Urban Revitalization | Waste Management | Energy | Environmental

Wolf Creek Restoration Design

Wolf Creek Restoration Planning Meeting
Maumee Bay State Park Lodge
November 4, 2010

William Petruzzi, Principal
Hugh Crowell, Ecology & Wetlands Practice Leader

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Hull's Role

- Work under direction of Wolf Creek Committee
- Assist with technical evaluations related to engineering, science and planning
- Develop design to reduce and minimize beach advisories under constraints issued by the committee

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Baseline Observations

- *E. coli*, suspended sediment and phosphorus are closely correlated with flow during summer recreational season
- *E. coli* peaks often occur in summer after minimal flow events (flushing)
- *E. coli* peaks also occur in association with high flows

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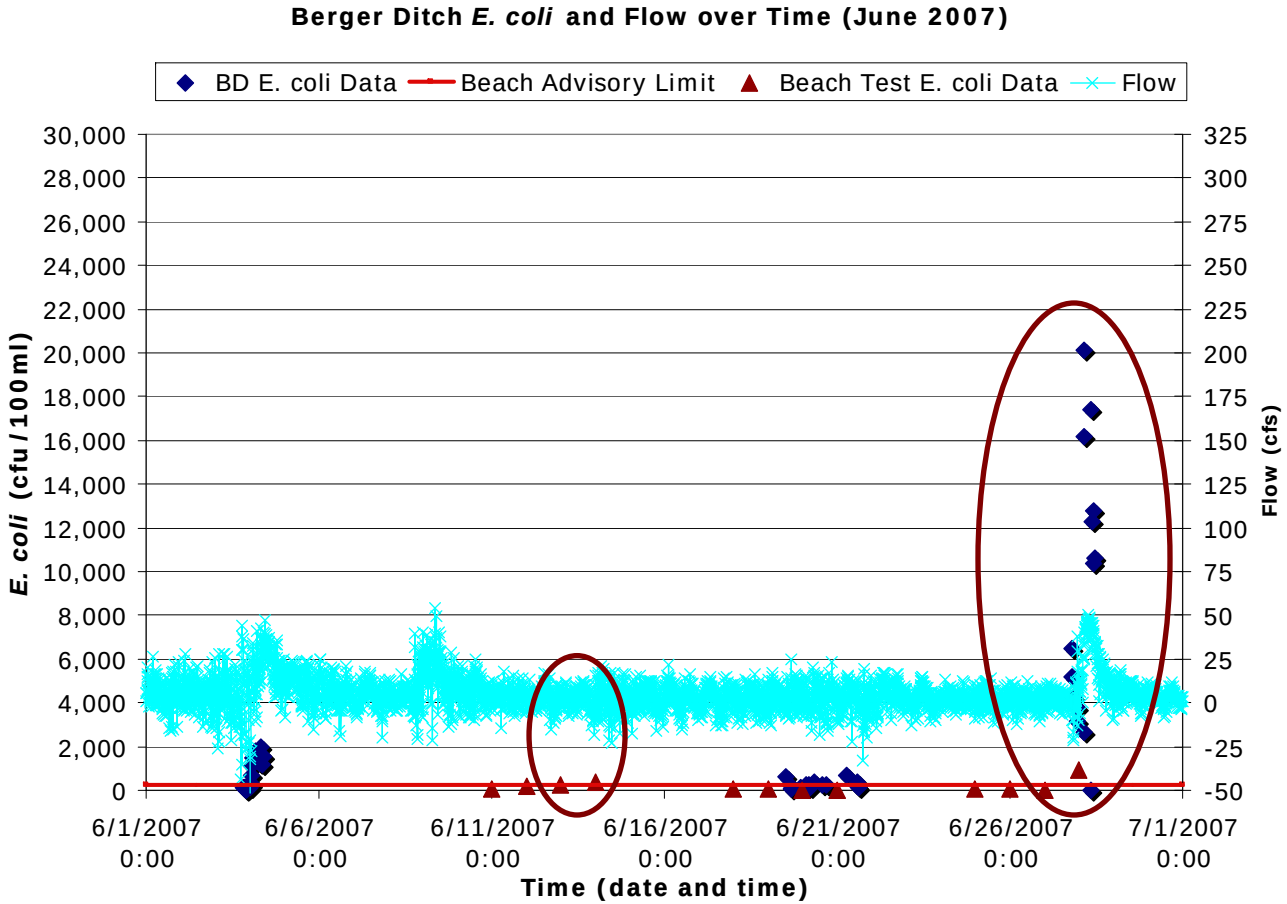
Data Analysis – 2007



Data Source: "Microbial contamination in public waters at Maumee Bay State Park", Research by Colin de Saint Victor, University of Toledo, 2007.

