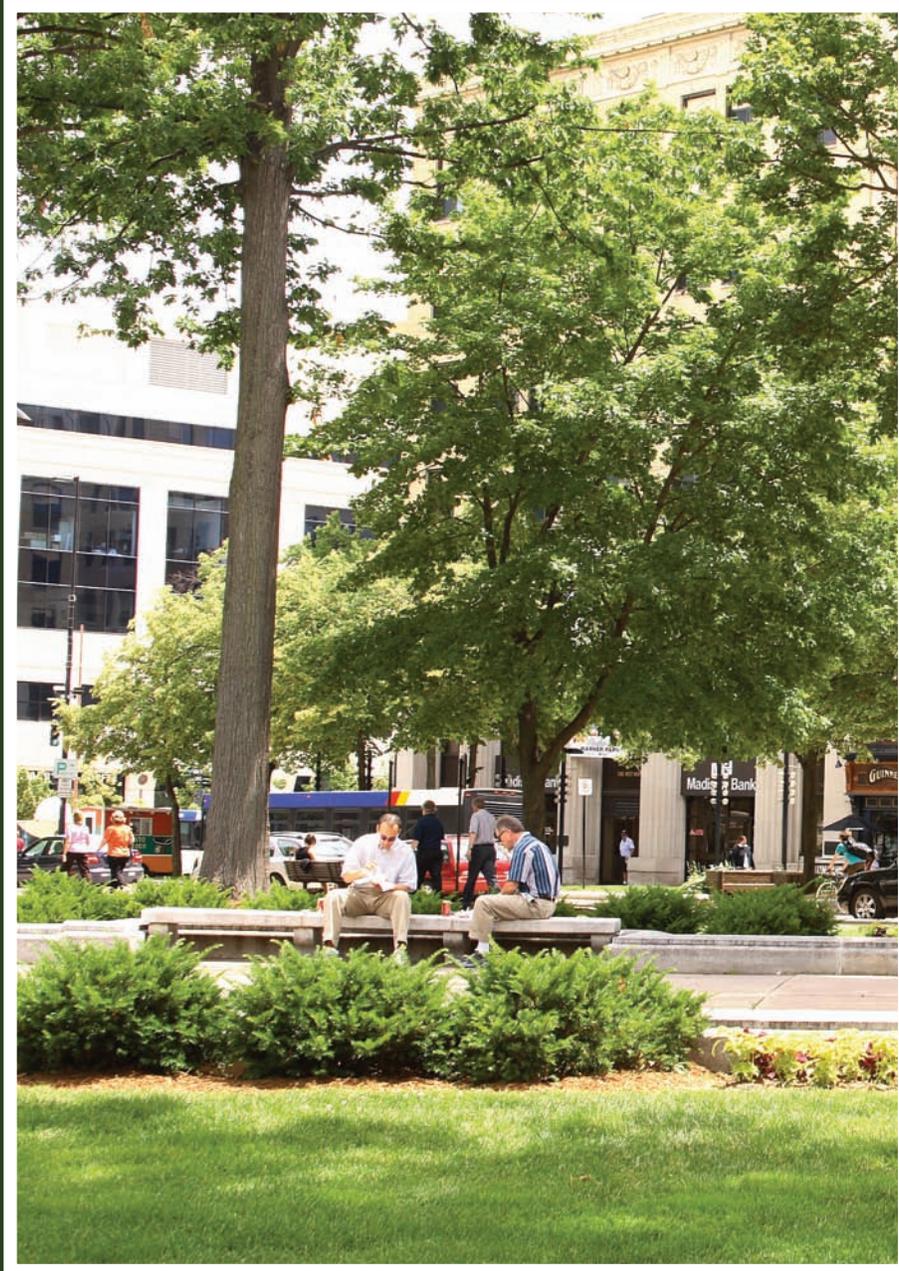


NATIONAL FOREST HEALTH MONITORING PROGRAM

Wisconsin Street Tree Assessment 2002–2003



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Wisconsin Street Tree Assessment, 2002–2003

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Street trees grow along roadways within the public right-of-way. They are an important part of the urban forest due to their visibility to motorists and pedestrians, even if their numbers represent a small fraction of trees in urban areas. Little data are available that describe this resource at a large, statewide scale. Street trees, a subpopulation of the urban forest, were chosen for this project because:

- Their proximity to commercial districts puts them at high risk to invasive pests.
- Their proximity to nonpoint source air pollution generated by cars and trucks makes them important for improving air quality.
- Their proximity to stormwater runoff pathways makes them an important component in stormwater management and water quality in urban areas.
- They are the most visible element of the urban forest.
- Their proximity to roads, sidewalks, and parking lot surfaces makes them a key moderator of temperatures.
- They are frequently managed by public agencies.

In Wisconsin, 891 street-side assessment plots were established throughout urban areas as a jointly funded, U.S. Forest Service–Wisconsin Department of Natural Resources project. Data were collected to describe the structure and characteristics of street trees and to estimate their functions and values statewide. The project will establish baseline data, with the intent to remeasure the plots over time. These remeasurements will allow us to learn about changes in the structure and function of the street tree component of the urban forest and what caused them.

