Temporal and Spatial Optimization of Existing and Emerging Nutrient Management Technologies and Practices for Control of Harmful Algal Blooms

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Project Team Members

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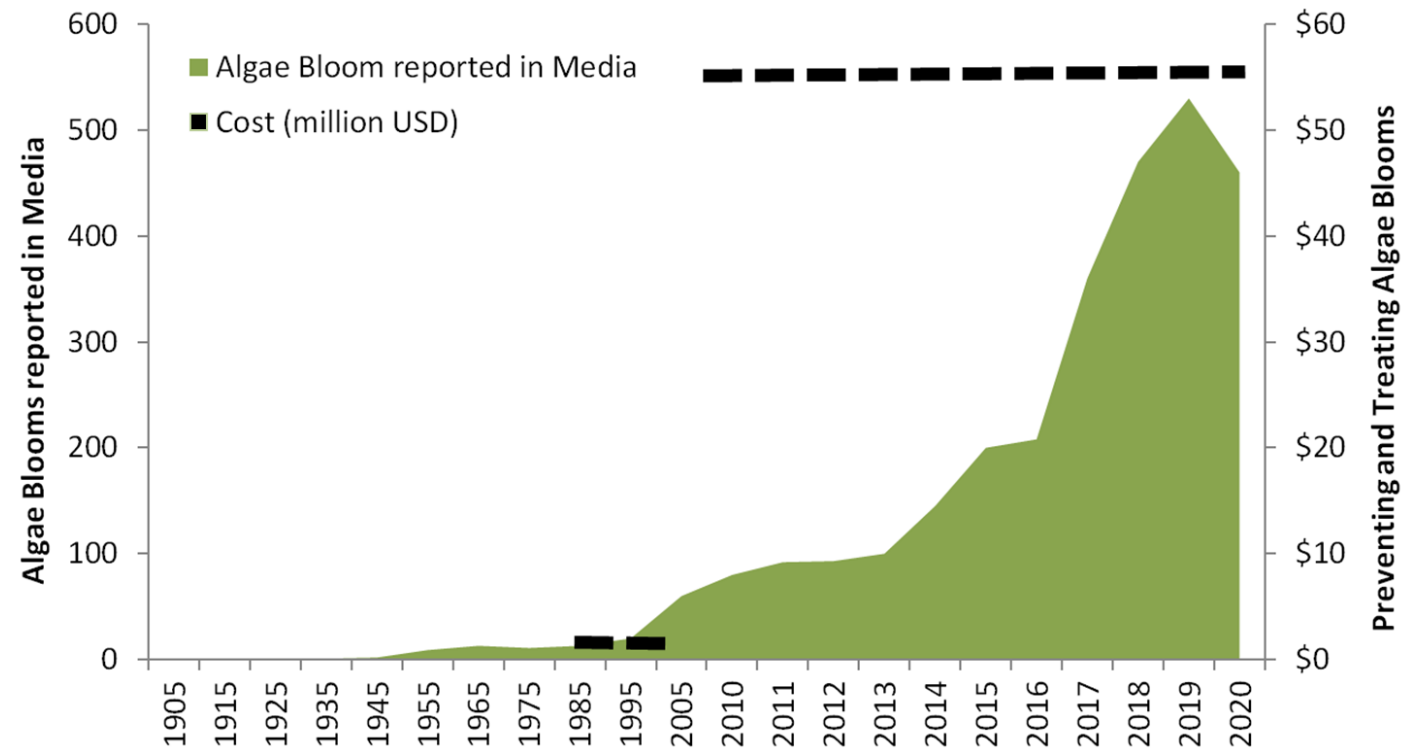
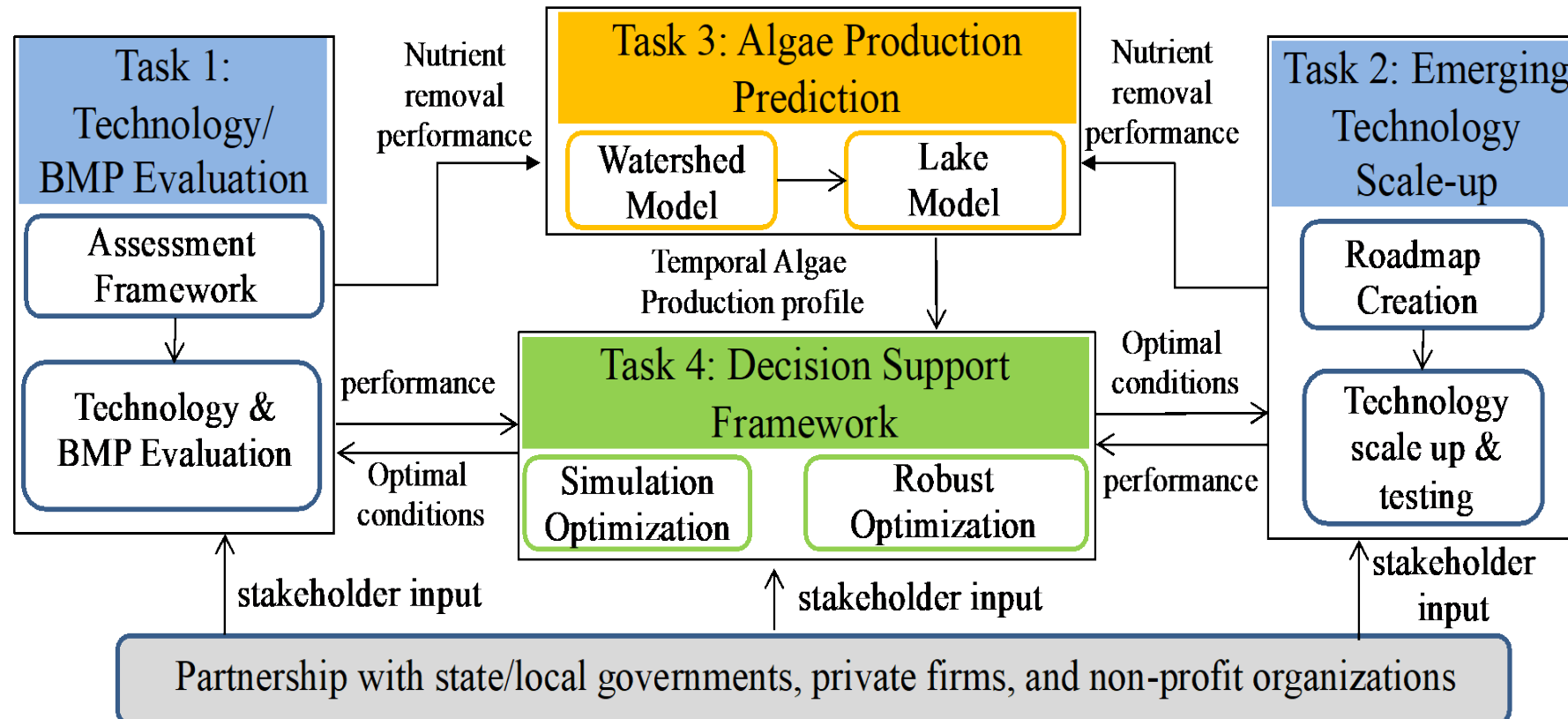# Implementation of nutrient management technologies for HABs control