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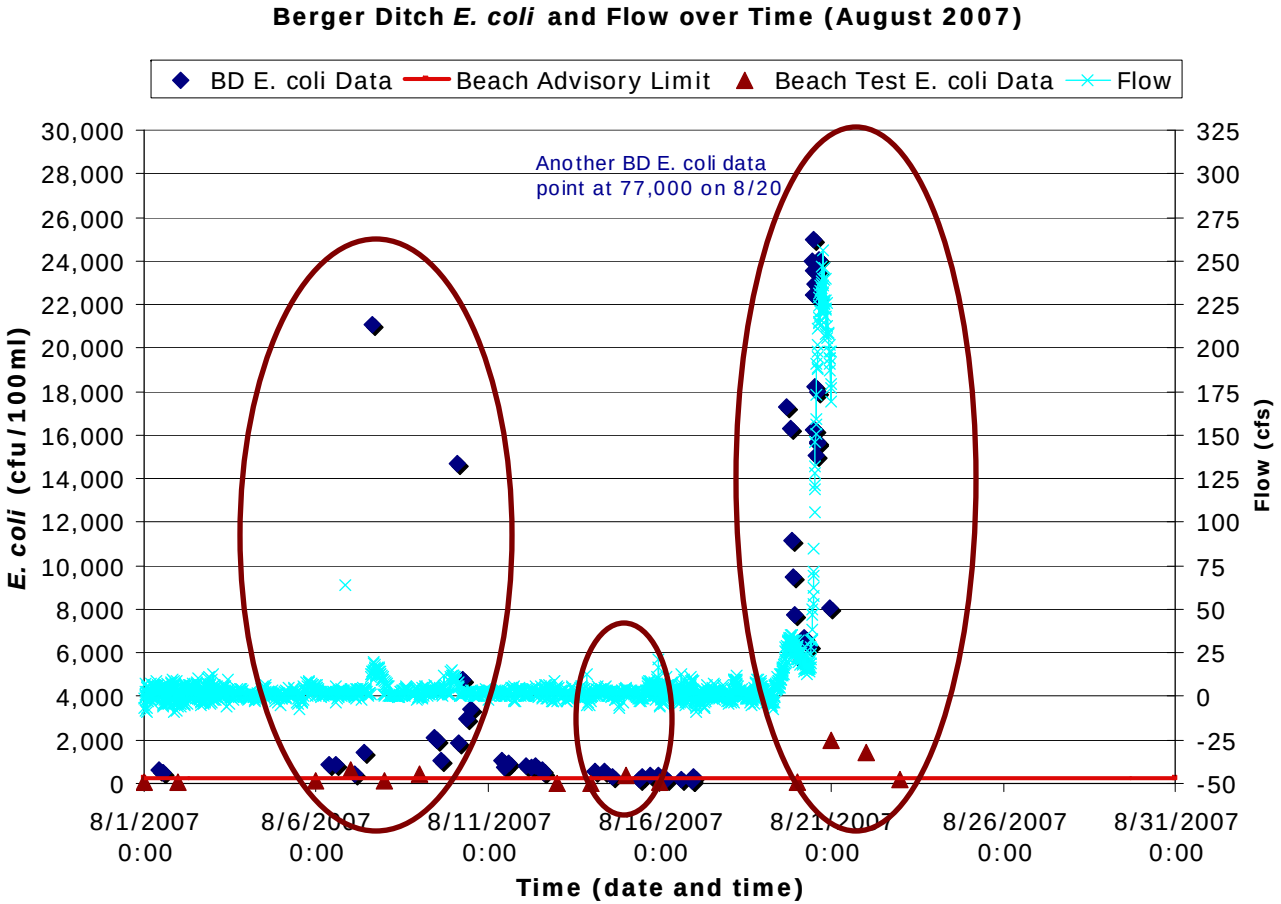
Data Analysis – 2007



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2007 Conceptual Wetland System Design Objectives

- Reduce beach advisories
- Passive treatment system
- Minimize operation & maintenance
- Restore wetlands
- Restore stream floodplains
- Reduce sediments and *E. coli* in Berger Ditch during recreational season
- Intercept/treat both low and high flows
- Include both surface and subsurface flow wetlands
- Minimize cost
- Allow public access

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2007 Study Design Constraints

- Available locations
- Project area/size
- Existing infrastructure
- Lake Erie seiche effect

