Using Geographic Information Systems (GIS) for Municipal Operations and Watershed Planning

The purpose of this workshop is to provide an overview of how Geographic Information Systems (GIS) and geospatial data can be used for municipal operations and watershed planning. Advancements in the remote sensing and GIS fields are making available dynamic, new services to users across different disciplines. This workshop will showcase the newest data available to municipal and environmental stakeholders in the Pennsylvania Lake Erie Basin, but will also include information for planners and decision-makers from any geographic region. Specific topics will include:

* An overview of GIS;
* Acquiring high resolution imagery, LiDAR, and impervious cover data;
* Using impervious data to generate dedicated revenue for storm water management;
* Using geospatial data to develop and implement watershed plans; and
* Using geospatial data for land use, transportation maintenance, and energy planning.

Pennsylvania Sea Grant and the Pennsylvania Department of Environmental Protection are collaborating to provide this workshop for municipal officials, planners, engineers, environmental organizations, and others interested in using GIS to increase municipal efficiency, effectively manage storm water, and protect local water quality. Funding for the workshop is being provided by the Growing Greener Program and Pennsylvania Sea Grant.

When: Friday, November 15, 2013

Where: Tom Ridge Environmental Center

Time: 9:00 AM to 2:15 PM (Lunch will be provided)

Cost: FREE

Registration: Email Sean Rafferty at sdr138@psu.edu to confirm your registration. In your email, please include your ***Name, Affiliation, Job Title, Phone Number, Email Address, and Meal Preference*** (Vegetarian or No Preference). Attendance is limited to 100 persons, with municipal and environmental personnel from the Pennsylvania Lake Erie Basin given preference if interest is greater than the number of openings. If you would like further information or have questions feel free to email Sean Rafferty or call him at 814-217-9013.

You must register by Wednesday, November 6, 2013

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Sea Grant
Pennsylvania

Using Geographic Information Systems for Municipal Operations and Watershed Planning

Tom Ridge Environmental Center; Erie, Pennsylvania

Friday, November 15, 2013

Agenda

8:30 AM	Registration	
9:00 AM	Welcome and Introduction	Sean Rafferty, PASG Tim Bruno, DEP
9:15 AM	Lake Erie Watershed Project Overview GIS Overview Aerial and LiDAR Acquisition Creating Impervious Cover Data	 Mike Merchant, Woolpert Brian Stevens, Woolpert Brian Stevens, Woolpert
10:30 AM	Break	
10:45 AM	Impervious Data: Dedicated Revenue	Brian Merritt, AMEC
11:30 AM	City of Meadville Impervious Cover Fee	Andy Walker, Meadville
Noon	Lunch Provided	Sunset Café
12:45 PM	GIS: A Tool for Decision Making 1. Watershed Planning 2. Natural Resources and Energy 3. Transportation Maintenance	 Sean Rafferty, PASG David Alvarez, Woolpert David Alvarez, Woolpert
1:45 PM	Comments/Wrap-Up/Survey	Tim Bruno, DEP
2:15 PM	Have a Nice Weekend!	

You must register by Wednesday, November 6, 2013

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WOOLPERT

DESIGN | GEOSPATIAL | INFRASTRUCTURE

GIS for Municipal Operations and Watershed Planning

Mike Merchant, GISP

&

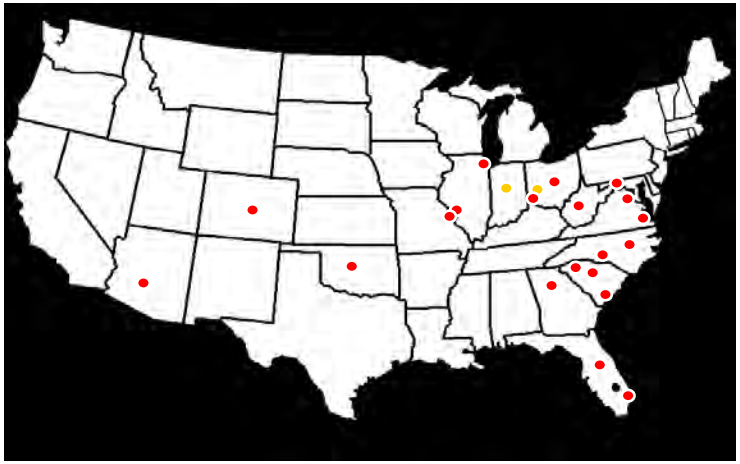
Brian Stevens, CP

November 15, 2013

CELEBRATING 100 YEARS

Woolpert, Inc.
Who are we?

- Woolpert has provided surveying since 1911, photogrammetry since 1969, and GIS since 1980
- Woolpert employs over 650 professionals – 250 of whom are employed in the surveying, photogrammetry, and GIS fields



Presentation Agenda

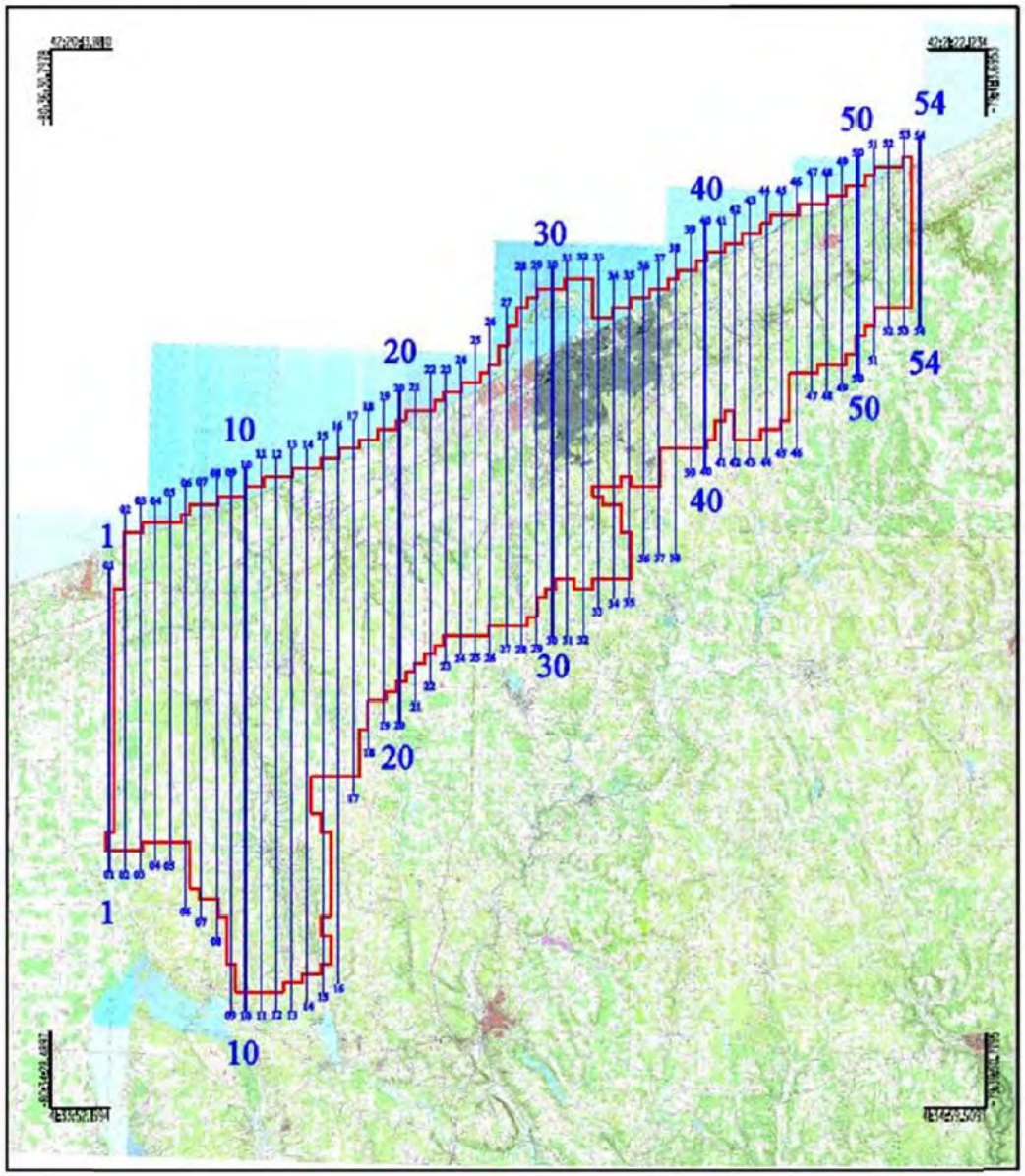
- Project Area – Lake Erie Watershed (PA); 512 Square Miles
- Aerial Imagery and LiDAR Acquisition
  - Aircraft
  - Aerial Imagery Flight Plan
    - Aerial Sensor
  - Aerial LiDAR Flight Plan
    - Aerial Sensor
- Digital Ortho-Imagery
- LiDAR Data
- Creating Impervious Cover Data
  - Remote Sensing

Project Area

Aerial Equipment Used (Aircraft)

- Cessna 404 Aircraft
- Twin Engine/11-Passenger
- Dual Port Capable

Aerial Imagery (Flight Plan)

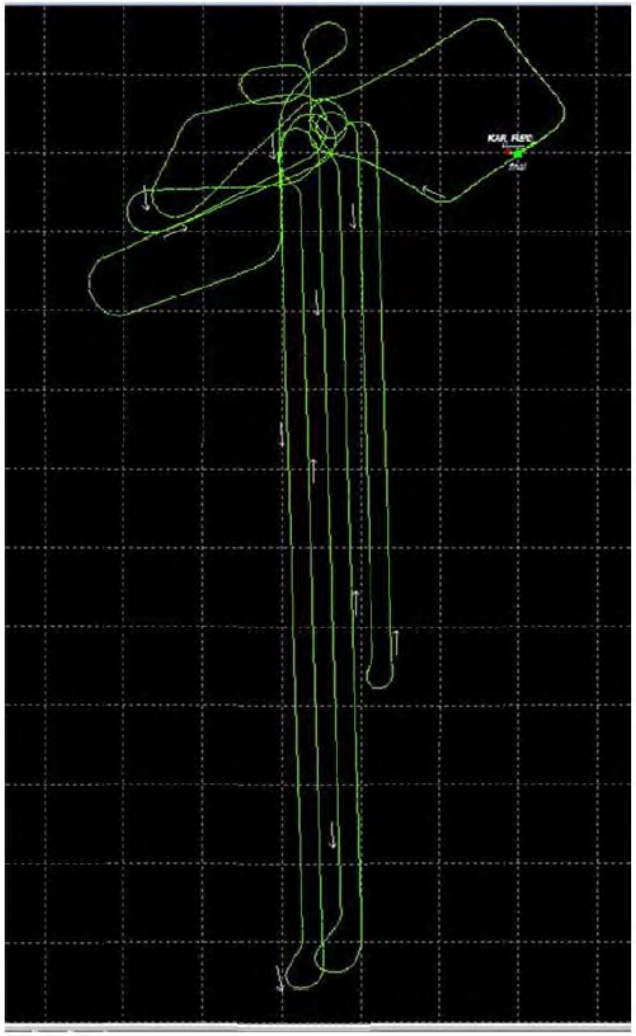


Aerial Imagery (Flight Plan)

- Aerial Imagery Specifications:
  - 6-Inch Pixel Resolution
  - Imagery Acquired During the Fall of 2012 (November)
  - Imagery Acquired with Leica ADS80 Digital Aerial Sensors
  - Imagery Acquired as 12-Bit, Sampled to 8-Bit
  - Imagery Acquired at an Altitude of 4,747-Feet (AGL)
  - Imagery Acquired at a Speed of ~150 Knots (~172 MPH)
  - Sidelap Between Imagery Flights: 25% or greater

Aerial Imagery (Flight Plan)

+ Aerial Imagery Flight Trajectory

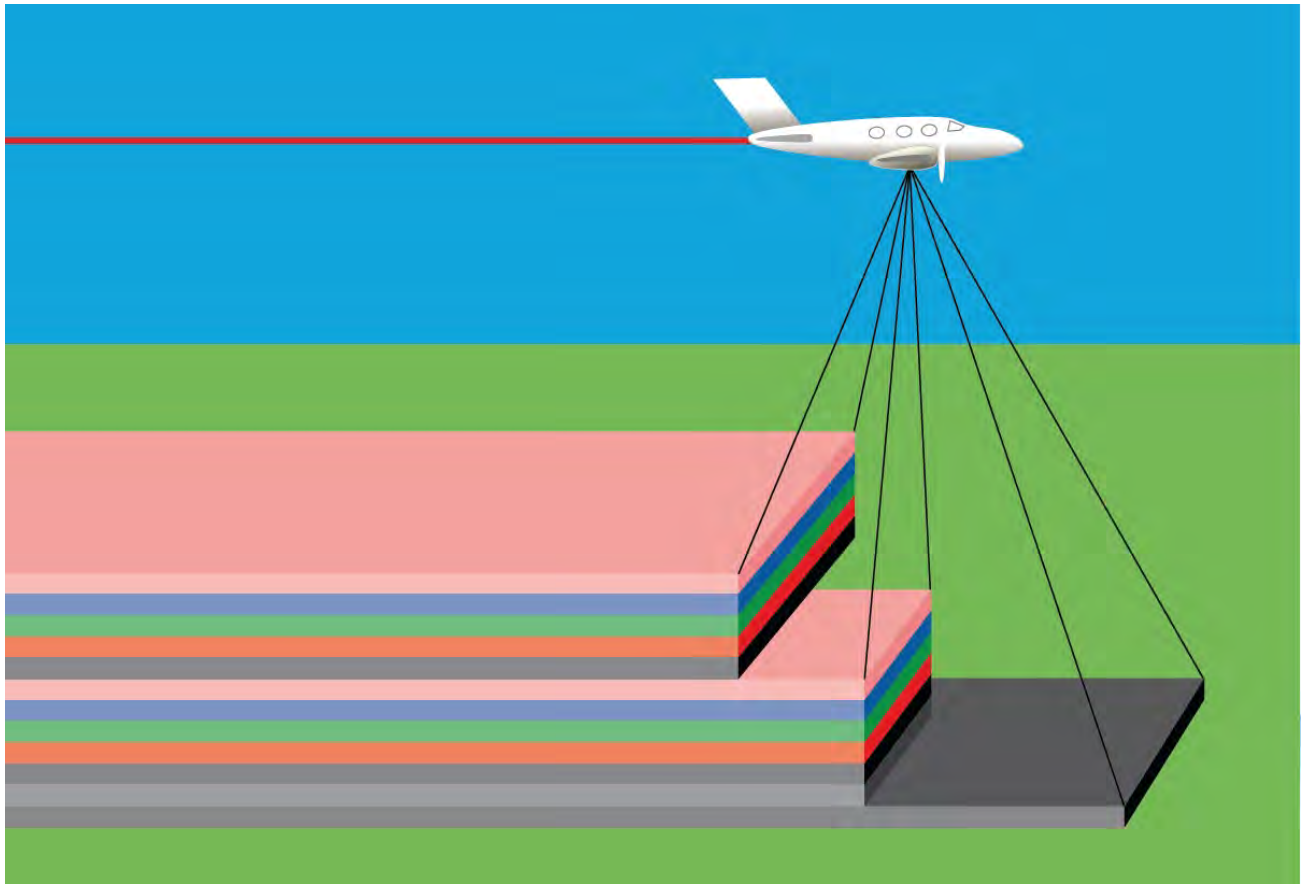


Aerial Imagery Equipment Used (Aerial Sensors)

- Leica Digital Camera Sensors
- Model: ADS80 (SH81 & 82)
- 12-Bit Image Acquisition
- 4-Band Imagery (Red, Green, Blue, Near Infrared)
- Push-Broom Sensor

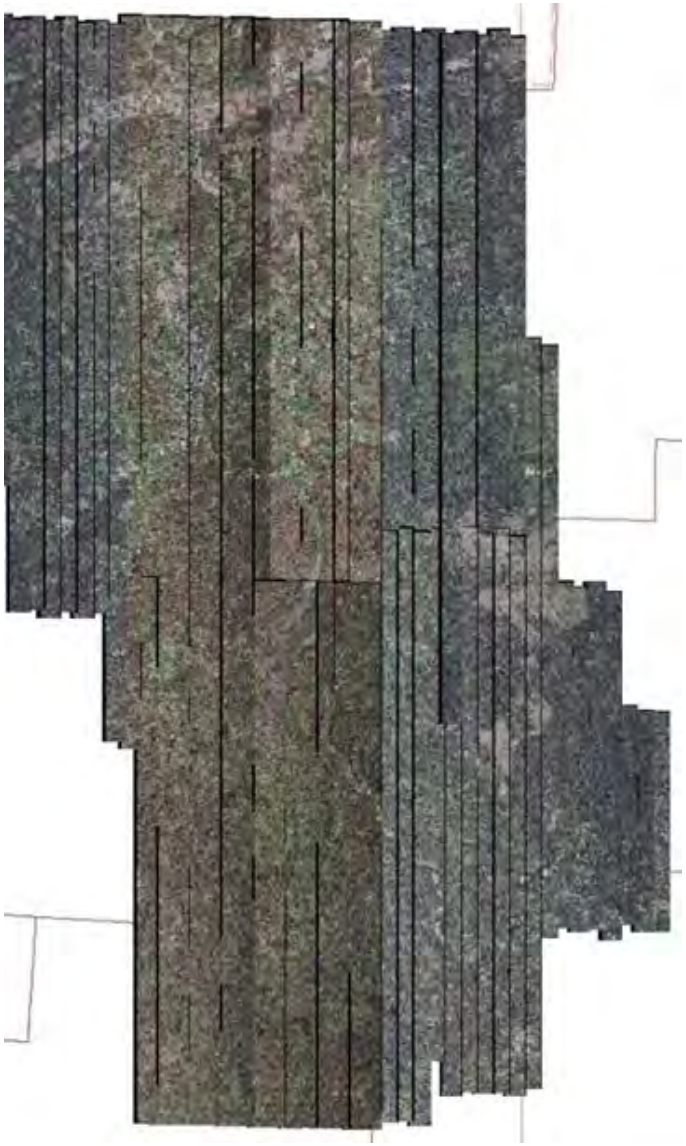
Aerial Equipment Used (Aerial Sensors)

+ Push-Broom Sensor

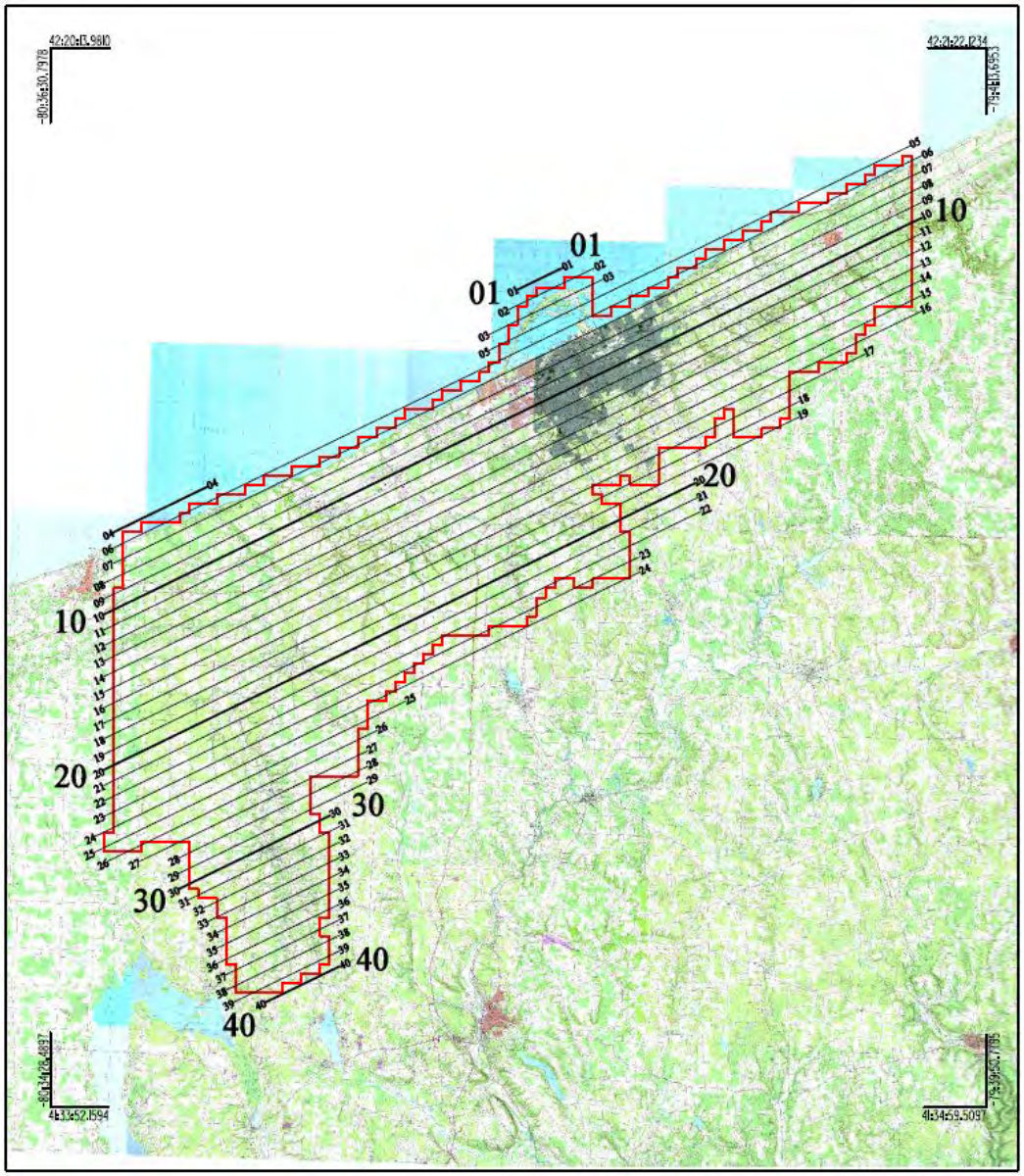


Aerial Equipment Used (Aerial Sensors)

+ Push-Broom Sensor



Aerial LiDAR (Flight Plan)

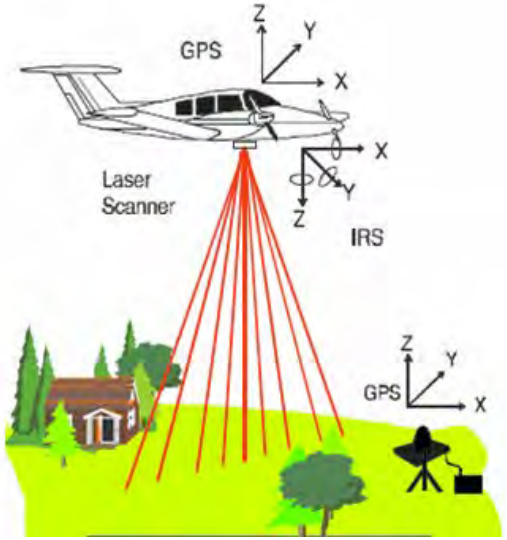


Aerial LiDAR (Flight Plan)

- Aerial LiDAR Specifications:
  - 1-Meter Point Density (Average)
  - LiDAR Acquired During the Fall of 2012 (November)
  - LiDAR Acquired with Leica ALS70 Digital LiDAR Sensors
  - LiDAR Acquired at an Altitude of 7,800-Feet (AGL)
  - LiDAR Acquired at a Speed of ~150 Knots (~172 MPH)
  - Sidelap Between LiDAR Flights: 25% or greater

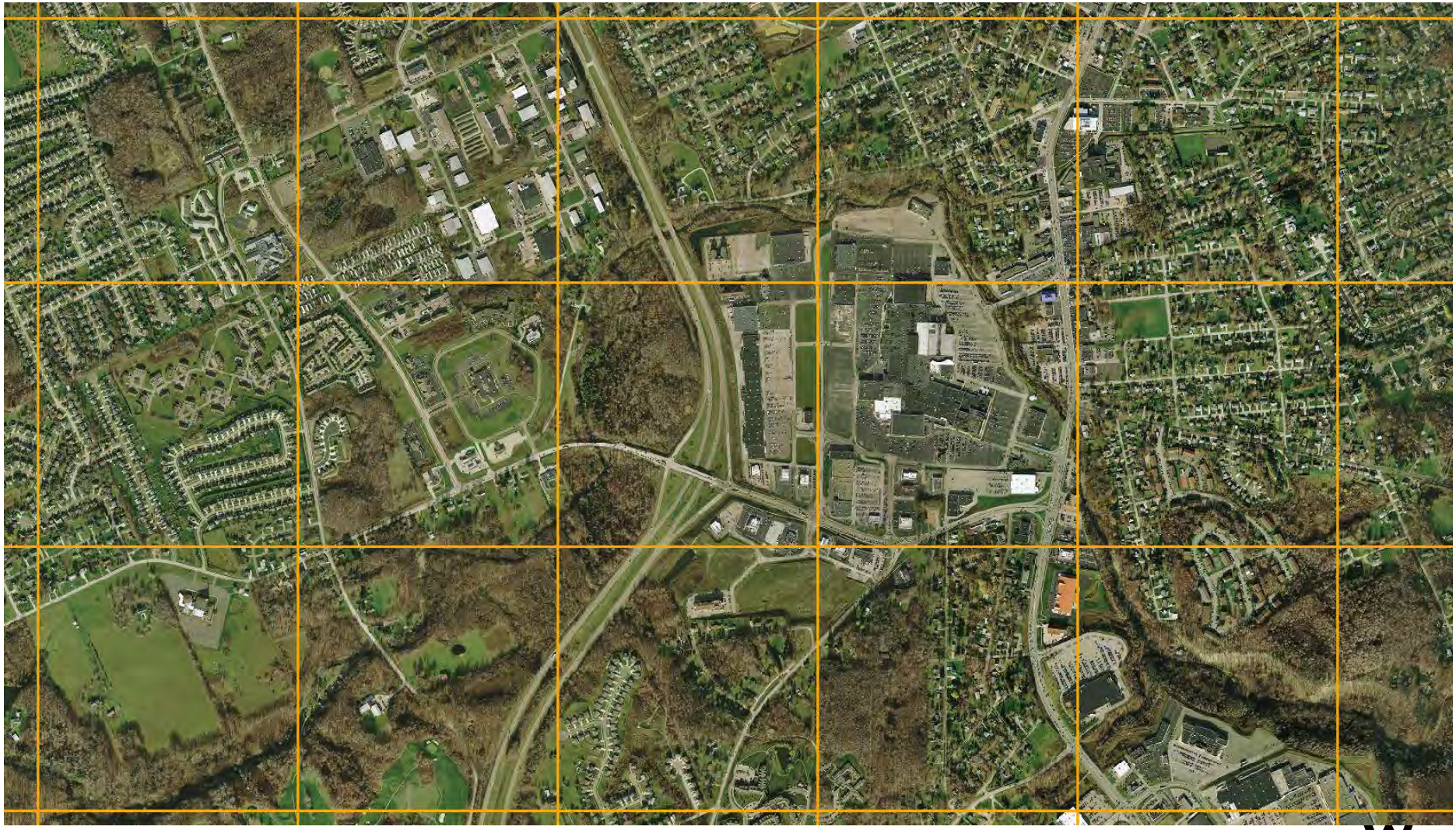
Aerial LiDAR Equipment Used (Aerial Sensors)

- Leica Digital LiDAR Sensors
- Model: ALS70
- Multiple Return Capable (up to 5 returns)
- Infrared Laser



QUESTIONS?????

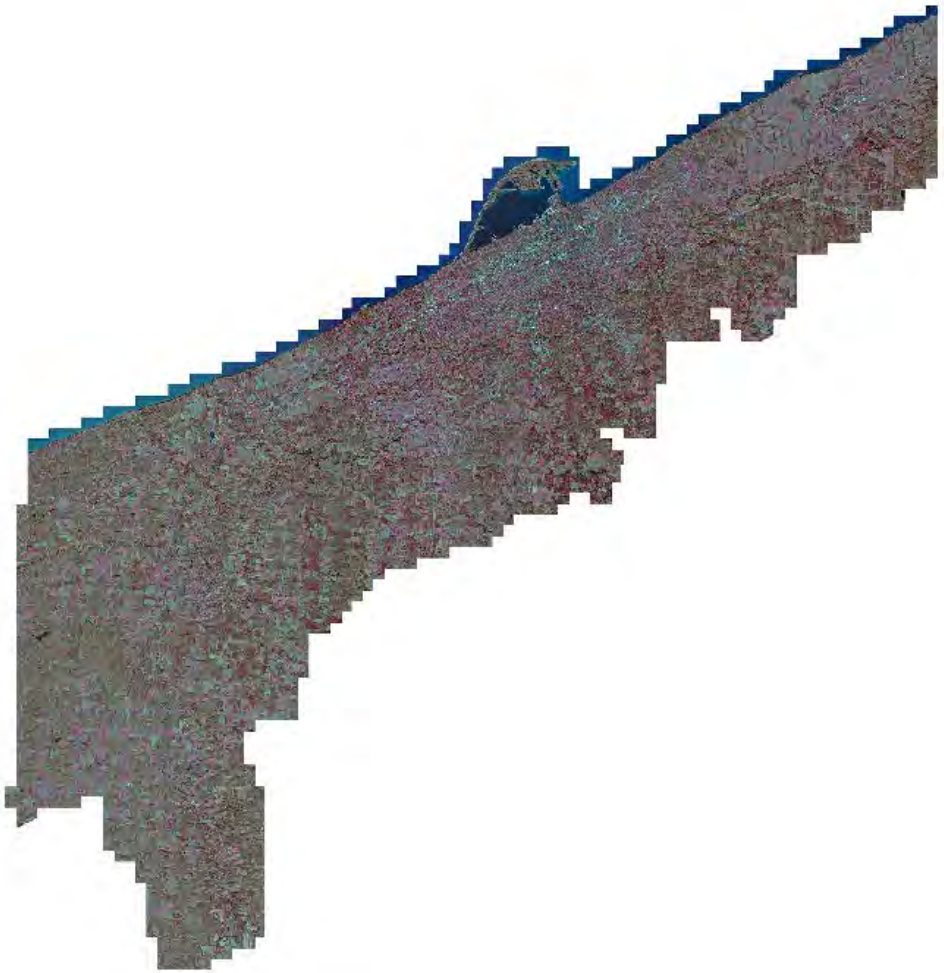
Digital Ortho-Imagery (Tiled System)



Digital Ortho-Imagery (Tiled System)

- 2,500’ x 2,500’ Ortho Tiles (Project Wide)
- Each Ortho Tile = 100MBs / Each
- Each Ortho Tile Delivered as Geotiffs with World Files
- Each Ortho Tile Delivered in 8-bit, 4-band Configuration
- Total Ortho Data Size = ~205GBs

Digital Ortho-Imagery (MrSID Imagery)



Digital Ortho-Imagery (MrSID Imagery)

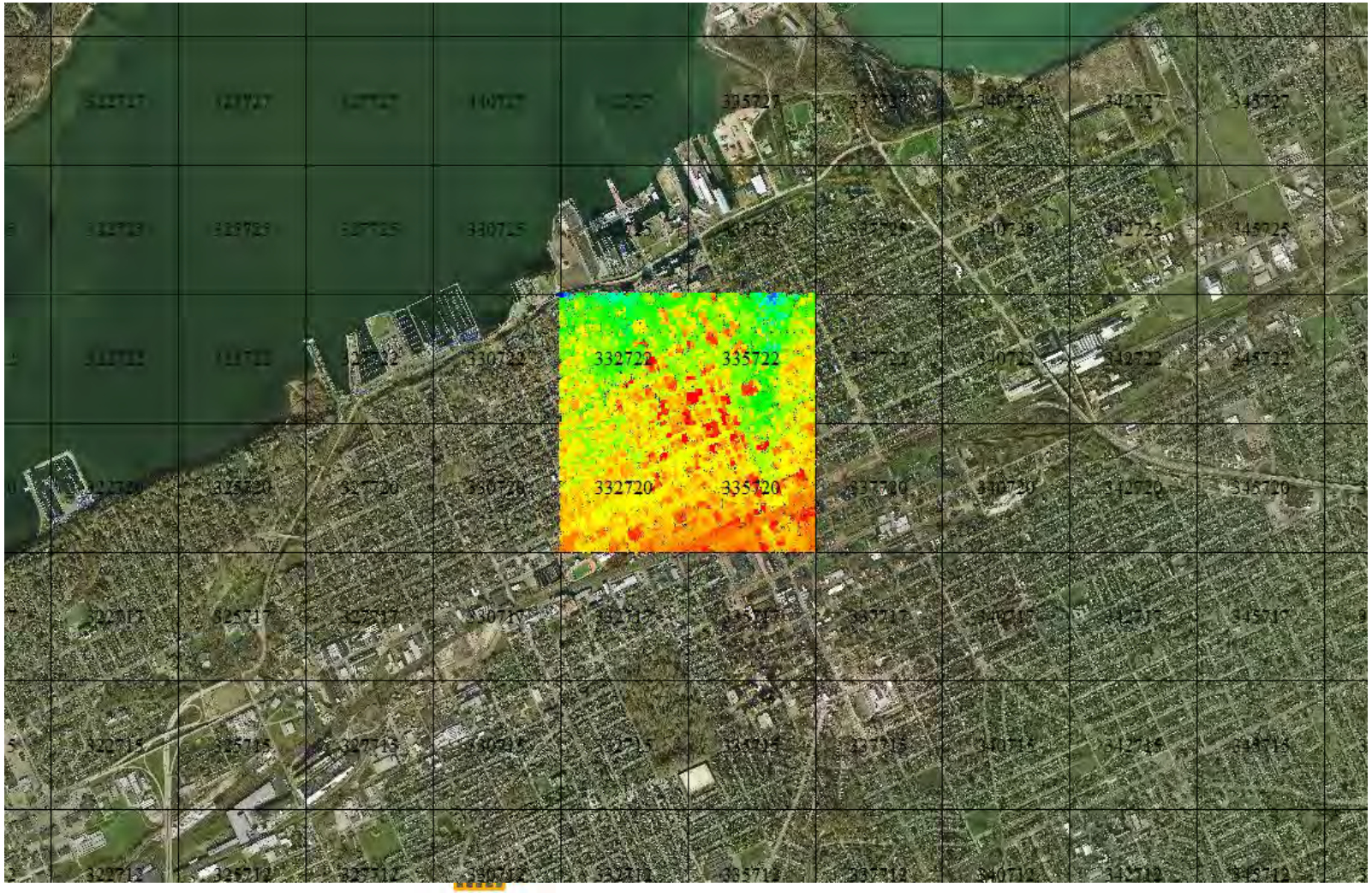
- Mosaic of the Entire Project Area
  - Individual Natural Color and Color Infrared Imagery
- Imagery is Compressed
  - 100x Compression
  - Some minor data loss
- File Size: ~5.6GBs (100x compression)

Digital Ortho-Imagery (Natural Color - RGB)

Digital Ortho-Imagery (Color Infrared - RGN)

QUESTIONS?????

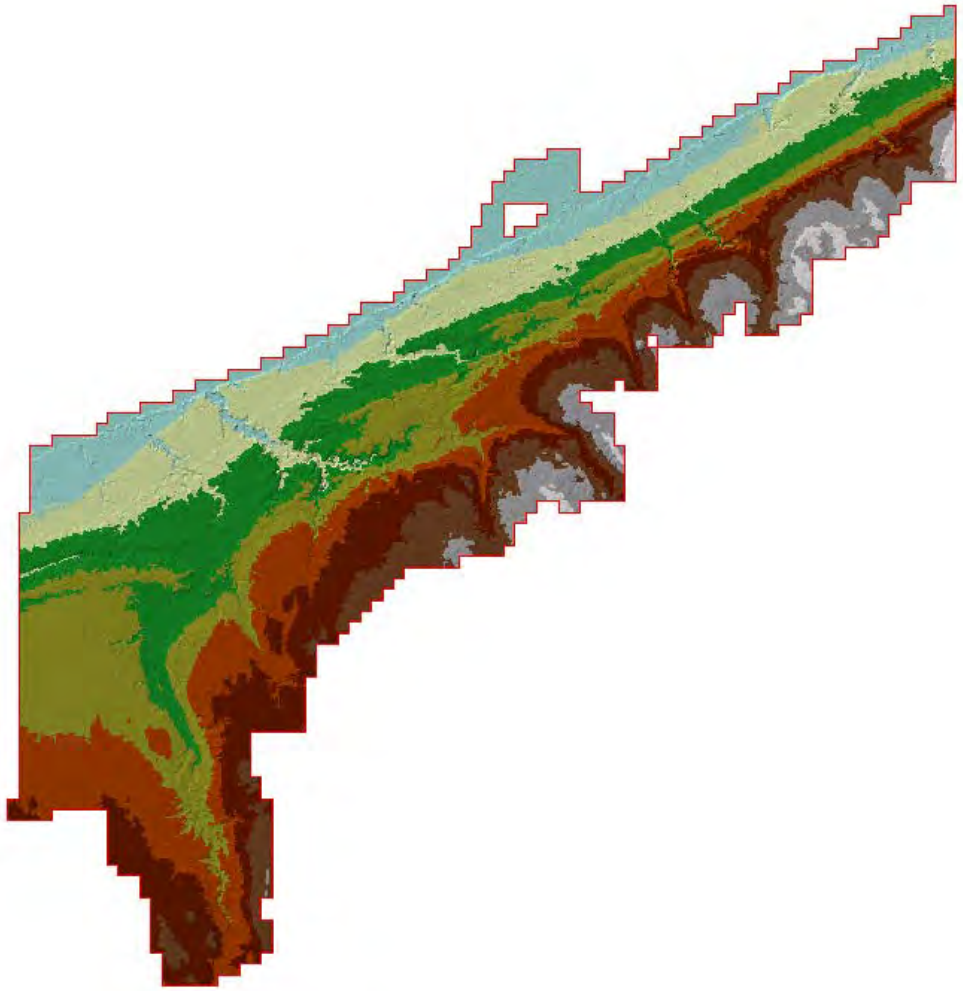
LiDAR Data (Tiled System)



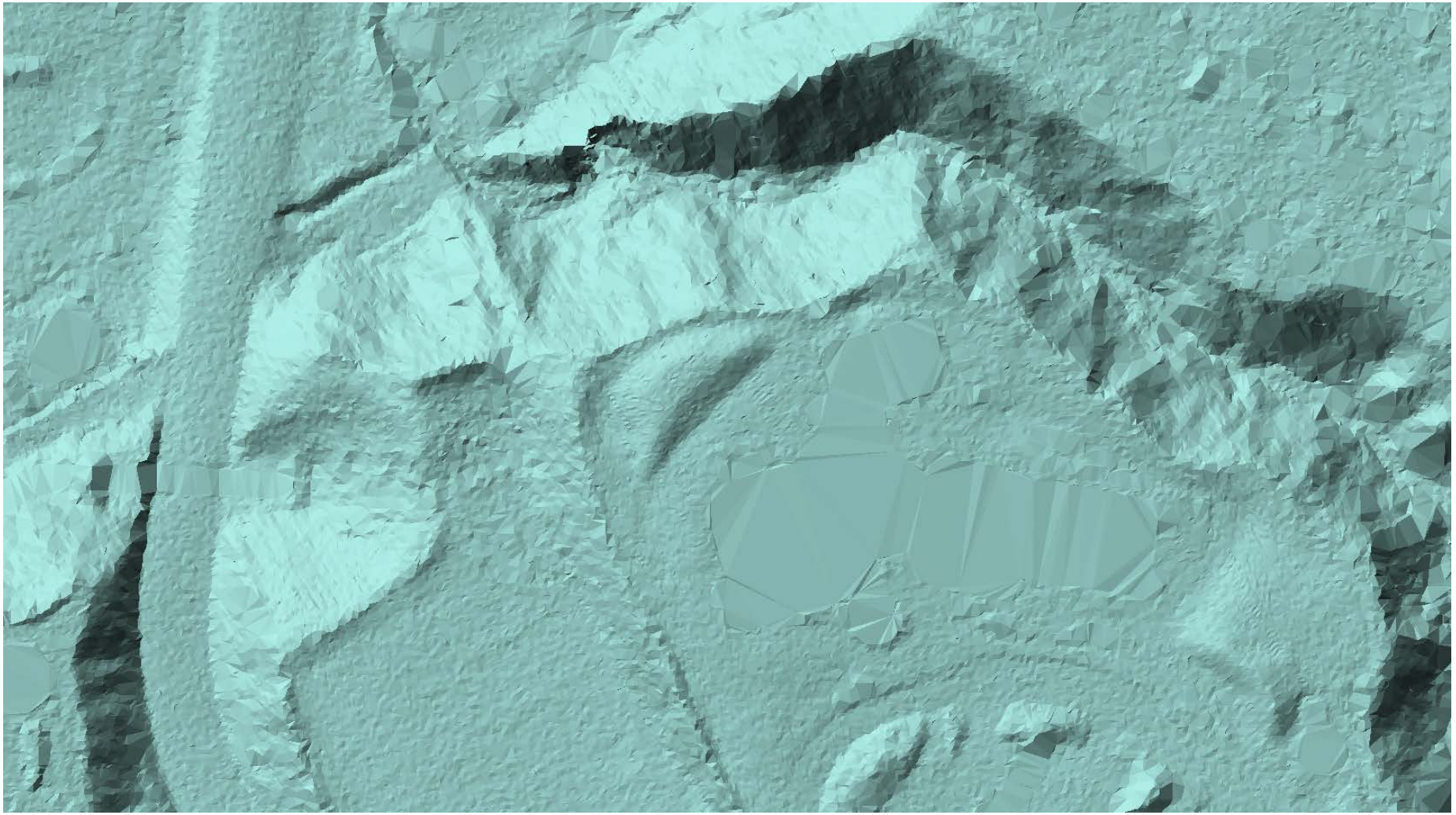
LiDAR Data (Tiled System)

- 2,500’ x 2,500’ LiDAR Tiles (Project Wide)
  - Same Size and Naming Convention as the Orthos
- Each LiDAR Tile = Range in Size
- Each LiDAR Tile Delivered in LAS Format (ground and above ground classifications)

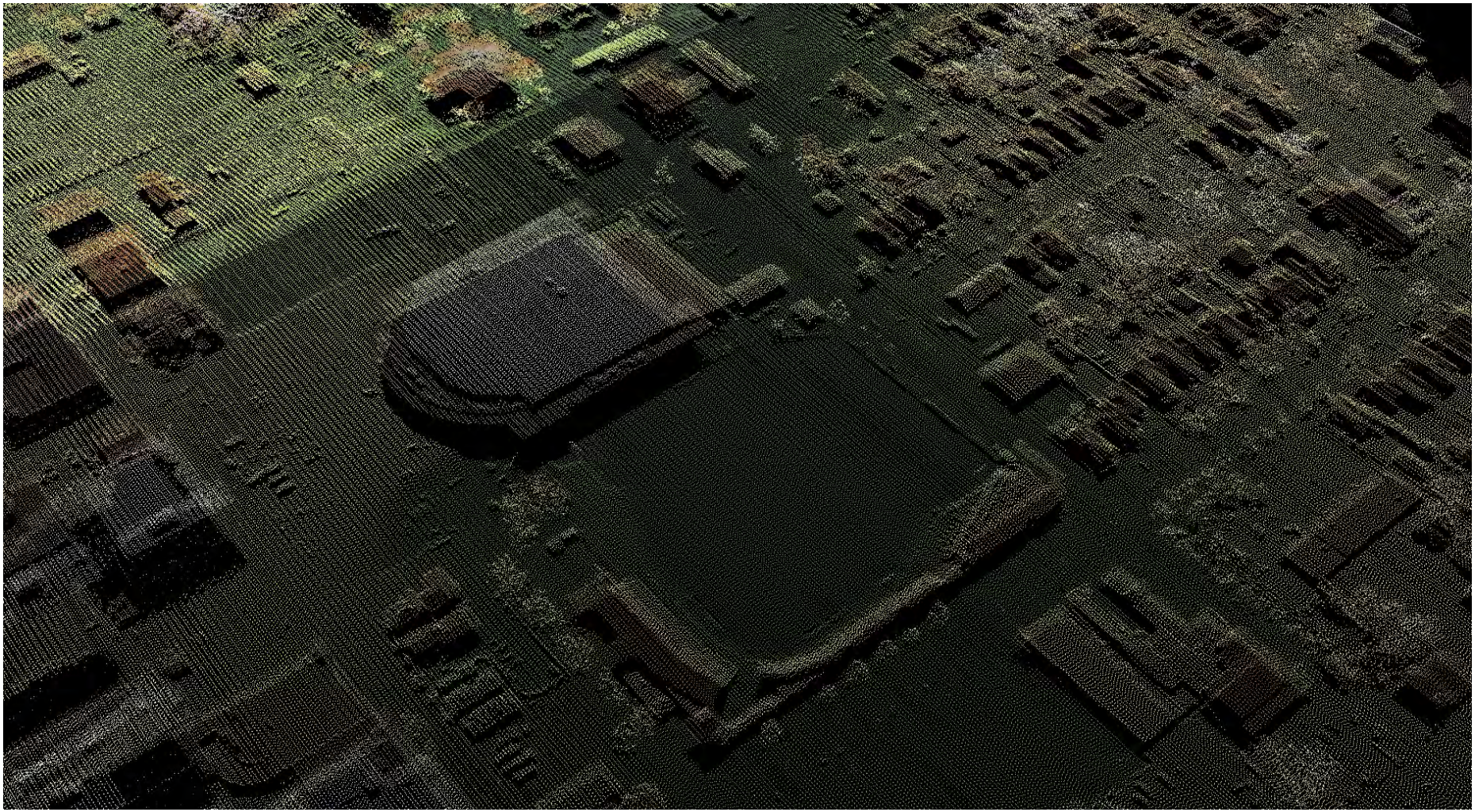
LiDAR Data (ESRI Terrain)



LiDAR Data
(ESRI Terrain – Tom Ridge Center)

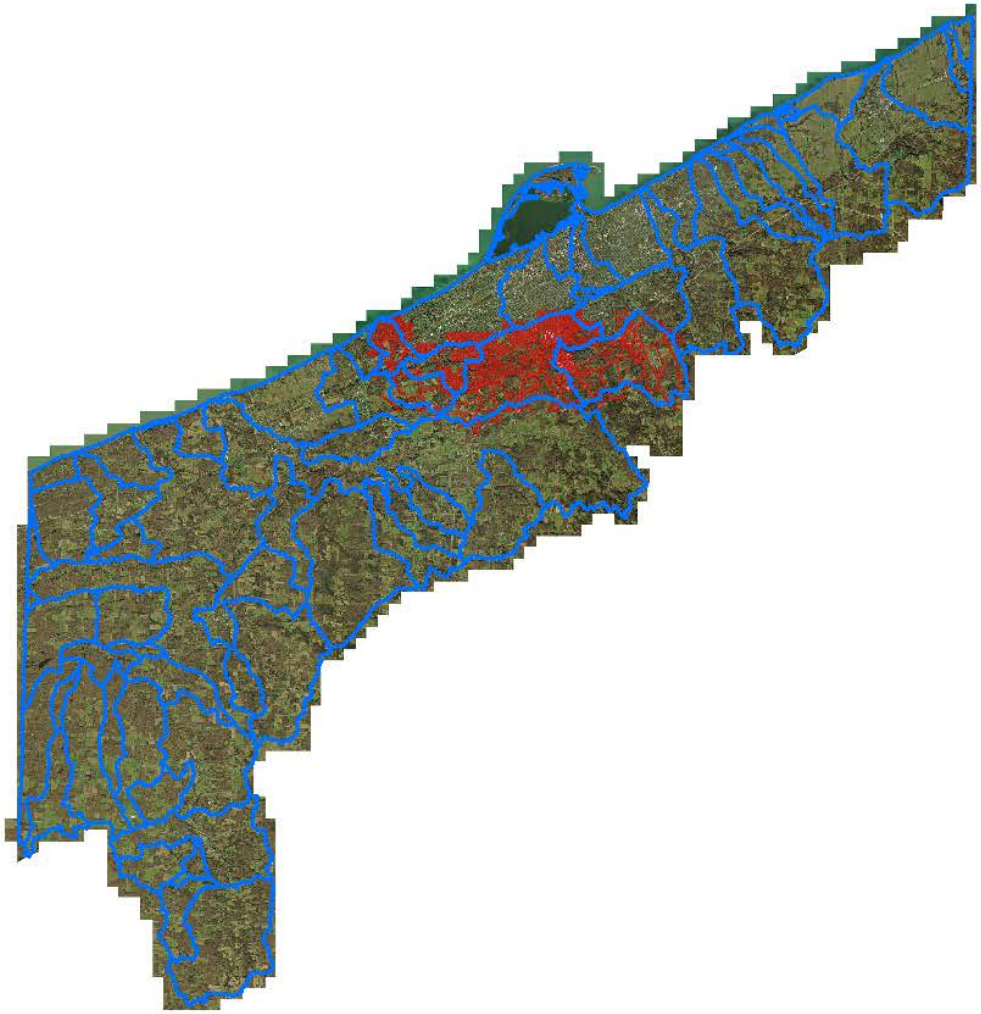


LiDAR Data
(Point Cloud – LAS Format)



QUESTIONS?????