- Primary anthropogenic driver to HABs: excess nutrient loadings

- Significant investment: prevent and treat algae blooms

- Algae blooms reported: continue to increase

- **Need**: holistic evaluation and strategic implementation of existing and emerging technologies and BMPs

Data source: EWG, 2020

Project Overview

- Goal: Optimize the implementation of nutrient treatment technologies and management practices
    - What, where and when?

Task 1: Technology/BMP Evaluation

Objective

Examine the effectiveness and sustainability of nutrient management technologies and practices
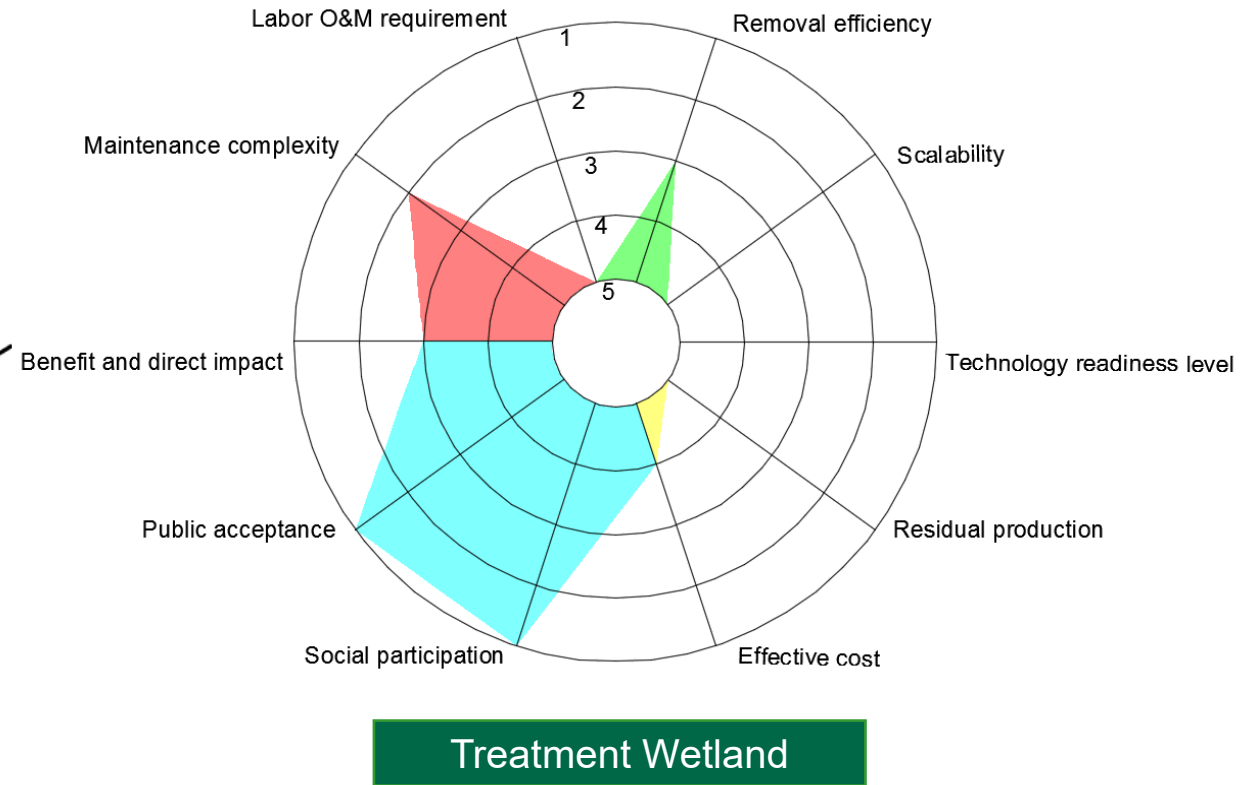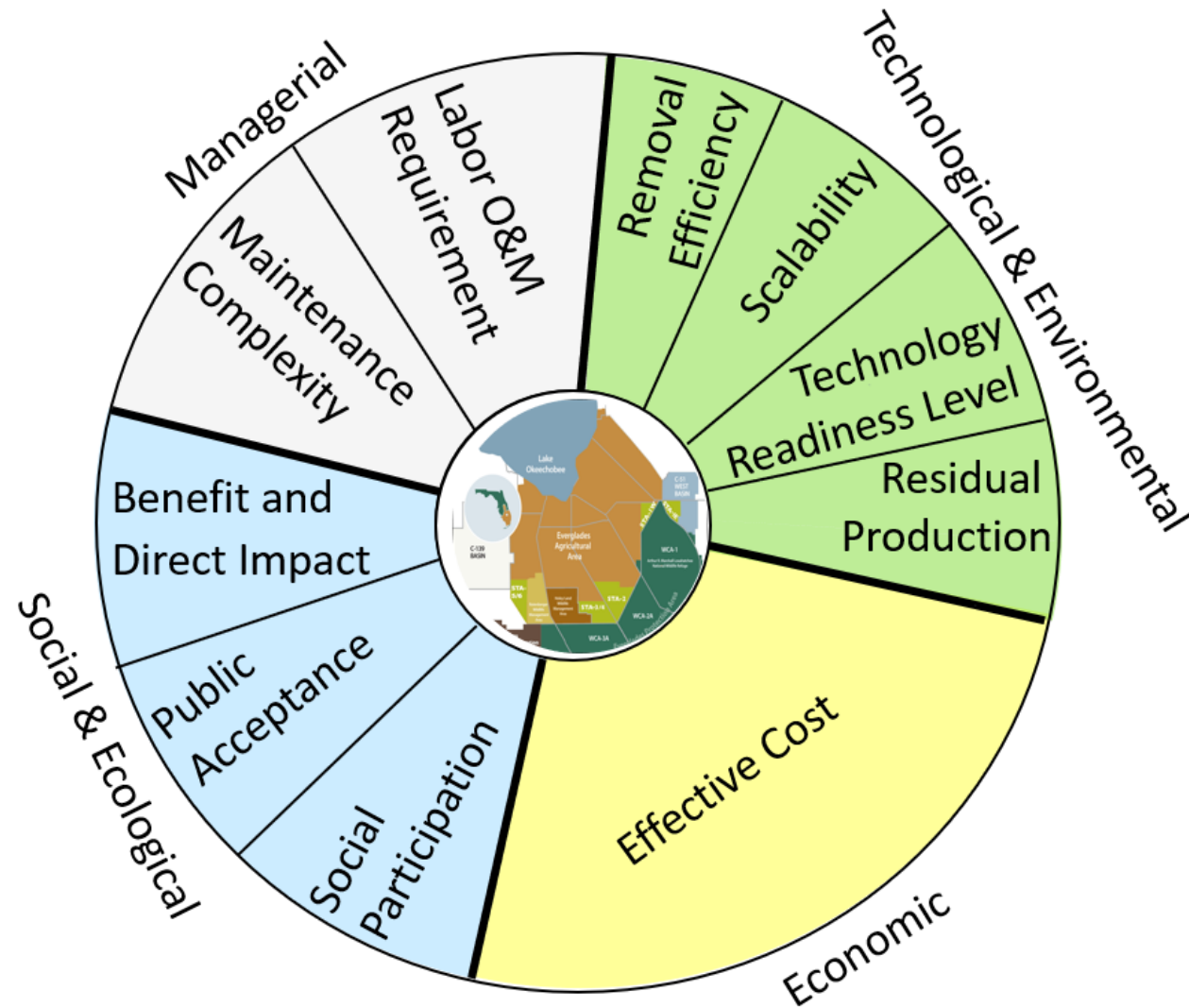
Approaches

