Comprehensive Watershed Planning for Nutrient Reduction in Ellerbe Creek, Durham, NC

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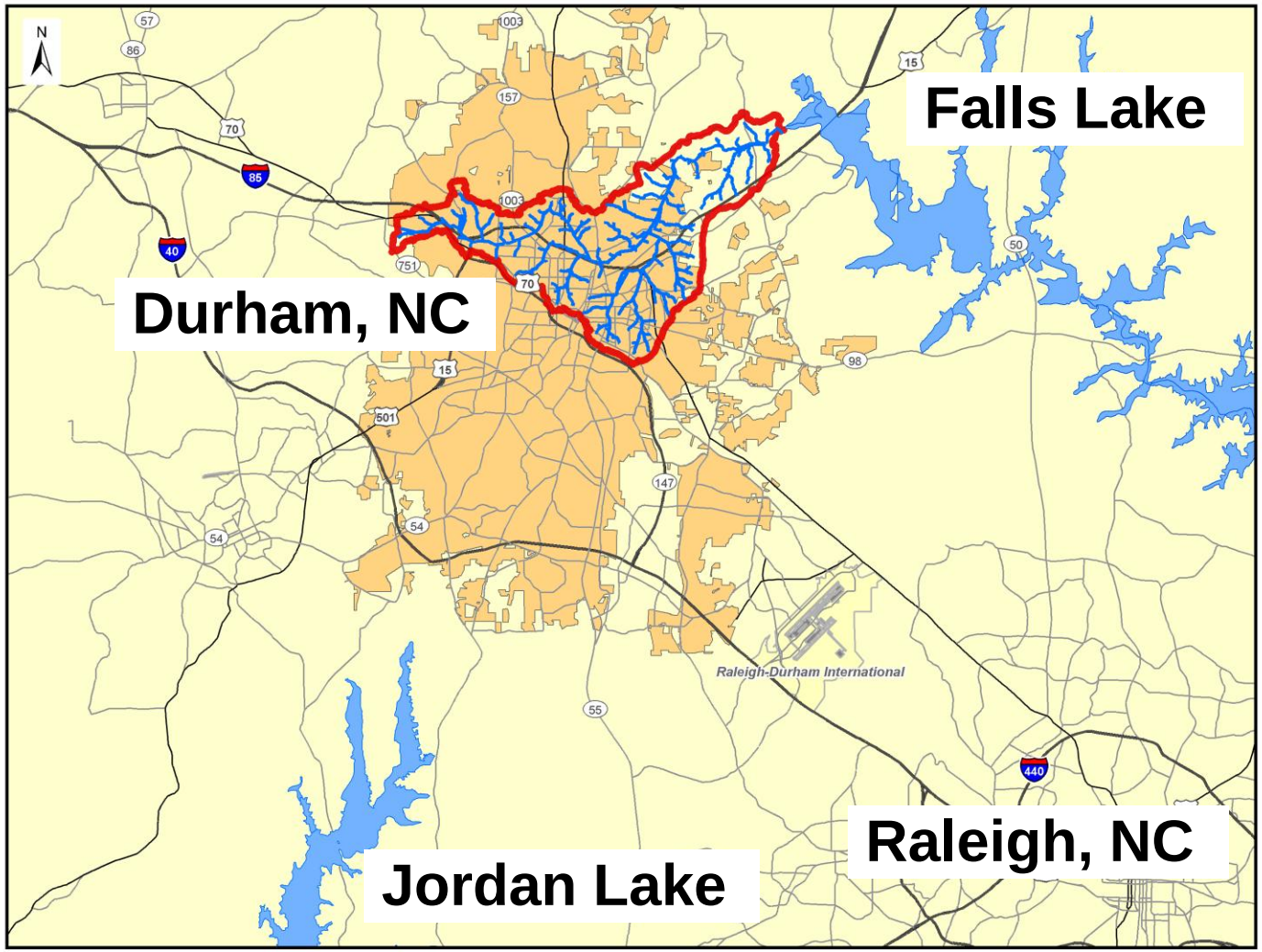
City of Durham – Nutrient Sensitive Waters



