

Water Economics at EPA

Social Cost of Water Pollution Workshop

April 2021

The views expressed in this presentation are those of the author and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

Outline

- Water Economics Center
- Executive Orders and Presidential Memoranda
- Economic Analysis and Research at EPA

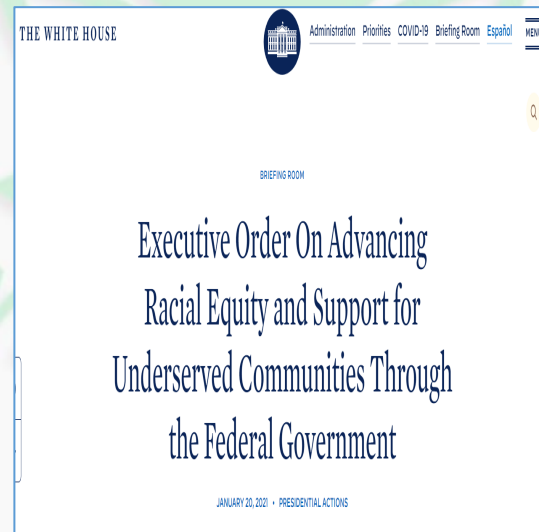
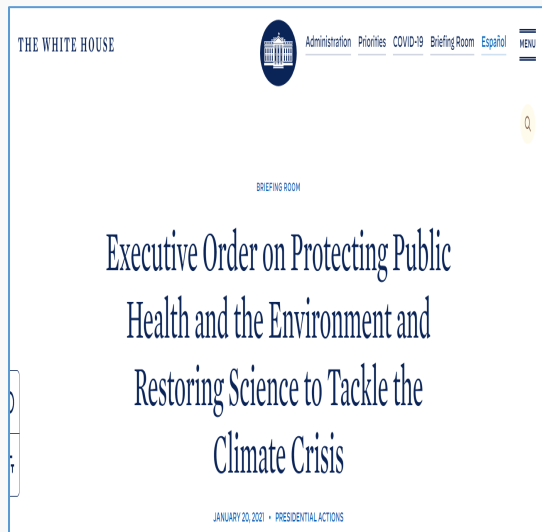


Water Economics Center

- Established November 2020
- Conduct economic analysis for EPA's Office of Water's regulatory and nonregulatory programs
- Advise EPA's Office of Water senior management and represent EPA's Office of Water on economic issues
- Develop tools/methodologies and conduct research to support water-related economic analysis
 - Collaborate with EPA's Office of Research and Development and EPA's National Center for Environmental Economics, other federal agencies, other external partners
 - Provide ORISE post-masters and post-doctorate fellowships

Executive Orders and Presidential Memorandum

- EO 13990- Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis
- EO 13985- Advancing Racial Equity and Support for Underserved Communities through the Federal Government
- Presidential Memorandum on Modernizing Regulatory Reform



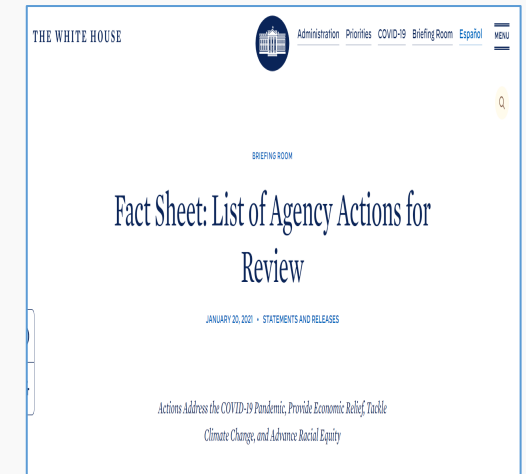
Executive Order 13990- Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis

- “directs all executive departments and agencies (agencies) to immediately review and, as appropriate and consistent with applicable law, take action to address the promulgation of Federal regulations and other actions during the last 4 years that conflict with these important national objectives, and to immediately commence work to confront the climate crisis.”
- Review of agency actions taken between 1/20/17 and 1/20/21 and “consider suspending, revising, or rescinding the agency actions.”
- Fact sheet list of actions for review
- <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/>