Creating Impervious Cover Data



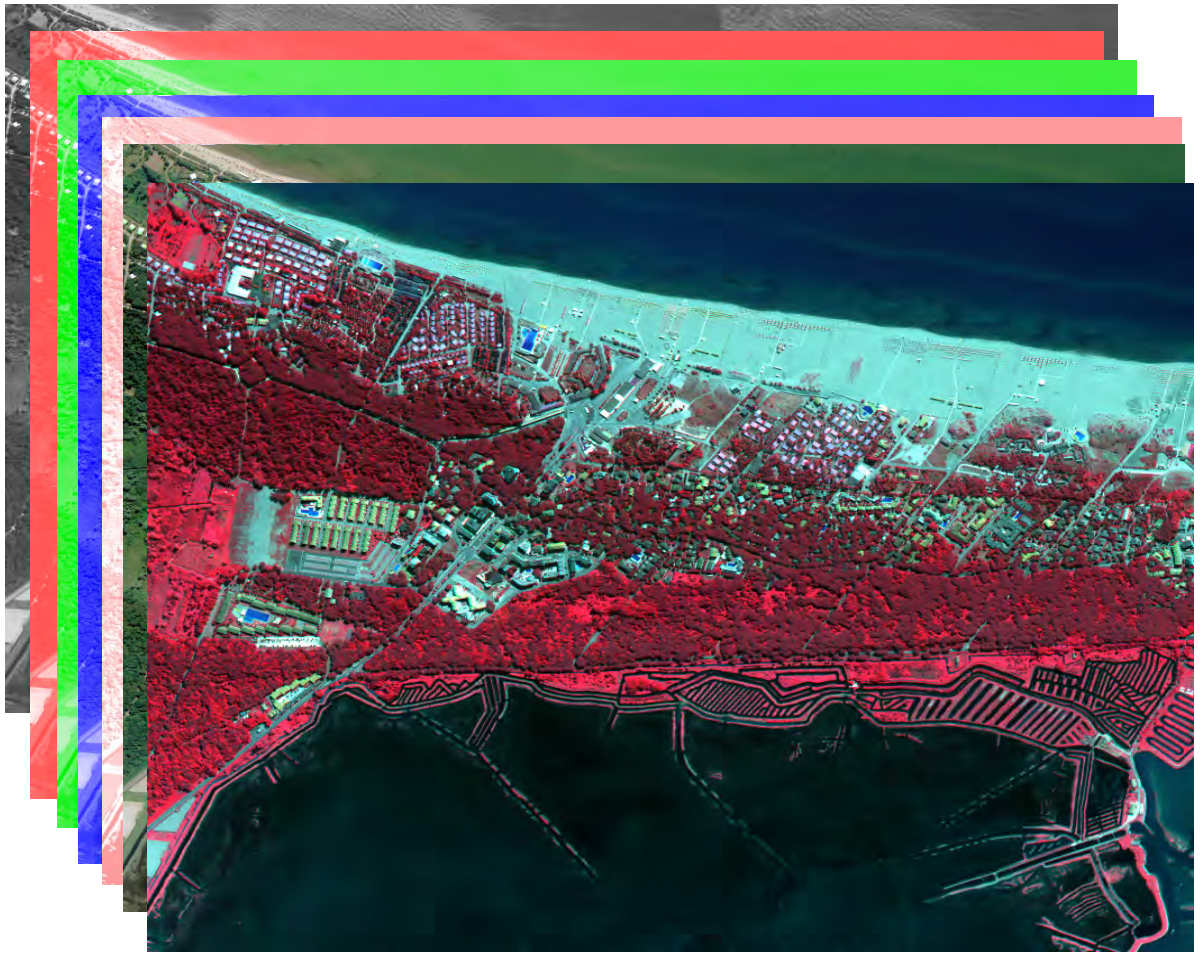
Creating Impervious Cover Data (Lake Erie Watershed, Pennsylvania)

- Project Area: 512 Square Miles
- Along Lake Erie From the Ohio to New York Borders
- Delineating Impervious Surfaces using Remote Sensing
- Impervious Surfaces for Commercial, Industrial and Residential Parcels (including the right-of-way (ROW) are being Identified)
- Impervious Surfaces that are 100 Square Feet and Larger are being Identified

Creating Impervious Cover Data (Process)

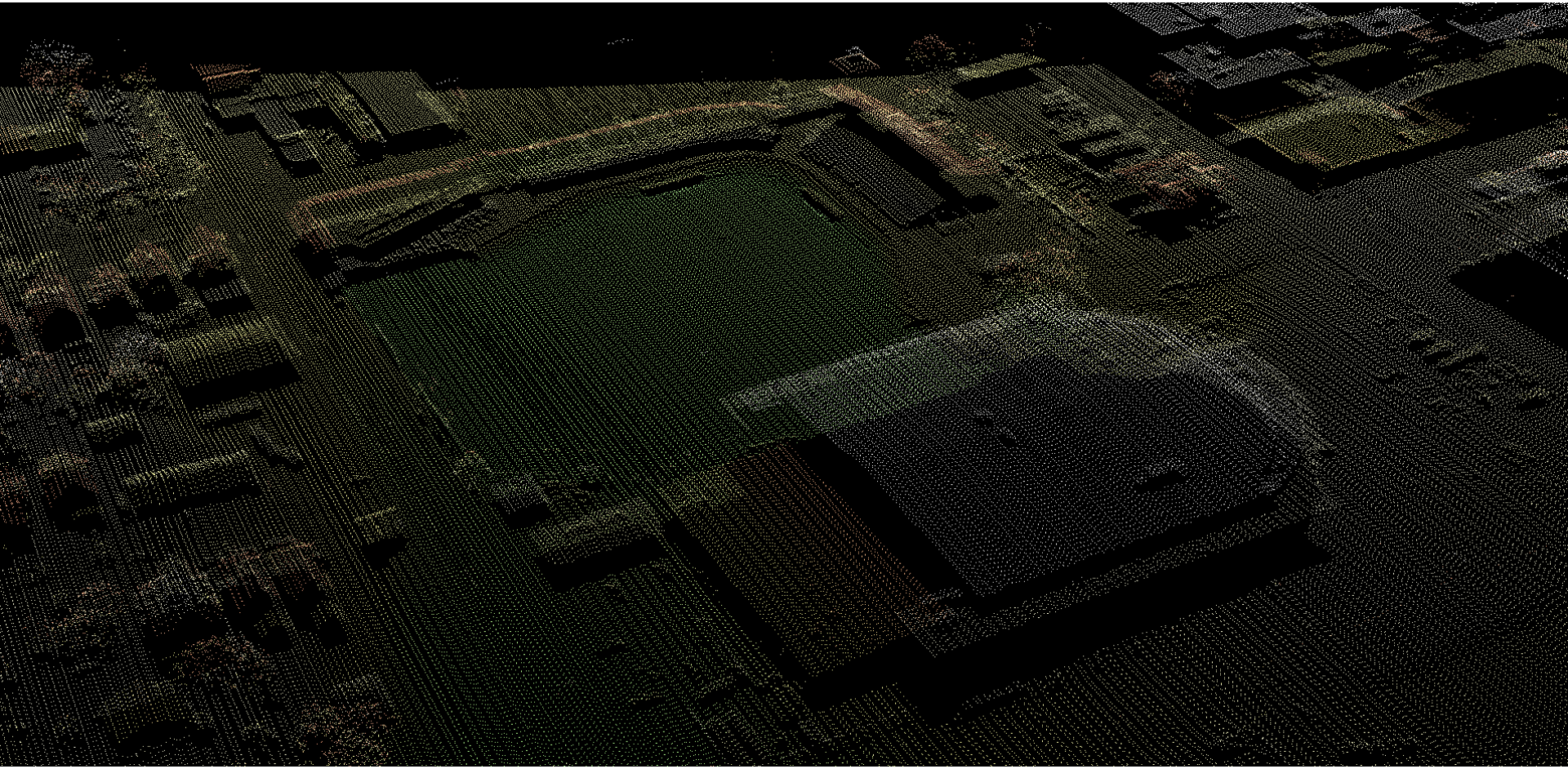
- Data Inputs
  - Existing Base Mapping
    - Color/Color Infrared Ortho-Imagery
      - Typical Resolutions: 3-, 6-, or 12-Inch
    - LiDAR Data
      - Typical Point Densities: 1-, 1.5-, 2-Meter
    - Parcels, Buildings, Land-Cover, etc.

Creating Impervious Cover Data (Ortho-Imagery – Spectral Values)



Creating Impervious Cover Data (Ortho-Imagery - Resolution)

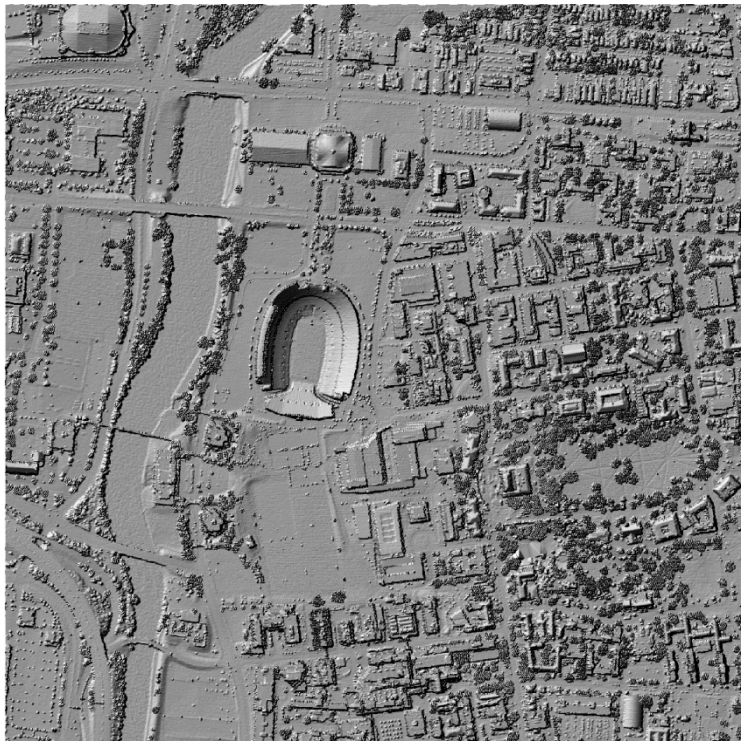
Creating Impervious Cover Data (LiDAR Data)

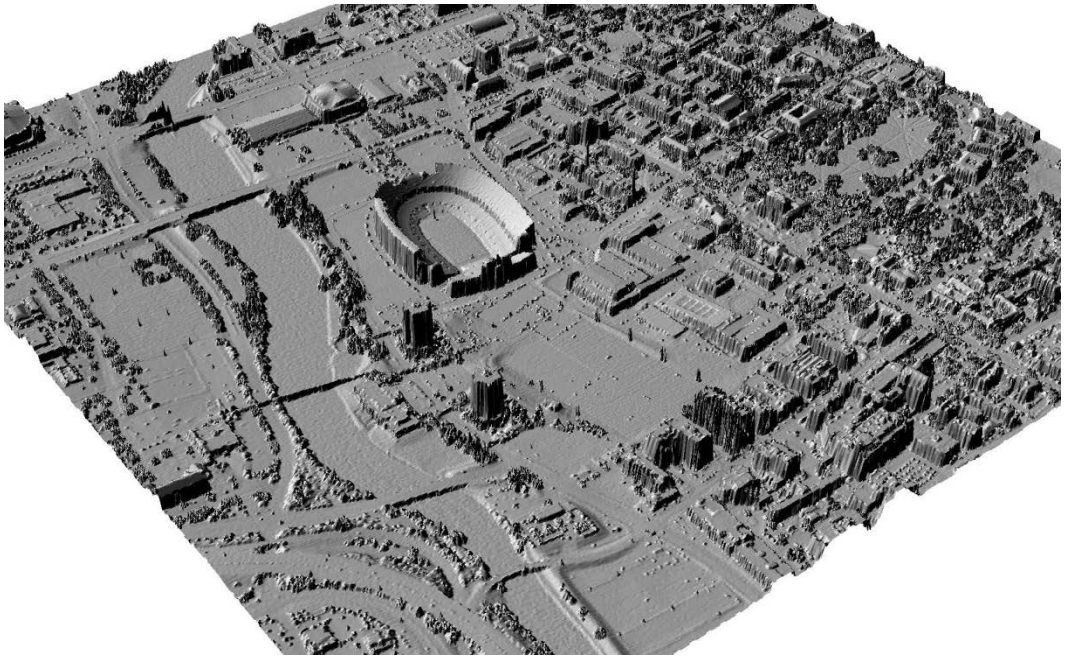


Creating Impervious Cover Data (LiDAR DSM – Digital Surface Model)

Highly accurate positional horizontal elevation values

LiDAR Elevation Data





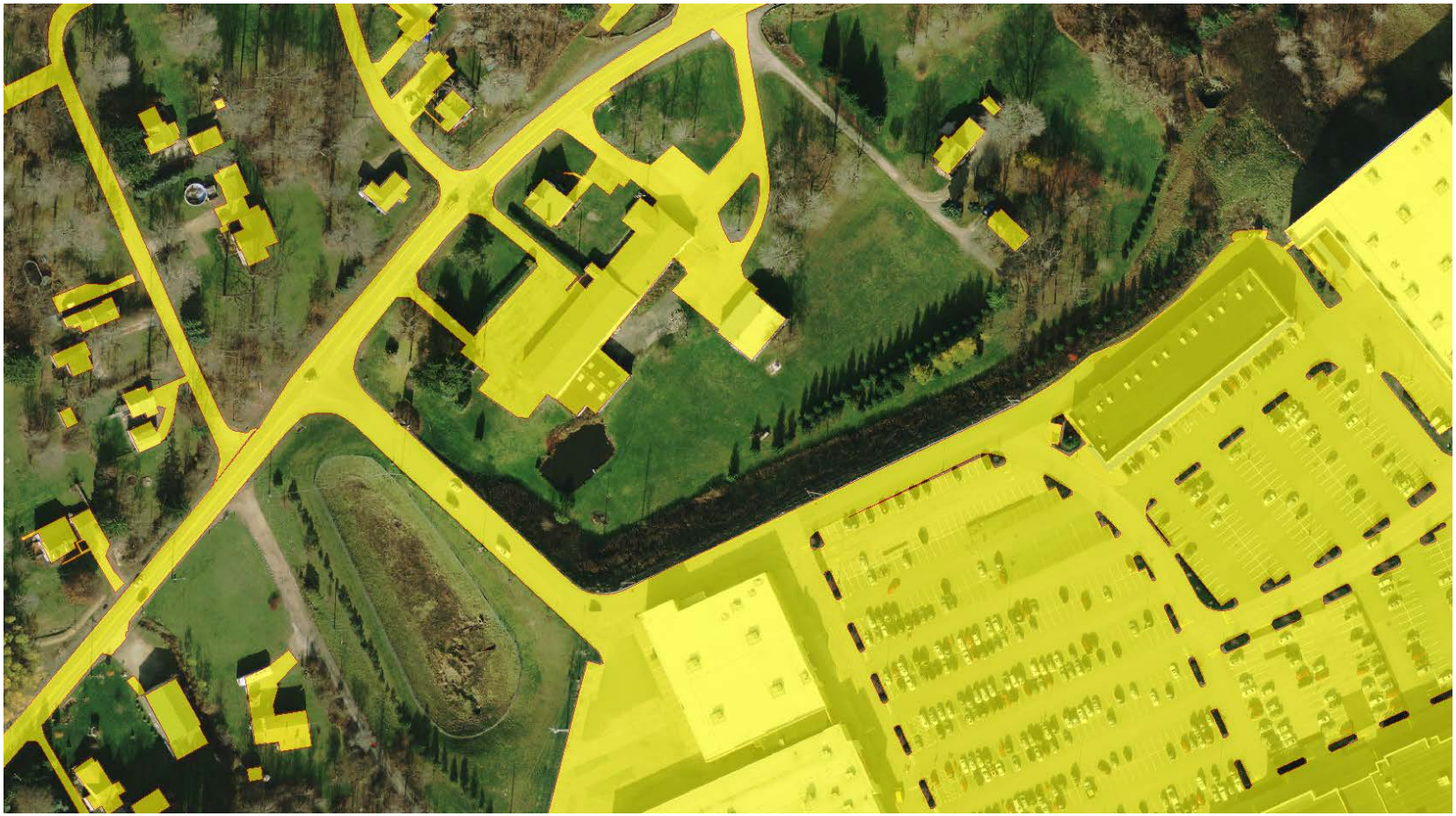
LiDAR allows for the delineation of impervious surfaces obscured by foliage (tree canopy), areas of shadow (around buildings) and buildings/structures (elevation and intensity).

Creating Impervious Cover Data (LiDAR Pattern/Intensity)

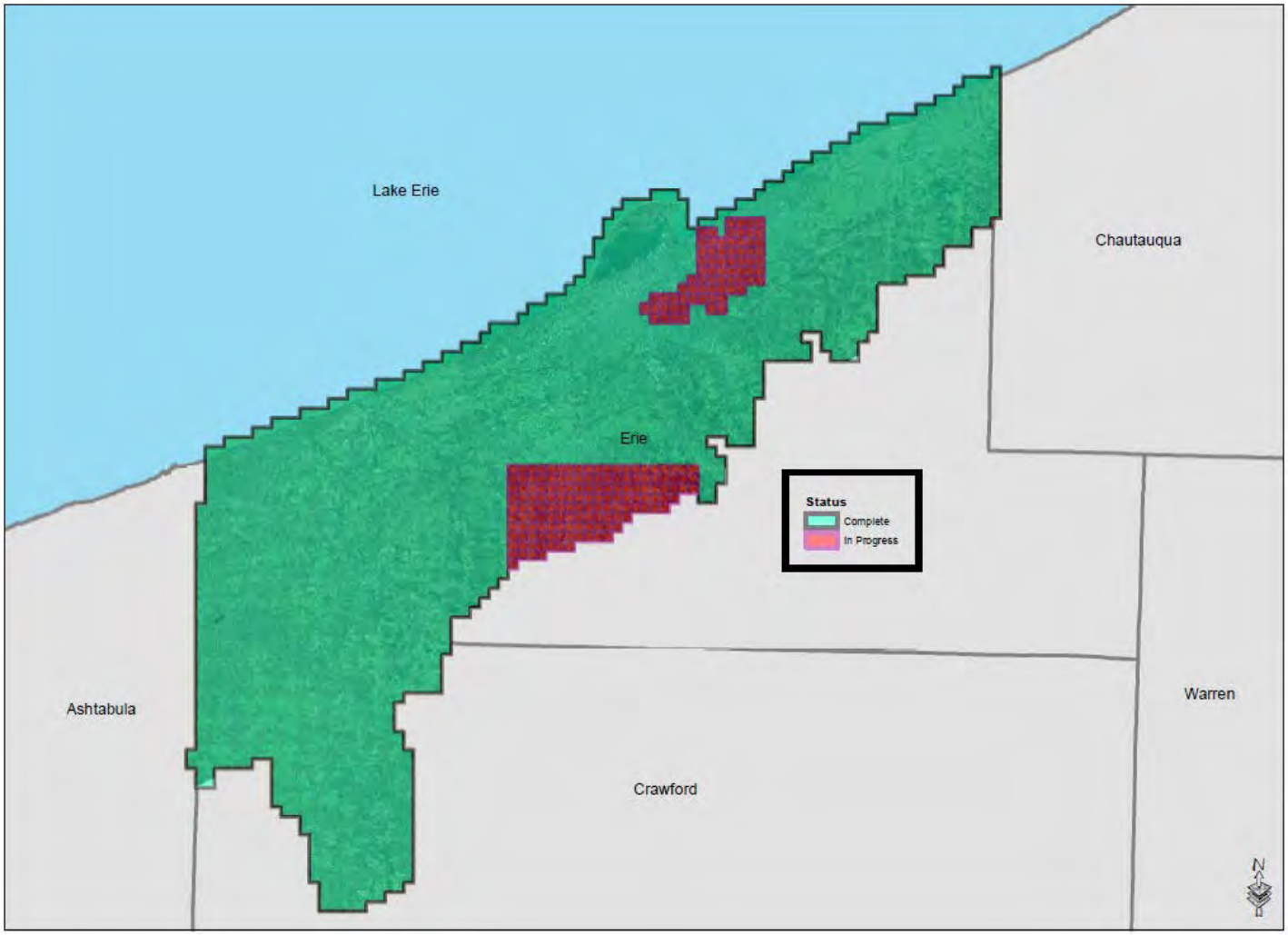
QUESTIONS?????

Creating Impervious Cover Data
Priority Area – Walnut Creek Sub-Basin

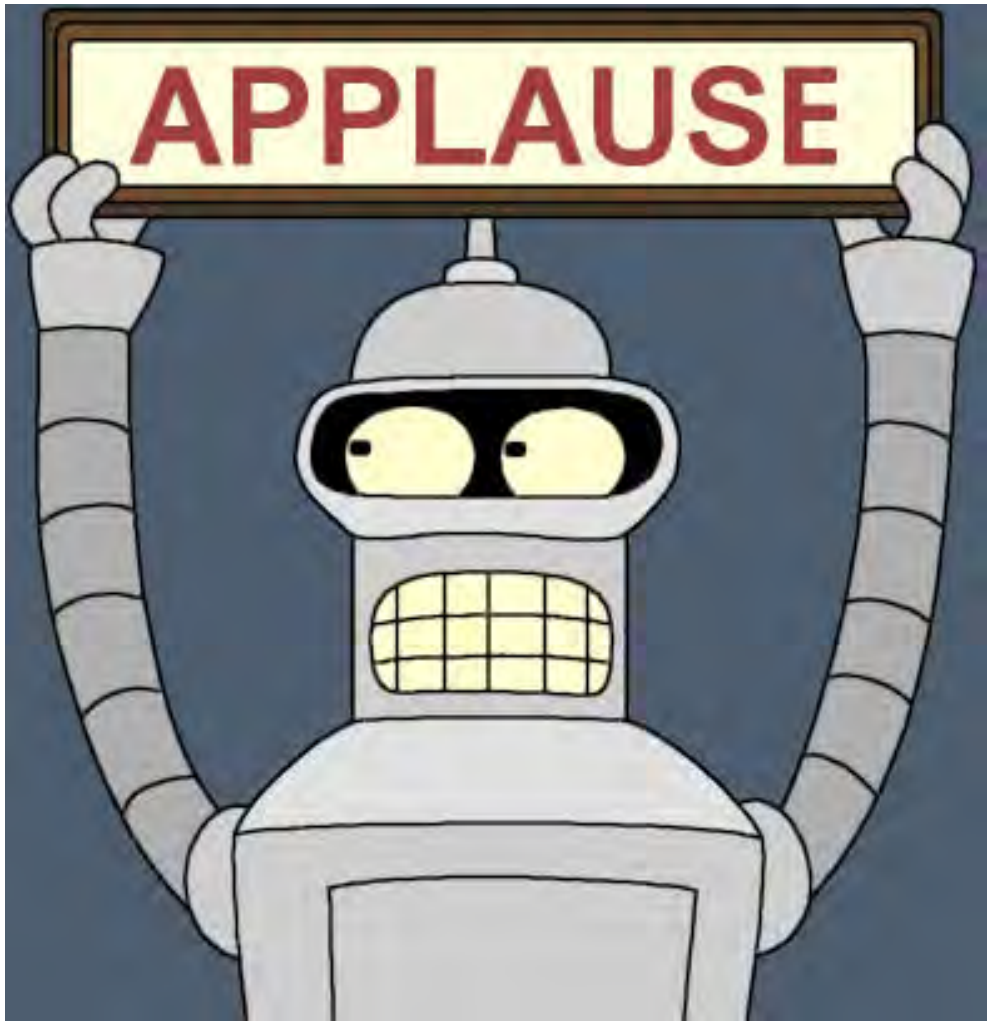
Creating Impervious Cover Data
Priority Area – Walnut Creek Sub-Basin



Creating Impervious Cover Data Project Status



QUESTIONS?????



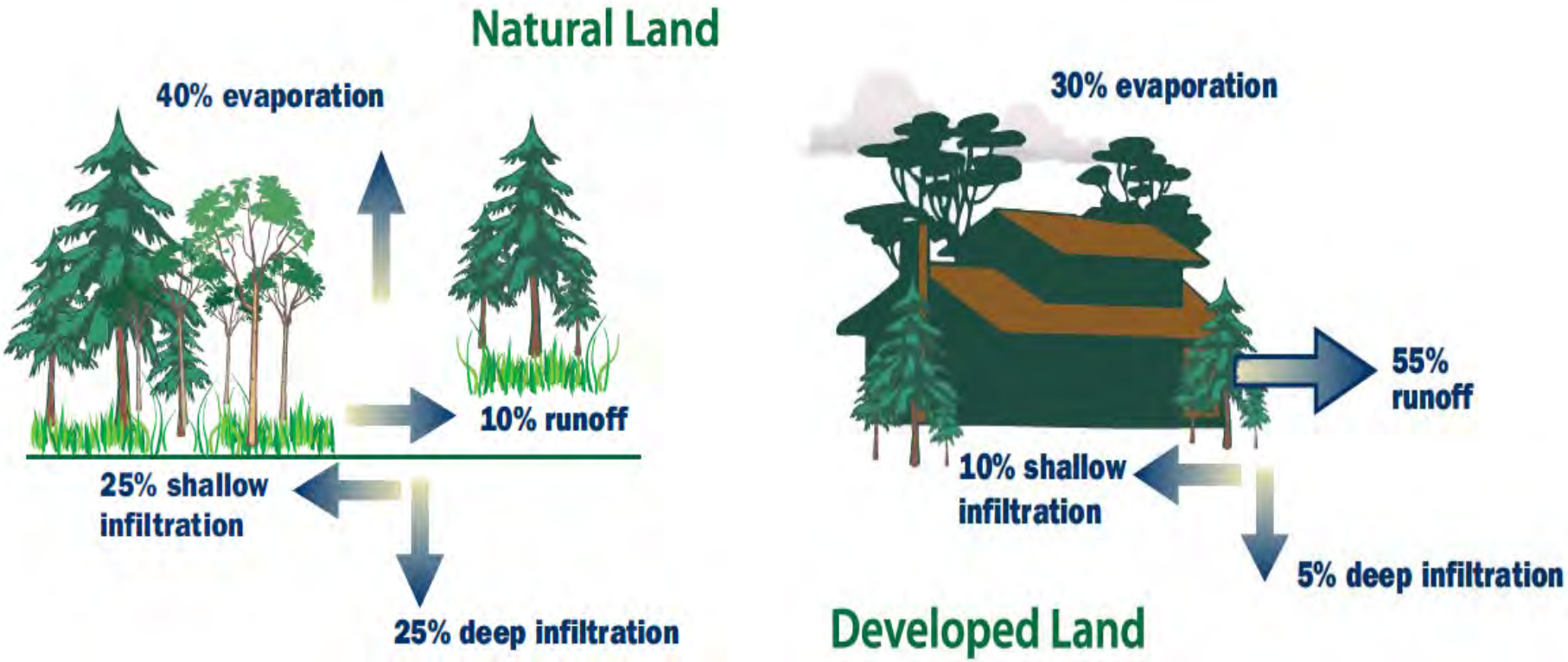
Stormwater Management Program Development & Funding

Brian L. Merritt, AMEC Environment & Infrastructure

Overview

- Stormwater Challenges
- Stormwater “Utilities” in PA
- Stormwater as a “Business”
- Funding Options
- Lessons Learned
- The Keys to Success
- Is it Right for You?

What is stormwater?



A Paradigm Shift in Stormwater Management

Past:

- Stormwater is a nuisance – flood control through combined systems
- Transportation safety – ditches, ponds and road drainage
- Separate - don't overload the WWTP
- Protect my property – upstream stormwater quantity controls (BMPs)

Now:

MS4 compliance

- TMDLs; *quantity as a pollutant*
- Tracking and Reporting

LID approaches; emphasis on *source controls*

Climate changes; new flood maps; hazard mitigation

The Master Plan for a Low Impact Development Demonstration Project at the EPA Headquarters

No Respect!

Complaints that stormwater managers don't have the same "clout" as the wastewater/streets operations

- Easier to cut budgets/services

  > No powerful advocate or influential constituency

  > No repercussions (yet!)

- Due to the history, stormwater services are dispersed across operations

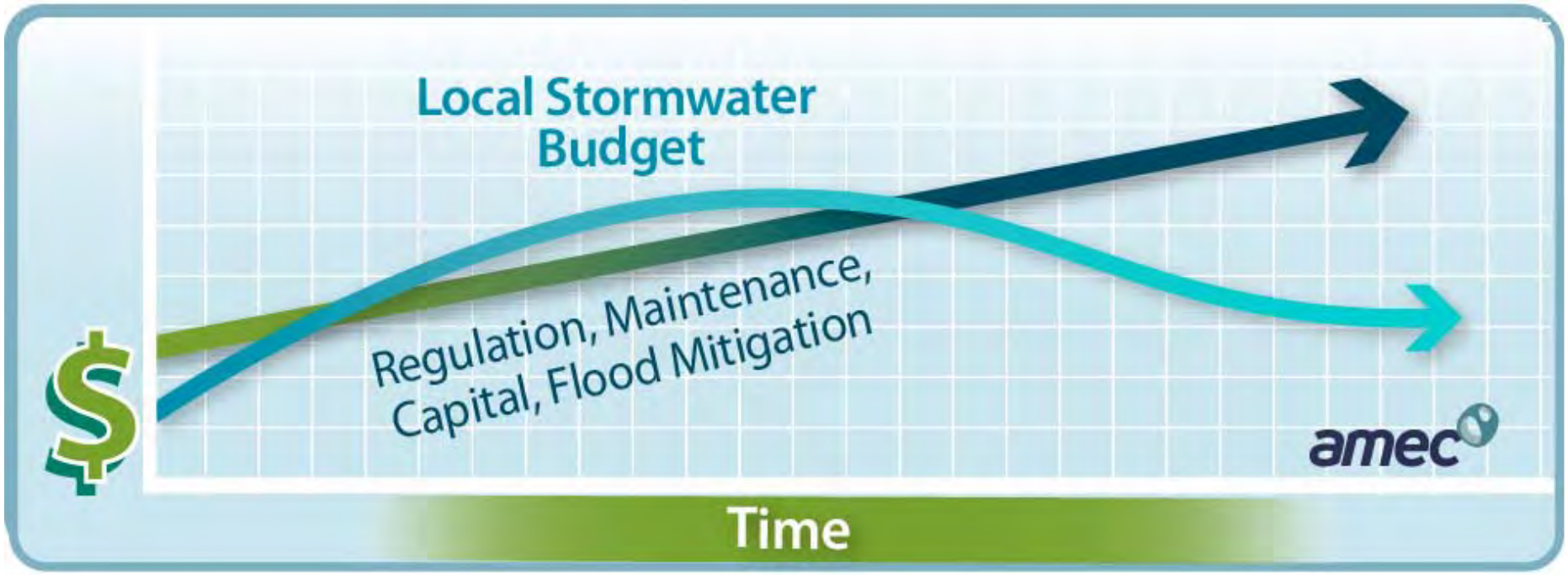
  Streets, planning, drainage, engineering, code compliance, wastewater, office of sustainability…

- Often funded from "other" pots of money

Stormwater Management Challenges - A Perfect Storm

- Aging infrastructure
- New regulations focusing on water quality
- More intense and frequent storm events
- Higher expectations from the public
- Desire for more transparency
- Fewer resources available
- No dedicated funding

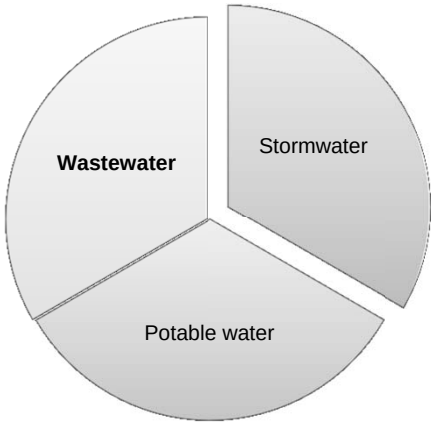
The Premise



Is this true of your community?

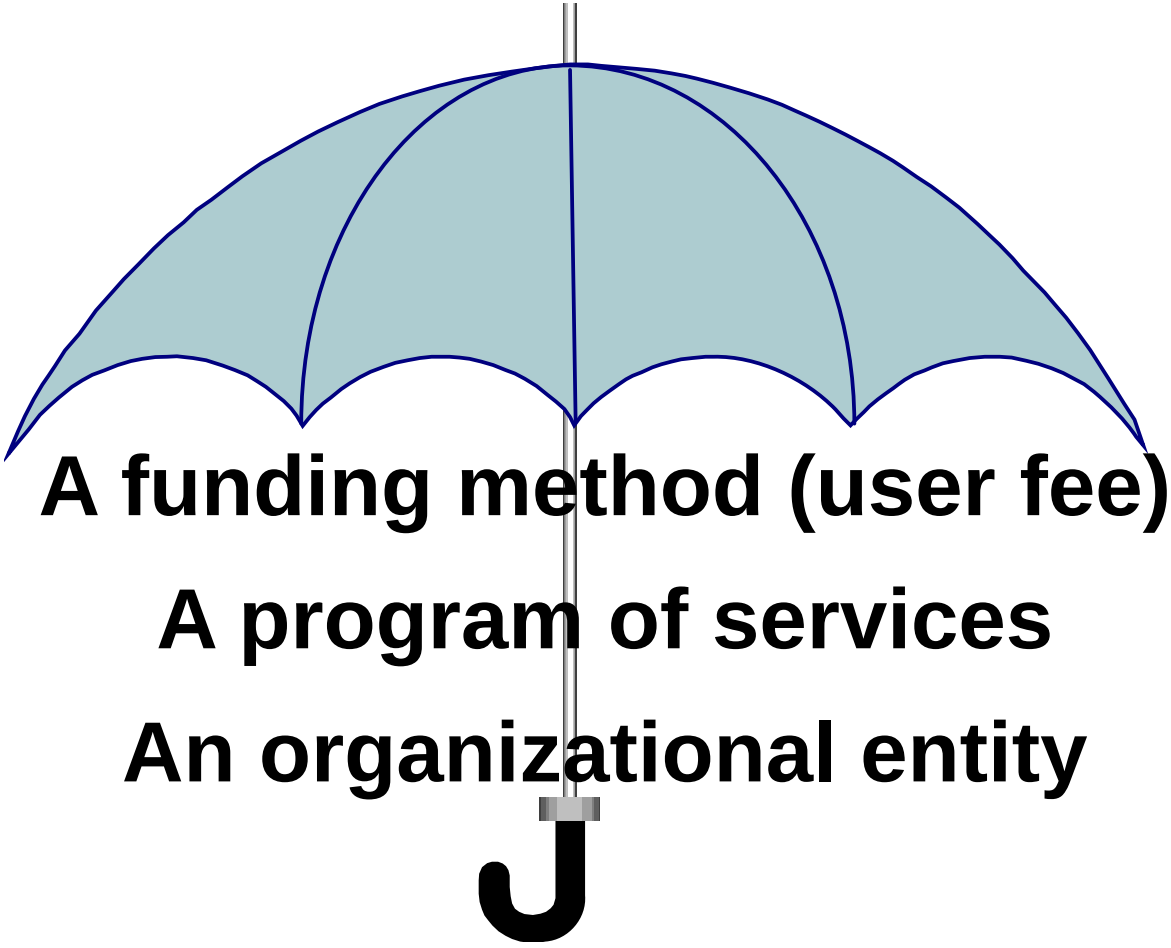
Is there a compelling case or reason to change?

How do we elevate stormwater?



- **Learn from wastewater circa 1980**
  - New regulations forced investment
  - Stakeholders demanded accountability
  - Environmental lawsuits led to consent decrees
  - Result: New management structures (authorities or regional commissions with new charters)
    - *Defined public services provided*
    - *Established dedicated, sustainable funding sources*
    - *Performed public outreach and education*

What is a stormwater utility?



A funding method (user fee)

A program of services

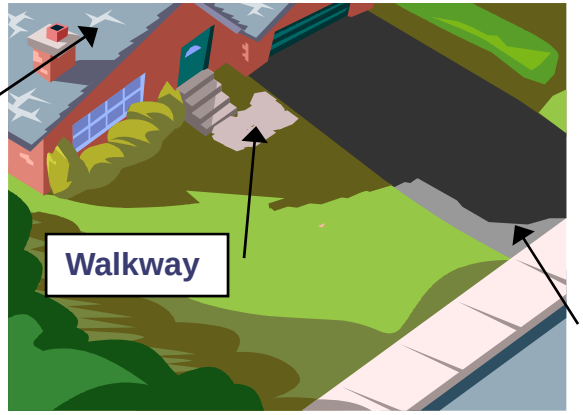
An organizational entity

Otherwise known as a Stormwater User Fee or Authority

Which one depends on <u>your</u> community

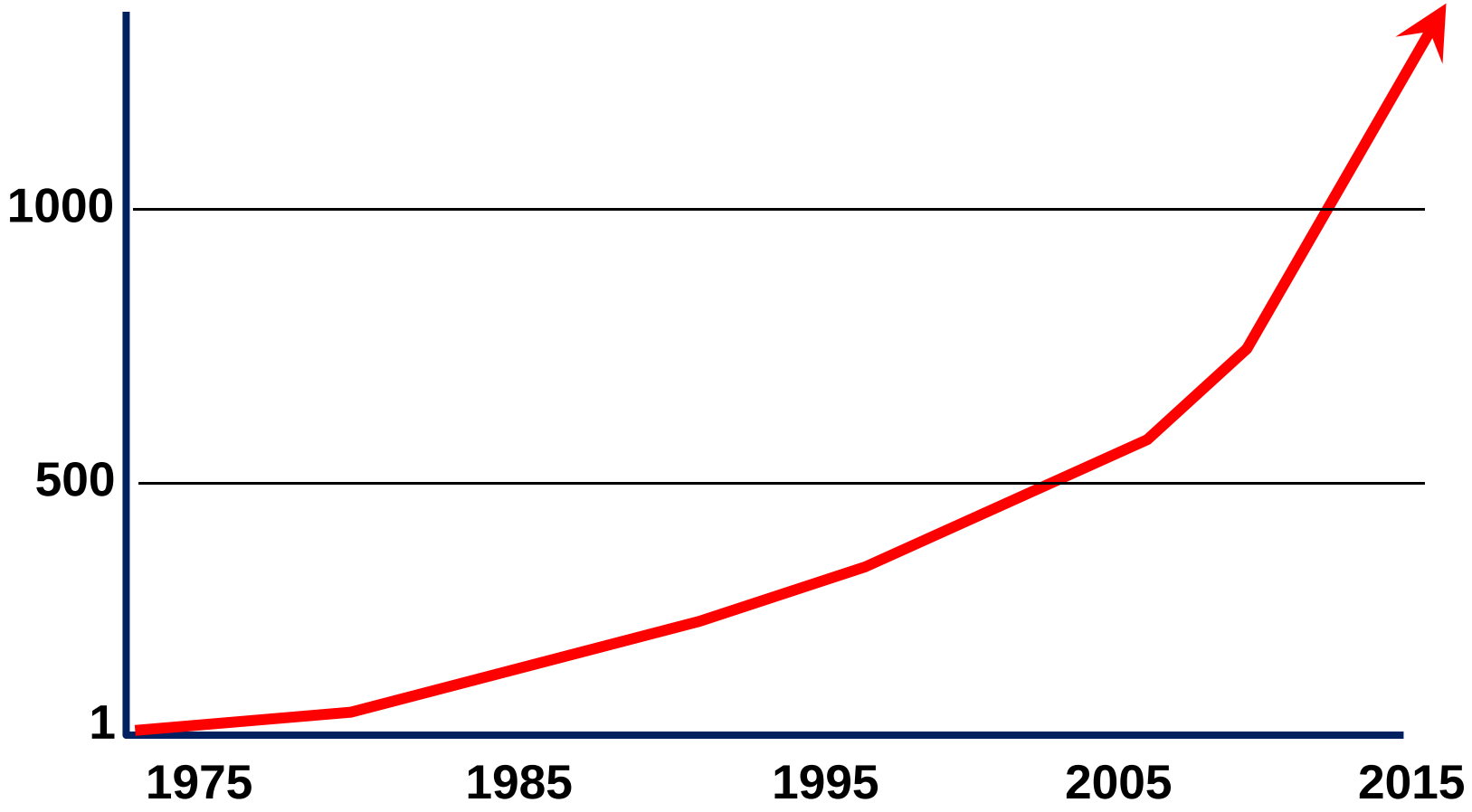
Stormwater Utility Concept

Urbanized surfaces produce stormwater runoff that must be managed to protect us and our environment.



The amount of stormwater runoff produced is related to the amount and density of developed areas with impervious surfaces.

Growth of Stormwater Utilities/User-Fee Financing in the US

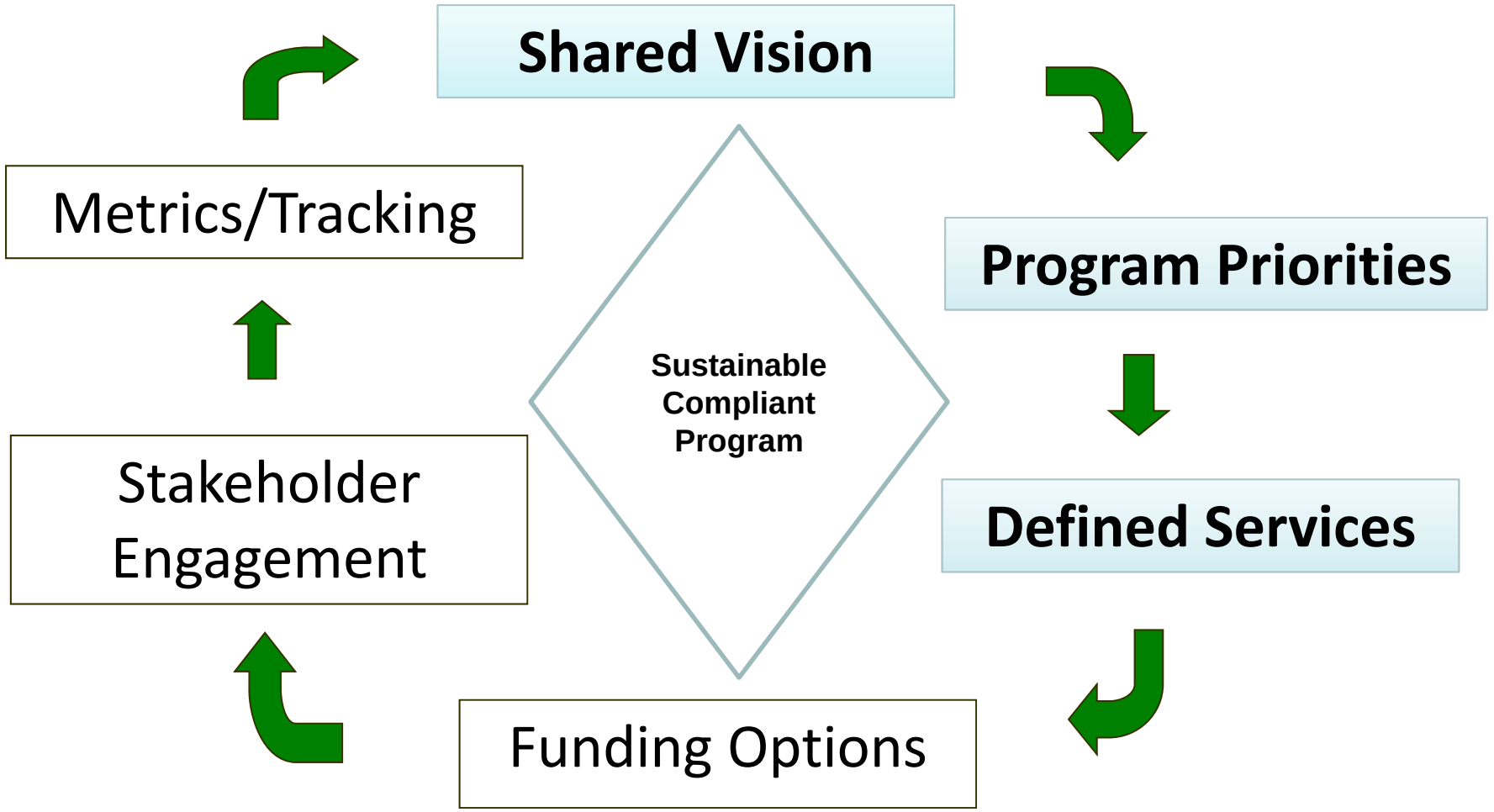


Pennsylvania Examples

How do we get there?

