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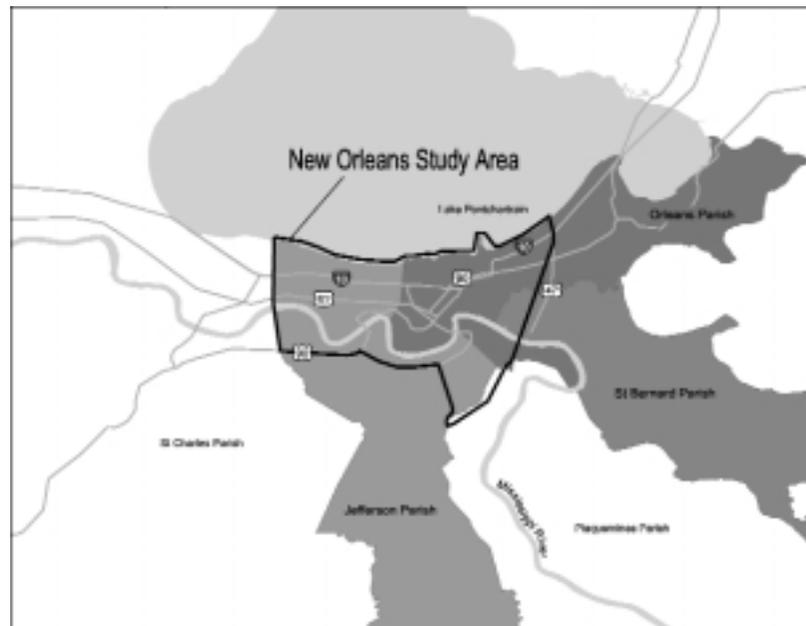
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# **Urban Ecosystem Analysis New Orleans, Louisiana Metropolitan Area**

*Calculating the Value of Nature*

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## Project Overview

AMERICAN FORESTS conducted an Urban Ecosystem Analysis of the New Orleans, Louisiana Metropolitan Area (including portions of Jefferson, Orleans, and St. Bernard Parishes) to build a “green infrastructure” data layer for use in community planning and development. The data was assembled using remote sensing images and data collected by satellite in the summer of 2001. The study produced detailed and reliable information about the region’s land cover features, especially its tree cover. Local agencies and groups can use the data for daily decision-making. The New Orleans Metro Area tree cover can be evaluated in budgetary as well as environmental terms. Adding data describing trees to existing infrastructure data reveals to city managers assets they did not know they had.

Between 1982 and 1997, New Orleans’ population declined by 1.4%, while its urban area increased by 25% (the Brookings Institution). Though the New Orleans area faces unique ecological challenges, increased tree cover is one way the city can begin to balance the built and natural environment. The data from this study coupled with its relevance and accessibility to those working at the local level, offers the opportunity for much better land use and development decisions than in the past. These data are an important new resource for those working to build better communities—ones that are more livable, produce fewer pollutants, and are more cost effective to operate.

The data collected are unique because they contain both green infrastructure—areas covered with trees, shrubs, and grass and gray infrastructure—areas covered by buildings, roads, utilities, and parking lots. While municipalities commonly use geographic information systems (GIS) to map and analyze their gray infrastructure, they typically do not integrate trees and other elements of the green infrastructure into their day-to-day planning and decision-making process. Reasons for this include: 1) the lack of understanding of the ecological and economic value of trees and other environmental features, and 2) the absence of a means to readily use this information in commonly used GIS systems.

This study addresses both of these impediments. Data documenting the environmental characteristics of trees are now available thanks to research from the USDA Forest Service and the Natural Resources Conservation Service. This report describes how an accurate green data layer can be produced for a community’s GIS systems. Today we have a clear understanding of the active role trees play in improving our environment. Those working in planning, urban forestry, and related natural resource issues can now readily calculate the dollar value of these ecological benefits in their communities using CITYgreen software and these data. AMERICAN FORESTS has developed CITYgreen software as a tool to help communities analyze the value of their green infrastructure.

When a community recognizes the value of its green infrastructure it starts a process that leads to a better, more cost effective community. Since communities are in a constant state of change, combining green and gray data is an essential element for building better communities. This report provides valuable information for improving the environment in the New Orleans Metropolitan Area, but it should also be used as a model for other communities to follow.

## Findings for the New Orleans Metropolitan Area

For the New Orleans Metropolitan Area, AMERICAN FORESTS used high-resolution (4 meter multispectral) satellite imagery. From this data, AMERICAN FORESTS calculated stormwater runoff, air quality, and carbon storage/sequestration benefits of tree cover in the 194 square mile area. While this study presents some overall findings, the real value of this project is to show how the communities within this study area can apply the data to their specific issues. Building a tree canopy into communities is important for improving air and water quality as well reducing management costs. Some highlights of the findings are presented below.

*The New Orleans area’s urban forest provides ecological benefits for managing stormwater and mitigating air pollution.*

- The city is comprised of 30,019 acres of tree canopy (24%), 40,489 acres of impervious surfaces (33%), 35,049 acres of open space (28%), and 15,288 acres of water (12%).
- The total stormwater retention capacity of the urban forest in New Orleans is 370 million cubic feet in avoided storage of water and is valued at \$741 million (based on construction costs estimated at \$2 per cubic foot to build equivalent retention facilities).
- The urban forest provides air quality benefits by removing nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and particulate matter 10 microns or less. New Orleans’ tree cover removes 2.8 million pounds of pollutants from the air each year, a benefit worth \$7.1 million annually.
- Tree cover in New Orleans currently stores 1,291,700 tons of carbon and sequesters 10,000 tons/year.

