Eco-Link
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Urban Forestry & Open Space

There are more than 749 million acres of forest land in the United States, comprising over one-third of the land area of the country. To be included in that 749 million acre figure, land must be at least 10 percent stocked by forest trees of any size and a minimum of one acre in size. In addition, roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Because of the way in which forest land is defined, wooded lands located in urban and metropolitan areas are generally not counted when determining the area of forests nationally.

The skylines of Atlanta (right) and Minneapolis (left) are surrounded by forests of urban trees.

Although not counted as part of forests, there are nearly four billion urban trees[1] in the U.S. today. Another 70 billion trees are growing in suburbs and other metropolitan areas. As urban land in the U.S. expands, so do the urban forests. Urban land in the lower 48 states increased from 2.5% of total land area in 1990 to 3.1% in 2000, an area about the size of Vermont and New Hampshire combined. Researchers from the U.S. Forest Service predict that urban land will nearly triple in size to over 8% of total land area by 2050, an area larger than the state of Montana (Nowak 2005).

Benefits of Urban Forests

Urban forests are areas for recreation, and include parks, trails and other open space. These areas provide opportunities for people to enjoy nature, engage in recreational activities, games and sports, and pursue environmental education. In addition to these benefits, urban forests also positively affect air and water quality.

It is well known that urban air quality can impact human health. Allergies, asthma, bronchitis, and related conditions have all been linked to airborne pollutants. The good news is that there is strong evidence of the mitigating impacts that land use, open space, and vegetation management can have on local and regional air quality.
Urban trees provide distinct benefits related to air quality:

- Microclimate effects, including temperature reductions
- Removal of air pollutants
- Reduced energy consumption in heating and cooling buildings

[1] Urban areas as defined by the Bureau of the Census include (1) urbanized areas with populations of 50,000 or more and a minimum density of 1000 people /sq. mi, (2) places that contain some urbanized areas within their boundaries, and (3) places with at least 2,500 people and located outside of urbanized areas. Also, areas totally surrounded by urbanized areas but not within an urbanized area are considered to be an urban area (Nowak et al. 2001).

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Benefits of Urban Forests continued

Various studies have quantified the role of urban trees in pollution removal. In areas with 100 percent tree cover, as much as 15 percent of ozone and sulfur dioxide are removed.[2] Pollution removal by urban trees in the United States has been estimated at 711,000 metric tons annually, a service valued at $3.8 billion.[3]

Urban trees also assist in moderating climates and reducing the "heat island" effect. The USDA Forest Service estimates that every 1% increase in canopy cover results in maximum mid-day air temperature reductions of 0.07 to 0.36°F (0.04° to 0.2°C).[4]

Threats to Urban Forests and Open Space

Over the next three decades, housing development is projected to impact 44 million acres of what is now commercial timberland.[5] Subdivision is often viewed as undesirable even if not accompanied by development, as small landowners are much more likely to restrict access than a larger landowner. For instance, a 1997 USFS survey of private landowners in Wisconsin showed that only 20% make their land available for public recreation.[6]

Urban Tree Mortality

Just as with trees located in natural forests, urban trees are subject to the threats of disease, insects, storm events, and advancing age. But, whereas trees in wild areas simply fall to the forest floor following death, urban trees are typically removed before they fall or, in the case of storm damage, immediately after they come down. All too often these trees wind up in landfills, with relatively little wood used in making useful products.

Urban Forests as Sources of Wood

Utilization of urban trees for production of useful products is still a fairly new idea. However, the idea is drawing more attention from researchers, community officials, arborists, tree care firms, and wood-using industries including bio-energy producers.

Questions that often arise when discussing the potential for urban tree utilization include:

- How much wood is removed from our urban areas each year?
- What are the major constraints to utilizing this wood?
- Are there viable examples of urban tree utilization industries?
- Can bio-energy play a role in urban tree utilization?

How Much Wood is Removed Annually From Our Urban Areas?

Various researchers have recently addressed the question of how much wood is removed from urban forests each year. Estimates of these researchers vary widely, but regardless of the method used in developing an estimate, the volume of urban tree removals is a substantial number. The estimates range from over 16 to 38 million green tons (short tons) per year. Even the lower range of the estimate is comparable to total annual harvests from America's National Forests. By including metropolitan area trees, the volume would increase by at least another 17 million green tons.

[2] A pollution removal calculator can be found at http://www.fs.fed.us/ne/syracuse/Tools/tools.htm
[3] http://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2006_nowak001.pdf
[4] http://www.epa.gov/hiri/strategies/vegetation.html
[5] http://www.fs.fed.us/openspace/fote/fote-6-9-05.pdf
[6] http://woodrow.mpls.frb.fed.us/pubs/fedgaz/07-01/forests.cfm?js=0

What are the Major Constraints to Utilizing Urban Wood?

