

# Northern Research Station

Urban Forests, Human Health and Environmental Quality

Syracuse, NY

## i-Tree Spatial

As i-Tree expands into geographic models and online design and decision-based tools, it opens opportunities to link urban areas with surrounding landscape management issues. This document is designed to provide a brief overview of where i-Tree is evolving in terms of spatial landscape modeling. i-Tree partners, particularly Davey Tree and the Casey Tree Foundation, are critical collaborators in this effort.

### Overview

The goals of i-Tree are to develop tools to assess current ecosystem services and illustrate how current management decisions and landscape change will influence future benefits (to guide optimal management decisions today). The foundation of i-Tree is the use of local field data to assess ecosystem services and values. The move into spatial modeling requires these field data to be linked with cover maps to illustrate spatial variation and how ecosystem services will change in the future as the landscape structure changes (e.g., changes in tree cover). This work is currently being conducted using national cover maps developed by the National Land Cover Data base or high resolution cover maps (e.g., i-Tree Vue at [www.itreetools.org](http://www.itreetools.org)). To meet the needs of truly integrated spatial decision tools at the landscape level, linking spatial modeling with local field and geographic data is required. To facilitate this need, several new i-Tree components are being designed and built.

### Spatial Model Components

**City Scale Mapping** (i-Tree Vue; *released in version 3.0*) – This work illustrates current ecosystem services across a city and how changes in tree cover will affect these services. The goal of i-Tree is to move this mapping capability to a web server (i-Tree Geo) to allow for more sophisticated analyses and determine the best locations to plant trees, for example to improve water quality or protect the most people in the warmest and most polluted parts of the city. This work is well underway.

**Future effects** (i-Tree Future; *in development*) – When completed, this work will allow managers to project future tree population totals, tree cover and ecosystem services within land use types given various planting and mortality rates. Goals of this program include: a) determining the number of trees needing to be planted to reach a future sustainable tree cover goal; b) illustrating likely future tree composition, canopy cover, and ecosystem services; and c) linking to i-Tree Geo to illustrate future canopy cover and ecosystem services on landscape maps.

**Local Scale Site Design** (i-Tree Design; *proposed*) – This newly proposed web-based tool will allow users to draw their local site on maps (e.g., building outlines, existing trees on a

residential lot) to: a) map the best locations on the site for optimizing ecosystem services; b) provide suggestions for the best trees for various locations on the site given site constraints; and c) allow users to virtually “move” new trees around the site to illustrate effects on future tree benefits and cover on the site. Integrated with this tool will be an individual species benefits calculator that will estimate tree benefits through time. This calculator will also be released as a separate web tool (i-Tree Value). The goal of this design program is to aid in specific site designs to optimize ecosystem services.

**Module Components** – i-Tree ecosystem services calculations are being developed as separate functional programs to aid in linking i-Tree programs with other data sets (e.g., FIA) and provide consistent ecosystem services and value estimates amongst multiple delivery platforms or tools. The modules include:

- Pollution removal
- Carbon storage and sequestration
- Tree rainfall interception and runoff effects
- Volatile organic compound emissions
- Tree values (\$)
- Energy conservation and avoided pollutant emissions
- Pest risk
- Tree leaf area
- Tree population projector

## Link to Landscape Assessments

The model components above provide the foundation to link with other Forest Service work related to Regional Assessments and Landscape Scale Conservation. The i-Tree work focuses on ecosystem services, but integrating the spatial platform with other Forest Service research and data sets will allow ecosystem services to be assessed in rural areas and additional forest benefits to be assessed (e.g., timber, wildlife). Existing work on mapping future landscape changes (e.g., work of Wear, Theobald, Stewart, Alig, RPA and NFF) can be integrated with this spatial platform to illustrate how landscape change will affect the flow of forest ecosystem services. Projecting of future landscapes will take additional work to link with the i-Tree spatial platform, but could provide a means to bridge urban lands and ecosystem services with existing data sets (e.g., FIA) and regional assessments.



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