- Review existing assessment framework
- Stakeholder meetings
- Collect data for existing technologies and practices
- Perform metadata analysis
- Develop a user-friendly tool for assessment

Outputs

- An assessment framework for nutrient management
- A database for existing technologies and practices
- A spreadsheet tool with visual output for assessment
- Metadata analysis results

Task 1: Assessment Framework

Treatment Wetland

Task 2: Roadmap for Emerging Technology Scale-up

Objective

Create and implement an appropriate approach to scale up selected emerging technologies and evaluate their performance

Approaches

- Literature review
- Stakeholder meetings
- Partnership with technology vendors
- Field and laboratory scale testing

Outputs

- Roadmap with identified strategies for technology scale-up
- Capacity building for testing nutrient management solution through meaningful partnerships and interactions
- Test two to three emerging nutrient management technologies
- Knowledge transfer

Task 2: Engaging Stakeholders: Lessons Learned

Successful adoption of new technology requires partnerships between local municipalities, vendors, regulatory agencies, and universities.

Entity	Strength	Weakness
Local Government	Public Outreach & Potential Sites	Capacity for Testing Emerging Technology
Private Vendor	Potential Products & Ideas	Limited Data
University	Extensive Data	Experience with Commercialization & Long-term Operation

Task 2: Projects and Partnership

Bioretention

- Mg-Modified Biochar
- Agriculture Runoff

Pre-Cast Biological Filter
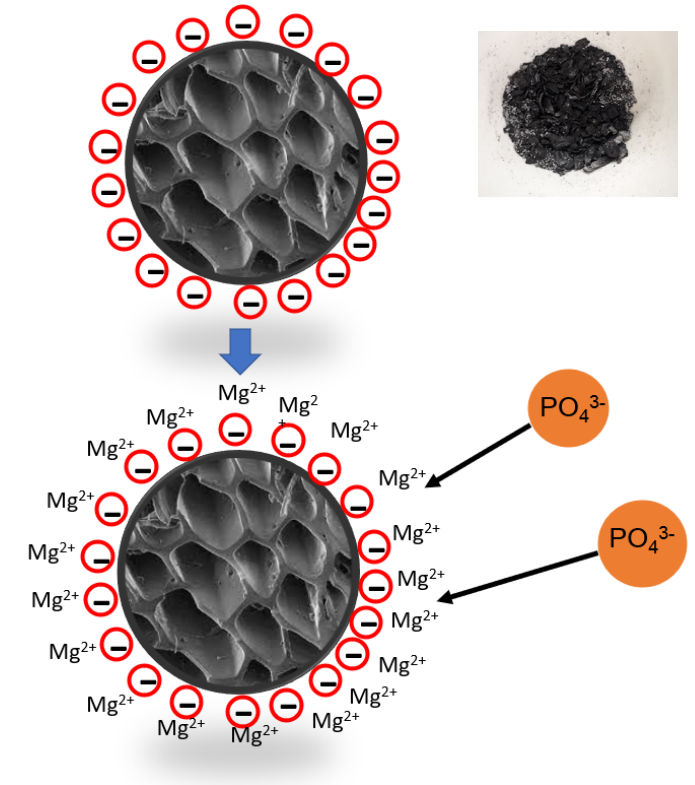
- Mg-Modified Biochar
- Urban Runoff

