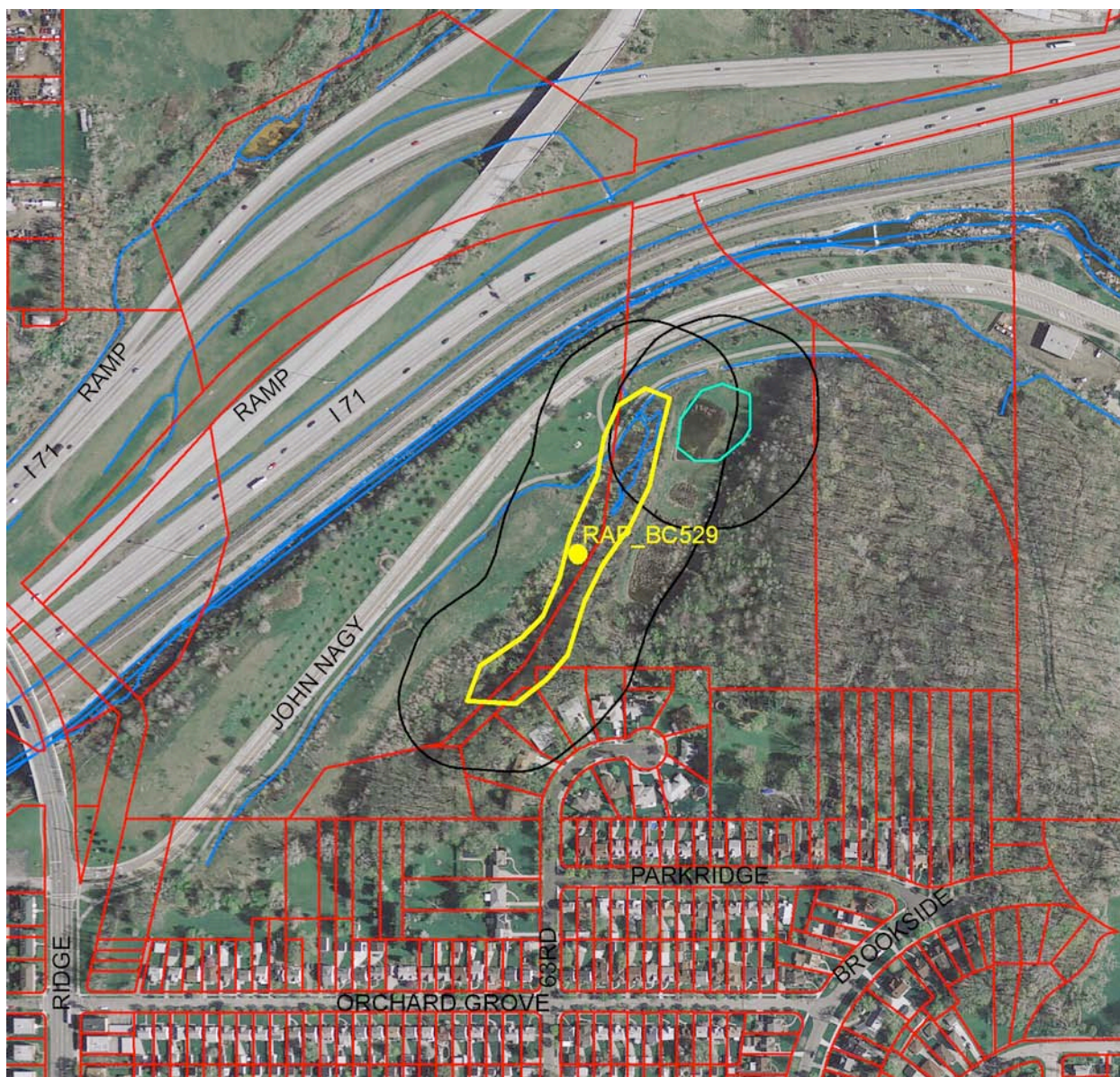
Wetland BC529 is a 2-acre forested wetland, dominated by Black Willow, along a tributary stream near the mainstem of Big Creek. Notable features include the connection with Big Creek and the riparian corridor, a neighboring wetland to the northeast, moderate quality forested buffer zone and the nearby Cleveland Metroparks' Brookside Reservation. Wetland BC529 is located in the city of Cleveland. Ownership complexity is relatively easy with 4 parcels and 3 property owners. City of Cleveland owns two of those parcels.

Wetland BC501 is most likely a moderately low quality wetland. This is due to the urban nature of the watershed, the altered tributary stream, potential runoff from upstream residential development and the moderate quality forested buffer. Sources of water feeding this wetland site include precipitation and surface water.

This site has been field visited in a 2003 RAP funded project. Field notes indicate no impacts to the wetland site. Future enhancement project should include removing invasive plants (Common Reed), which covers approximately 25% of the area, and adding riparian/wetland plantings. These plans should be made in cooperation with the city of Cleveland, other property owners and possibly Cleveland Metroparks. Equipment accessibility is easy.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$660	0.5acres	\$330
Riparian / Wetland Plantings	\$8,000	0.5acres	<u>\$4,000</u>
<b>TOTAL</b>			<b>\$9,330</b>



Big Creek Wetland Ranked #3: RAP\_BC529

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

WETLAND ID# RAP_BC544 No. 4	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Emergent Wetland (PEM)
Size (acres)	1.99
Wetland Buffer Condition	High Quality
Impacts (Field Assessments)	None
Restoration Potential	Remove Invasive Plants Seeding/Wetland Planting
Ownership (Public or Private)	Private
Number of Parcels	3 Parcels / 3 Property Owners
Cost Estimates	\$10,094
Location (Lat/Long)	41.361832489482 / -81.740126096022
Community	Parma

Wetland BC 544 is a nice 1.99-acre emergent wetland along the upper reaches of the Big Creek Watershed. Notable features include the connection with the riparian corridor, three neighboring wetlands including BC546, high quality forested buffer zone and the tributary stream. Wetland BC544 is located in the city of Parma. Ownership complexity is relatively easy with 3 parcels and 3 property owners. One of the parcels covers nearly 80% of the site.

