



Addressing stormwater and water quality issues through watershed planning

Calumet Stormwater Collaborative
December 4, 2020

Topics to be covered

Overview of watershed planning

Importance of water quality modeling

Overview of HSPF model

HSPF applications for addressing water quality and stormwater management objectives

Watershed planning

Collaborative, multi-objective framework for water resources management

Restore and protect water quality

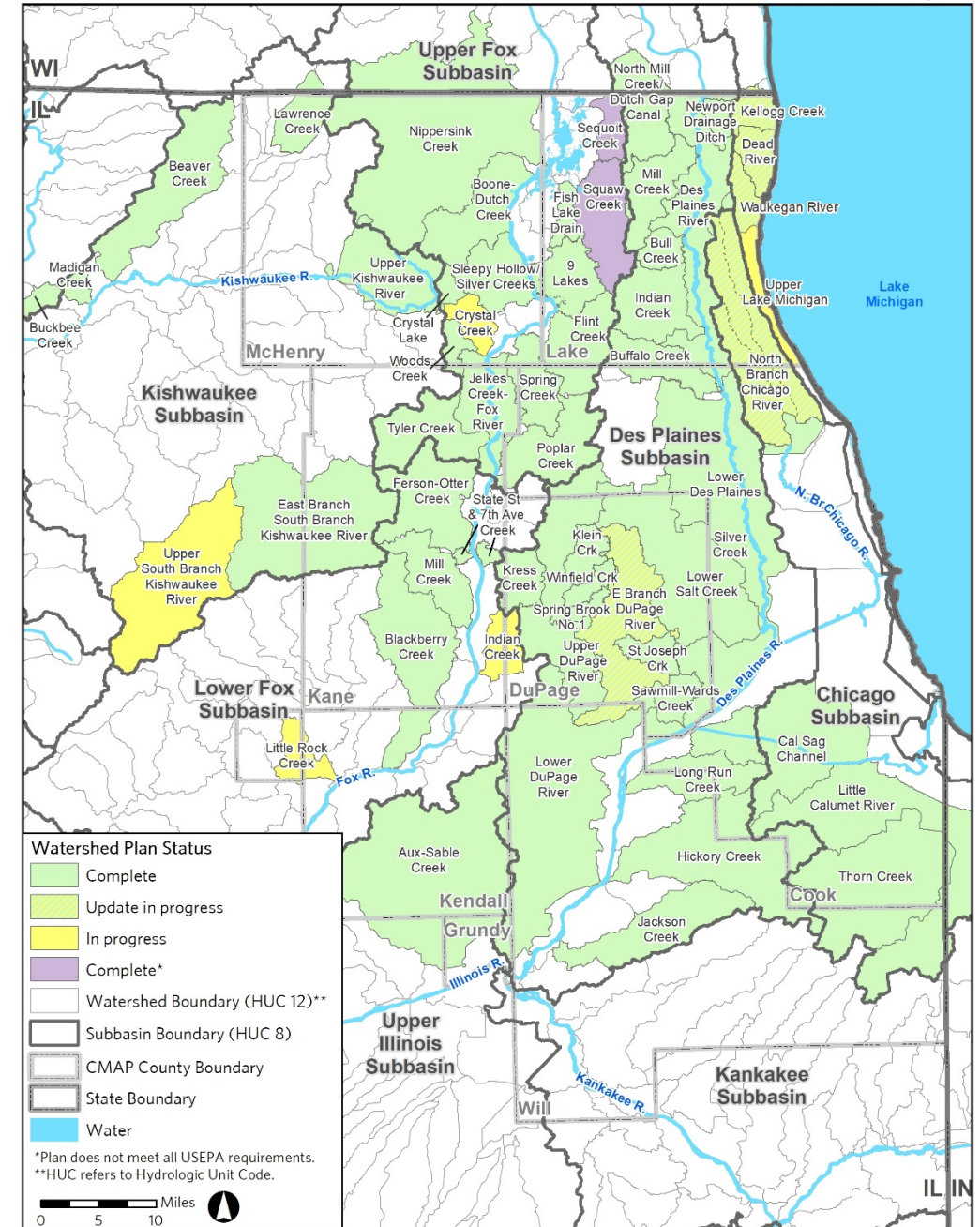


Source: Lake County Stormwater Management Commission

Watershed planning

Funding opportunities

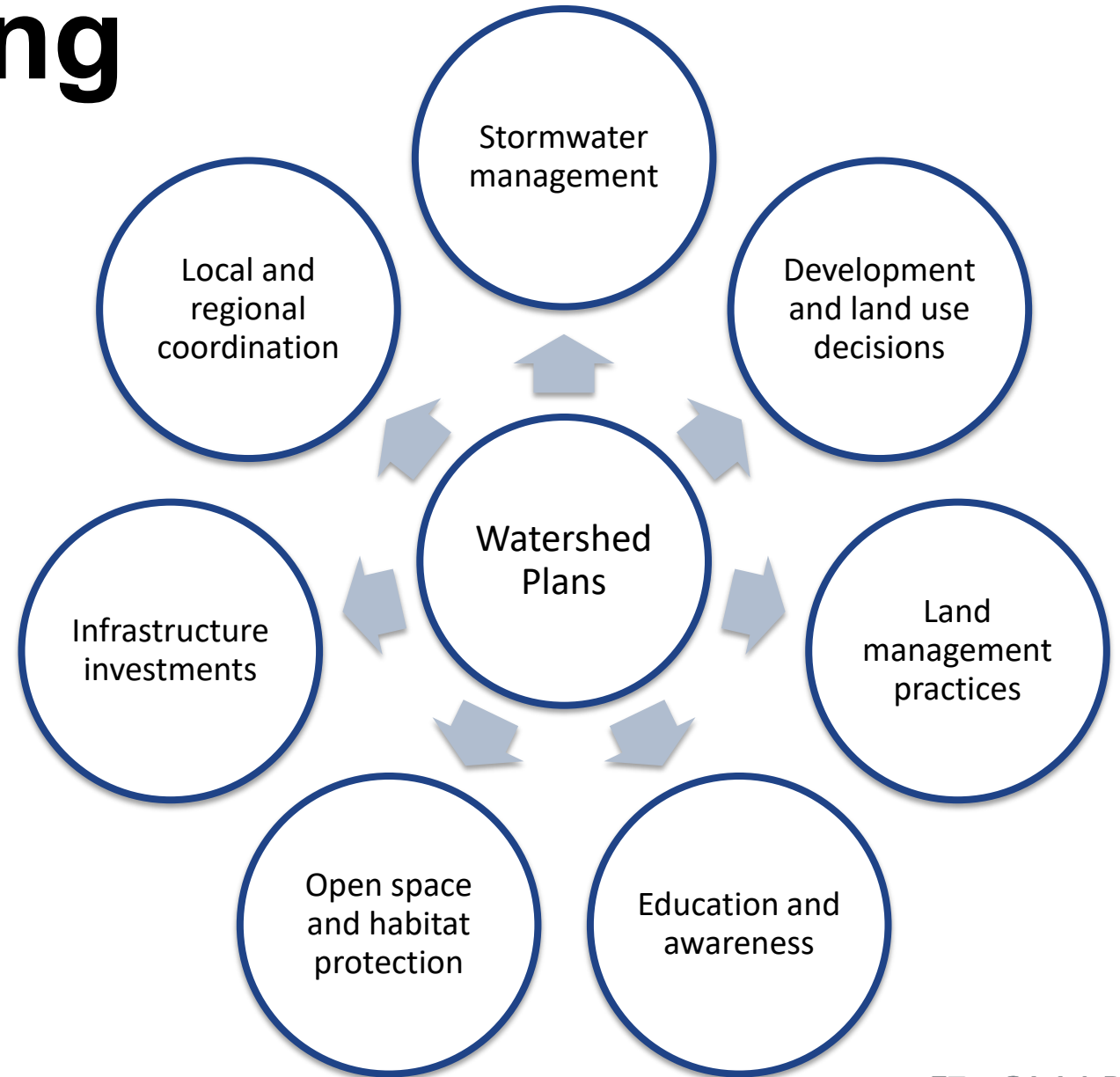
- Section 319(h) Nonpoint source management program
- Green Infrastructure Grant Opportunities Program (GIGO)
- Local and regional programs



Watershed planning

Co-benefits

- Open space and habitat protection
- Flood control
- Safe, adequate water supply
- Smart growth