Aquatic Barrier

- Mg-Modified Biochar
- Legacy Phosphorus (Mining)

CITY OF Lakeland
www.lakelandgov.net

MACKWORTH-ENVIRO
Aquatic Barrier & Screening Solutions
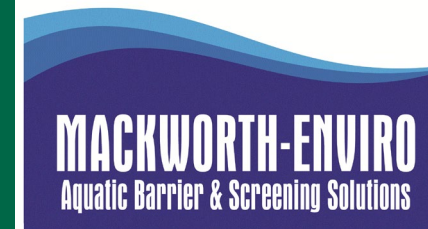
Task 3: Watershed and Lake Modeling

Objective

Develop hydro-ecological models of spatiotemporal changes in algae production

Approaches

- Review existing modeling frameworks
- Collect historical observed data and remote sensing data
- Develop watershed hydrology models
- Develop lake ecology model
- Integrate two models to predict algae production

Outputs

- Well-calibrated hydrologic model for recent hydro-climatic conditions
- Well-calibrated hydrodynamic and water quality lake model
- Estimates of the effect of BMPs on nutrient load reduction and algae production

Task 3: Watershed, Nutrient, and Lake Modeling
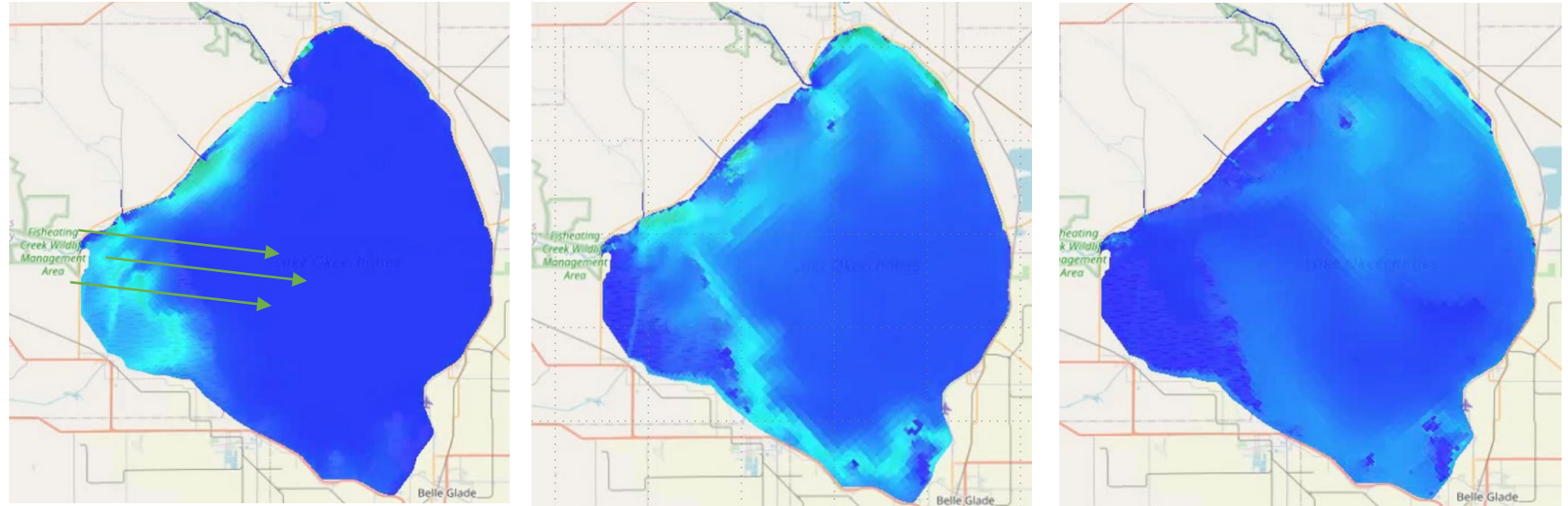

WAM watershed & nutrient model
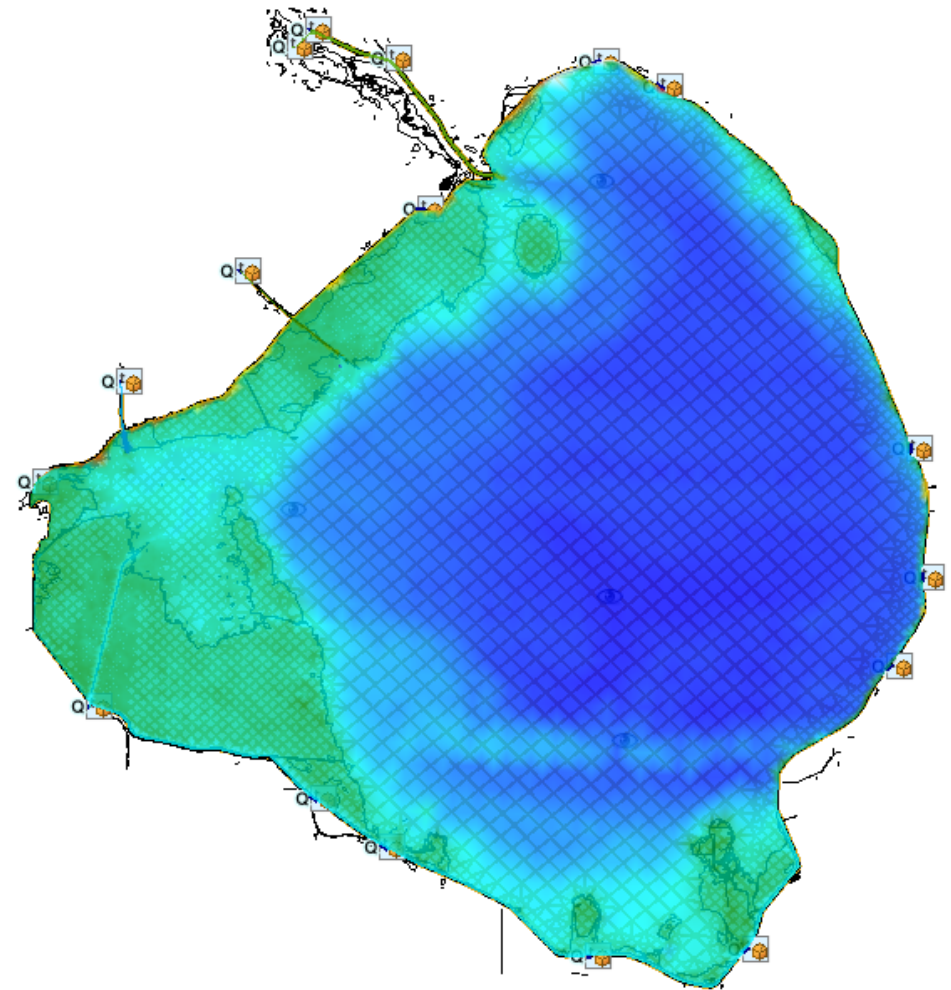
Lake model

