Western Lake Erie Nutrient Source Inventory (NSI) – Guiding Policy, Practices & Resources

2019 Ohio Stormwater Conference – Sharonville, Ohio

May 9, 2019

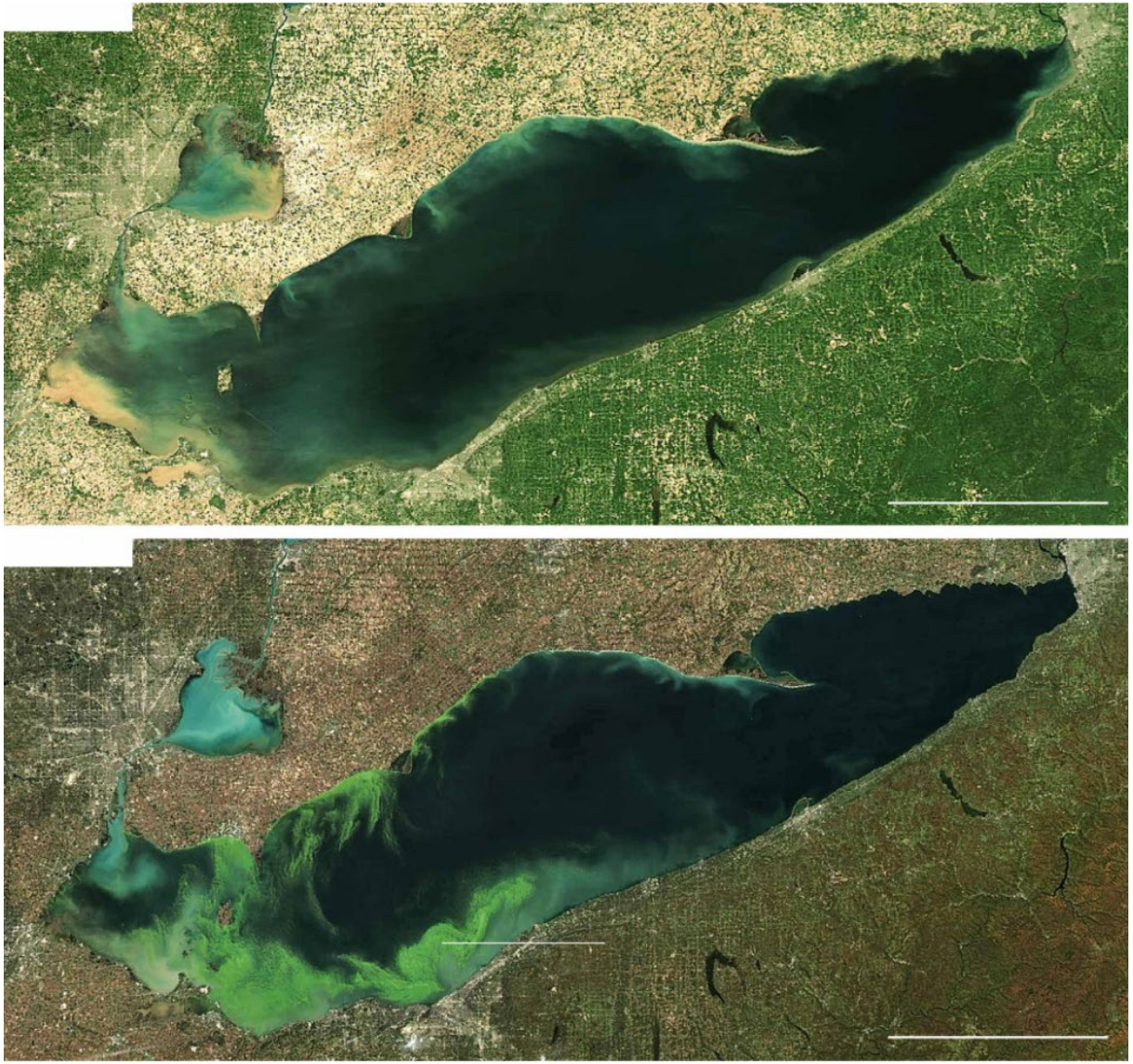
Presented By:

Melissa Greene-Hopfer, Sustainability Project Manager, Lucas County Commissioners

Regina Collins, Chief, Water Resources, City of Toledo

Tim Murphy, Principal, CESSWI, CEC

Background



Source: NOAA Centers for Coastal Ocean Science; data from the NASA MODIS sensor

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NSI – Who's Involved?

- **Lucas County – Board of County Commissioners**
- **City of Toledo**

- **Internal Stakeholder Group**
  - Toledo – Lucas County Sustainability Commission
  - Lake Erie Waterkeeper
  - American Rivers
  - Toledo Metropolitan Area Council of Governments
  - Partners for Clean Streams
  - National Wildlife Federation
  - Area Water Treatment Facilities
- **Peer Review Group**
  - Ohio EPA
  - US EPA
  - Great Lakes Commission
  - Research Institutions – UT, Heidelberg, BGSU, UM, OSU, Purdue, MSU
  - USDA – NRCS
  - Soil and Water Conservation Districts
  - Michigan DEQ
  - Indiana DEM
  - Farm Bureau
  - Great Lakes Funders Network
  - And others….
- **Technical Service Provider**
  - Civil & Environmental Consultants, Inc. (CEC)

