

GETTING MORE THAN WE PAY FOR

Research Update: Center for Urban Forest Research, UC Davis

Photos courtesy of the Center for Urban Forest Research

Dr. Greg McPherson directs the Center for Urban Forest Research (CUFR) and teaches urban forestry courses at the University of California, Davis. Dr. McPherson and his colleagues conduct research that measures and models the benefits and costs of urban forests. McPherson joined the Forest Service as the lead scientist on the Chicago Urban Forest Climate Project in 1991. He has been at CUFR since 1993.

For more than 20 years, CUFR has quantified the benefits and costs of city trees in order to stimulate investment in tree management. The Center began by measuring the effects of tree shade on building energy use, then added tree effects on microclimate and CO₂ reduction. Over time, CUFR's measurements have extended to include more subtle benefits of city streets as well as the glaring positives, such as stormwater retention.

“What is unique about CUFR,” says McPherson, “is that we do a complete accounting of the costs as well as the benefits, so that cities can see the dollar-to-dollar benefit:cost ratio (BCR).”

CUFR has developed a tool called STRATUM (Street Tree Resource Assessment Tool for Urban Forest Managers). CUFR identified 20 unique climate zones around the U.S.—from Northern Mountain &



Volunteers collecting data to enter into STRATUM

Prairie, to Texas Plains, to Piedmont—that have distinct tree palattes, air quality, rainfall patterns and climate. CUFR has picked reference cities for 12 of those zones and completed a BCR analysis for each. Data from these reference cities provides tree growth and benefit information that can be applied and adapted by other cities in the same climate zone.

To date, CUFR has partnered with city foresters in the reference cities of Longview, WA; Berkeley, Modesto, Claremont, and Santa Monica, CA; Glendale, AZ; Fort Collins, CO; Minneapolis, MN; Charlotte, NC; and Charleston, SC. CUFR has also worked with non-reference cities like Cheyenne, WY; San Francisco, CA; Bismarck, ND; and Boulder, CO.

The full reports of CUFR's findings using STRATUM are available on its Web site, <http://cufu.ucdavis.edu>, but here's a snapshot: the ratio of benefits to costs (BCR) in Bismarck was found to be \$3.09—one of the most favorable. For every dollar spent on city trees in Bismarck, a return of \$3.09 in benefits is realized. Berkeley had a 1.37 BCR, relatively low due to its benign climate and clean air (which reduced benefits) as well as substantial sidewalk repair expenditures. BCRs were 2.09, 2.18, and 2.41 in Cheyenne, Fort Collins, and Glendale.

The benefits that STRATUM quantifies are those familiar to all MAs, including stormwater retention, urban heat island cooling, CO₂ sequestration, and increased property values. STRATUM also takes a complete accounting of both tree program costs—planting, pruning, removals, IPM, inspections, administration costs, irrigation, and the like—and non-program costs, like claims and settlements from trip-and-fall cases, property damage, sidewalk repair by other sectors of public works, sewer line damage, leaf cleanup, and storm cleanup. According to McPherson, this detailed cost analysis is unique to STRATUM.

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STRATUM takes into account the costs of maintaining the urban forest, as well as benefits.



STRATUM findings indicated that palms provided low benefit relative to cost for Glendale, AZ.



STRATUM found that sidewalk repair costs depressed Berkeley's benefit to cost ratio.



Chinese elms (*Ulmus parvifolia*) in Glendale's historic district

What STRATUM Found:

Berkeley, Bismarck, and Glendale

Berkeley, CA

Berkeley's benefit-to-cost ratio (BCR) was \$1.07, the lowest of the reference cities to date. According to Greg McPherson, because Berkeley has relatively small planting areas, the city was spending an inordinate amount on sidewalk repair, and that reduced the BCR. The city could explore expanding cutouts, meandering sidewalks, and planting fewer shallow-rooted trees associated with sidewalk heave.

STRATUM revealed that Berkeley's municipal forest is well stocked with mostly young trees. Therefore, young tree maintenance is critical and deserves investment.

Bismarck, ND

STRATUM revealed a BCR of 3.09 for Bismarck, a figure closely tied to the number of large American elm and green ash trees there. Sustaining these trees, as well as planting a more diverse palette of replacements, deserves funding if the city is to continue its current level of benefits.

Glendale, AZ

According to STRATUM findings, Glendale's BCR of 2.41 can be improved by reducing reliance on palms. Currently, palms represent 10% of Glendale's urban forest, but provide only \$6/tree value, as compared to \$13, \$29, and \$20/tree for small conifers, broadleaf evergreens, and deciduous trees. Although Glendale's urban forest is diverse and young trees are being planted to replace the aging mulberry and eucalyptus, Glendale should diversify further, with an emphasis on large-maturing trees where feasible.



Bismarck enjoys a high BCR in part because of the extensive canopy provided by its American elms.

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There is another facet of STRATUM that is unique—the ability to use statistical sampling. McPherson says, “With this program, cities that don’t have tree inventories can do a three to five percent sample, which is much less expensive than a full inventory and will give estimates of tree numbers that are within 10% accuracy. We have worked out all the protocols on how to do the sampling, and it’s fairly straightforward. We’ve minimized the number of fields of information that need to be collected.”

McPherson says the sampling method allows smaller communities to get started with less up-front investment. He says, “My observation has been that cities will invest in a complete inventory, but they often don’t have the resources to update it and use it on a daily basis, so it becomes quickly outdated.”

In addition to tallying the number and kinds of tree species, the empty planting sites, trees in need of removal, and pruning priorities, STRATUM computes the value of the benefits that the trees are producing.

McPherson says, “STRATUM shows that trees are a capital asset worth preserving. When city decision makers see that although you spend \$20 per tree, you get \$30 to \$50 in benefit, it makes it easier for them to see the urban forest as part of the infrastructure, worthy of investment in its maintenance and perpetuation.”

CUFR is partnering with Davey Resource Group, the U.S. Forest Service, and the National Arbor Day Foundation to bring STRATUM to communities, free of charge. Davey Resource Group will provide free training and technical support. A full release of STRATUM is due late in 2006. See www.itreetools.org for more information on STRATUM and related urban forest management tools.

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