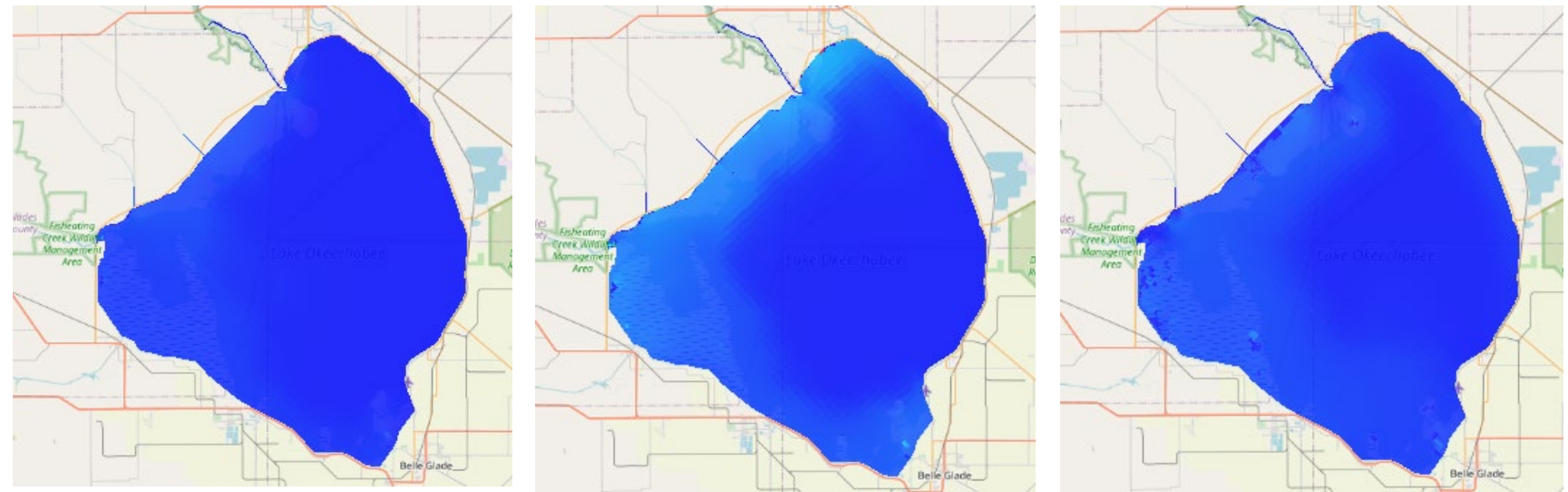# Task 3: Watershed, Nutrient, and Lake Modeling