There is a long list of reasons why urban trees are not always utilized to their best and highest value. Some of these reasons or constraints are justified, while others fall into more the excuse category. Here's a quick look at some of the more common constraints.

Wood Quality - Urban trees are typically more openly grown than trees growing in a natural forested setting; this often results in shorter trunks and more branches. Throw in the possibility of embedded materials-nails, cables, and other hardware-and many timber buyers are frightened away. In addition, among both urban wood generators and many in the traditional wood products industry, there is a perception that urban trees have 'zero' value.

Wood Quantity - With the exception of storm events or a large pest outbreak, most individual urban tree removal projects generate small quantities of wood. Most existing wood industries can't afford to scurry around town picking up one or two logs. Also, many urban tree projects involve pruning (branch removal) and other maintenance activities rather than main stem (trunk) removal.

Markets - Most timber sales in rural forests involve multiple tree species. This 'product variety' enables a range of potential buyers and markets to be interested in the sale. In urban areas, especially after an invasive species attack (i.e., emerald ash borer or Dutch elm disease), the availability of a single species or two is more the norm, limiting the number of potential buyers, utilization options, and markets. Urban tree removals also generate many species that are not conventionally valued in traditional timber markets.

Inventories - Tree inventories in urban areas often lack the scope and specificity (such as log volume and grade) needed by wood-using industries to set-up an effective utilization program.

Utilization Plans - Most urban forestry programs have weak or non-existent utilization plans. This lack of planning includes a poor understanding of local markets and potential products, a reluctance to engage timber buyers and existing wood-using industries, and a general lack of knowledge of how to create a viable utilization plan.

Community Support - Community leaders are often short-staffed and struggling with tight budgets. Asking them to develop and/or incorporate new ideas for how they dispose of urban tree removals is often difficult, even if it will result in savings for the city. In many cases, communities don't care what happens to the wood, as long as it is removed from public areas in a timely manner.

When the added expense of working in an urban environment is considered in the light of a general lack of enthusiasm by many wood industry firms, the constraints of utilizing the urban wood resource seem daunting. Surprising to many, however, is that a movement is afoot to minimize these constraints, and develop viable markets for wood from urban forests. As more cities are creating strategies to "green" their communities, urban tree utilization planning has the potential to be included in these plans.

Are there Examples of Urban Tree Utilization Industries?

The short answer is, yes, and their numbers are growing. Most of the firms that utilize urban trees are small (fewer than 5 employees), or the firms are part of a larger business (ex: a large tree service firm that creates a wood utilization business line). The green building movement, storm-related tree cleanup, and pest outbreaks are examples of opportunities for urban tree utilization. Today, a large number of businesses involved in urban tree utilization are focused on lumber and related value-added businesses (furniture, flooring, cabinets, etc.).

How Does Urban Tree Utilization Relate to Bio-Energy?

An example of the connection between bio-energy and urban trees can be found in downtown St. Paul, Minnesota. Located about one-half mile from the State Capitol building, District Energy St. Paul operates a combined heat and power plant serving the commercial, industrial and residential downtown area. The energy output of the steam-powered turbine is 25 MW; "waste" energy created in the process is used to heat the downtown area. Completed in 2003, the plant was built as a multi-fuel unit, capable of burning coal, natural gas, or biomass in the form of wood chips. Currently, the plant consumes up to 300,000 tons of wood chips per year, primarily sourced from urban tree removals. To put the District Energy St. Paul example in perspective, consider the earlier estimate of annual urban tree removals in the lower 48 states. With District Energy's 25 MW plant using upward of 300,000 tons of wood per year, and the volume of urban tree removals nationally 16-38 million tons annually, such removals could theoretically support 57 to 127 similar size bio-energy plants!

In addition, urban trees are not the only urban wood resource that can be tapped for energy. When combined with construction and demolition wood, discarded wood pallets and related shipping containers, and other forms of recyclable urban wood, the potential for urban areas to serve as local wood baskets (or supplement existing wood baskets) for industrial energy-producing applications is compelling.

Summary

Urban areas, and adjacent "metropolitan land", will continue to expand throughout the United States, as will the extent of the urban forest. The volume of urban trees removed annually, already quite significant, will increase as well and new strategies for dealing with such material are needed. Consequently, more attention-including research, education, and technology transfer-should be given to the potential for urban forests to provide a source of useful products, including lumber and bio-energy, while also conserving landfill space and generating economic opportunities.

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