Municipal Stormwater Funding Key Components

Use a Business Plan Approach for Stormwater



What are your Stormwater Challenges?

Flooding Related Challenges

What are your Stormwater Challenges?

Maintenance Related Challenges

Regulatory Needs

NPDES????
Act 167????
MS4????
MCM????
IDD&E????
TMDL????
Chapter 102????

Identifying the Problem: Typical Gaps Analysis

Existing	Desired
Minimal capital program – **Millions ($$) in backlog**	**Funded capital program** (stable funding source) that reduces backlog in a reasonable timeframe
Reactive maintenance – no asset management plan	**Proactive**, **prioritized, scheduled**, effective, maintenance program
Incomplete inventory – of system condition, BMPs, outfalls	**Complete inventory and inspection schedule** for all applicable assets
Planning – Limited studies focused only on water quantity issues	**Comprehensive master planning** - Setting priorities with cost-effective solutions (including water quality issues)
Outdated equipment/technology	**Up-to-date** hardware, software, and field equipment
Public Education limited to water quality issues (NPDES)	Effective education/outreach on **all aspects of stormwater issues**

Radnor Program Plan - Average Annual Costs

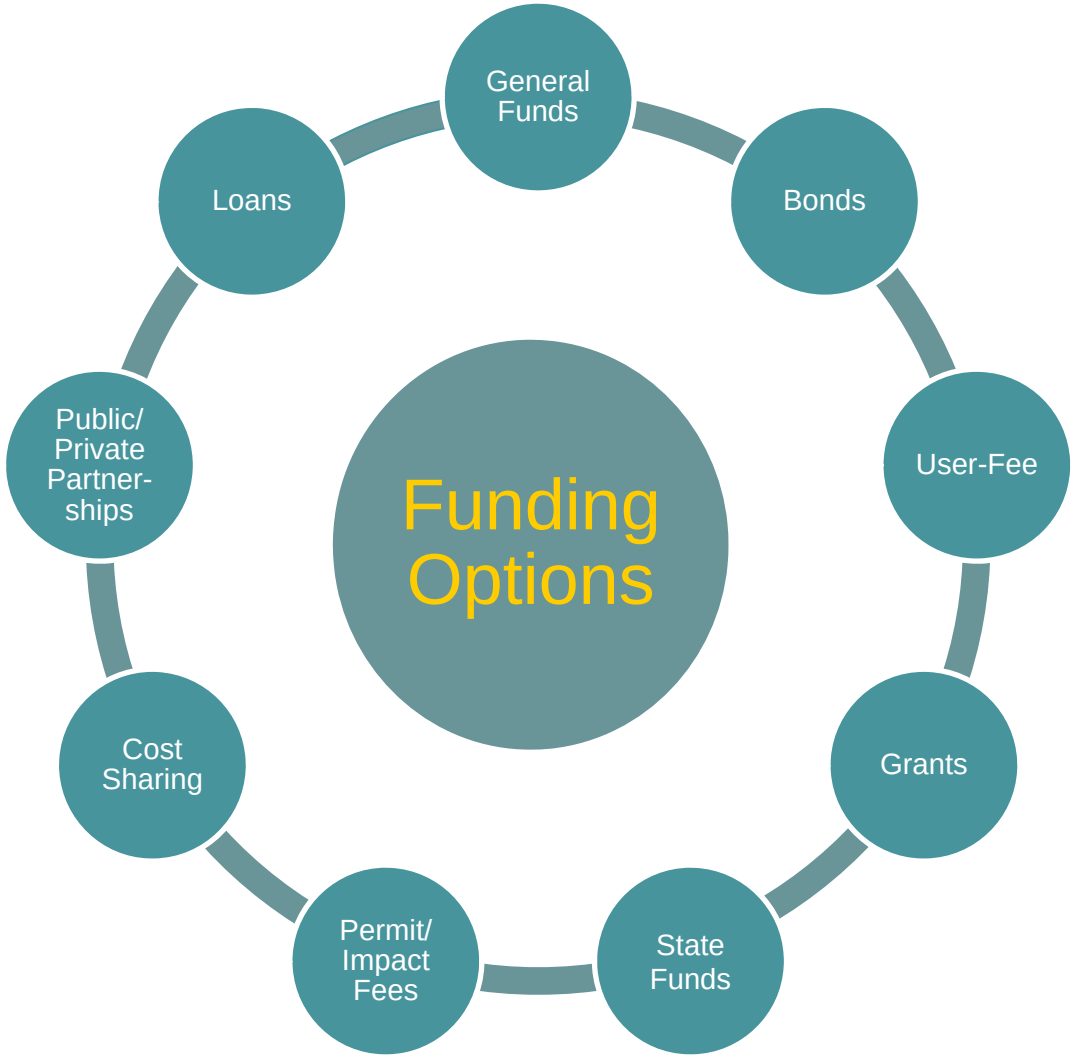
COST CENTER	CURRENT 2013 SNAPSHOT	ENHANCED AVERAGE YEAR	TOTAL PROGRAM AVERAGE ANNUAL
CAPITAL IMPROVEMENTS	$0	$567,325	$567,325
OPERATIONS & MAINTENANCE[1]	$930,711	$254,000	$1,184,711
ENGINEERING, ENFORCEMENT &REGULATORY COMPLIANCE	$134,807	$33,600	$168,407
EMERGENCY PREPAREDNESS AND RESPONSE[2]	$0	$0	$0
PROGRAM MANAGEMENT[3]	$45,519	$117,200	$162,719
TOTAL ANNUAL COST	**$1,111,037**	**$972,125**	**$2,083,162**

[1]Current Operation & Maintenance includes minor system clearing, street sweeping, leaf collection and composting, vehicle maintenance, pre-storm activities

[2]No budgeted amount – handled via operating reserve if a fee is enacted

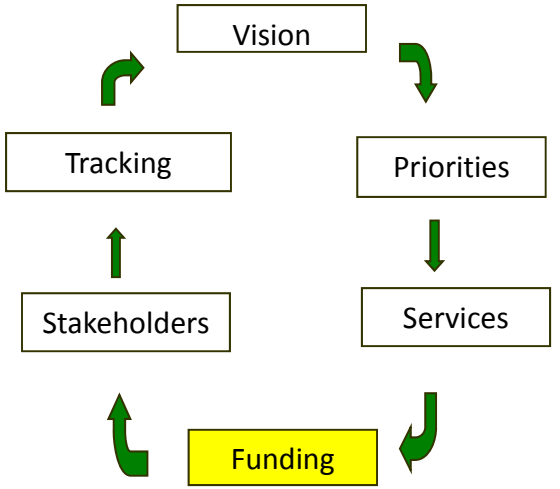
[3]Expanded costs would cover increased construction management, asset management and mapping, support tools, aerial imagery, rate structure updates, fee support and billing

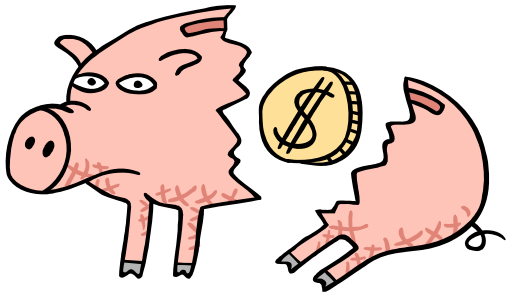
Variety of Funding Options



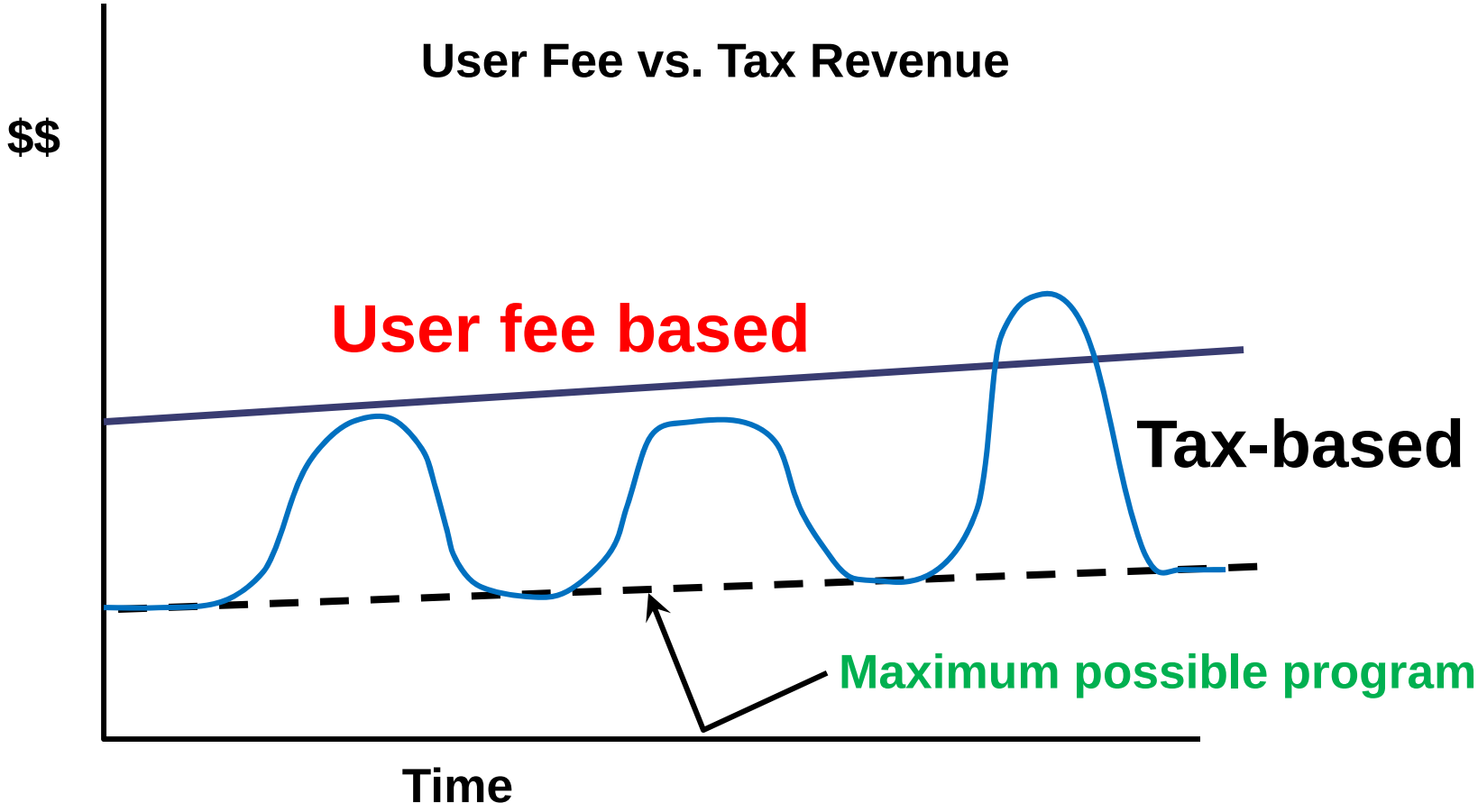
Developing a Business Plan – Funding Options

- **Evaluate and maximize existing resources**
  - Plan review fees, inspection fees, tapping fees, environmental impacts fees, etc. - Are they covering actual costs?
- **Determine funds needed by function to target potential sources**
  - Bond sales for capital needs
  - Cost share with neighbors; partner when possible
  - State and Federal grants and loans – stream restoration, green infrastructure, public education
- **Is there a compelling reason to seek new revenue sources?**
  - What is the cost of the “do nothing” option?





Sustainable, Dedicated Funding



How are costs distributed?

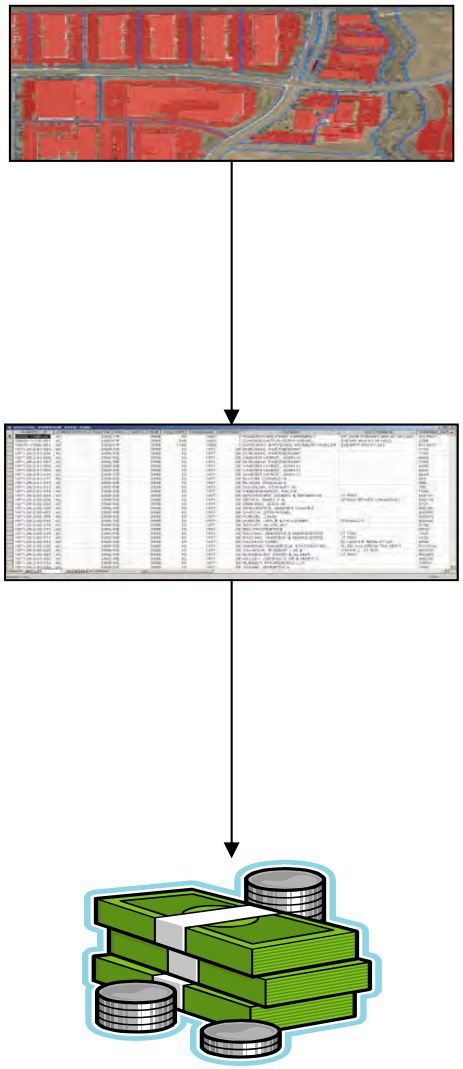
- Typically fees are based on amount of impervious area not on the assessed value of the property
- Like water and wastewater, everyone pays (including tax-exempt properties)
- Because residences often have less impervious cover, they typically pay less than large commercial lots



Rate Structure Options

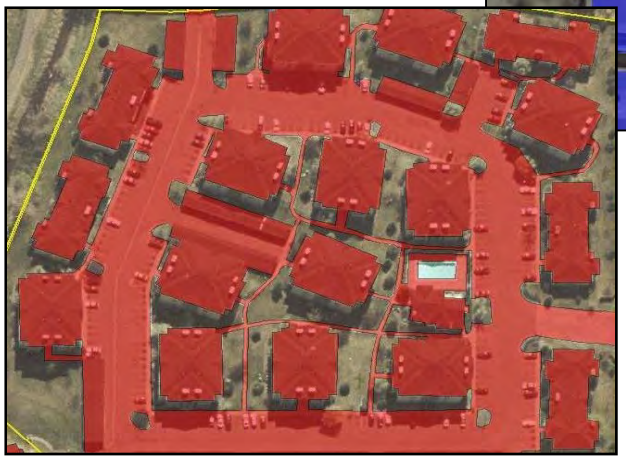
Communities adopting a stormwater fee typically use one of four rate structure methodologies:

- Impervious area
- Impervious area and gross area
- Impervious area and percentage of imperviousness
- Gross property area and intensity of development



Fee Options: Impervious Area

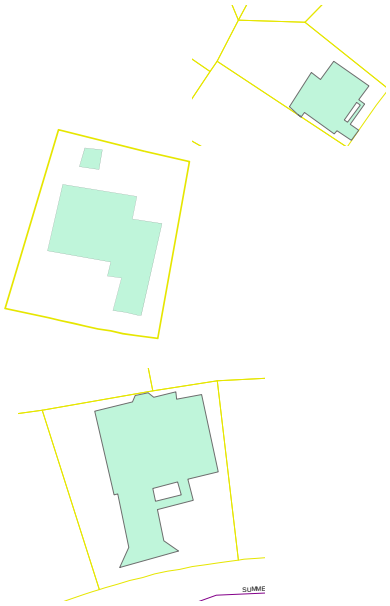
- Advantages of Measuring Impervious Area
- Defining “Impervious”
- Important Considerations
  - Accuracy Requirements & Other Criteria
  - Imagery Availability
  - Time Constraints
  - Automated vs. Manual Extraction



Flat Residential Fee Structure

Flat rate for single family residential detached.

Any Single Family Detached House
One Billing Unit

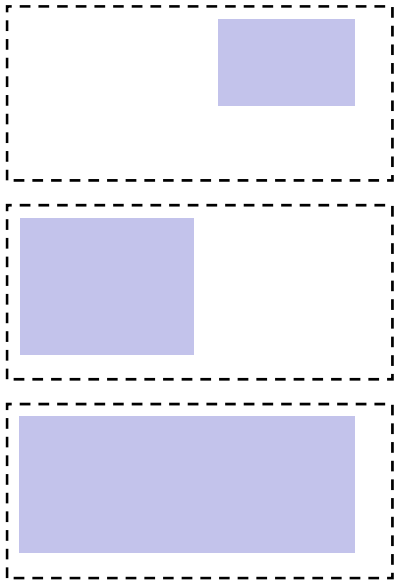


ERU

1 ERU

1 ERU

Properties Other Than SFD Lots
Based on Average Impervious Area square footage in a Billing Unit



1 ERU

2 ERUs

3 ERUs

Example Rate Structure – Radnor Township

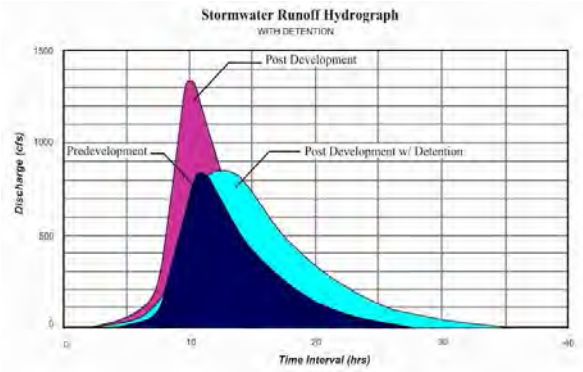
- Initial Approach – Flat Rate (aka ERU) for Single Family Residential
  - Feedback: Doesn't work for Radnor, how about a tiered structure?
- Adopted Rate Structure – Single Family Residential

Tier	Lot Square Footage	# of Billing Units
1	0 to 7,000 SF	1
2	7,000 to 20,000 SF	2
3	20,000 to 43,560 SF	3
4	Greater Than 43,560 SF	4

  - All "Other Developed Properties" - 1 Billing Unit per 1,500 SF
  - 25% of total billing units are from tax exempt properties

Credits

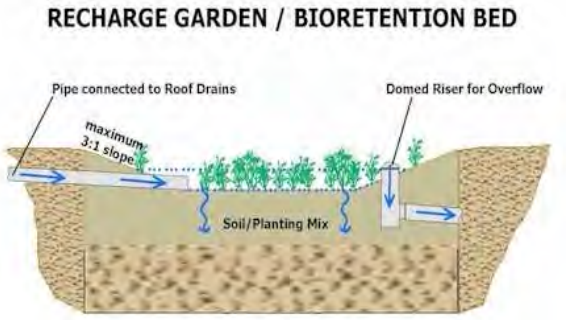
- Credits recognize that certain on-site activities support the goals of the stormwater program
- Based upon cost avoidance to the stormwater program of services



Peak & Volume Control

Education

Self Maintenance



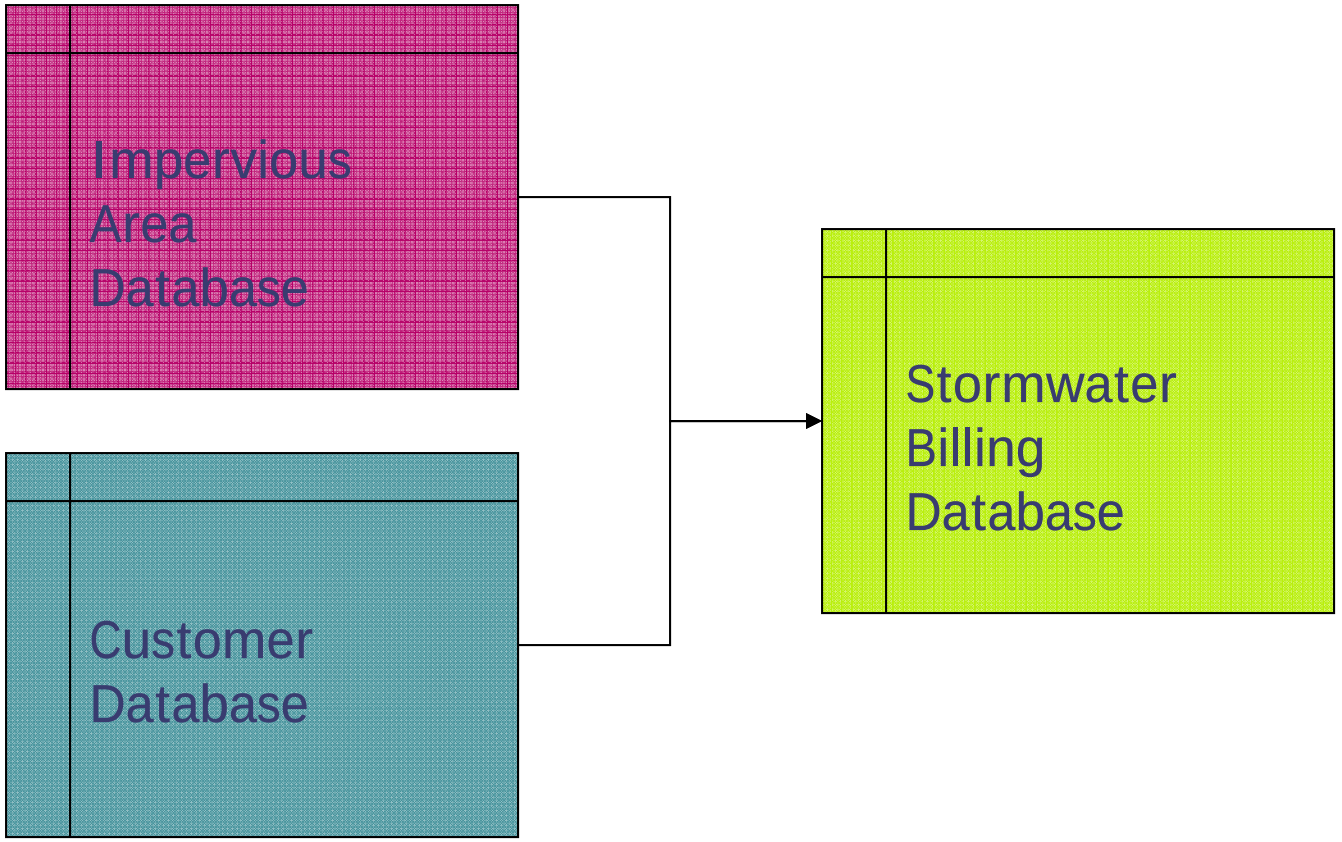
Water Quality

Credit programs impact the rate – shifts costs to other ratepayers

Fee Calculation

- Program Costs + Financial Adjustments = Revenue Needs
- Divide Total Revenue needs by # of Billing Units = Rate
- Future years need to be adjusted for inflation and account for potential growth
- Generally look to keep rates relatively steady over several years

Billing Database: Basic Components



Billing Options: Invoice Method

- Invoice Format
  - Standalone stormwater invoice
  - Property tax statement line-item
  - Existing utility bill
- Invoice Production
  - Existing process
  - In-house
  - Vendor
  - Hybrid

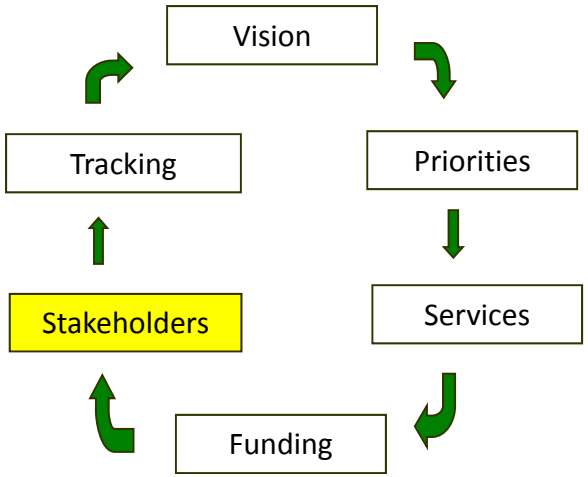
- Considerations
  - Billing frequency
  - Bill visibility
  - Payment enforcement
  - Ability to invoice/collect
  - Accounting system
  - Costs

Utility Implementation is a Change in Funding Policy

Success or failure is all in the process*….*

- Help your elected officials make the **"compelling case."**
- The **program** must drive the rate.
- The technical basis for **assessing costs** must be sound and defensible.
- **Rates** must be equitable and **bills** easy to understand.

Developing a Business Plan – Stakeholder Buy-in (Internal and External)



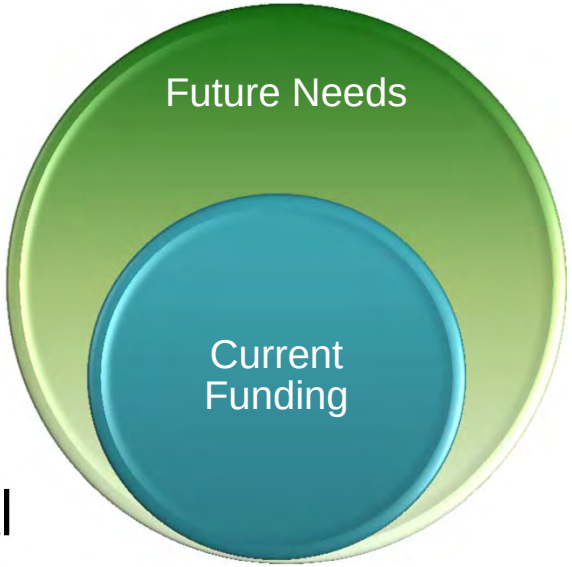
- Bring me in early, I'm a **partner**; bring me in late and I'm a **critic!**
- **Internal** and **External** stakeholder engagement –
  - When:
    - Establishing goals and priorities
    - Balancing the program services
    - Identifying the best funding strategy
    - Reporting on progress
- Engagement supports the **political challenges** of raising stormwater management to a higher level

Pennsylvania Examples

Community	Population	Original Stormwater Program Budget	Estimated Annual from Revenue from User fee	User Fee Rate ($/SF Impervious Area)
Mt Lebanon (Allegheny Co.)	33,137	$590K	$1.5M	$96/ 2,400 SF
Meadville (Crawford Co.)	13,616	$370K	$873K	$90/ 2,660 SF
Radnor (Delaware Co.)	31,531	$1.1M	$1.0M	$29/ 1,500 SF

Lessons Learned

- Follow an effective, proven process
- Build your business plan - the cost and resultant impacts need to be clearly communicated
- Involve the community early and in the right ways – Build Public Support
- Make your program and user fee easy to understand
- Prepare your elected officials for potential negative feedback – give them solutions
- Think of the long-term benefits and recognize the effort will be worth the gain



Is it right for you?

A Self-Assessment

✓ Why change funding policy? Do you have a **compelling case**?

✓ Do you have a committed **leader** to work through the process?

✓ Have you set a realistic schedule to allow time to **build support**?

Contact Information

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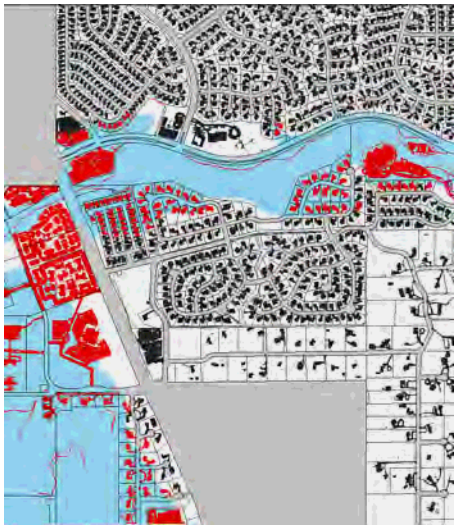
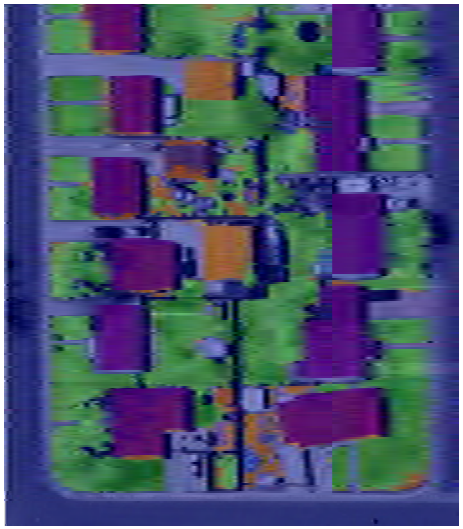
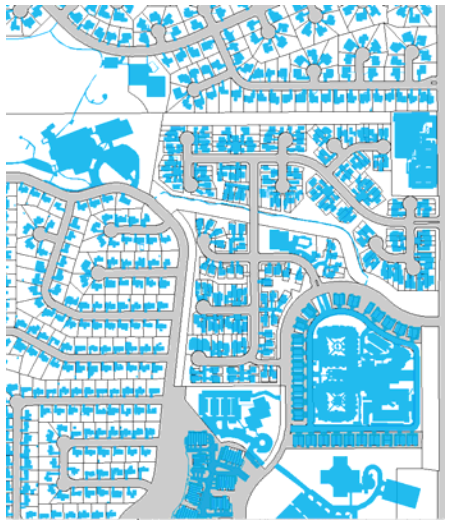






Where is funding being directed?

Program activities funded by the respective stormwater fees for first 5 years of expanded stormwater program

Community	Capital Improvements	Operations & Maintenance	Regulatory Compliance
Mt Lebanon (Allegheny Co.)	27%	66%	1%
Meadville (Crawford Co.)	26%	49%	7%
Radnor (Delaware Co.)	56%	26%	3%

City of Meadville
Stormwater Program and Funding Project

Andy Walker, City of Meadville

Stormwater Challenges

Stormwater in Meadville

- Over 100 years of stormwater management: structural system components reaching design life
- Commercial and industrial development in the floodplain
- Flood protection, major system management and high hazard dam are costly to maintain
- City's stormwater needs continue to grow – increasing regulatory mandates require increased efforts to meet federal and state law. We're the only MS4 municipality in Crawford County.

Stormwater Challenges

Stormwater in Meadville –Infrastructure Needs

Stormwater service is funded via the general fund and competes with other City needs

- The City is responsible for operation and maintenance of:

Rainbow Lake Dam	Shadybrook Park BMP
Mill Run Flood Control Project	Major System Culverts
30+ Miles of Stormwater Pipe	1200+ Catch Basins/Inlets
Roadside swales	New Public SW Infrastructure

- Meadville must comply with Municipal Separate Storm Sewer System (MS4) Permit requirements
- Reduced staffing and limited funding has deferred maintenance
- Some infrastructure is rapidly deteriorating requiring emergency repair e.g. Dick Run Culvert, Neason Run Culvert,

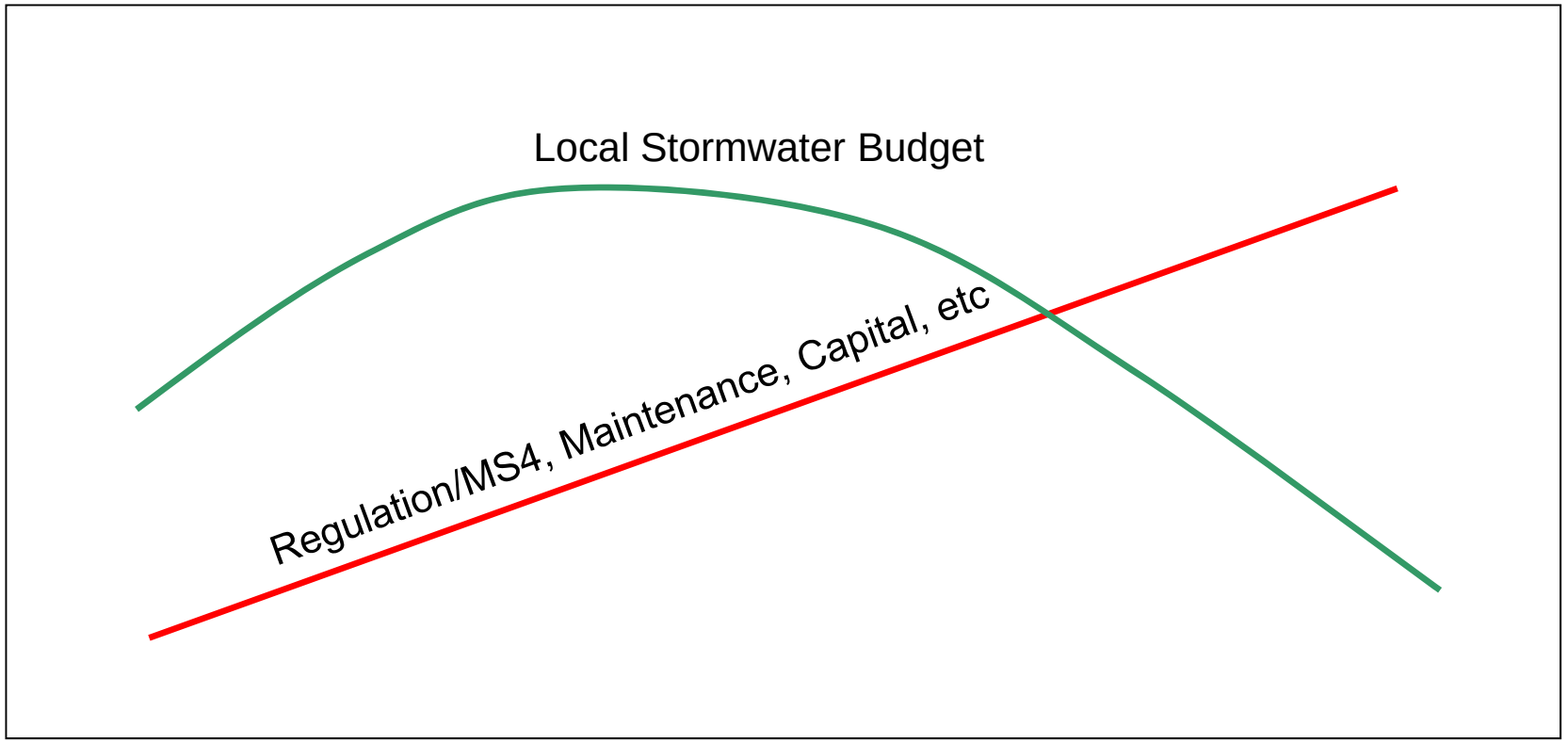
Stormwater Challenges- Rainbow Lake Dam

Stormwater Challenges – Summary

- Aging Infrastructure
- Maintenance Needs
- Flood Safety and Mitigation
- Regulatory Requirements
- Water Quality Protection

Even without new challenges, the complexity and cost of stormwater management in Meadville will continue to increase.

The Reality



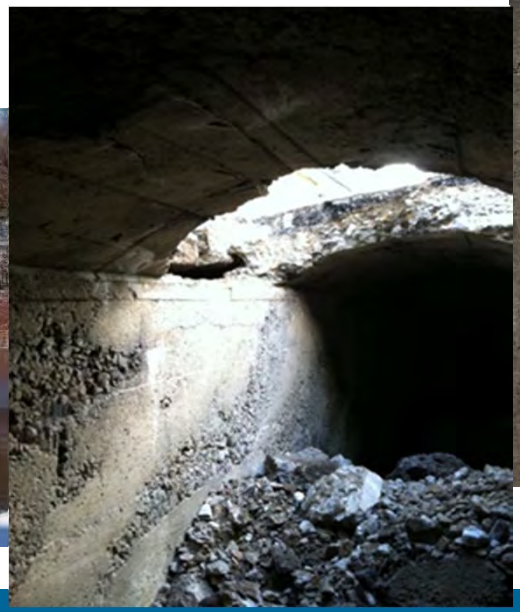
Stormwater costs continue to increase - competing with other City needs

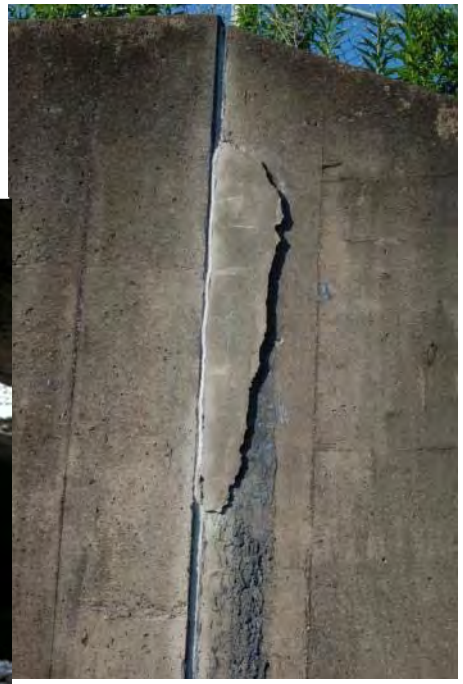
Meadville Financial Challenges – Pre User Fee

- FY2012 No Capital Improvement budget for stormwater projects.
- The City has approximately $500-$750M in stormwater related assets “in the ground” - the recommended industry standard is to invest 1% annually in infrastructure maintenance ($5M+ annually).
- Spending fluctuates significantly on a year to year basis – driven mostly by emergency repairs and maintenance. All funding currently comes from the General Fund.
- Taxes have only been raised ~3 times in the past 20 years and more than 40% of Meadville properties are tax-exempt.
- The budget for stormwater related efforts competes with other City needs:
  - Current stormwater spending estimated at $366K per year (includes personnel, materials, vehicles and supplies); and
  - Mainly personnel time > 65% of current costs go to emergency response/repairs.
- Over the past several years personnel levels have been reduced and maintenance has been deferred to meet budget constraints.

Stormwater in Meadville - Infrastructure

- Majority of stormwater infrastructure is located underground
- In Meadville
  - Under streets and roads
  - Under lawns
  - And in some instances under buildings!
- Out of Sight / Out of Mind
  - Until It Isn't!





June 27, 2013 Storm

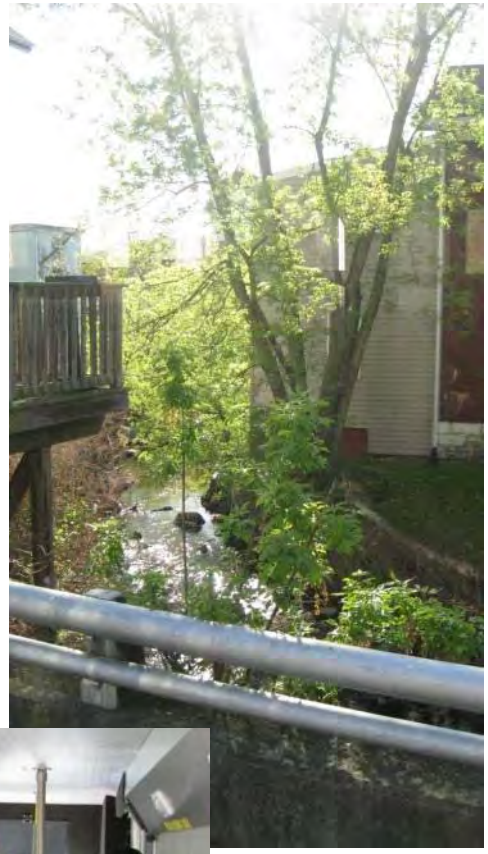
Stormwater Funding and Implementation Study

Scope of Study

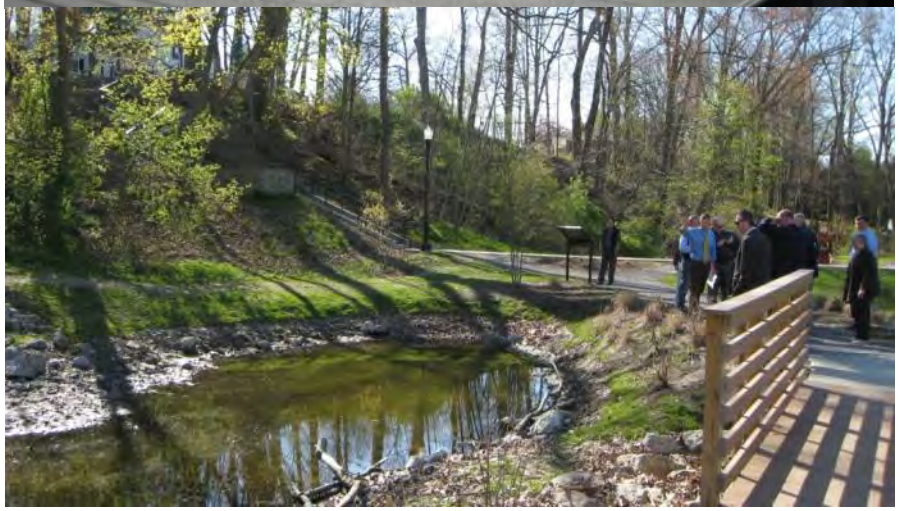
- Develop a better understanding of the City's existing and future stormwater management challenges
- Recommend appropriate Levels of Service (LOS) and the revenue required to meet the identified needs
- Examine and discuss the feasibility (technically and practically) of funding stormwater services through a service fee in Meadville
- Obtain feedback and input from the community on key policy decisions
- Provide a decision-making tool for the Mayor and City Council

Stakeholder Advisory Committee

- **Represented diverse voices of the community**
  - Allegheny College (largest tax exempt), French Creek Valley Conservancy (watershed group), Meadville Medical Center (large tax exempt), Wesbury Retirement Community (largest taxpayer), CHAPS (human services non-profit), Crawford County Planning Office, Local Ministerium Representative, Local Realtor, Local Engineer, Small Commercial Guys, Large Industrial Guys
- **Provided feedback on proposed policies and recommendations:**
  - Program Needs and Proposed Levels of Service
  - Data Analysis and Rate Methodology Options
  - Rate Structure and Cost Projections
- **Goal : Reach consensus on a recommendation to Council**



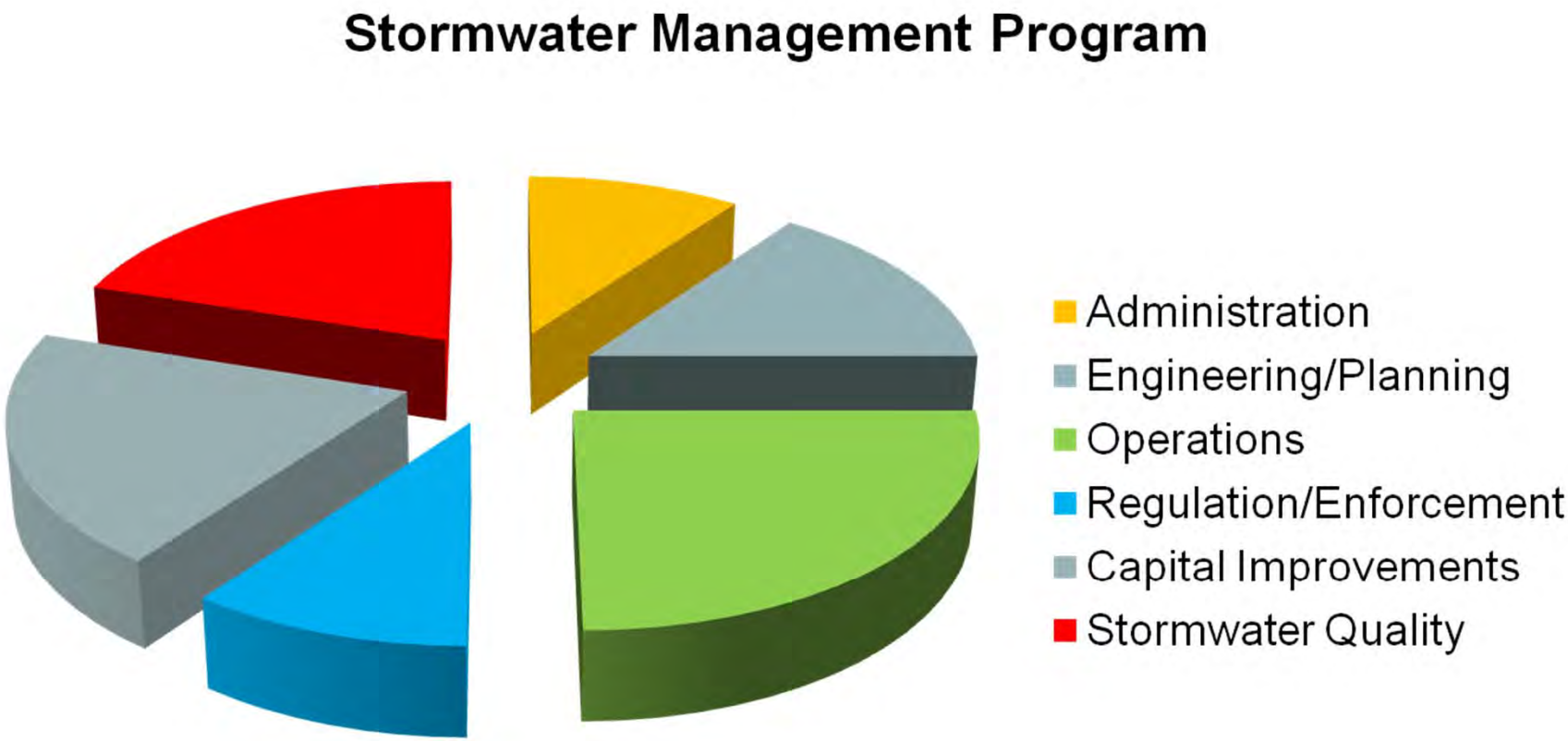
Field Tour Highlights



Current Services and Preliminary Program Gaps

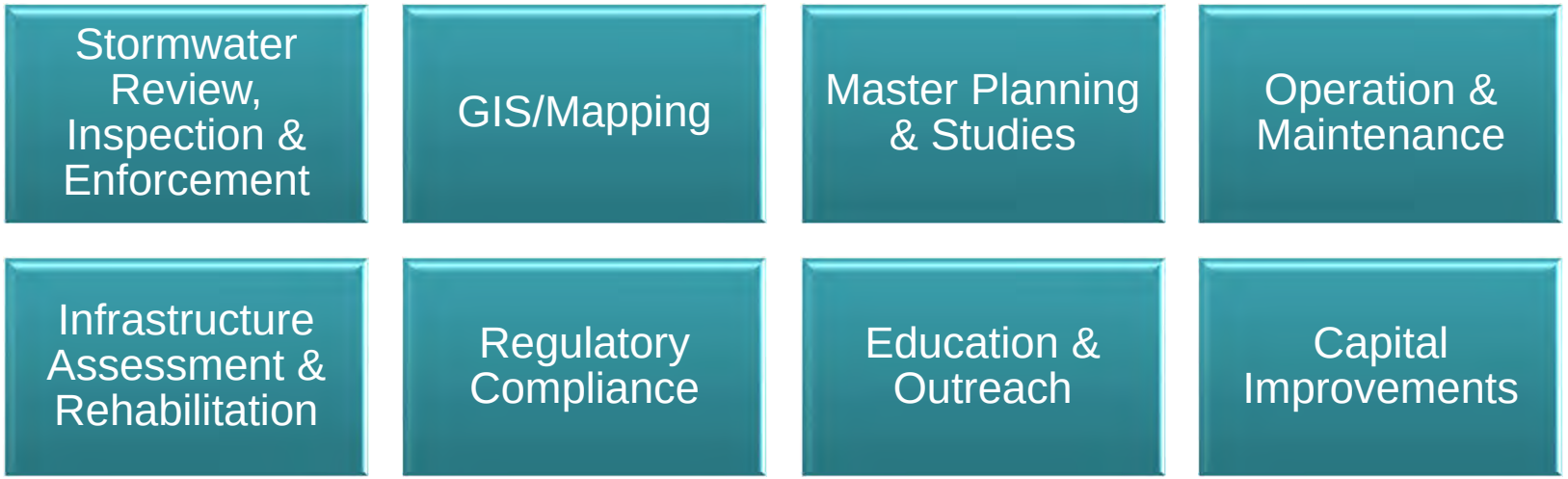
- Represents a snapshot of the City's program.
- Based on a review of existing documents and staff interviews.
- Needs driven by:
  - Aging system and need for funding for both maintenance and capital improvements
  - Flooding Concerns and the need for mitigation
  - MS4 permit/regulatory compliance
  - Health and Safety issues

Identifying the True Costs of Stormwater Management



Current Stormwater Program – Cost Center Approach

- There are several Departments involved in stormwater: Management & Development, Zoning Administration, Public Works, Finance, City Solicitor
- Using cost centers allows for thinking outside of organizational lines in preparation for the next question: “What should the City be doing?”