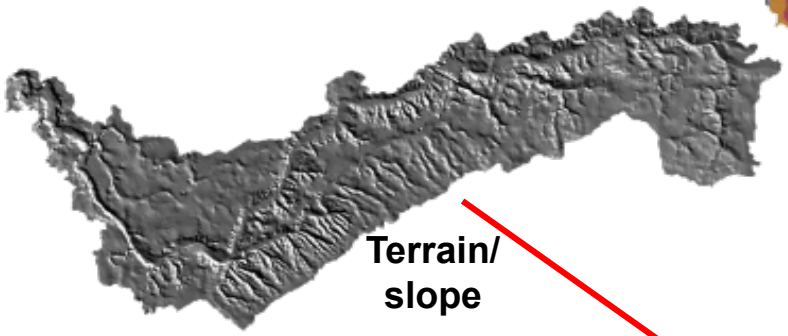
NSI – A Multi-Phase Approach

- **Phase 1 – Initial Steps**
  - Inventory and Mapping of Potential Nutrient Contributors in the WLEB
    - Identify potential pollutant sources that need to be controlled to achieve desired nutrient load reductions (GLWQA 40%) using an unbiased approach and the best data readily available.
    - Utilize GIS to manage database and develop an interactive mapping system.
  - Develop a Nutrient Load Model & Identify Management Measures for Nutrient Reduction for the Lower Maumee HUC-8
    - Determine nutrient loads and develop an estimate of the load reductions expected from management measures.
    - Address data gaps identified during Phase 1.
    - Develop nutrient load models at the sub-basin level or HUC-12 levels and prioritize by their respective nutrient load contributions.
    - Identify stakeholders in the priority sub-basins and/or HUC-12s.
    - Use the model to demonstrate best management practice scenarios.

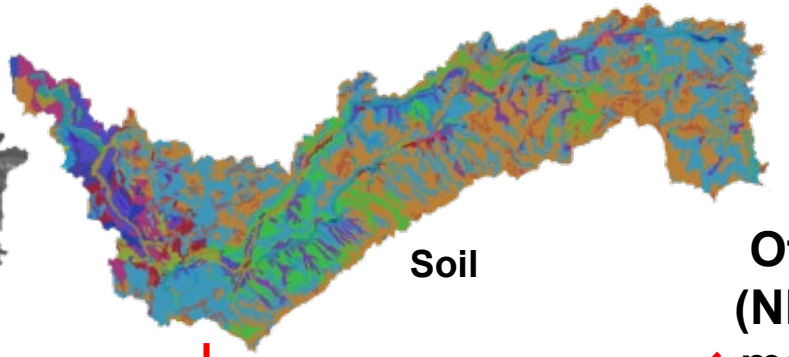
NSI – A Multi-Phase Approach

- **Phase 2 – Expanded Modeling**
  - Develop a Nutrient Load Model & Identify Management Measures for Nutrient Reduction for:
    - Blanchard HUC-8
    - Auglaize HUC-8
    - St. Joseph HUC-8
    - St. Marys HUC-8
    - Upper Maumee HUC-8
- **Phase 3 – Use as a Supportive Tool for Implementation and Monitoring of Management Measures**

The SWAT Model:



Terrain/
slope

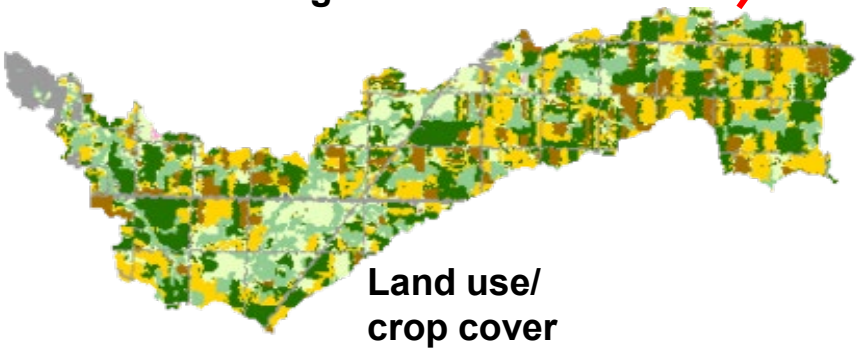


Soil

Other sources
(NPDES, CAFO,
manure, HSTS)

Weather &
climate change

Flow, sediment,
nutrients
(N & P), etc.



Land use/
crop cover

Practices & mgt.: tillage, fertilizer, etc.