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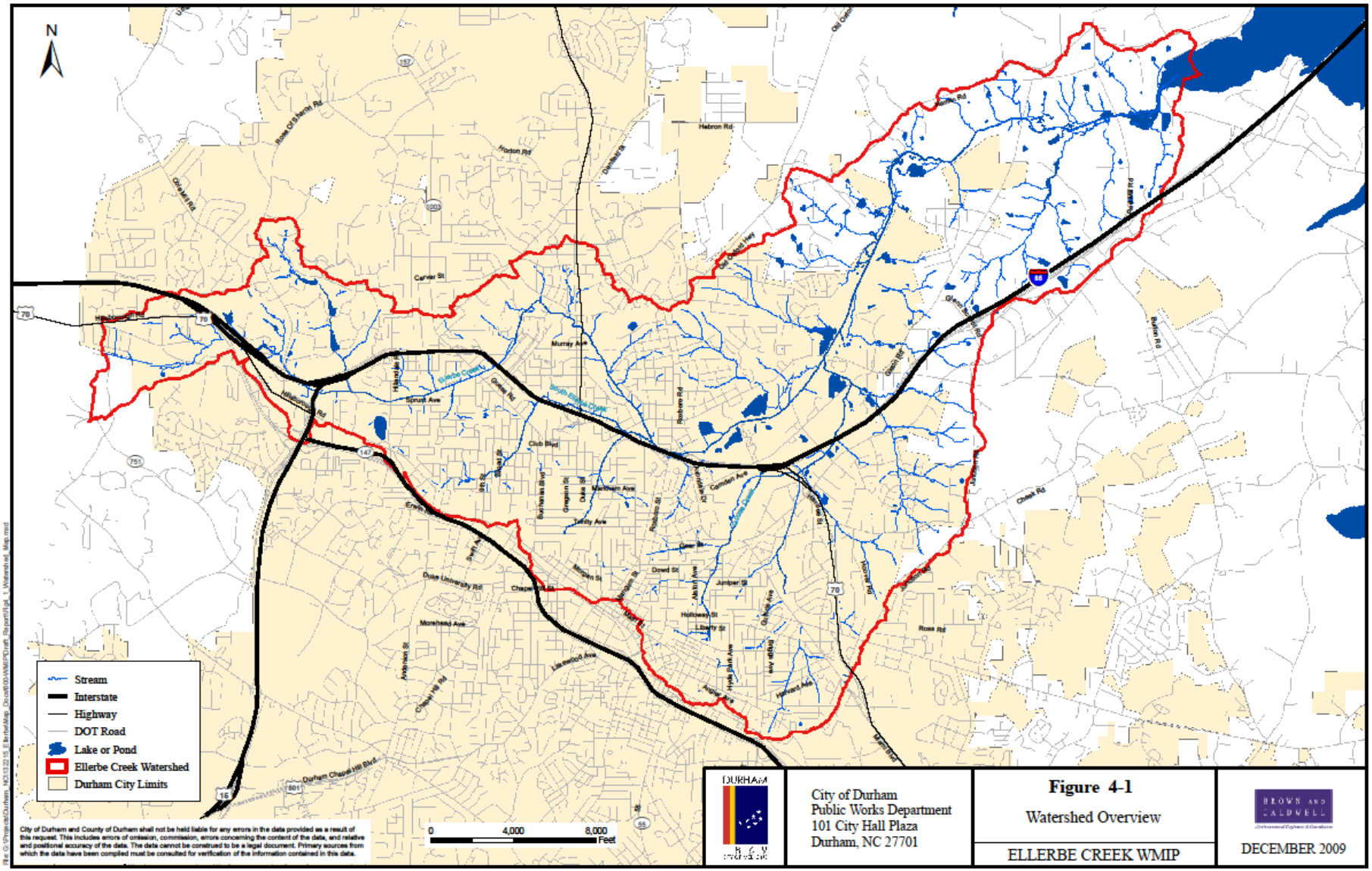
Falls Lake Nutrient Management Strategy

- 2008 – “water quality limited”
- Nutrient Reductions:
  - Stage 1 Reductions - 20% N and 40% P by 2021
  - Stage 2 Reductions - 40% N and 77% P by 2025
  - Measured against 2006 baseline
- Expected to Cost over $1.5 Billion

