ASSESSMENT OF ECOSYSTEM SERVICES IMPACTS FROM URBANIZATION

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

- Restoration efforts are sometimes challenged to adequately evaluate and communicate their value to the public
- An ecosystem services approach can help translate environmental changes into human benefits
- Here we demonstrate a simple to use, publicly available ecosystem services assessment tool (EPA H2O) developed by the US EPA Office of Research and Development
What is the EPA H2O tool for?

- Preliminary assessments of benefits supplied from hydrologically connected landscapes to a defined area of interest.
  - Summarizes land cover/use types in areas supplying benefits to humans
  - Translates biophysical metrics into common currency suitable for tradeoff analyses
  - Informative for conservation, restoration and land use planning decisions

- Scenario analysis for comparing existing landscape’s production of benefits to decision alternatives.
  - Landscape changes can be made on a parcel by parcel basis
  - Side by side comparisons summarized in an easy to share pdf report
  - Summaries focused on area of interest and upstream landscape
What does the tool address?

• EPA H2O is designed to assess the production of four ecosystem services humans benefit from:
  • Nutrient removal (via Denitrification)
  • Atmospheric pollution removal (PM10, ozone, etc.)
  • Greenhouse gas removal (via Carbon sequestration)
  • Flood protection (soil precipitation retention)

• Transportation module also assesses driving or walking travel times from any user defined point to areas of interest such as parks, facilities, water access etc.
  • Scenario building function allows user to modify the transportation network and assess changes in travel times which can be used for travel cost estimates
Mobile Bay Sub-watershed – D’Olive

Access to water/open spaces for recreation and vistas (Human Uses)

Heritage/Culture: This is a new value aimed at protecting the legacy of the coast.

Beaches and Shorelines protection, economy, beauty (Habitat Management)

Resiliency: The capacity of human and natural physical systems to rebound from unforeseen events: protecting beauty (Human Uses/Habitat Management)

Fish habitats, abundance, livelihood (Living Resources)

Water Quality: Whether drinkable, tolerable or swimmable, the public places high value on quality rivers, creeks, and bays (Water Quality)
Demonstrate Need for Past Restoration Efforts – Joe’s Branch, AL 2001-2011

Watershed Ecosystem Service Assessment

2001

2011

Watershed Ecosystem Service Assessment

- $24,980 yr$^{-1}$
- $7,398 yr$^{-1}$
- $8,109 yr$^{-1}$
- $178,218$

2001-2011
Future Scenario of Neighborhood Buildout

*Reduction in soils ability to retain water when ag converted to medium density residential is only ~15% due to fairly impermeable soil types in this area
How is tool output tailored for decision makers?

• Translates landscape production into relatable benefit terms:
  • Changes in health care costs
  • Waste water treatment costs
  • Social cost of carbon emissions
  • Stormwater infrastructure costs

• Hydrological delivery pathways automatically accounted for upstream production of nutrient removal and flood water retention

• Results summarized as an easy to read pdf report with descriptions for each result and a convenient reference map of summarized area
H2O is Accessible and Expandable

- EPA H2O was developed as an extension of the open source, freely available QGIS software package
- Tool is ready for development of modules for assessing more ecosystem benefits as methods and data layers become available

H2O is as good as the data put into it.

- Power of the tool is limited by the availability and resolution of publicly available landscape data layers
- Databases for areas not part of EPA pilot studies need to be developed
- Addition of landscape attributes specifically valued by local community will require further collaboration with stakeholders
Opportunities

• US government was being encouraged to increase the incorporation of ecosystem service assessments into their decision making

• Quick assessment tools such as EPA H2O provide decision makers preliminary information as a starting point

• EPA H2O is freely available so all stakeholders can leverage the same information as they engage with the decision making process
Contact information

• Tool developed for Tampa Bay Ecosystem Services Demonstration Project by presenters and others at NHEERL’s Gulf Ecology Division

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EPA H2O tool can be downloaded at: https://www.epa.gov/water-research