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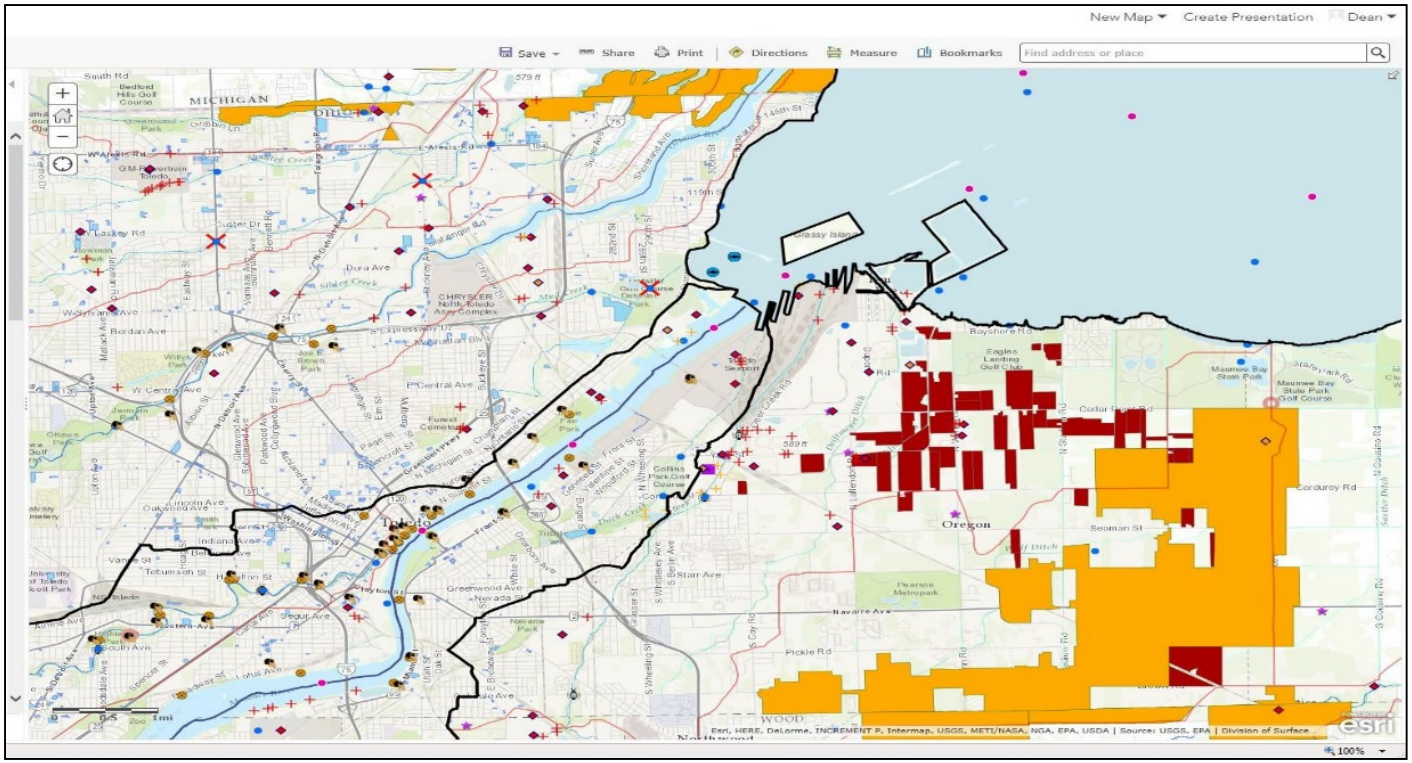
Challenges / Data Gaps

- Manure land application information.
- Information on unpermitted CAFO's.
- Lack of water quality monitoring data.



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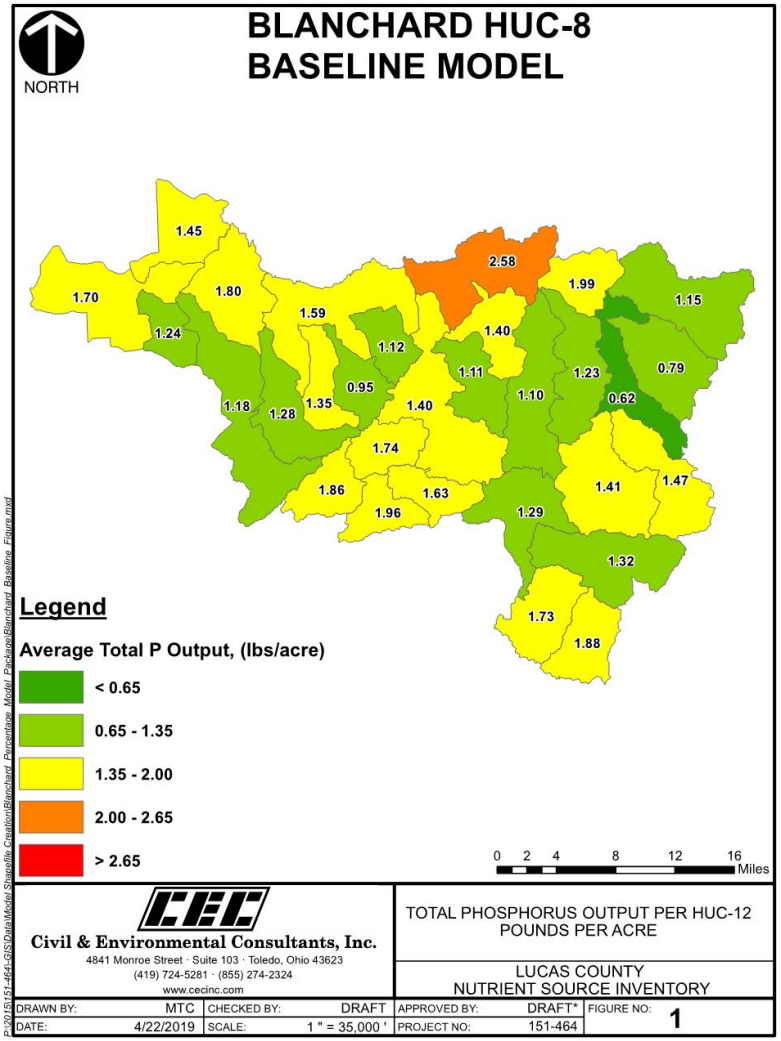
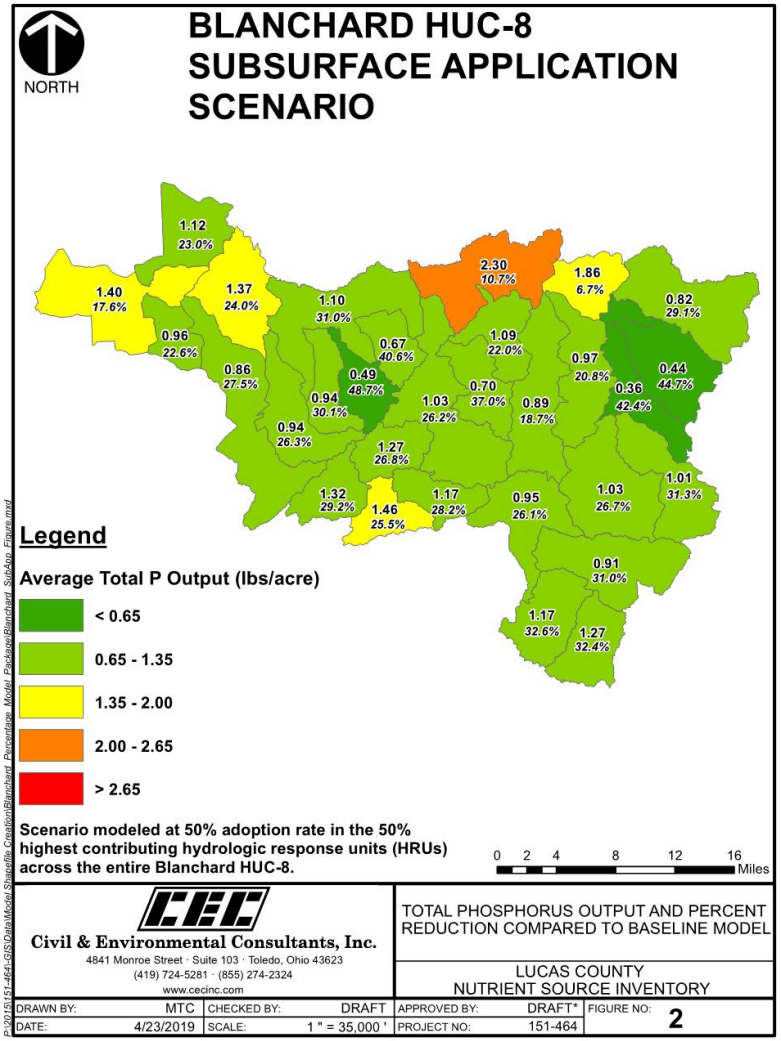
Baseline Model vs. Best Management Scenarios – Blanchard