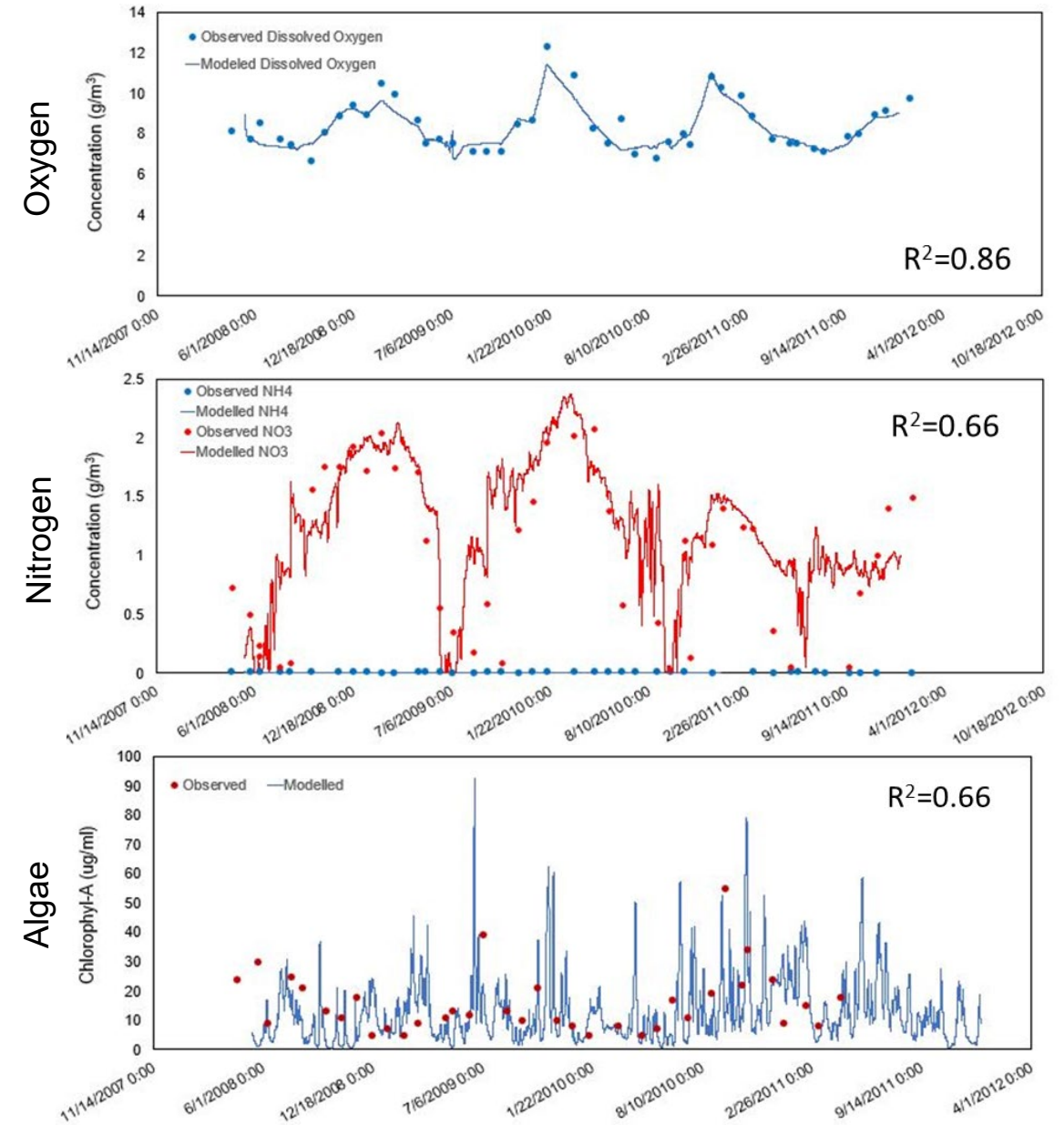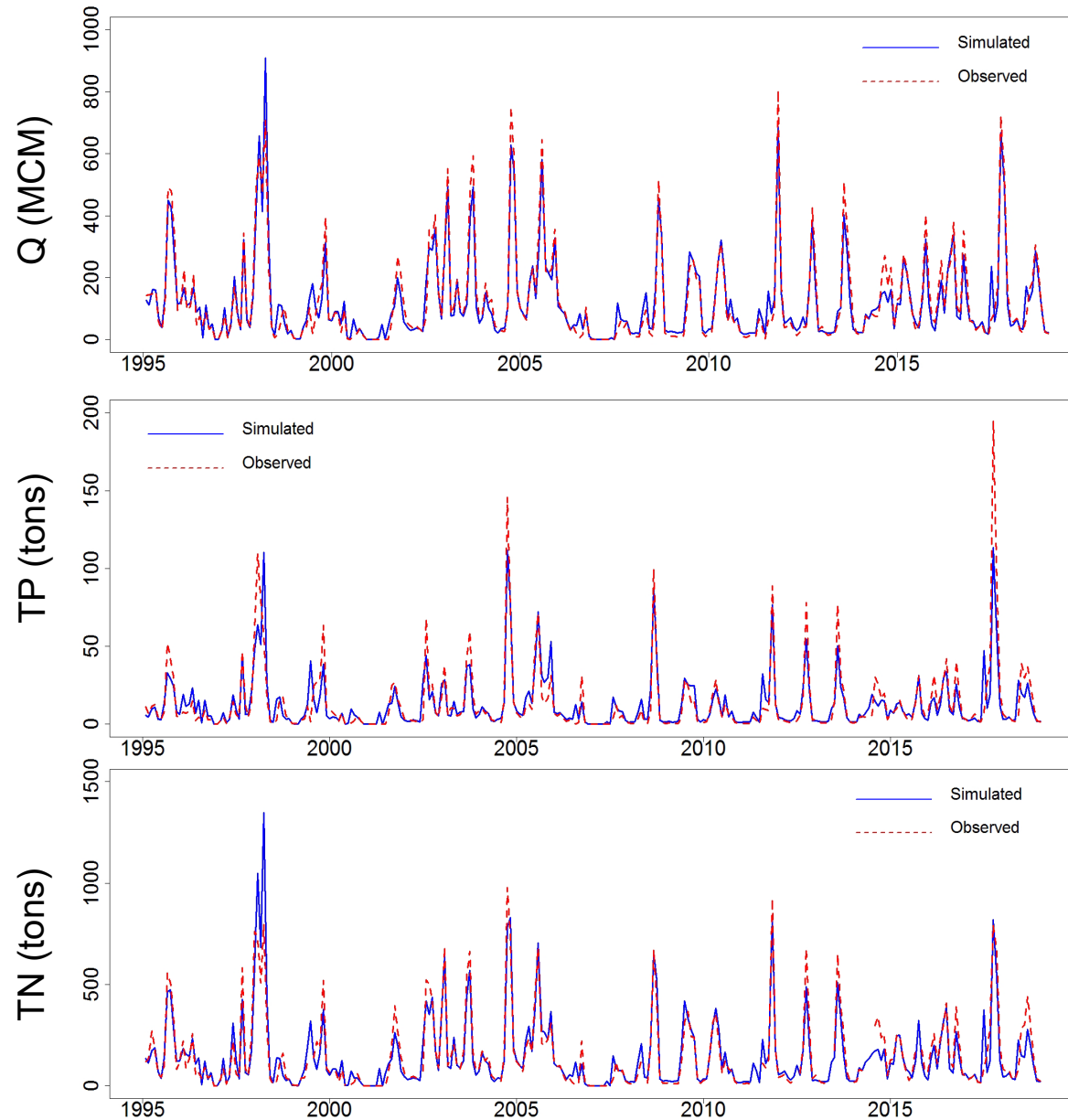
Task 3: Watershed, Nutrient, and Lake Modeling

