

# *ASSESSMENT OF ECOSYSTEM SERVICES IMPACTS FROM URBANIZATION*

ACES 2018

By

Richard Fulford, Marc Russell, Justin Bousquin, *and Madison Jackson*

U.S. Environmental Protection Agency, Gulf Breeze, FL, USA

# Disclaimer

***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.***

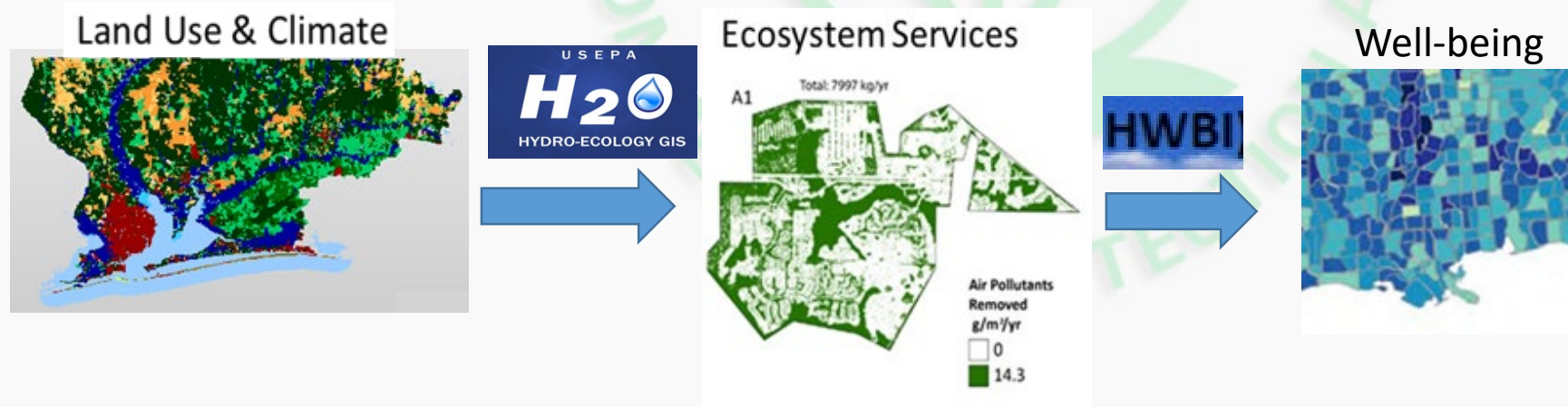
# Introduction

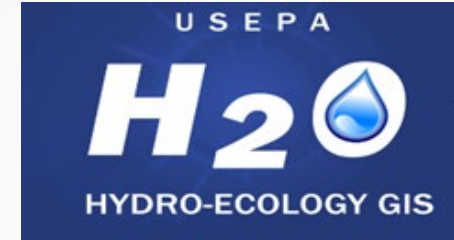
- Restoration efforts are sometimes challenged to adequately evaluate and communicate their value to the public
- An ecosystem services approach can help translate environmental changes into human benefits
- Here we demonstrate a simple to use, publicly available ecosystem services assessment tool (EPA 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