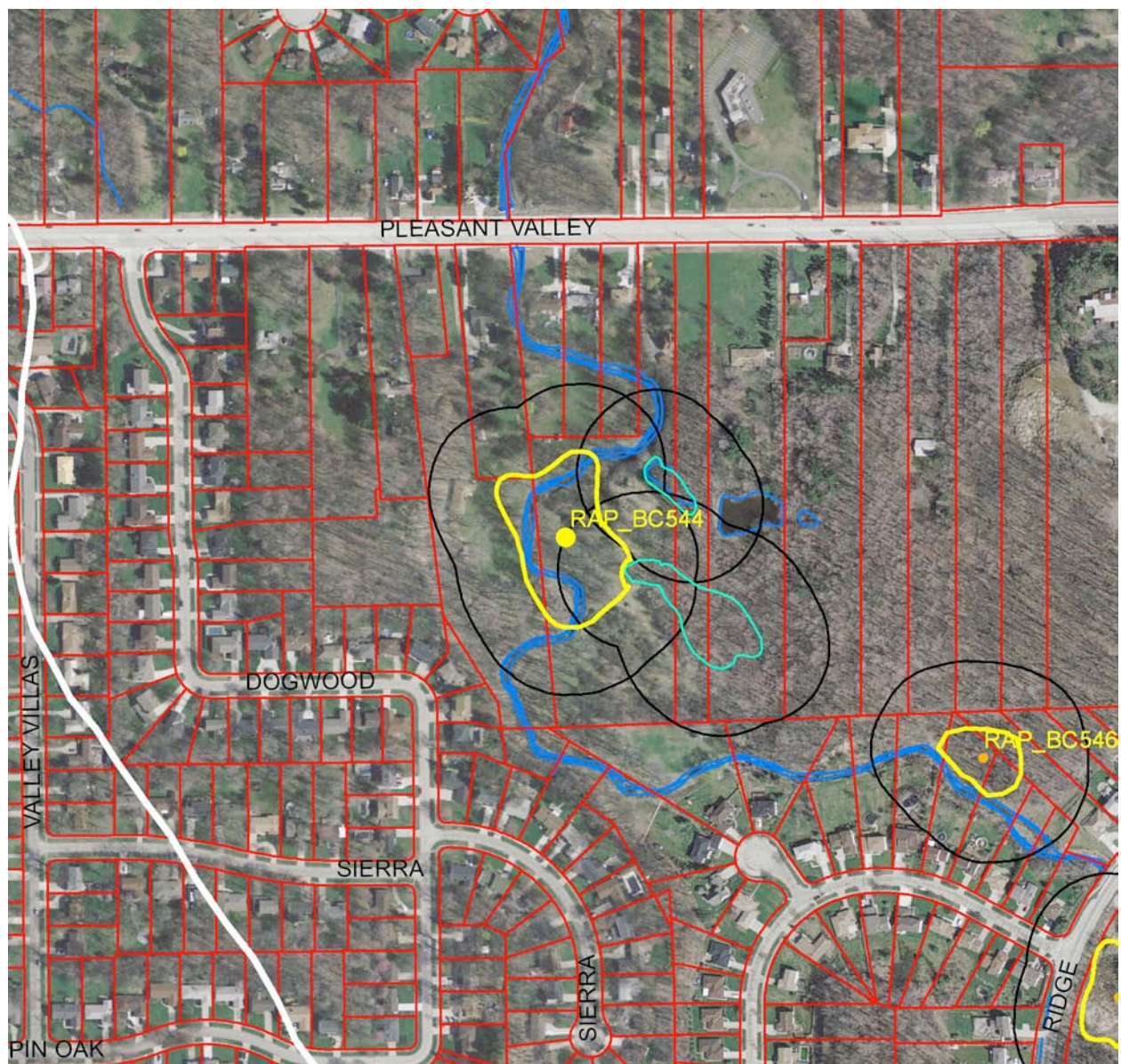
Wetland BC544 is most likely a moderately quality wetland. This is consideration of the urban nature of the watershed, high quality forested buffer and 50% coverage of invasive plant species. Sources of water feeding this wetland site include surface water.

This site has been field visited in a 2003 RAP funded project. Data indicates no habitat and water quality impacts to the wetland site. A noted plant on-site was the Green Ash. A future enhancement project should include targeting invasive plants (Reed Canary Grass) covering approximately 50% of the site and enhancing with seeding/wetland plantings. A conservation easement should be pursued on the developed parcels to help preserve any future enhancements. Equipment accessibility is medium.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$660	0.9acres	\$594
Seeding / Wetland Plantings	\$5,000	0.9acres	\$4,500
Conservation Easement	??	1.99	???
<b>TOTAL</b>			<b>\$10,094</b>





Big Creek Wetland Ranked #4: RAP\_BC544  
(Big Creek Wetland Ranked #19: RAP\_BC546)

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

WETLAND ID# RAP_BC528 No. 5	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	2.05
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	None
Restoration Potential	Stream Restoration Riparian Plantings
Ownership (Public or Private)	Public & Private
Number of Parcels	3 Parcels / 3 Property Owners
Cost Estimates	\$372,600
Location (Lat/Long)	41.44424936687 / -81.739892552962
Community	Brooklyn

Wetland BC528 is a nice 2-acre forested wetland located along the lower reaches of the Big Creek Mainstem. The wetland is located in the area referred to as the “Oxbow Property”. Notable features include a small neighboring wetland, the mainstem of Big Creek, the connection with the riparian corridor and floodplain and the oxbow, which is an abandoned meander in the river. This wetland is located in the city of Brooklyn. Ownership complexity is easy with 3 parcels and 3 property owners, in the city of Brooklyn owns 2 parcels.