Historical events

Insights into interventions (e.g. reducing 50% of phosphorus and nitrogen inputs into the lake)

Task 4: BMP/ Technology Implementation Optimization
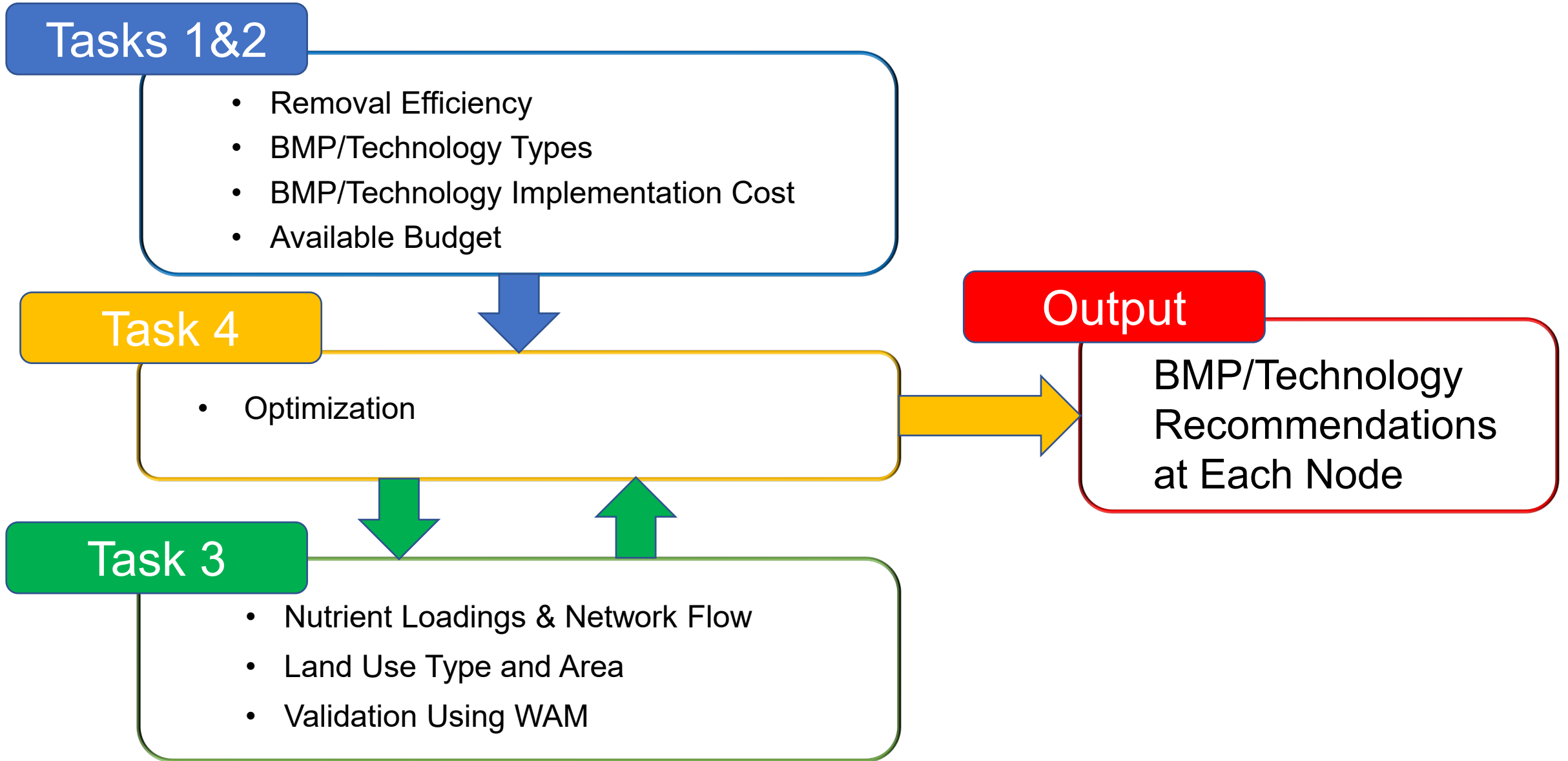
Upper Kissimmee (UK) Case Study: Optimized Implementation