Watershed planning

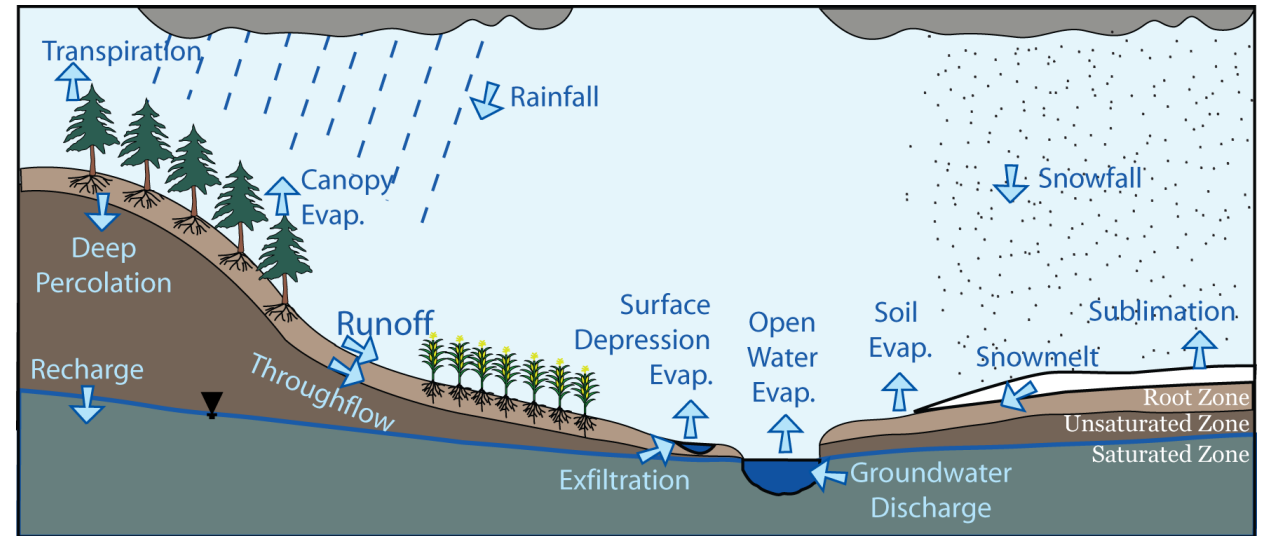


Water quality modeling

“Mathematical representation of pollutant fate, transport, and degradation within a watershed and/or waterbody.” – US EPA

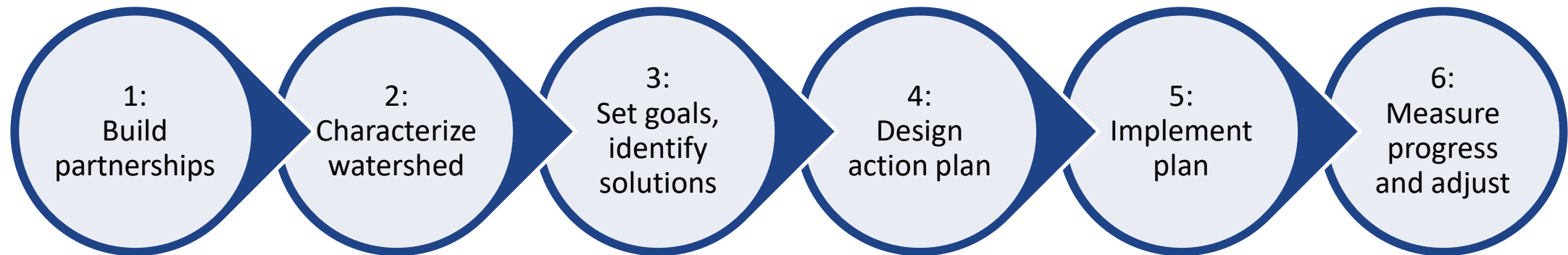
Selection factors

- Model complexity
- Land use / land cover
- Water quality concerns
- Resources
- Partnerships



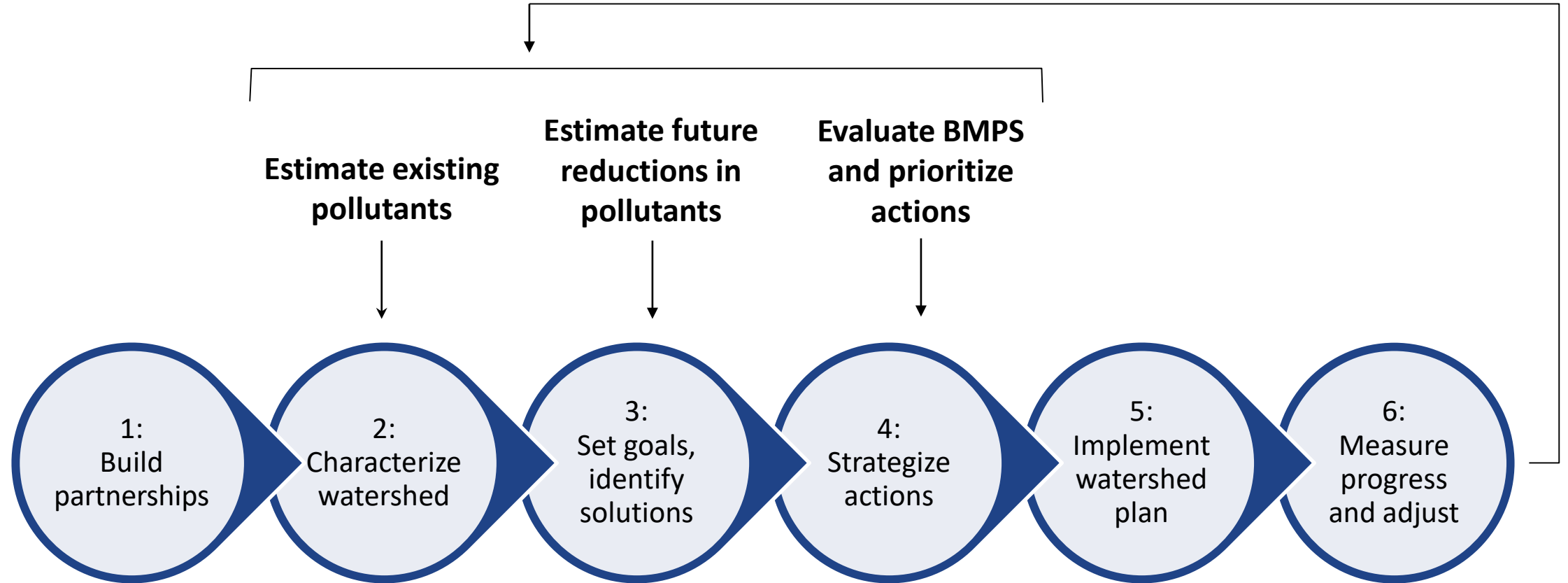
Source: MSU Hydrology Lab, Dept. of Earth and Environmental Sciences

Watershed planning process



Source: Adapted from 'Handbook for Developing Watershed plans to Restore and Protect Our Waters' (EPA, 2008)

Role of water quality modeling



Watershed Planning Process

Source: Adapted from 'Handbook for Developing Watershed plans to Restore and Protect Our Waters' (EPA, 2008)