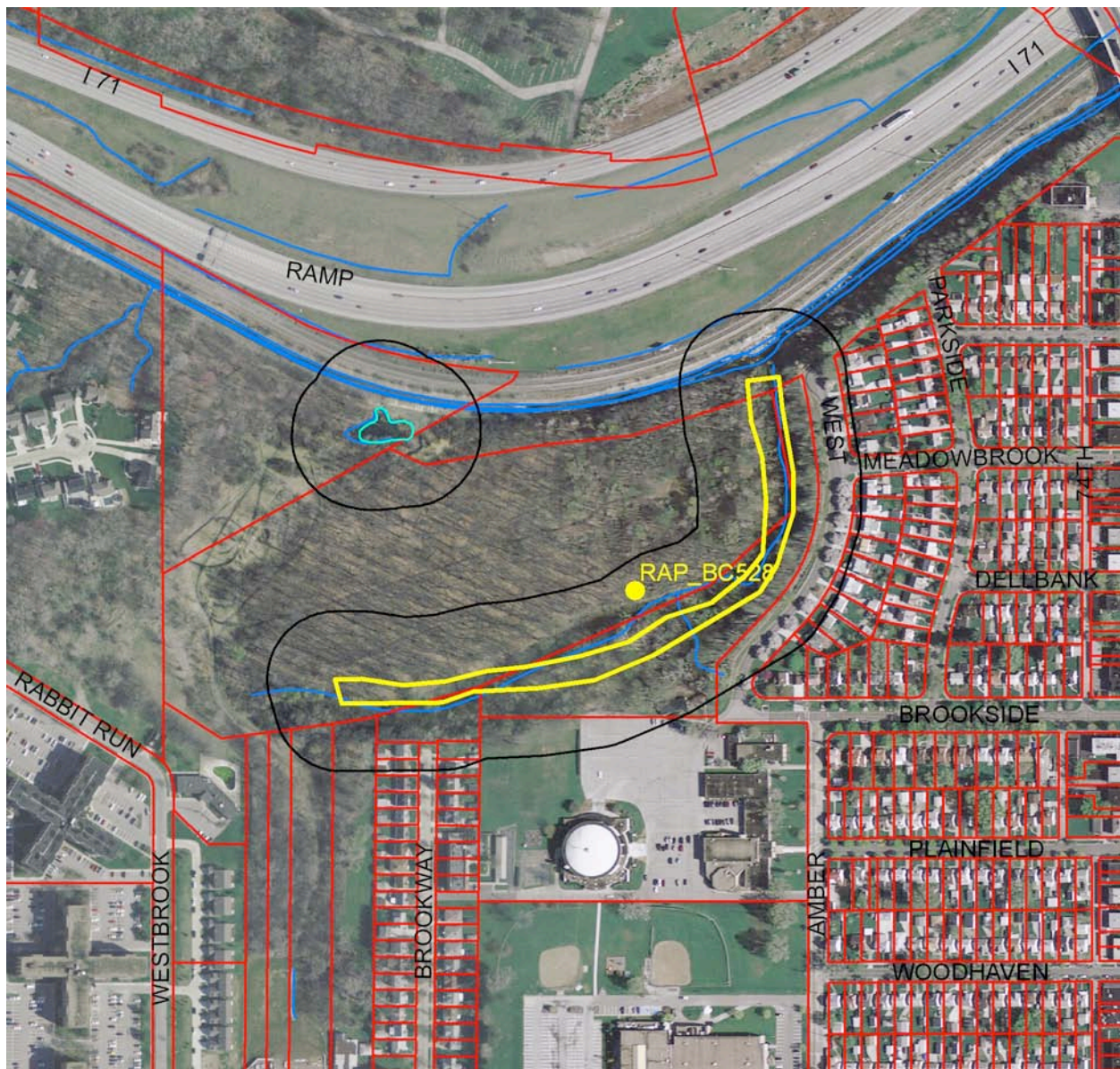
Wetland BC528 is most likely a moderately to moderately low quality wetland. This is consideration of the urban nature of the watershed, residential land use intensity surrounding the site and the moderate quality forested buffer zone. Sources of water feeding this wetland site include seasonal surface water, precipitation and groundwater.

This site has been field visited in a 2003 RAP funded project. Field notes indicate no habitat and water quality impacts to the wetland site. A future conservation project should include preserving this site, possibly by purchasing parcel 431-21-001. Parcels 431-20-009 and 013-30-004 are owned by the city of Brooklyn. These parcels could be protected through and easement or other form of protection. A stream restoration will be needed to create a connection (inflow) with the mainstem of Big Creek. Discussions should begin with the city of Brooklyn considering they own majority of the site. This site would make an attractive project due to the close proximity of the Metroparks and the unique situation along the oxbow of lower Big Creek.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Mobilizing Equipment	\$2,500		\$2,500
Parcel 431-20-009	City property		
Parcel 013-30-004	City Property		
Purchase Parcel 431-21-001	Market Land Value		\$4,100
Stream Restoration	\$300/LF	1,150/LF	\$345,000
Riparian Plantings	\$8,000	2acres	<u>\$16,000</u>
<b>TOTAL</b>			<b>\$372,600</b>





Big Creek Wetland Ranked #5: RAP\_BC528

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

WETLAND ID# RAP_BC229 No. 6	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	1.16
Wetland Buffer Condition	High Quality
Impacts (Field Assessments)	Old Fill
Restoration Potential	Remove Invasive Plants Riparian/Wetland Plantings Wetland Expansion
Ownership (Public or Private)	Private
Number of Parcels	1 Parcel / 1 Property Owner
Cost Estimates	\$73,737
Location (Lat/Long)	41.354784046663 / -81.730015992294
Community	Parma

Wetland BC229 is a nice 1.16-acre forested wetland located in the upper reaches of the Big Creek Watershed. Notable features include the high quality forested buffer, numerous adjacent wetlands and the location along multiple tributary streams and related riparian corridors. Wetland BC229 is located in the city of Parma. Ownership complexity is easy with only one parcel and owner. Arbor Park Village Homeowners currently own this site.

