BIG CREEK WATERSHED STORMWATER RETROFIT AND RANKING

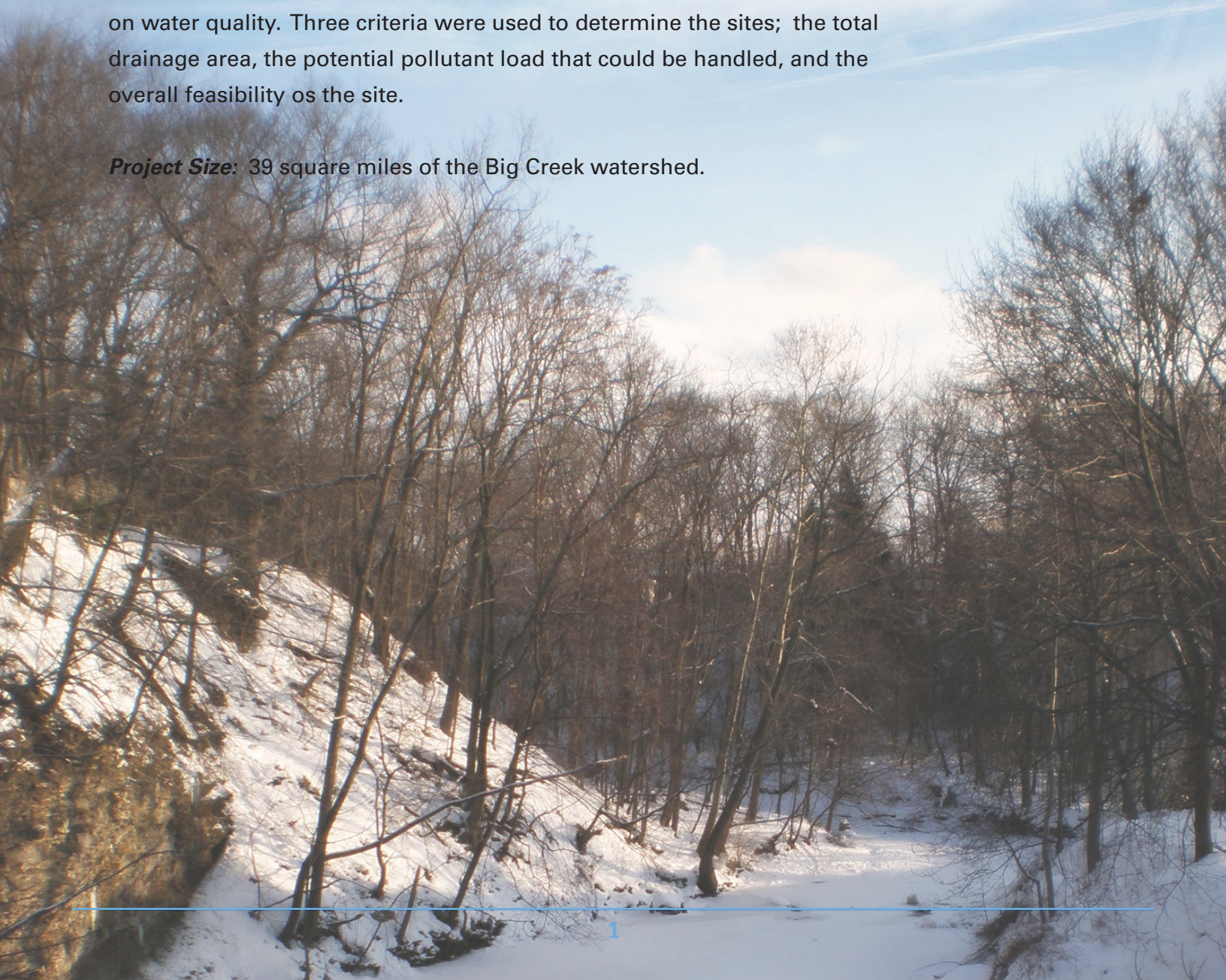
Metropolitan Cleveland, Cuyahoga County

Date Completed: March 2012

Description: Big Creek is the third largest tributary of the Cuyahoga River and its watershed is over 90% developed and nearly 40% of the land surface has been made impervious. Comprehensive analysis of potential storm water retention within the entire watershed involved a total of 185 sites. Stormwater conceptual design work was completed for the top three sites of the 185 potential sites. Ranking was based on which sites would have most impact on water quality. Three criteria were used to determine the sites; the total drainage area, the potential pollutant load that could be handled, and the overall feasibility os the site.