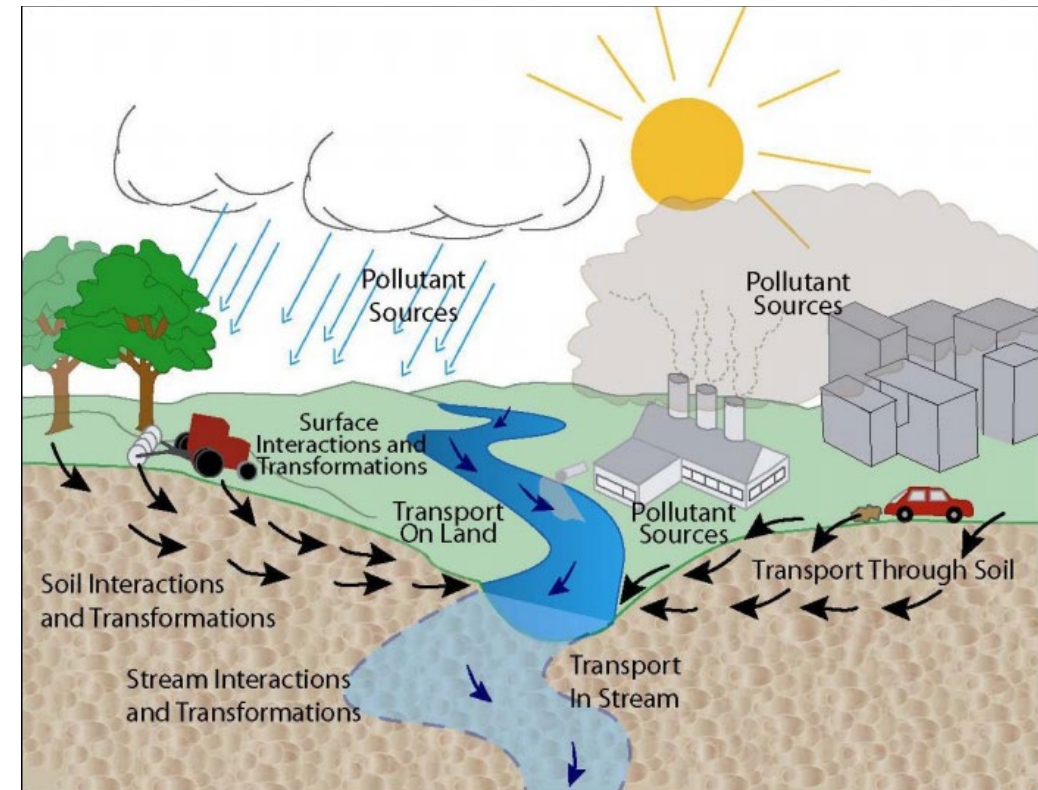
HSPF Modeling



Overview of HSPF Model

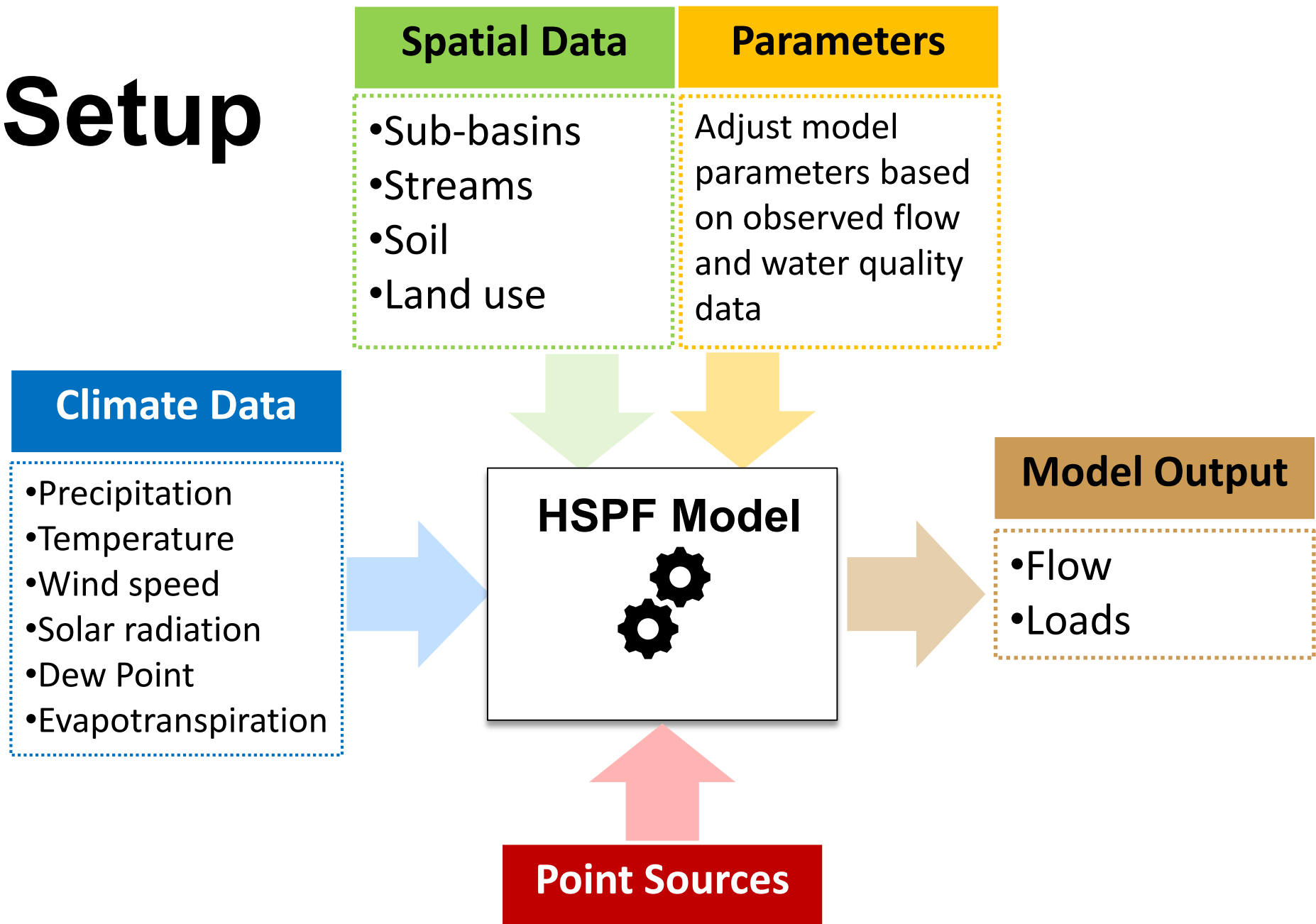
HSPF is a comprehensive watershed model that simulates long-term hydrology and water quality.

Watershed-based plans (WBP) and total maximum daily loads (TMDLs)



www.epa.gov

HSPF Setup

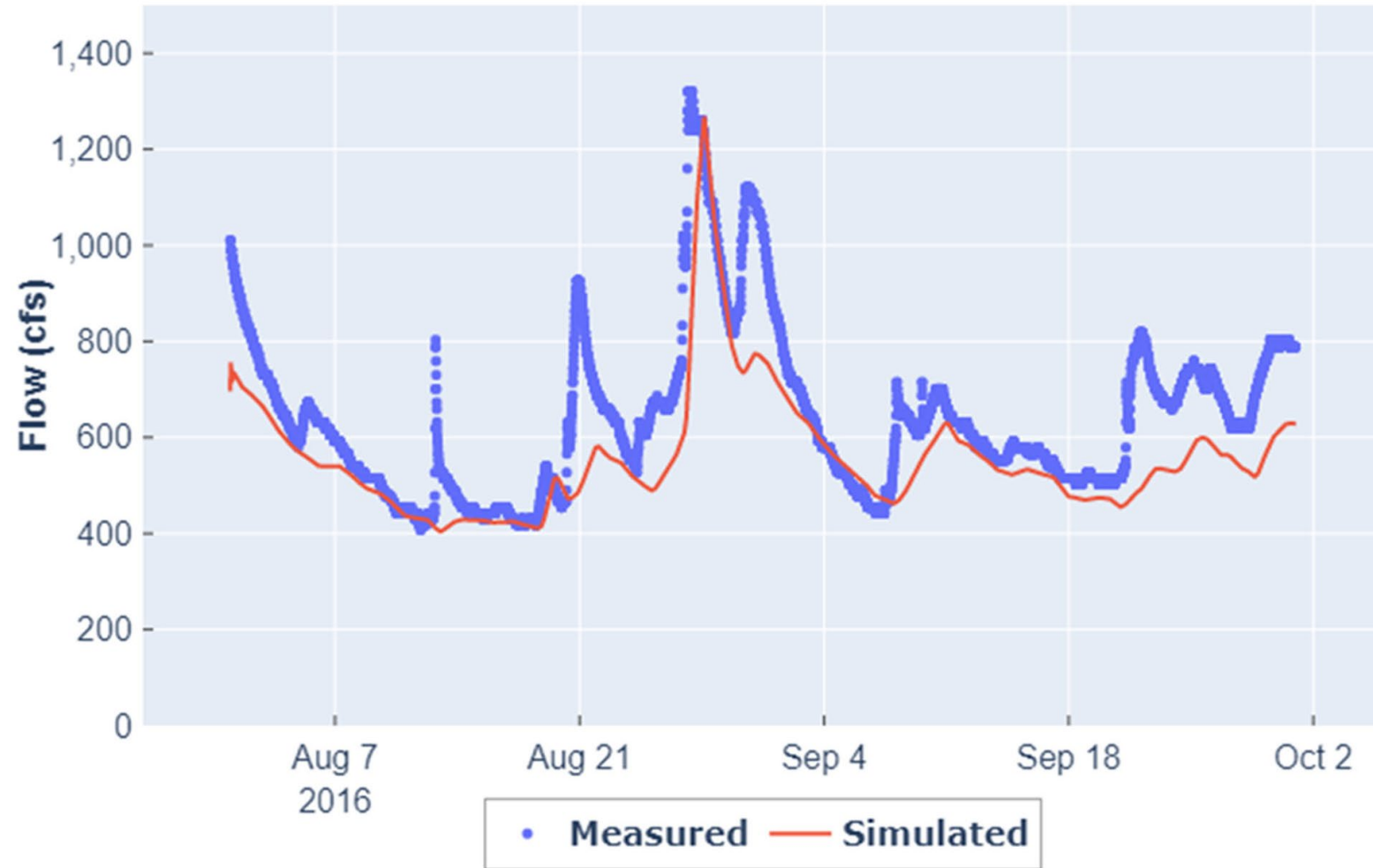


HSPF Model Calibration

Adjust model parameter
to measured data.