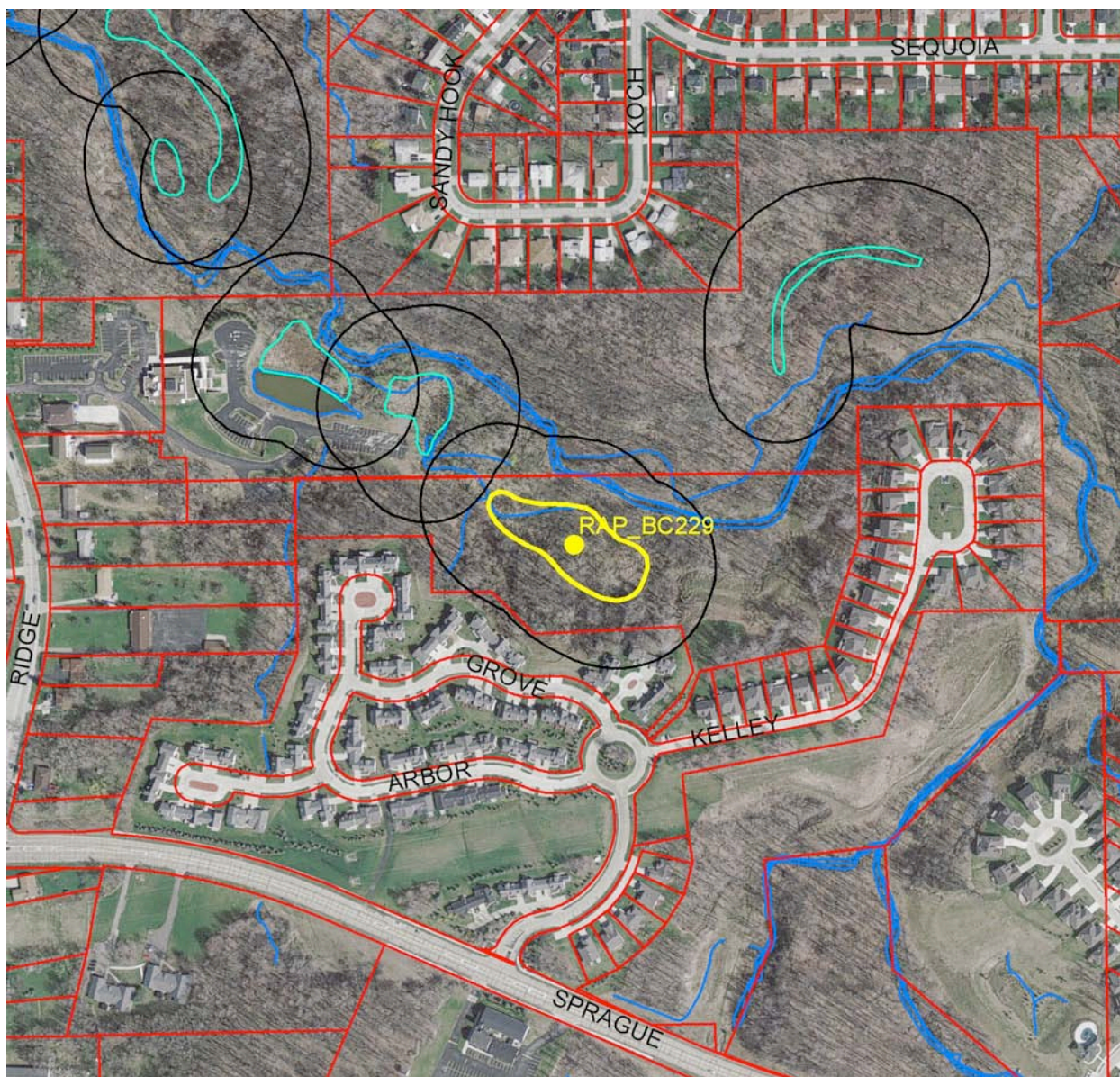
Wetland BC229 is most likely a moderately quality wetland. This is consideration of the urban nature of the watershed, adjacent land use intensity and the high quality forested buffer zone. Sources of water feeding this wetland site include seasonal surface water and precipitation.

This site has been field visited in a 2003 RAP funded project. Field notes indicate the site was impacted from old fill, most likely resulting from the neighboring land use. However, no water quality impacts were noted. A plant noted on-site was the Green Ash. A future enhancement project should include targeting invasive plant species and enhancing with riparian/wetland plantings. Small areas of invasive plants cover the site, these include Reed Canary Grass and Buckthorn. Also, suitable hydric soils exist onsite to allow for a wetland expansion project (expand 3 acres). Discussion should begin the Village to discuss long-term management options, purchasing or a conservation easement.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Mobilize Equipment	\$2,500		\$2,500
Remove Invasive Plants	\$220	0.17acres	\$37
Riparian / Wetland Plantings	\$8,000	3.17acres	\$25,360
Onsite Excavation	\$1.75CY	9,680CY	\$16,940
Purchase Property 454-28-004	Land Market Value		<u>\$23,900</u>
<b>TOTAL</b>			<b>\$73,737</b>





Big Creek Wetland Ranked #6: RAP\_BC229

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83



WETLAND ID# RAP_BC224 No. 7	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	1.46
Wetland Buffer Condition	High Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings* Wetland Expansion
Ownership (Public or Private)	Private
Number of Parcels	2 Parcels / 2 Property Owners
Cost Estimates	\$1,416,158
Location (Lat/Long)	41.372992972344 / -81.721973172006
Community	Parma

\* Extrapolated Restoration Potential

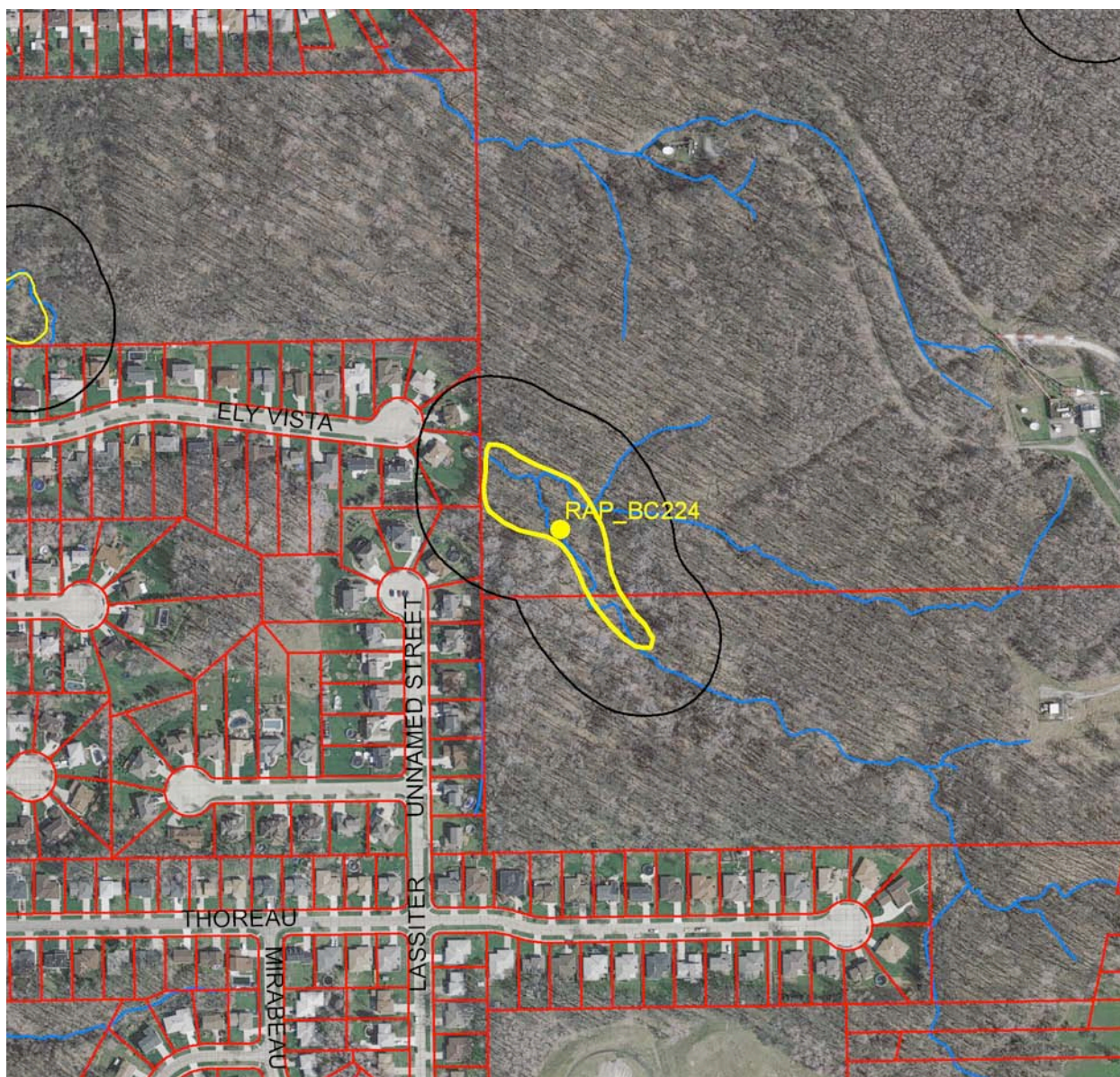
Wetland BC224 is a nice 1.46-acre forested wetland located on a tributary to Big Creek, just upstream from Stearns Farm Homestead. Notable features include a high quality forested buffer zone, the location along multiple tributaries and riparian corridors and this site is nearby both Stearns Farm and West Creek Preserve. Plans have been discussed to preserve this site as a greenway connector for both parks. Wetland BC224 is located in the city of Parma. Ownership complexity is fairly easy with 2 parcels and 2 property owners. Citicasters Co. and Scripps Howard Radio Inc. are the owners.