EO 13990 Fact Sheet List of Agency Actions for Review

Include:

- Lead and Copper Rule Revisions
- Steam Electric Reconsideration Rule
- Drinking Water: Final Action on Perchlorate
- Clean Water Act Section 401 Certification Rule
- Navigable Waters Protection Rule (Definition of “Waters of the United States”)



This is independent of any new actions by EPA (e.g., actions identified under standard Clean Water Act and Safe Drinking Water Act processes)

Executive Order 13985- Advancing Racial Equity and Support for Underserved Communities through the Federal Government

- “pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.”

EPA Administrator Regan directive on environmental justice (April 2021)

- “Take immediate and affirmative steps to incorporate environmental justice considerations into their work, including assessing impacts to pollution-burdened, underserved, and Tribal communities in regulatory development processes and to consider regulatory options to maximize benefits to these communities.”
- <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>
- <https://www.epa.gov/newsreleases/epa-administrator-announces-agency-actions-advance-environmental-justice>

Presidential Memorandum- Modernizing Regulatory Review

- Reaffirms the basic principles set forth in E.O. 12866
- Directs the OMB Director, in consultation with representatives from federal agencies, to:
 - “identify ways to modernize and improve the regulatory review process, including through revisions to OMB’s Circular A-4, Regulatory Analysis”
 - “propose procedures that take into account the distributional consequences of regulations, including as part of any quantitative or qualitative analysis of the costs and benefits of regulations, to ensure that regulatory initiatives appropriately benefit and do not inappropriately burden disadvantaged, vulnerable, or marginalized communities”
- <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/modernizing-regulatory-review/>

Executive Orders 13990, 13985, and Presidential Memorandum on Modernizing Regulatory Review

Taken together:

- Evaluating and possibly revising regulations taken over past four years
- Evaluating how to account for environmental justice and equity issues in benefit cost analysis, distributional analysis, and environmental justice analysis
 - Building on EJSCREEN, EPA's Environmental Justice Technical Guidance, and EPA's Guidelines for Preparing Economic Analysis (Ch 10)
- <https://www.epa.gov/ejscreen>
- <https://www.epa.gov/environmentaljustice/technical-guidance-assessing-environmental-justice-regulatory-analysis>
- <https://www.epa.gov/children/guidelines-preparing-economic-analyses-chapter-10-environmental-justice-childrens>

Economic Analysis and Research at EPA- Water Quality Benefits Initiative

- “Three office effort” between EPA’s Office of Policy (NCEE), Office of Research and Development, and Office of Water
- In-house original research and tool development (e.g., HAWQS, BenSPLASH)
- 2015 STAR Grant RFA on Water Quality Benefits
- New STAR Grant RFA (Notice of Intent)

Economic Analysis and Research at EPA

Typical Clean Water Act analysis:

1. Measure/model environmental impact of policy (HAWQS, SWAT, SPARROW)
2. Translate environmental impact into valuation endpoints (Water Quality Index, Biological Condition Gradient, Macroinvertebrate Index, Individual Ecosystem Services)
3. Value Δ in endpoints and aggregate over relevant population (benefits transfer, original valuation)

Multiyear research portfolio in EPA's Office of Research and Development organized around these three areas

Safe and Sustainable Water Resources Strategic Research Action Plan 2019-2022: Output 1.5

<https://www.epa.gov/research/safe-and-sustainable-water-resources-strategic-research-action-plan-2019-2022>



Water Quality Models and Economic Analyses to Support Science-Based Water Quality Decisions

- Develop/improve water quality, watershed, and economic models to enable effective, science-based water quality decisions
- Contribute to EPA's Hydrologic and Water Quality System (HAWQS)- Benefits Spatial Platform for Aggregating Socioeconomics and H2O Quality (BenSPLASH) Integrated Assessment Model; support Water Modeling Workgroup

Δ Policy (or Local Action) \rightarrow Δ Water Quality \rightarrow Δ Benefits

Product 1

Improved national watershed and water quality model capability
(John Johnston)