*“All models are wrong, but
some are useful”*

George Box

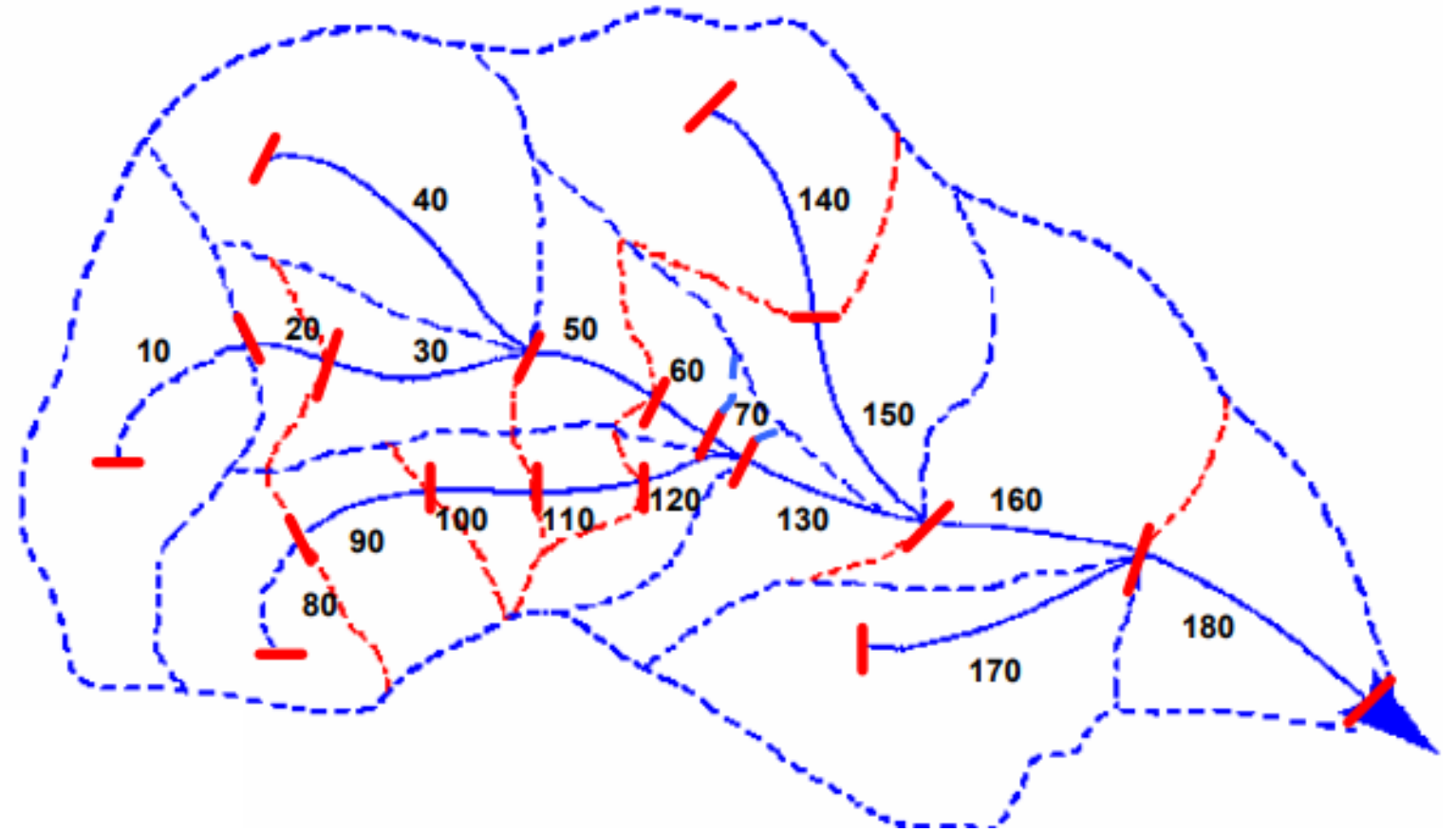


Continuous Simulations Importance

Not feasible to collect data at every subcatchment.

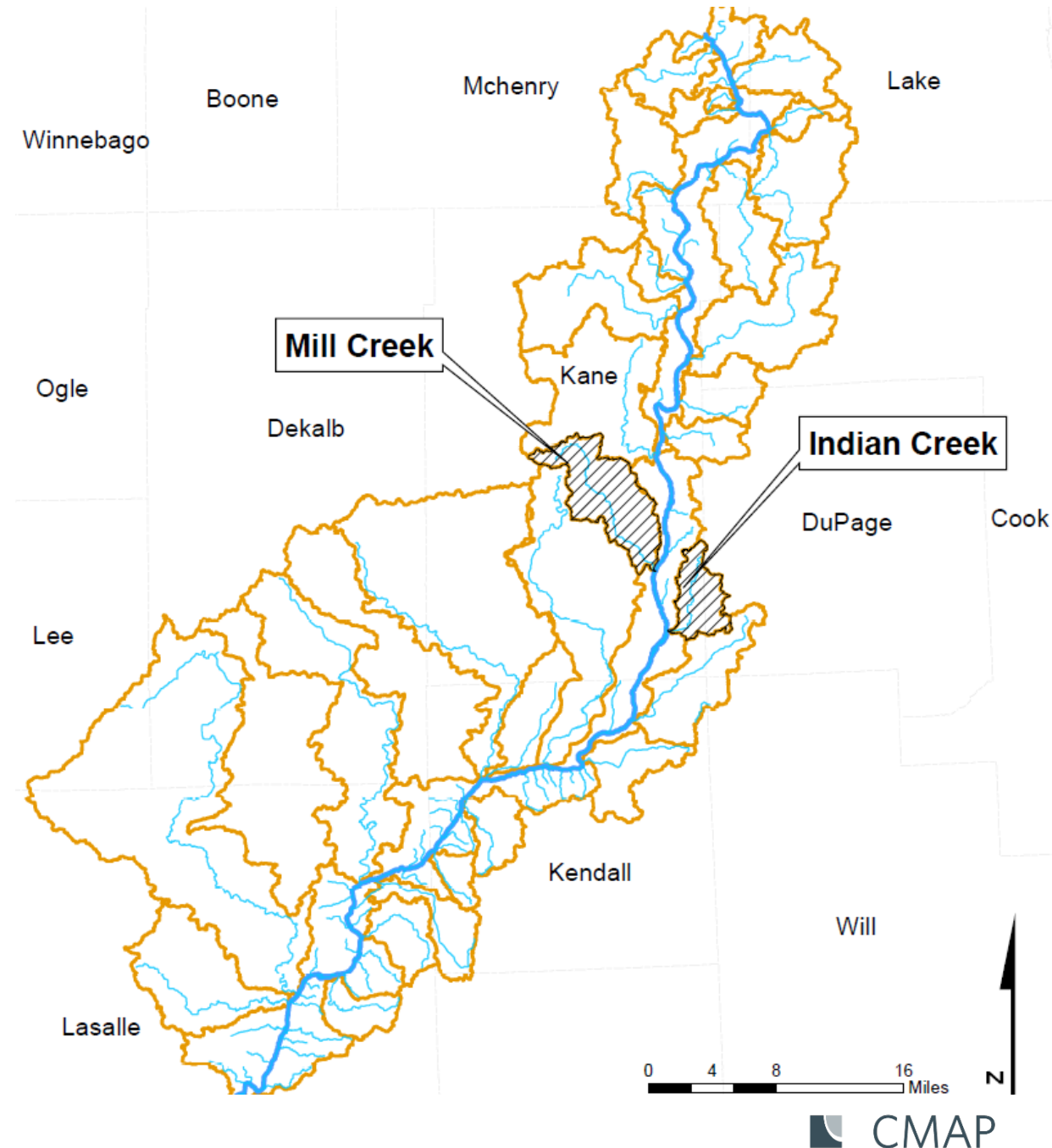
Capture water quality variability.

Determine hotspots locations (e.g., most loadings, runoff.)



HSPF Applications

CMAP and Geosyntec applied the HSPF to predict pollutant loads in Mill Creek and Indian Creek tributaries of Fox River