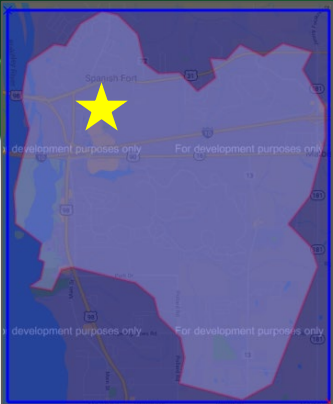


# What does the tool address?

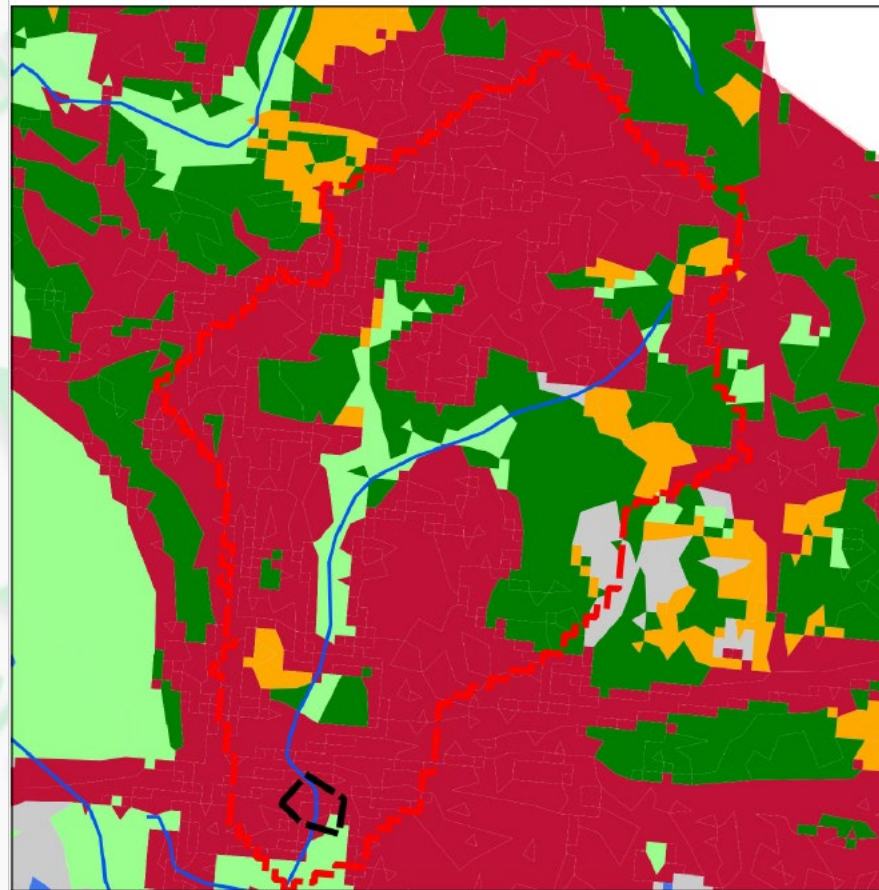
- EPA H2O is designed to assess the production of four ecosystem services humans benefit from:
  - Nutrient removal (via Denitrification)
  - Atmospheric pollution removal (PM10, ozone, etc.)
  - Greenhouse gas removal (via Carbon sequestration)
  - Flood protection (soil precipitation retention)
- Transportation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



# Demonstrate Need for Past Restoration Efforts – Joe's Branch, AL 2001-2011



2018



1:23871

2001

**Legend**

- NHD\_flowlines
- Upstream Area Of Interest
- Area Of Interest
- Scenario-FutureUrbanization
- FLUCCS Classifications
  - Urban and Built-Up
  - Agriculture
  - Rangeland
  - Woodlands
  - Water
  - Wetlands
  - Barren Land
  - Utilities and Transportation
  - Tidal Flats
  - Seagrass and Algae Beds