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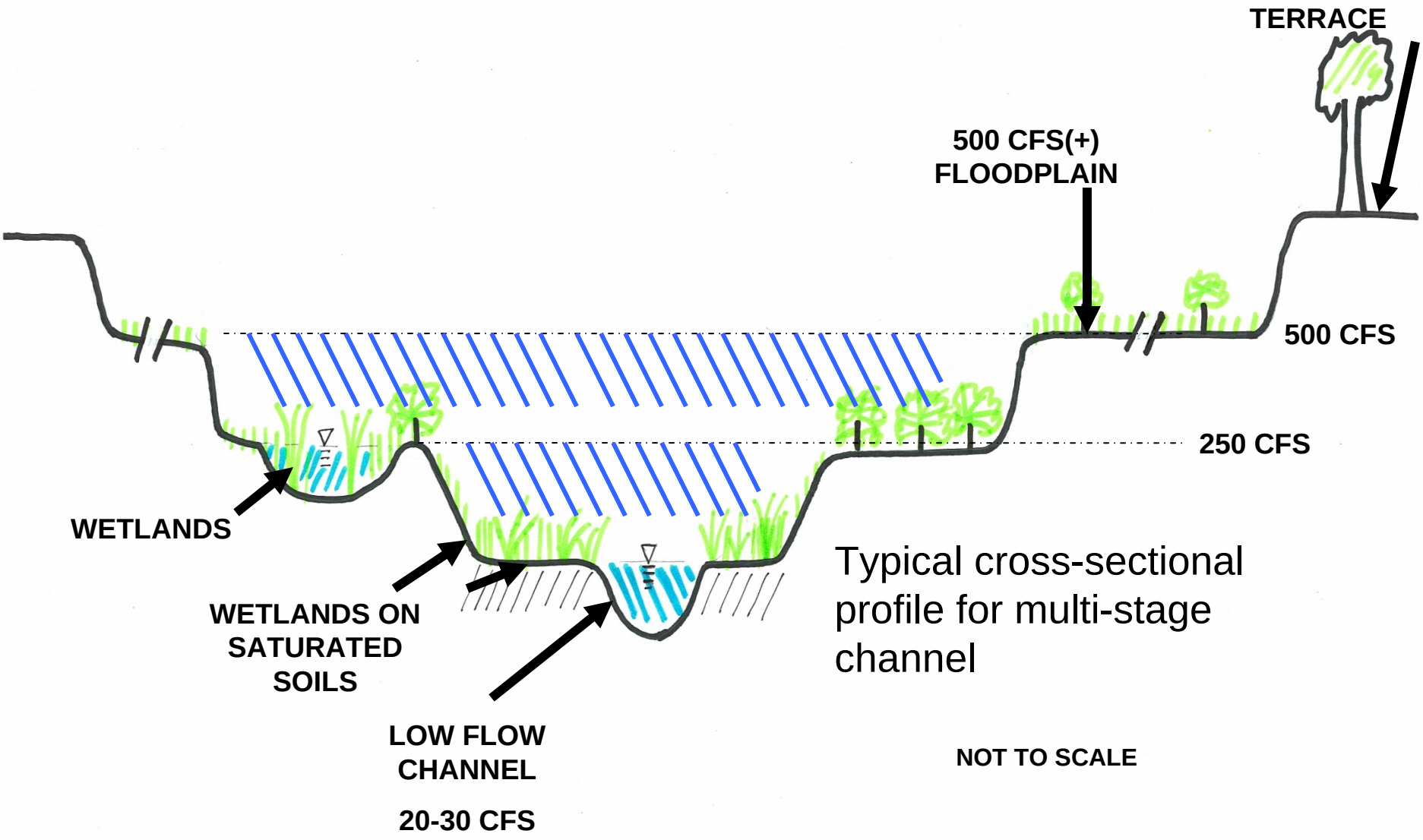
2007 Study
Conceptual Design for
Multi-stage Channel Concept



Typical cross-sectional profile for multi-stage channel

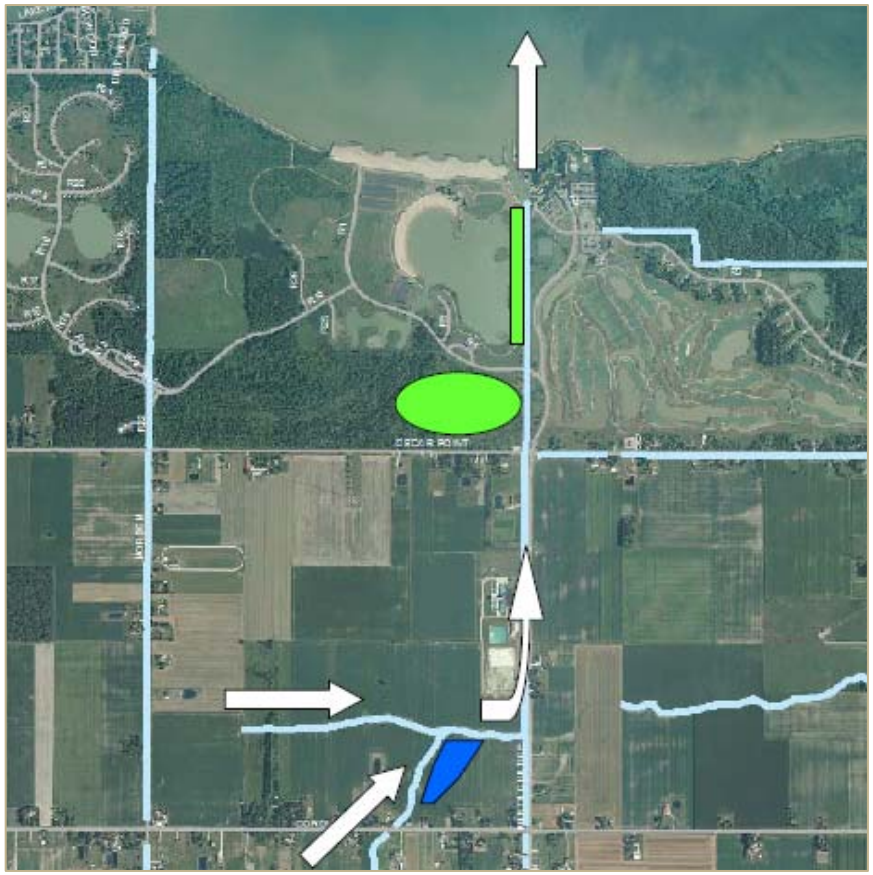
2010 Study Updated Restoration Concept

Stage 2: Downstream Terraced Wetland Habitat Restoration and Treatment System

- Terraced surface flow wetlands with subsurface flow wetland components

Stage 1: Upstream Floodplain Restoration and Sediment Removal Area

- Floodplain restoration with sediment catchment ponds/basins



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2010 Study Treatment Goals

- **Stage 2 (Downstream/MBSP):**
  - Reduce fine-grained sediments with attached *E. coli* and nutrients
  - Reduce unattached *E. coli*
  - Stabilize/reduce nutrients
  - Restore wetland
  - Restore habitat benefits
  - Increase flood storage capacity