Product 2

Economic methods/tools to estimate the benefits of water quality improvements (Marisa Mazzotta)

Product 3

Quantification of water quality-economic linkages (Nate Merrill/Paul Ringold)





Improved national watershed and water quality model capability (J. Johnston)

- Watershed modeling
 - Cloud-based watershed simulation models (HAWQS/SWAT) that incorporate key source terms, nutrient/sediment loadings and BMPs to mitigate loadings (J. Johnston)
 - Further development of Hydrologic Micro Services (HMS) -interoperable modeling framework for managing data and modeling workflows for water quality benefits assessment, with automated data retrieval and model setup from publicly accessible data (using NOAA National Water Model forecasts) (R. Parmar)
 - Spatial statistical network model of stream temperature for TMDLs in the Pacific Northwest and Maine evaluating high resolution data for riparian zones (Finished in FY20) (N. Detenbeck)
- Waterbody modeling
 - Waterbody simulation capability for flowing streams, rivers and impounded waters within HMS modeling framework (J. Johnston)
 - Coastal modeling approach with reduced-form water quality model (WASP) with fewer parameters, default options, and batch execution for use in national modeling framework (C. Knightes)
 - Open-source plumes simulation model to evaluate coastal mixing zones (NPDES permitting) (C. Knightes)
 - Improved linkage of water quality/habitat to population models to support benefits assessment for tribes and other partners (J. Ebersole)



Economic methods/tools to estimate the benefits of water quality improvements (M. Mazzotta)

- Drinking water, source water protection
 - Nationally transferable methods using consumer purchase data to estimate drinking water quality benefits, with proof-of-concept application (M. Papenfus)
 - Valuation of source water protection using avoided drinking water treatment costs across the country (M. Heberling)
 - Proof-of-concept study using HAWQS/BenSPLASH to assess feasibility of market mechanisms for improving water quality in watersheds (M. Heberling)
- Hedonics
 - Hedonic valuation models for various regions, using consistent housing and water quality data, producing regional estimates of property value impacts of changes in water quality (M. Papenfus)
 - Hedonic module for BenSPLASH using a meta-analysis and a nationwide housing population dataset (M. Heberling)
 - National database to predict changes in home values associated with increasing riparian green space/GI (Finished in FY20) (N. Detenbeck)
- Recreation
 - Economic valuation models using data collected by a revealed preference survey of coastal recreation and water quality (M. Mazzotta)
 - Development of nationally transferable methods using human-mobility data to estimate recreational water quality benefits, with proof-of-concept application (N. Merrill)
- Assessment of spatial variation in values/extent of market for property values (M. Papenfus) and recreation (M. Mazzotta)