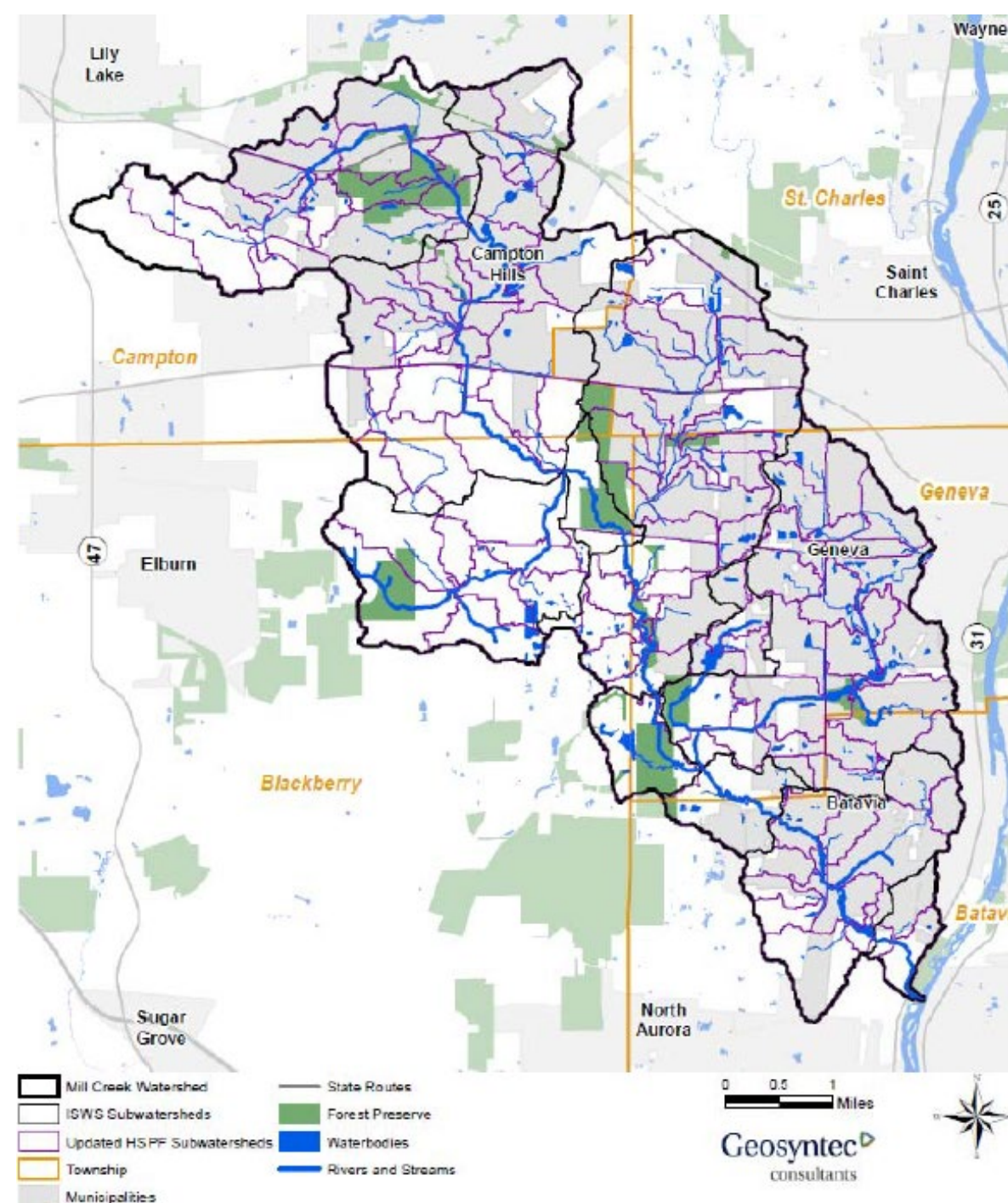
HSPF Applications

Mill Creek HSPF modeling support

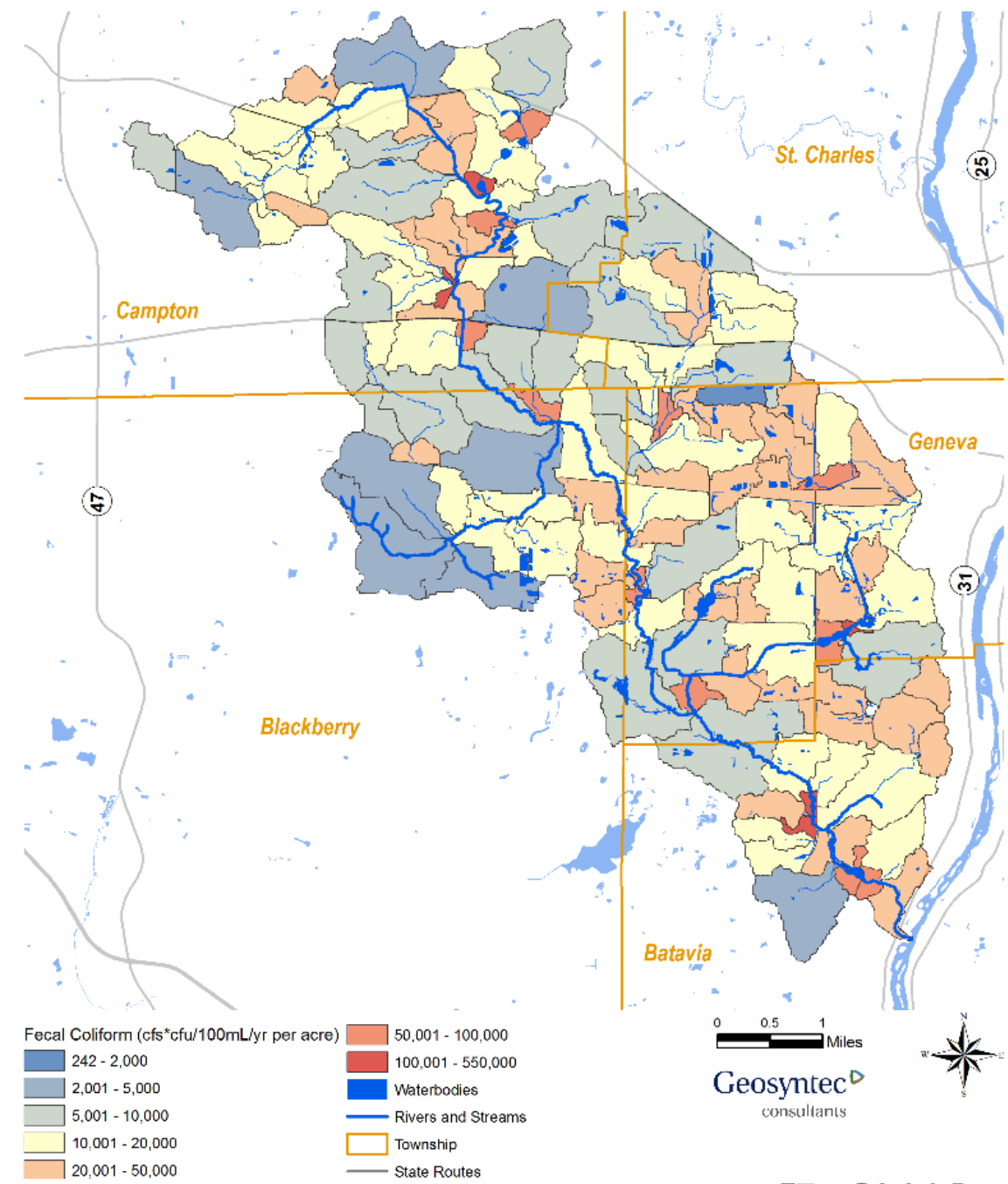
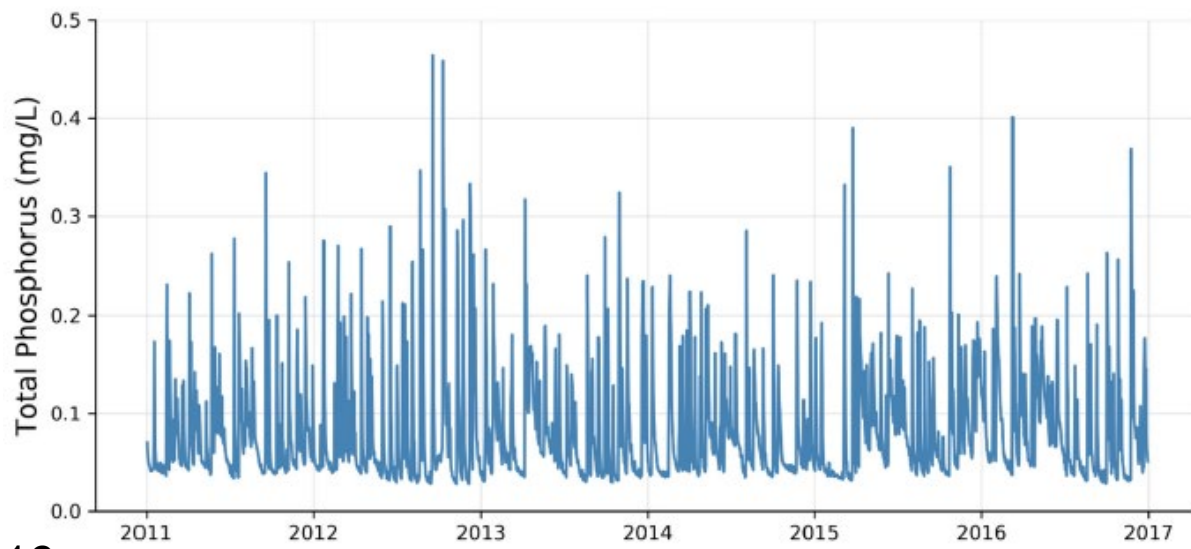
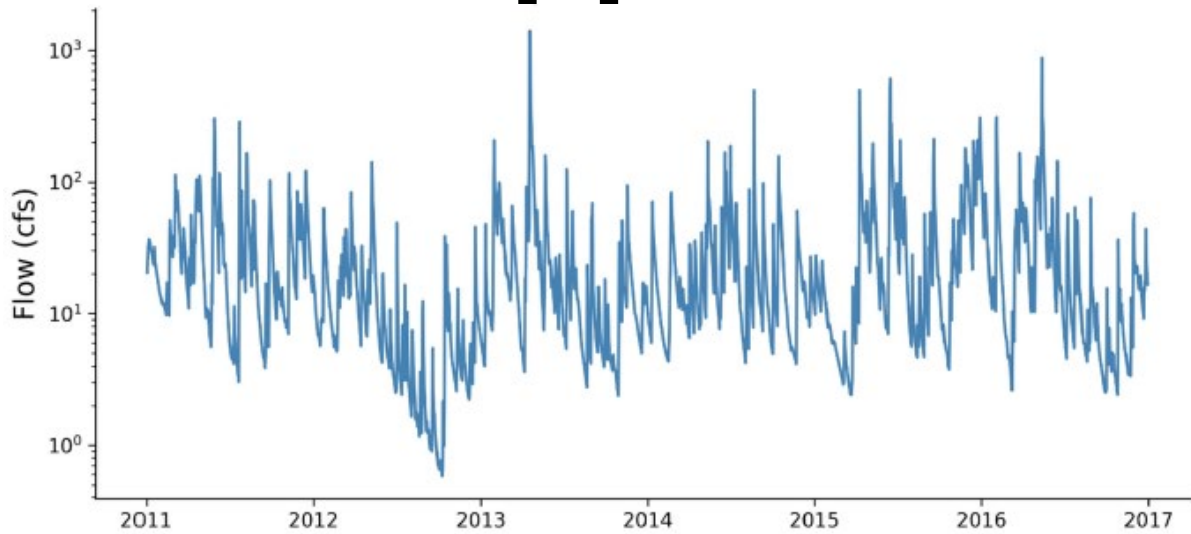
- From 11 to 129 subcatchments