- **Stage 1 (Upstream/Corduroy Road):**
  - Removal of suspended solids
  - Removal of sediment-attached *E. coli* and nutrients
  - Reduction of dominant sand fraction to protect Stage 2 wetlands
  - Floodplain/habitat restoration

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2010 Study Principles of Restoration Design

- Stream with floodplain and wetlands removes pollutants
- On floodplain, water velocity falls and sediments drop out
- Sediments dry out and exposed to sunlight/UV rays
- Floodplain sediments remobilized during later storm events, after bacterial attenuation
- Subsurface wetlands remove *E. coli* and P
- Sediments are best captured in an area that can be easily maintained (cleaned out)
- Multi-stage ditch/wetland design is difficult to maintain for sediments without destroying wetland ecosystem

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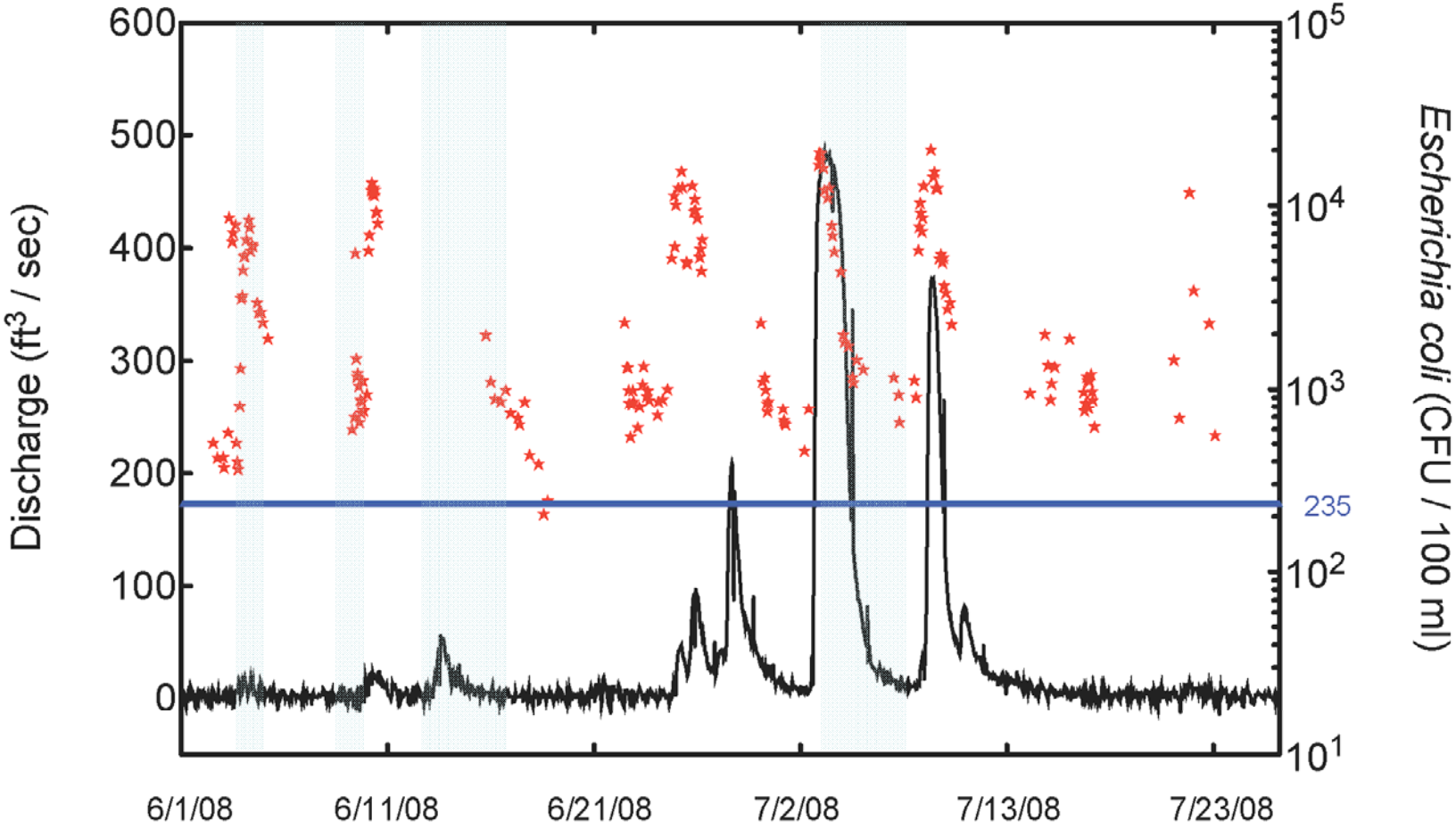
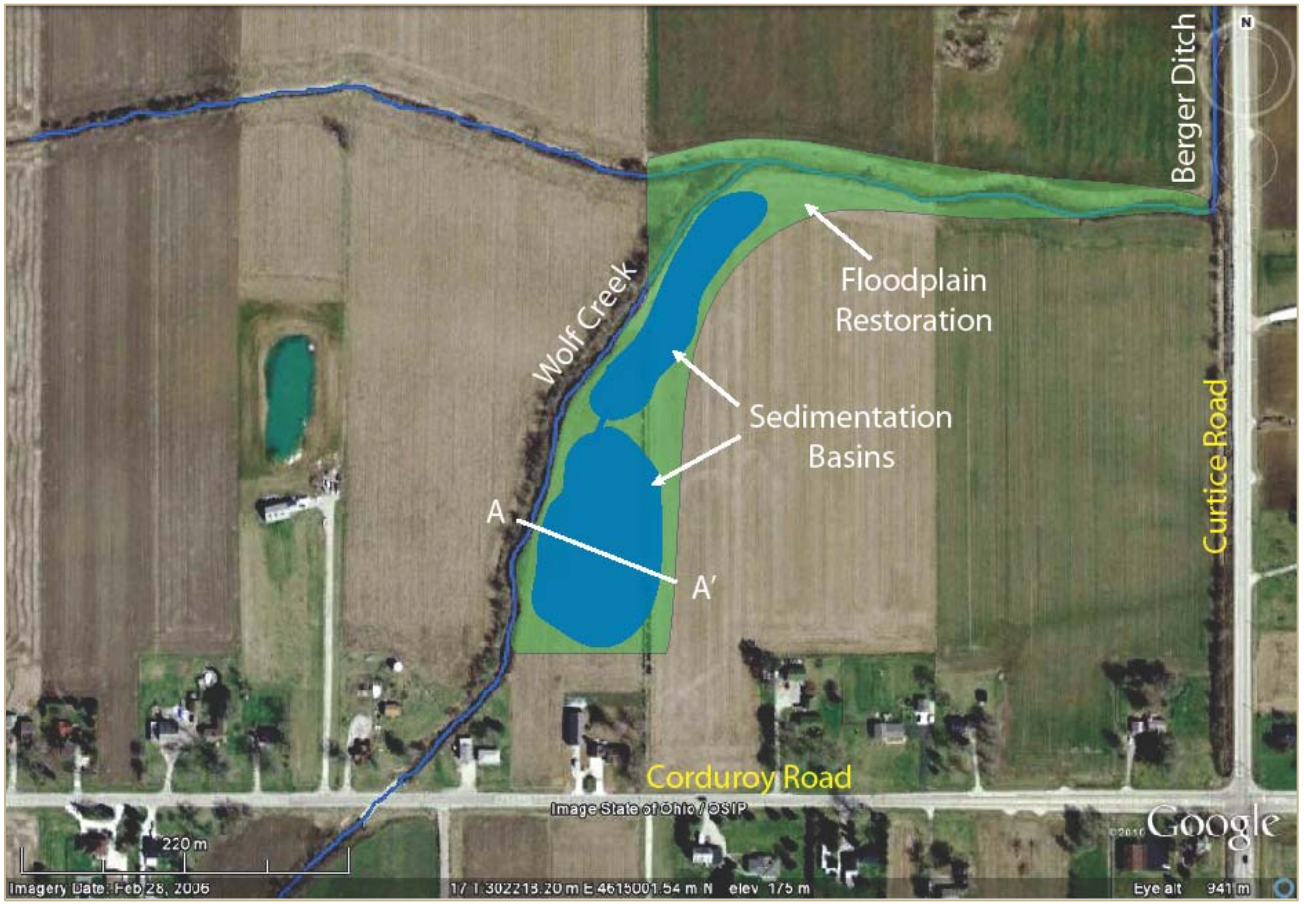
Data Analysis – 2008