Wetland BC224 is most likely a moderate quality wetland. This is consideration of the urban nature of the watershed, relatively low land use intensity, the location along an altered tributary stream and high quality buffer zone.

Next steps include a more detailed site assessment of this wetland. The site assessment should include an ORAM and Penn State Stressor Checklist completed. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future conservation project should include preserving this site through a conservation easement or purchasing the parcels. Invasive specie removal and enhancements with riparian/wetland plantings will be likely needed. Also, suitable hydric soils exist onsite to allow for a wetland expansion project (expand 3 acres)

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Detailed Sight Assessment	\$720	1	\$720
Plans & Specification	\$5,000	1	\$5,000
Mobilize Equipment	\$2,500		\$2,500
Remove Invasive Plants	\$660	0.3acres	\$198
Riparian / Wetland Plantings	\$8,000	3.3acres	\$26,400
Onsite Excavation	\$1.75CY	9,680CY	\$16,940
Parcel 450-26-002	Land Market Value		\$836,300
Parcel 450-27-001	Land Market Value		<u>\$528,100</u>
<b>TOTAL</b>			<b>\$1,416,158</b>



Big Creek Wetland Ranked #7: RAP\_BC224

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

WETLAND ID# RAP_BC9 No. 8	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Forested Wetland (PFO)
Size (acres)	1.82
Wetland Buffer Condition	High Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings* Wetland Expansion
Ownership (Public or Private)	Private
Number of Parcels	3 Parcels / 3 Owners
Cost Estimates	\$30,063
Location (Lat/Long)	41.376832375224 / -81.716885024115
Community	Parma

\* Extrapolated Restoration Potential

Wetland BC9 is a nice 1.82-acre forested wetland located on a tributary to Big Creek, just upstream from Stearns Farm Homestead. Notable features include a high quality forested buffer zone, location along a tributary stream and related riparian corridor this site is nearby both Stearns Farm and West Creek Preserve. Plans have been discussed to preserve this site and connect the two parks. Wetland BC9 is located in the city of Parma. Ownership complexity is fairly easy with 3 parcels and 3 property owners. Scripps Howard Radio Inc. is the major landowner.

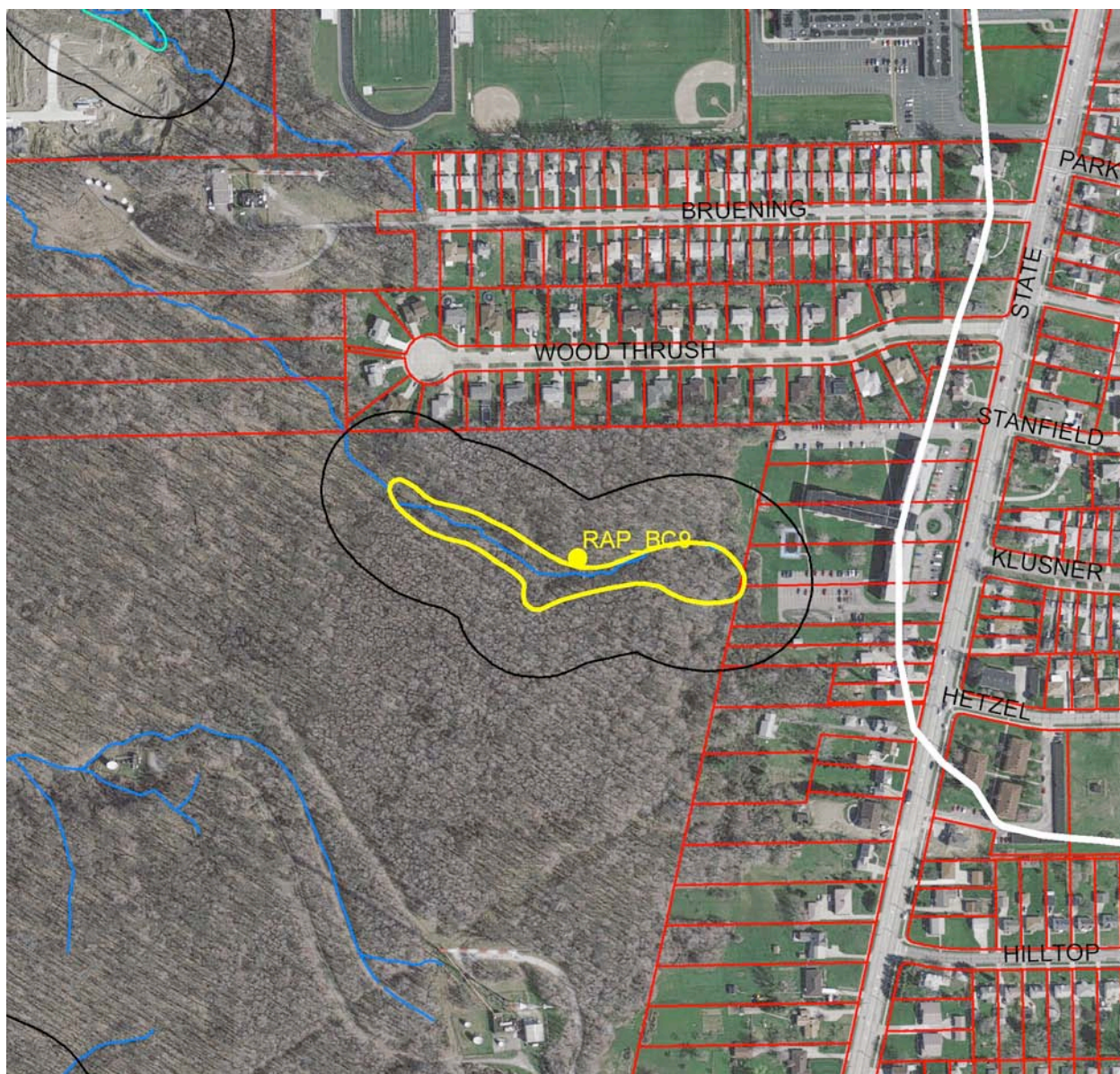
Wetland BC9 is most likely a moderate quality wetland. This is consideration of the surrounding urban watershed and fairly low land use intensity, its location along an altered tributary stream and high quality buffer zone.

