

Valuation of Water-Quality Ecosystem Services Available From Farms

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Project Team

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Project Objectives

- To assess the **replicability** of the process for **identifying** and **estimating the values** of public ecosystem service benefits realized from implementation of conservation plans carried out under USDA Farm-Bill programs
- To apply the process, and **develop** ecosystem service benefit estimates for a landscape-scaled application
- To assess the process and application for improvement opportunities

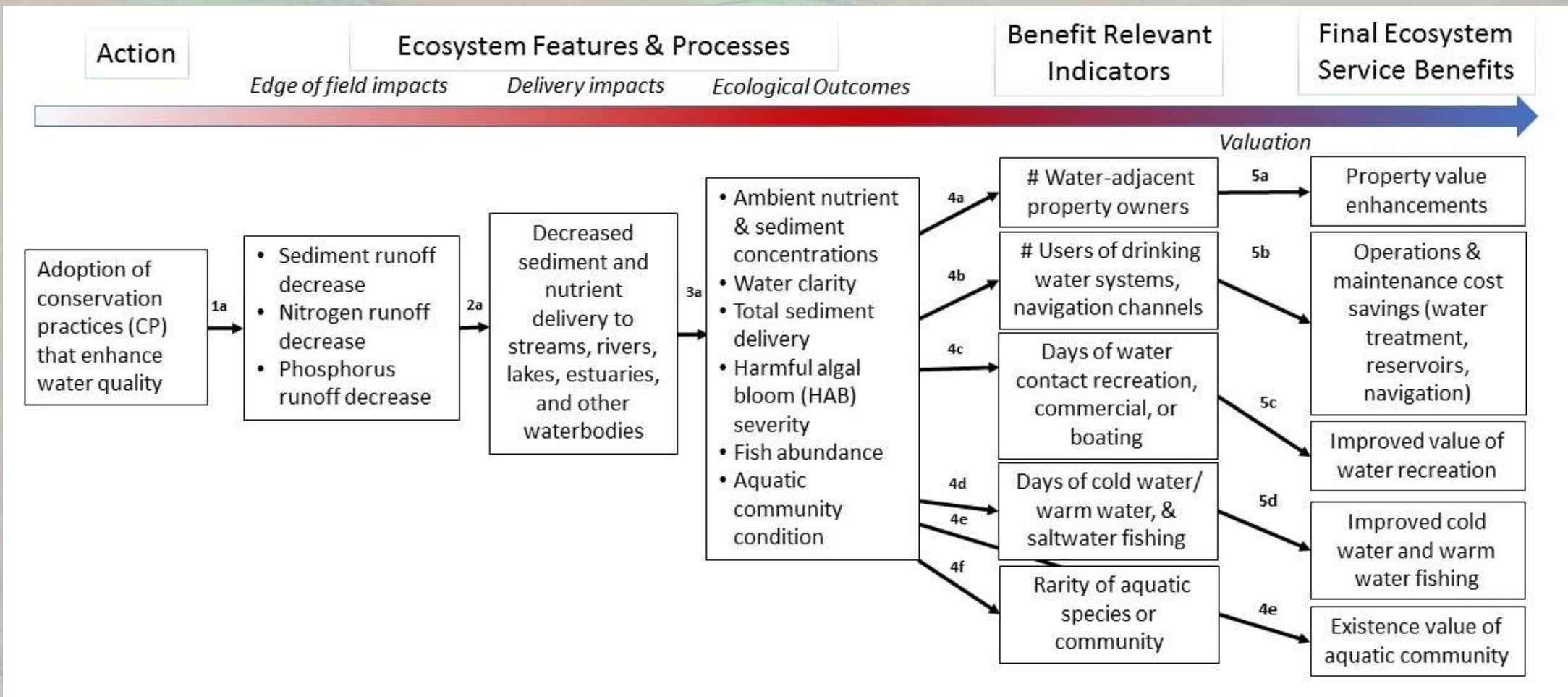


First step – Identification

- Interdisciplinary team developed a Conceptual Model to map potential Ecosystem Services from the implementation of conservation practices
- Focus on benefits from water quality improvements
- Other models could be developed for water quantity, soil, habitat, and air quality management