2010 Study

Stage 1: Upstream Floodplain Restoration and Sediment Removal Area



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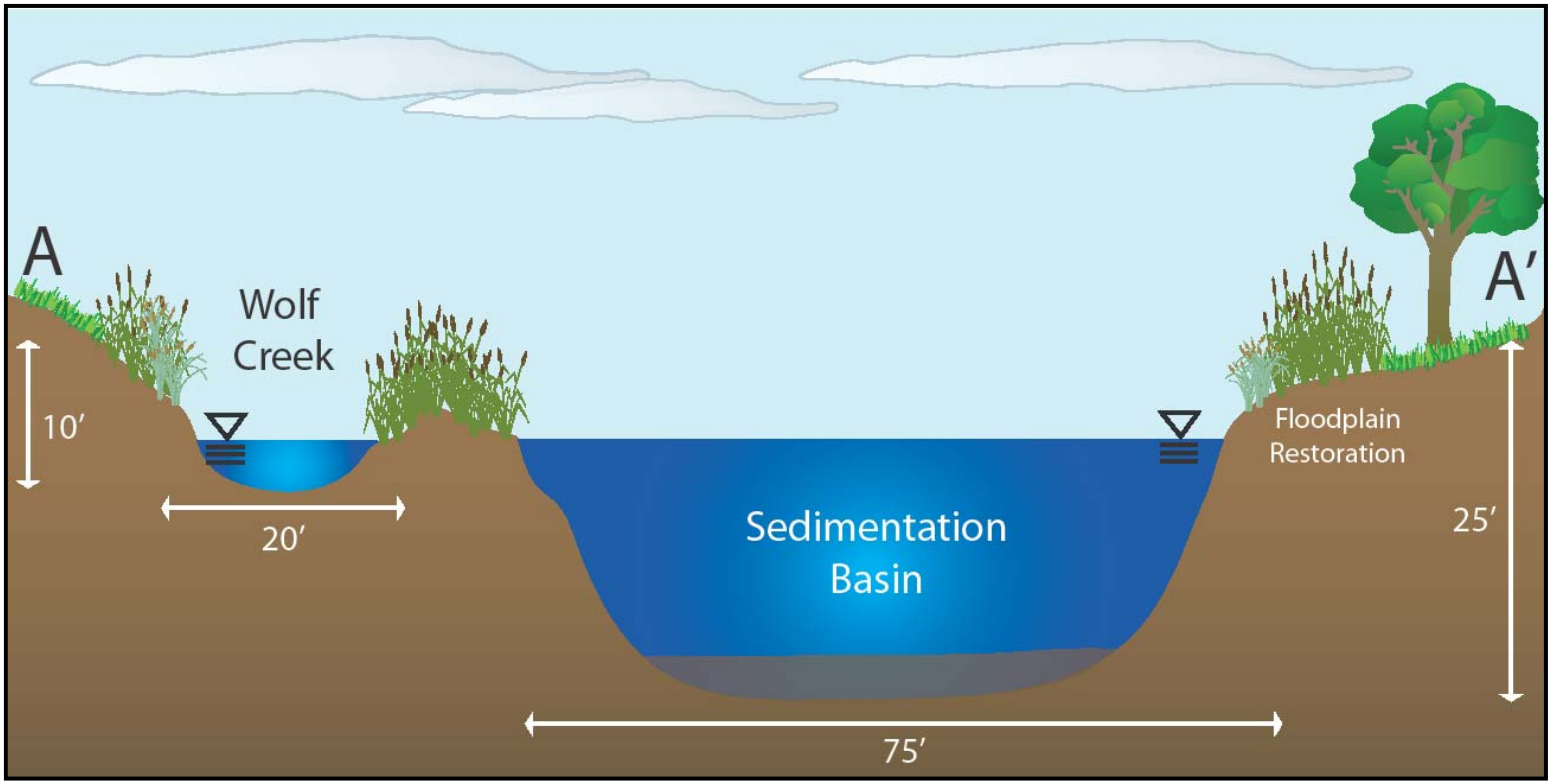

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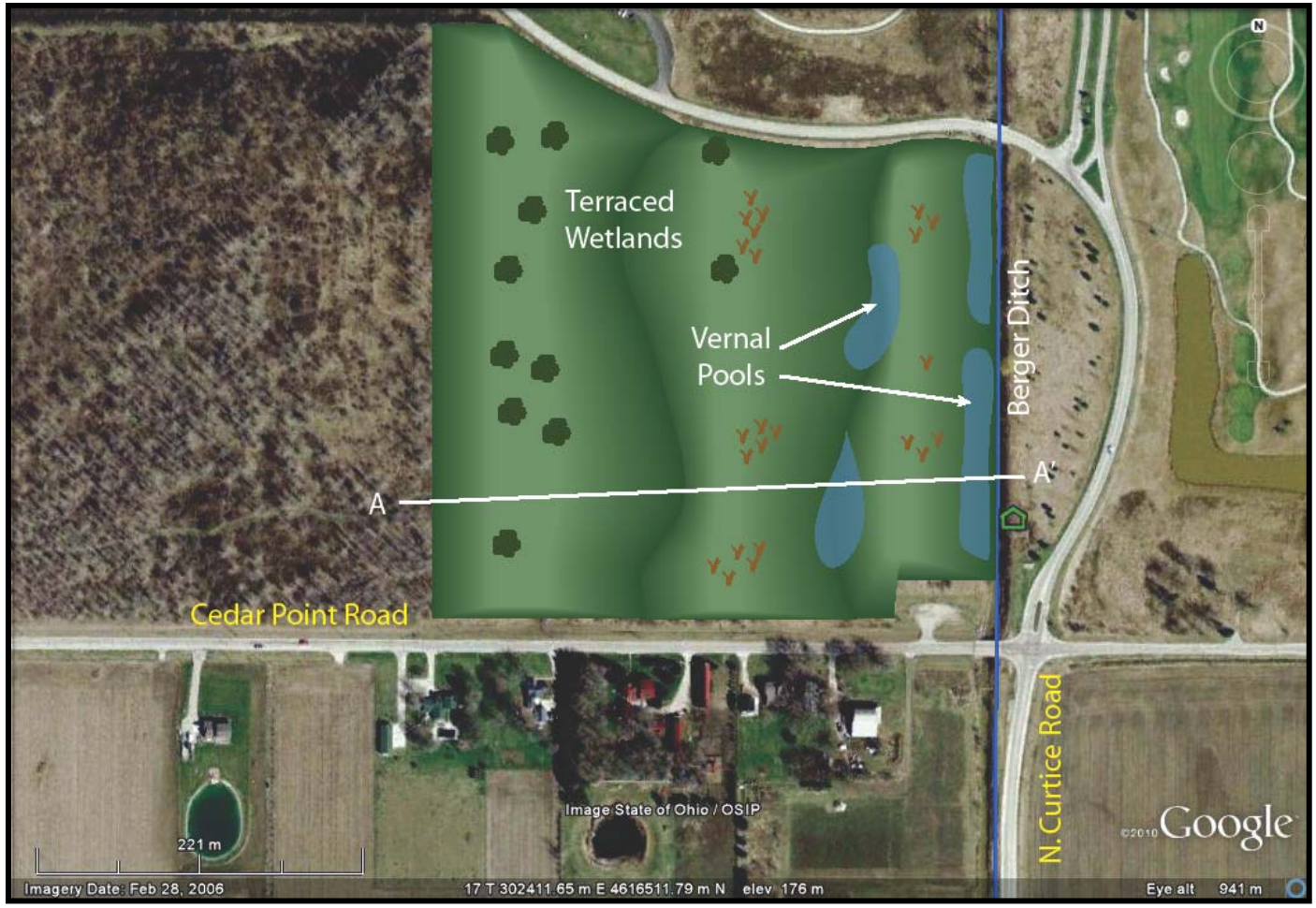
2010 Study