Next steps include a more detailed site assessment of this wetland. The site assessment should include an ORAM and Penn State Stressor Checklist completed. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. A future conservation project should include preserving this site, which would help link the West Creek Preserve and Stearns Farm. Invasive specie removal and enhancements with riparian/wetland plantings will be likely needed. Buffer Plantings should also be targeted on the two homeowner properties. Also, suitable hydric soils exist onsite to allow for a wetland expansion project (expand 1 acre).

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Detailed Sight Assessment	\$720	1	\$720
Plans & Specification	\$5,000	1	\$5,000
Mobilize Equipment	\$2,500		\$2,500
Remove Invasive Plants	\$660	0.3acres	\$198
Riparian / Wetland Plantings	\$8,000	2acres	\$16,000
Onsite Excavation	\$1.75CY	3,226CY	\$5,645
Purchase Property# 450-26-002	Land Market Value		\$836,300 (not included in total- Calculated in BC224)
<b>TOTAL</b>			<b>\$30,063</b>





Big Creek Wetland Ranked #8: RAP\_BC9

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

WETLAND ID# RAP_BC677 No. 9	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Emergent & Forested Wetland (PEM) (PFO)
Size (acres)	1.29
Wetland Buffer Condition	Moderate Quality
Impacts (Field Assessments)	N/A
Restoration Potential	Remove Invasive Plants* Riparian/Wetland Plantings*
Ownership (Public or Private)	Private
Number of Parcels	1 Parcel / 1 Property Owner
Cost Estimates	\$8,318
Location (Lat/Long)	41.422453410072 / -81.793402877907
Community	Cleveland

\* Extrapolated Restoration Potential

Wetland BC677 is a 1.29-acre emergent and forested wetland located near an industrial park on a tributary to the West Branch of Big Creek. Notable features include a neighboring wetland, a moderate quality forested buffer zone and the location along a tributary stream and related riparian corridor. Also notable is the Puritas stormwater basin located north of this site. Puritas basin is large birding habitat and has evolved into an urban wetland area. Wetland B677 is located in the city of Cleveland. Ownership complexity is fairly easy with 1 parcel and 1 property owners. Consolidated Rail Corp. is the landowner.

Wetland BC677 is most likely a moderate to moderately low quality wetland. This is consideration of the surrounding urban watershed, nearby industrial park and rail system and its location along an altered tributary stream. A sustainable restoration could be challenging in this area due to the intensity of land use.

Next steps include a more detailed site assessment of this wetland. The site assessment should include an ORAM and Penn State Stressor Checklist completed. This will help provide the location and extent of surrounding impacts, restoration potential and ultimately cost estimates. Preliminary cost estimates for this site are based on and extrapolated from previous wetland assessment projects. This site should be targeted for invasive plant removal and enhancements with seeding / wetland plantings.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Detailed Sight Assessment	\$720	1	\$720
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$660	0.3acres	\$198
Seeding / Wetland Plantings	\$5,000	0.3acres	<u>\$2,400</u>
<b>TOTAL</b>			<b>\$8,318</b>





Big Creek Wetland Ranked #9: RAP\_BC677

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83



WETLAND ID# RAP_BC521 No. 10	
Site Description	
Wetland Classification (Hydrogeomorphic or Cowardin)	Palustrine Emergent Wetland (PEM)
Size (acres)	3.37
Wetland Buffer Condition	Low Quality
Impacts (Field Assessments)	Old & New Fill Adjacent Land Use Drainage Ditch
Restoration Potential	Remove Invasive Plants Seeding/Wetland Planting
Ownership (Public or Private)	Public
Number of Parcels	1 Parcel / 1 Property Owner
Cost Estimates	\$23,960
Location (Lat/Long)	41.430260643306 / -81.792454232715
Community	Cleveland