Water Quality Based Ecosystem Service Benefits From Conservation Practices

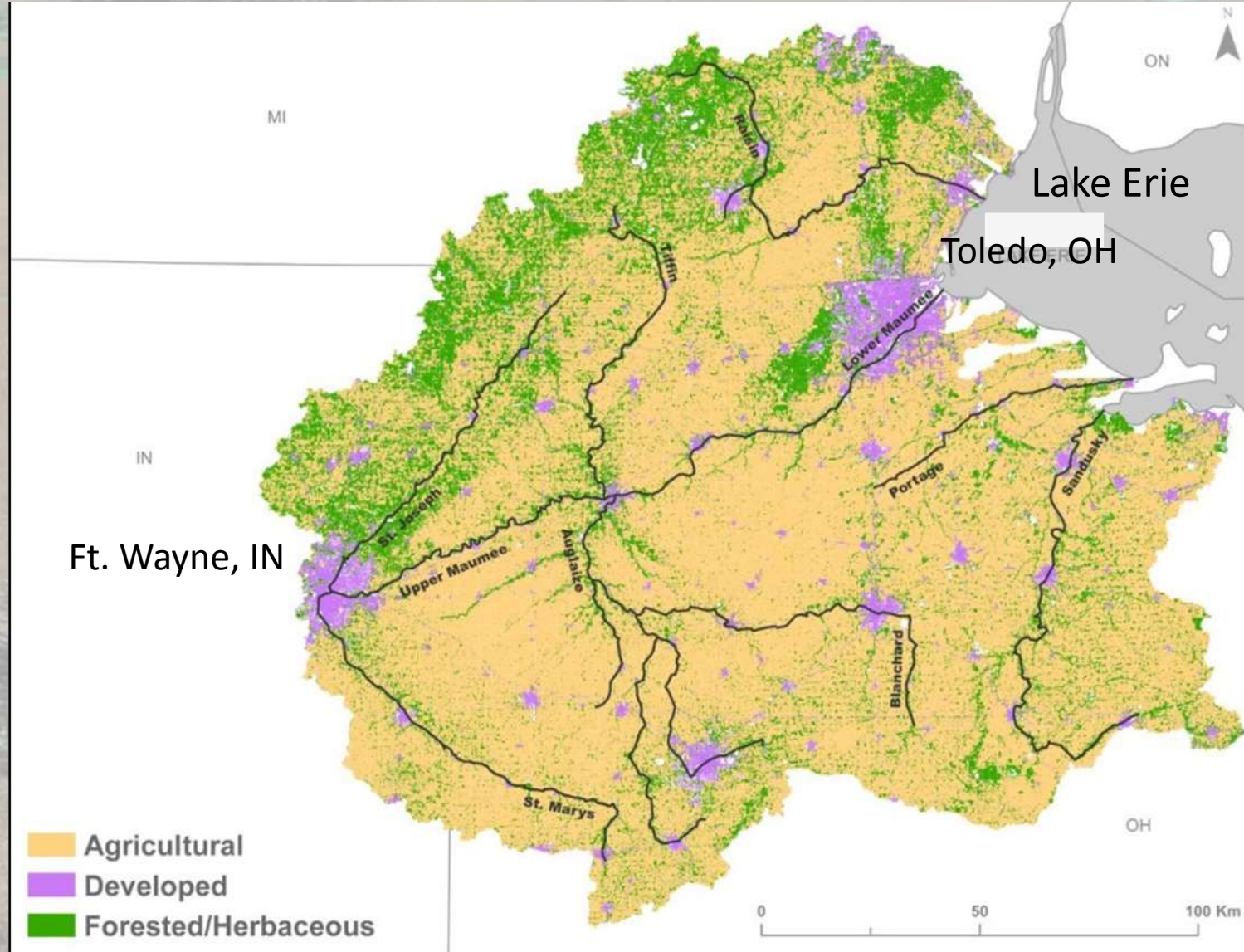


Second step – Framing

- Identified more Ecosystem Services than resources for evaluation
 - Focus on four key benefits that may be overlapping
 - Enhanced property values
 - Improved sportfishing
 - Improved aquatic community condition (non-use value)
 - Avoided costs in drinking water & navigation systems
- Benefit values are location-specific, need a location to site the valuation procedures
 - Western Lake Erie Basin



Western Lake Erie Basin



Third step – Baseline & Estimating Change

- Element of project objective was to examine effects from implementing USDA working lands programs to improve water quality
- Specify the change from a baseline
- Determine how to measure the change in benefits
 - Models used to estimate the change in water quality from applying conservation practices
 - Applied APEX and HUMUS/SWAT from CEAP
- Applied the valuation methodology
 - Identify available data and methods
 - Note missing data and linkages
 - Develop illustrative ecosystem service values



Benefit: Residential property values

Start

- 26,000 private residences near Maumee River

Literature linkages

- Hedonic model to relate ↓ nutrients to ↑ in property values (Liu, et al 2014)
- Benefit transfer model

Apply

- Conservation practices on 8% of acres
- Reduces nutrients by 7-8% (Keitzer, et al, 2016)

Value

- \$27 million in improved property values (river only)



Benefit: Improved sportfishing

Start

- Participation day values
- Current catch rates

Literature linkages

- Benefit transfer model for catch value per fish, adjusted for income and location (Johnson & Wainger, 2015)

Apply

- Conservation practices on 48% of acres
- Increase fish abundance 42% (Keitzer, et al, 2016)

Value

- \$22 million increase in annual value of fishing



Benefit: Improved aquatic community condition

Start

- Accept the use of an index as an acceptable indicator
- Determine appropriate population

Literature linkages

- Benefit transfer model for Index of Biotic Integrity (IBI) (Johnson, et. al 2011) adjusted for income

