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EnviroAtlas: A new geospatial tool to foster ecosystem services science and resource management

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ABSTRACT

In this article we present EnviroAtlas, a web-based, open access tool that seeks to meet a range of needs by bringing together environmental, economic and demographic data in an ecosystem services framework. Within EnviroAtlas, there are three primary types of geospatial data: research-derived ecosystem services indicator data in their native resolution, indicator data that have been summarized to standard reporting units, and reference data. Reporting units include watershed basins across the contiguous U.S. and Census block groups throughout featured urban areas. EnviroAtlas includes both current and future drivers of change, such as land use and climate, for addressing issues of adaptation, conservation, equity, and resiliency. In addition to geospatial data, EnviroAtlas includes geospatial and statistical tools, and resources that support research, education, and decision-making. With the development of EnviroAtlas, we facilitate the practice of ecosystem services science by providing a framework to track conditions across political boundaries and assess policies and regulations. EnviroAtlas is a robust research and educational resource, with consistent, systems-oriented information to support nationally, regionally, and locally focused decisions.

1. Introduction

The world is facing a growing set of environmental challenges; population continues to increase, expanding human use into environmentally dynamic or resource limited areas and raising pressures on local and regional ecosystems to satisfy attendant demands for nature's resources (Carpenter et al., 2009). Globally, focus has shifted from simply preserving intact resources to understanding and quantifying the societal benefits of ecosystems. Ecosystem services (ES) are broadly defined as the benefits people receive from nature (Costanza and Folk, 1997; Costanza et al., 1998; Millennium Ecosystem Assessment (MEA), 2005). The continued provisioning of these services in the face of increasing environmental challenges will require planning efforts that consider a suite of possible effects and strategic management of both anthropogenic and natural systems. The focus placed on market and non-market based valuation of ES has prompted a need for long-term, spatially complex study of the earth's natural capital, requiring both innovation and the integration of novel technologies (Carpenter et al., 2009).

The 2005 Millennium Ecosystem Assessment (MEA) highlighted that mainstreaming ES into policy and decision making depends on the availability of spatially explicit information about ecosystems, methods to measure and map ES, and the development of models and proxies for ES valuation (Maes et al., 2012). Even with adequate methods and models, much of this research could not have been accomplished in the previous decade because the computing ability to manipulate, map, model, and archive extensive ecological data (e.g., vegetation, land cover, and biophysical attributes) in sufficient detail was not widely available. As an emerging field of research, geospatial analysis of ES has grown substantially in the past decade (Seppelt et al., 2011). The use of advanced geospatial technologies, mainly Geographic Information Systems (GIS) and remote sensing, has enabled quantitative and qualitative spatial information on ES delivery and demand across multiple locales, scales, and time periods (Maes et al., 2012). Yet, many challenges remain, in part because ES have disparate spatial and temporal characteristics that were not routinely measured or mapped in the past. Historically, much of the environmental and socio-economic data have been collected with a well-defined focus and have not typically been aggregated across topic sectors nor integrated in ways that can provide meaningful insight into ES quantification and valuation.

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