

# Minneapolis' Urban Forest

## Introduction:

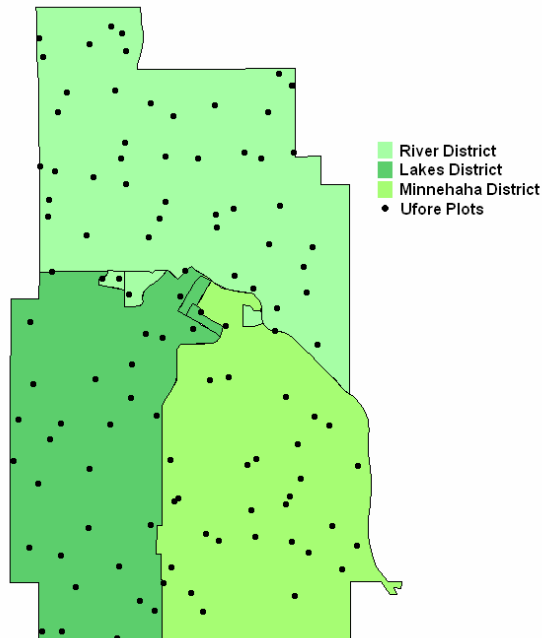
Urban forests are an invisible resource to society. Fulfilling a role which provides tangible benefits such as shading, reduced air temperatures, noise reduction, increased property value and improved human health and well-being; but some of the less tangible benefits to society are carbon storage and sequestration, pollution mitigation, volatile organic compound exchange, and building energy-use due to tree interactions. Every tree within urban areas contributes and affects each and everyone. These trees constitute the urban forest.

The city of Minneapolis was selected to test a program to collect tree information using volunteers along with professional help. The participants used PDAs (Personal Digital Assistants) to enter the tree information which was then analyzed using the Forest Service's Urban Forest Effects (UFORE) model.

The model provides estimates for urban forest structure, carbon storage and sequestration, air pollution removal, structural value, etc. A few of the findings are outlined for this important step in understanding the benefits realized by society.

## Data Collection:

During the summer of 2004 field crews gathered data on the urban forest in Minneapolis. The field crews visited 110 field plots to obtain information on a variety of attributes. The plots were located using a randomized-grid



system to establish one field plot approximately every 245 acres. The sample was later stratified into smaller units. Since the city had service districts (River, Lakes, and Minnehaha Districts) already established the sample was divided among those land-areas for a more refined analysis.

On each of the field plots individual tree measurements were recorded, parameters such as species, tree height, diameter at breast height (d.b.h.), and canopy size. These measurements provided base information for UFORE to

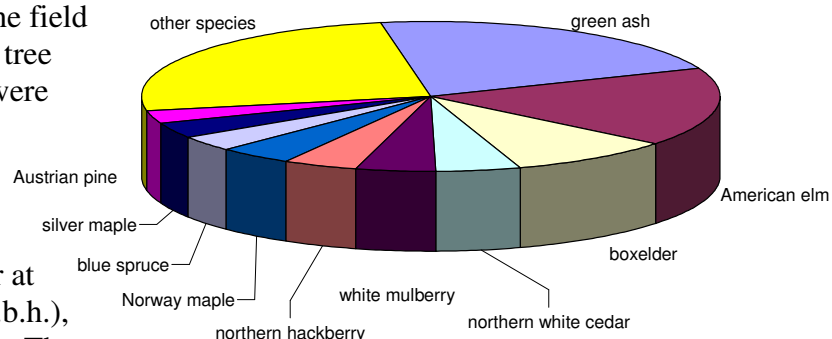
estimate for the entire city's urban forest.

## Minneapolis Urban Forest:

Minneapolis has an estimated 979,000 trees in the urban forest. Green ash (*Fraxinus pennsylvanica*) (21.6%), American elm (*Ulmus americana*) (17.1%) and boxelder (*Acer negundo*) (9.1%) are the most predominant species. Forty-one different species were sampled, but the top ten species constituted seventy-five percent of the total population estimate.

The urban forest canopy covers 26.4% of the city. The largest individual contributors are silver maple and American elm; both provide over a thousand square meters of leaf area.

The largest tree in the sample was a honeylocust with a trunk diameter of 46 inches, followed by a littleleaf linden (41 inch trunk diameter). Larger-sized trees provide greater benefit than smaller trees in the city, but there are usually fewer large trees. Usually urban forests have approximately half of their population with diameters less than 6 inches d.b.h.; in Minneapolis 47.3% of the population are less than six inches in diameter.