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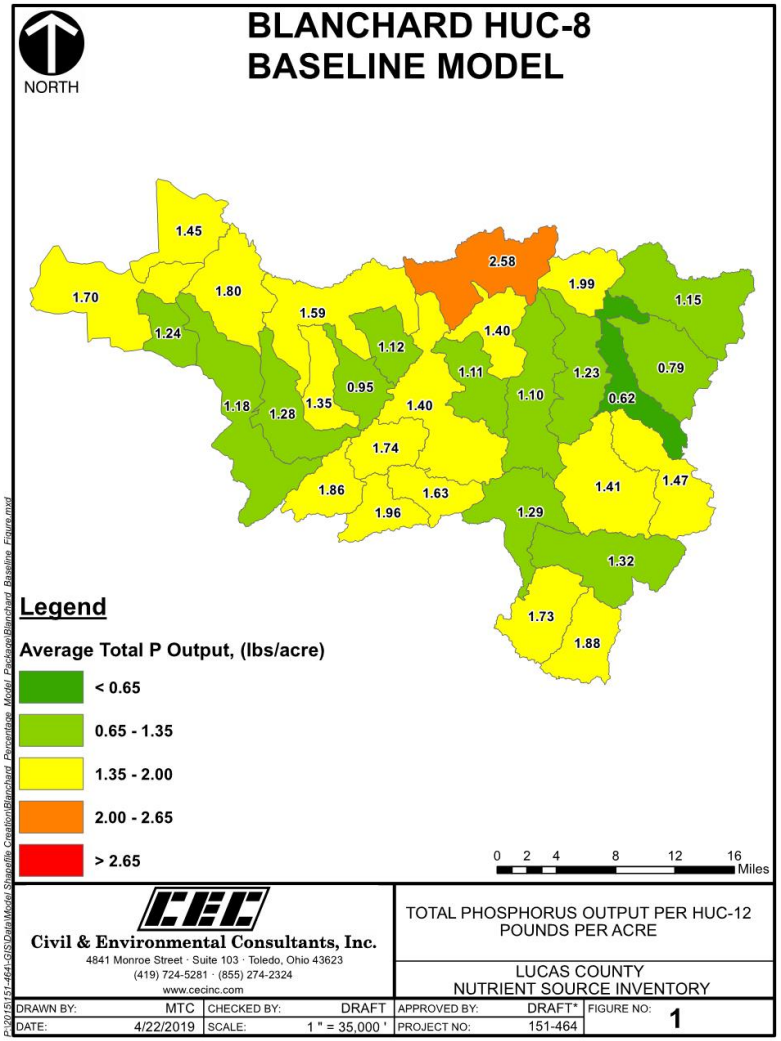