Legend

- Sub-catchment
- Water control
- Drainage improvement
- Retention
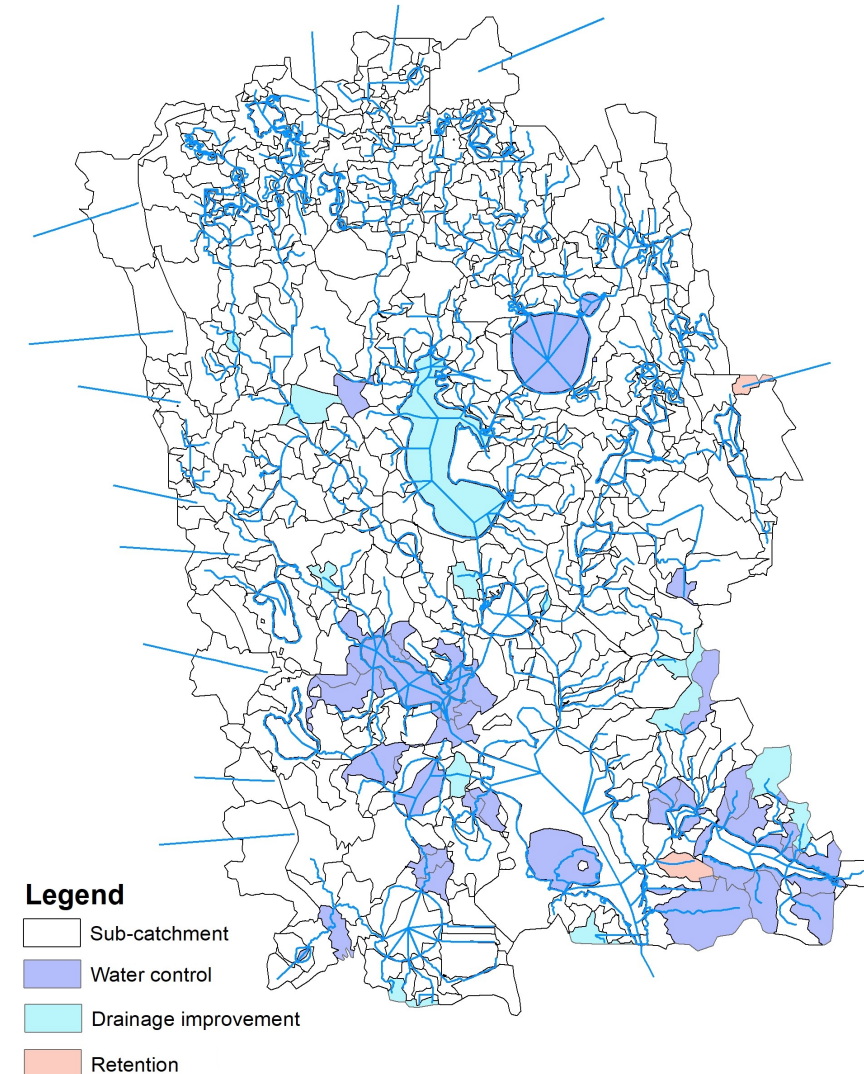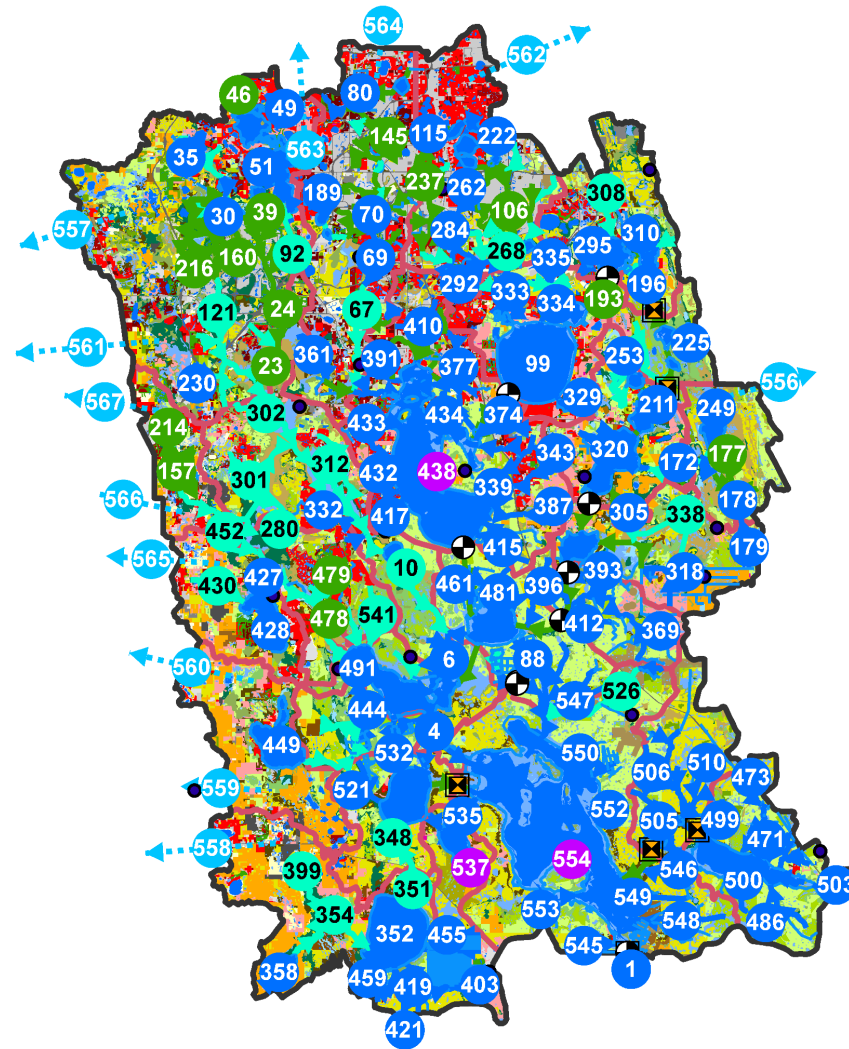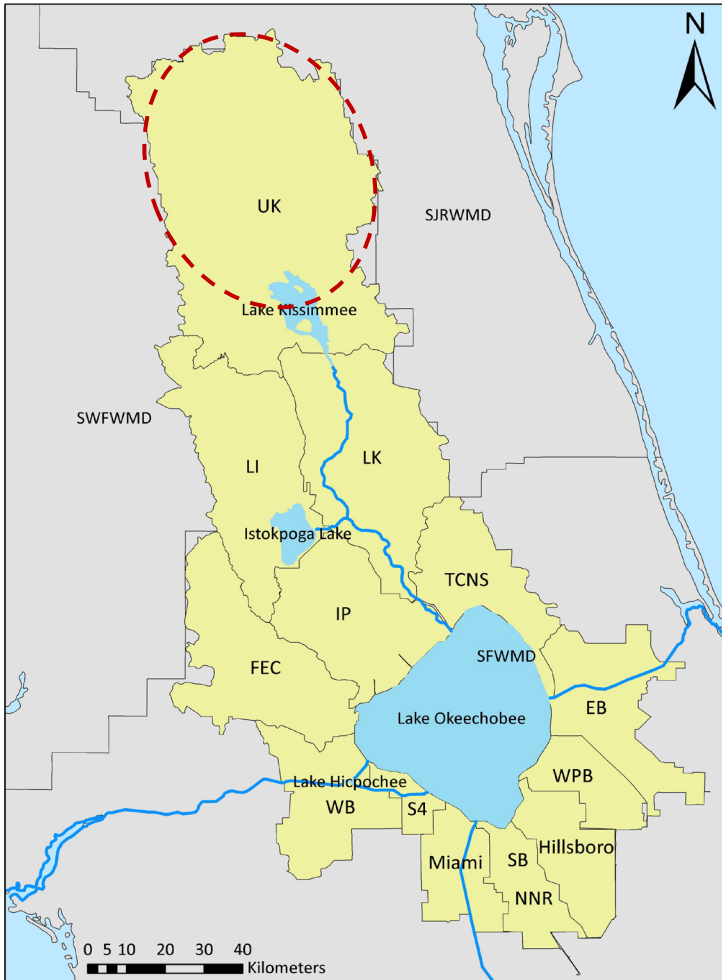
Project Outputs to Date

- Developed and tested a new assessment framework with 10 indicators.
- Collected data on nutrient removal and cost for 45 BMPs.
- Identified several innovative nutrient removal technologies to control nutrients in urban and agricultural runoff.
- Identified potential sites for pilot and full-scale investigations through stakeholder meetings and field visits.
- Developed and calibrated/validated a coupled watershed and lake model.
- Developed a deterministic optimization model to optimize spatial implementation of BMPs.
- Developed an optimization package to be used by others.

Questions?

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