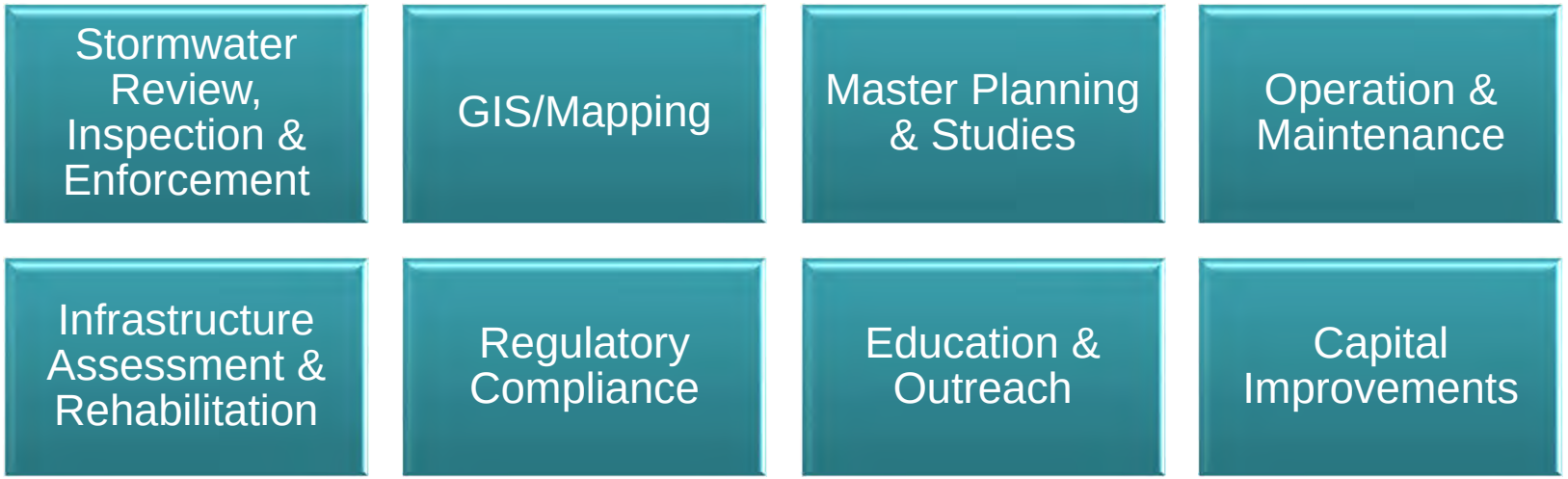


Preliminary Program Goals

- Maintain system's existing capacity and integrity through proactive inspections and maintenance
- Ensure compliance with regulatory requirements
- Protection of French Creek
- Flood protection and mitigation
- Public health and safety
- Funding for stormwater priorities

Level of Service (LOS) Recommendations

- Compared Existing program vs. Moderate and Significant LOS Increases
- City Staff recommended further evaluation of Moderate LOS for all Cost Centers
- SAC input helped to further develop LOS recommendation and prioritize funding



LOS Example - Preliminary Gaps

Infrastructure Assessment & Rehabilitation

- Need for an asset management program
- Complete a City-wide conditions assessment
- Planned and systematic infrastructure replacement

Defining the appropriate Level of Service

Example – Infrastructure Assessment & Replacement

LOS	Program Element	Estimated Cost
Existing	Pipe Replacement – approximately 400 LF/yr	$20,000
"Moderate"	Existing Conditions assessment	$225,000
	Televideo System - 5 Miles/yr	
	Replace 1,000 LF Storm Sewer/yr	
	Repair/Replace- 20 Structures/yr	
"Aggressive"	Televideo System -10 Miles/yr	$403,000
	Replace 2000 LF Storm Sewer/yr	
	Replace 40 structures/yr	

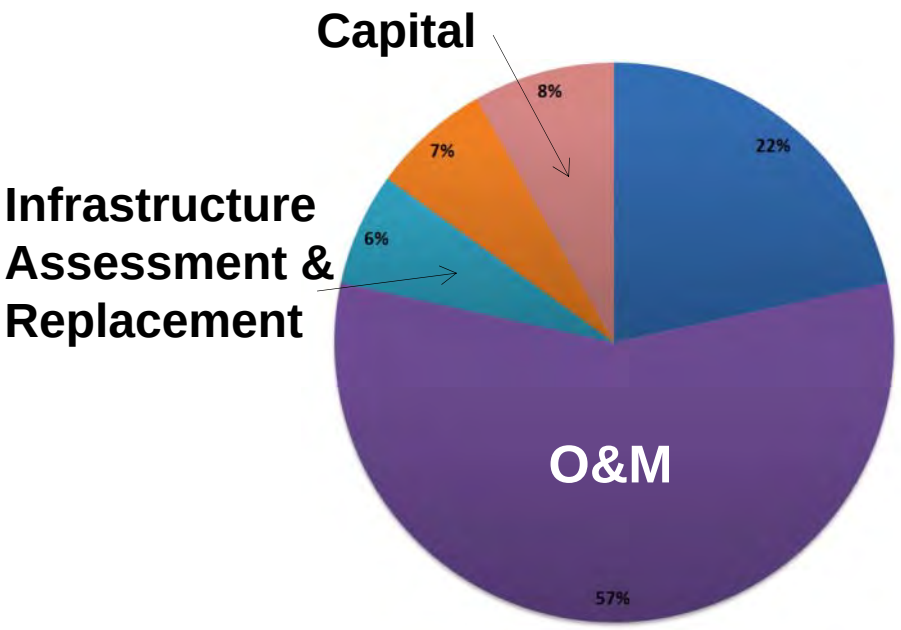
Stormwater Funding Priorities

Combined Priorities and Ranking

Cost Category	Combined Priority	Rank
8 - Capital Improvements	3	1
5 - Infrastructure Assessment & Rehabilitation	5	2
4 - Operations & Maintenance	6	3
3 - Master Planning & Studies	9	4
2 - GIS/Mapping	10	5
7 - Education & Outreach	11	6
1- Stormwater Review, Inspection, Administration, & Enforcement	13	7
6 - Regulatory Compliance	13	7

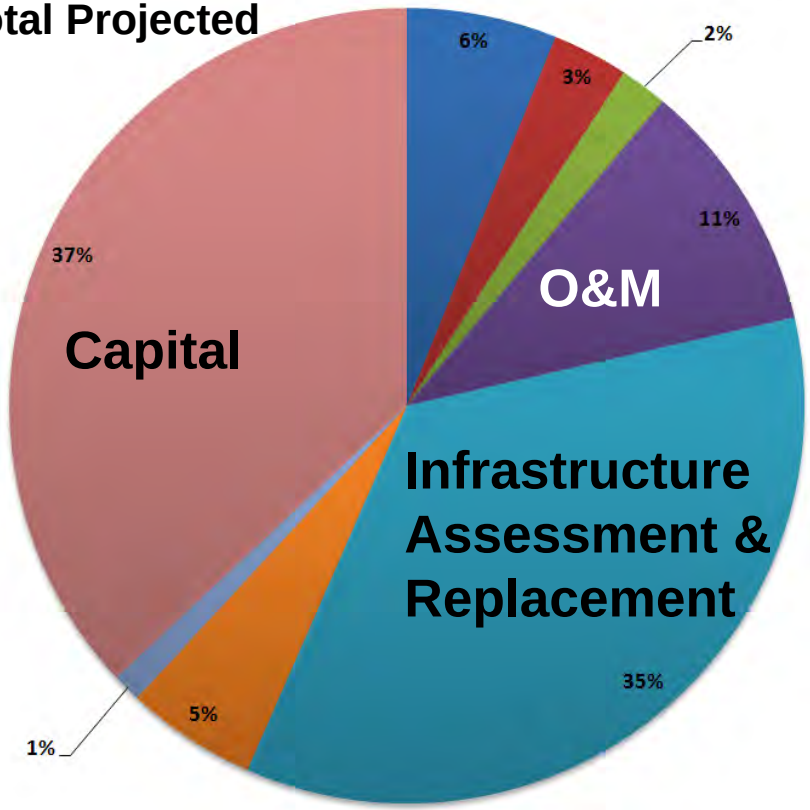
Preferred 5-yr Program Overview

Existing



5-Year Total = $1.53M

Total Projected



5-Year Total = $4.31M

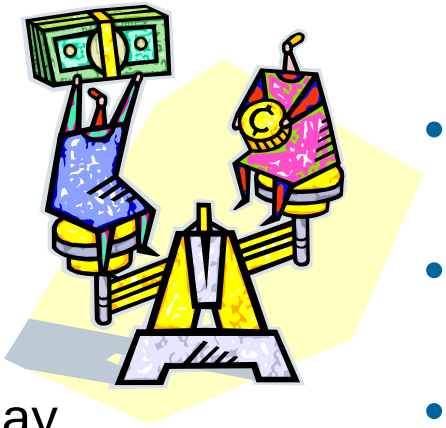
1. Stormwater Review, Inspection, Administration & Enforcement
2. GIS/Mapping
3. Master Planning & Studies
4. Operations and Maintenance
5. Infrastructure Assessment & Rehabilitation
6. Regulatory Compliance (MS4 & Floodplain Management)
7. Education & Outreach
8. Capital Improvement Program

Now That We Have the Program Plan - How Do We Pay for It?

How to pay for it?
Evaluation Considerations

General Tax Fund

- Pros
  - No need to change process
  - Less media attention
- Cons
  - Inequitably Apportioned based on property value
  - Only “taxed” properties pay
  - Competition between programs/departments
  - Variable by year



Dedicated Service Fee

- Pros
  - Equitable – all developed properties contribute
  - Set based on the actual costs of services
  - Reviewed and adjusted annually
  - Stable
- Cons
  - Cost to implement a new system
  - Stakeholder acceptance

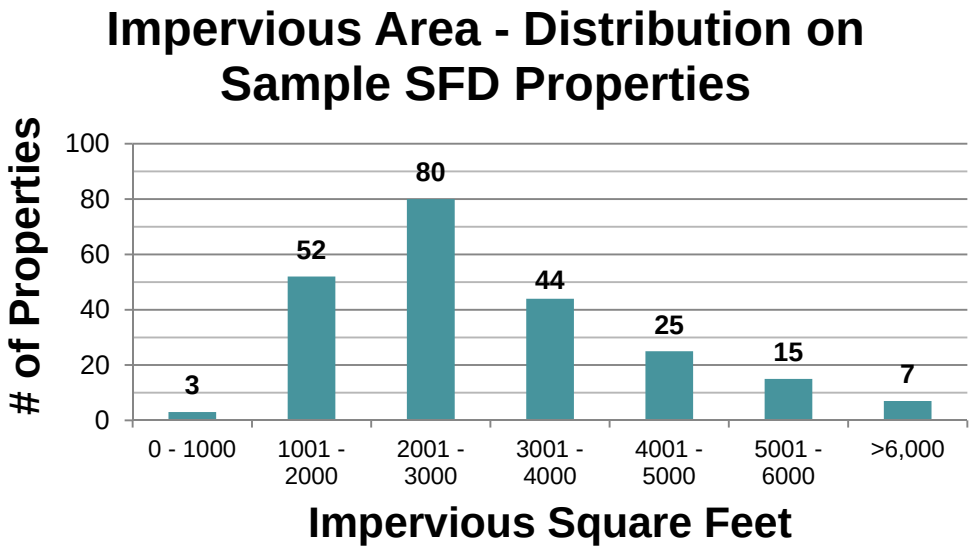
Impervious Area Definition

- Impervious Area Definition from 2011 City Stormwater Ordinance:

  "Impervious surface (impervious area)" means a surface that prevents the infiltration of water into the ground. Impervious surface (or areas) include, but is not limited to: roofs, additional indoor living spaces, patios, garages, storage sheds and similar structures, parking or driveway areas, and any new streets and sidewalks. Any surface areas proposed to initially be gravel or crushed stone shall be assumed to be impervious surfaces."

Meadville Rate Structure

All developed Single Family Detached (SFD) properties are billed a flat rate of one ERU (equal to 2,660 square feet of impervious surface) and all Non-SFD (NSFD) developed properties are billed for stormwater at the rate of one ERU per 2,660 square feet of impervious surface.



Meadville City Hall

Total Impervious Area = 56,408 sq ft

Estimated ERUs = 21 ERUs

Preferred Rate Strategies

- Preliminary recommendation is focused on 2 Options which could result in a range of rates between $75-90 per billing unit per year:
  - Option 1 - All cash; annually adjusted; program and rate reviewed after year 3
  - Option 2 - 50% Bond; annually adjusted; program and rate reviewed after year 3

	Adjusted Annual Rates Per Billing Unit				
Option	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. All Cash	$89.40	$89.40	$88.80	$120.00	$108.00
2. 50% Bonds	$75.00	$79.20	$82.20	$105.00	$100.80

	Adjusted Monthly Rates Per Billing Unit				
Option	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. All Cash	$7.45	$7.45	$7.40	$10.00	$9.00
2. 50% Bonds	$6.25	$6.60	$6.85	$8.75	$8.40

Financial Impact of New Stormwater Fee vs. Real Estate Tax Increase

- Winners & Losers – now based on impervious area
  - 231 Chestnut St (commercial, NSFD)
  - Assessed Value = $192,650
    - Proposed Fee: 2 ERUs (5,150 sf.) x $90/ERU = $180.00
    - Tax Increase : 3.05 mils x 192.65 = $587.58

Financial Impact of New Stormwater Fee vs. Real Estate Tax Increase

- Winners & Losers – now based on impervious area
  - Downtown Mall
  - Assessed Value = $343,250
    - Proposed Fee: 35 ERUs (92,523 sf.) x $90/ERU = $3,150
    - Tax Increase: 3.05 mils x 343.25 = $1,046.91

Stakeholder Advisory Committee
What We Heard

- General Consensus:
  - Program of services needs to be funded at or near recommended program plan level - "Don't Kick the Can Down the Road"
  - Keep services at a reasonable rate - concerned about the fee getting to high in the future
  - Use funding efficiently
  - Concern about erosion of "Non-profit" status though they agreed everyone needs to pay their share
  - Stormwater fee approach is reasonable way to raise necessary revenue - preferred over a tax increase
  - Consider fee in the context of all other costs to the community (e.g. taxes, utilities, service fees, etc) – consider relief to general fund
  - Additional public education and outreach is needed on stormwater
  - Timing of implementation is aggressive – doesn't allow for budgeting this year

Meadville – Process Overview

- Worked with City staff to identify Meadville's program needs and develop proposed approach for filling gaps
- Facilitated Stakeholder Advisory Committee Meetings for input on program and funding options
- Developed program and funding recommendations based on stakeholder input
- Presented program plan and recommendations to Top Potential Rate Payers as well as general public
- Convened a working group to help develop credit and appeals policies
- Reviewed project status and funding recommendations with Council along the way

Meadville - Results

- Results:
  - Annual stormwater budget will triple by the 3rd program year
  - Dedicated funding for stormwater activities
  - Supported by the Stakeholders, Staff, and Political Leaders
  - Understood by the public
- Current Progress:

1st Year of Program Plan	Current Status
Purchase a new street sweeper	Complete
Replace 500 feet of storm sewer	824 feet installed to date
Replace 15 structures	10 structures installed to date
Address Rainbow Lake Dam erosion	Complete
Replace curb	Over 800 feet replaced to date
Map and verify the system	Ongoing/Multi-year effort

Lessons Learned

- Stakeholder engagement is critical!
- Educate, educate, educate. If they stop to listen, you'll win them over
- Sometimes the media is our friend-use them
- Don't throw out a target rate, build the program first
- Stormwater infrastructure used to be "out of sight, out of mind"—now that people are paying for it, they pay attention!
- Steady dedicated funding = steady planning and budgeting
- Show results

Mapping & Verifying the System

Existing Maps

- Paper map from 1942
- Intermittently updated—gaps in data
- PDF maps from 1970s surveys

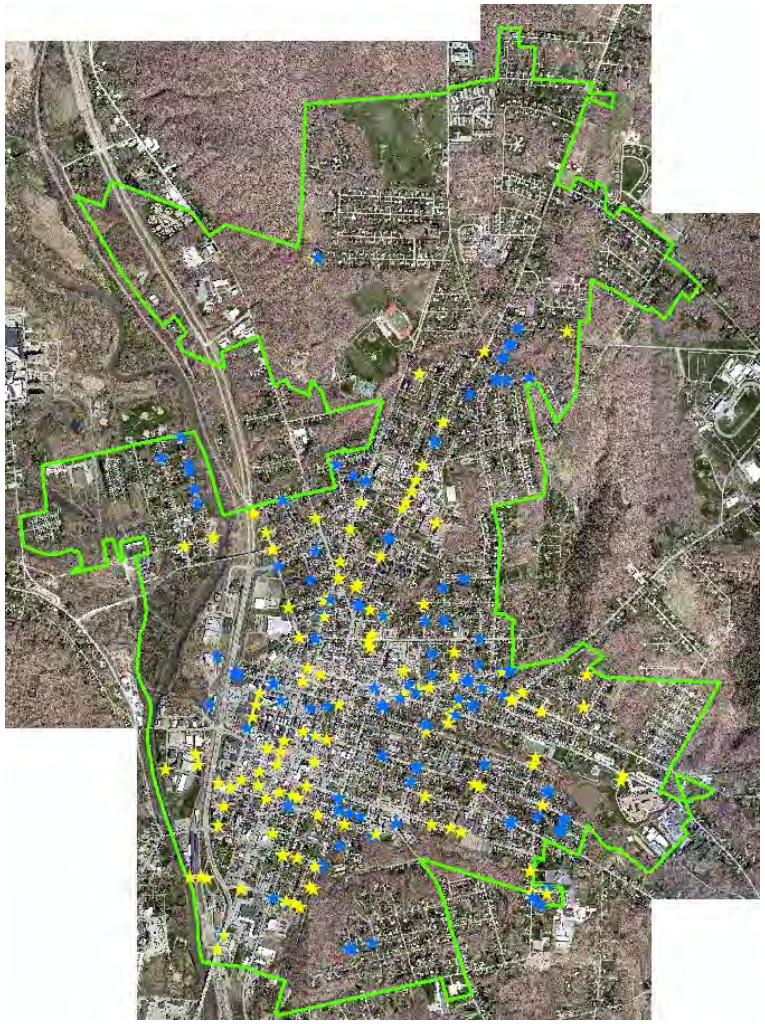
New GIS-Based Map

- Meet the requirements of MS4 compliance:
  - Illicit Discharge Detection and Elimination
  - System maintenance
  - BMP inspection

2012 Developments

- **March 2012-** Catch basins and manholes from existing maps spray painted
- **April 2012-** Aerial photos taken
- **Remainder of 2012-** Sewer Authority staff compared aerial images to existing (paper) maps

Field Verification

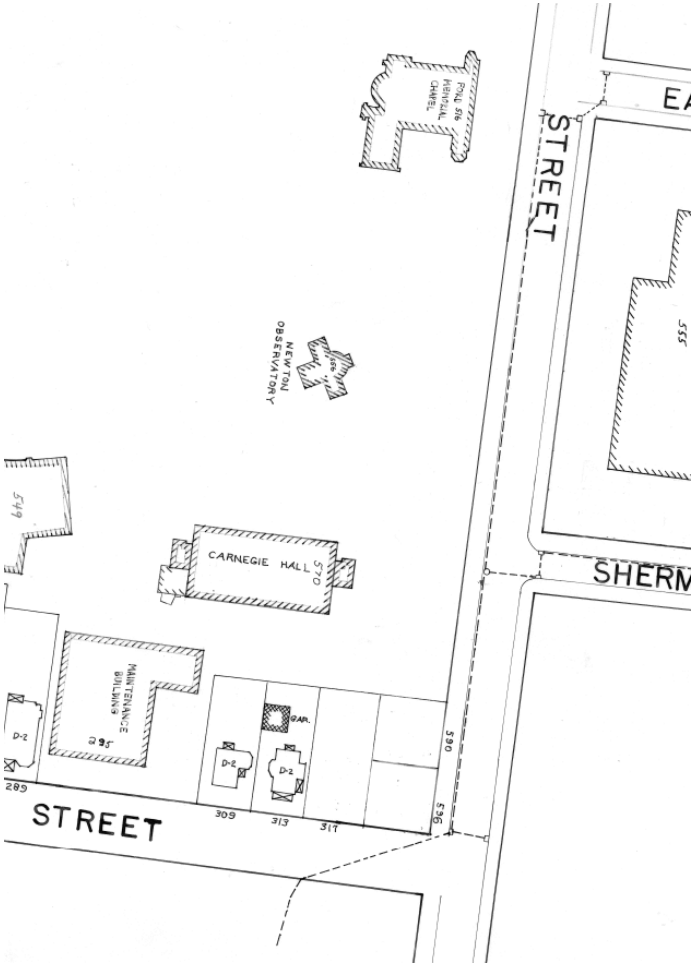


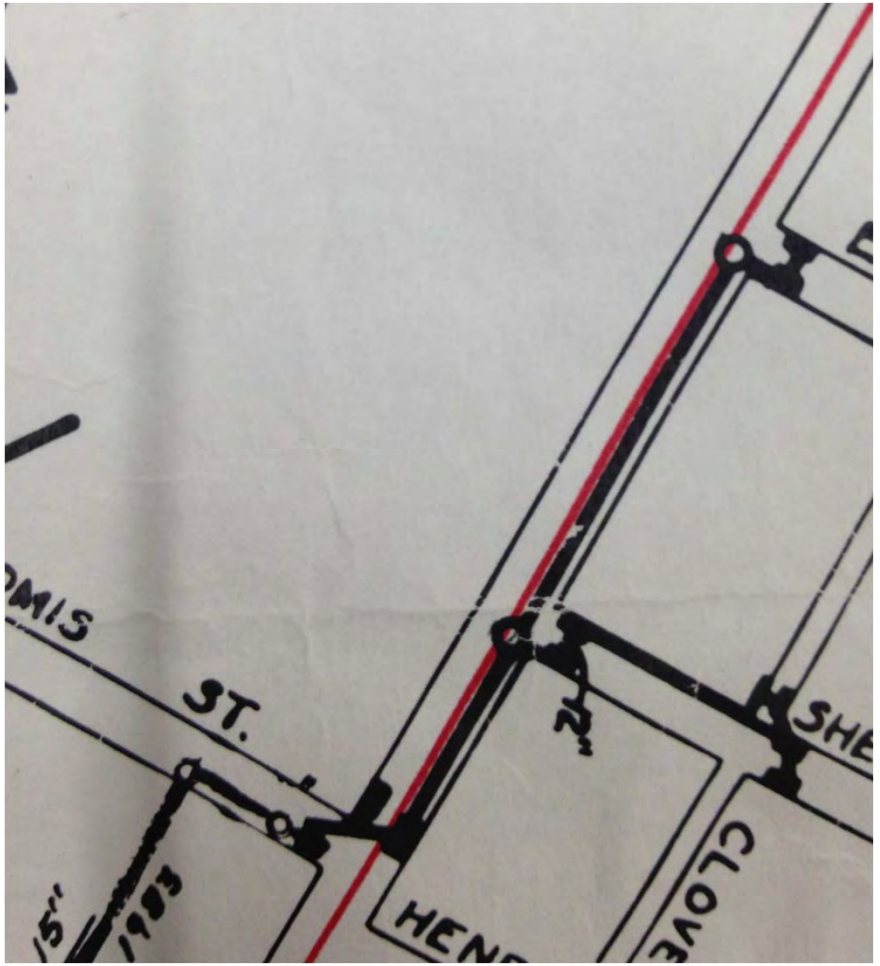
- Print out maps
- Neighborhood by neighborhood
- Field verify stars, connect the dots

Challenges


MARKET ST

Conflicting Maps

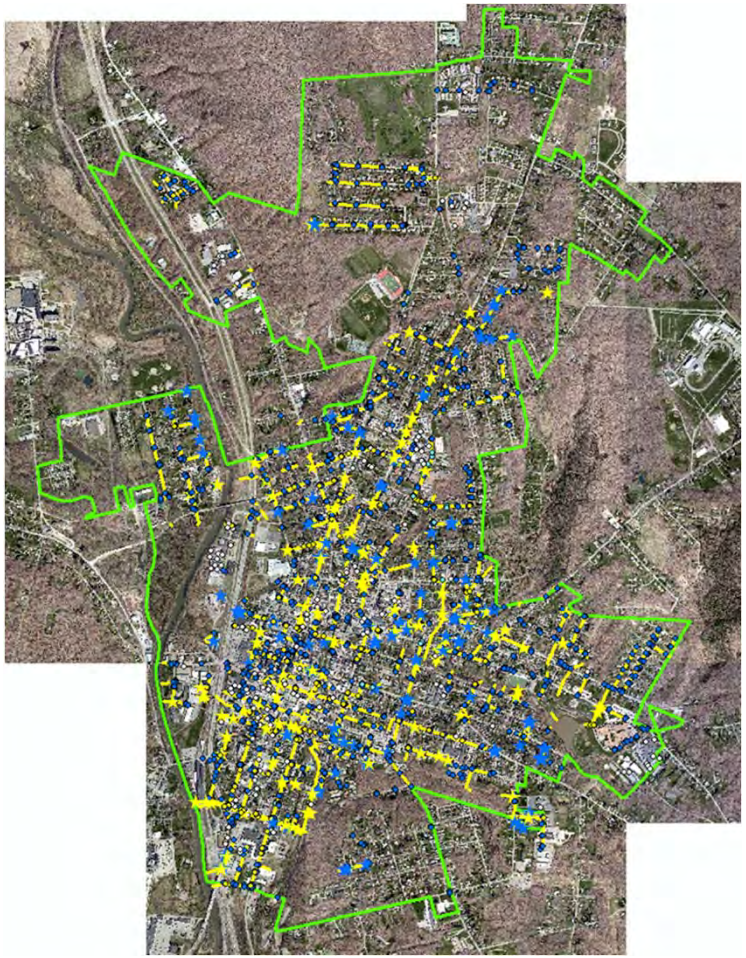


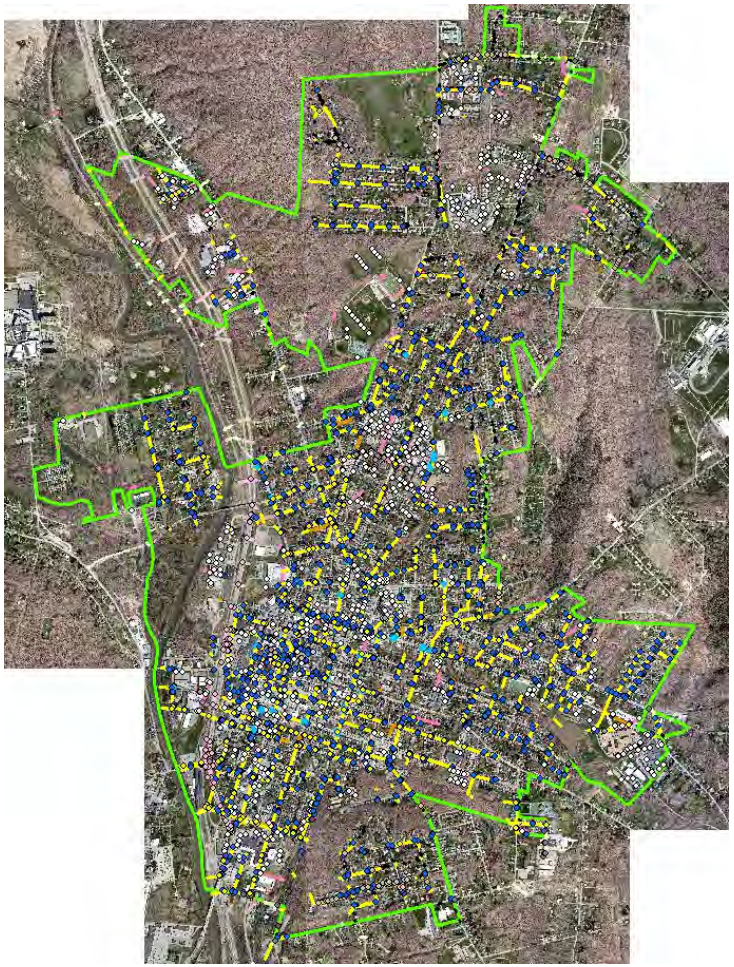


Popping Manholes

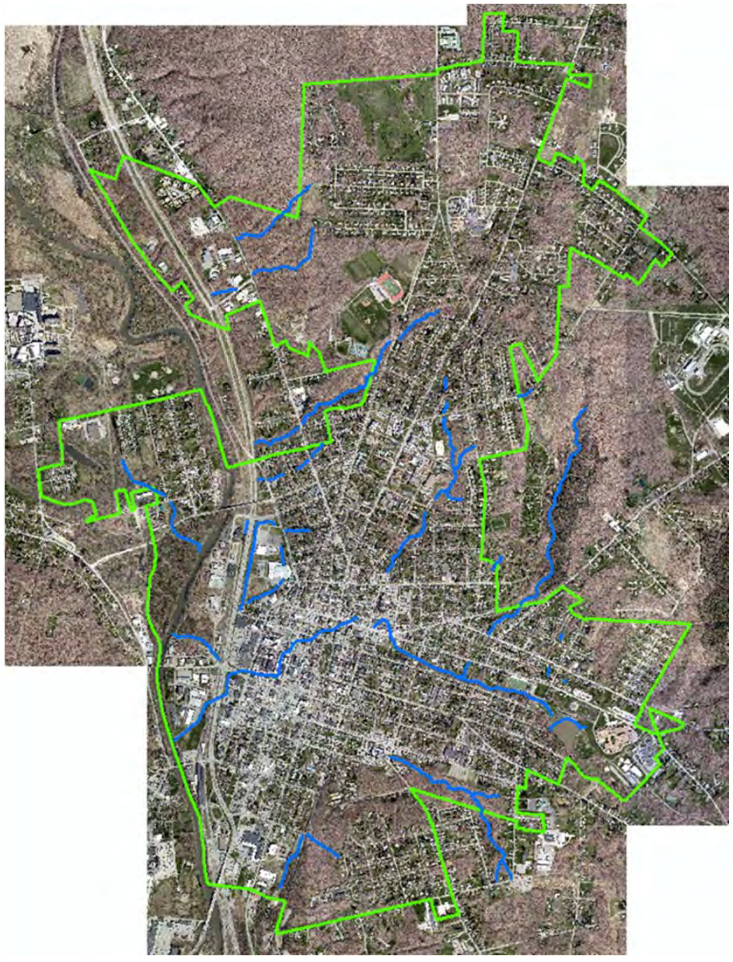
Mapped Features

Pipe/Culvert & Fixtures

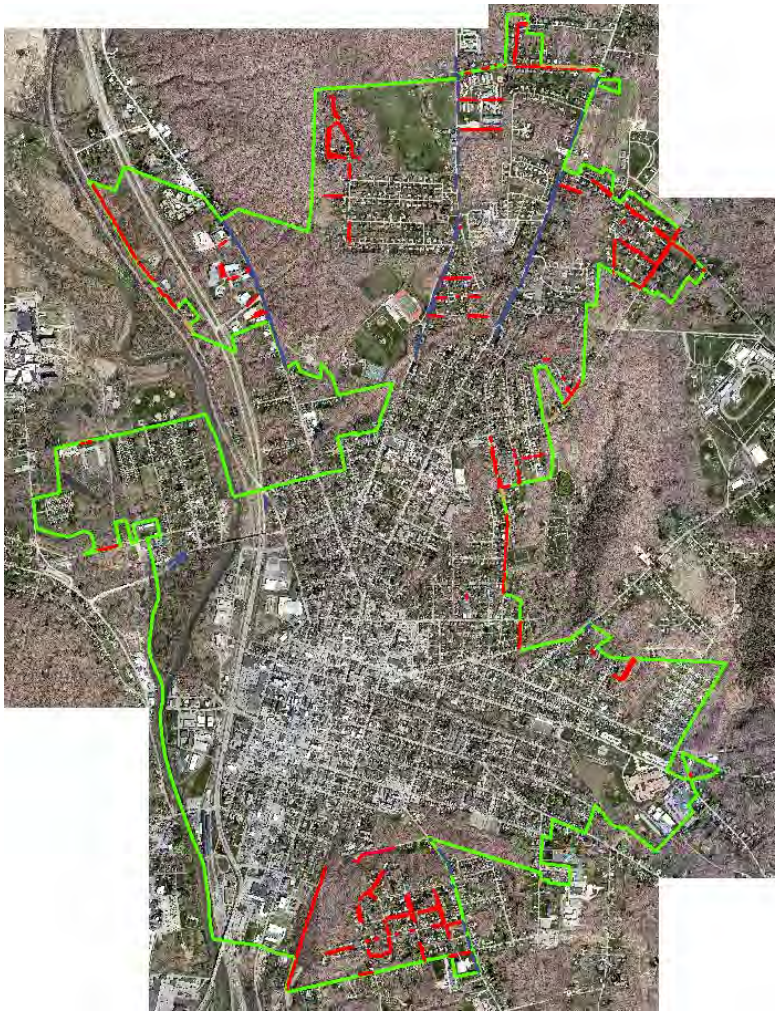




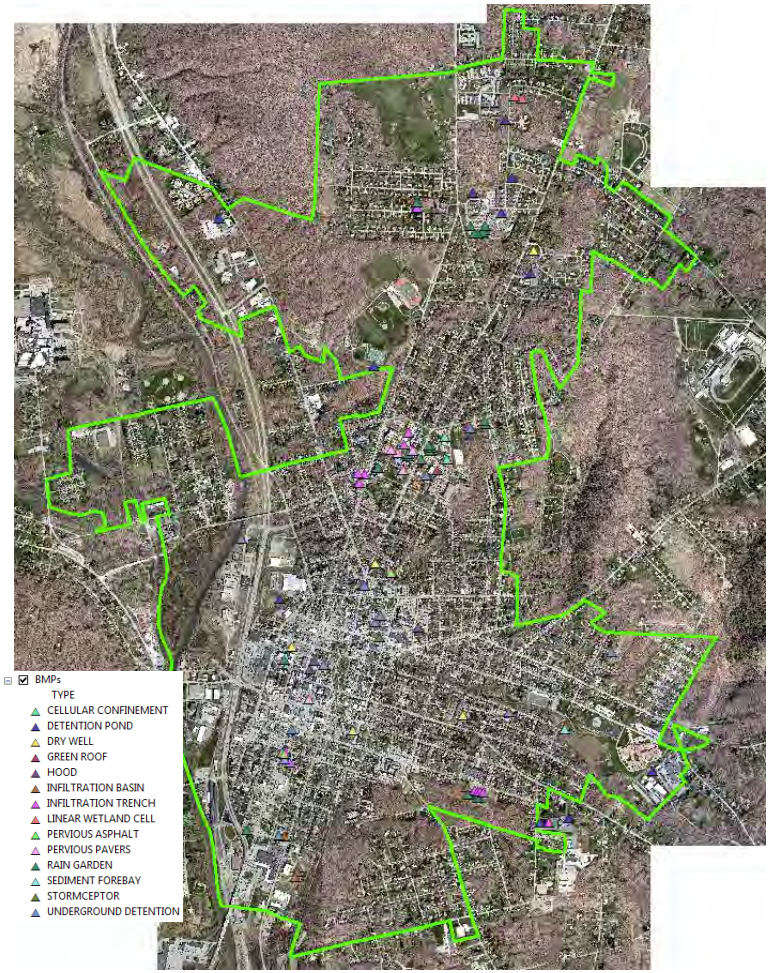
Bodies of Water



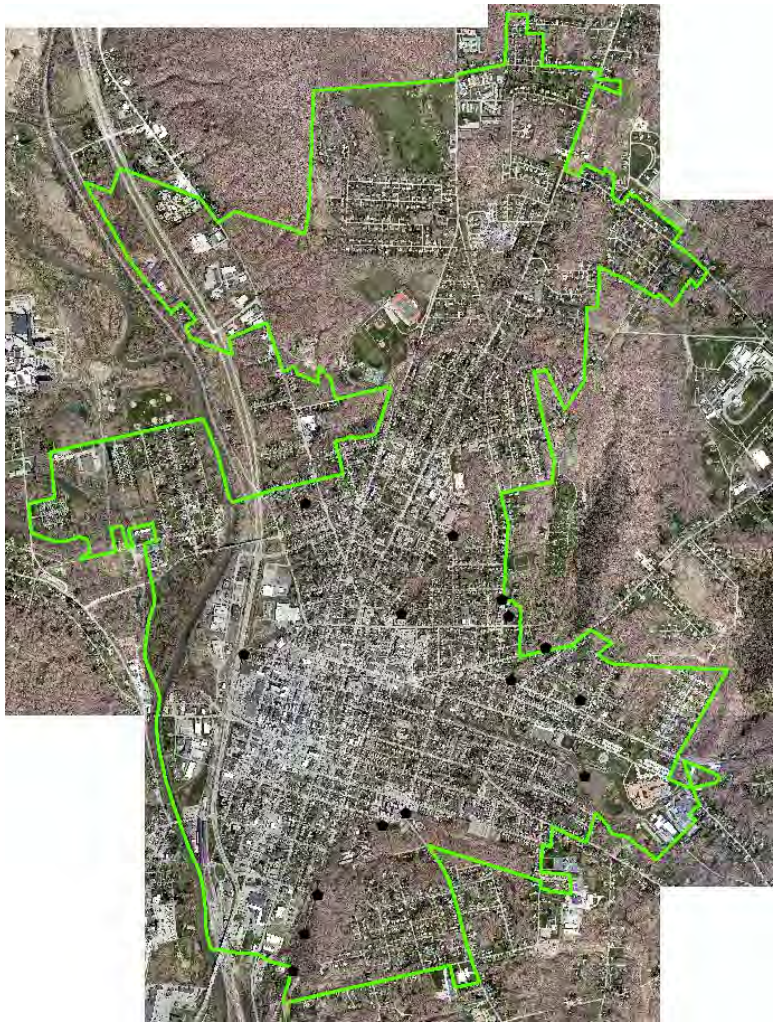
Ditches and Swales



Best Management Practices (BMPs)



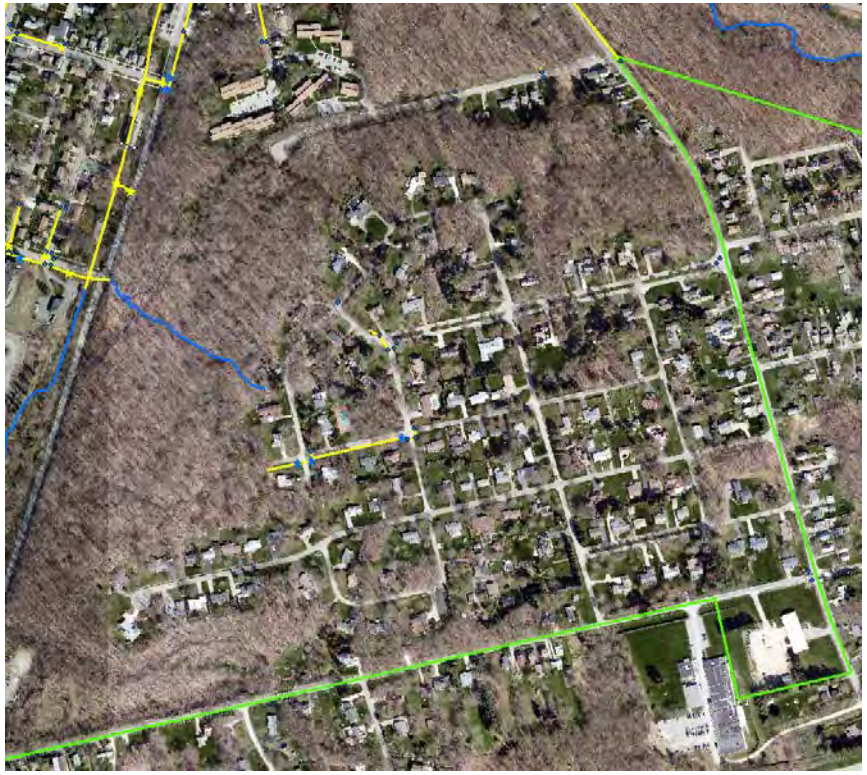
Trash Racks

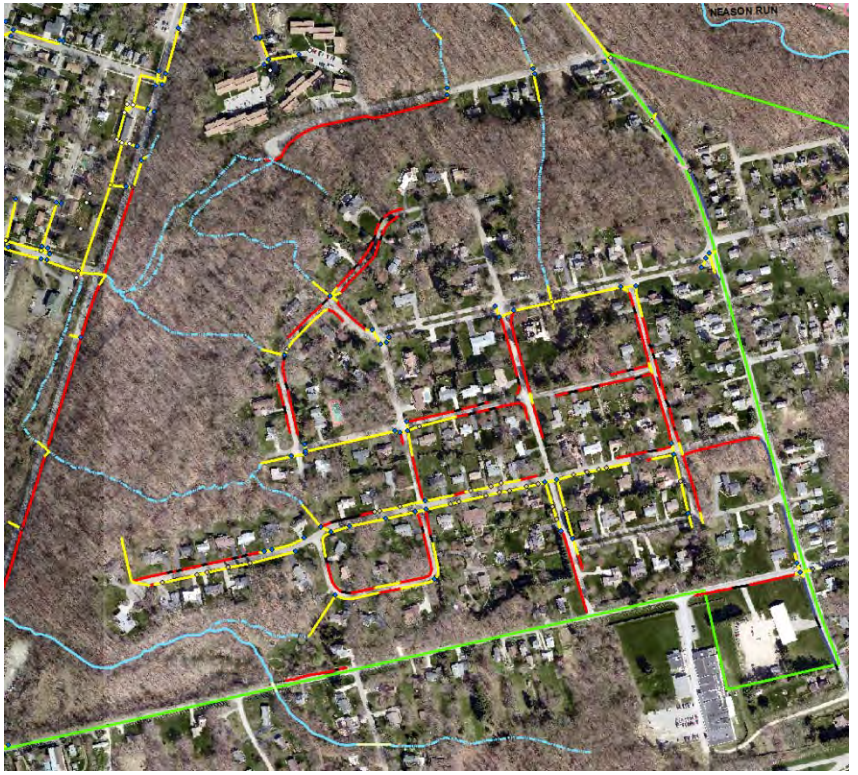


Other Mapped Features

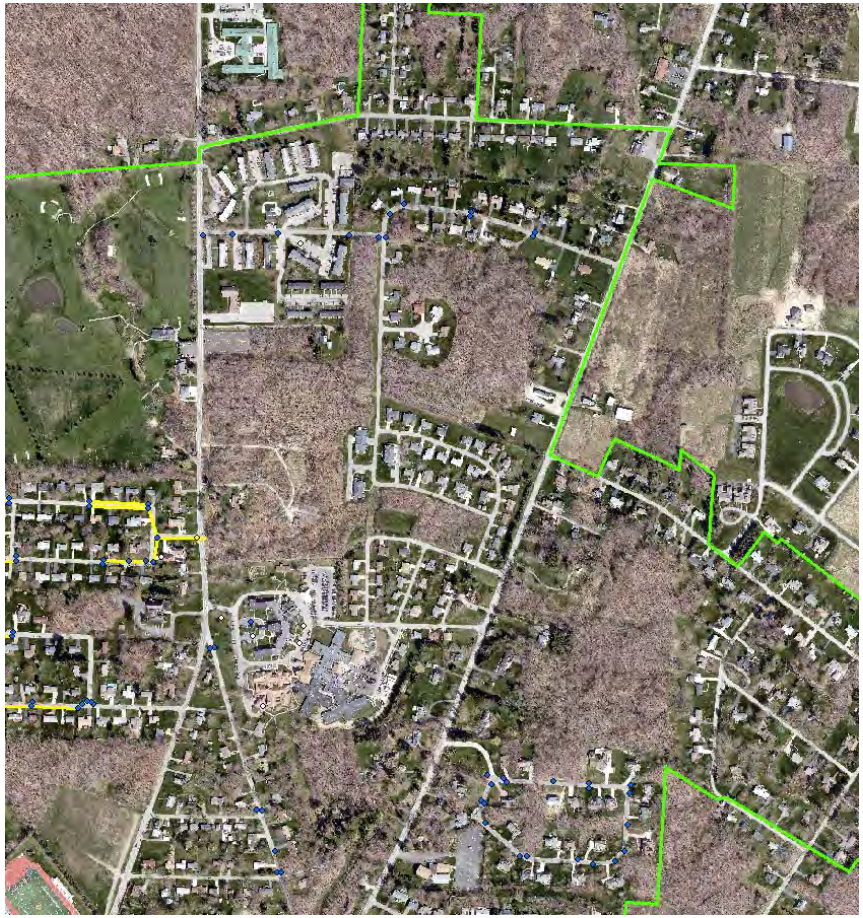
- Mill Run Bridges
- NPDES discharges
- Outfalls
- Tail Ditches