Ellerbe Creek Watershed



Project Goals

Restore and Protect Watershed Functions

- Assess current water quality and watershed conditions
- Improve or prevent further deterioration of water quality conditions
- Gain input from the public and key stakeholders
- Identify and prioritize highly-effective water quality improvement projects

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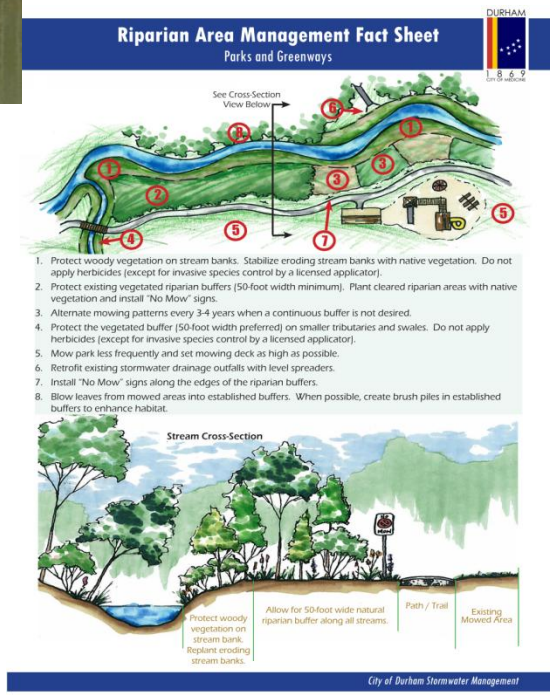
Comprehensive Approach to Improve Watershed Health



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Existing and New BMPs

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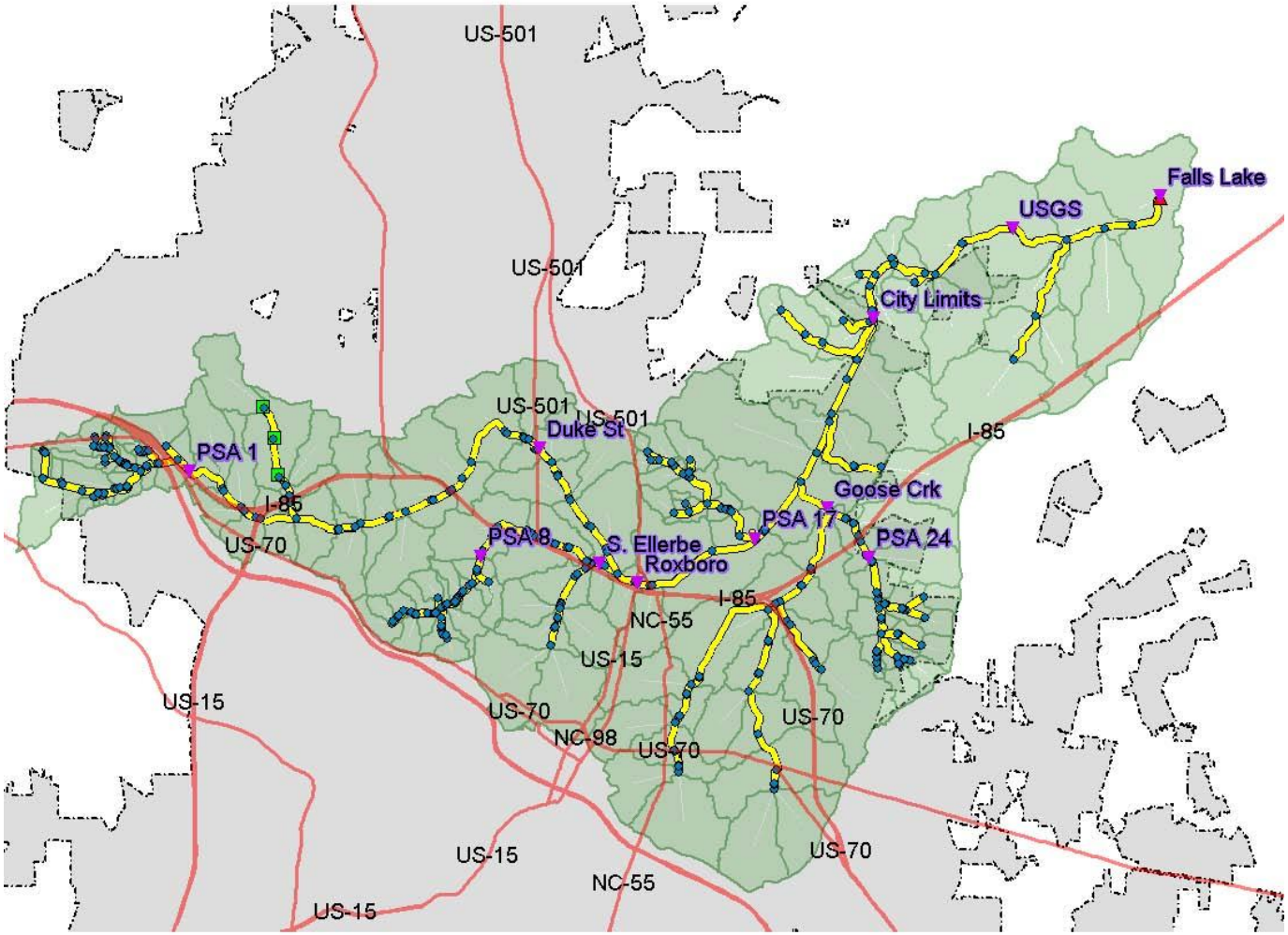
Feasibility of BMP Projects