Apply

- Conservation practices on 48% of acres
- Increase IBI by 6% (Keitzer, et al, 2016)

Value

- \$9 million increase in annual WTP for watershed population



Benefit: Avoided costs from reduced Sedimentation

Start

- CEAP study estimates of soil loss that becomes sediment

Literature linkages

- Sediment to reduced reservoir capacity model (Hansen & Hellerstein, 2007)
- Sediment to reduced dredging cost model (Hansen, 2002)

Apply

- Conservation practices adaptation continues in watershed at the same rate as past 8 years

Value

- \$220K in annual increased reservoir storage capacity benefits
- \$120K in annual reduced dredging costs



Summary of Water Quality Findings

- “Case-study” framework to demonstrate
 - Replicable process
 - Identifying & valuing several ecosystem service changes
 - Application based on working-lands conservation
- Sited in relatively data-rich Western Lake Erie Basin
 - Location of a recent CEAP (Conservation Effects Assessment Project) Study and additional studies
- Four types of ecosystem services from increased conservation were valued
- Limited the set of ecosystem services to those that could be valued (others possible)



Many Future Challenges

- Reducing the number of major assumptions required to connect components from actions to benefits.
- Valued several ecosystem service changes to illustrate the process, but assumptions to fill data gaps limit use.
- Isolating conservation practice effects from other trends requires a strong baseline (CEAP study)
- Without study like CEAP, data limitations will further limit physical to final ecosystem services analysis.
- Lack common variables to link ecological and economic models.
- Improving the precision of the ecological and economic estimates will involve substantial cost.



Requirements

Thoughts and opinions presented today are those of the author and do not represent those of USDA or the Natural Resources Conservation Service

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Thank you!



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