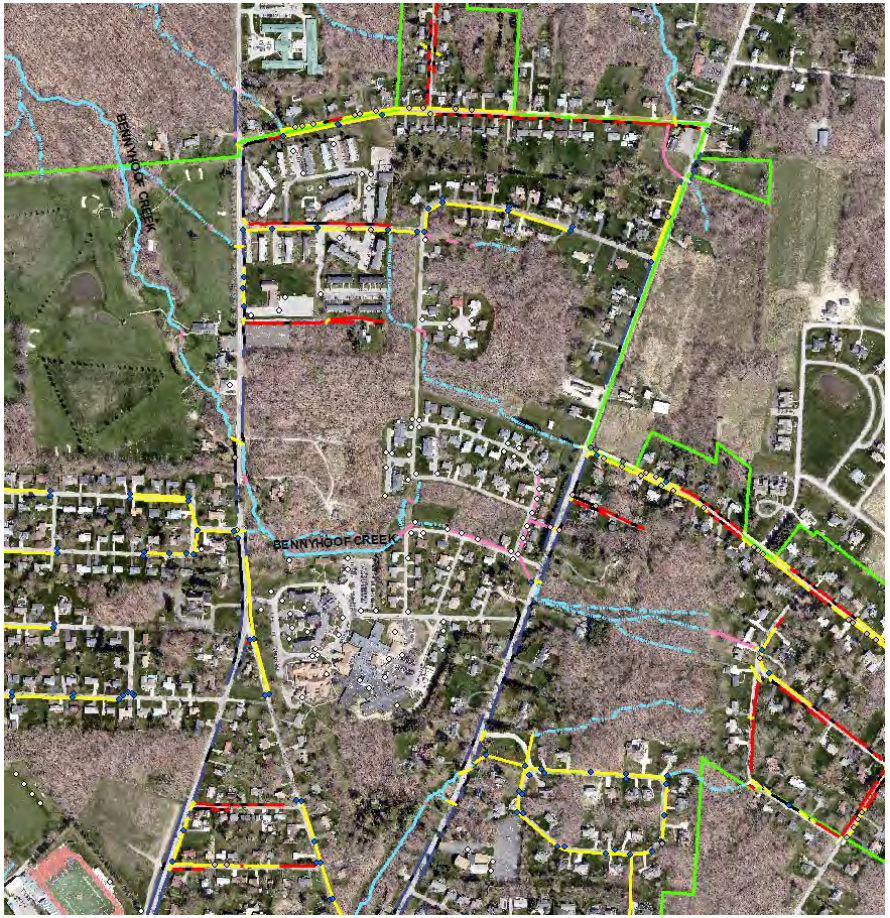
Plateau Area





North End of City

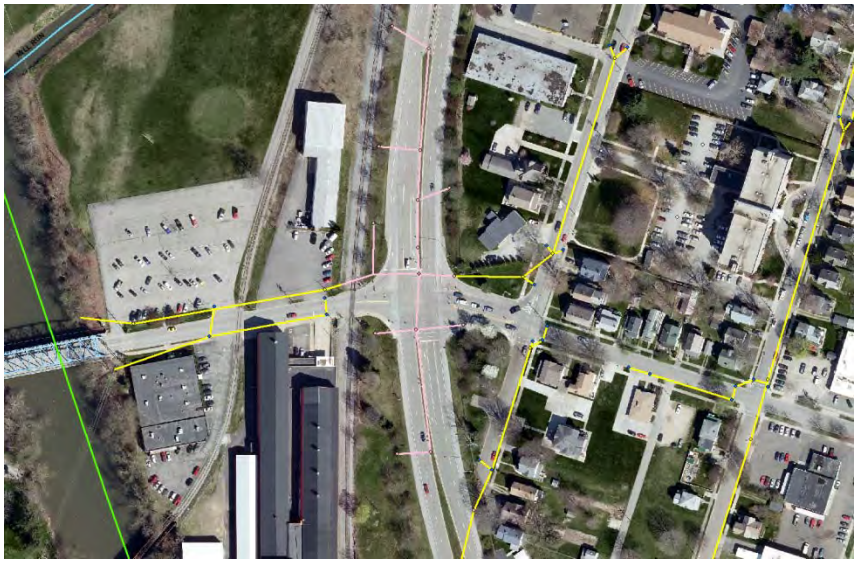




Willow St

- Before

- After



Around Rainbow Lake

- Before

- After

Work in Progress

- Will continuously be refined—still working
- Not everything clear cut
- More project files might be in storage
- Future improvements can be updated as built

Rain Garden Update


DEERE
160G

Using GIS as a tool for watershed planning:

The Presque Isle Bay watershed restoration, protection, and monitoring plan

Sean D. Rafferty

Senior Research and Outreach Specialist

Pennsylvania Sea Grant – Penn State University

GIS Workshop

November 15, 2013

Erie, Pennsylvania

Outline

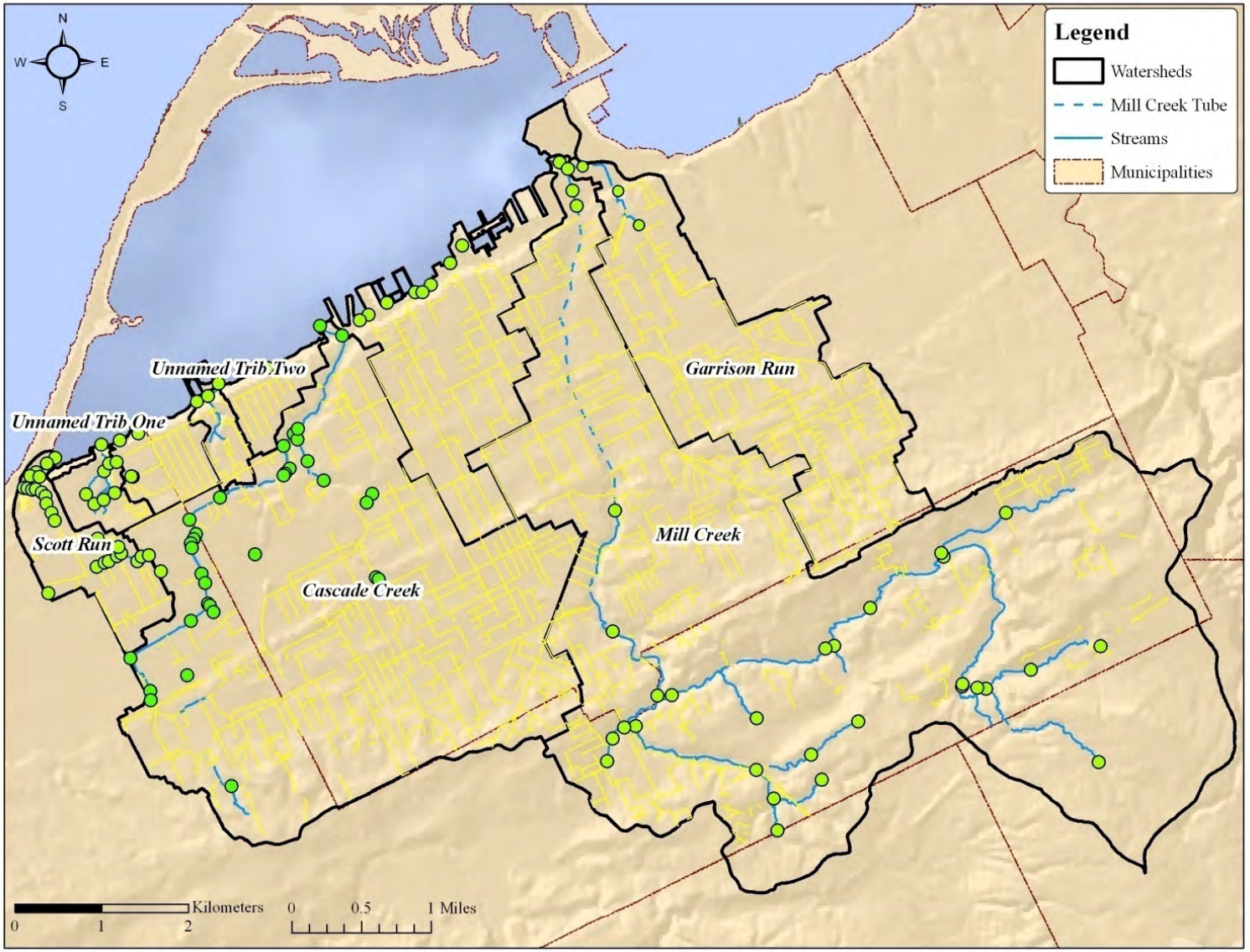
- **Why a Watershed Plan?**
- **Developing the Plan**
  - Watershed Characterization
  - Data Analysis
  - Recommendations
- **Implementing the Plan**
- **Accessing the Data**
  - ArcGIS Online
  - ArcGIS

Why a Plan?

- **3,655 Acre Embayment**
- **Historical Pollution**
- **1991: Area of Concern**
- **Transition of Erie's Bayfront**
  - 1989: EWTP upgrades began
  - 1991: GPU Energy
  - 1997: National Fuel Gas
- **2002: Area of Recovery**
- **2007: Restrictions on Dredging Delisted**
  - No "chemical hotspots"
  - Not toxic to aquatic life

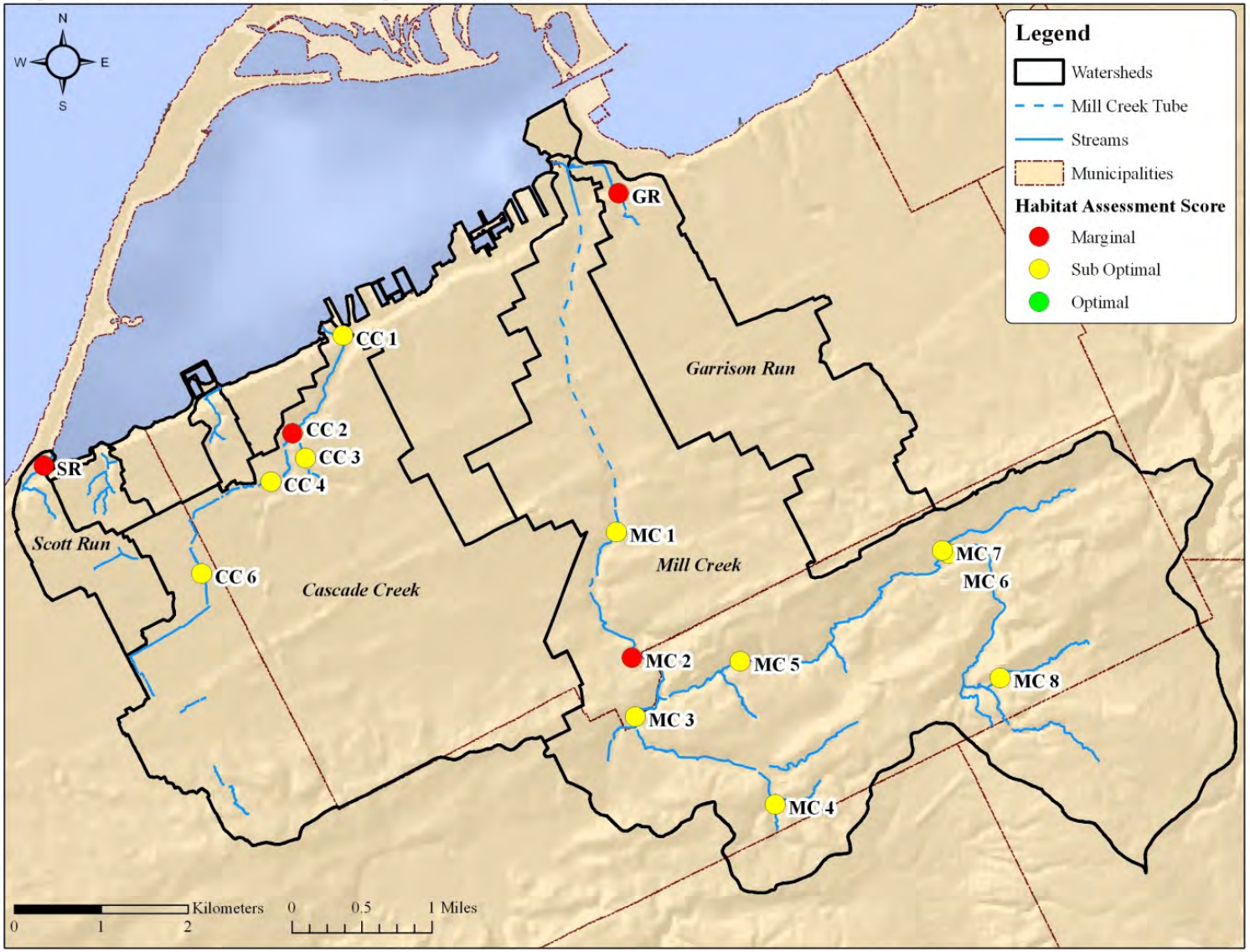
Why a Watershed Plan?

Developing the Plan: *Watershed Delineation*



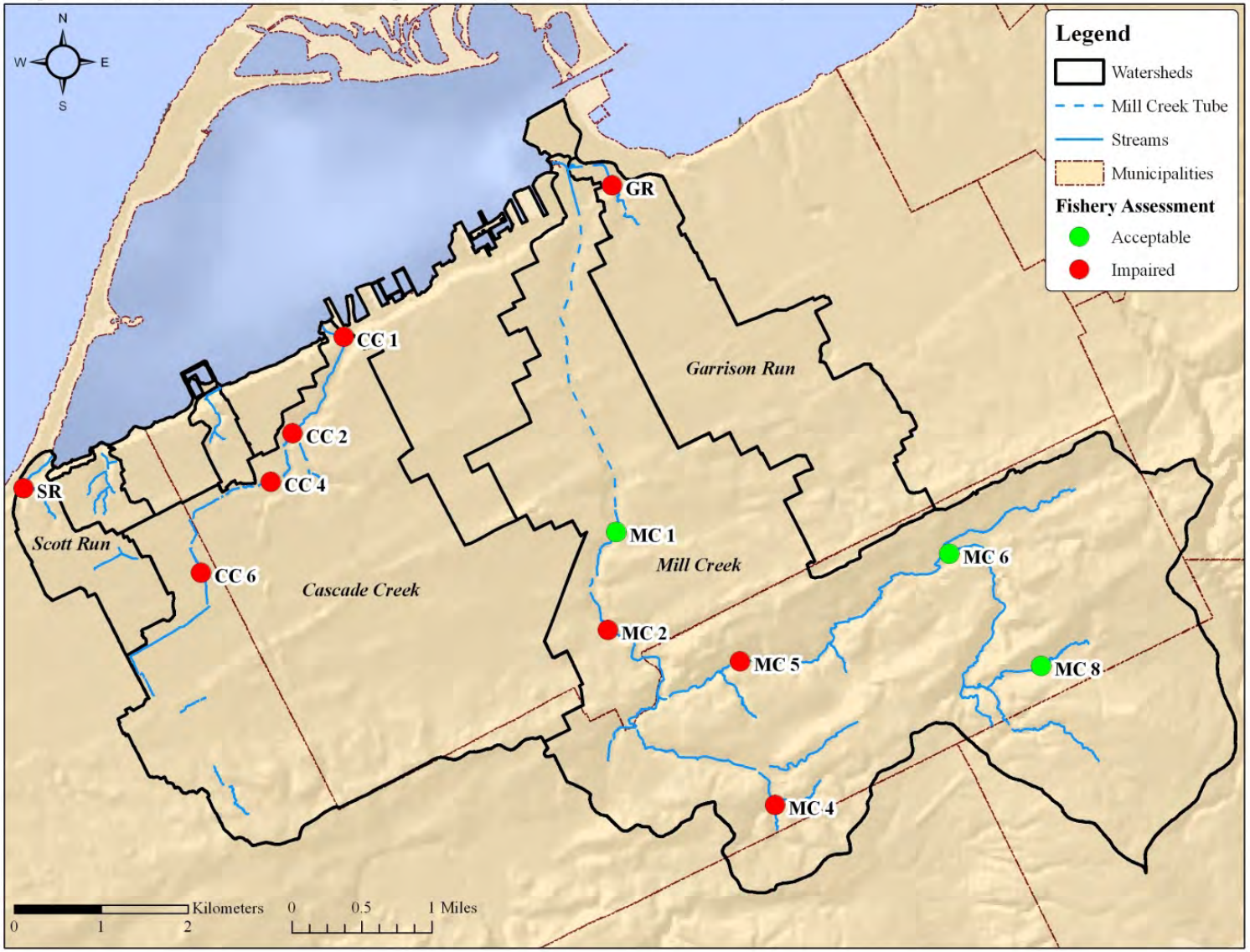
Developing the Plan: *Watershed Characterization*

Map 5: Habitat assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



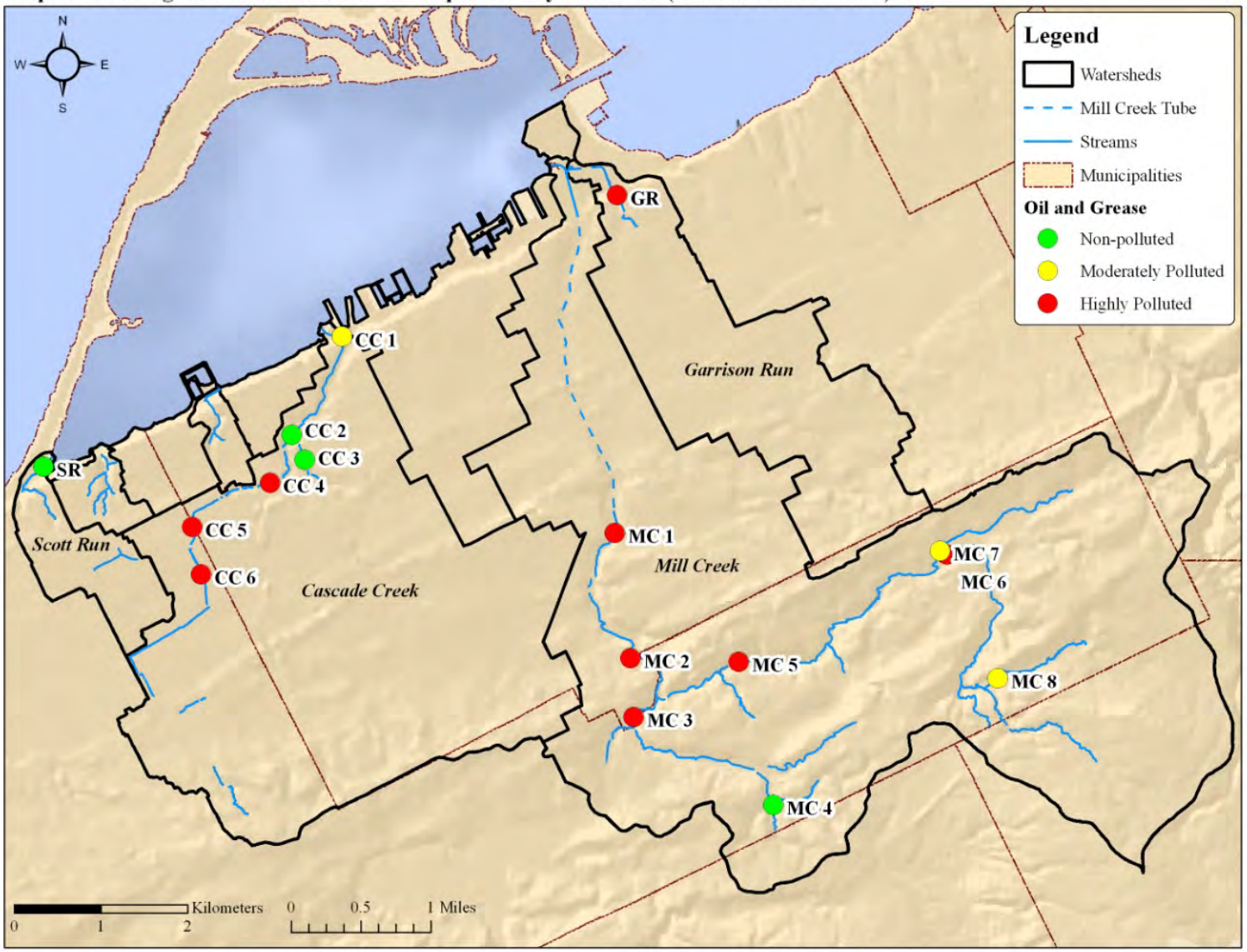
Developing the Plan: *Watershed Characterization*

Map 12: Fishery assessment of the Presque Isle Bay watershed (Pyron et al. 2004)



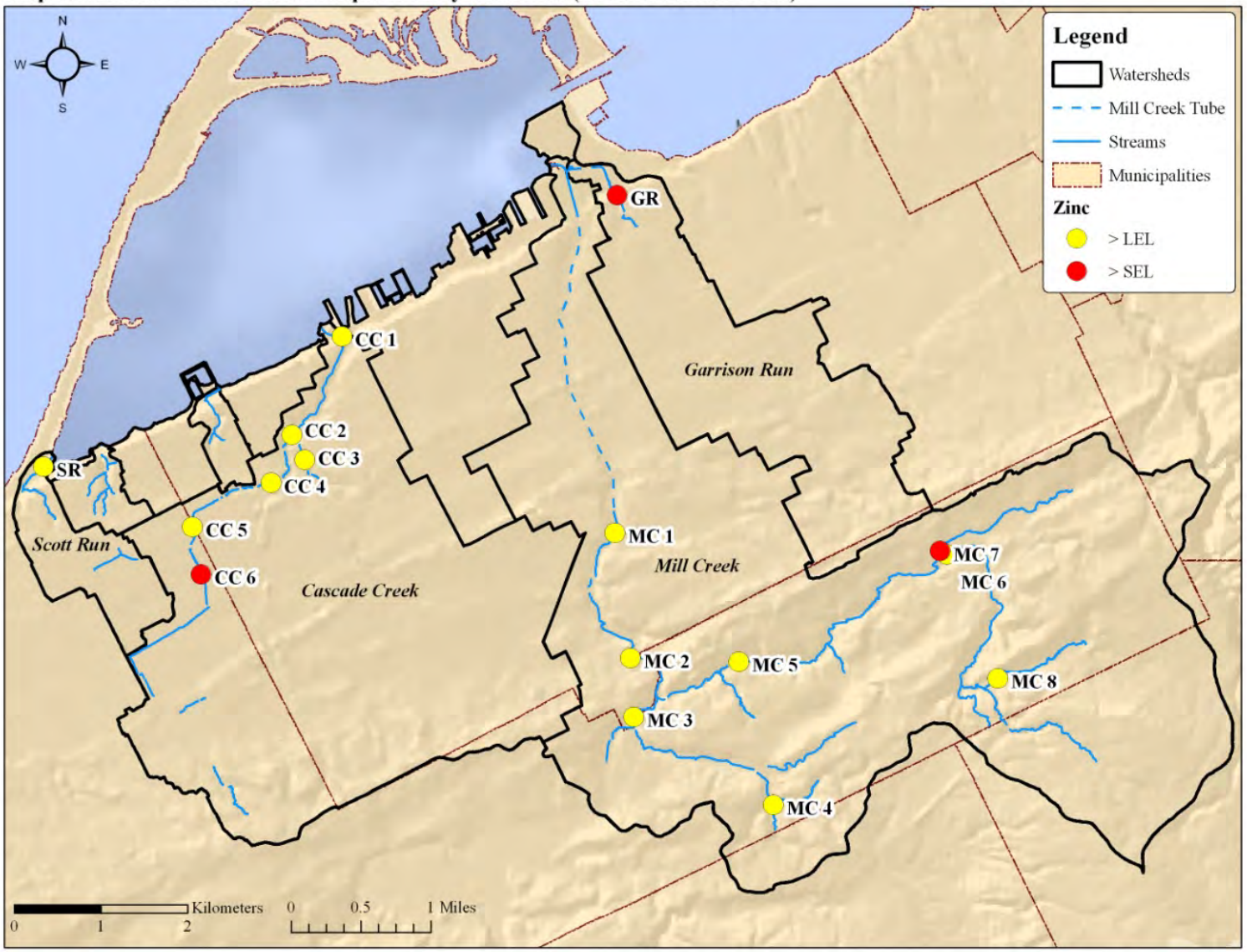
Developing the Plan: *Watershed Characterization*

Map 6: Oil and grease assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



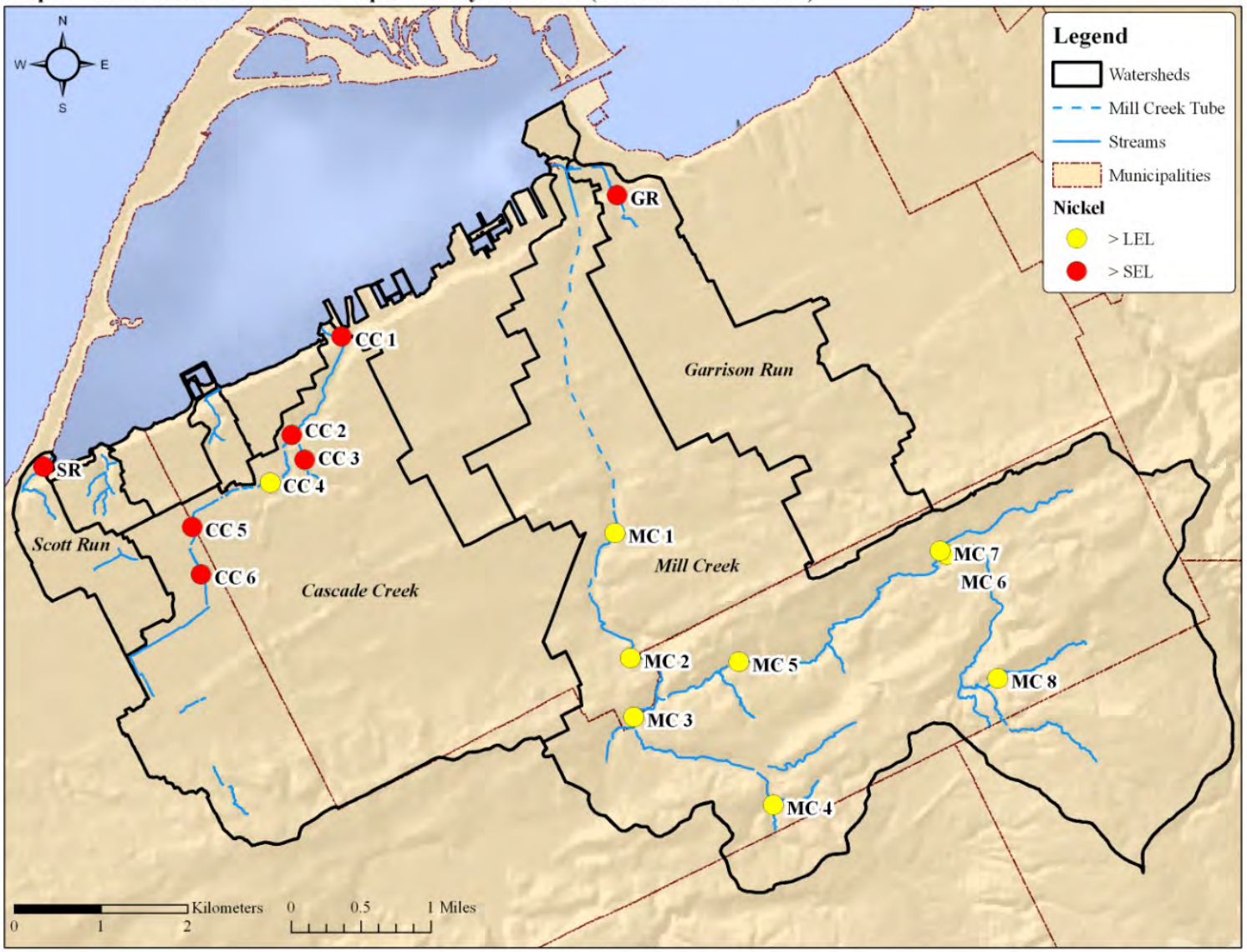
Developing the Plan: *Watershed Characterization*

Map 7: Zinc assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



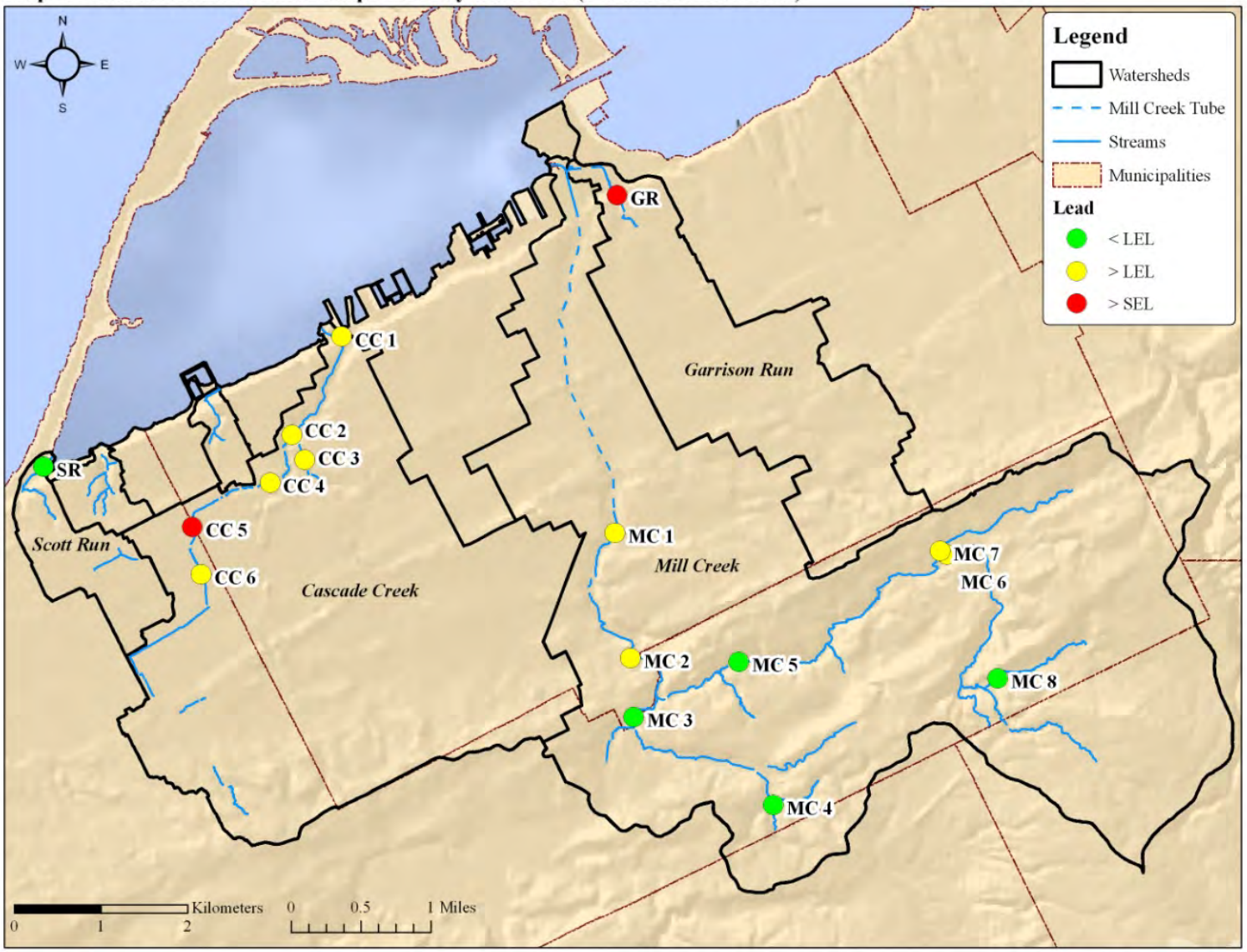
Developing the Plan: *Watershed Characterization*

Map 8: Nickel assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



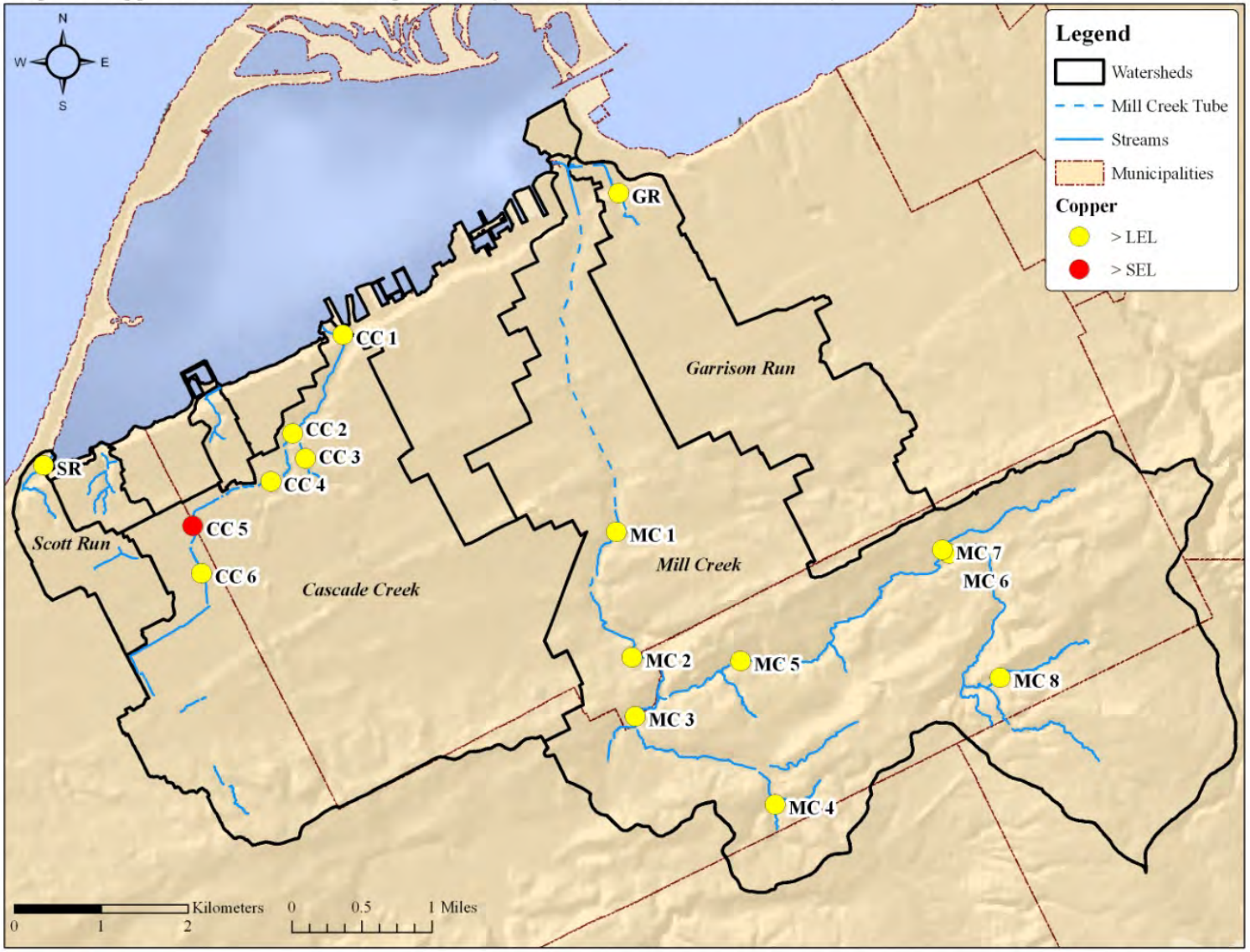
Developing the Plan: *Watershed Characterization*

Map 9: Lead assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



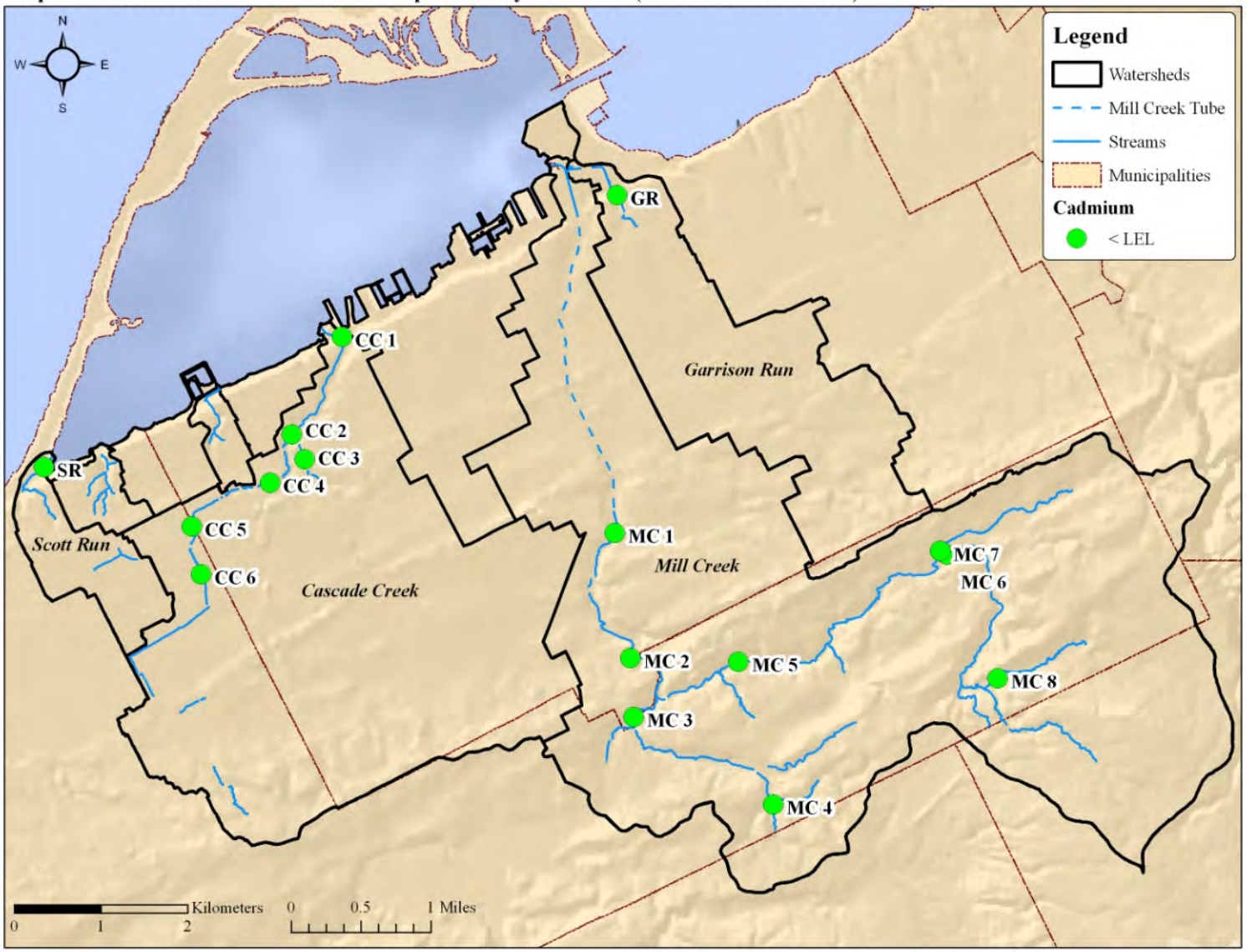
Developing the Plan: *Watershed Characterization*

Map 10: Copper assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



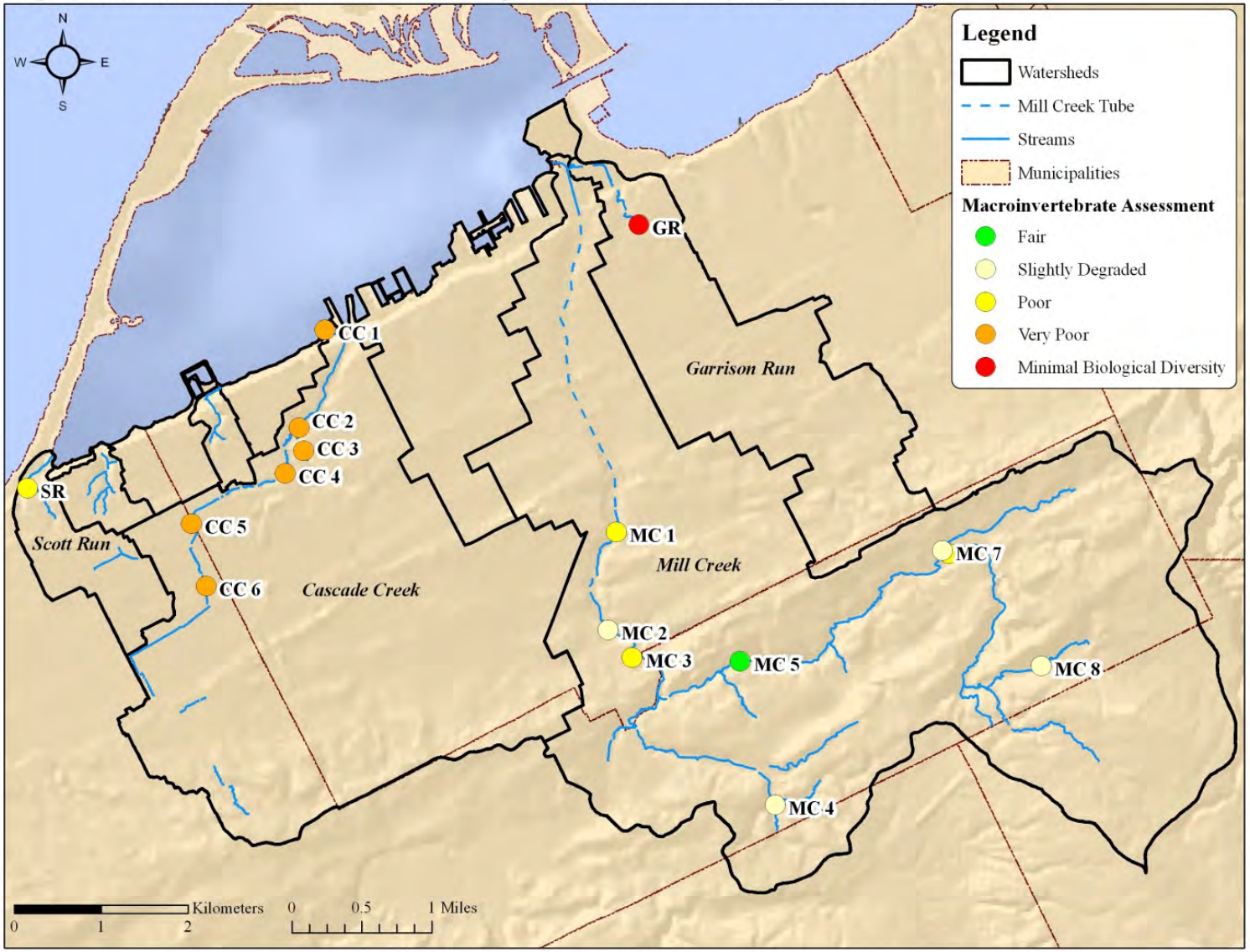
Developing the Plan: *Watershed Characterization*

Map 11: Cadmium assessment of the Presque Isle Bay watershed (Diz and Johnson 2002)



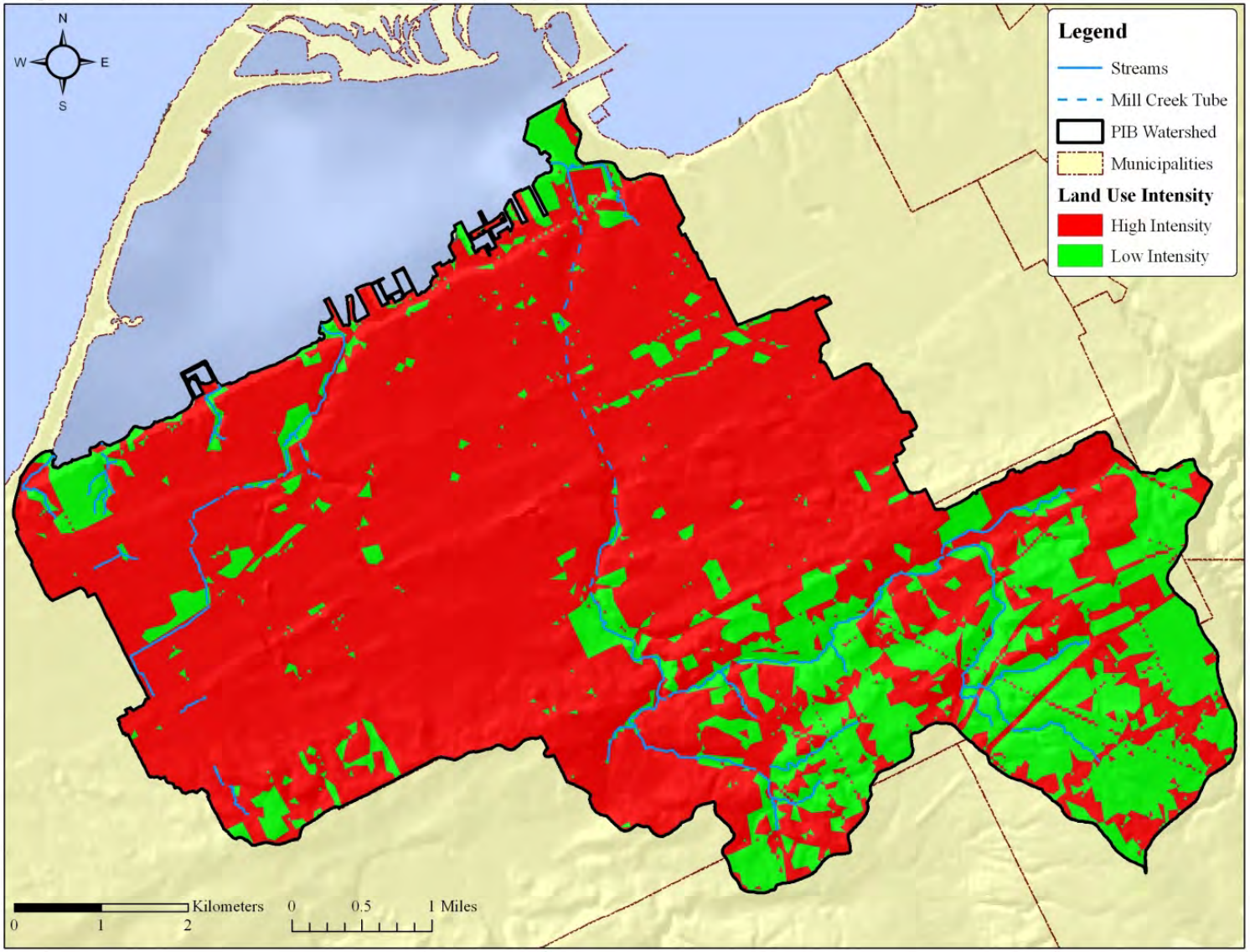
Developing the Plan: *Watershed Characterization*

Map 13: Macroinvertebrate assessment of the Presque Isle Bay watershed (Campbell 2002)