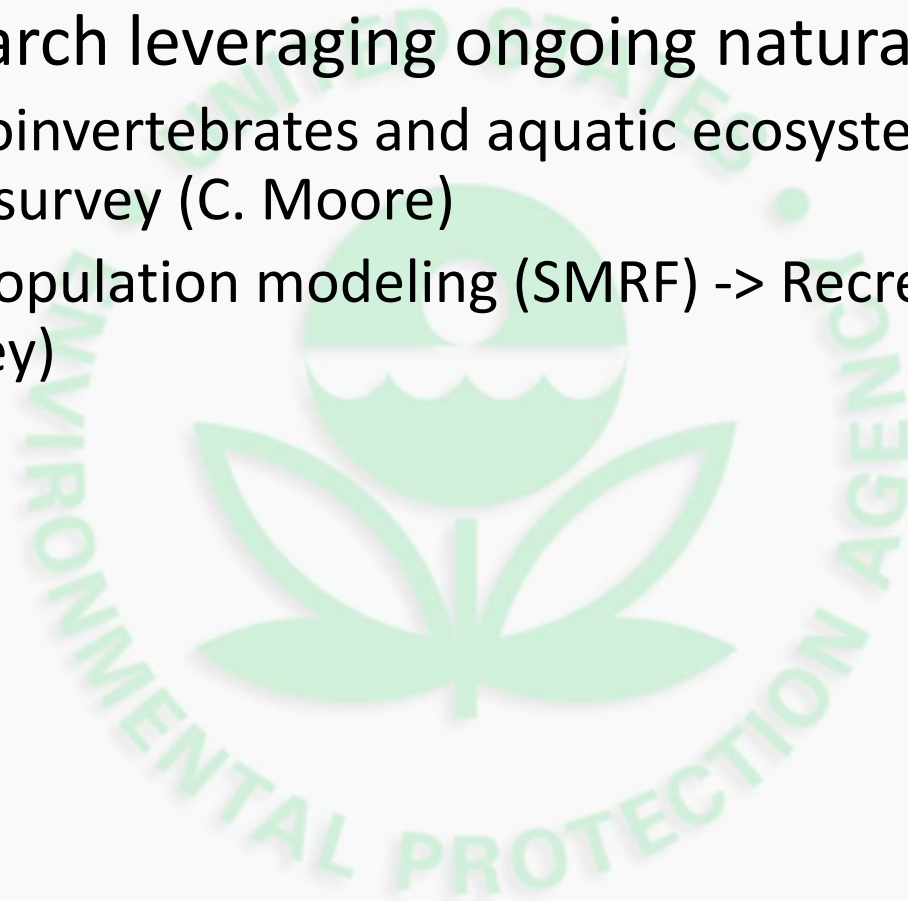


Quantification of water quality-economic linkages (N. Merrill and P. Ringold)

- Improve Water Quality Index (WQI) with updated metrics adapted for use with NARS data (S. Paulsen); indicators for selected designated uses (P. Ringold)
- Models to forecast number of macroinvertebrate taxa in lakes and streams under policy scenarios at regional and national scales. This work will start with problem formulation and conceptual model development with OW/NCEE/ORD aquatic ecosystem modelers (P. Ringold)
- A proof-of-concept evaluation of EPA's Virtual Beach Model, comparing costs/benefits of outcomes using current testing-based approaches to outcomes using Virtual Beach to augment current approaches (K. Mulvaney)
- Linkage of fish population/community models with economic models for scenario analysis, i.e., a discrete-choice economic model evaluating willingness-to-pay for changes in salmon populations and recovery status (M. Papenfus, J. Ebersole)
- A use case demonstrating integration of water quality data (modeled and monitored) with measures of economic benefit for scenario assessment across OP5 Products - specifics TBD with partners and ORD capabilities (M. Heberling)