PCSWMM model:

- Feasibility of BMP retrofits
- Conceptual design for new BMPs



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Stream Assessment

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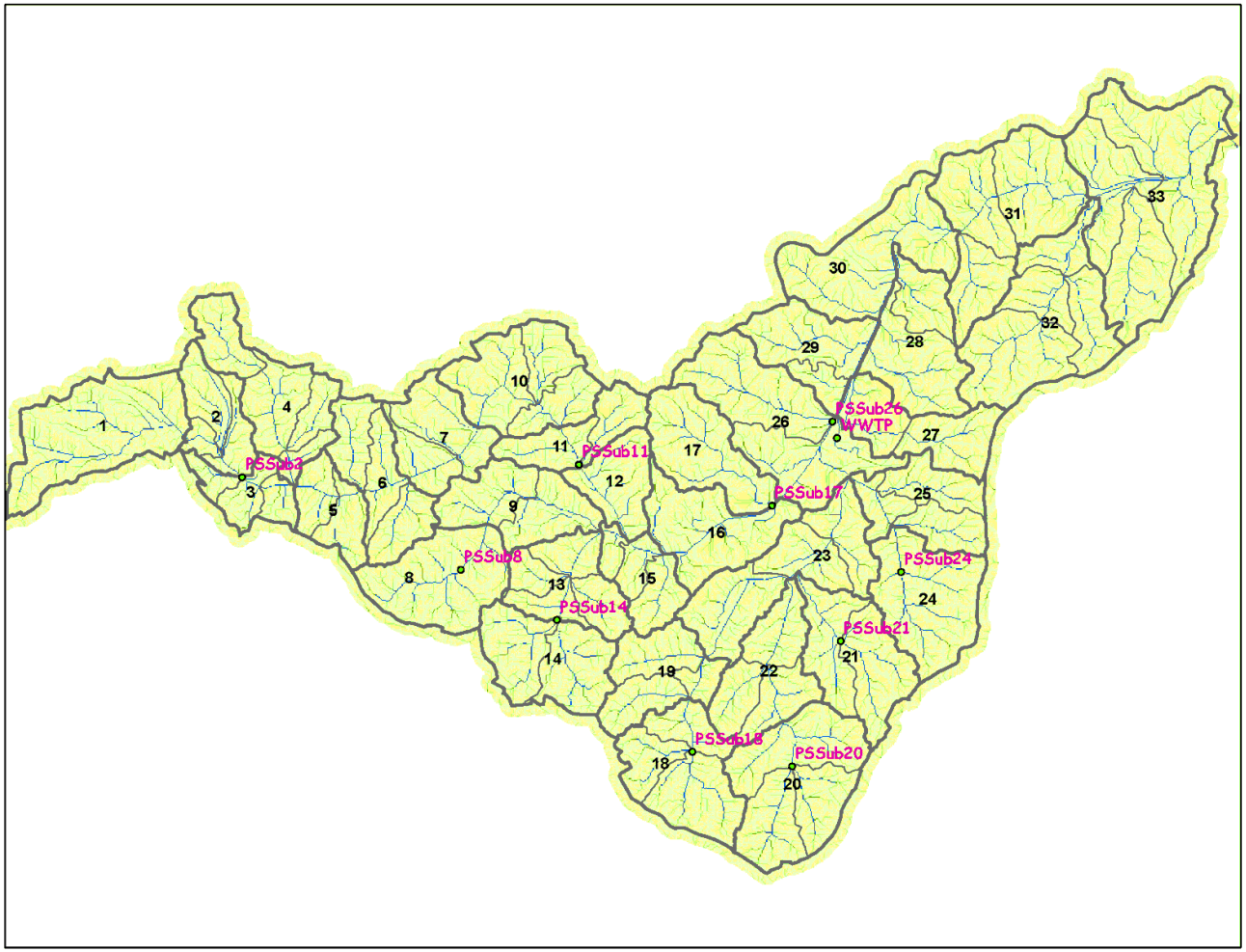
Point Sources

