

Assessing Ecosystem Value: Restoration Scenarios on Tribal Lands using the EPA H2O Tool

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By

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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, 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

Poarch Band of Creek Indians Perdido Headwaters Restoration



On behalf of the Creek Indian Enterprises Development Authority (CIEDA), Constantine Engineering, Inc. prepared an Environmental and Land Use Assessment (ELUA) for the proposed restoration of four segments of the Perdido Headwaters to improve the hydrology and water quality of Perdido Creek, which passes through the Poarch Band of Creek Indians (PBCI) land near Atmore, Alabama. The assessment area consists of approximately 190 acres with three stream segments and one tributary segment and includes both tribal trust property and fee property owned by the PBCI.

The ELUA provided assessments of the environmental, archeological, cultural and hydrological resources within the project boundaries. The ELUA also serves as master plan, providing appropriate design and engineering studies, construction drawings and specifications and preliminary cost estimates.

The primary goals of the Restoration Project are to achieve an increase in total wetland area, improve water quality and hydrology, restore native vegetation and wildlife species to the area, and enhance public access and recreation. The agricultural lands to the east of the project area should also be improved or retrofitted with stormwater management systems to improve water quality within the Perdido Headwaters.

Constantine Engineering performed an Environmental Assessment of the headwaters of Perdido Creek for the Creek Indian Enterprises Development Authority.

The goals are to improve water quality, habitat, hydrology and public access for recreation. The proposed project involves restoring the natural stream alignment in order to prevent stagnate waters from collecting. Emergent and forested wetlands will be enhanced by removal of non-native species and re-introduction and planting of native species.