Simulate loads for

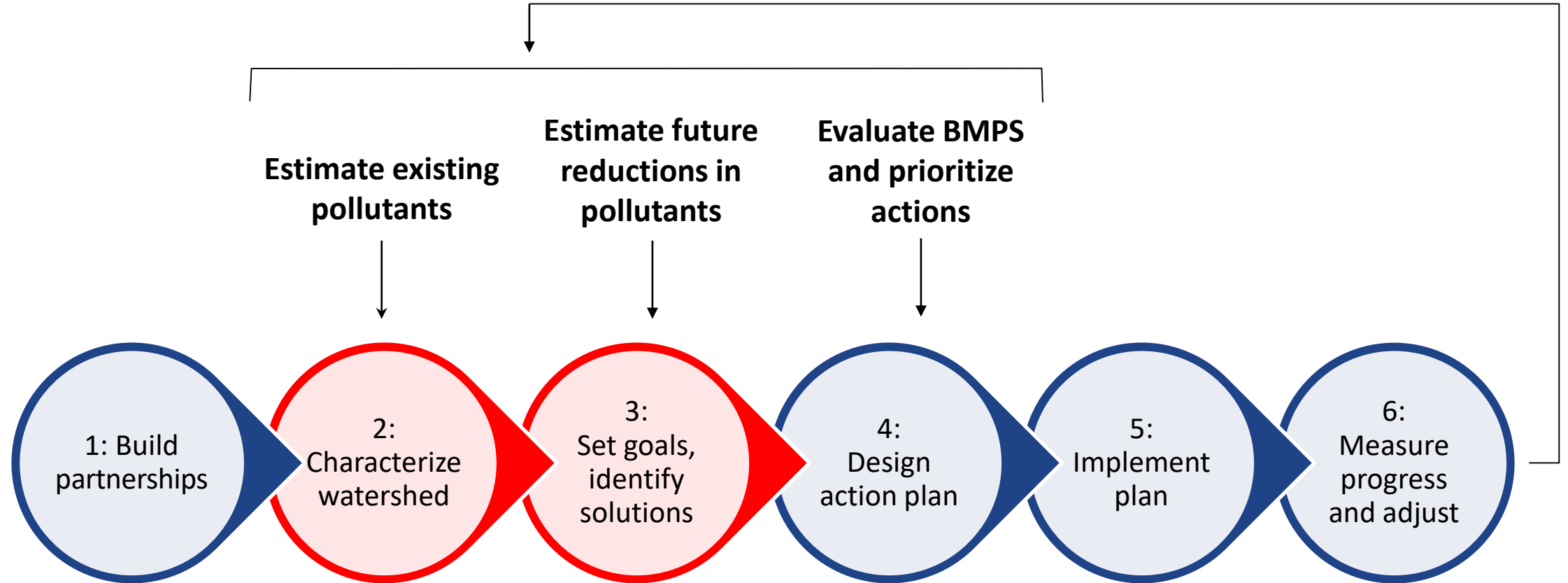
- Total Nitrogen
- Total Phosphorus
- Sediment and E.coli



HSPF Applications



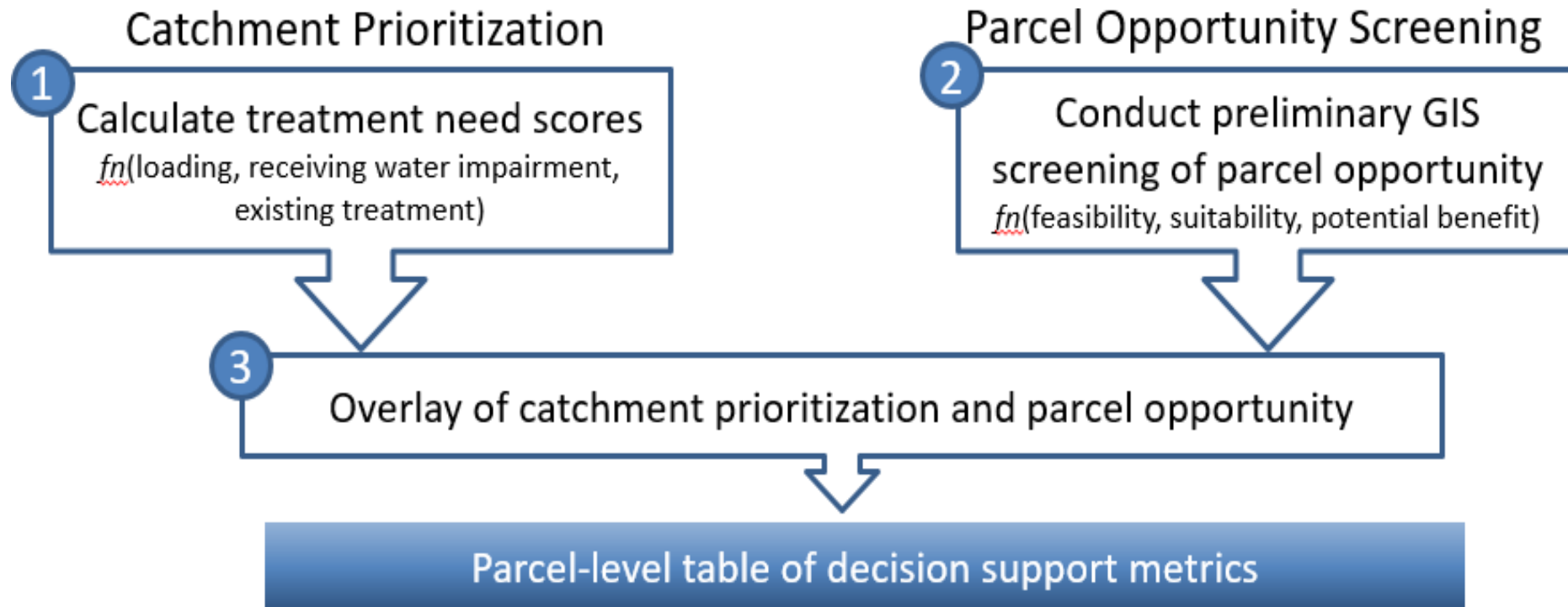
Water quality modeling



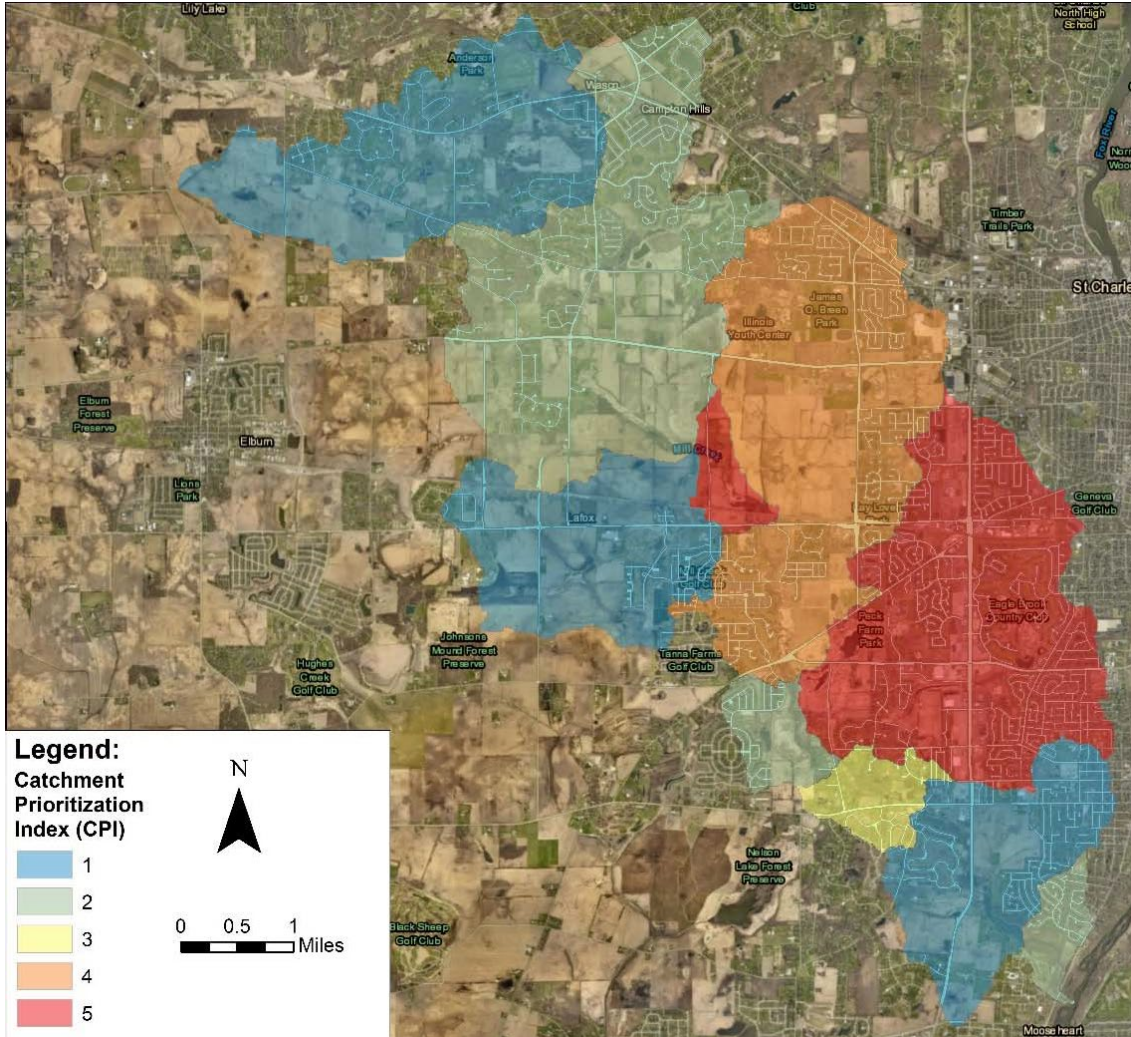
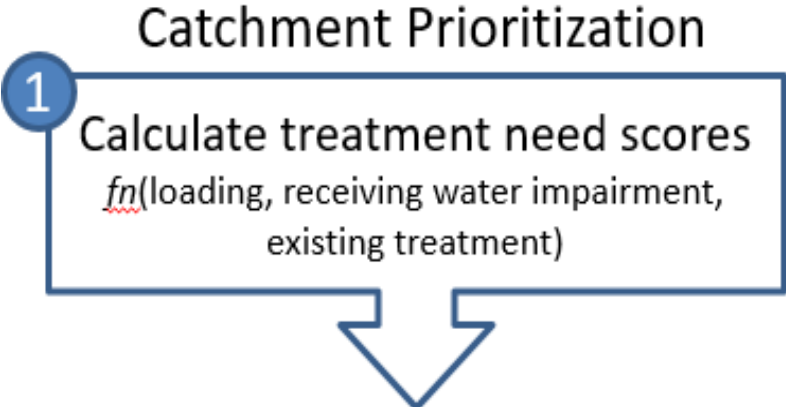
Watershed Planning Process