- North Durham WRF
- Leaks, spills, SSOs



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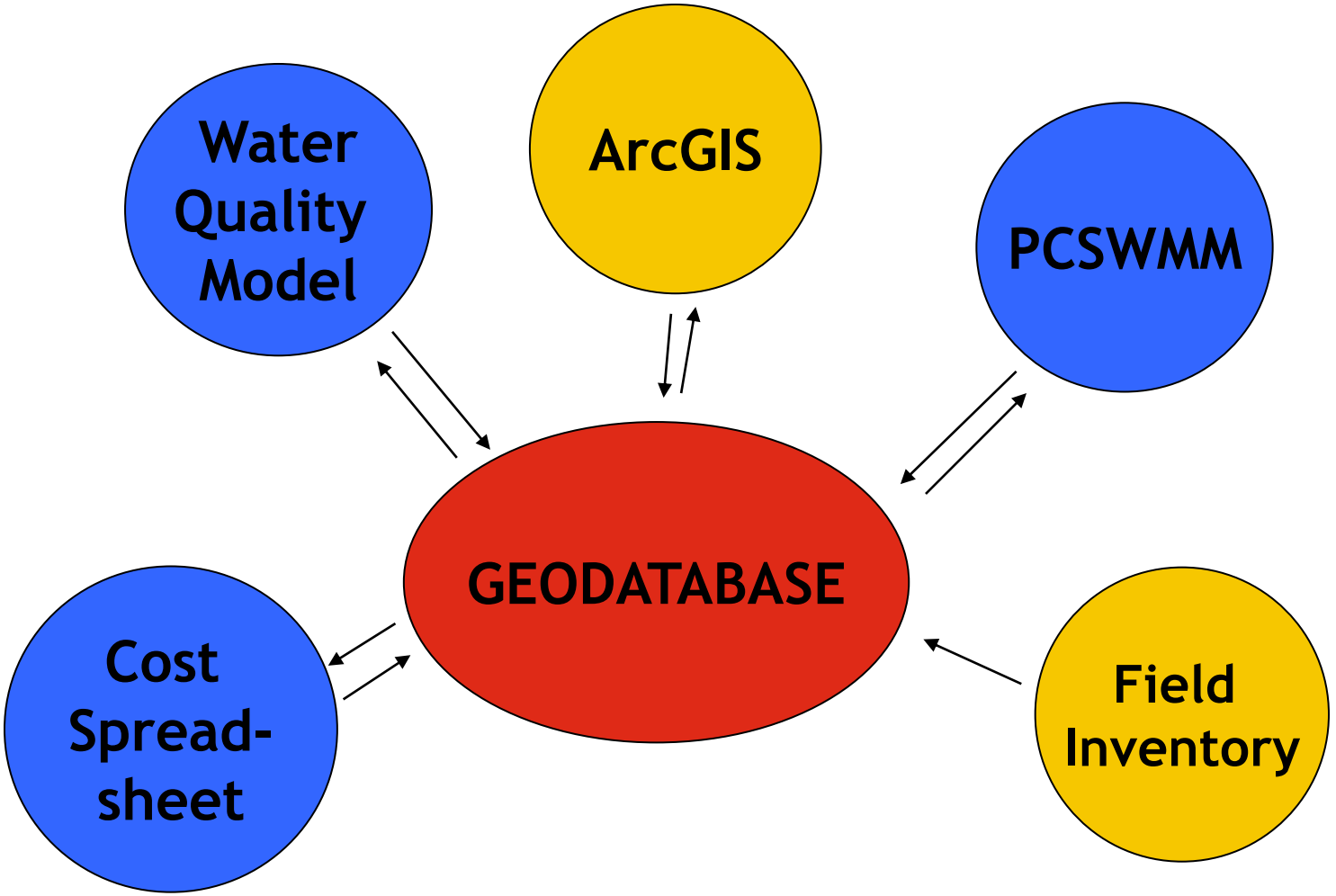
Watershed Planning Tools