Below: Big Creek in Winter
(photo: Friends of Big Creek)

Project Size: 39 square miles of the Big Creek watershed.



TETRA TECH, INC.

Big Creek Watershed Stormwater Retrofit and Ranking Project

Relevant Skill Areas:

- Stormwater Management
- Green Infrastructure Design

Client(s):

Bob Gardin
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(216) 661-7706
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Cost:

$16,000 (paid to Tetra Tech)

Duration:

September 2011 – March 2012

Tetra Tech Contact:

Jennifer Olson
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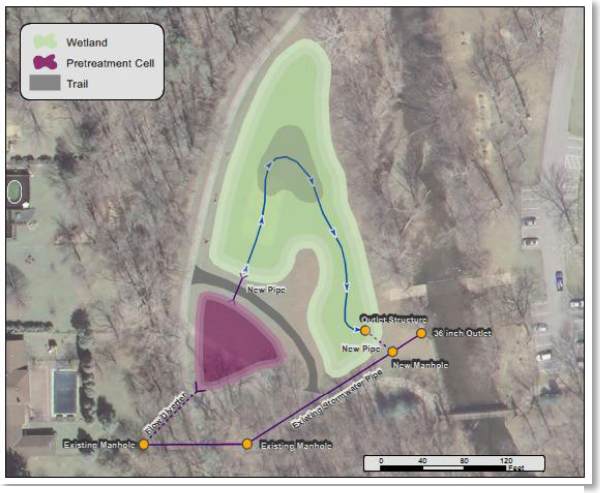
Big Creek is one of the largest and most urbanized tributaries to the Cuyahoga River watershed at nearly 39 drainage square miles and with only six percent of open space remaining. Consequently, the surface runoff has increased in total volume, peak rates, and pollutant loads, while groundwater recharge and base flow conditions have decreased.

In 2006, Friends of Big Creek (FOBC) formed the Big Creek Watershed Planning Partnership and developed the Big Creek Watershed Balanced Growth Plan in coordinationwith the Cuyahoga River Community Planning Organization. The plan discusses that a conservation or restoration strategy can include implementation of structural and non structural practices to improve stream health, but structural restoration practices such as stormwater retrofits are more effective in urban watersheds. To help implement this plan, FOBC hired Tetra Tech to evaluate and rank 156 potential stormwater retrofit sites that were identified in the Balanced Growth within the Big Creek watershed using desktop GIS analysis.

The potential sites included:

- 69 Parking Lots Greater than 5-acres
- 35 Existing Detention Basins
- 46 New Storage Areas Below Outfalls
- 6 Highway Interchanges.

After ranking each of the sites using additional GIS criteria, the top 25 sites were visited in the field and conceptual plans and cost estimates were developed for the top 3 sites. FOBC intends to eventually develop additional conceptual plans and implement stormwater retrofits to as many sites as feasible. Therefore, this project is the beginning of a long term initiative by FOBC to mitigate water quality, flooding, and erosion issues within the Big Creek watershed.



Proposed Constructed Wetland

During this project Tetra Tech coordinated extensively with stakeholders, collected both desktop and field data, evaluated and prioritized potential stormwater retrofit sites, and developed conceptual plans and cost estimates.
Tetra Tech also provided support preparing a successful Ohio EPA Cuyahoga SWIF grant application. As a result of this effort, $150,000 was awarded to implement a constructed wetland within the Cleveland Metroparks, which was one of the three conceptual plans developed by Tetra Tech during this project.