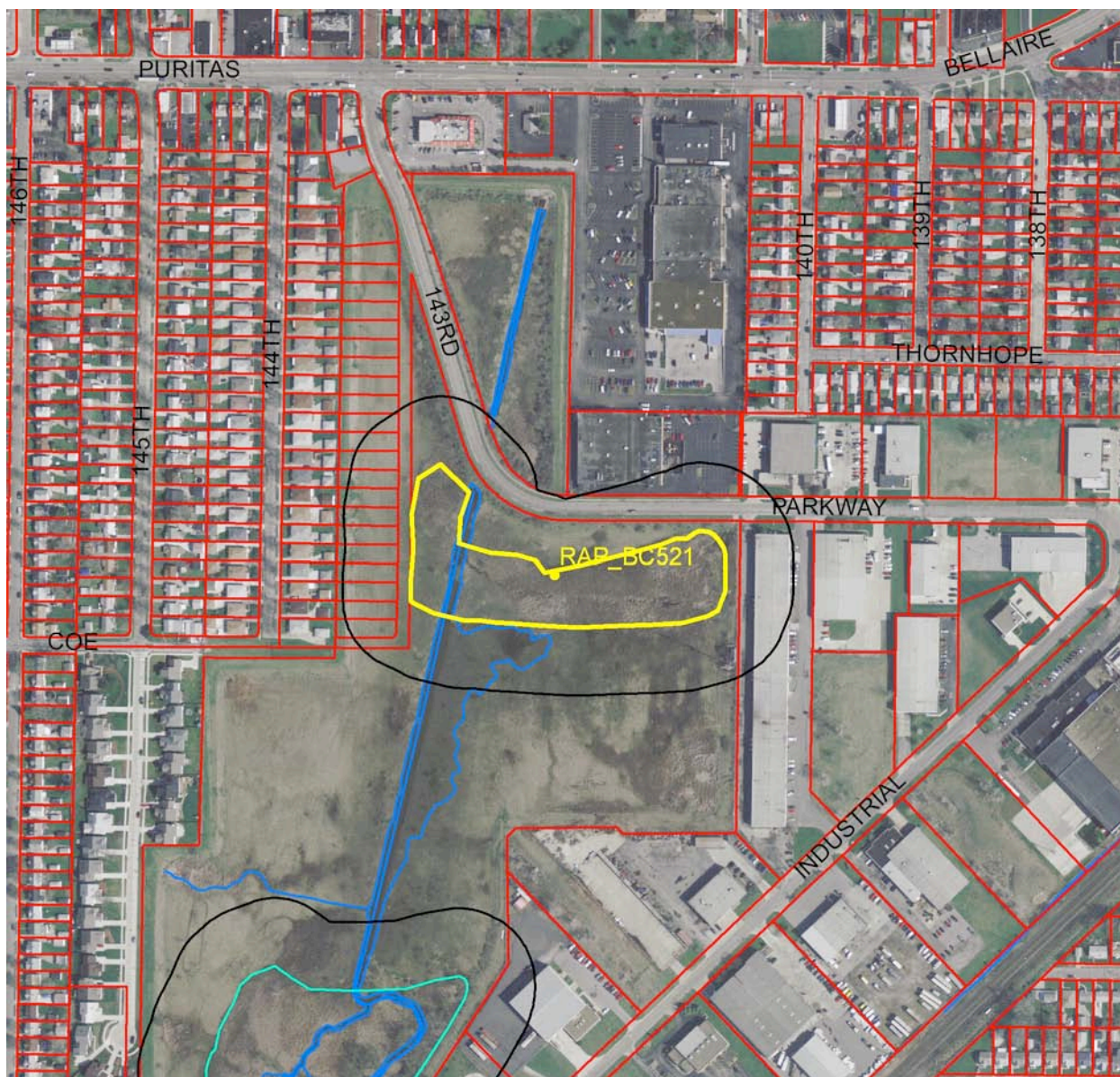
Wetland BC521 is a 3-acre emergent wetland located in what is a large detention basin of the West Branch of the Big Creek Watershed. Notable features include its location within the Puritas stormwater basin. This basin, over the years, has turned into a large wetland habitat in the middle of an industrial park. This site has also been noted by the Museum of Natural History as a great birding habitat. In addition, a small wetland enhancement project occurred in the spring of 2008 just to the south in the same detention basin. Wetland BC521 is located in the city of Cleveland. Ownership complexity is easy with only one parcel and owner. City of Cleveland Water Pollution Control is the landowner.

Wetland BC521 is most likely a low to moderate quality wetland. This is consideration of the urban nature of the watershed, adjacent land use intensity and this site receives runoff directly from I-480. Sources of water feeding this wetland site include seasonal surface water, precipitation and one or more storm drains.

This site has been field visited in a 2003 RAP funded project. Data indicates the site was impacted from old and new fill, adjacent land use and a concrete drainage ditch flows through the site. Invasive species is a big problem not only at this site but the entire detention basin. Wetland BC521 is has approximately 90% coverage of narrow leaved cattail. An invasive species removal project should target this site and the rest of the basin, along with enhancements of seeding/wetland plantings. Costs will be approximated just for site BC521.

#### Cost Estimate

Item	Unit Cost	Unit	Cost
Plans & Specification	\$5,000	1	\$5,000
Remove Invasive Plants	\$1,320	3acres	\$3,960
Seeding / Wetland Plantings	\$5,000	3acres	<u>\$15,000</u>
<b>TOTAL</b>			<b><u>\$23,960</u></b>



Big Creek Wetland Ranked #10: RAP\_BC521

Scale: 1:5,000

#### Map Key

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

Base Layer -Ohio 2006 orthophotos

Projection -Ohio State Plane North, NAD83

# Big Creek Watershed Wetlands Analysis - Top Ten Wetlands

Rank	Name	Acres	Size Group	Riparian SB	Flood Zone	Roadway	Other Wetlands	Forest Cover	Agriculture	Residential	Urban	Positive	Negative
Rank	Name	Acres	SG	RP	FZ	RW	OW	FR	AG	RS	UB	Pos	Neg
1	RAP_BC97	3.33	2	5	2	0	0	4	0	0	-5	13	-5
2	RAP_BC501	9.59	3	5	1	0	0	4	0	-4	0	13	-4
3	RAP_BC529	2.15	2	5	0	-2	1	5	0	0	0	13	-2
4	RAP_BC544	1.99	2	5	0	0	1	5	0	0	0	13	0
5	RAP_BC528	2.05	2	5	1	0	0	4	0	-4	0	12	-4
6	RAP_BC229	1.16	2	5	0	-2	0	5	0	0	0	12	-2
7	RAP_BC224	1.46	2	5	0	-1	0	5	0	0	0	12	-1
8	RAP_BC9	1.82	2	5	0	0	0	5	0	0	0	12	0
9	RAP_BC677	1.29	2	5	0	0	0	5	0	0	0	12	0
10	RAP_BC521	3.37	2	5	1	-3	0	3	0	-4	-5	11	-12
Total		28.20	21	50	5	-8	2	45	0	-12	-10	123	-30
Average		2.82	2.1	5.0	0.5	-0.8	0.2	4.5	0.0	-1.2	-1.0	12.3	-3.0