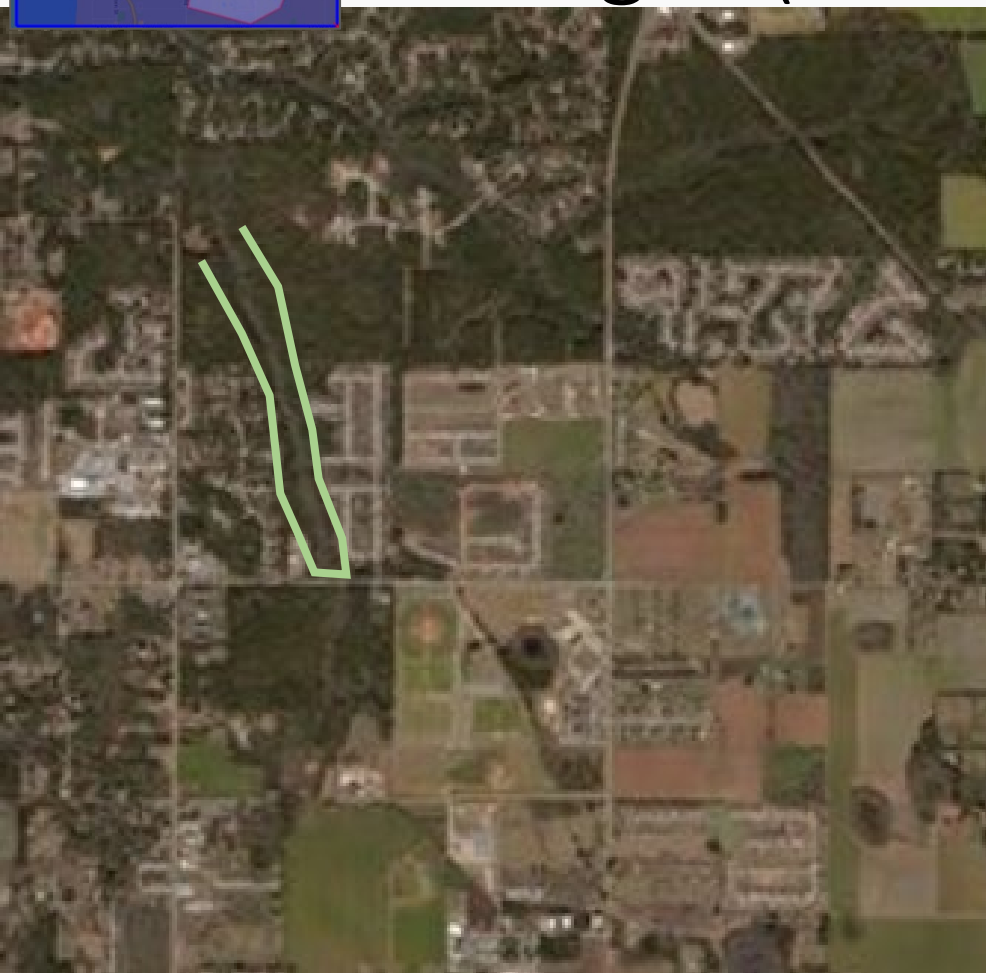
**Water Quality**

- Nitrogen: 14.00  $\text{yr}^{-1}$
- Carbon:  $\text{yr}^{-1}$

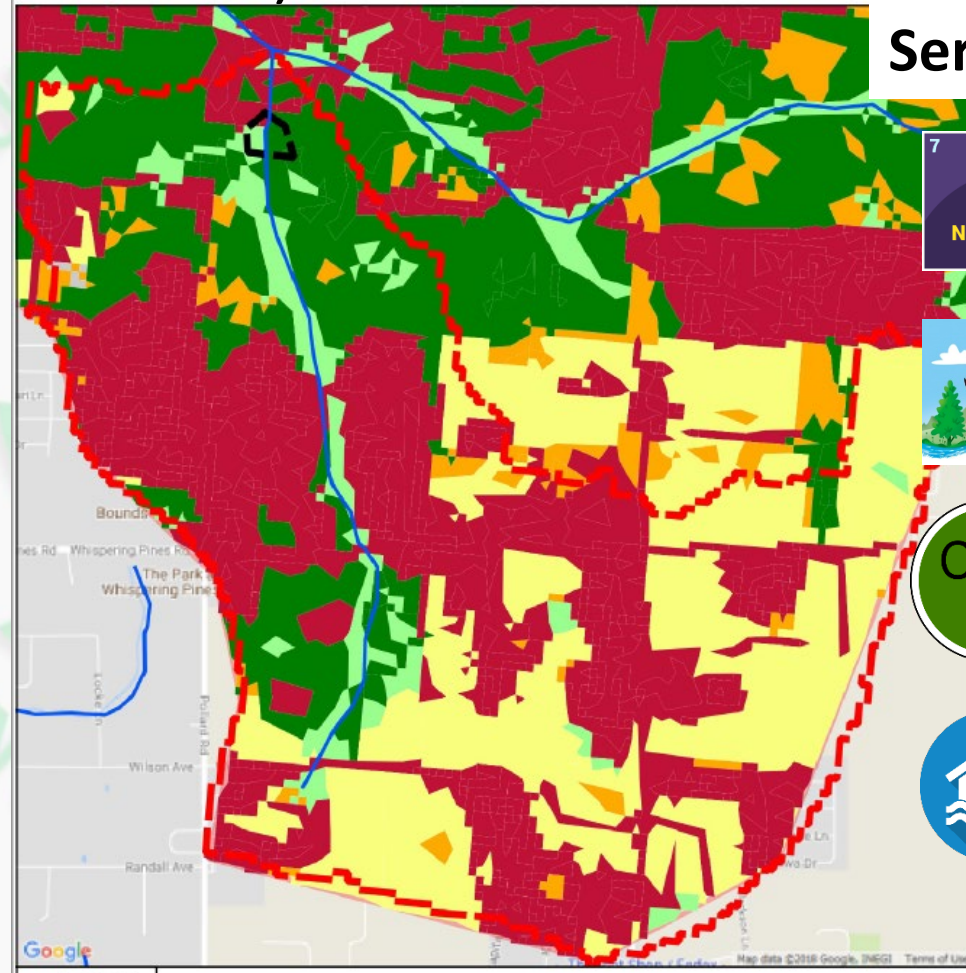