## Minneapolis urban forest snapshot:

**Number of trees: 979,000**

### Most common species:

**green ash (21.6%)**

**American elm (17.1%)**

**boxelder (9.1%)**

**northern white cedar (4.8%)**

**white mulberry (4.3%)**

**Percent of trees < 6" d.b.h.: 47%**

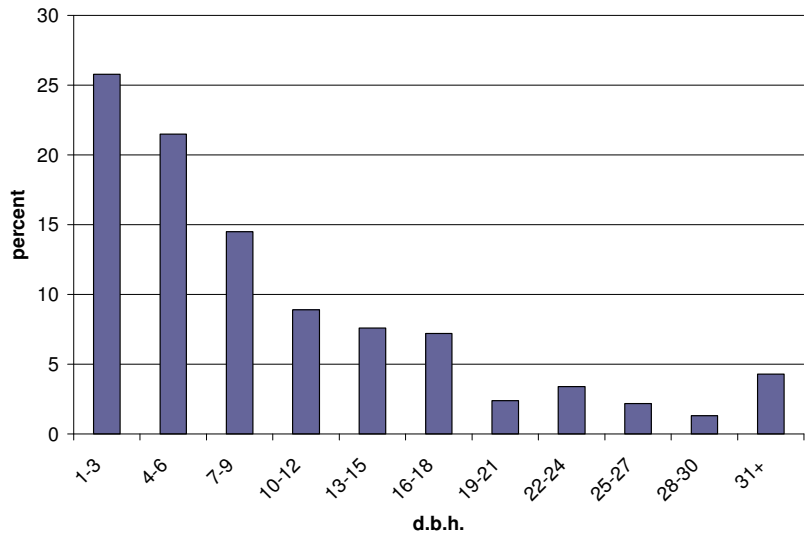
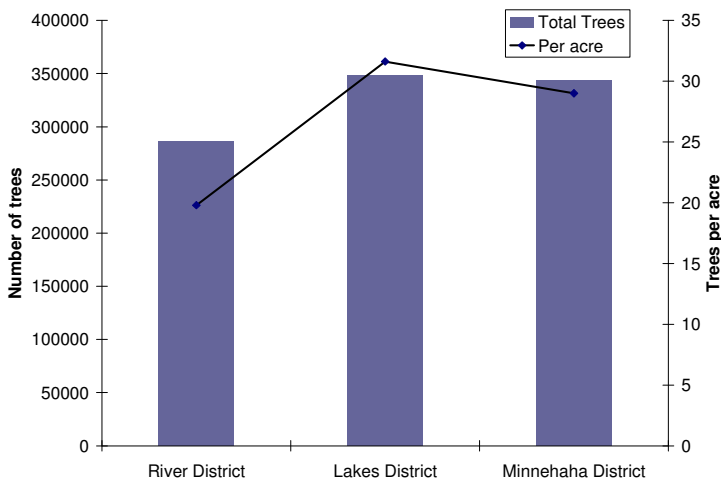
**Air pollution removal: 423 tons (annual) (\$1.9 million)**

**Carbon storage: 250,000 tons (total) (\$4.6 million)**

**Carbon sequestration: 8,900 tons (annual) (\$164,000)**

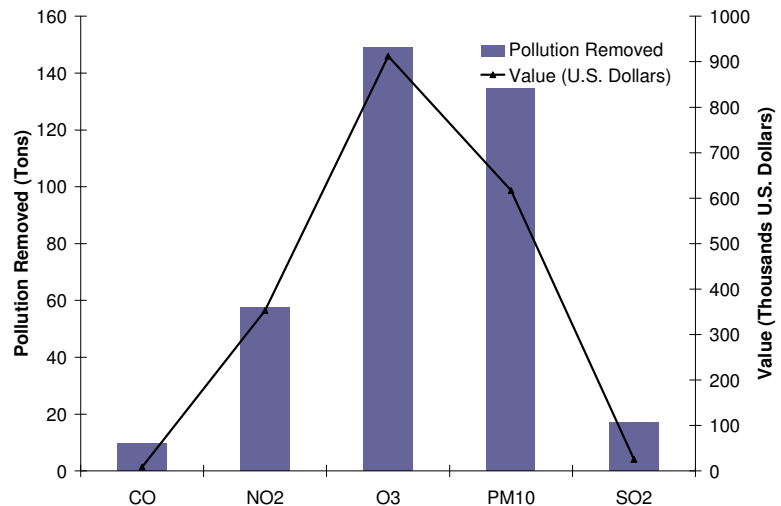
**Structural value: \$756 million (total)**

By district, the highest density (number of trees per acre) was in Lakes (31 per acre) followed by Minnehaha (29 per acre). Both districts have similar numbers for the total population of trees. The River District lags behind in both categories of total number of trees and trees per acre (19 trees per acre).



Pollution removal by trees in the urban forest was estimated using ambient pollution data and weather data from the year 2000. Based on the results, the forest removes 423 tons of pollution a year with an associated societal value of \$1.9 million.

The greatest impact was observed on the ground-level ozone (O<sub>3</sub>) concentration, followed by particulate matter less than 10 microns (PM<sub>10</sub>), and nitrogen dioxide (NO<sub>2</sub>). Both sulfur dioxide (SO<sub>2</sub>) and carbon monoxide (CO) removal was relatively low.



### What this means:

The Minneapolis urban forest is an important resource for the health and well-being of the environment and society. However, urban trees face many threats from development, to the harsh urban environment, as well as insects and diseases. By monitoring this resource, the urban forest could be sustained to contribute benefits for future generations.