Source: Adapted from 'Handbook for Developing Watershed plans to Restore and Protect Our Waters' (EPA, 2008)

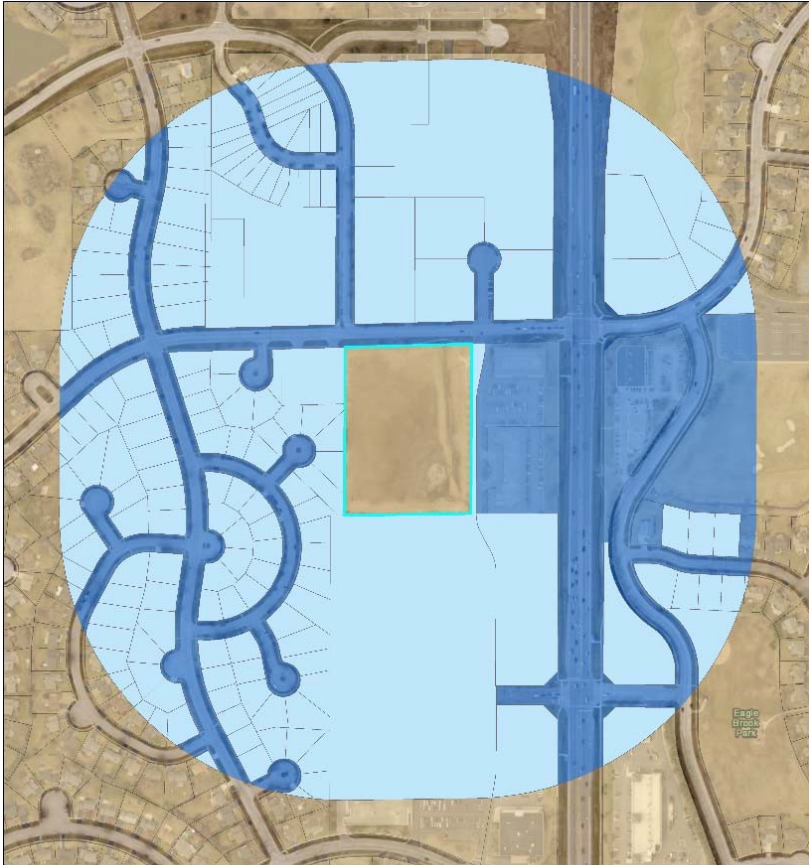
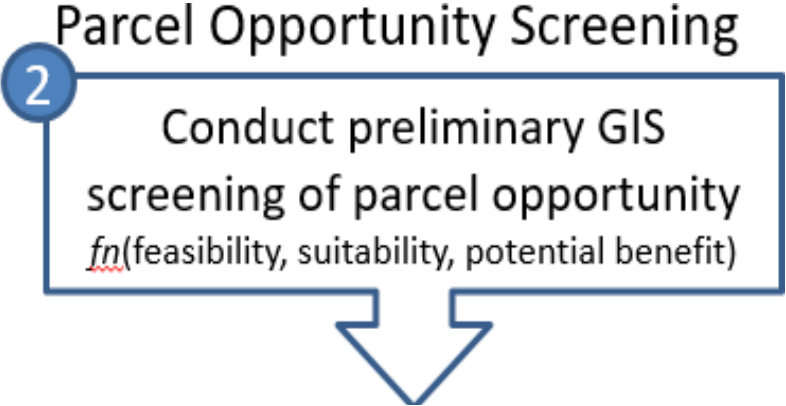
BMP Prioritization Framework



BMP Prioritization Framework



BMP Prioritization Framework



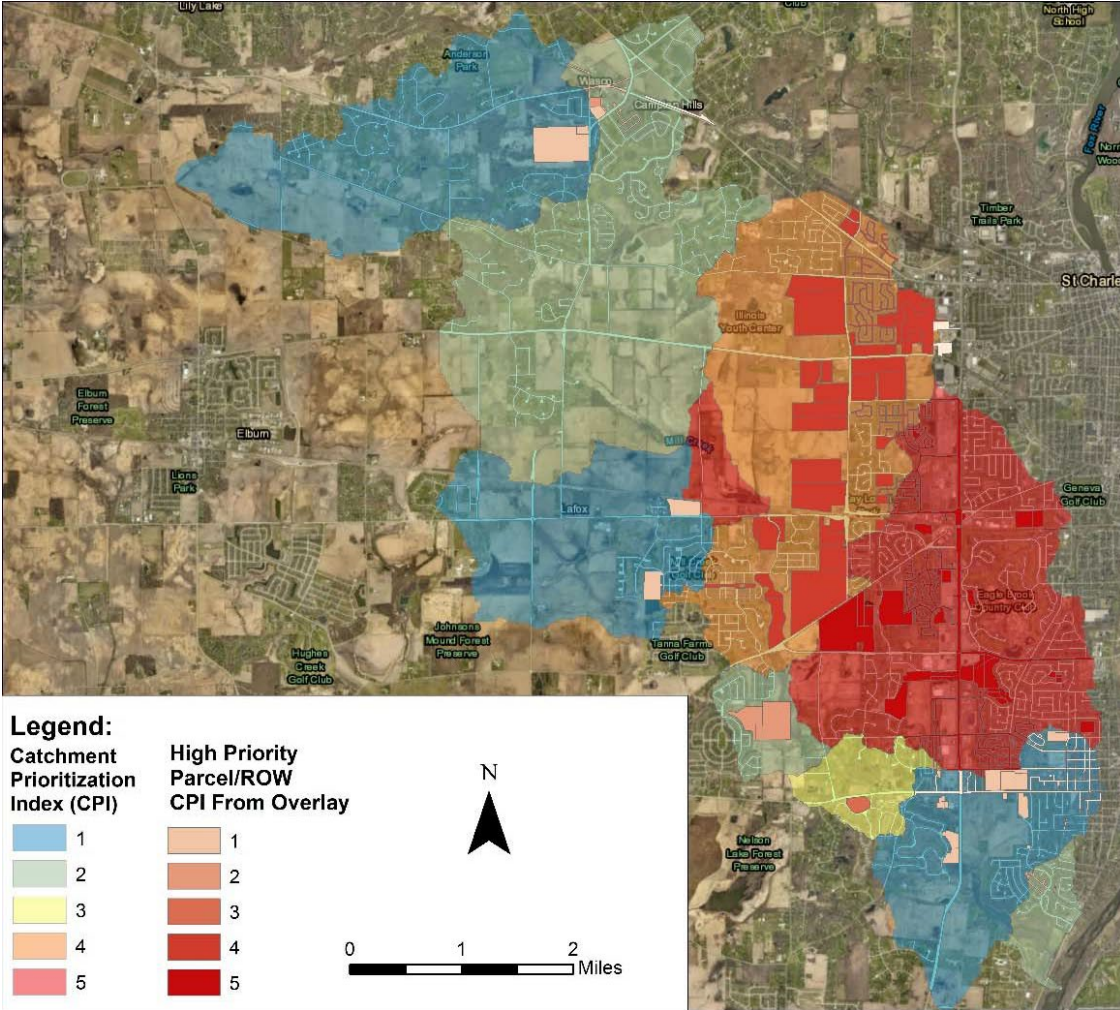
Legend:

- Parcel buffer
- Parcels
- High elev. parcels

0 0.05 0.1 0.2 Miles

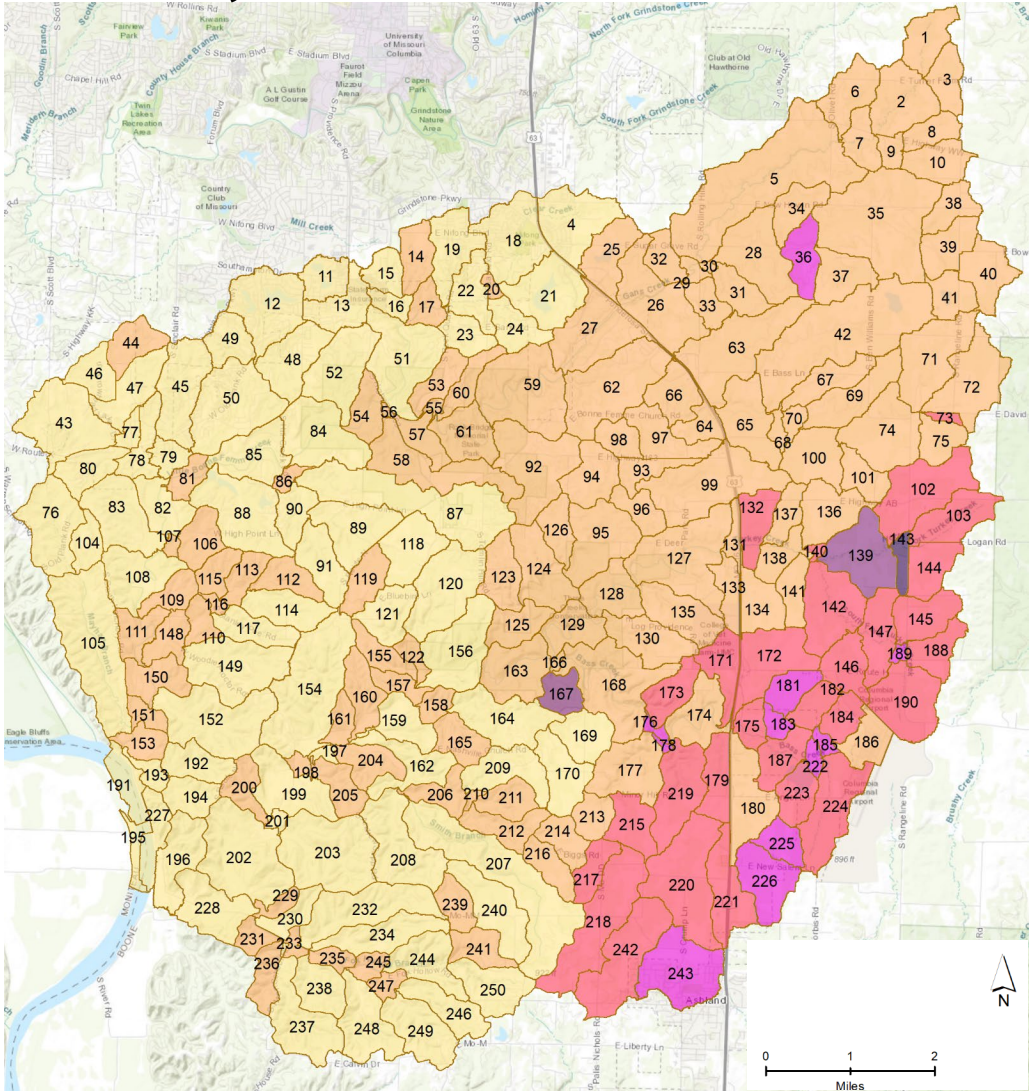
BMP Prioritization Framework

3 Overlay of catchment prioritization and parcel opportunity



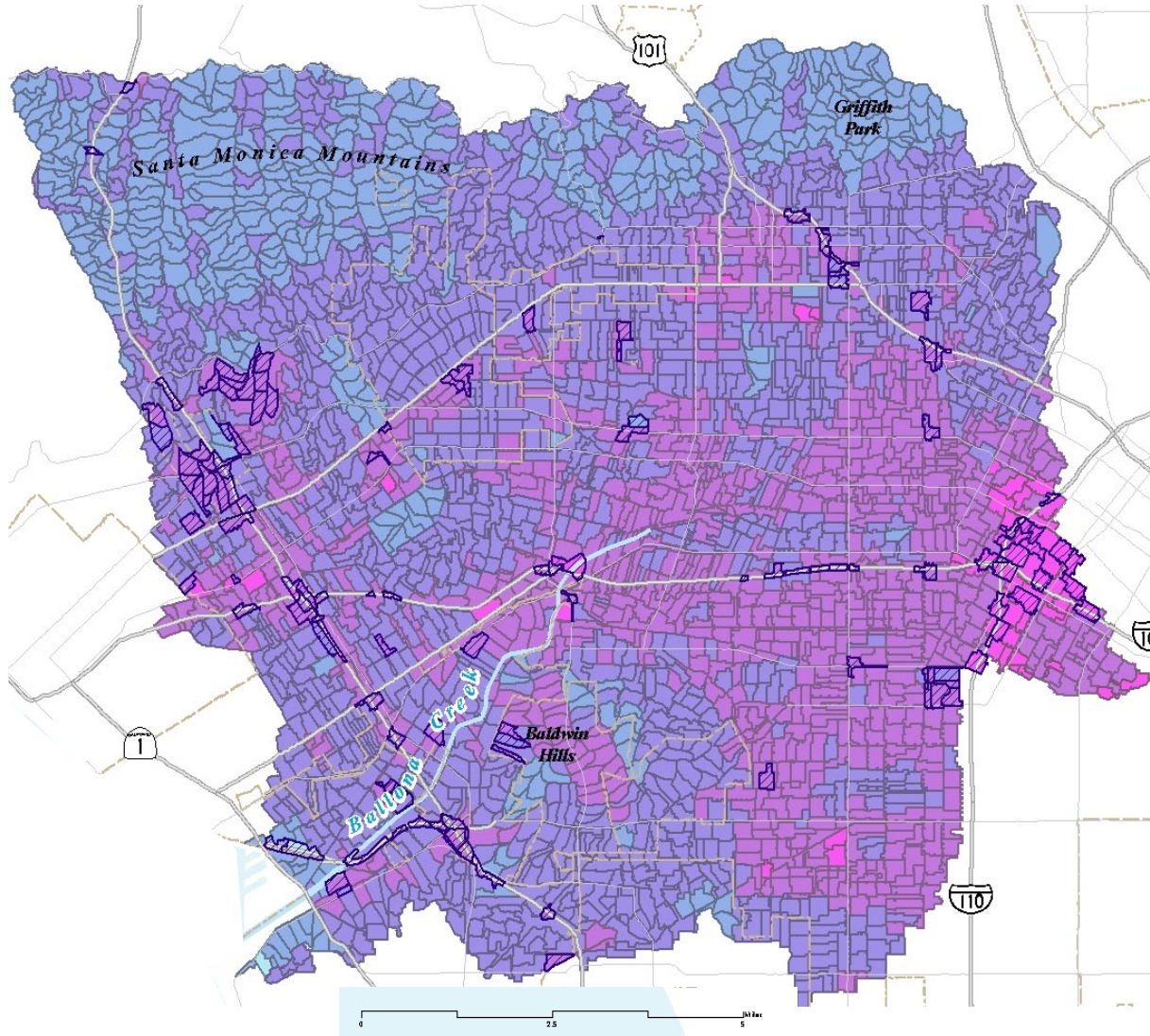
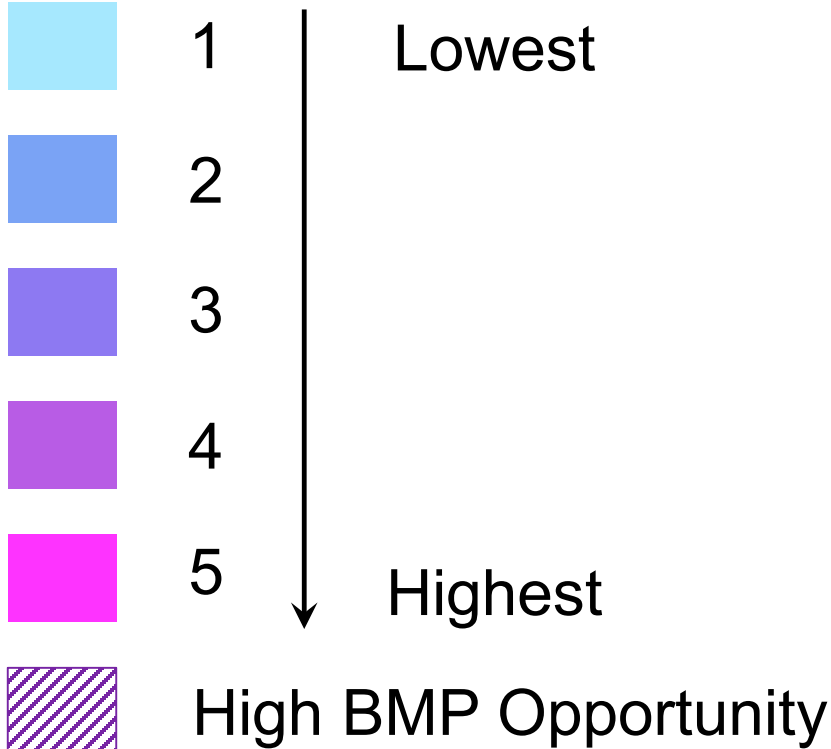
Bonne Femme Watershed, MO

Pollutant loads for E.coli, nutrients, sediments and downstream impairments.



Ballona Creek Watershed, CA

Pollutant loads for E.coli, nutrients, sediments and downstream impairments.



Key Takeaways

Water quality models like HSPF can:

- Simulate runoff through urban and rural watersheds
- Provide better estimate of pollutant loads and reductions
- Identify and prioritize cost-effective projects
- Inform detailed stormwater models

BMPs can address water quality and simultaneously help minimize peak flows of stormwater runoff

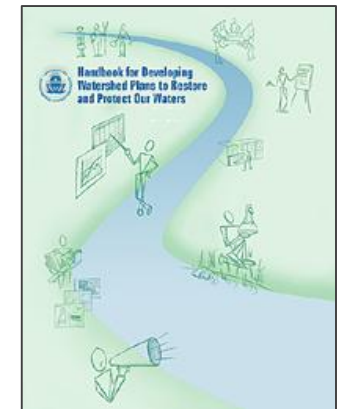
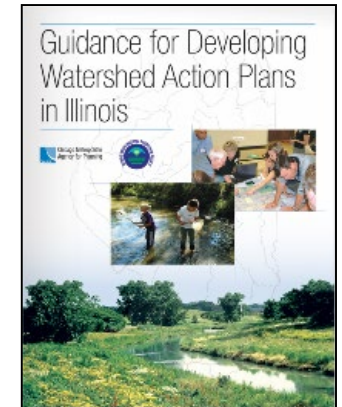
Watershed planning resources

Guidance for Developing Watershed Action Plans in Illinois (CMAAP & IEPA, 2007) <https://www.cmap.illinois.gov/programs/water/water-quality-management/watershed-planning>

Handbook for Developing Watershed Plans to Restore and Protect our Waters (USEPA, 2008)
https://www.epa.gov/sites/production/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf

A Quick Guide to Developing Watershed Plans to Restore and Protect our Waters (USEPA, 2013)
https://www.epa.gov/sites/production/files/2015-12/documents/watershed_mgmt_quick_guide.pdf

Watershed Academy
<https://www.epa.gov/watershedacademy>



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