Additional Research and Tool Development

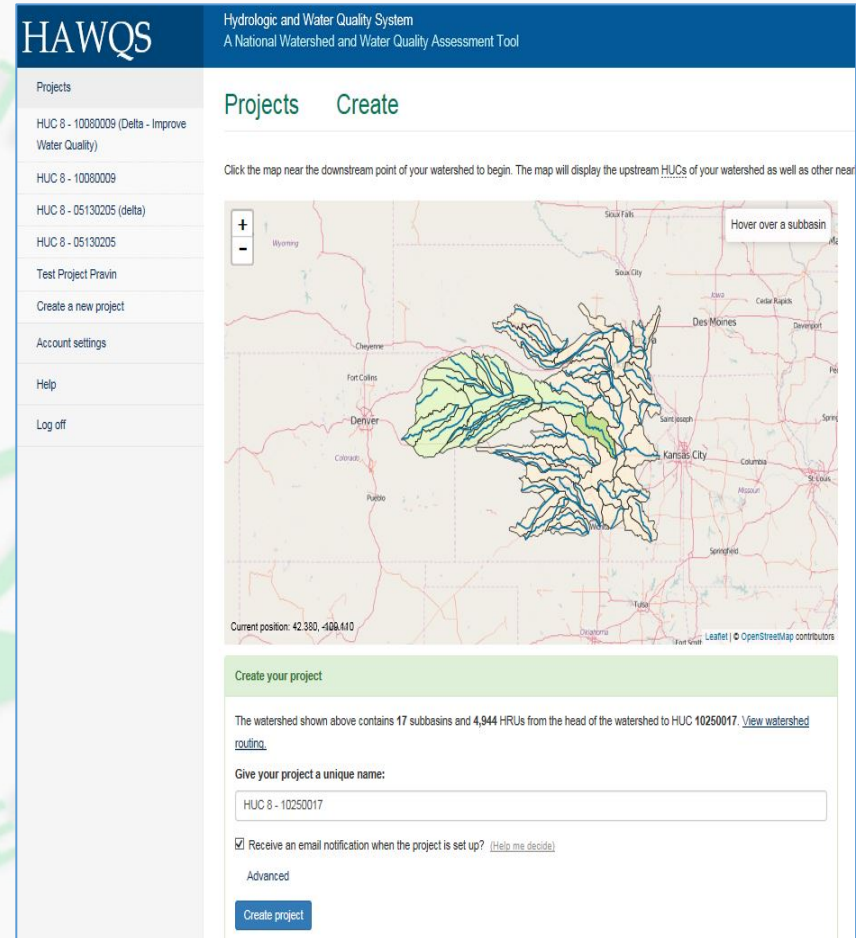
- EPA valuation research leveraging ongoing natural science research
 - Research on macroinvertebrates and aquatic ecosystem health -> National stated preference survey (C. Moore)
 - Research on fish population modeling (SMRF) -> Recreational fishing meta-analysis (M. Massey)
- Tool Development
 - HAWQS
 - BenSPLASH



Tool Development- HAWQS

Hydrologic and Water Quality System (HAWQS)

- **A national watershed and water quality assessment system**
 - Web-based user interface
 - National data layers
 - SWAT as core engine
- Cooperative project of the:
 - USEPA
 - USDA-ARS Grassland Soil and Water Research Lab
 - AgriLIFE Research, Texas A&M University
- HAWQS 1.2 released July 2020, currently developing 2.0
- <https://hawqs.tamu.edu/#/>



The screenshot displays the HAWQS (Hydrologic and Water Quality System) web interface. The header includes the HAWQS logo and the text "Hydrologic and Water Quality System - A National Watershed and Water Quality Assessment Tool". A navigation menu on the left lists options: Projects, HUC 8 - 10080009 (Delta - Improve Water Quality), HUC 8 - 10080009, HUC 8 - 05130205 (delta), HUC 8 - 05130205, Test Project Pravin, Create a new project, Account settings, Help, and Log off. The main content area features a "Projects Create" section with a map of a watershed in the central United States. The map shows a network of blue lines representing waterways and green areas representing subbasins. A tooltip "Hover over a subbasin" is visible. Below the map, the current position is given as 42.380, -102.412. A "Create your project" section follows, stating that the watershed contains 17 subbasins and 4,944 HRUs. It prompts the user to "Give your project a unique name:" with a text input field containing "HUC 8 - 10250017". There is a checkbox for "Receive an email notification when the project is set up?" and an "Advanced" section with a "Create project" button.

Tool Development- BenSPLASH

- **Benefits Spatial Platform for Aggregating Socioeconomics and H²O Quality (BenSPLASH)**
- Currently under development
- Open source
- Default valuation approaches + R window for user-defined applications



File Tools Help

- (1) Input Water Quality Files
- (2) WQI Definition
- (3) Calculation
- (4) Options
- (5) Uncertainty
- (6) Output Choices
- (7) Review and Run
- (8) Result Datasets**

All
None

- Water Quality Baseline
- Water Quality Post-Policy Scenario
- Water Quality Deltas
- Water Quality Cell Parameters
- Benefit Results (Grid Cell)
- Benefit Results (County)
- Run Log