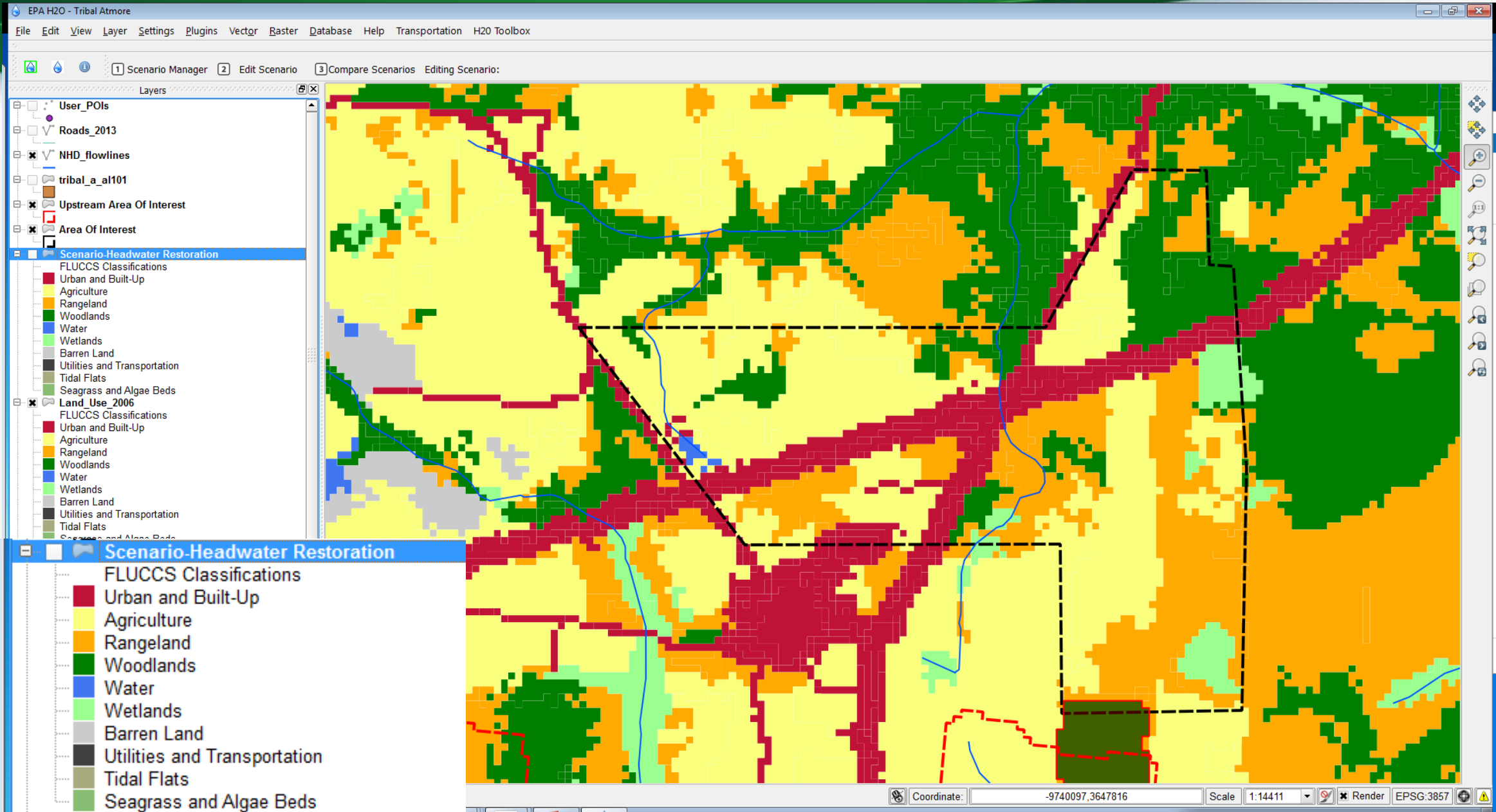


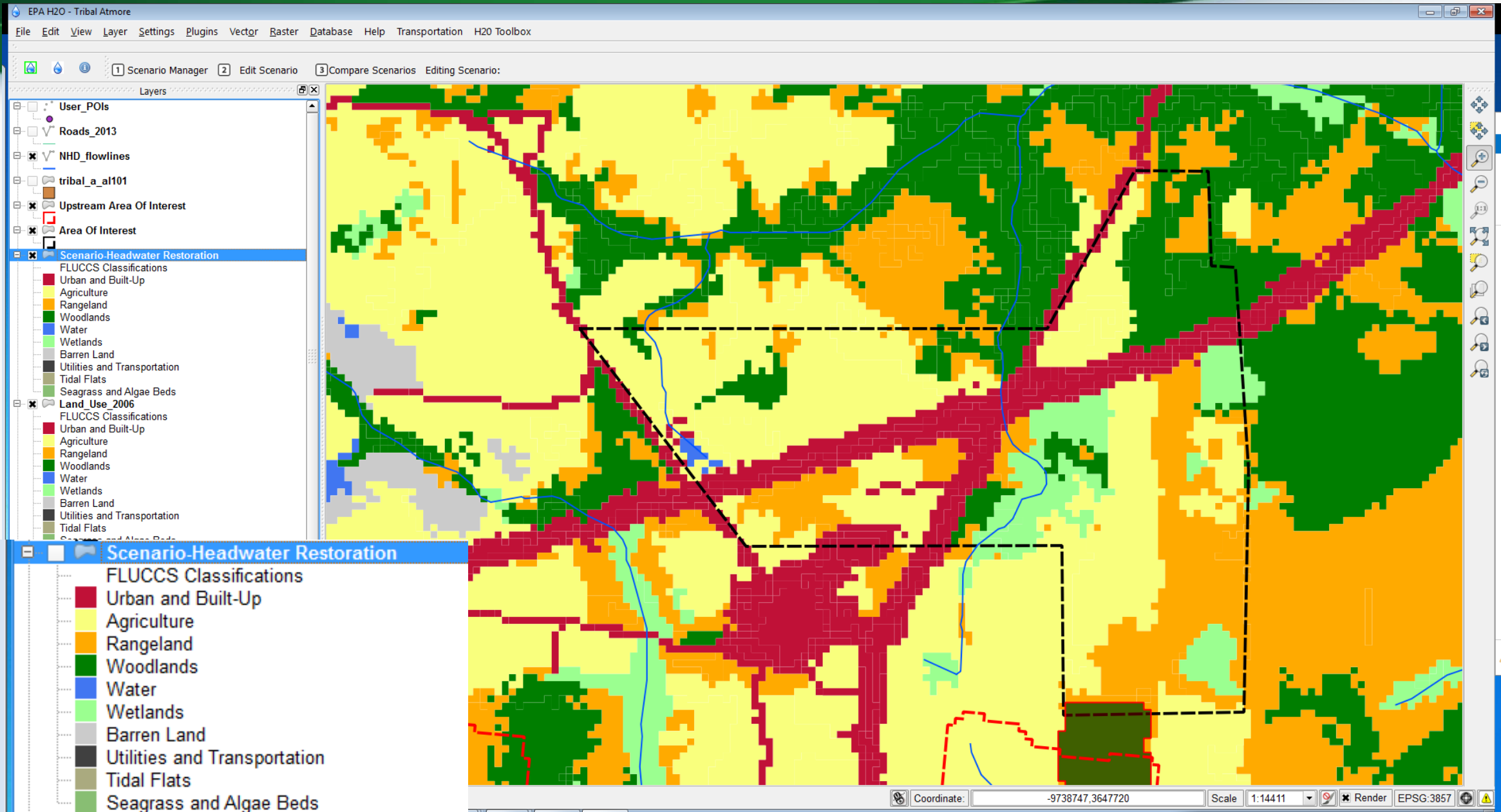
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What does the tool address?