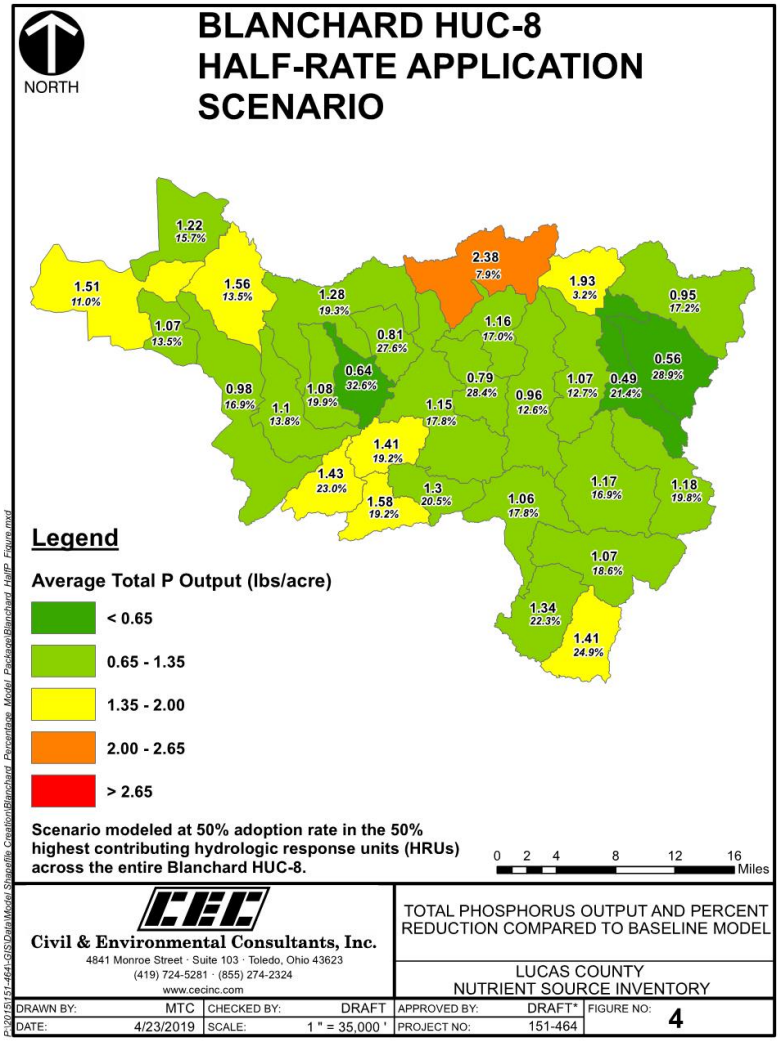

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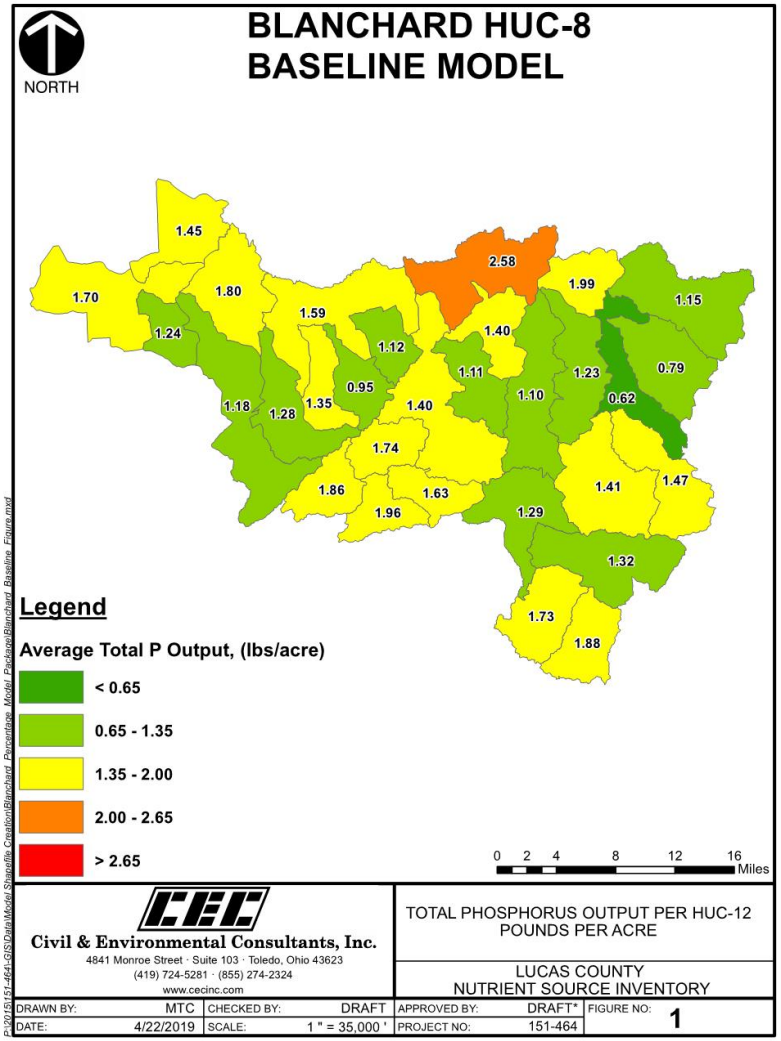

