

THE ESII TOOL: METHODS OVERVIEW

The Ecosystem Services Identification & Inventory (ESII) Tool was designed to provide ecosystem services information to decision makers to facilitate improved site management decisions. The ESII Tool achieves this by modeling and estimating the value of eight ecosystem services and five sub-services.

MODELING APPROACH AND STRUCTURE

The ecosystem service models within the ESII Tool are built in Bayesian Belief Networks (BBNs). BBNs provide an effective modeling mechanism for ecological systems and natural resource management, situations in which uncertainty and incomplete information are common. The BBN structure in which the models are housed tracks the uncertainty associated with the ecological models within the ESII Tool, as well as the uncertainty associated with the relative level of expertise of the data collector. The outputs are reported with a standard deviation value, which enables the user to make an informed decision about the reliability of the outputs.

The BBN structure is organized according to the standard ecosystem services cascade model (shown at right), which depicts site attribute data determining the likely level of ecological functions, which in turn produce ecosystem services. Within the ESII Tool, the relationships between site attributes, functions, and services are based on best available models, data, and expert judgment.

Site attribute data collected using the ESII Field App include vegetation structure, soil conditions, topography, and water regime. The ESII Tool user divides the site into relatively homogenous areas called *map units* and then walks the site to collect ecological attribute data for each map unit.

This attribute data is then processed by 20 ecological function models that provide the first tier of analysis. The results of this analysis are combined with relevant regional information, such as the rainfall level for a 25-year storm event and the average growing season, to drive the second tier analysis using the ecosystem service models.

These analyses provide screening-level estimates of the ecosystem services produced on the site. The results are provided in two metrics: a service-specific metric of absolute performance in biophysical units such as gallons per minute, milligrams per liter, or pounds per year; and a common metric of percent performance, which is a measure of the performance of an area, ecosystem service, or function relative to its maximum potential.



The cascade model shows the steps involved in measuring ecosystem services.

While modeling complex ecosystems can be challenging, the Dow Chemical Company, The Nature Conservancy, and EcoMetrix Solutions Group have spent several years developing and testing the ESII Tool. The result is a unique, scientifically rigorous tool that enables both experts and non-experts to identify and quantify ecosystem services for a site quickly and efficiently.