*Increasing tree canopy in the New Orleans Metro Area to meet AMERICAN FORESTS’ recommended goals would provide the city with sizeable benefits.*

- If tree cover were increased to 40% throughout the area, the New Orleans Metropolitan Area would have 1.8 million fewer pounds of air pollutants to deal with each year, at a value of \$4.6 million annually.

- The additional 19,583 acres of trees would mitigate 60.8 million more cubic feet of stormwater runoff, at a value of \$121.6 million.
- At 40% tree cover, an additional 842,600 tons of carbon would be stored in tree biomass and an additional 6,600 tons of carbon would be sequestered each year from the New Orleans environment.

### Recommendations

Though this report provides valuable information regarding the tree cover and its benefits throughout the New Orleans area, the true strength of this project is in the data it provides and for those planners, engineers, environmentalists, and decision-makers who use it for additional analyses as needed for local planning. With the land cover data set (pictured bottom right) provided to the communities participating in the study, community leaders in New Orleans now have the tools they need to put trees back in the decision making process. By using CITYgreen software in conjunction with this highly accurate green data layer, community leaders can now integrate green and gray infrastructure on a daily basis.

### Setting Tree Canopy Goals

Local communities should set specific tree cover targets for various land use areas. They should be established with an understanding of current and future ecological and land use developments. AMERICAN FORESTS recommends the following benchmarks as a starting point for local discussion and goal-setting.

- 40% tree canopy overall
- 50% tree canopy in suburban residential
- 25% tree canopy in urban residential
- 15% tree canopy in the central business district



True color image (top) and land cover classification showing tree cover (bottom) for the New Orleans Metropolitan Area.

### New Orleans Metropolitan Area Tree Cover Benefits

	Current Tree Cover (24%)	Modeled at 30% canopy	Modeled at 40% canopy
Air Pollutants Removed Annually (lbs.)	2,854,237	3,537,126	4,716,169
Air Pollutants Removed Annually (\$)	\$7,103,173	\$8,802,639	\$11,736,852
Stormwater Mitigated (total cubic feet)	370,500,836	409,553,346	431,250,928
Stormwater Mitigated (total \$)	\$741,001,672	\$819,106,692	\$862,501,856
Carbon Stored (total tons)	1,291,700	1,600,700	2,134,300
Carbon Sequestered Annually (tons)	10,000	12,400	16,600

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# About the Urban Ecosystem Analysis

## Ecological Structure Classification

AMERICAN FORESTS Urban Ecosystem Analysis is based on the assessment of “ecological structures”—unique combinations of land use and land cover patterns. Each combination performs ecological functions differently and is therefore assigned a different value. For example, a site with heavy tree canopy provides more stormwater reduction benefits than one with lighter tree canopy and more impervious surface.

## Data Used

For this Urban Ecosystem Analysis, high-resolution (4 meter pixel) multispectral satellite imagery was used. American Forests used a full-pixel “knowledge based” classification technique to categorize different land covers such as trees, impervious surfaces, open space, and water.

## Analysis Formulas

A CITYgreen® analysis was conducted for the area as whole. CITYgreen version 5.0 used the raster data land cover classification from the high-resolution imagery for the analysis. The following formulas are incorporated into CITYgreen software.

**TR-55 for Stormwater Runoff:** The stormwater runoff calculations incorporate formulas from the Urban Hydrology of Small Watersheds model, (TR-55) developed by the US Natural Resources Conservation Service (NRCS), formerly known as the US Soil Conservation Service. Don Woodward, P.E., a hydrologic engineer with NRCS, customized the formulas to determine the benefits of trees and other urban vegetation with respect to stormwater management.

**UFORE Model for Air Pollution:** CITYgreen uses formulas from a model developed by David Nowak, PhD, of the USDA Forest Service. The model estimates how many pounds of

ozone, sulfur dioxide, nitrogen dioxide, and carbon monoxide are deposited in tree canopies as well as the amount of carbon sequestered. The urban forest effects (UFORE) model is based on data collected in 50 US cities. Dollar values for air pollutants are based on averaging the externality costs set by the State Public Service Commission in each state. Externality costs, are the indirect costs to society, such as rising health care expenditures as a result of air pollutants’ detrimental effects on human health.

## Acknowledgements for this Study

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ESRI for GIS software  
ERDAS for remote sensing software

## For More Information

AMERICAN FORESTS, founded in 1875, is the oldest national nonprofit citizen conservation organization. Its three centers—Global ReLeaf, Urban Forestry, and Forest Policy—mobilize people to improve the environment by planting and caring for trees.

AMERICAN FORESTS’ CITYgreen software provides individuals, organizations, and agencies with a powerful tool to evaluate development and restoration strategies and impacts on urban ecosystems. AMERICAN FORESTS offers regional training workshops and technical support for CITYgreen and is a certified ESRI developer and reseller of ArcView products. For further information contact:

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