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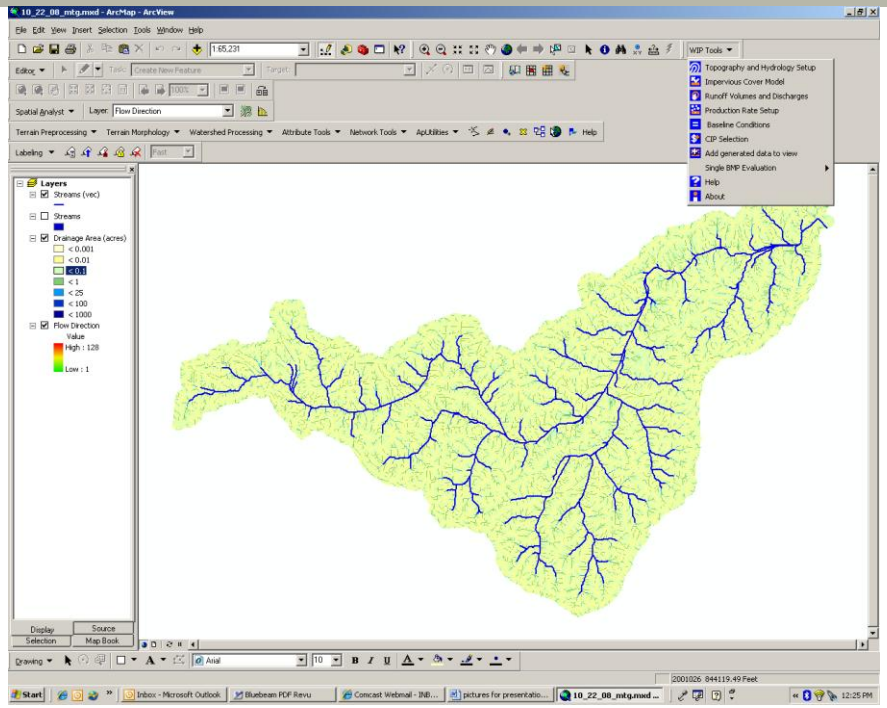
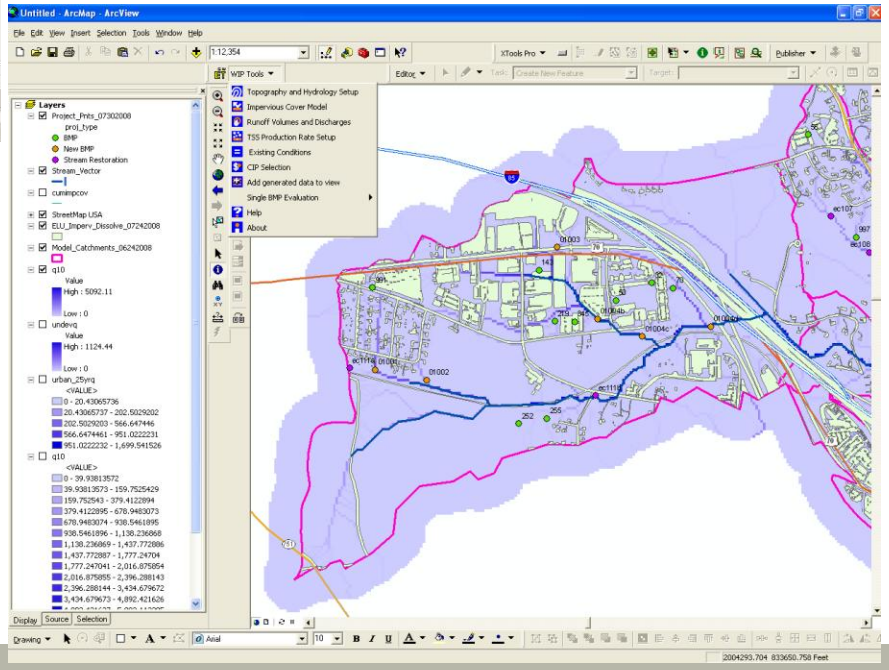
Water Quality Modeling