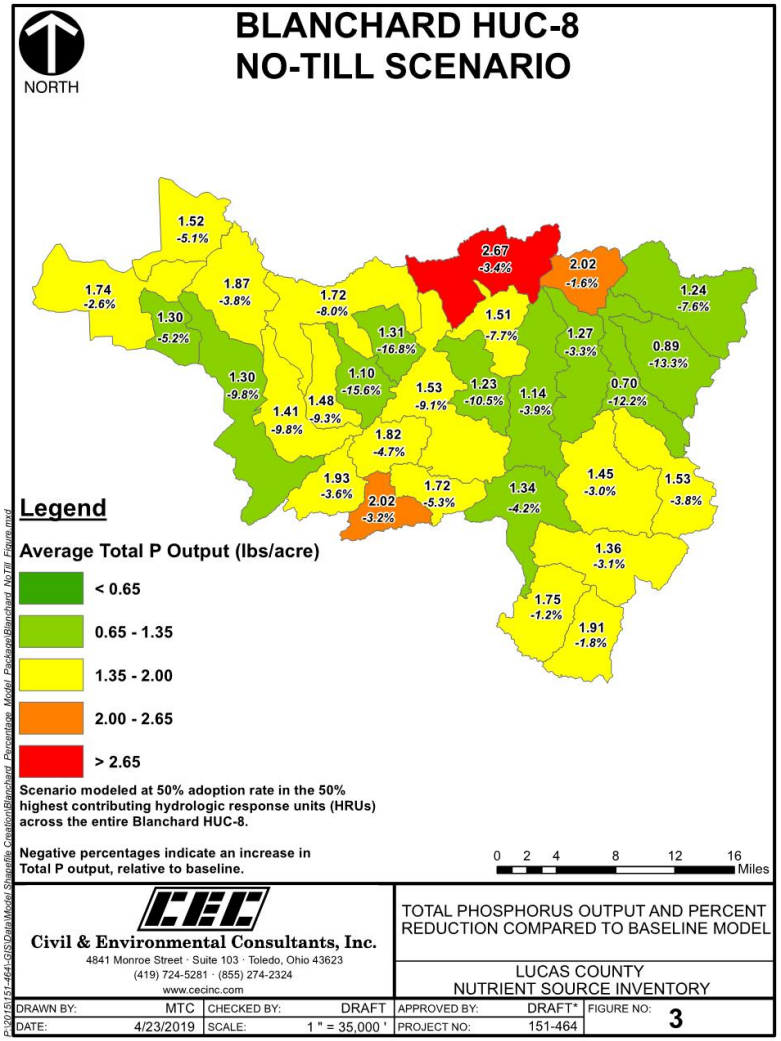

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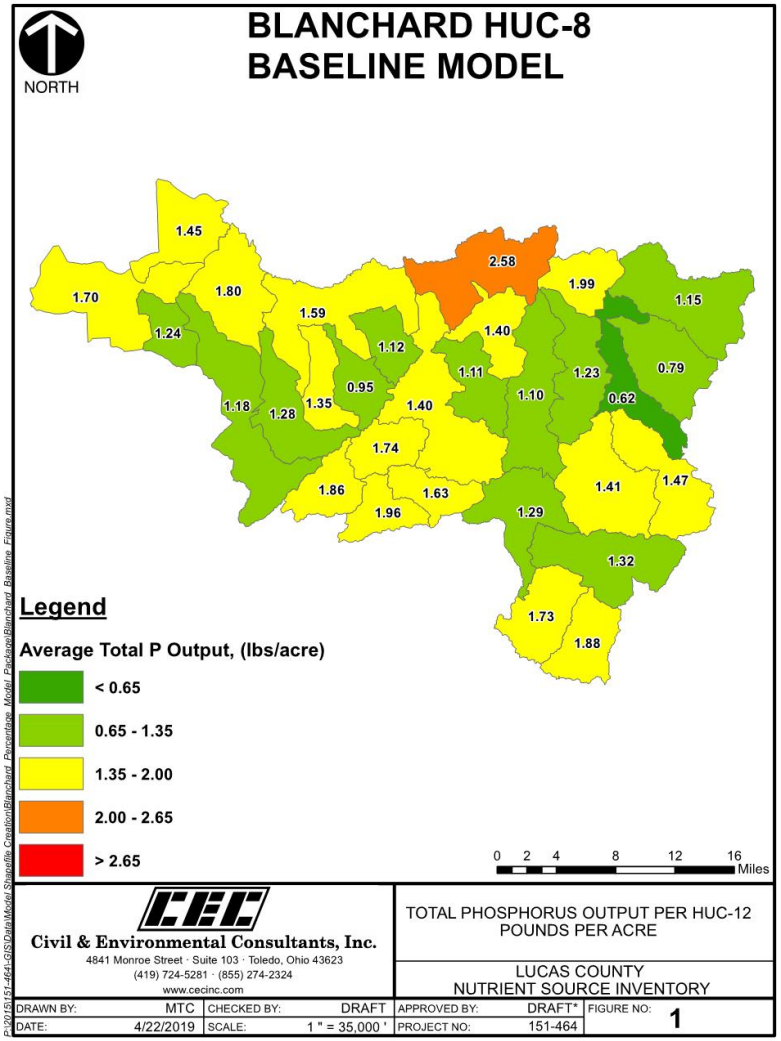