Save

About BenSPLASH Map View Table View

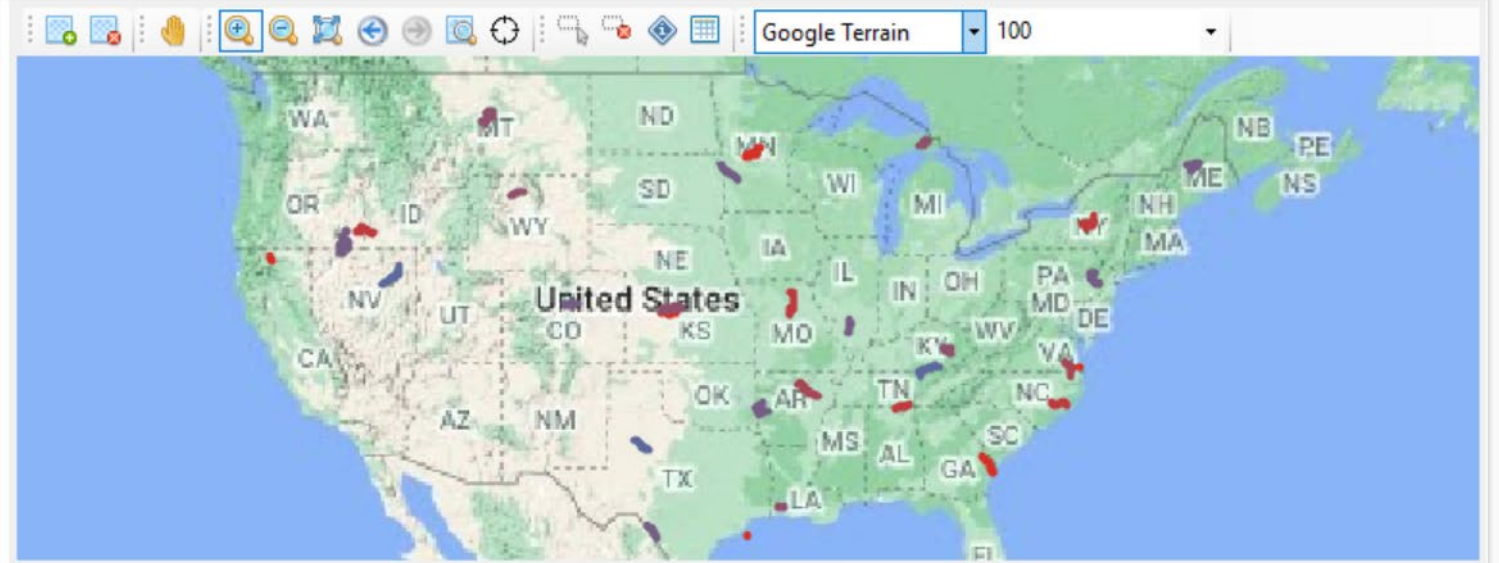
Deltas

Water Quality Index

- <= 3.3
- 3.3 - 3.6
- 3.6 - 3.9
- 3.9 - 4.6
- 4.6 - 5.5
- 5.5 - 5.9
- > 5.900

Reference Layers

- Water Boundary (HUC8)
- Tract
- County



> 5.900

Reference Layers

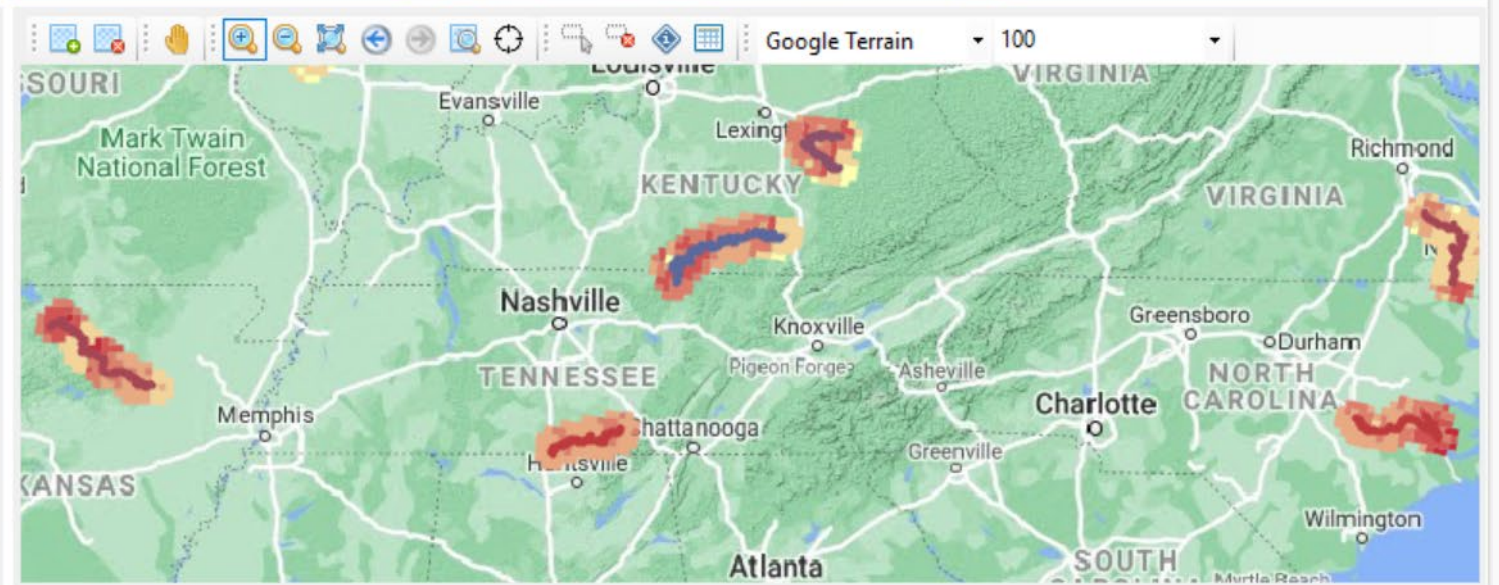
Benefit Results

- Grid Cell
- MRM_Newbold_S_Full

- <= 9.19
- 9.19 - 16.43
- 16.43 - 25.02
- 25.02 - 34.30
- 34.30 - 46.95
- 46.95 - 72.72
- > 72.720

County

Base Map



Tool Development- Further Work

HAWQS 2.0

- Updating national data layers for land use and weather
- Adding new data layers and modeling features for soil and wetlands
- Integrating NHD-Plus catchments for finer resolution
 - in addition to the 3 existing HUC levels- 8,10,12
- Updating stream temperature calculations
- Updating point source data and approach