- **Watershed Improvement Planning Tools Model**
  - GIS-based
  - Conservative and non-conservative parameters
  - Evaluates the benefits of structural and non-structural control measures



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Types of Control Measures

- New stormwater BMPs
- Retrofits to existing BMPs
- Stream restoration
- Low Impact Development (LID) measures
- Local Stormwater Ordinance for new development and redevelopment
- Upgrades to sanitary sewer collection system
- Nutrient Control upgrades to WRF

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Project Costs

- Implementation Costs were generated for each structural control measure:
  - Construction
  - Eng./Surveying/Permitting/Admin.
  - Land Acquisition
  - Annual O&M
  - Contingency
  - Cost Escalation Factor

20-Year Present Value Cost for Each Potential Project

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Project Evaluation Criteria

- Water Quality
- Habitat
- Stream Protection
- Community Enhancement
- Implementation
- Public Safety

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Watershed Scenarios

- Combination of point source and non-point source controls
- Ten watershed scenarios were evaluated:

  #2 - Baseline = Existing BMPs and Stream Conditions

  #3 - Individually analyzed each point source and non-point source control measure

  #8 - Combination of all Point Source Controls

  #9 - Combination of all Non-Point Source Controls

  #10 - Combination of all Point Source and Non-Point Source Controls

Establish Water Quality Goals

- Total Nitrogen = 40% reduction from existing pollutant yield

  Based on Stage 2 Requirements

- Total Phosphorus = 77% reduction from existing pollutant yield

  Based on Stage 2 Requirements

- Sediment = 1,600 lbs/ac/yr

  Maintain aquatic habitat and biological integrity

- Fecal Coliform = 5.1 * 10^9 CFUs/ac/yr

  state water quality standard

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Results for Watershed Scenarios

Summary of Watershed Scenarios

Scenario	Pollutant Yield at City Limits (% Reduction from Existing Conditions Scenario 2)				Cost (millions)
	Nitrogen (lb/ac/yr)	Phosphorus (lb/ac/yr)	Sediment (lb/ac/yr)	Fecal Coliform (10^9 cfu/ac/yr)	
Scenario 2: *Existing Stormwater BMPs and Stream Conditions*	12.6	1.6	2,250	15.6	n/a
Scenario 8: *Point Source Controls for Sewer Collections System and North Durham Water Reclamation Facility*	12.1 (4%)	1.3 (20%)	2,250 (0%)	6.4 (59%)	$56-$60
Scenario 9: *Combined Non-Point Source Controls*	11.0 (13%)	1.3 (16%)	1,700 (25%)	14.7 (6%)	$320 - $370
Scenario 10: *Combined Point and Non-Point Source Controls*	8.5 (33%)	1.0 (36%)	1,700 (25%)	5.5 (65%)	$376 - $430
Water Quality Goals	**7.5**	**0.38**	**1,600**	**5.1**	

First Steps Selected by City of Durham

1. Coordinate with the City's Department of Water Management to implement $60 million in point source controls
2. Consider $48 million of high-priority water quality improvement projects
3. Implement the Riparian Area Management Plan
4. Acquire or preserve the high-priority riparian buffers and new BMP sites valued at $60 million

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