Stage 2: Downstream Terraced Wetland Habitat Restoration and Treatment System



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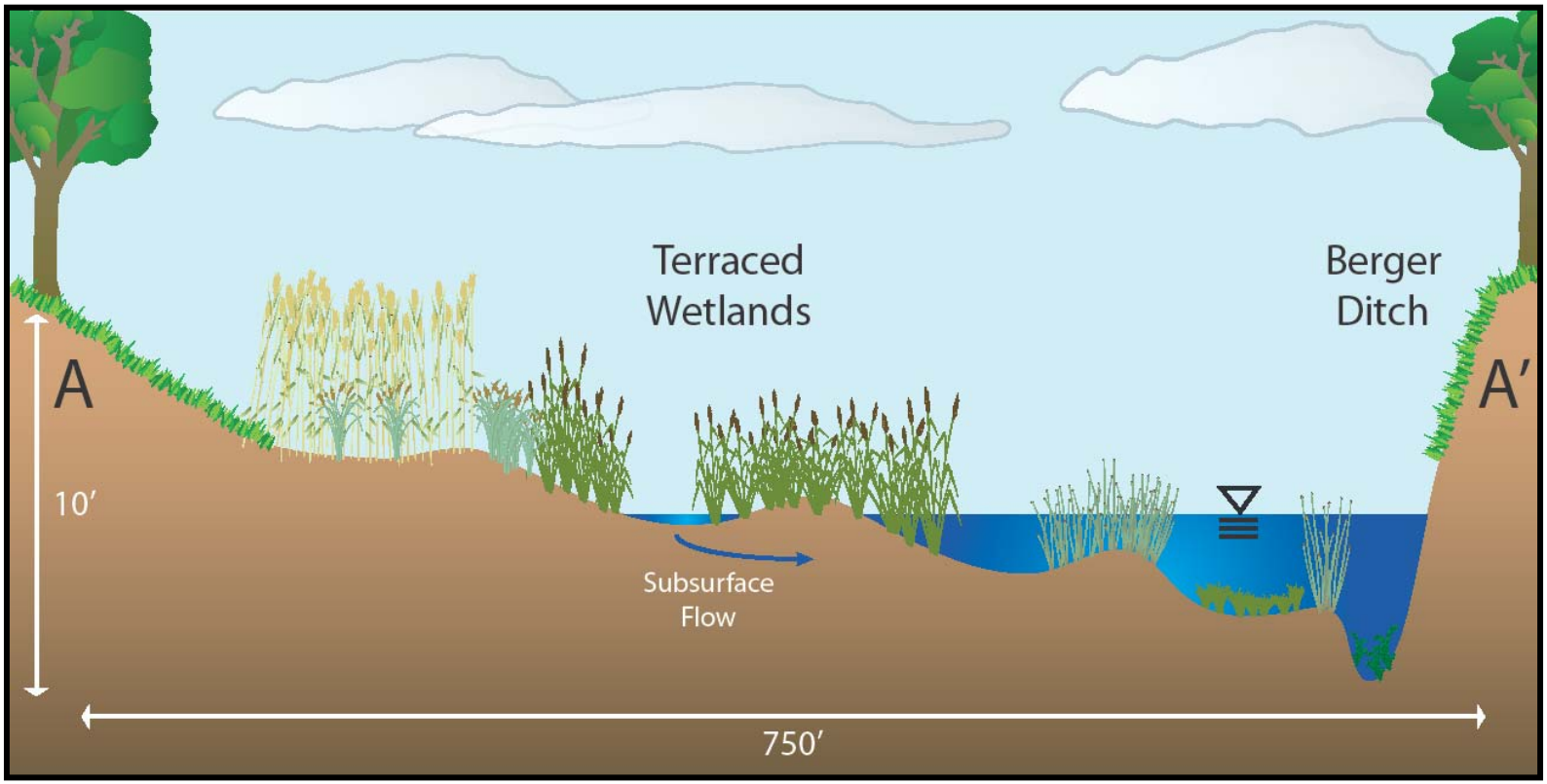
2010 Study

Stage 2: Downstream Terraced Wetland Habitat Restoration and Treatment System



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2010 Study

Future Final Plan Development Considerations

- Integrate findings of refined hydrologic and hydraulic model
- Establish final treatment goals based on water quality and flow data
- Optimize restoration configuration and layout
- Maximize treatment capacity and minimize O&M costs
- Design based on balanced treatment goals, funding availability and schedule

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2010 Study

Preliminary Estimated Range of Costs

Wolf Creek - Berger Ditch Wetland Restoration
Estimated Design and Construction Costs