Developer/Client/Owner:
Friends of Big Creek (FOBC)
www.friendsofbigcreek.org

Designer/Consultant:
Tetra Tech, Inc.
1468 West Ninth Street, Ste. 620
Cleveland, OH 44113
http://www.tetratech.com/

Project Cost: The total cost of the project, not including in-kind was $22,000.

- Engineering - $16,000
- FOBC Intern working under the direction of Tetra Tech - $3000
- FOBC project manager - $3000

Maintenance Cost: Not applicable

Funding Sources / Incentives:
- Ohio Lake Erie Commission (OLEC)/Lake Erie Protection Fund (LEPF) - $15,000
- Northeast Ohio Regional Sewer District (NEORSD) - $5000
- Freshwater Future - $2000

The City of Parma and Cleveland Metroparks, in partnership with FOBC, submitted and received a $150,000 Cuyahoga Surface Water Improvement Fund (SWIF) grant to design and construct one of the three conceptual plans developed under this project (Fernhill Constructed Wetland).

Applicable Zoning Regulations: None

Key Features:

Task 1: Preliminary (Desktop GIS) Screening

Four general types of retrofits evaluated:
- Parking lots greater than 5 acres
- Existing detention basins
- Storage below outfalls
- Highway Interchanges

Large amount of GIS data collected & reviewed.
Extensive stakeholder coordination required.
Evaluated approximately 185 sites for four criteria:

- Impervious Area
- Treatment Area
- Total Suspended Solids
- Drainage

- Selected top 20 locations (which included 29 retrofit sites) to conduct Field Reconnaissance under Task 2.

Task 2 Field Assessment & Priority Ranking

20 locations consisting of 20+ retrofit sites.

Field Observed stormwater mgmt varied -- level of existing treatment became a critical factor when prioritizing sites:

- Low Priority - Sites having BOTH water quality AND flood control.
- Medium Priority - Sites providing water quality OR flood control.
- High Priority - Sites with NO flood control OR water quality control.

Additional Task 2 criteria:

- Property owner interest.
- Site constraints.
- Environmental concerns.
- Maintenance issues vs performance issues.

Ground-truthed Task 1 criteria, (considered three additional criteria) :

- Percent of Ohio EPA water quality treatment provided.
- Percent of flood treatment provided.
- Good demonstration project.

Task 2 locations were initially prioritized into three groups:

- Strong (4)
- Fair (6)
- Limited (9)

Three primary sites were selected for conceptual design.
Three alternative/backup sites were also selected.

Task 3 Conceptual Plans

Developed three conceptual plans.
Contact landowners and discussed initial concepts to get preliminary feedback (e.g., presented concept plan to GM's E-Team).
Presented draft conceptual plan to FOBC Techinal Advisory Committee.

Final Conceptual Plans included:

- Existing Conditions
- Proposed Conditions
- Field Photos
- Retrofit Description
- Concept drawing
- Typical Details
- Planning Level Cost Estimates

Lessons Learned:

Parking Lots Greater than 5-acres:

- **Challenge:** Typically privately owned & costly to implement
- **Recommendation:** Consider public parking lots & smaller projects that fit within available grants

Highway Interchanges:

- **Challenge:** Extensive coordination with ODOT is needed
- **Recommendation:** Approach ODOT early in process to understand where future projects are planned

Storage Below Outfall:

- **Challenge:** Limited opportunities in highly developed watersheds where open area is covered with urban forest
- **Recommendation:** Consider smaller opportunities above outfall

Existing Detention Basins:

- **Challenge:** Understanding original design objectives
- **Recommendation:** Contact Municipal Engineer and request documentation early in field reconnaissance task

Drainage Area Delineation:

- **Challenge:** Urban retrofit sites rely upon storm sewer connections
- **Recommendation:** Collect storm sewer maps early in the project

General Recommendations:

- Use technically-based Techinal Advisory Committee (TAC) with broad perspectives.
- Determine where watershed is already treated.
- Evaluate retrofit sites collectively on same property.
- Discuss economic benefits of stormwater retrofit with property owners to improve chances of continued coordination.

Lower Big Creek
(photo: Friends of Big Creek)