Methods

The protocols used to sample street trees in Wisconsin were based upon methods developed and used in Maryland and Massachusetts (Cumming and others 2001, 2006). In general, all roadways within U.S. Census Bureau-defined urban areas were considered the statistical “population” to be sampled. Segments of road were randomly chosen and plots were located in the right-of-way along both sides of the road. The plots were installed and sampled during the summers of 2002 and 2003.

All trees 1 inch (2.54 cm) in diameter at breast height (d.b.h.) and greater were tallied. Data included tree species, diameter, height, crown conditions, and occurrence of damage. Ground cover was estimated. Tree conflicts with sidewalks or overhead electric utilities were recorded.

Results

Based on the 1990 U.S. Census Bureau’s urban definition, there were 16,073 miles of roadway in urban areas (table 1). Almost half of the plots (435) had trees, and a total of 2,865 live trees were sampled. The estimated urban street tree population for the State of Wisconsin was calculated to be 1,018,000 based on the average area of the right-of-way along urban roads. An estimated 934,000 of these trees occur in residential areas. Wisconsin’s street trees are dominated by Norway maple (30 percent), green ash (15 percent), honey locust (8 percent), and littleleaf linden (7 percent), and averaged 12.8 inches (32.5 cm) d.b.h. (figure 1 and table 2). These would be considered well-established, “mid-sized” trees. Managers will be contending with many mature trees within the next 10 to 20 years, depending on species and site characteristics.

Table 1. Plot-level data, Wisconsin street trees, 2002–2003.

Variables	Value
Number of plots	891
Miles of urban roadway	16,073
Number of living trees sampled	2,865
Average d.b.h., inches (cm)	12.8 (32.5)
Number of trees per mile	63
Population estimate - live	1,018,000
Population estimate - dead	2,364
Number of species sampled	87
Number of genera sampled	36
Number of families sampled	19
Monetary (structural) value	\$1,771,000

Indicators of Forest Health

Three characteristics were examined as indicators of forest health—crown condition, crown density, and the presence of damage on the roots, trunk, or branches. Combined, these measurements revealed that only about 2 percent of street trees have crown dieback exceeding thresholds of concern, and 84 percent have no observable damage. The most commonly observed types of damage were cracks and seams, open wounds, and conks.

Figure 1. Diameter distribution within the 10 most common species, Wisconsin street trees, 2002-2003.