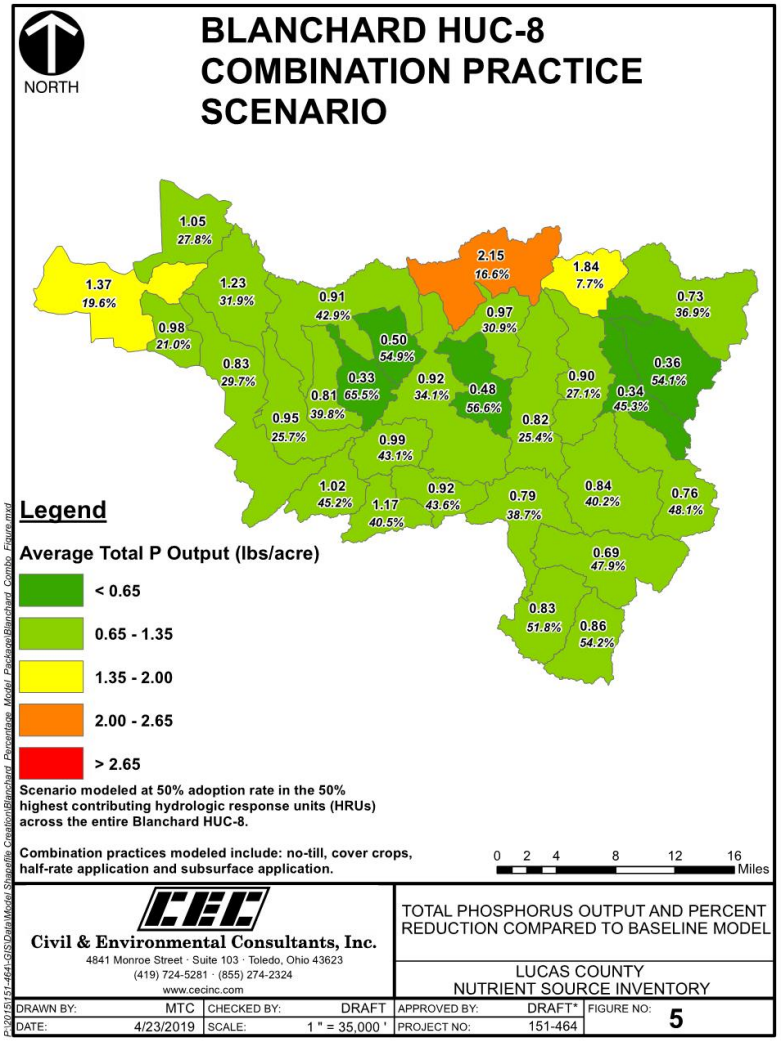

Stakeholder Outreach – Summarizing the Results

A Story Map

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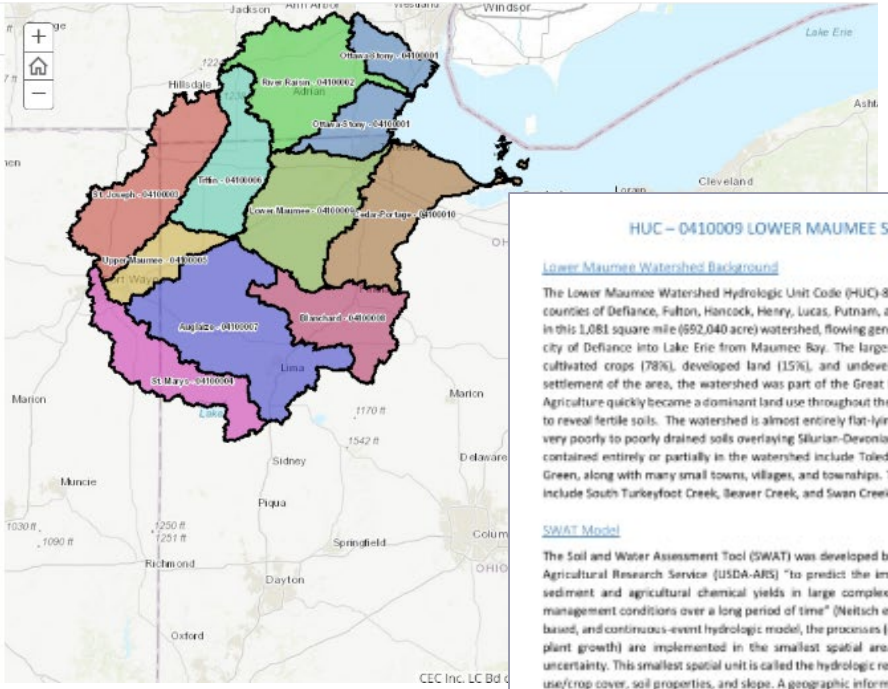
Guidance Manual to the Western Lake Erie Basin Nutrient Source Inventory

The Nutrient Source Inventory is an inventory and mapping tool that identifies causes of impairment and potential pollutant sources that need to be controlled to achieve desired nutrient load reductions. This guidance manual includes pertinent information about the Nutrient Source Inventory and reviewing it prior to accessing the Inventory will allow the user to maximize the amount of information he or she can obtain from the Nutrient Source Inventory.

LUCAS COUNTY

TOLEDO LUCAS COUNTY SUSTAINABILITY COMMISSION



HUC – 0410009 LOWER MAUMEE SWAT MODEL SUMMARY

Lower Maumee Watershed Background

The Lower Maumee Watershed Hydrologic Unit Code (HUC)-8 (04100009) is located in northwest Ohio in the counties of Defiance, Fulton, Hancock, Henry, Lucas, Putnam, and Wood. The Maumee River is the largest river in this 1,081 square mile (692,040 acre) watershed, flowing generally north-eastward from its headwaters in the city of Defiance into Lake Erie from Maumee Bay. The largest land use classifications in the watershed are cultivated crops (78%), developed land (15%), and undeveloped natural land (7%). Prior to the original settlement of the area, the watershed was part of the Great Black Swamp, a region dominated by wetlands. Agriculture quickly became a dominant land use throughout the region when the natural wetlands were drained to reveal fertile soils. The watershed is almost entirely flat-lying, with an average slope of 2% or less, featuring very poorly to poorly drained soils overlaying Silurian-Devonian lime- and dolostone bedrock. The major cities contained entirely or partially in the watershed include Toledo, Maumee, Perrysburg, Rossford, and Bowling Green, along with many small towns, villages, and townships. The main tributaries to the lower Maumee River include South Turkeyfoot Creek, Beaver Creek, and Swan Creek.