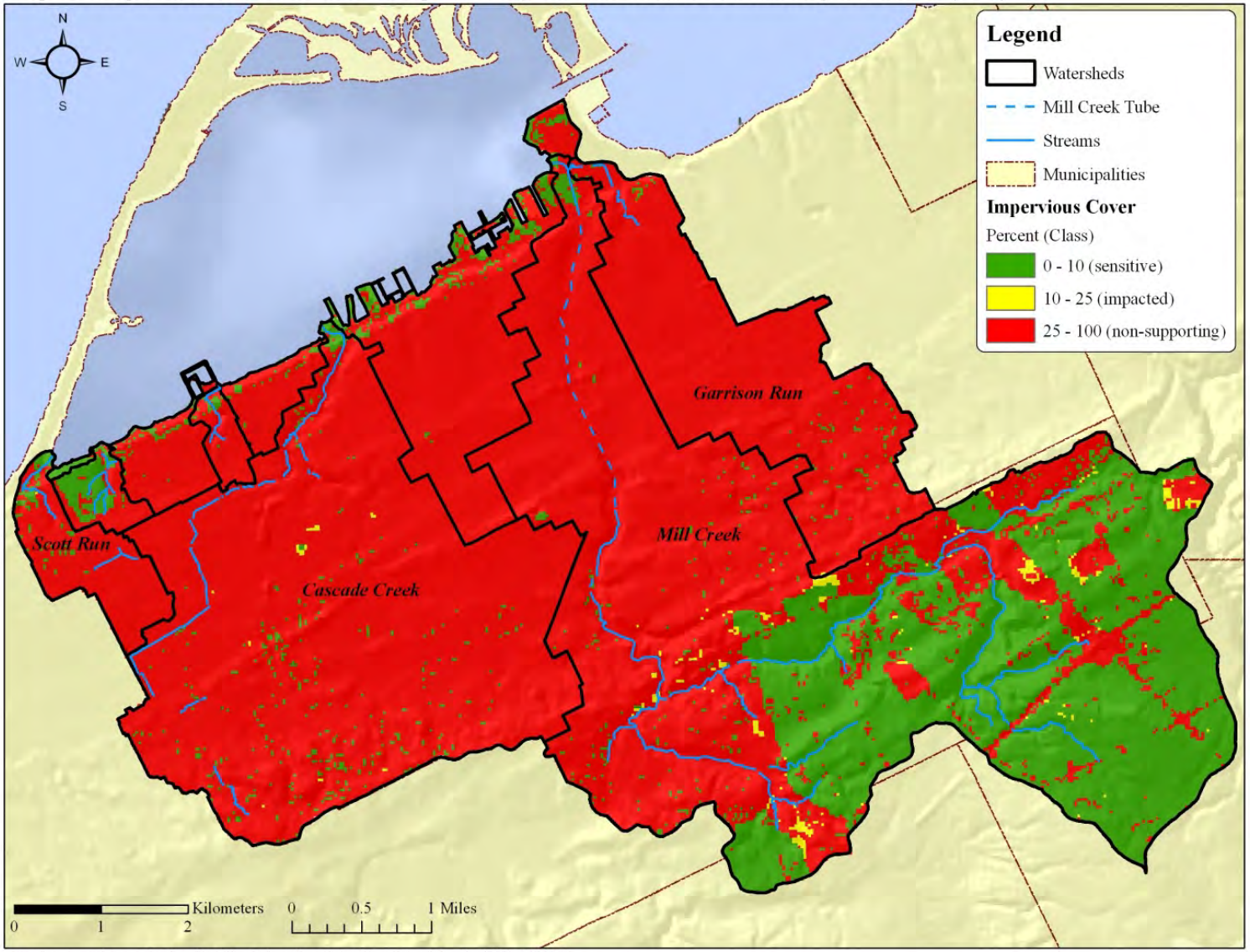
Developing the Plan: *Watershed Characterization*

Map 30: Land Use intensity within the Presque Isle Bay watershed



Developing the Plan: *Watershed Characterization*

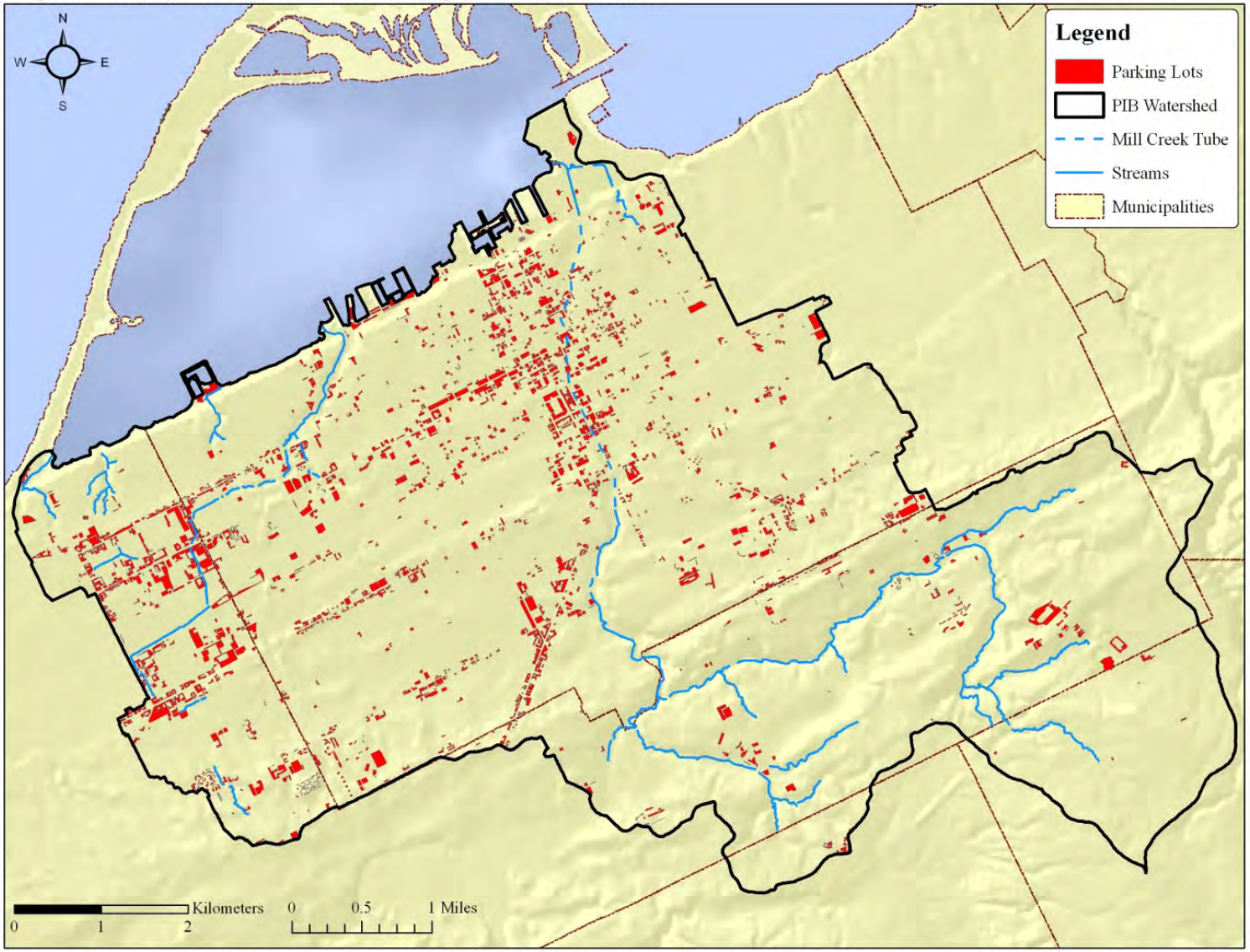
Map 23: Impervious cover within the Presque Isle Bay watershed classified according to Schueler (1994)



Impervious cover data was developed by Toby Carlson (Penn State University) and downloaded from PASDA.

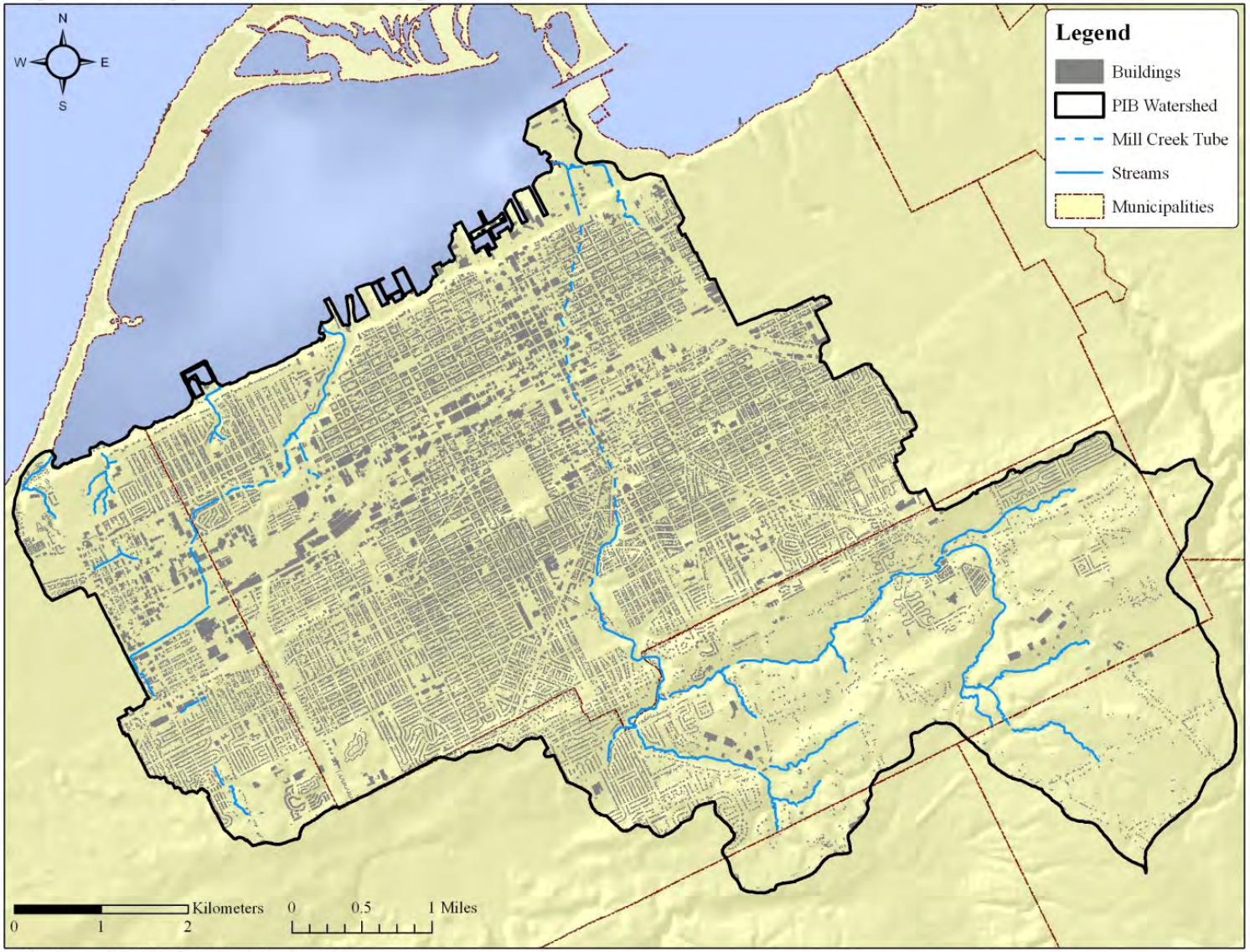
Developing the Plan: *Watershed Characterization*

Map 25: Parking lots located within the Presque Isle Bay watershed



Developing the Plan: *Watershed Characterization*

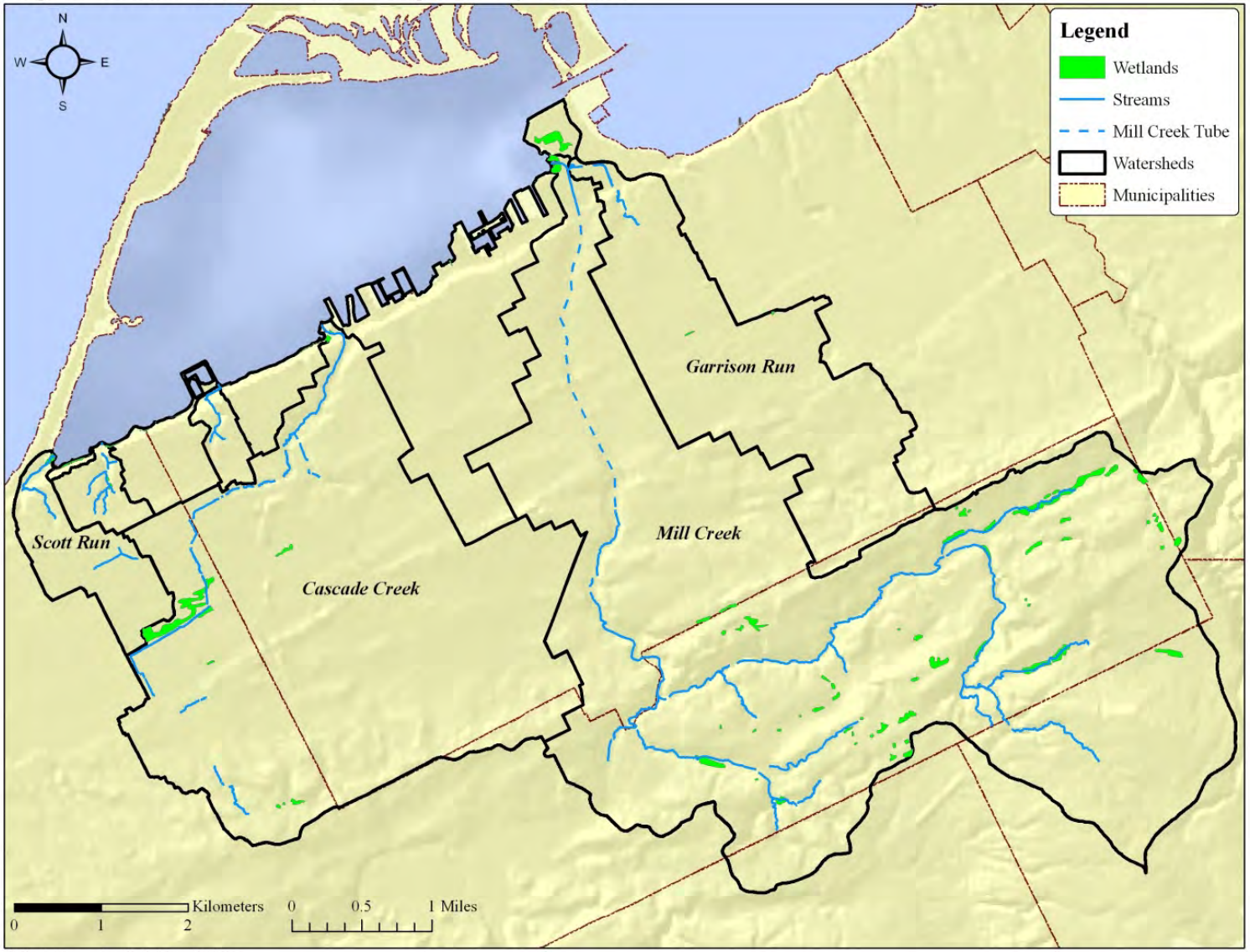
Map 26: Buildings located within the Presque Isle Bay watershed



Building data was obtained from the Erie County Department of Planning

Developing the Plan: *Watershed Characterization*

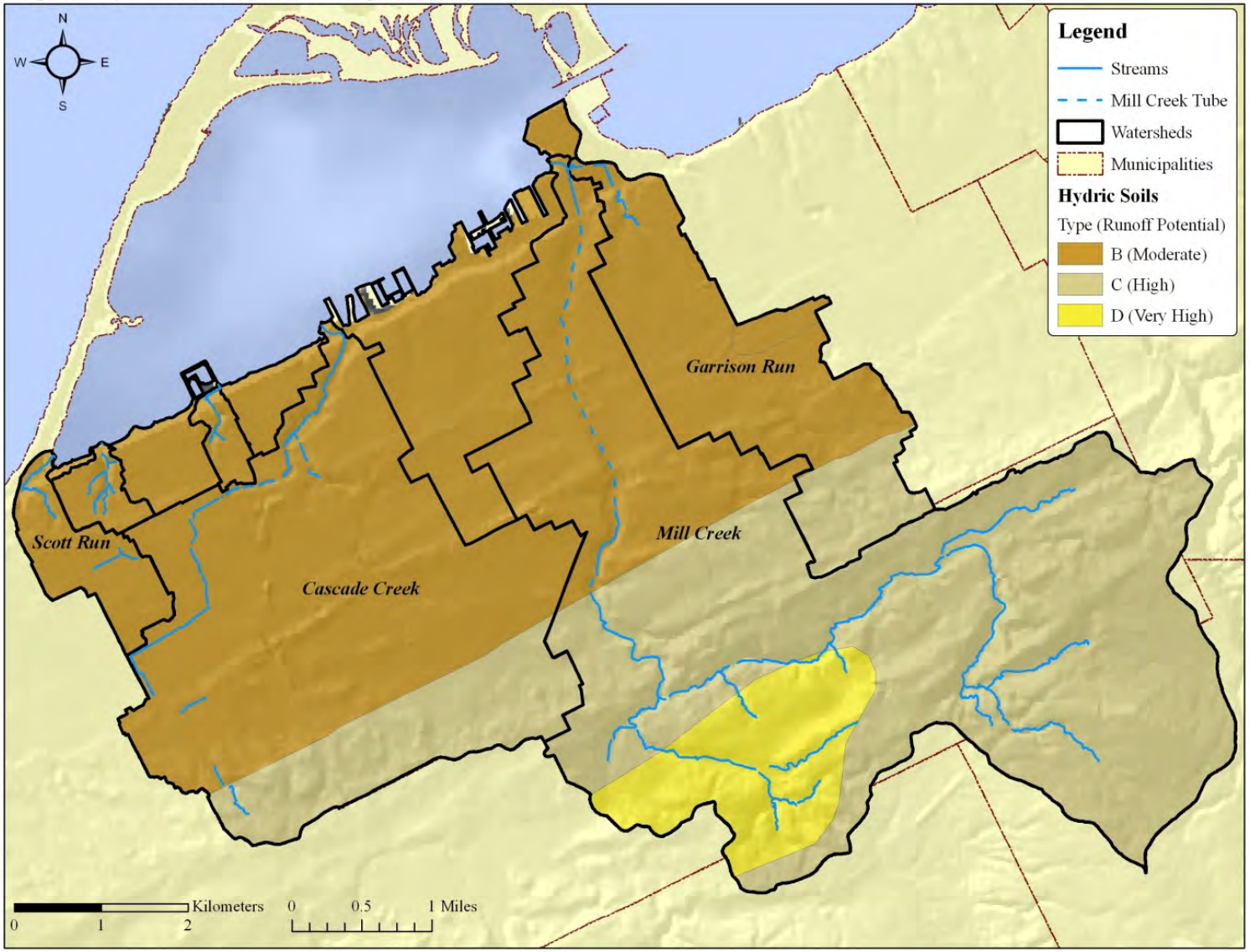
Map 31: Wetlands located within the Presque Isle Bay watershed



Wetland data was downloaded from PASDA

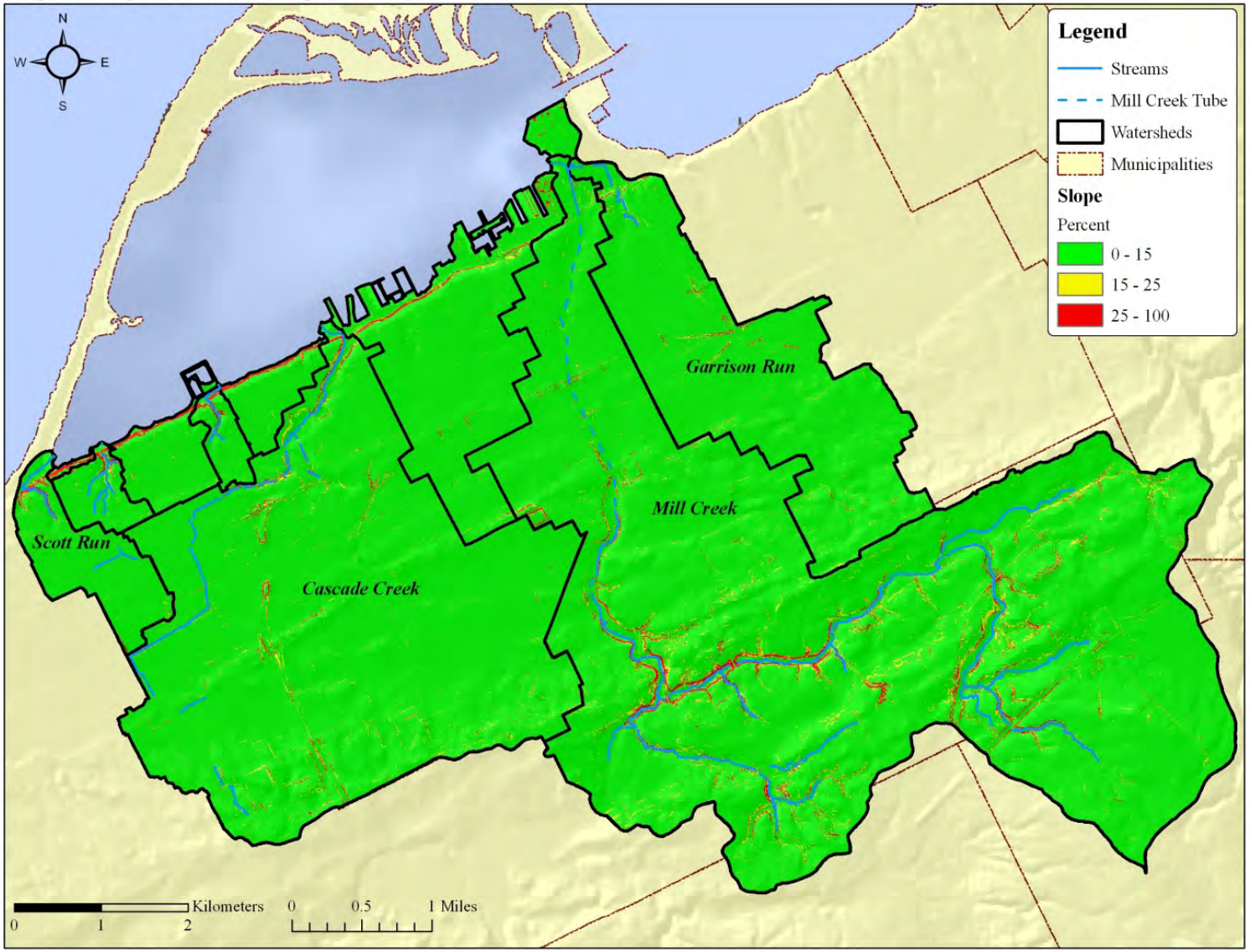
Developing the Plan: *Watershed Characterization*

Map 32: Hydric soils within the Presque Isle Bay watershed



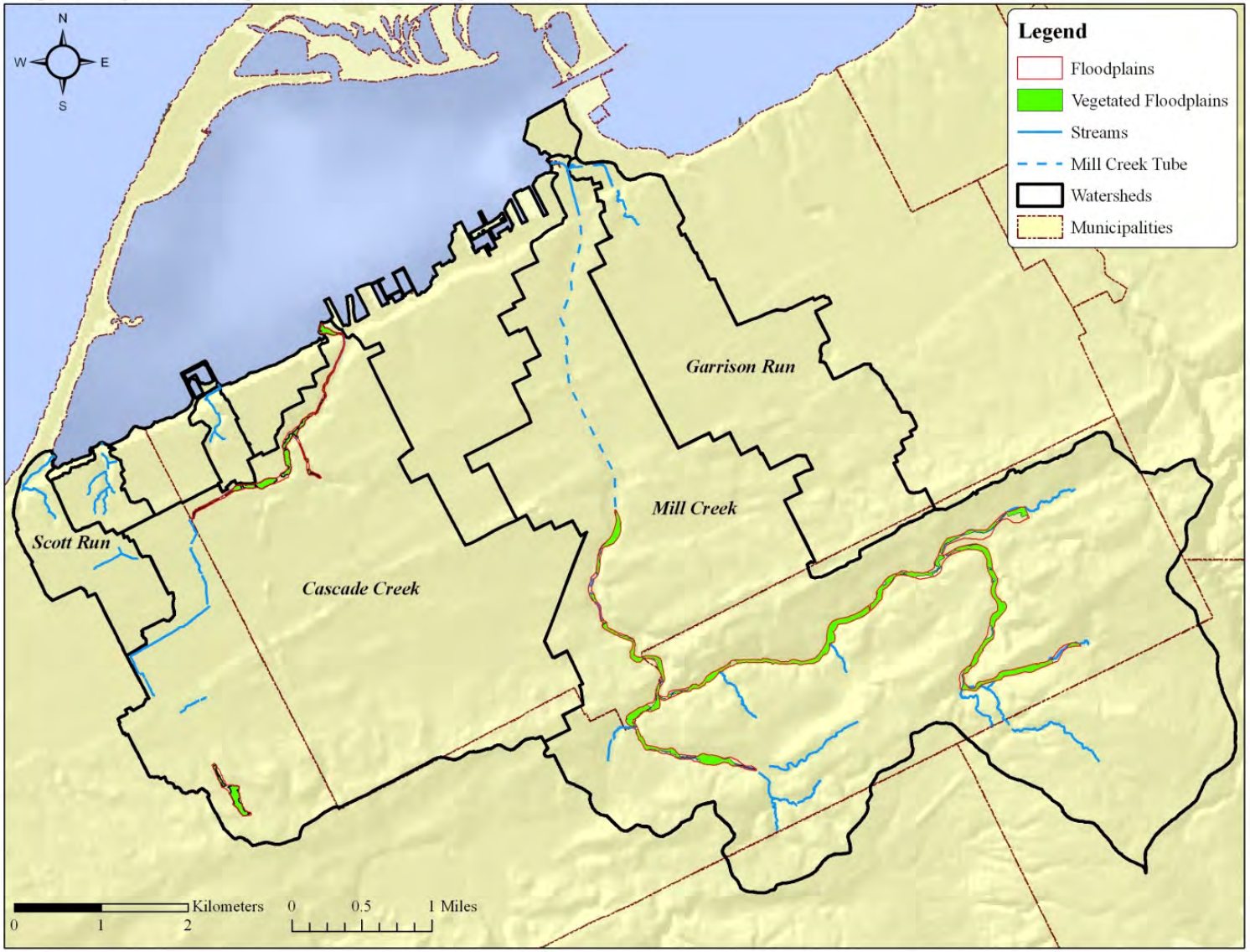
Developing the Plan: *Watershed Characterization*

Map 33: Slope within the Presque Isle Bay watershed



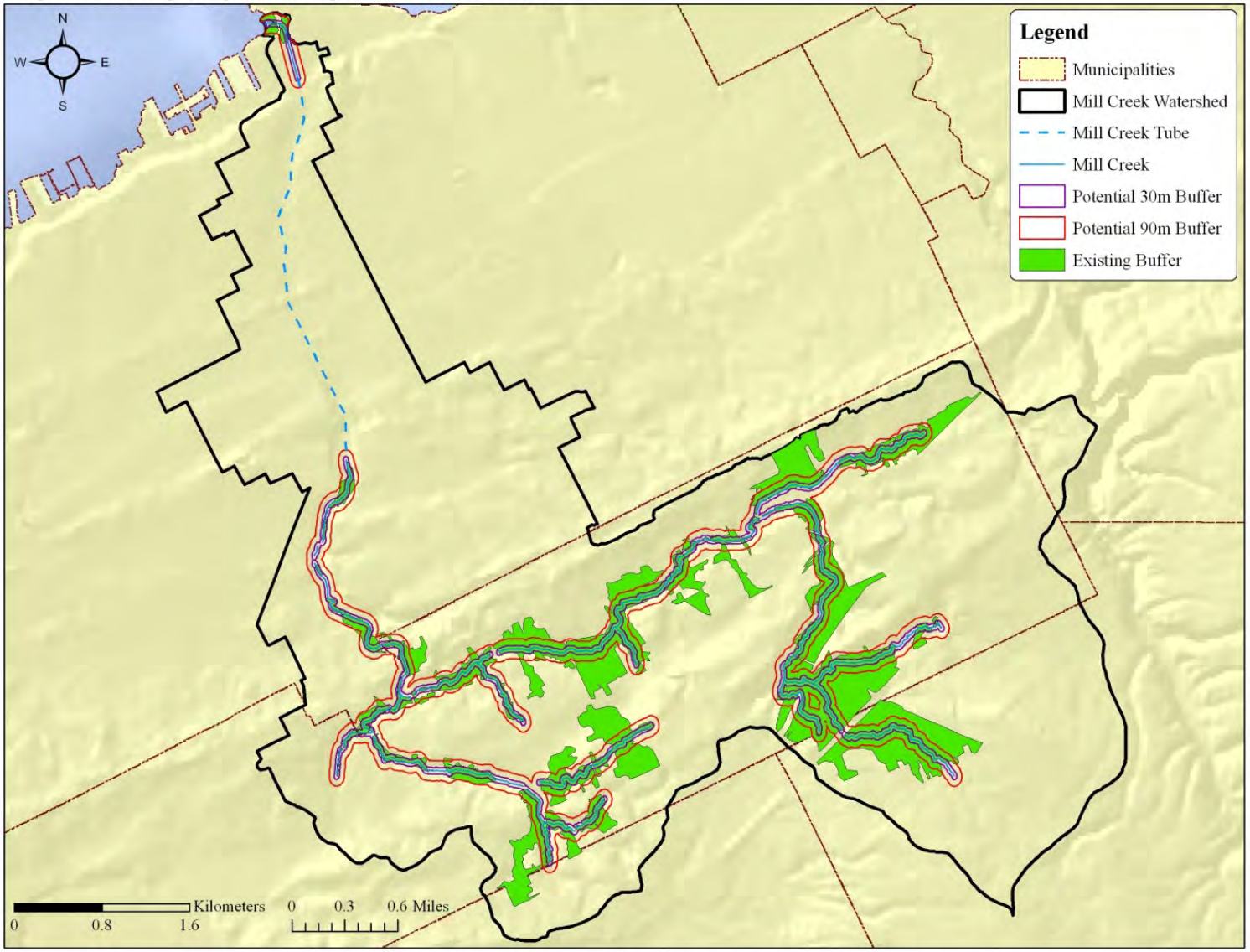
Developing the Plan: *Watershed Characterization*

Map 40: Vegetated floodplains within the Presque Isle Bay watershed



Developing the Plan: *Watershed Characterization*

Map 37: Existing and potential riparian buffer for Mill Creek

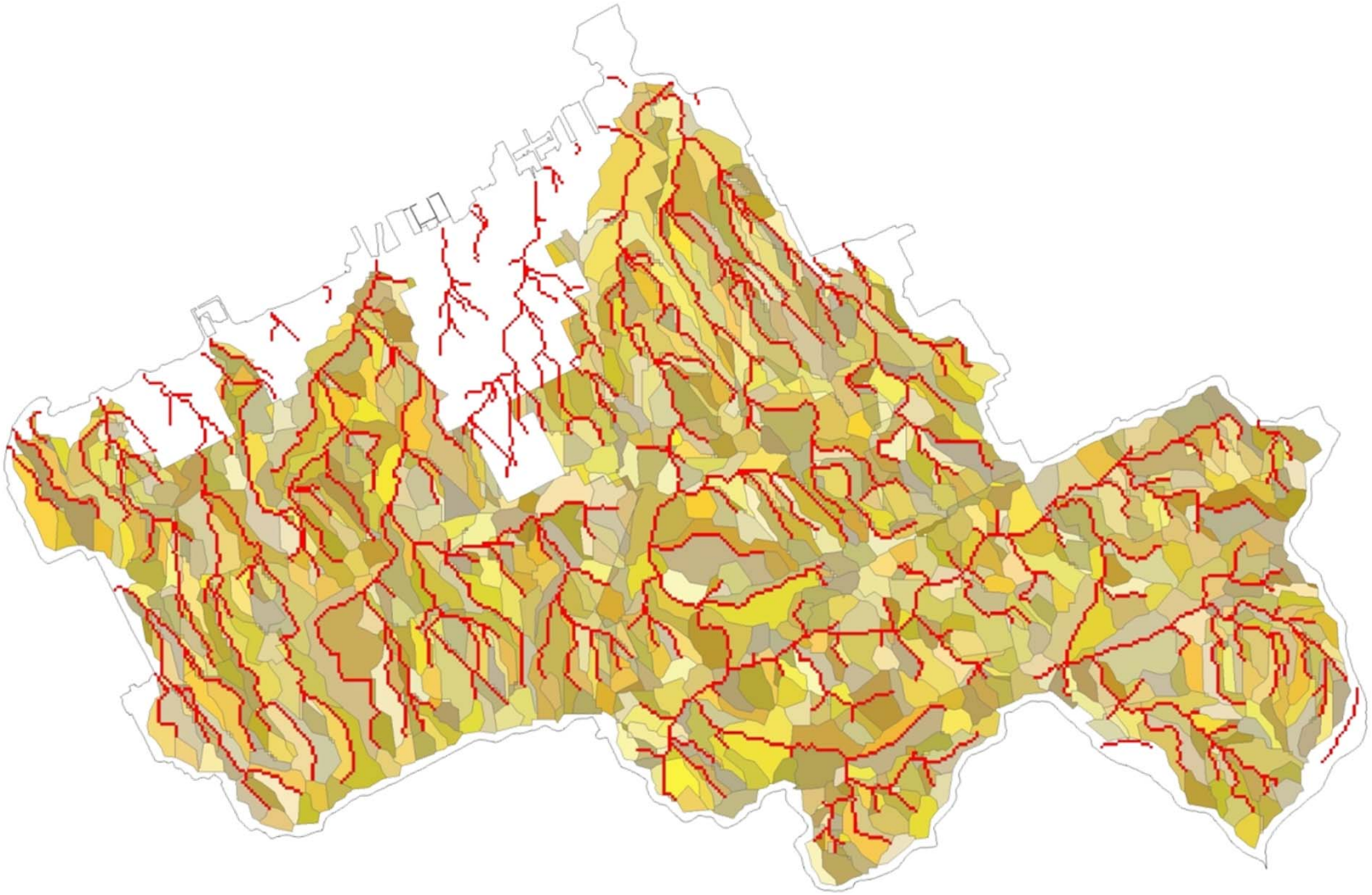


Developing the Plan: *Goals*

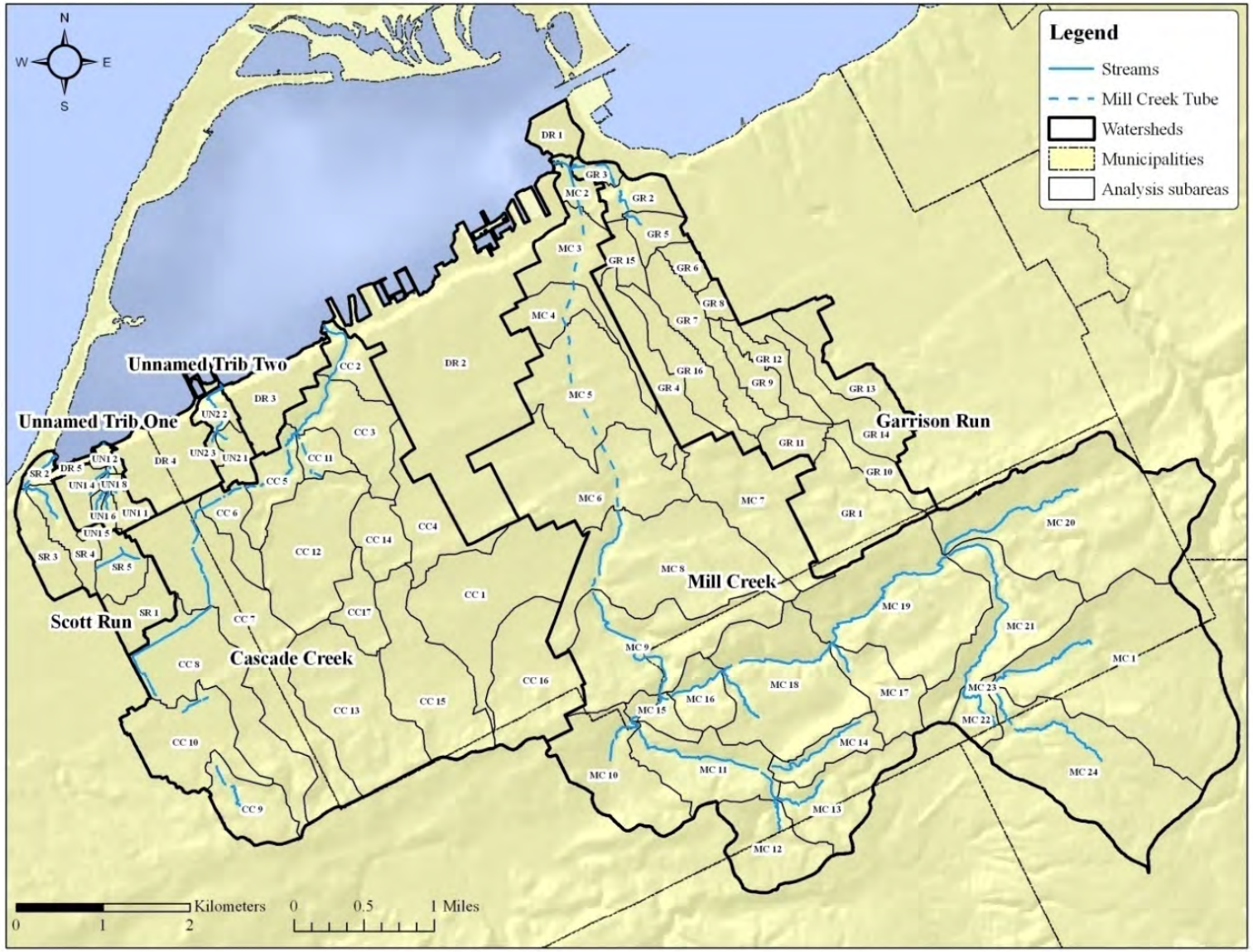
- Protect, restore, and enhance the quality of water resources within the watershed
- Protect, restore, and enhance aquatic diversity and habitat within the watershed
- Reduce the impacts of storm water runoff on water quality and increase the natural filtering capacity of the watershed
- Increase public awareness of and involvement in watershed restoration, protection, and monitoring activities, and incorporate watershed stakeholders into the decision making process.

Developing the Plan: *Data Analysis*

Developing the Plan: *Data Analysis*



Developing the Plan: *Data Analysis*



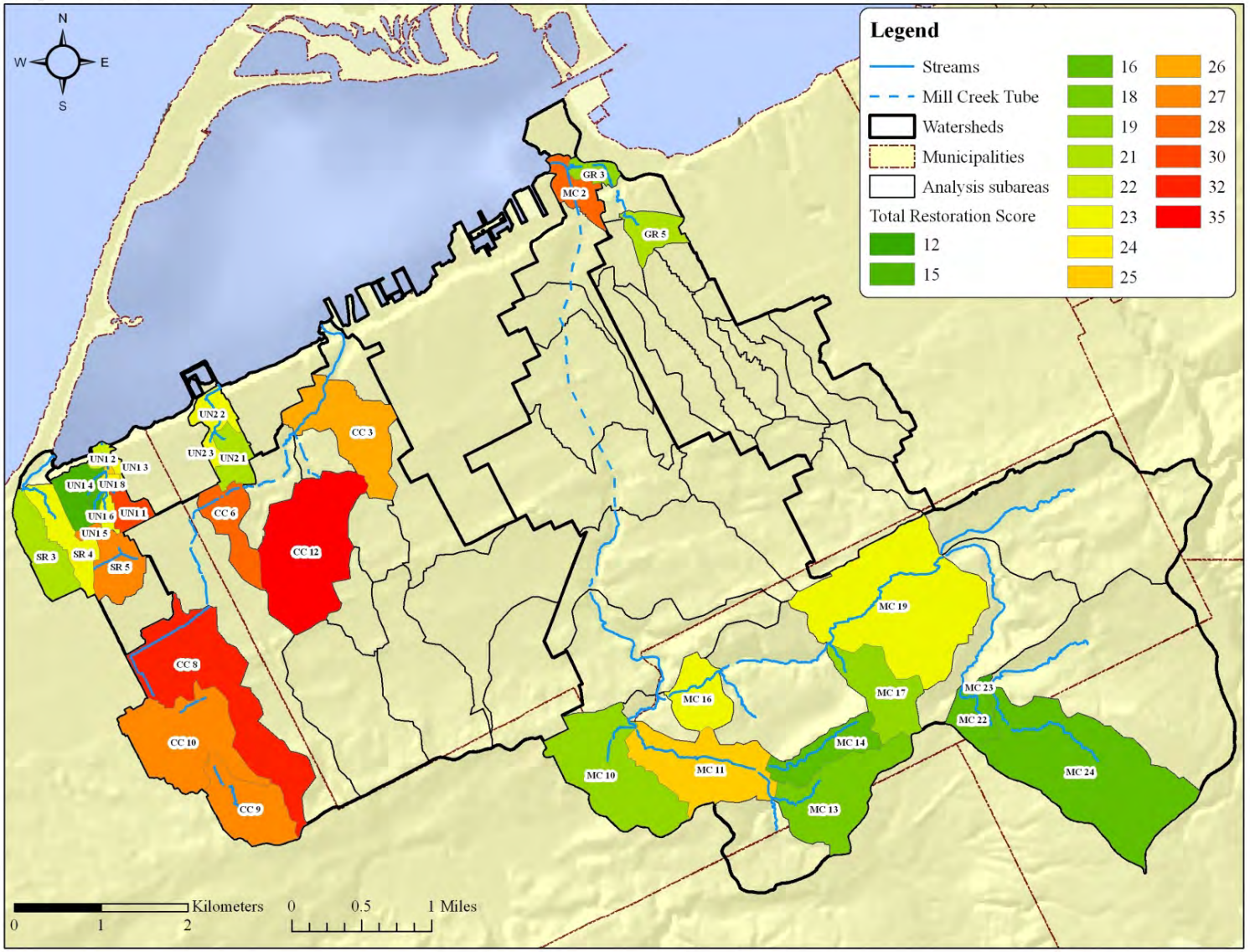
Developing the Plan: *Data Analysis*

Table 1. Criteria used to calculate total restoration scores for the Presque Isle Bay sub-watersheds

	Score			
Parameter	0	1	3	5
Watershed Resource Parameters				
Land use[a]		< 25% high intensity	25-50% high intensity	> 50% high intensity
Impervious cover		0-10%	10-25%	> 25%
Parking lots		0-10%	10-25%	> 25%
Buildings		0-10%	10-25%	> 25%
Floodplains	no floodplain	> 75% vegetation	50-75% vegetated	< 50% vegetated
Wetlands	no wetland			wetland present
100' (30m) buffer	no 100' buffer	> 75% vegetated	50-75% vegetated	< 50% vegetated
Slope		0-15%	15-25%	> 25%
Hydric soils[b]		> 50% Type D	> 50% Type C	> 50% Type B
Watershed Assessment Parameters				
Habitat[c]	no assessment	optimal	sub-optimal	marginal
Oil and grease[d]	no assessment	non-polluted	moderately-polluted	highly-polluted
Zinc[e]	no assessment	< LEL	> LEL	> SEL
Nickel	no assessment	< LEL	> LEL	> SEL
Lead	no assessment	< LEL	> LEL	> SEL
Copper	no assessment	< LEL	> LEL	> SEL
Cadmium	no assessment	< LEL	> LEL	> SEL
Fish (IBI)[f]	no assessment	acceptable		impaired
Macroinvertebrate[g]	no assessment	fair/slightly degraded	poor	very poor/minimal biological diversity