## Big Creek Watershed Wetlands Prioritization Data

Rank	Name	Acres	SG	RP	FZ	RW	OW	FR	AG	RS	UB	Pos	Neg
1	RAP_BC97	3.33	2	5	2	0	0	4	0	0	-5	13	-5
2	RAP_BC501	9.59	3	5	1	0	0	4	0	-4	0	13	-4
3	RAP_BC529	2.15	2	5	0	-2	1	5	0	0	0	13	-2
4	RAP_BC544	1.99	2	5	0	0	1	5	0	0	0	13	0
5	RAP_BC528	2.05	2	5	1	0	0	4	0	-4	0	12	-4
6	RAP_BC229	1.16	2	5	0	-2	0	5	0	0	0	12	-2
7	RAP_BC224	1.46	2	5	0	-1	0	5	0	0	0	12	-1
8	RAP_BC9	1.82	2	5	0	0	0	5	0	0	0	12	0
9	RAP_BC677	1.29	2	5	0	0	0	5	0	0	0	12	0
10	RAP_BC521	3.37	2	5	1	-3	0	3	0	-4	-5	11	-12
11	RAP_BC681	2.76	2	5	0	0	0	4	0	0	-5	11	-5
12	RAP_BC682	1.15	2	5	0	0	0	4	0	0	-5	11	-5
13	RAP_BC539	8.10	3	5	0	0	0	3	0	-4	0	11	-4
14	RAP_BC3	2.67	2	5	0	0	0	4	0	-4	0	11	-4
15	RAP_BC680	1.74	2	5	0	0	0	4	0	-4	0	11	-4
16	RAP_BC5	1.48	2	5	0	0	0	4	0	-4	0	11	-4
17	RAP_BC6	0.75	1	5	0	-4	0	5	0	0	0	11	-4
18	RAP_BC225	0.62	1	5	0	-2	0	5	0	0	0	11	-2
19	RAP_BC546	0.53	1	5	0	-2	0	5	0	0	0	11	-2
20	RAP_BC67	0.95	1	5	0	0	0	5	0	0	0	11	0
21	RAP_BC545	0.85	1	4	0	0	1	5	0	0	0	11	0
22	RAP_BC541	0.72	1	5	0	0	0	5	0	0	0	11	0
23	RAP_BC542	0.71	1	5	0	0	0	5	0	0	0	11	0
24	RAP_BC70	0.48	0	5	0	0	1	5	0	0	0	11	0
25	RAP_BC226	0.18	0	5	0	0	1	5	0	0	0	11	0
26	RAP_BC543	0.17	0	5	0	0	1	5	0	0	0	11	0
27	RAP_BC1	0.64	1	5	0	-4	0	4	0	-4	0	10	-8
28	RAP_BC2	0.46	0	5	0	-3	0	5	0	0	0	10	-3
29	RAP_BC228	0.43	0	5	0	-1	0	5	0	0	0	10	-1
30	RAP_BC66	3.05	2	3	0	0	0	5	0	0	0	10	0
31	RAP_BC227	0.45	0	5	0	0	0	5	0	0	0	10	0
32	RAP_BC231	0.41	0	5	0	0	0	5	0	0	0	10	0
33	RAP_BC15	0.36	0	5	0	-3	0	4	0	0	-5	9	-8
34	RAP_BC519	13.83	4	5	0	0	0	0	0	0	-7	9	-7
35	RAP_BC676	8.22	3	5	1	0	0	0	0	0	-7	9	-7
36	RAP_BC530	0.57	1	3	0	-3	1	4	0	0	0	9	-3
37	RAP_BC230	0.17	0	4	0	-3	0	5	0	0	0	9	-3
38	RAP_BC514	2.59	2	2	0	0	0	5	0	0	0	9	0
39	RAP_BC413	0.30	0	4	0	0	0	5	0	0	0	9	0
40	RAP_BC64	1.84	2	1	1	-3	0	4	0	0	-5	8	-8
41	RAP_BC221	1.10	2	2	0	0	0	4	0	-4	0	8	-4
42	RAP_BC245	0.12	0	3	0	-3	0	5	0	0	0	8	-3
43	RAP_BC13	2.08	2	5	0	-2	0	0	0	0	-7	7	-9



## Big Creek Watershed Wetlands Prioritization Data

Rank	Name	Acres	SG	RP	FZ	RW	OW	FR	AG	RS	UB	Pos	Neg
44	RAP_BC222	0.83	1	5	1	-2	0	0	0	-6	0	7	-8
45	RAP_BC411	0.99	1	5	1	0	0	0	0	0	-7	7	-7
46	RAP_BC78	5.05	3	0	0	0	0	4	0	0	-5	7	-5
47	RAP_BC517	1.22	2	0	0	-2	0	5	0	0	0	7	-2
48	RAP_BC516	3.21	2	0	0	0	0	5	0	0	0	7	0
49	RAP_BC518	2.10	2	0	0	0	0	5	0	0	0	7	0
50	RAP_BC525	2.18	2	4	0	-4	0	0	0	0	-7	6	-11
51	RAP_BC223	0.54	1	5	0	-3	0	0	0	-6	0	6	-9
52	RAP_BC63	0.15	0	5	1	-4	0	0	0	-5	0	6	-9
53	RAP_BC520	1.75	2	4	0	-1	0	0	0	0	-7	6	-8
54	RAP_BC246	0.43	0	2	0	-3	0	4	0	-4	0	6	-7
55	RAP_BC65	2.34	2	0	0	-2	0	4	0	-4	0	6	-6
56	RAP_BC524	0.98	1	5	0	0	0	0	0	0	-6	6	-6
57	RAP_BC678	2.38	2	0	0	0	0	4	0	0	0	6	0
58	RAP_BC523	2.93	2	0	0	-2	0	3	0	-4	-5	5	-11
59	RAP_BC522	0.48	0	5	0	-4	0	0	0	0	-7	5	-11
60	RAP_BC540	0.28	0	5	0	-5	0	0	0	-6	0	5	-11
61	RAP_BC234	0.37	0	5	0	-2	0	0	0	-6	0	5	-8
62	RAP_BC4	0.36	0	5	0	-1	0	0	0	-6	0	5	-7
63	RAP_BC232	0.14	0	5	0	-1	0	0	0	-6	0	5	-7
64	RAP_BC515	4.26	2	0	0	0	0	3	0	0	-6	5	-6
65	RAP_BC76	0.88	1	3	0	-3	0	0	0	0	-7	4	-10
66	RAP_BC74	7.26	3	0	0	0	0	0	0	0	-7	3	-7
67	RAP_BC526	1.12	2	1	0	0	0	0	0	0	0	3	0
68	RAP_BC679	0.88	1	1	0	-4	0	0	0	0	-7	2	-11
69	RAP_BC410	1.09	2	0	0	0	0	0	0	-5	-5	2	-10
70	RAP_BC531	3.00	2	0	0	-1	0	0	0	-6	0	2	-7
71	RAP_BC79	0.62	1	0	0	-5	0	0	0	0	-7	1	-12
72	RAP_BC8	0.85	1	0	0	0	0	0	0	-6	0	1	-6
73	RAP_BC532	0.12	0	0	0	-5	0	0	0	0	-7	0	-12
74	RAP_BC75	0.08	0	0	0	-2	0	0	0	0	-7	0	-9
AVERAGES		1.9	1.3	3.5	0.1	-1.3	0.1	3.0	0.0	-1.4	-2.0	8.1	-4.7