SWAT Model

The Soil and Water Assessment Tool (SWAT) was developed by the United States Department of Agriculture - Agricultural Research Service (USDA-ARS) "to predict the impact of land management practices on water, sediment and agricultural chemical yields in large complex watersheds with varying soils, land use and management conditions over a long period of time" (Neitsch et al., 2011). As a spatially distributed, physically-based, and continuous-event hydrologic model, the processes (e.g. precipitation, evaporation, nutrient loss, and plant growth) are implemented in the smallest spatial area possible to increase accuracy and minimize uncertainty. This smallest spatial unit is called the hydrologic response unit (HRU), a unique combination of land use/crop cover, soil properties, and slope. A geographic information system (GIS) interface is used to enter and designate land use, soil, weather, groundwater, water use, management, pond and stream water quality data, and the simulation period (DiLuzio et al., 2002). GIS input files include a digital elevation model (DEM), land use/land cover and soil properties layers, and a daily weather database.

SWAT is one of many tools available for assessing watersheds and is regarded as the most versatile and customizable tool available to best achieve real-world scenarios for evaluating best management practices (BMPs) employed within a watershed. It is the most appropriate model to test the effects of BMPs on crop yield and environmental outputs. Runoff movement, sediment, nutrient, and pesticide loadings to the main channel in each subbasin are simulated by considering realistic physical processes.

Lower Maumee SWAT Model Methodology

In order to best represent actual conditions within the Lower Maumee HUC-8 watershed, USGS streamgages (which are active, continuously functioning measuring devices in streams that measure the height of water to calculate average daily streamflow), local weather data, point source nutrient contributors, knowledge of agricultural practices and land management procedures were used in conjunction with the USDA Cropland Data Layer (CDL) to isolate the HUC-8 and determine the actual contribution of its loading into Lake Erie.

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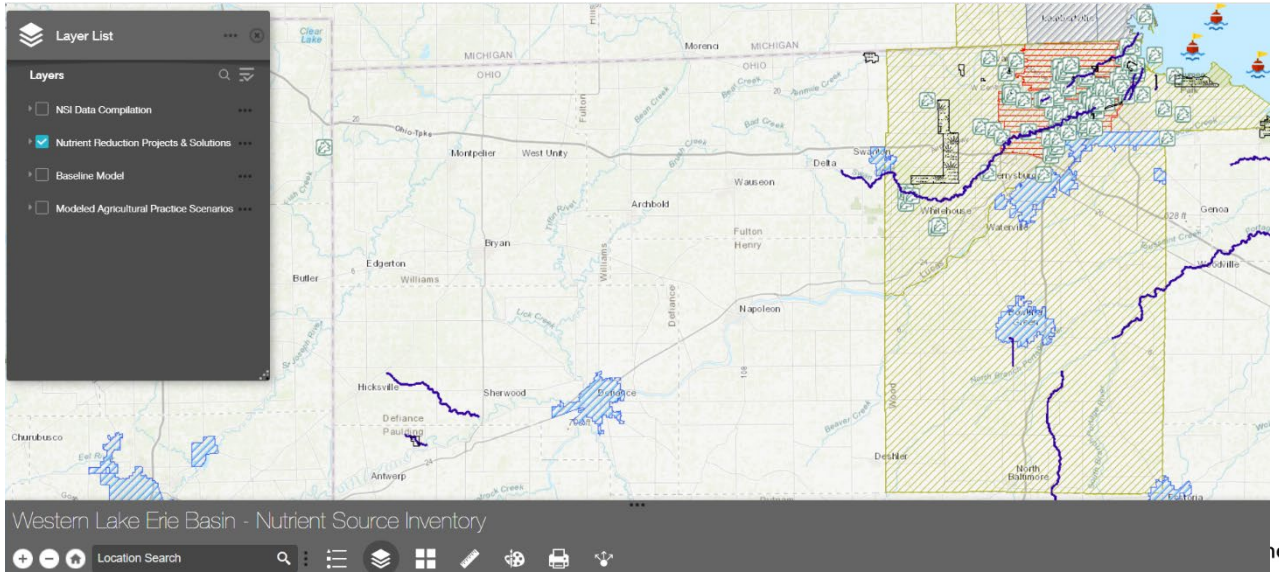
Stakeholder Outreach – Guiding Policy, Practices & Resources

- **Creating Awareness and Fostering Connections and Collaboration Across the WLEB**
- **Developing an External Stakeholder Group**
- **Prioritization and Informed Direction of Resources**
  - Nine-Element Watershed Planning Process
  - Grant Funding
  - Project Implementation



Contact Information

- **Melissa Greene-Hopfer**
  - Lucas County Commissioners Office – Sustainability Project Manager
  - P: 419.213.4530 | E: mgreene@co.lucas.oh.us
- **Regina Collins**
  - City of Toledo Environmental Services – Chief, Water Resources
  - P: 419.936.3780 | E: regina.collins@toledo.oh.gov
- **Timothy Murphy, CESSWI**
  - **Civil & Environmental Consultants, Inc.** – Principal
  - P: 419.724.5281 | E: tmurphy@cecinc.com