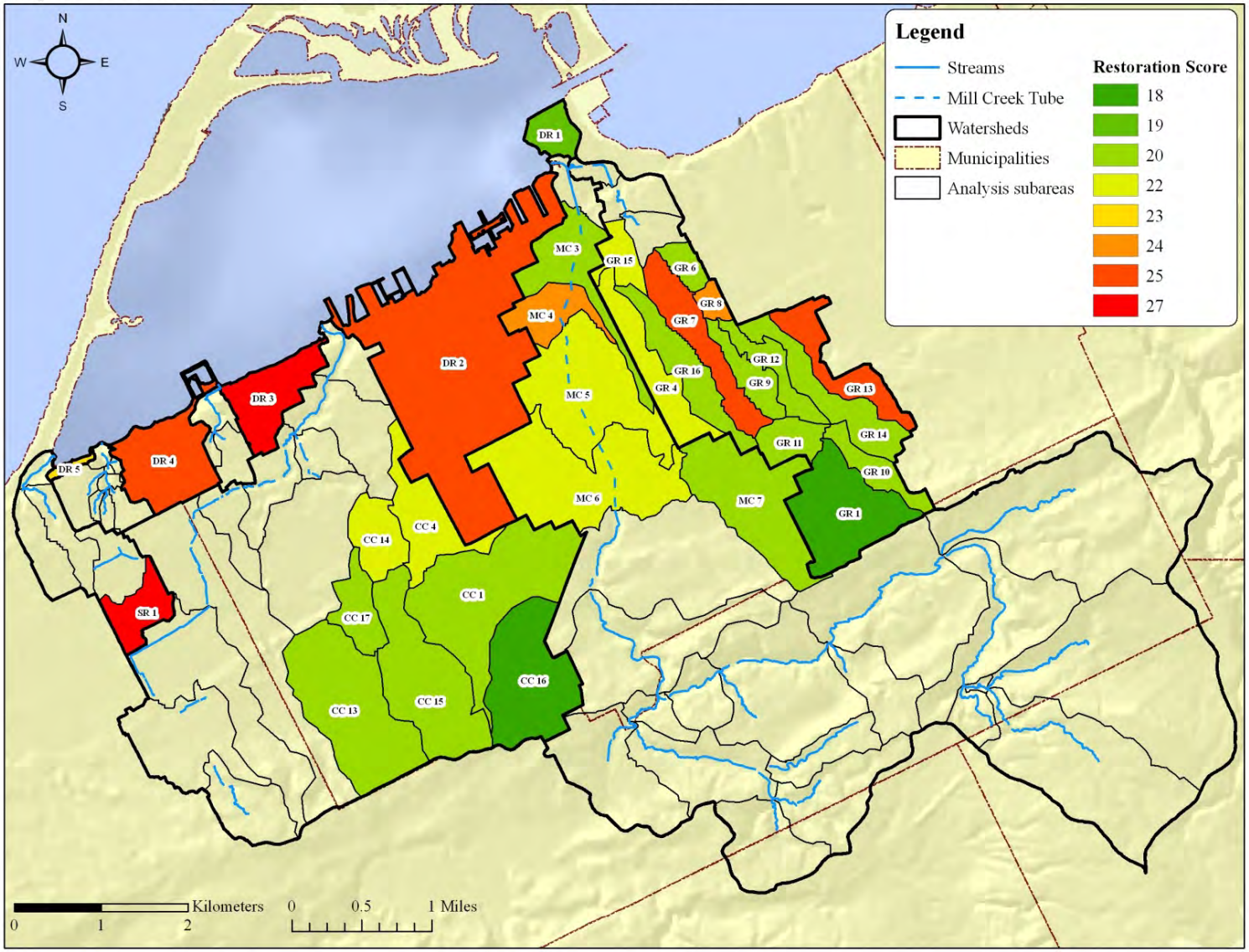
Developing the Plan: *Data Analysis*

Map 49: Total restoration scores for the subareas assessed under Scenario 1



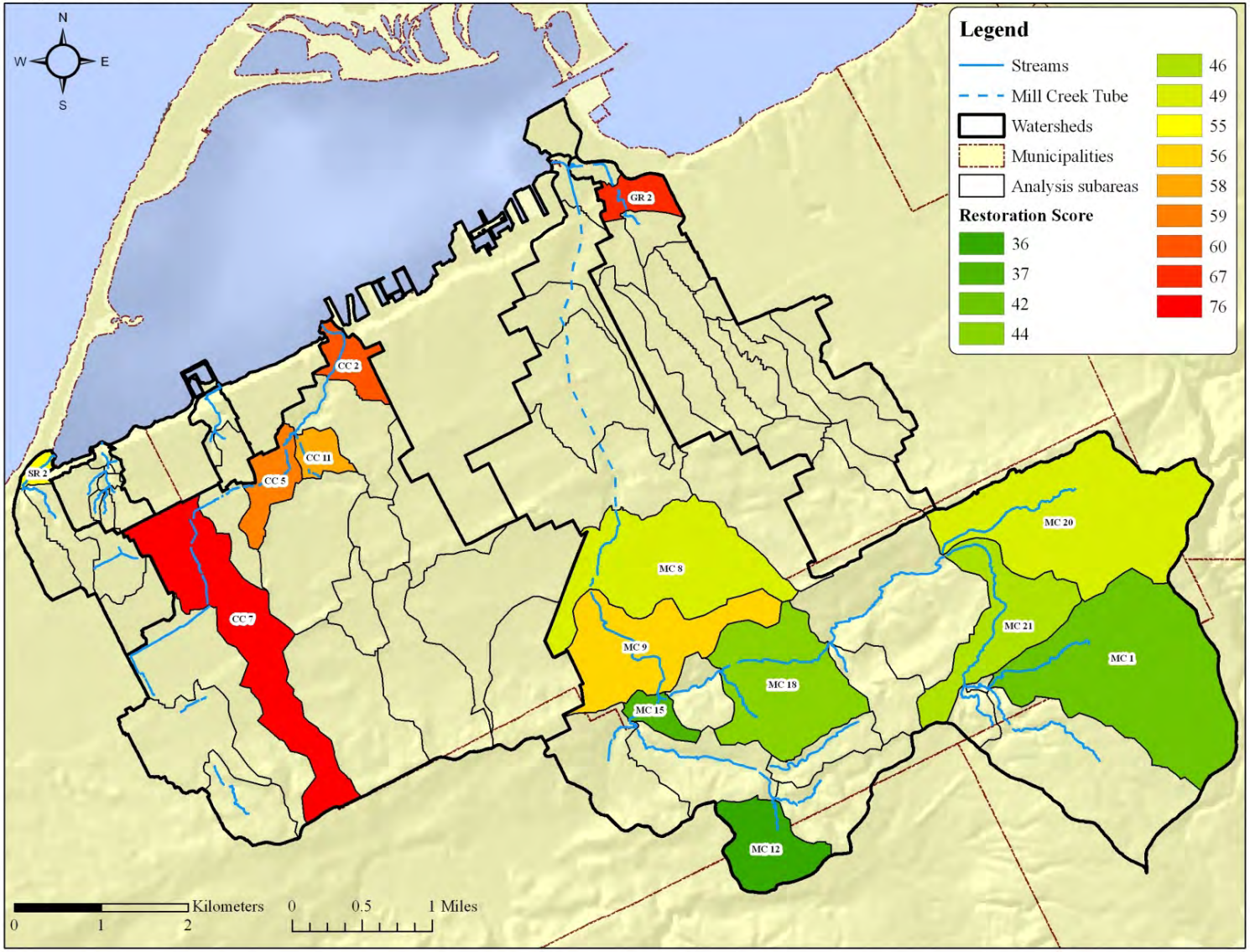
Developing the Plan: *Data Analysis*

Map 50: Total restoration scores for the subareas assessed under Scenario 2



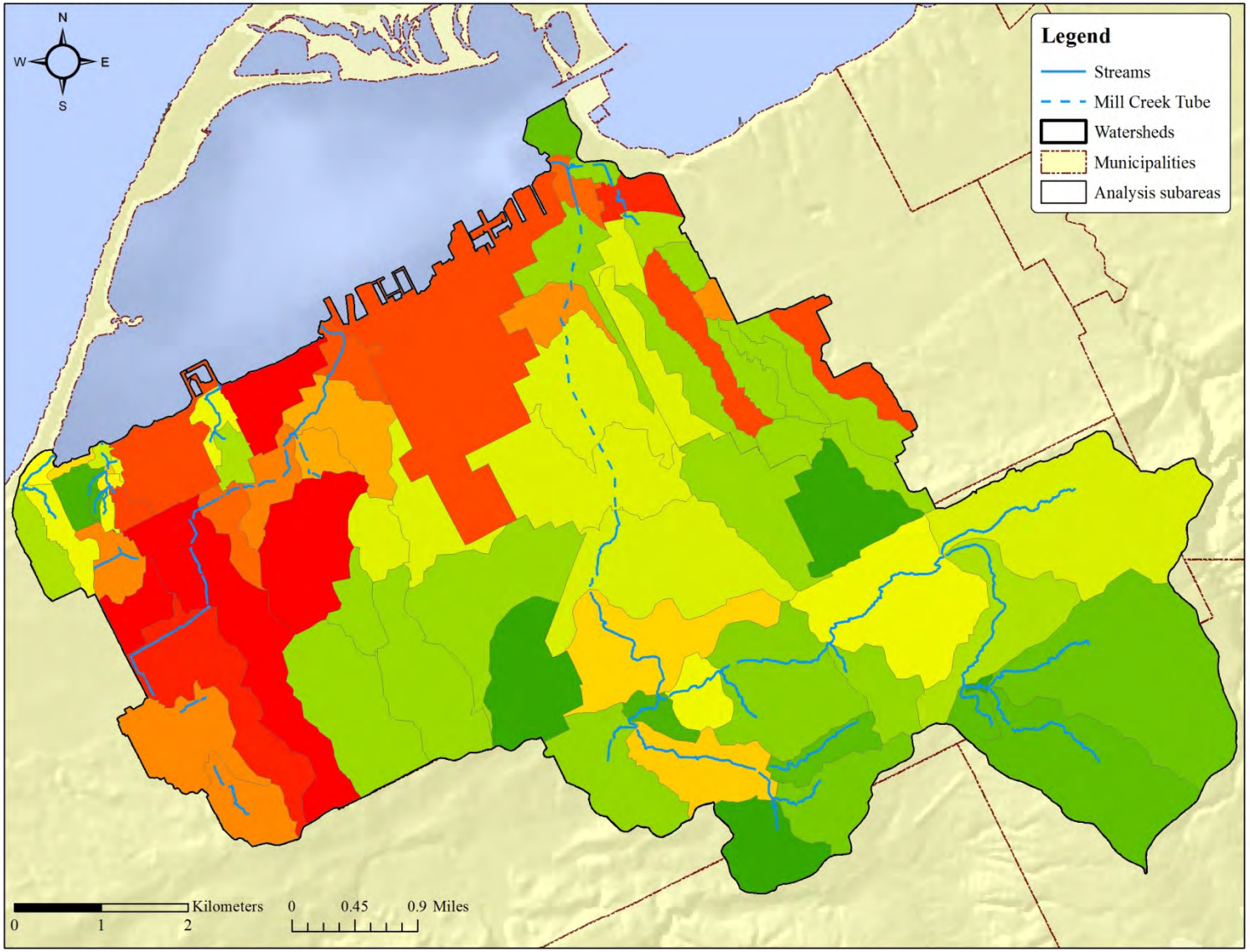
Developing the Plan: *Data Analysis*

Map 51: Total restoration scores for the subareas assessed under Scenario 3



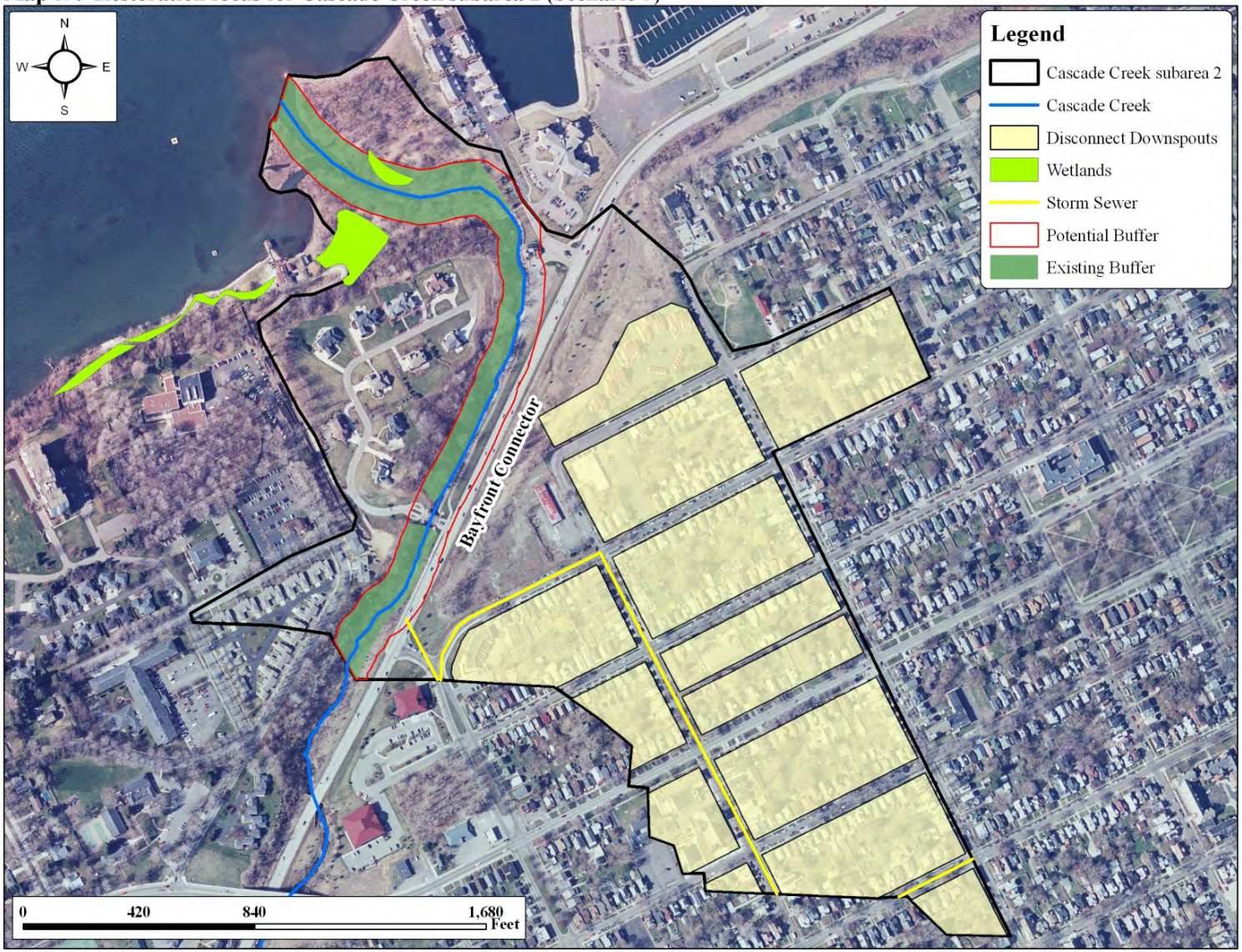
Developing the Plan: *Data Analysis*

Total restoration scores: All three scenarios combined



Developing the Plan: *Recommendations*

Map 59: Restoration focus for Cascade Creek subarea 2 (Scenario 3)



Developing the Plan: *Recommendations*

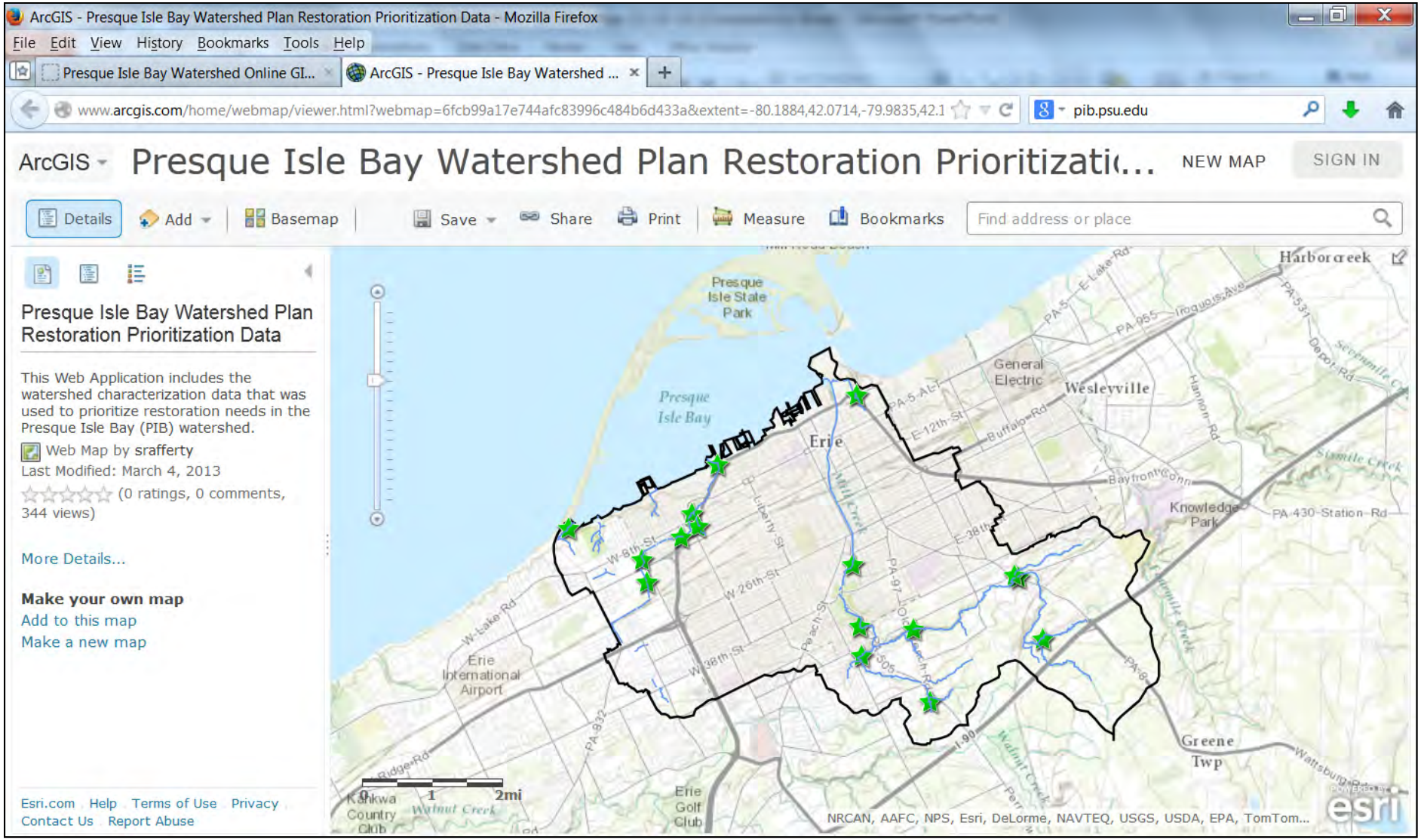
Table 26. Restoration recommandations (*Scenario 3*)

Subarea	Restoration Score	Restoration Action										
		Reestablish fish communities	Reestablish macro community	Reduce chemicals in stream-bed sediment	Stabilize highly erodible stream banks	Restore and expand riparian buffers	Restore and expand wetlands	Remove unused impervious surfaces	Disconnect downspouts from storm sewer system	Install raingardens	Install oil/grit separators	Incorporate BMPs in future development
MC 12	36	X		X					X	X		X
MC 15	37			X					X	X		
MC 1	42			X			X		X	X	X	X
MC 18	44	X		X			X		X	X		X
MC 21	46		X	X			X		X		X	X
MC 8	49		X	X	X	X	X	X	X	X		
MC 20	49			X			X		X	X		X
SR 2	55	X	X	X	X	X	X				X	
MC 9	56	X		X	X	X	X		X	X		
CC 11	58		X	X	X	X		X	X		X	
CC 5	59	X	X	X	X	X	X		X	X		

Implementing the Plan: *10-Year Strategy*

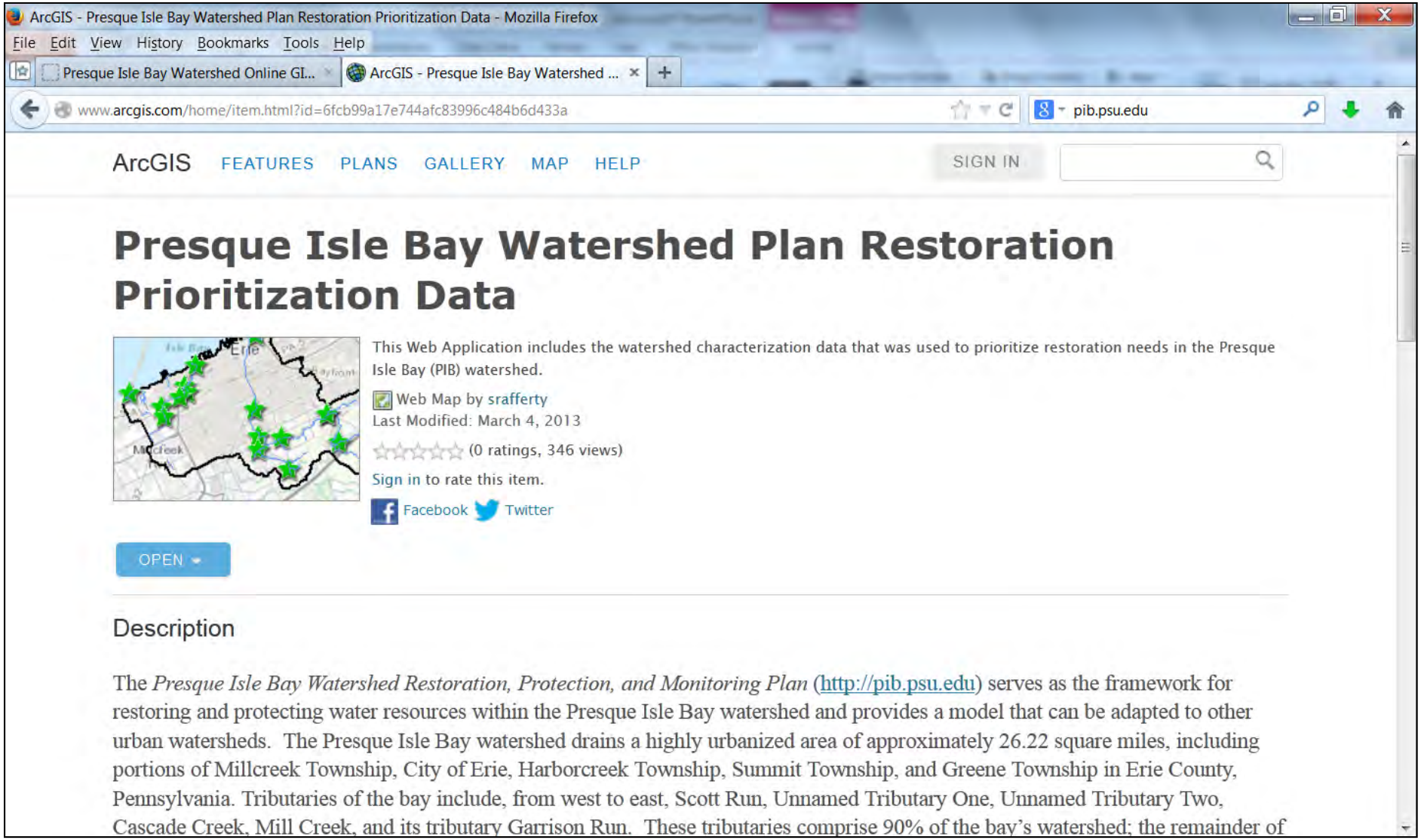
Action	Partners	Year									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Conduct a watershed-wide physical, chemical, and biological assessment as outlined in *Section 7.4*	PASG, PFBC, DEP, ECDH, RSC, Gannon , Penn State Behrend, Mercyhurst		X					X			
Develop TMDLs for Scott Run, Cascade Creek, Mill Creek, and Garrison Run	DEP, ECHD	X	X	X	X						
Identify all historical restoration and protection projects within the Presque Isle Bay watershed	DEP, PFBC, DCNR, ECDH, ECCD, PASG, PLEWA, LERC, PAC, S.O.N.S, Millcreek Twp, City of Erie, ECDP	X	X								
Identify unused impervious surfaces within the Presque Isle Bay watershed	PASG, Mercyhurst, ECDP		X	X							
Identify and correct illicit discharges	DEP, Millcreek Twp, City of Erie, Greene Twp, ECDP		X	X	X	X	X	X	X	X	
Implement restoration recommendations for Cascade Creek subarea 7 (*Scenario 1*)	PASG, DEP, ECCD, PLEWA, Millcreek Twp, City of Erie	X	X	X	X						
Update the *Presque Isle Bay watershed restoration, protection, and monitoring plan*	PASG, DEP, ECCD					X					X

Accessing the Data: *ArcGIS Online*

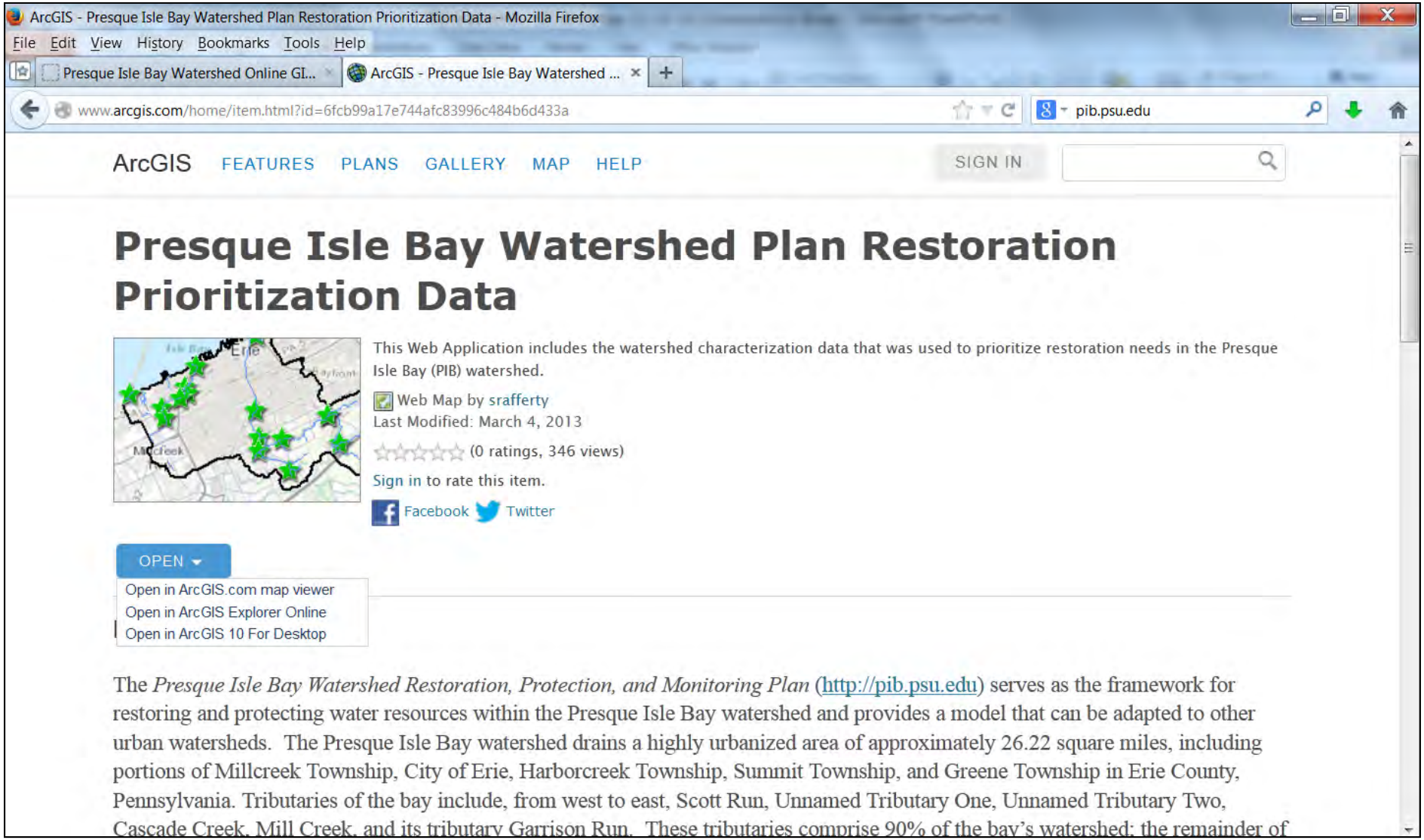


http://pib.psu.edu

Accessing the Data: *ArcGIS Online*



Accessing the Data: *ArcGIS Online*



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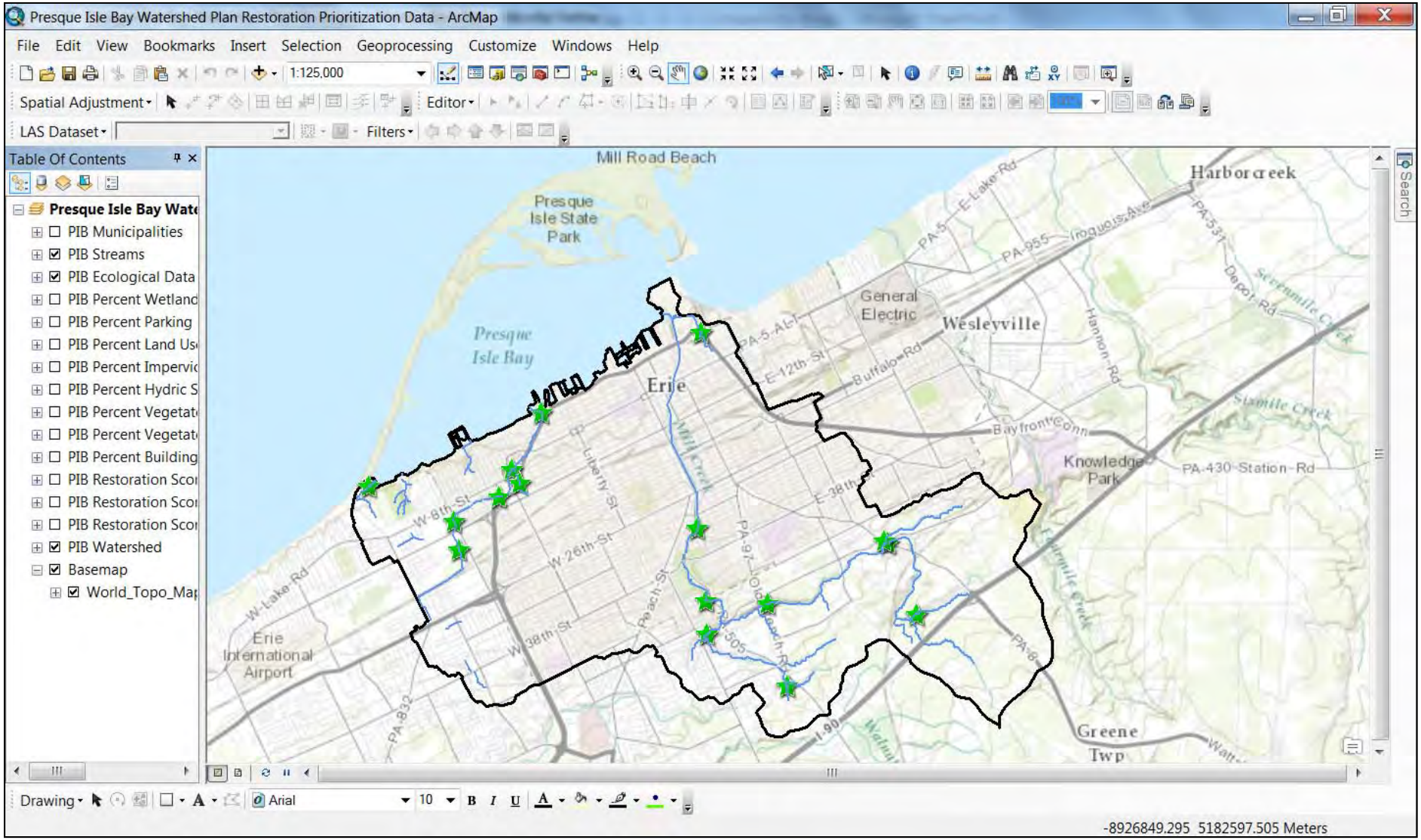

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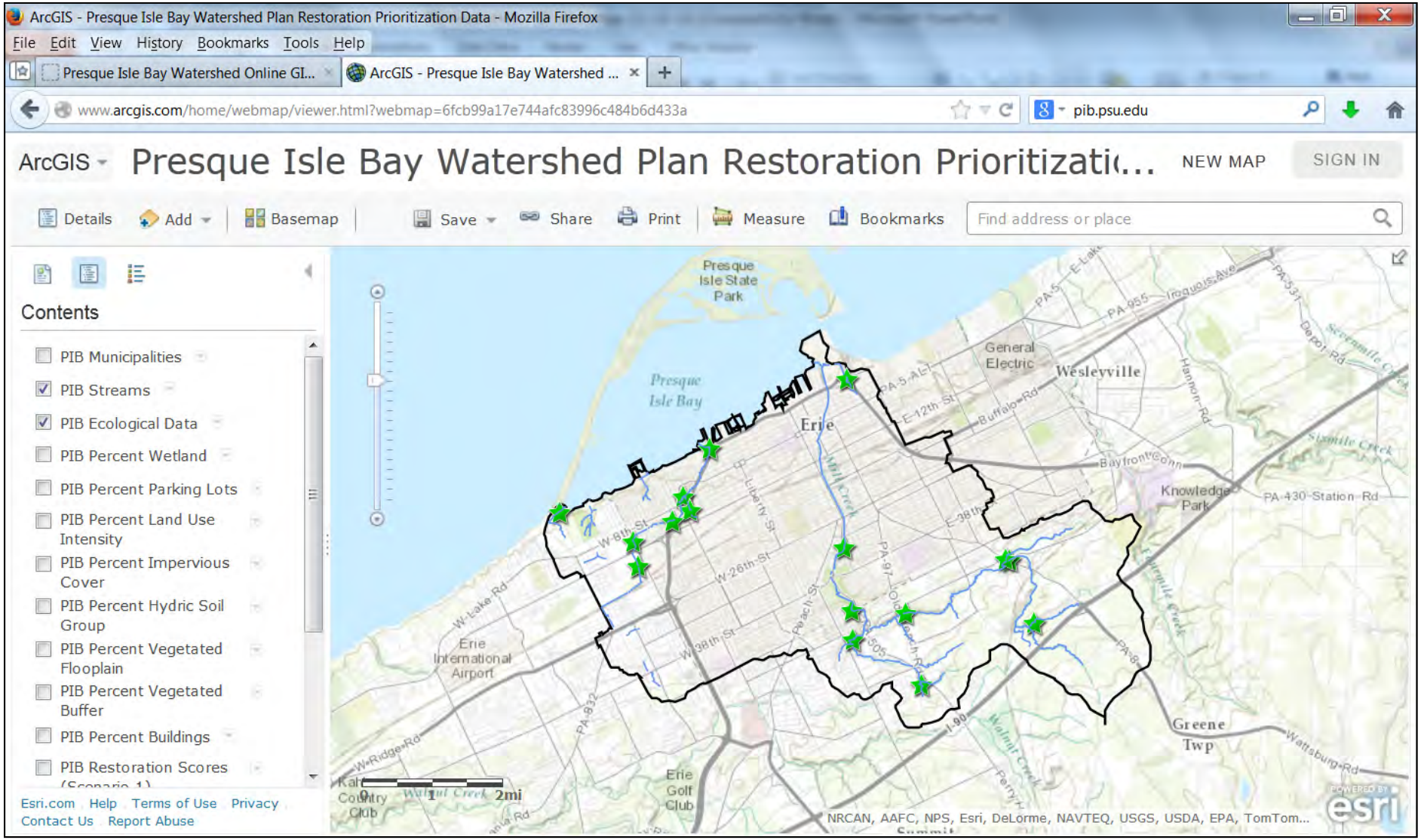

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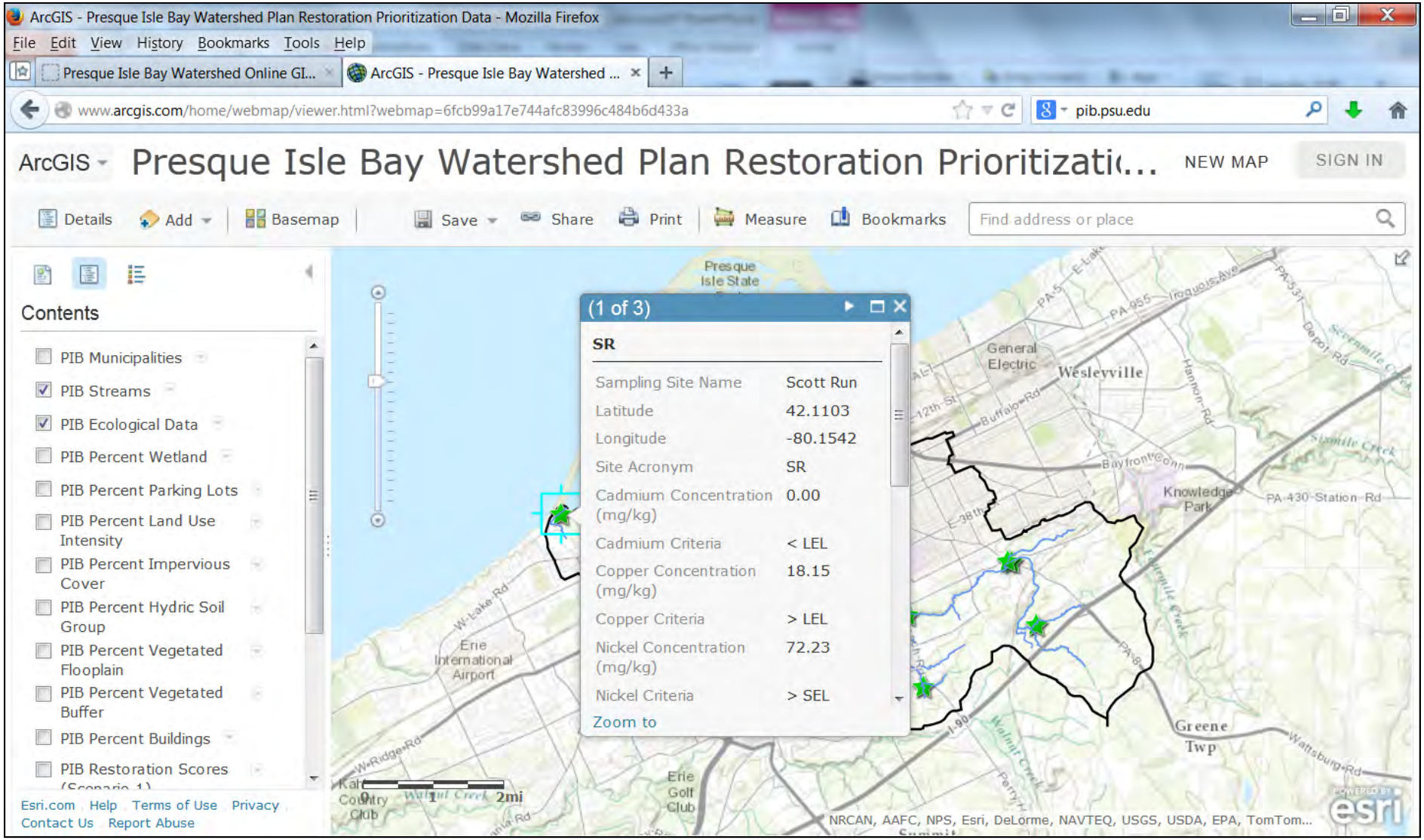

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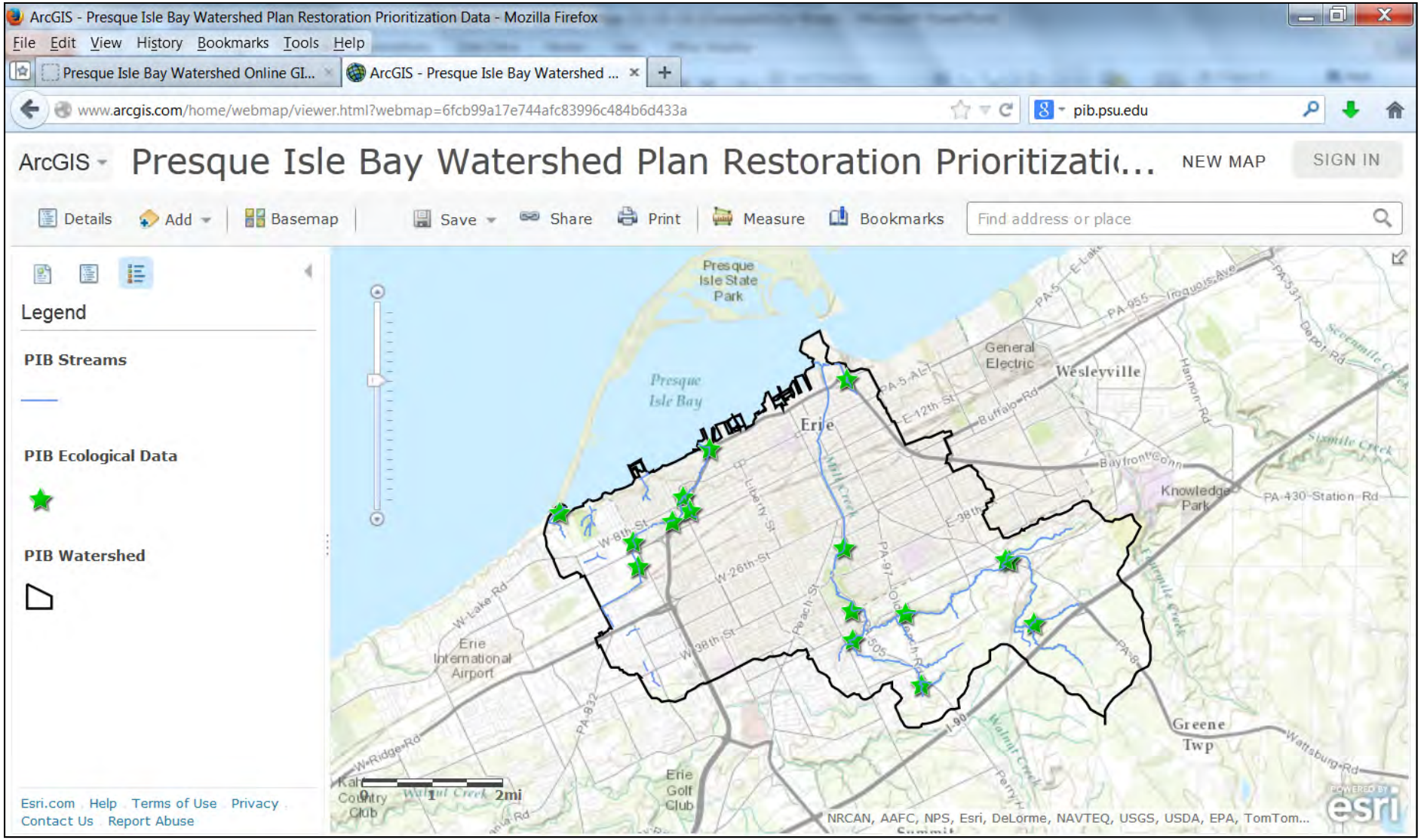

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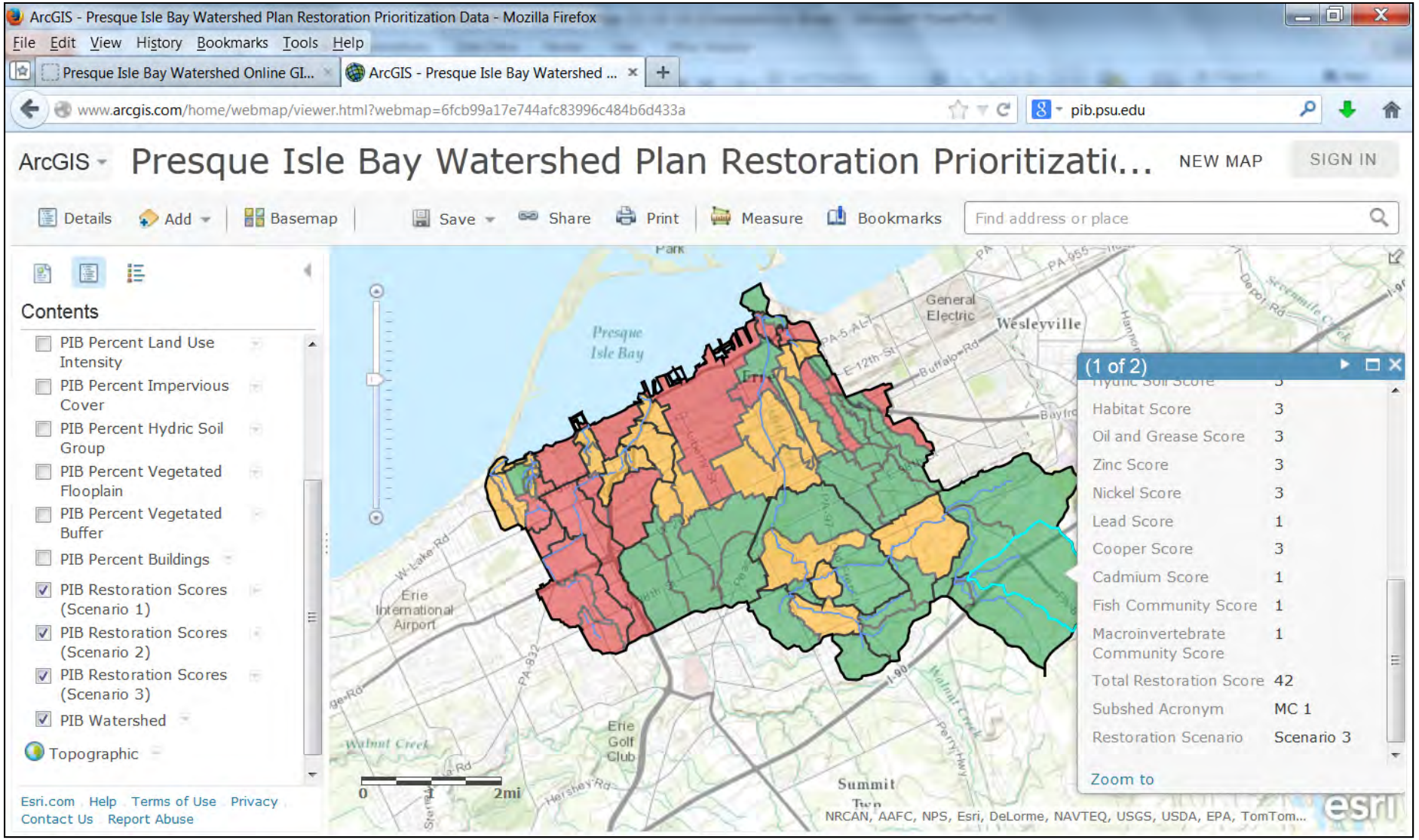

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QUESTIONS

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http://www.paseagrant.org/
http://pib.psu.edu/

WOOLPERT

DESIGN | GEOSPATIAL | INFRASTRUCTURE

GIS: A Tool for Decision Making

Presented by:
David Alvarez CMS Intern, GISP (11152013)

CELEBRATING 100 YEARS

Data Sources

- Woolpert INC
  - Light Detection and Ranging (Lidar)
  - Imagery (RGB, CIR)
  - Impervious Areas
- USGS
  - Water Quality
  - Hydrologic Unit (HUC)
- Erie County
  - Parcel Data (08/08/2013)
- Other Sources
  - Soils (USDA)
  - National Agriculture Imagery Program (NAIP) (USDA)
  - PRISM Dataset (Climate Group Oregon State University)

Data Sources

- PASDA
  - Storage Tank Location
  - Storm water boundaries
  - Public Water Supply
  - Stream Designation (Chapter 93)
  - Municipalities Boundaries
  - Historical Imagery
  - Hospitals
  - Trails (Rails-to-Trails Conservancy)
  - Nonprotectedsites (aquatic sampling sites from the Pennsylvania Aquatic Database (PAD)
  - WaterResources2013_07 (DEP primary facility type related to the Water Use Planning Program)
  - Assess land use at a HUC 12
  - Dams (“Run-of-the-River" dams)

Analyses

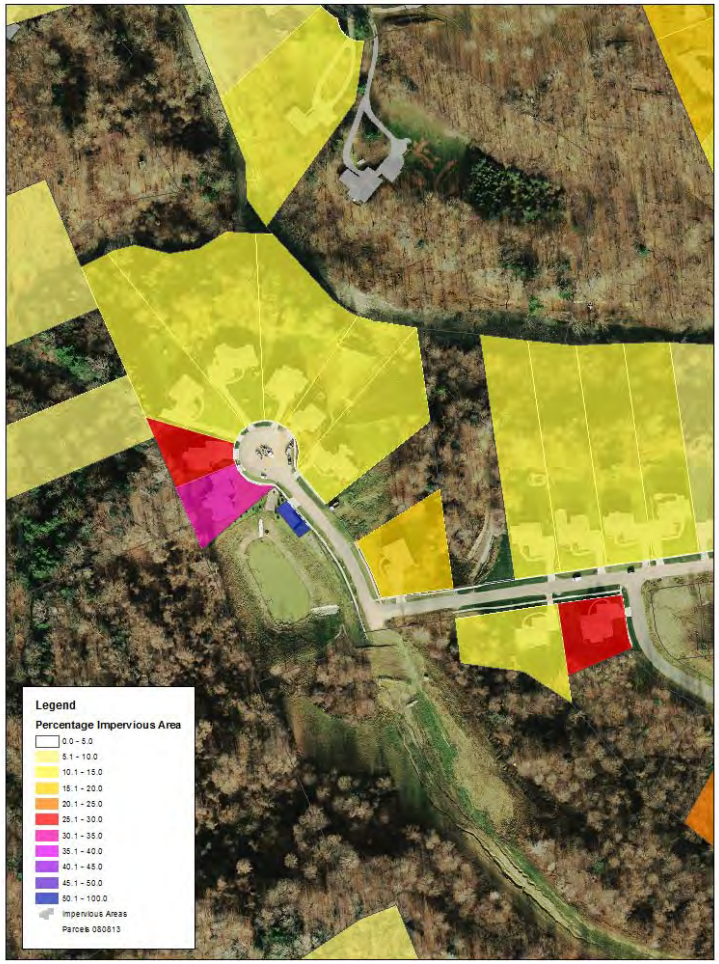
- Watershed Planning
  - Impervious Areas
  - Infiltration Analysis
  - Hillslope Erosion Potential
  - Watershed Delineation
- Change Detection
- Forestry Analysis
- Solar Radiation Analysis
- Transportation
  - Visibility Analysis
- 3D Representation

