

ECOSYSTEMS SERVICES RESEARCH PROGRAM BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

www.epa.gov/ecology

Development of US EPA's National Atlas of Ecosystem Services and Implications for Human Health and Wellbeing

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ECOSYSTEMS SERVICES RESEARCH PROGRAM National Atlas Contributors and Collaborators



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Presentation Outline

- Overview of the Ecosystems Services Research Program (ESRP)
- Vision/Implementation for the National Atlas of Ecosystem Services
- Examples of ongoing Atlas products
- Implications for Human Health and Wellbeing



Millennium Ecosystem Assessment

- All aspects of human well-being are dependent upon nature and the world's ecosystems
- Unless we account for the full value of ecosystem services, humans will continue to degrade and deplete natural systems.

ESRP's role is to provide the science to

- Clarify this dependence,
- Describe the full range of values, and
- Quantify what we know about the limited v. limitless nature of different services.



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Program Goal

To transform the way we understand and respond to environmental issues by

making clear the ways in which our choices affect the type, quality and magnitude of the services we receive from ecosystems –

such as clean air, clean and abundant water, productive soils, and food, fiber, and fuels.

Program Organization





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Place Based Studies



Opportunity for coordinated site work: Standardization, Scaling, Applicability Testing, Measurement Uncertainty....

Vision for the National Atlas of Ecosystem Services

How many ecosystem services can you identify in this image?

Attenuation of pollutants from agricultural runoff Protecting downstream water Maintaining flow / temperature regime Providing wildlife habitat Recreational opportunities Imagine the flow of services into and out of this area

And, summarizing all of this and mapping for the nation!

Location, Location, Location! (Spatial Pattern Matters)



Broad scale questions Atlas will answer:

What is the current supply / stock of ecosystem services in conterminous US?

What is the current supply / stock of ecosystem services compared to the potential?

What services can we expect to gain/lose under multiple future scenarios?



Implementation Strategy

- Reliance on existing monitoring and remote sensing data, literature, models, and tools while conducting additional research and keeping eye on future developments
- Reliance on extramural participation
- Staged Implementation
- Use of existing future scenarios (ICLUS, FORE-SCE, IPCC); also incorporating alternative management scenarios

Atlas Vision/Implementation



Food, Fiber, and Fuels

 Contain series of clickable background maps 2

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- Select ecosystem services from Table of Contents
- Allow "stacking" of multiple services
- Multiple metrics for each category
- Ancillary data
- Include potential and future scenarios

• Allow user to place their "area" in context of others

Atlas Vision/Implementation



Summarizing services by HUCS

Hierarchical system

Maintain upstream/ downstream connectivity

Maintain landto-sea connectivity



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Atlas Vision/Implementation -- Suite of Finer-Scale Metrics for Urban Environments

- In-depth analysis of urban areas with population ~> 100,000 using I-Tree in collaboration with USFS
 - Air pollutants removed by vegetation
 - Energy savings due to shading of buildings
 - Carbon storage benefits
 - Storm water runoff benefits
 - Water Quality benefits
- Near-roadway removal of pollutants by vegetation
- Developing other metrics

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- Heat Island Index
- Indices of green places (parks)
- Number of days exceeding air quality standards
- Nighttime lights index



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Atlas Implementation – High Visibility Venue



www.landscope.org

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Examples of Ongoing Atlas Work

Water Quality -- Drinking Water Sustainability Jim Wickham, Tim Wade



Source: Ernst (2004)

Finding: for every 10% loss of forest, treatment and chemical costs increased by 20%

- Acquired OW Drinking Water Source Water Intake points and wells for U.S. – Done
- Delineating watershed area contributing to those points – ~ majority/6000 delineated
- Conducting landscape assessment of drinking water source areas
- Relate landscape metrics to intake water quality/degree of treatment required/ # of violations
- Relate to populations served & multiple benefits

Examples of Ongoing Atlas Work Terrestrial Habitat -- Green Infrastructure Approach (i.e., Hubs and Corridors)

Jim Wickham, Tim Wade, Kurt Riitters



- 7 green infrastructure classes mapped for entire US based on NLCD 30 m data
- Used NLCD forest and wetland classes only
- Identifies potentially important wildlife habitat
- Identifies areas for restoration/protection
- Will soon be included on LandScope web site

Developed from: Vogt P, Riitters KH, Iwanoski M, et al. 2007. Mapping landscape corridors. Ecol. Indic. 7:481-488. http://forest.jrc.ec.europa.eu/biodiversity/GUIDOS/

Examples of Ongoing Atlas Work Terrestrial Habitat -- Green Infrastructure Approach (i.e., Hubs and Corridors)

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Can also add projected urban growth, impervious surface, etc.

Useful for land trusts/ governments in guiding land purchases

Examples of Ongoing Atlas Work

Mapping pollutant loading and removal

Example: Nitrogen

Loading Fertilizer Manure/Animal Feedlots Atmospheric deposition (industrial emissions, vehicles and fertilizers) Wastewater Treatment Plants Nitrogen fixation - natural Nitrogen fixation - crop

30 m

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Removal Wetlands, riparian buffers Streams and rivers Lakes and reservoirs Soil and vegetation 1 = 2 6

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Overview Mag



Implications for Human Health and Wellbeing

It is a joint goal of the National Atlas effort and the Human Health and Wellbeing components of the program to explicitly relate Atlas metrics to human health and wellbeing

Activities:

Literature reviews Exploratory data analysis Reaching out to human health community Reaching out to other programs

Examples:

Bird diversity – West Nile Virus Forest fragmentation – Lyme disease Air quality (PM^{2.5} removal) – Asthma Availability of green spaces – Mental wellbeing Multiple metrics --Disease incidence Heat Island Index – Vulnerable populations



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