- EPA H2O is designed to assess the production of four ecosystem services humans benefit from:
 - Atmospheric pollution removal (PM10, ozone, etc.)
 - Nutrient removal (via Denitrification)
 - 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





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

Land Use: Land maps are made from Florida Land Use and Cover Classification System (FLUCCS) data. These are photo interpretations of aerial photographs. Future scenarios are the result of models or subjective table top exercises.

Land_Use_2006

Scenario-Headwater Restoration

Cultivated Crops : 655,721

Cultivated Crops : 655,721

Deciduous Forest : 98,957

Deciduous Forest : 98,957

Developed, High Intensity : 11,625

Developed, High Intensity : 11,625

Developed, Low Intensity : 178,528

Developed, Low Intensity : 178,528

Developed, Medium Intensity : 192,730

Developed, Medium Intensity : 192,730

Developed, Open Space : 252,973

Developed, Open Space : 252,973

Emergent Herbaceous Wetlands : 725

Emergent Herbaceous Wetlands : 725

Evergreen Forest : 424,369

Evergreen Forest : 424,369

Grassland / Herbaceous : 724,536

Grassland / Herbaceous : 724,536

Shrub / Scrub : 453,127

Shrub / Scrub : 233,274

Woody Wetlands : 156,335

Woody Wetlands : 376,188

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Total Area: 4,307,087 sq meters

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Poarch Creek Restoration Scenario.pdf - Adobe Acrobat Pro

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STATISTICS FOR LAYERS IN DRAWN AREA

DRAWN AREA OF INTEREST: 430 Hectares

Usable Water: Human activities produce water pollutants. As water moves through a watershed it is filtered by wetlands, forests, and aquatic areas. Replacement costs for removing a pound of nitrogen from various sources range from less than \$10 to as high as \$855. Costs increase as the nitrogen becomes harder to route towards treatment areas and as simpler, more cost efficient mechanisms for removing nitrogen need to be replaced by more centralized advanced waste water treatment facilities.

<p>Land_Use_2006 Estimated total value (\$) per year: 266,113</p>	<p>Scenario-Headwater Restoration Estimated total value (\$) per year: 308,393</p>
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Usable Air: Human activities produce air pollutants. Trees and other plants remove these harmful pollutants. Pollution removal results in healthier people with reduced health care costs. The loss of trees and other plants would result in increased health care costs and decreased human well-being.

<p>Land_Use_2006 Estimated total value (\$) per year: 96,571</p>	<p>Scenario-Headwater Restoration Estimated total value (\$) per year: 98,936</p>
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Stable Climate: Stored carbon provides a more stable climate by keeping greenhouse gasses out of our atmosphere. Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. Carbon sequestration helps reduce future social costs associated with a more unstable climate.


<p>Land_Use_2006 Estimated total value (\$) per year: 26,533</p>	<p>Scenario-Headwater Restoration Estimated total value (\$) per year: 29,883</p>
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Flood Protection: Human activities alter the way water moves through the landscape. Natural landscapes retain and slow the movement of water offering protection from flooding. The loss of these natural landscapes would result in the need for more man made flood protection at much higher cost.


<p>Land_Use_2006 Estimated total value: 3,445,281</p>	<p>Scenario-Headwater Restoration Estimated total value: 3,326,125</p>
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Tradeoff Assessment

 \$42,280 yr⁻¹

 \$2,365 yr⁻¹

 \$3,350 yr⁻¹

 \$119,156

Accessibility and Expandability of Tool

- EPA H2O was developed as an extension of the open source, freely available QGIS software package
 - Packaged for easy download and installation with example database
 - User interface simplified for most users
 - Full functionality of QGIS available for advanced users
 - Databases generated using only publically available data layers
 - Benefit functions enter tool as simple look up tables based on default peer reviewed studies which can be easily adjusted to account for local data if available
- Tool is ready for development of modules for assessing more ecosystem benefits as methods and data layer become available

Challenges

- Power of the tool is limited by the availability and resolution of publically available landscape data layers
 - National Land Cover Database (NLCD) available nationally
 - Further resolved state or local based land use datasets are not consistent across state, county, or municipal borders
- Peer reviewed landscape specific rates may be scarce
- Databases for areas not part of EPA pilot studies need to be developed
 - Requires some GIS technical skills
- Addition of landscape attributes specifically valued by tribes will require further collaboration with stakeholders

Opportunities

- US government is being encouraged to increase the incorporation of ecosystem service assessments into their decision making – 2015 Memo from OMB/CEQ/OSTP to Federal Agencies
- Quick assessment tools such as EPA H2O provide decision makers preliminary information about how ecosystem functions and their related benefits to humans may change under different land use management strategies
- 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 Marc Russell and others at NHEERL's Gulf Ecology Division
- Russell.marc@epa.gov
- EPA H2O tool can be downloaded at:
- <https://www.epa.gov/water-research>