Impervious areas

- Source Data
  - Lidar 2012
  - Color Infrared (2012)

Impervious Areas

Impervious Areas

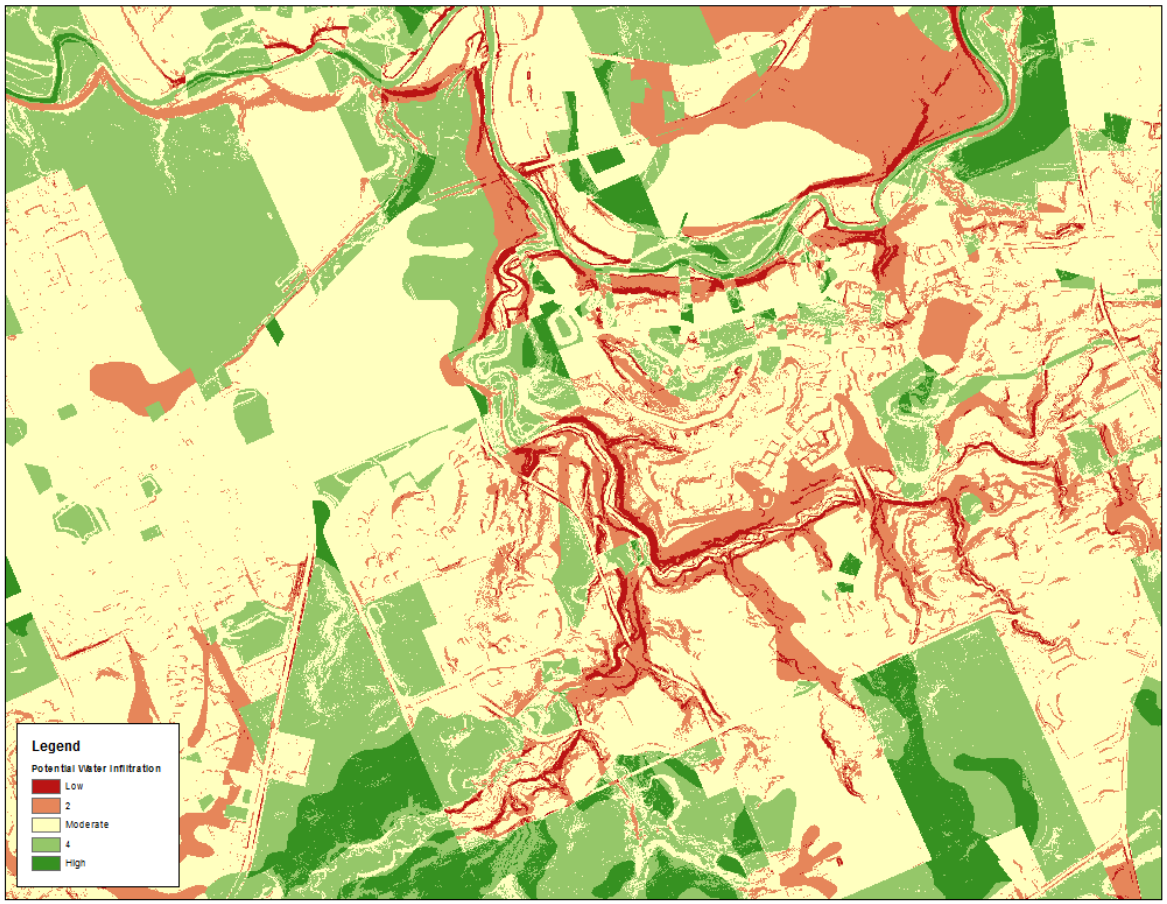


TAXPIN	Parcel Area	Impervious Area	Percentage
33200001003600	70570.66	23.9	0.0
33200001003700	51352.16	6022.6	11.7
33200001003800	49067.49	6641.2	13.5
33200001003900	47120.37	5355.4	11.4
33200003000200	31266.54	4585.0	14.7
33200003000300	19067.15	5328.5	27.9

Infiltration Analysis

- Source Data
  - Lidar 2012
    - Digital Terrain Model (DEM) Bare-Earth
      - Slope
  - Impervious Area
  - Land Use
    - Parcel Data (08/08/2013)
  - Soils (USDA)
    - Hydrologic Soil Group

Infiltration Analysis



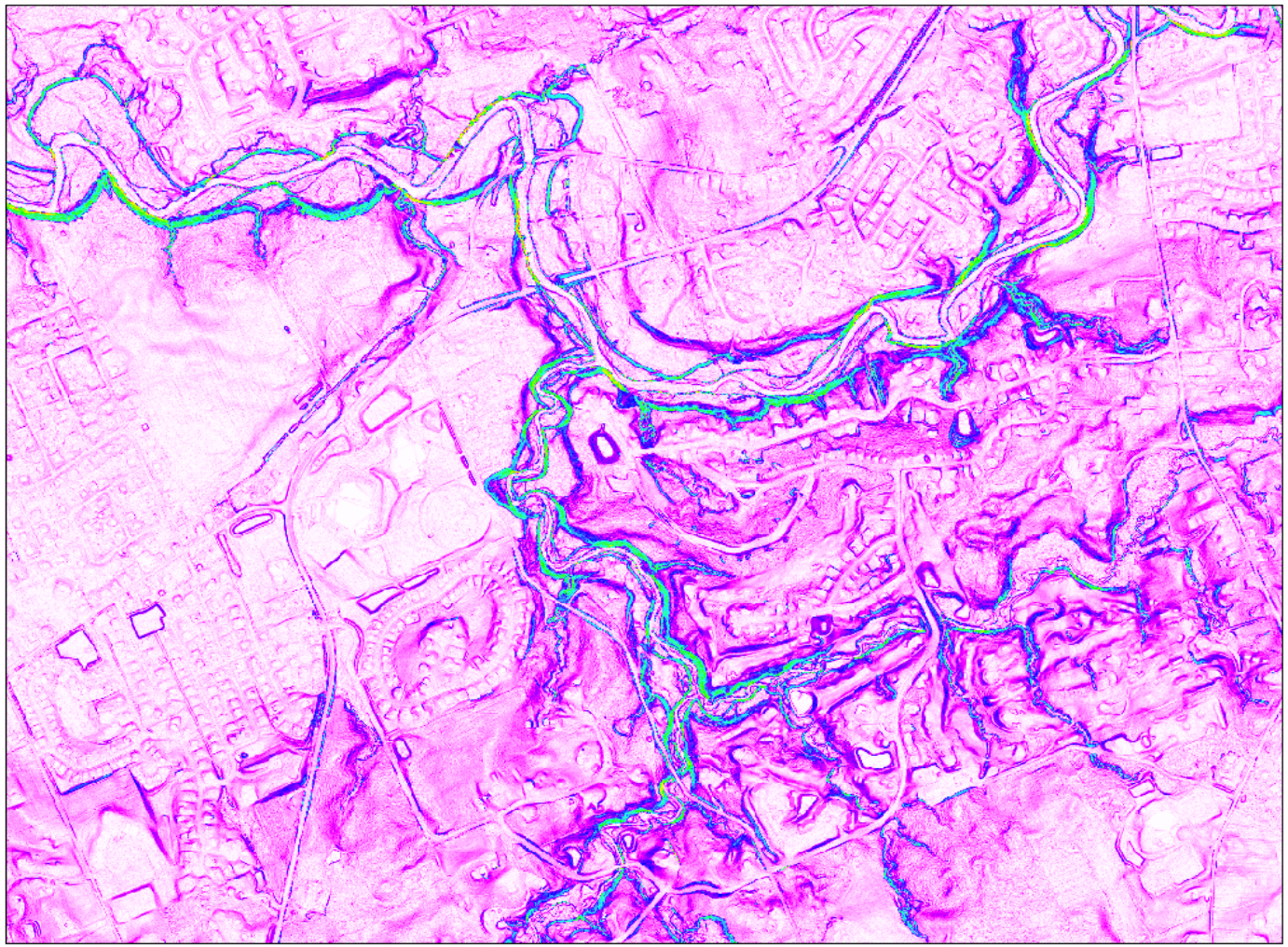
Hillslope Erosion Potential (HEP)

- Source Data
  - Lidar 2012
    - Digital Terrain Model (DEM) Bare-Earth
      - Slope
  - Mean Annual Precipitation

  - HEP = Slope * Mean Annual Precipitation

HEP is an index that reveals spatial differences in erosion, but values generated are relative and not actual bedrock erosion rates or stream power.

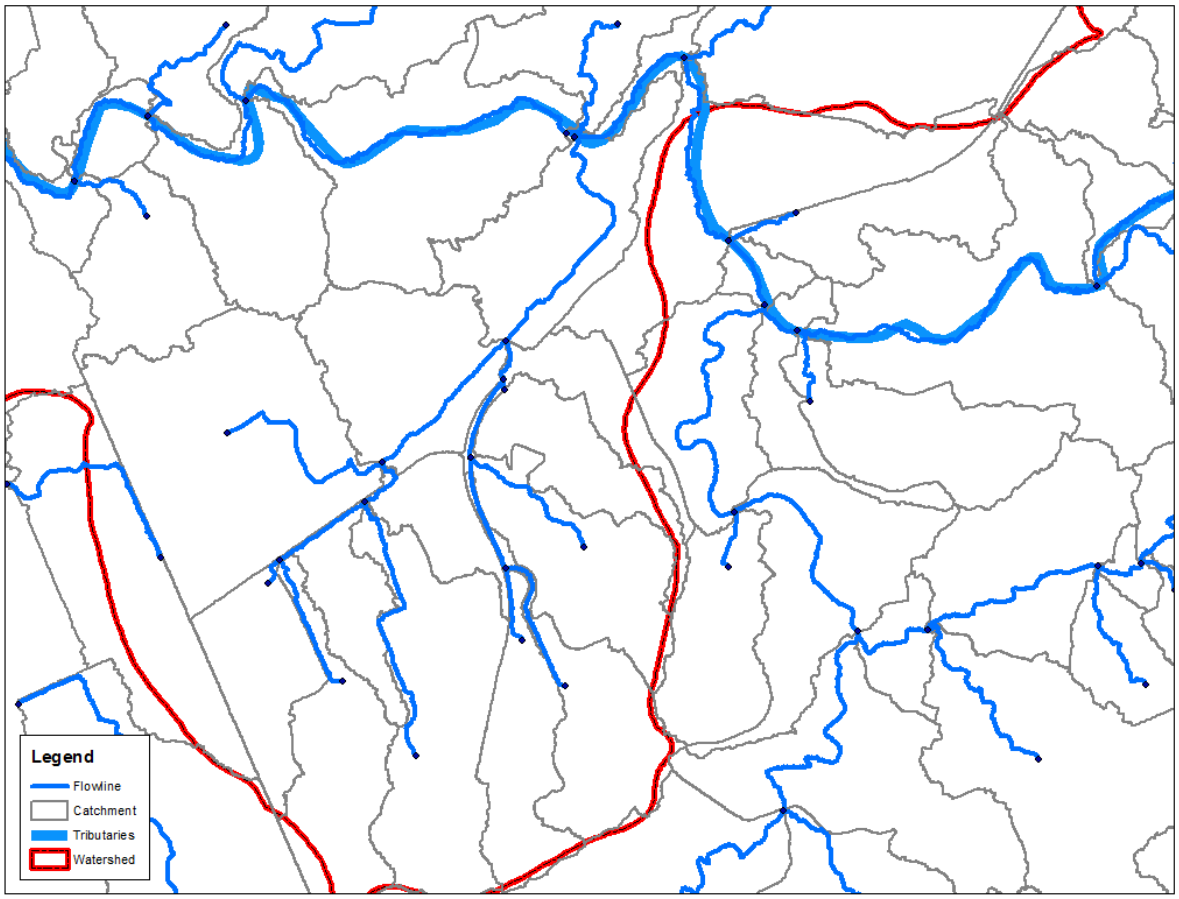
Hillslope Erosion Potential (HEP)



Watershed Delineation

- Source Data
  - Lidar 2012
    - Digital Terrain Model (DEM) Bare-Earth

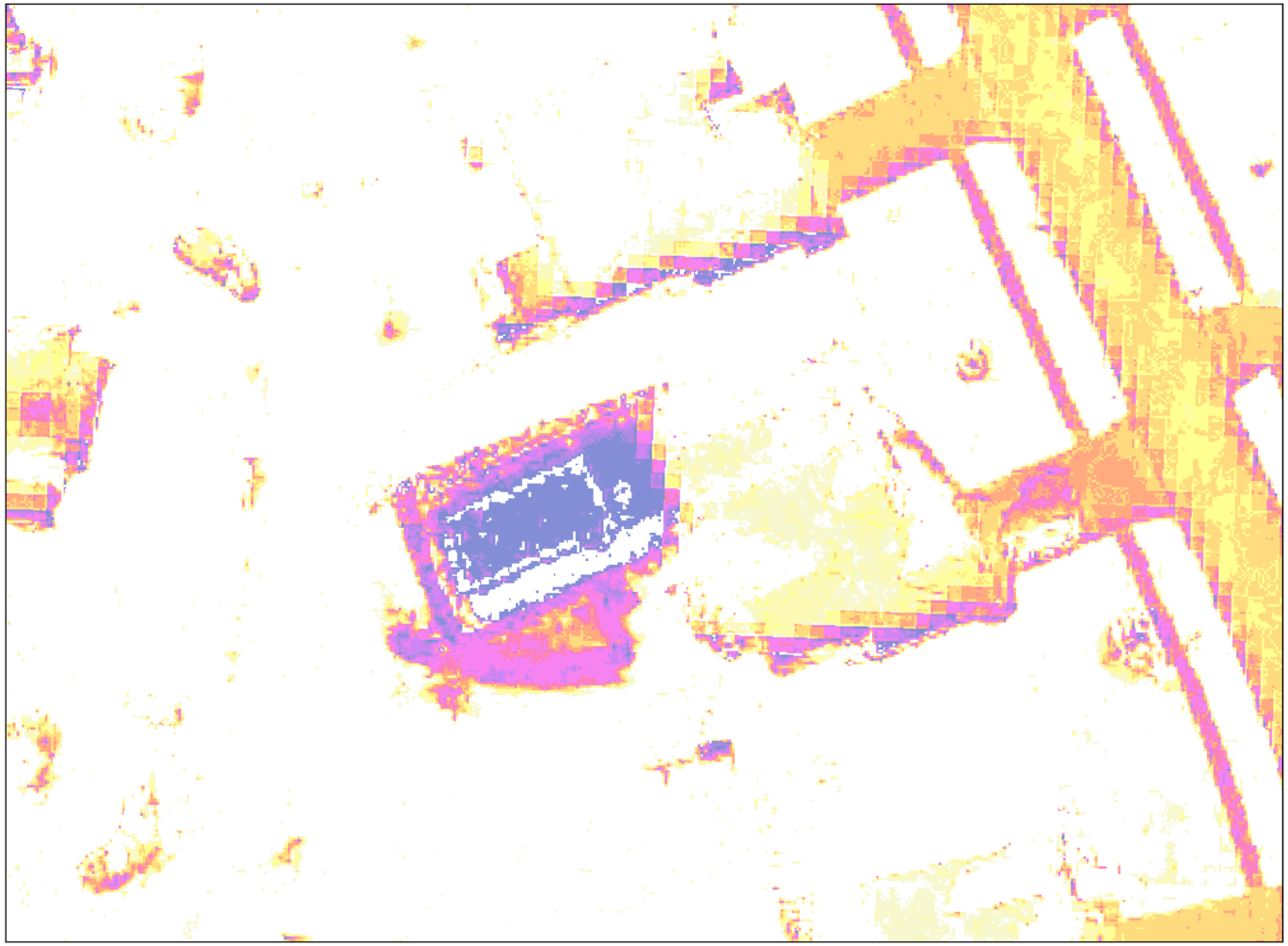
Watershed Delineation



Change Detection

- Source Data
  - Woolpert (CIR) 2012
    - Leaf Off (Autumn)
  - Lidar 2012
  - NAIP (CIR) 2010
    - Leaf On (Spring)
  - Lidar 2008

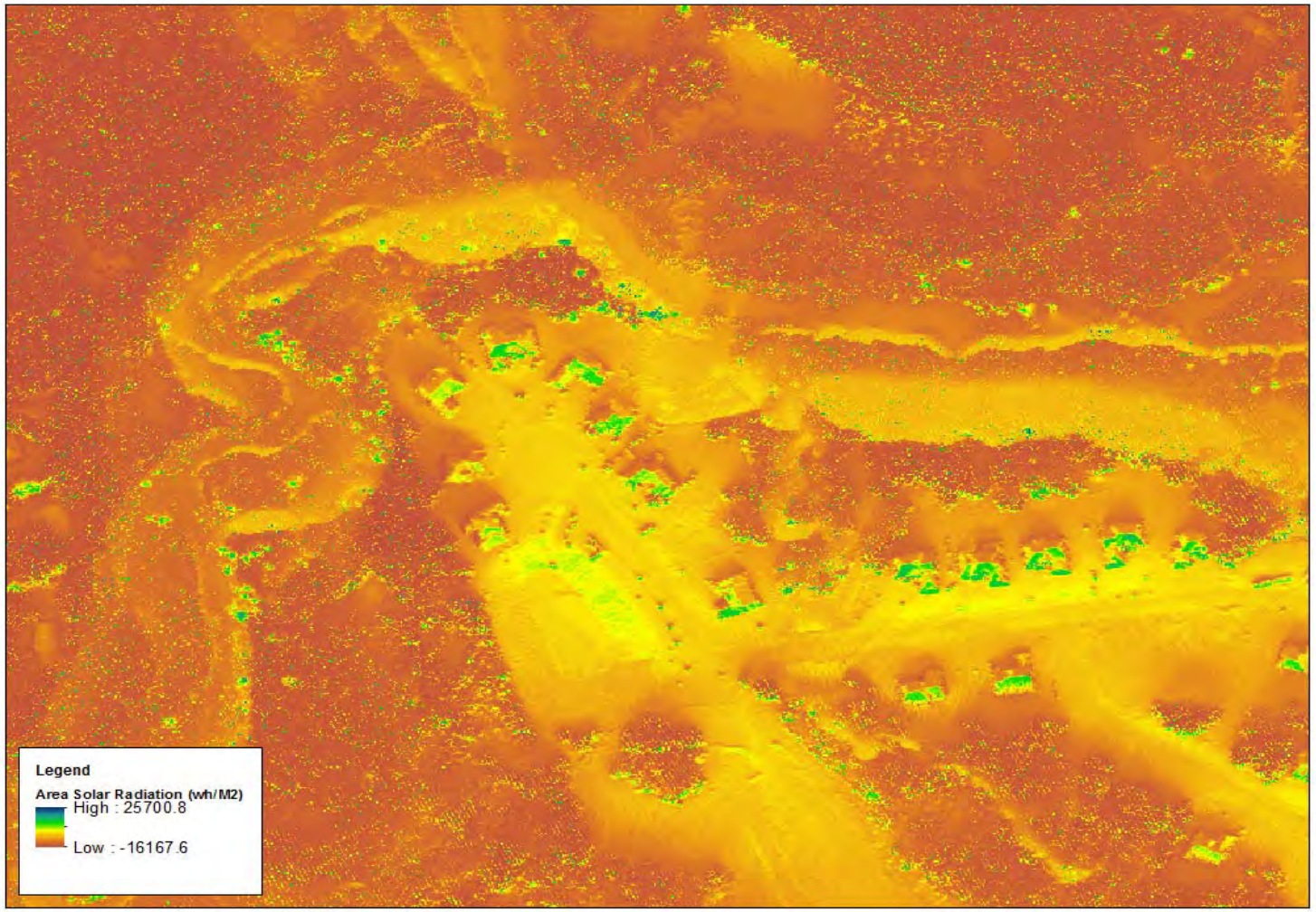
Change Detection



Solar Radiation Analysis

- Source Data
  - Lidar 2012

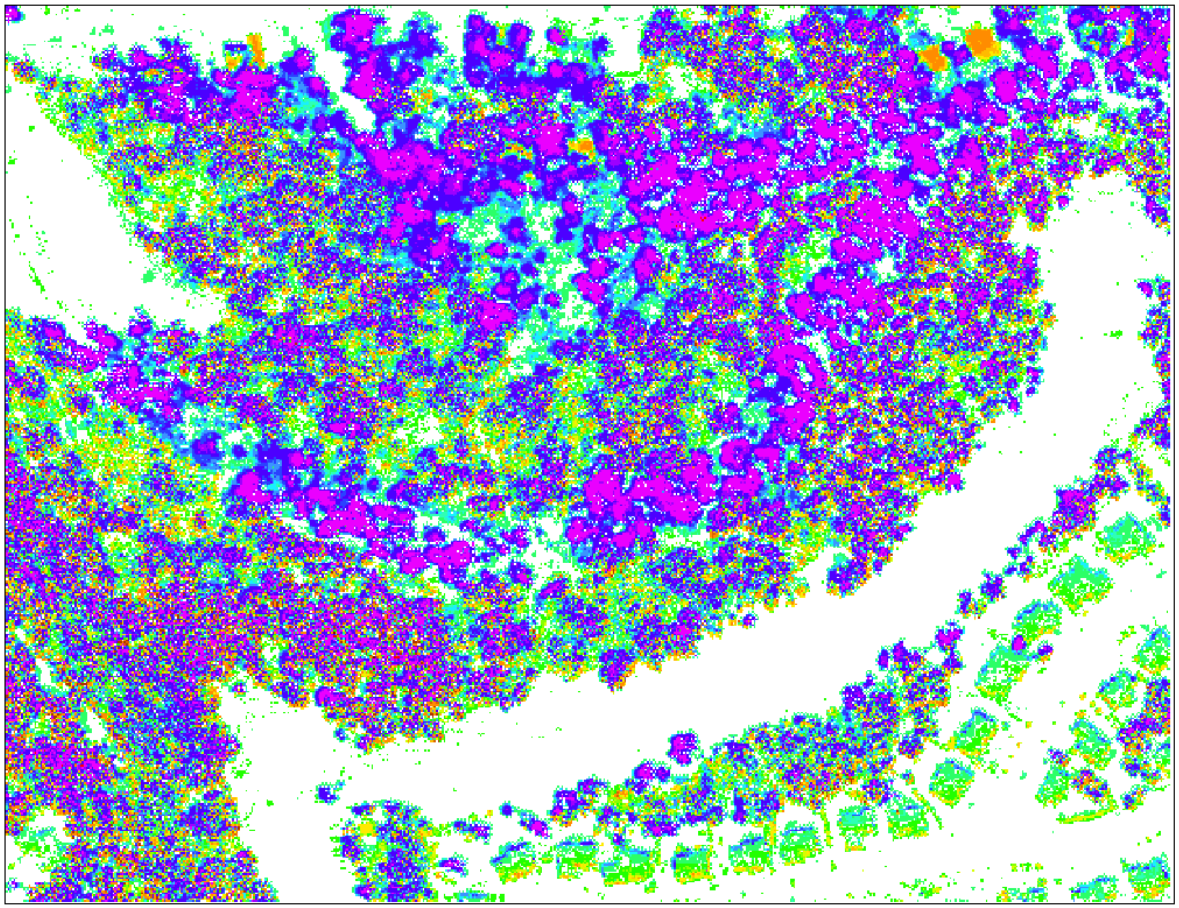
Solar Radiation Analysis



Forestry Analysis

- Source Data
  - Woolpert (CIR) 2012
  - Lidar 2012
  - NAIP (CIR) 2010
  - Lidar 2008

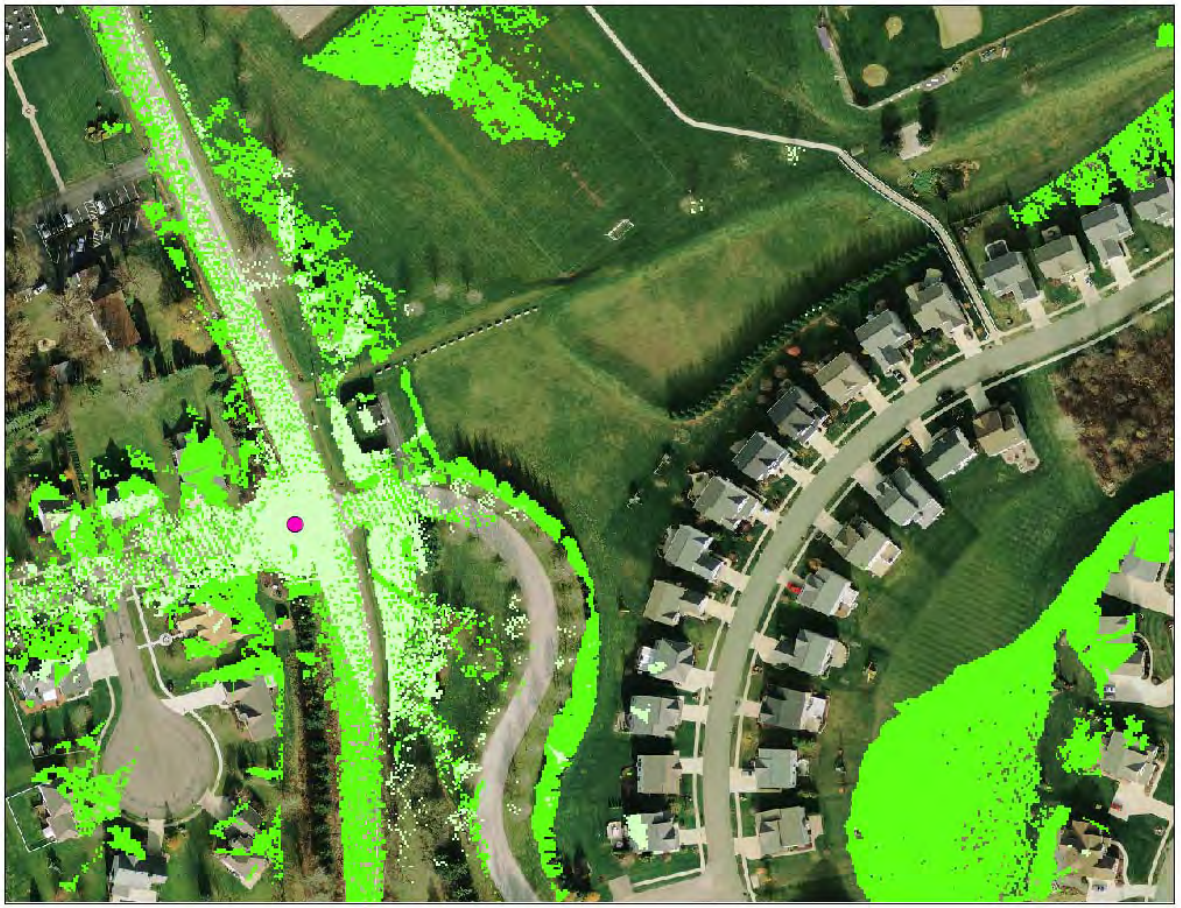
Forestry Analysis/Riparian Buffers



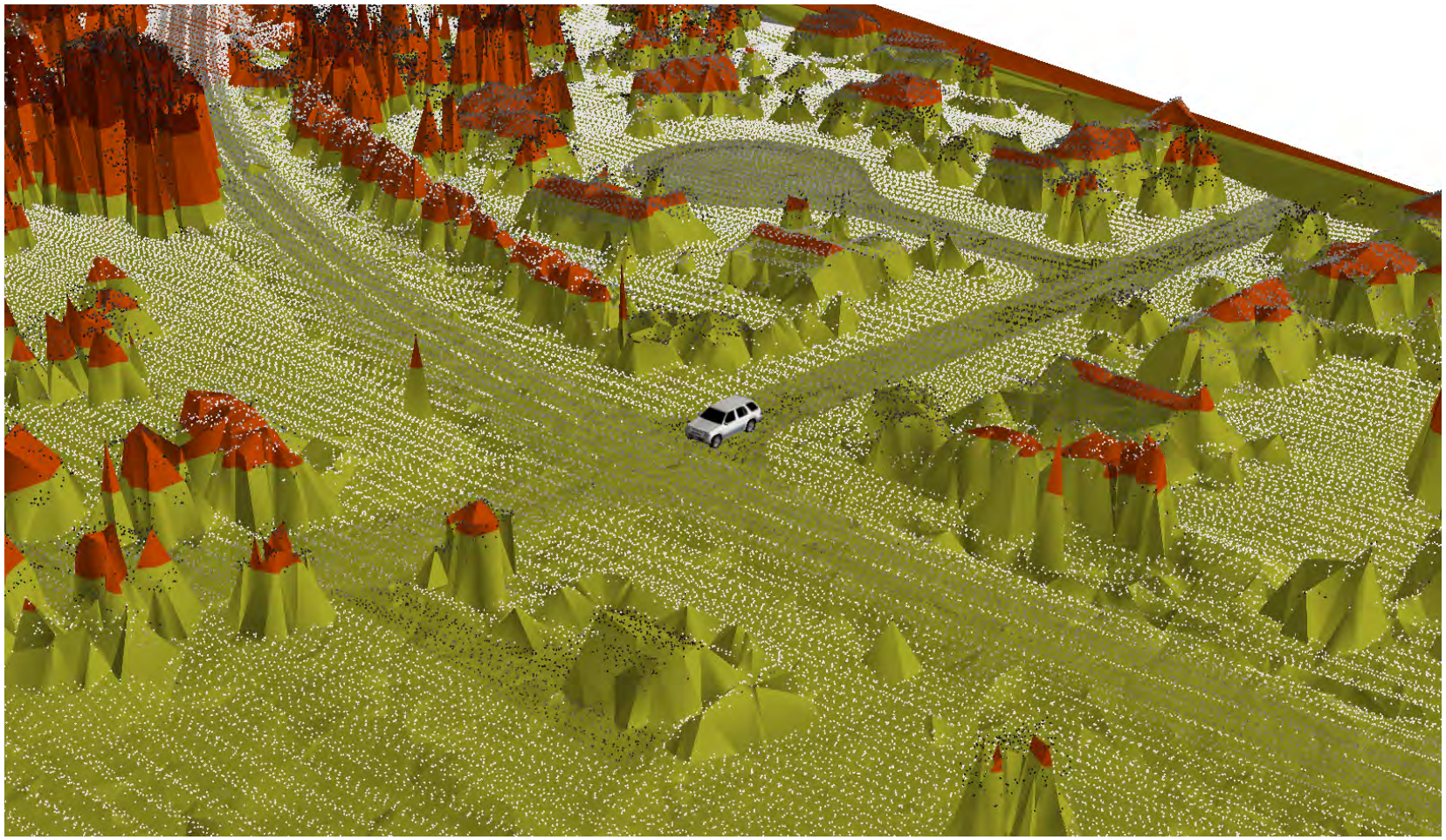
Visibility Analysis

- Source Data
  - Lidar 2012
    - Digital Terrain Model (DEM) Bare-Earth
    - Digital Surface Model (DSM) Bare-Earth Plus Above Ground Information (trees and man made structures)

Visibility Analysis



Visibility Analysis

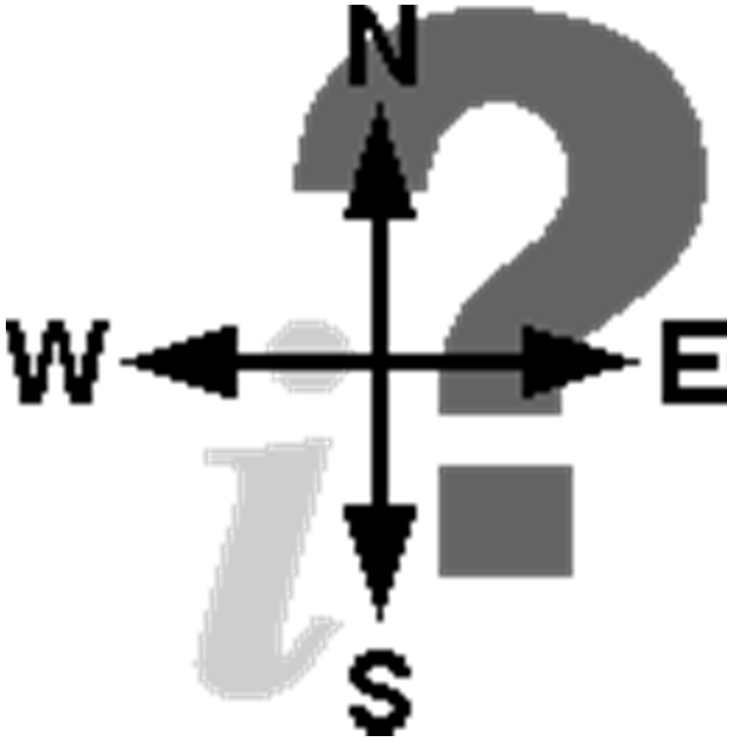


3D Representation

- Source Data
  - Lidar 2012
    - Digital Terrain Model (DEM) Bare-Earth
    - Digital Surface Model (DSM) Bare-Earth Plus Above Ground Information (trees and man made structures)
  - Lidar 2088
    - DEM
    - DSM
  - RGB Imagery 2012

3D Representation

DEMO



David.alvarez@woolpert.com

Using Geographic Information Systems (GIS) for Municipal Operations and Watershed Planning

Workshop Evaluation

We value your opinions! Please complete the following anonymous survey.

Using GIS for Municipal Operations and Watershed Planning	**Quality Rating**					
General						
How did you hear about this workshop?	Email	NIE	Flyer	Website	Other	
Do you currently use GIS software for your job?	Yes		No			
If NO, would you like to use GIS software?	Yes		No			
Does your municipality, company, agency, or organization currently use GIS software?	Yes		No		Unsure	
If YES, what is the primary use?						
Do you support the establishment of storm water utilities or dedicated revenue to offset the cost of storm water infrastructure?	Yes		No		Unsure	
Do you feel GIS is an important tool for making decisions regarding municipal operations?	Yes		No		Unsure	
Do you feel GIS is an important tool for making decisions regarding natural resource protection?	Yes		No		Unsure	
Do you feel GIS is an important tool for watershed planning?	Yes		No		Unsure	
Presentations						
Presentation topics were informative?	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Do Not Know
The length of the workshop was sufficient?	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Do Not Know
Have you learned NEW information?	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Do Not Know
How would you rate the overall satisfaction of this workshop?	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	Do Not Know

Please continue to questions on backside of page! Thank You!

Using GIS for Municipal Operations and Watershed Planning	**Quality Rating**					
Future Behavior						
Do you plan on utilizing the information you learned today?	Yes		No		Unsure	
If Yes, what information?						
Are you a municipal employee?	Yes		No		Unsure	
If YES, do you support storm water utilities?	Yes		No		Unsure	
If NO, do you support storm water utilities?	Yes		No		Unsure	
If you are a municipal employee, would your municipality be interested in funding for storm water utility feasibility studies?	Yes		No		Unsure	
Would you recommend this workshop to others?	Yes		No		Unsure	
Would you be interested in future GIS-related trainings and workshops?	Yes		No		Unsure	
If YES, what topics are you interested in?						
Additional Comments						
What, if any, GIS components or functions would be valuable to your organization or municipality? Would you be interested in subscribing to an affordable (less than $250-500 license per year), web-accessible, semi-individualized, and tailored GIS data clearinghouse? Please provide any additional feedback on the Workshop:						

Using Geographic Information Systems (GIS) for Municipal Operations and Watershed Planning

Workshop Evaluation Results

48 Participants

GENERAL

How did you hear about this workshop (46)?

Email:	40 (87.0%)
NIE:	0
Flyer:	0
Website:	0
Other:	6 (13.0%)

Do you currently use GIS software for your job (48)?

Yes:	38 (79.2%)
No:	10 (20.8%)

If NO, would you like to use GIS software (10)?

Yes:	9 (90.0%)
No:	1 (10.0%)

Does your municipality, company, agency, or organization currently use GIS software (45)?

Yes:	37 (82.2%)
No:	6 (13.3%)
Unsure:	2 (4.5%)

If YES, what is the primary use?

- Zoning/roads.
- Visualization, prioritization, analysis.
- Zoning.
- Storm sewer and water.
- Map making, spatial analysis, data reference.
- To support municipalities in the region and provide access to GIS technology.
- Urban tree canopy, stormwater map.
- Parcel mapping.
- Truck route mapping, project mapping.
- Modeling, mapping.
- Identifying non-point sources of nutrient pollution from run-off stormwater in watersheds.
- Planning, etc.
- Land trust – property analysis and record keeping; watershed wide public education and outreach.
- Floodplain, tax parcel, oil/gas mapping.
- Sanitary sewer system maintenance.
- Municipal maps.
- Environmental management.
- Analysis.
- Base mapping and site analysis.

- Research projects.
- Public usage.
- Educational.
- Zoning, floodplain.
- Planning; analysis.
- Zoning; planning; general maintenance of municipal operations.
- Land use; emergency services planning; assessment.
- Zoning and utility mapping.
- Conservation planning; information/database management.
- Using it to check resources for regulatory compliance (Section 404 CWA) and determining unauthorized fills.

Do you support the establishment of storm water utilities or dedicated revenue to offset the cost of storm water infrastructure (47)?

Yes:	33 (70.2%)
No:	6 (12.8%)
Unsure:	8 (17.0%)

Do you feel GIS is an important tool for making decisions regarding municipal operations (48)?

Yes:	46 (95.8%)
No:	0
Unsure:	2 (4.2%)

Do you feel GIS is an important tool for making decisions regarding natural resource protection (48)?

Yes:	48 (100.0%)
No:	0
Unsure:	0

Do you feel GIS is an important tool for watershed planning (48)?

Yes:	47 (97.9%)
No:	0
Unsure:	1 (2.1%)

PRESENTATIONS

Presentation topics were informative (48)?

Strongly Agree:	14 (29.1%)
Agree:	33 (68.8%)
Neutral:	1 (2.1%)
Disagree:	0
Strongly Disagree:	0
Do Not Know:	0

The length of the workshop was sufficient (48%)?

Strongly Agree:	8 (16.6%)
Agree:	33 (68.8%)
Neutral:	5 (10.4%)
Disagree:	1 (2.1%)
Strongly Disagree:	1 (2.1%)
Do Not Know:	0

Have you learned NEW information (48)?

Strongly Agree:	17 (35.4%)
Agree:	23 (47.9%)
Neutral:	7 (14.6%)
Disagree:	1 (2.1%)
Strongly Disagree:	0
Do Not Know:	0

How would you rate the overall satisfaction of this workshop (48)?

Very Satisfied:	15 (31.2%)
Satisfied:	27 (56.3%)
Neutral:	5 (10.4%)
Dissatisfied:	1 (2.1%)
Very Dissatisfied:	0
Do Not Know:	0

FUTURE BEHAVIOR

Do you plan on utilizing the information you learned today (46)?

Yes:	36 (78.3%)
No:	4 (8.7%)
Unsure:	6 (13.0%)

If Yes, what information?

- Utilizing LiDAR more/structure stormwater.
- Stormwater management, MS4 reports.
- Contact existing clients.
- The process for cities to improve.
- Developing a utility.
- Concept of using GIS mapping for future planning.
- Change detection.
- Master gardener focus for 2014 will be on promoting rain gardens, green roofs, and reclaiming water.
- The info I can get from ArcGIS online.
- Discussion on creating impervious cover data.
- A new job doing stormwater determinations.
- Stormwater fees.
- Some things were informative yet not necessarily applicable to my job.
- Impervious area shapefile.
- Manipulation of layers.
- Software.
- Hydrologic modeling.
- I use county tatuk – county is very helpful in training and updating.
- Impervious data analysis.
- Stormwater management programs and the use of LiDAR to track impervious surface.
- Educate other municipalities on approaches to stormwater planning.
- Ask populated municipality if they would be interested in a stormwater fee – MS4.
- Application to implement 167 regulations for our constituents.
- Change analysis; stormwater maintenance knowledge.

- Solar radiation data.
- Afternoon presentations.

Are you a municipal employee (46)?

Yes:	14 (30.4%)
No:	32 (69.6%)
Unsure:	0

If YES, do you support storm water utilities (13)?

Yes:	10 (76.9%)
No:	1 (7.7%)
Unsure:	2 (15.4%)

If NO, do you support storm water utilities (26)?

Yes:	20 (76.9%)
No:	1 (3.8%)
Unsure:	5 (19.3%)

If you are a municipal employee, would your municipality be interested in funding for storm water utility feasibility studies (13)?

Yes:	4 (30.8%)
No:	2 (15.4%)
Unsure:	7 (53.8%)

Would you recommend this workshop to others (45)?

Yes:	39 (86.7%)
No:	2 (4.4%)
Unsure:	4 (8.9%)

Would you be interested in future GIS-related trainings and workshops (47)?

Yes:	43 (91.5%)
No:	0
Unsure:	4 (8.5%)

If YES, what topics are you interested in?

- How and where to access data/more user friendly – not so high tech.
- Sewer and water.
- Data integration, cloud sourced GIS, increase proficiency.
- Bathymetry utilization.
- Remote sensing, actual tool to use.
- Land use preventing sprawl to local and county officials.
- GIS natural resource management.
- LiDAR use and functionality.
- Data collection; updated existing data.
- The effects of transportation facilities on air quality.
- What software is out there that we can afford, training for using it, and getting data.
- Environmental analysis.
- County TATUK system.
- Census utilization.

- Environmental GIS analysis.
- Individual site development to help with development and stream protection to the benefit of all.
- Watershed planning; conservation planning.
- Solar radiation analysis.
- Network analyst; actual GIS calculation implementation.

ADDITIONAL COMMENTS

What, if any, GIS components or functions would be valuable to your organization or municipality?

- Since PADEP considers gravel impervious, we would want gravel noted as impervious
- Stormwater – great topic.
- All impervious areas that DEP defines.
- Editing functions.
- Watershed delineation, LiDAR DEM, green LiDAR bathymetry.
- Using cloud-sourced GIS, access to LiDAR shown here.
- Change detection; watershed delineation.
- I noticed the resolution in PIB for the water, I was wondering if that can be used in conjunction with NOAA for chlorophyll A data.
- LiDAR; aerial photography.
- Street mapping for storm drains/catch basins; impervious surfaces.
- All GIS components useful to us – esp. stormwater, water quality, land changes.
- Cooperation and data sharing among other organizations for watershed-based environmental data and watershed recreated.
- Impervious cover data and/or changes/additions.
- Hardware/software purchasing – joint purchasing or bulk purchasing.
- Identifying incompliant sanitary sewer systems to help DEP regulate them.
- Amount of and changes in impervious cover; stormwater data/flooding occurrences.
- Elevation data; cost sharing.
- We need everything – equipment, software, data training.
- Infrastructure.
- Impervious land cover.
- The software.
- This info would be valuable to municipalities – not all but some – more info than needed for some. And county service is free.
- LiDAR.
- Stormwater management – mapping of impervious surface through the use of LiDAR.
- Soils; crops; impervious; watersheds.
- More extensions on ArcMap.
- Erie county land cover change data.
- Solar radiation; LiDAR data.
- Change detection.

Would you be interested in subscribing to an affordable (less than $250-500 license per year), web-accessible, semi-individualized, and tailored GIS data clearinghouse (33)?

Yes:	11 (33.3%)
Maybe:	9 (27.3%)
No:	13 (39.4%)

- Possibly, depending on what was available.
- No, we are planning on doing this in house with open source.
- No, WPC is very GIS.
- Probably.
- Maybe?
- Unsure.
- Yes.
- Yes.
- No.
- Maybe.
- No.
- Could.
- Yes.
- Would need more information on what would be available to be able to answer this. There is a lot of data already and there able to be shared, so it would depend.
- Yes, if more current and consistently updated mapping was involved.
- Yes.
- Yes – for the townships.
- Yes.
- No.
- It is not really an option for us at USACE, due to security and info tech. restrictions. But I do like the idea.
- Yes.
- Yes.
- Maybe.
- No.
- Not sure I could do that.
- No.
- Absolutely.
- Yes.
- Possibly – county level.
- No.
- No, thank you.
- No.
- No.

<u>Please provide any additional feedback on the Workshop</u>:

- Utilize our county GIS, who are also very knowledgeable (Mike Baker).
- Expected more information on GIS not stormwater utility pitch.
- Demos not needed, PPT would have worked.
- The last GIS session by Woolpert was very interesting. Always a plus to see GIS applications in action. Excellent venue – host in summer next time so I can spend my break on the Ravine Flyer!
- Have 1 grant opportunity; will call for metrics advice.
- Showing how to use the tool would have been more informative than just showing them.
- The workshop was great but the last speaker was confusing going back and forth – I am still not sure what he was trying to show me. Maybe he had a bad day but I felt is more lack of prep.

- Suggest not going through ArcMap during workshop. Have maps completed and pdf'd/jpeg'd and put in power point to move things along.
- Share costs.
- You started late – always start on time. The first segment on technical info was good by 2x longer than needed.
- Understanding how data is collected is very useful. I would not eliminate the first session, but shorten it favor of allowing more time for case study. Andy Walker's presentation on pit falls, challenges, lessons learned was extremely useful. Woolpert's presentations were useful, but for the audience I believe they were much too long – valuable but could be more concise.
- County wide stormwater planning showing benefit of GIS mapping and asset management.
- I would have preferred that the GIS applications be presented on before and after slides, rather than working in Arc. But the functions and applicability were very good. Overall, very good presentations and excellent topics.
- If you want to consolidate efforts; get to Philly and PG Hand individually meet each municipal body and talk, sell, motivate consolidation.
- Best cookies ever at lunch!
- A lot of info was covered – would be nice to have an in-depth workshop for watershed groups and similar (CD's) for watershed planning.
- Some of the presenters attempted to go into too much detail and got a bit lost. The workshop was a little too long.
- Stormwater utility not needed in our municipality. Workshop was not what I had anticipated. Would not recommend because not in my field.
- Presentations were well done. Last presenter took a little long and too many pauses in speaking to fiddle with layers in his maps.
- This was very timely with the implementation of the new stormwater ordinance.
- The workshop was very informative and interesting. I like that there were presenters from different organizations/types of organizations. I appreciate that the workshop was free of charge – Thank you!
- Solar radiation energy in Ohio example was a compelling use of GIS.
- The workshop was not fully GIS focused and part of it seemed like it was a proposal for municipalities as a funding focus.