# Inform Restoration Planning in Context of Past Changes (2001-2011)

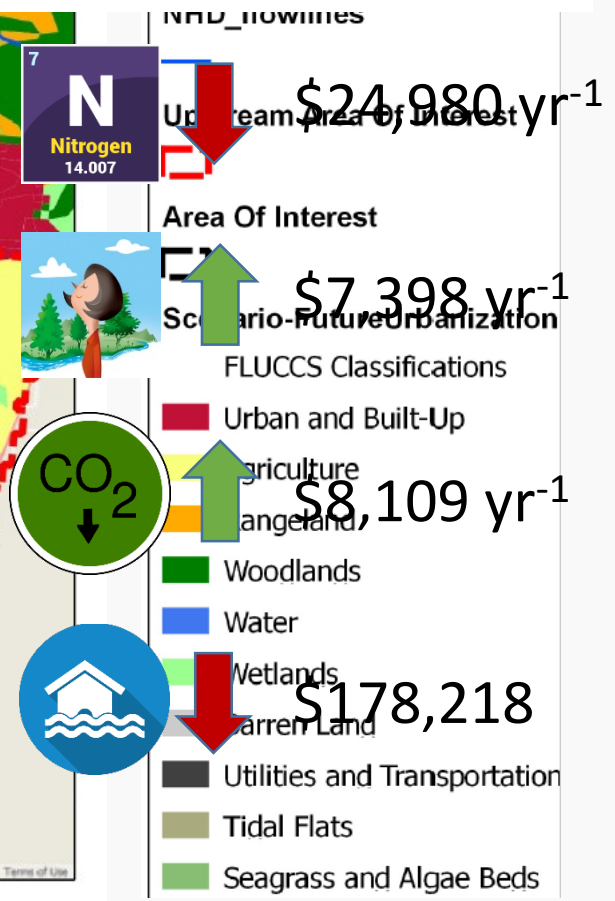
## Watershed Ecosystem Service Assessment