All Project Phases

Activity	Low Range Cost	High Range Cost	Estimated Cost
Planning / Design / Permitting	$418,000	$696,000	$556,000
Construction	$3,434,000	$5,724,000	$4,580,000
Post-Construction	$96,000	$150,000	$120,000
Total Costs	$3,948,000	$6,570,000	$5,256,000

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2010 Study

Construction Phasing

Wolf Creek - Berger Ditch Wetland Restoration
Estimated Design and Construction Costs

Individual Project Phases

Project Site	Phase	Low Range Cost	High Range Cost	Estimated Cost
Oregon - Wolf Creek	Wolf Creek floodplain wetlands and sedimentation basins	$1,387,130	$2,311,890	$1,849,500
Maumee Bay State Park	Berger Ditch Corridor Restoration (3 sites together) and terraced wetland	$2,628,960	$4,381,590	$3,505,280
Total Estimated Costs		$4,016,080	$6,693,470	$5,354,780

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2010 Study

Operation and Maintenance

Maintenance Function	Oregon Sedimentation Basins	Maumee Bay State Park Terraced Wetlands	Maumee Bay State Park Berger Ditch Restoration
Vegetation replanting		●	●
Invasive species control	●	●	●
Sediment dredging	●		

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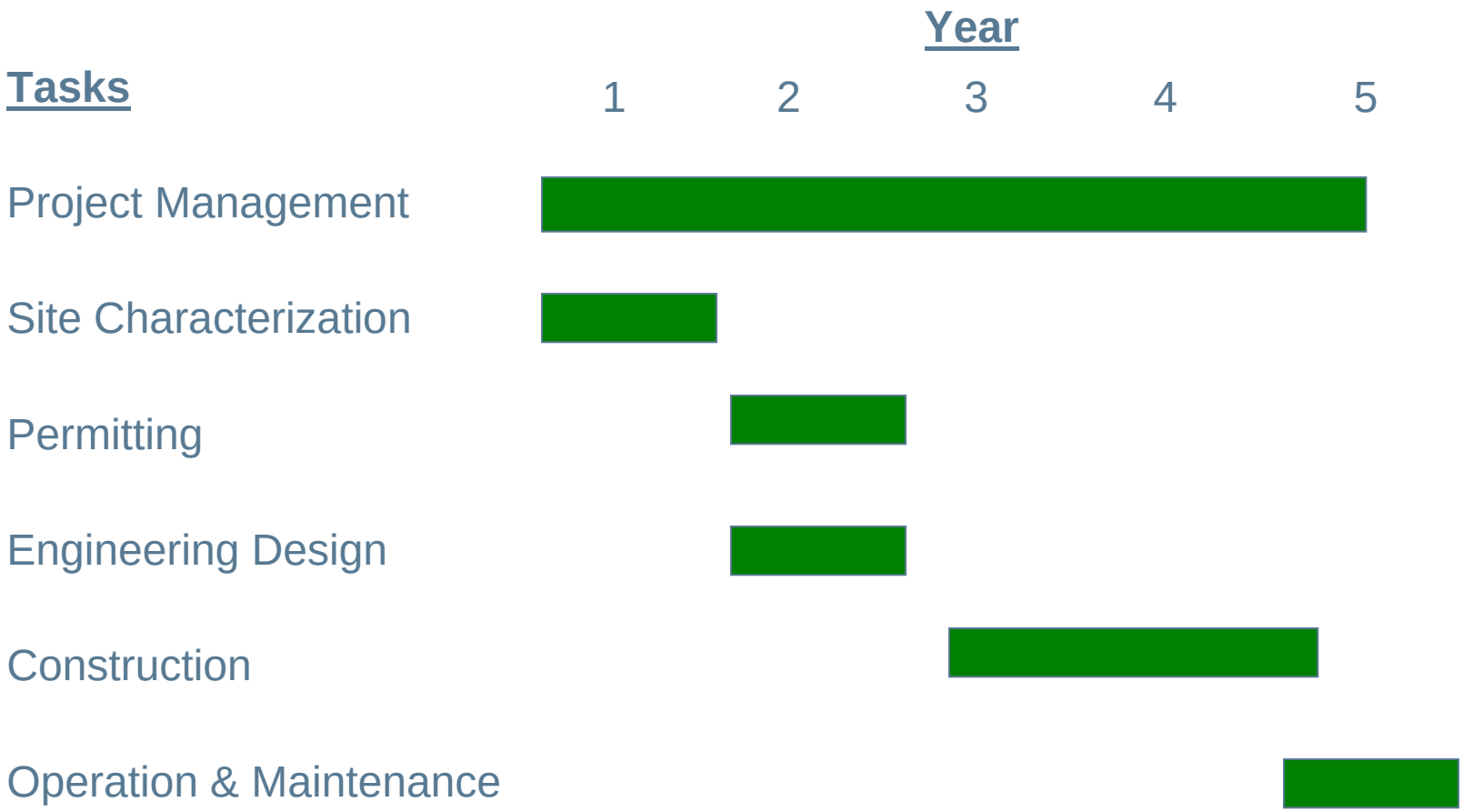
2010 Study

Estimated Project Progression Chart



- Actual work schedules, sequencing and timing dependent upon availability and scope of funding
- Estimated costs will vary dependant upon project phasing, final system design, and funding

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Questions?

Contact:

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- Bill Petruzzi, 419-385-2018

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