

# A Pilot Study in Urban Forestry Assessment: Petrozavodsk, Russia.

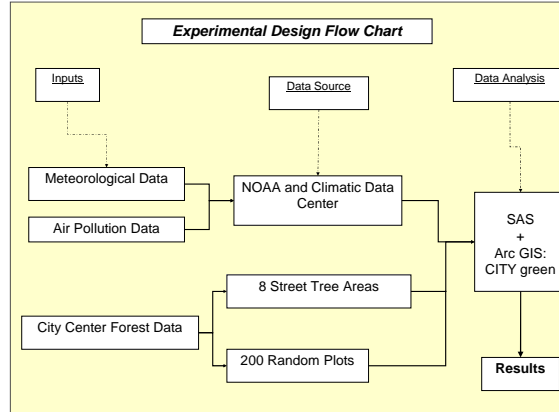
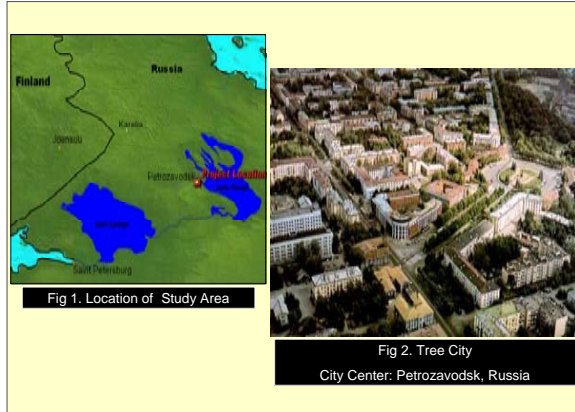
## Urban Forest Structure and Monetary Value

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### Introduction

Urban forests provide extensive environmental services including carbon sequestration and storage, improved air and water quality, energy conservation, noise reduction, moderation of climate, and recreational opportunities. Yet, tree canopy in many worldwide urban areas has been declining over the last few decades due to urban development and expansion (Dwyer 2000). Petrozavodsk, Russia (Fig 1) is a city of 266,000 people located on the western shore of Lake Onega in Northern Russia. Known as a tree city (Fig 2) and built largely during the communist era, Petrozavodsk's residents were largely dependent on public transportation for their mobility around the city. With the fall of communism and the opening of the economy to global free capitalism, automobile ownership and use has greatly increased, thereby increasing the need to widen downtown roads and parking spaces. This has the potential for the loss of urban forests and their environmental services.



### Results

Urban forest structure and function will include:

- Tree species composition
- Tree cover and density
- Tree health
- Hourly pollution removal rates
- Tree species' effects on air quality
- Total carbon stored and annual sequestration
- Tree transpiration

Urban forest monetary value will include:

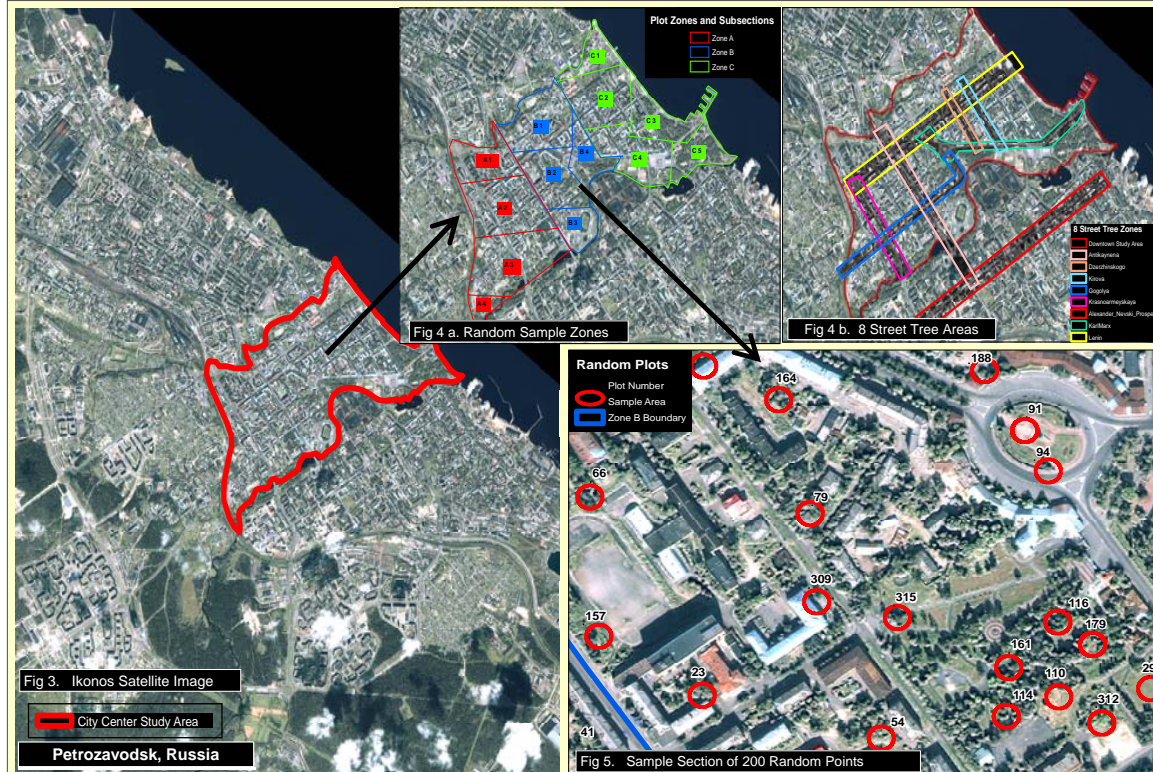
- Storm water runoff reduction of trees
- Air quality improvements (externalities factor)
- Water quality improvements (containment loading)

All resulting data will be integrated into an Arc GIS map that will further the usability and effectiveness of the gathered data.

### Objectives

The objective of this pilot study is to assess the structure of the urban forests of city center Petrozavodsk, Russia, and assign a dollar value to the urban forest's environmental services. The key questions are:

- What is the makeup and how healthy is the city center's urban forest?
- What is the dollar value in environmental services provided by these trees?
- How can this data be used to prevent the removal of urban trees due to urban traffic expansion?



### Methods

The Urban Forest Effect model (UFORE) is a computer based model that uses standardized field data and SAS software to quantify the urban forest structure and its associated environmental services. The model is a scientific and field based model designed by the U.S. Forest Service (Nowak 2000).

City center (Fig 3) forest data will be collected from 3 zones that are split into sub sections with a total of 200 random plots (Fig 4a and Fig 5.) and 8 selected street tree areas (Fig 4b.) over the summer of 2006.

In conjunction with the UFORE model, CITY green (an Arc GIS extension program) will calculate urban forest canopy cover for the city center from an IKONOS satellite image of the city (Fig 3). These two programs will assign a dollar amount to urban trees by calculating the cost of reduced storm water run off from sewers, mitigating air quality, carbon storage and sequestration, and energy conservation due to the green infrastructure found within the city center area. Dollar values assigned to these environmental services is based on the most up-to-date and peer-reviewed models and methods (American Forests 2004).

### Practical Implications

The answers to the first two objective questions will allow for informed management of Petrozavodsk's urban forests by providing up-to-date forest structure health and the start of an inventory of its urban forests. With guided management Petrozavodsk's urban forest can continue to perform its environmental services into the future.

The answer to the third objective question is a much more immediate question. With an accurate monetary value placed on Petrozavodsk's urban forests, government officials, public policy makers, and concerned citizens can better argue for preservation of the forest as urban development pressures increase.

### Literature cited

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