2018



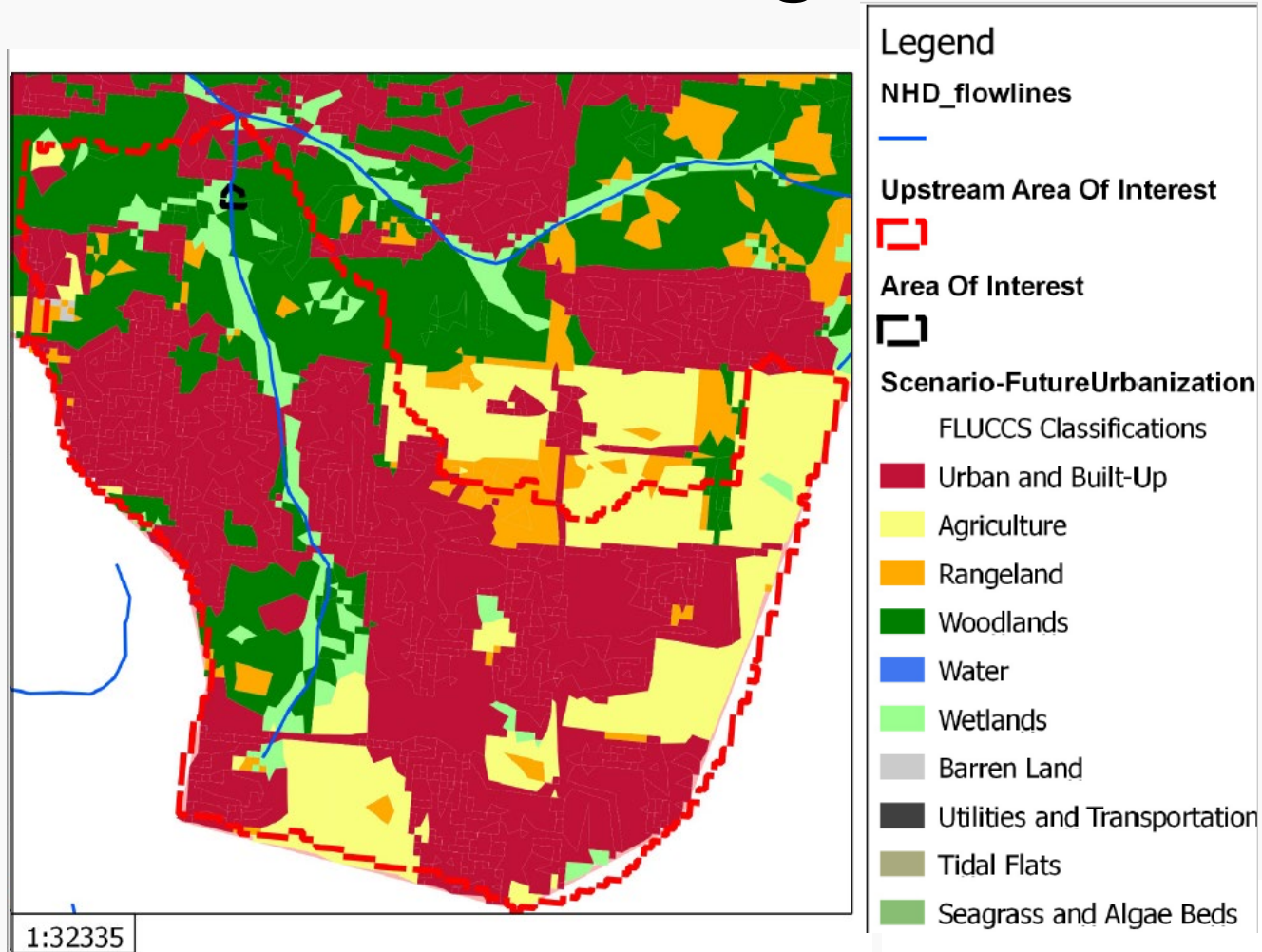
2001



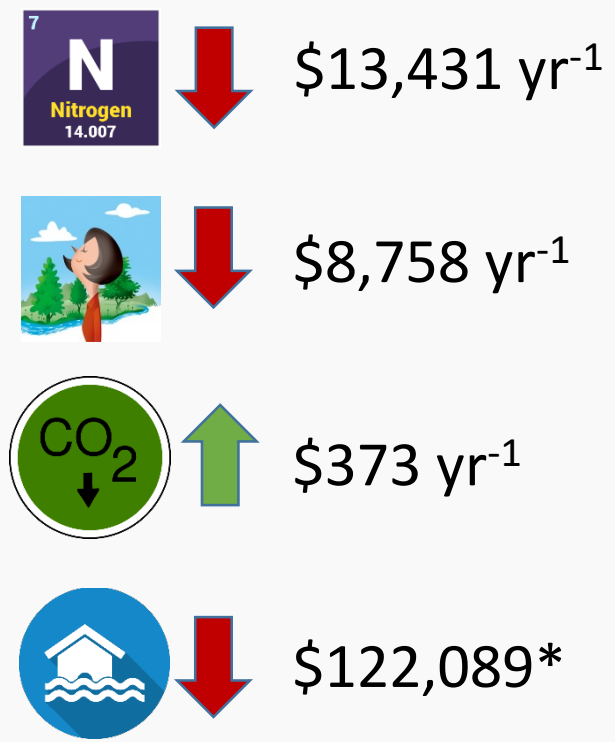


# Future Scenario of Neighborhood Buildout

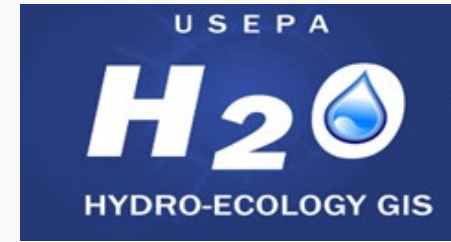
Future



## Watershed Ecosystem Service Assessment

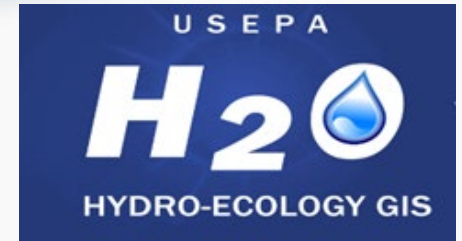


\*Reduction in soils ability to retain water when ag converted to medium density residential is only ~15% due to fairly impermeable soil types in this area



# 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

[Fulford.Richard@epa.gov](mailto:Fulford.Richard@epa.gov)

EPA H2O tool can be downloaded at:

<https://www.epa.gov/water-research>