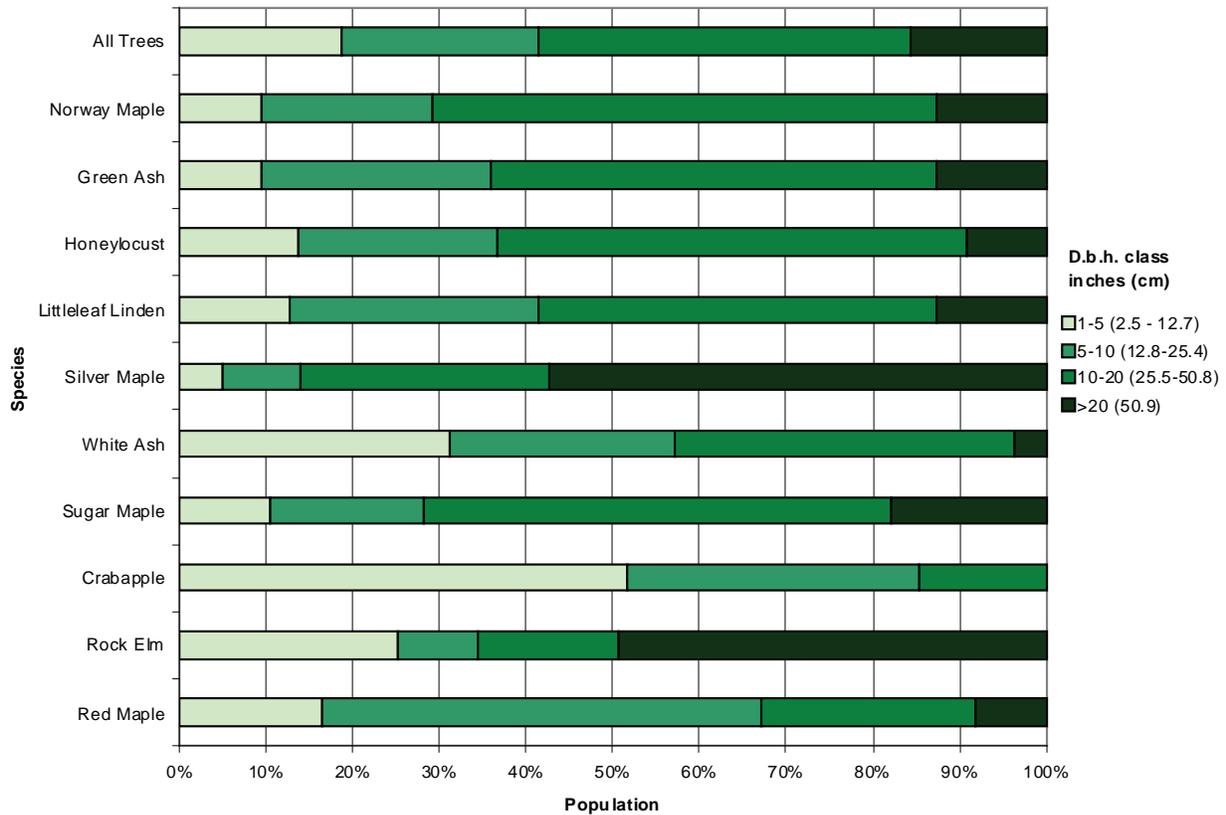


Table 2. Species Composition – Percentages of the 10 most frequent species along urban roadways in Wisconsin, 2002 - 2003.

Species	Common name	Percent of sample	Cumulative (%)
<i>Acer platanoides</i>	Norway maple	30.5	30.5
<i>Fraxinus pennsylvanica</i>	Green ash	15.2	45.7
<i>Gleditsia triacanthos</i>	Honeylocust	8.4	54.1
<i>Tilia cordata</i>	Littleleaf linden	6.6	60.7
<i>Acer saccharinum</i>	Silver maple	6.3	67.0
<i>Fraxinus americana</i>	White ash	3.9	70.9
<i>Acer saccharum</i>	Sugar maple	3.7	74.6
<i>Malus sp.</i>	Crabapple	3.2	77.8
<i>Ulmus thomasii</i>	Rock elm	2.3	80.1
<i>Acer rubrum</i>	Red maple	2.1	82.2
All other (78 species)		17.8	100.0

Benefits of Wisconsin's Urban Street Trees

Urban street trees provide a variety of benefits that contribute to improved air and water quality, aesthetics, and quality of life for those who live, work, and travel in urban areas. Data collected from the urban street trees in Wisconsin were analyzed using the Urban Forest Effects (UFORE) Model (Nowak and Crane 2000). Benefits from these trees were quantitatively described in terms of structural value, value of carbon removed from the atmosphere and stored, and the value of air quality improvement (tables 3 and 4). The structural and functional value of Wisconsin's street trees approaches \$1.8 billion. Carbon storage and sequestration (\$7.5 million), replacement value (\$1.8 billion), and pollution removal (\$1.7 million/year) are important assets to the citizens of Wisconsin.

Table 3. Value and extent of benefits provided by Wisconsin's urban street trees, 2002-2003.

Benefit	Extent of benefits	Value (million \$US)
Structural value (replacement costs)	1,018,000 street trees	\$1,771.0
Carbon storage (metric tons, t)	325,000	\$7.3
Carbon sequestration (t/yr)	9,500	\$0.2
Pollution removal (t/yr)	300	\$1.7

Table 4. Amount (metric tons) and value of pollution removed annually by Wisconsin's urban street trees, 2002-2003.

Pollutant	Amount removed by Wisconsin's urban street trees (t/year)	Value of removal
Ozone	160.34	\$1,082,610
Particulate matter less than 10 microns (PM ₁₀)	72.20	\$325,499
Nitrogen dioxide (NO ₂)	35.63	\$240,590
Sulfur dioxide (SO ₂)	25.22	\$41,695
Carbon monoxide (CO)	3.29	\$3,152

SIDEWALK AND OVERHEAD UTILITY CONFLICTS

Overhead utility wires and sidewalks are unique site features that affect the growth and success of street trees. Fourteen percent of urban street trees in Wisconsin had conflicts with overhead wires. Trees in commercial districts and in the northern and south-central regions of the State had above average occurrences of these conflicts. Sidewalks were less problematic, with only about 3 percent of trees affecting hardscape material.

PEST RISK

Based on its species distribution, the Wisconsin urban forest is at risk from several pests that could impact its health and sustainability. The impacts of three exotic pests and one disease—Asian longhorned beetle (*Anoplophora glabripennis*), gypsy moth (*Lymantria dispar*), emerald ash borer (*Agrilus planipennis*), and Dutch elm disease (*Ophiostoma novo-ulmi*)—were analyzed using the UFORE Model (Nowak and Crane 2000) (table 5).

Table 5. Pest risk to urban roadside trees – Monetary structural replacement value (\$US) and percent of total population of host tree species at risk to a disease and three important insect pests: Dutch elm disease, Asian longhorned beetle, emerald ash borer, and gypsy moth, Wisconsin 2002-2003.

Pest or disease	Replacement value of host trees (million \$US)	Percent of urban street trees in Wisconsin
Asian longhorned beetle	1,512	82.1
Emerald ash borer	338	19.5
Gypsy moth	227	15.0
Dutch elm disease	111	4.0

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