EPA's ECOSERVICE MODELS LIBRARY

How do ecological models help protect human health?

Human health and strength of our global economy depend on many goods and services provided by ecosystems such as forests, wetlands, and estuaries as well as agroecosystems and urban green spaces.

Ecosystems regulate the quality of our air and water, provide protection from storms and floods, produce food and other essential materials, and provide opportunities for recreation. Recognizing these ecosystem goods and services, and understanding how society's decisions affect them, is critical to citizens' well-being.

Fortunately, our knowledge about the underlying processes by which ecosystems provide these goods and services is growing. Ecological models describing these processes are developed and used by scientists in government, academia, and business, and have been used to help protect and enhance human well-being.

However, information about these ecological models is scattered throughout journals, websites, and government

Conceptual diagram adapted from J Van Wensem et al. 2016, Integrated Environmental Assessment and Management 13: 41:51.

reports, and might not be readily available when needed to inform decision makers. The quality, usefulness, and transferability of these models is also varied and could be difficult to assess through regular bibliographic searches.

EPA's EcoService Models Library

EPA's EcoService Models Library (ESML) is an online database for finding, examining, and comparing ecological models that can be useful for estimating the production of ecosystem goods and services. EPA created the ESML to catalog and characterize ecological models and make that information more readily available.

The ESML is designed for use by scientists, planners, and economists who give advice to communities, businesses, and conservation organizations on land-use and other community-

to-landscape scale planning decisions. It is also meant to be used by those who develop computer-based decision support systems. Additionally, the ESML is designed for researchers interested in improving ecological modeling methods.

Benefits of the EcoService Models Library

The ESML database focuses on models that can estimate how much goods and services an ecosystem produces. Some models include how production of these goods and services might be affected by different scenarios such as land use.

Understanding the production of ecosystem goods and services is an important step toward showing the connection between changes in natural systems to changes in human health, the economy, or other aspects of well-being. The ESML helps decision makers better

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understand the consequences to communities when changes are made to natural systems.

The ESML provides detailed descriptions of ecological models. Currently, it includes over 50 individual descriptors, covering purpose, approach, and environmental use for each ecological model in the database. An additional 40 descriptors are applied to each of the models' variables. An informative help screen is provided for each descriptor, and searchable bibliographic source information is available for each model.

While modeling expertise is not required to explore the information in ESML, the website is designed to enable analysts and model users to search and view information on models in the database, compare models to examine potential model appropriateness for other applications, and export model descriptions. With this information, the ESML helps users identify the best model for a given situation. It helps users compare the objectives, environmental contexts, and feasibility of models given the users'

specific needs. It also helps users understand the level of uncertainty associated with each model.

The ESML also provides a means to check for potential alignment between different models that could allow them to be mathematically linked. Users can compare the response variables (outputs) of one model with the predictor variables (inputs) of another. A close match indicates the potential for linkage that could enhance the user's ability to achieve modeling objectives.

A Growing Database

The ESML database currently describes over 250 ecological models that are useful for estimating ecosystem services. These models have been selected from collections such as EnviroAtlas, i-Tree, Envision online tools, literature sources, and EPA research. While this

collection of ecological models is large, it is not yet comprehensive, especially as new ecological models continue to be developed. Model users and authors are encouraged to nominate new models for inclusion in ESML. Adding a new model is a collaborative and iterative process.

Over time, EPA will continue to build ESML content to reflect the state of science and address user needs. EPA scientists will use the information gathered in ESML to better understand the transferability of ecological models and model predictions. EPA also expects to link ESML with other tools as part of an integrated approach to environmental decision support.

If you are interested in an ESML demonstration or in nominating an ecological model for inclusion in the library, please contact:

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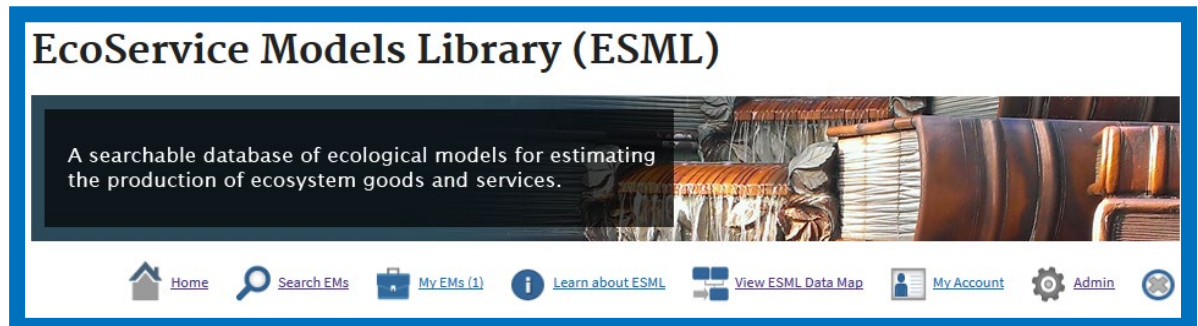
The EcoService Models Library (https://esml.epa.gov) lets users find and compare ecological models to help make better decisions on protection, restoration and use of ecosystems.