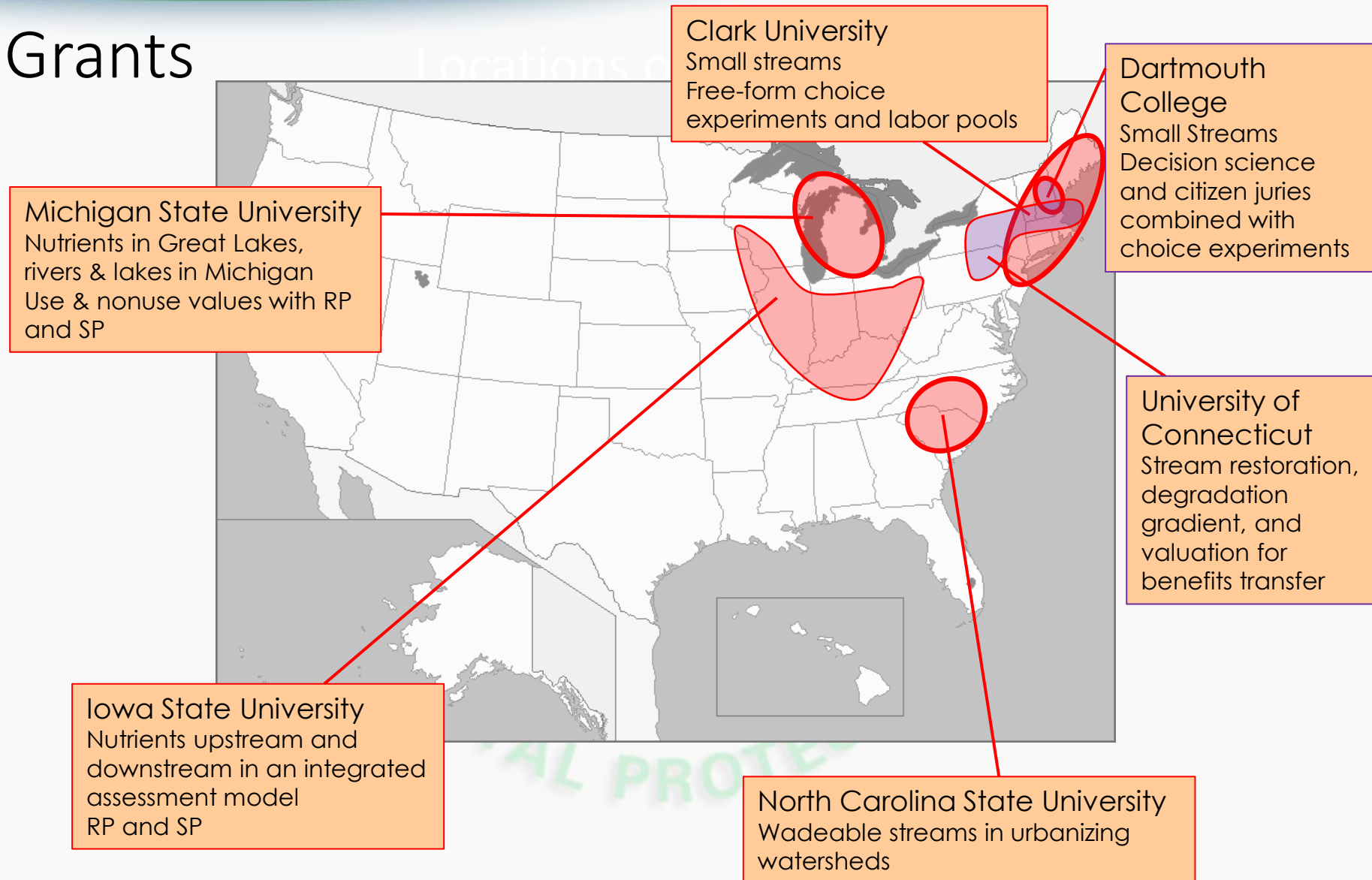
BenSPLASH

- Testing open source platform
- Optimizing model efficiency
- Expanding human health valuation module
- Adding uncertainty
- Adding water quality index functionality
- Adding hedonic property and avoided cost modules
- Exploring valuation of other water bodies/features

Water Quality Benefits STAR Grant (2015)

- Water Quality Benefits RFA - how changes in water quality can be valued using advanced non-use valuation methods for fresh water systems
 - Require interdisciplinary collaboration
- 6 grants awarded
- Research from grants presented this week and at past Social Cost of Water Pollution Workshops
- Map on next slide shows study locations
- Also, Notice of Intent for new STAR Grant RFA-
<https://www.epa.gov/research-grants/research-funding-opportunities>

STAR Grants



(Some) Research by EPA at this Workshop

- Climate Benefits of Reducing Nutrient Pollution in Aquatic Ecosystems (J. Beaulieu)
- Recreational User Perceptions of Water Quality and Relationships With Biophysical Water Quality in Marine Waters (K. Mulvaney)
- The Value of Water Quality to Coastal Recreation in New England (M. Mazzotta)
- Standardizing the Methodology for Revising the US EPA's Water Quality Index (J. Monsarrat)
- Throwing the Baby out With the Ashwater? Coal Combustion Residuals, Water Quality, and Fetal Health (W. Austin)
- Valuing Aquatic Ecosystem Health at a National Scale: Modeling Ecological Indicators Across Space and Time (R. Hill)

A large, faint watermark of the Environmental Protection Agency (EPA) logo is centered in the background. The logo consists of a circular border containing the text "UNITED STATES" at the top and "ENVIRONMENTAL PROTECTION AGENCY" at the bottom. In the center of the circle is a stylized flower with three leaves and a scalloped top.

Thank you

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