



Urban Forest Research

Spring 2003

Center for Urban Forest Research • Pacific Southwest Research Station • USDA Forest Service

Surviving a budget crisis

One City's Story

Modesto prides itself on having more trees than people and arguably has one of the best public tree management programs in California. Located in the hot, dry, central valley of California, this city of 190,000 people has well over 200,000 trees.

Trees have always been important to the citizens of Modesto. Early residents planted large numbers to add shade and beauty to their town. By 1915, so many trees had been planted that the new Planning Commission was charged with coordinating future tree planting and maintenance as their first task. In the 1930s the city wrote a tree ordinance, one of the first in California.

Budget Crisis

By 1991, trees were flourishing, but budgets were in crisis. As a budget cutting strategy, the city manager began looking for programs with "fat." And one of the first programs to be examined was the tree program with a \$2.6 million budget. The city manager began with some hard questions of the tree manager: "How do you justify expenditures of over \$2 million per year?" "What are the tangible values?"



Solution

While all agreed that the city trees provided beauty and other benefits, quantifiable values were more elusive. So, Peter Cowles, Operations and Maintenance Director for the

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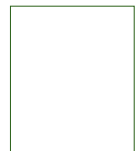
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Taking your program to the next level

The Modesto tree program has brought the city widespread recognition and numerous awards. For over 20 years Modesto has been a Tree City USA. The city was also designated a “sustainable urban forest.”

In 2002, Modesto entered a prestigious international contest—Nations in Bloom. This contest, which is very well known in Europe and Asia, drew over 600 entries from all over the world. Thirty-eight finalists were invited to the ceremony in Stuttgart, Germany, where Modesto received the “Enhancement of the Landscape” award for its sustainable urban forest and enhancement of the quality of life.

The city also competed in a similar national program—America in Bloom. Judges came to Modesto, giving it the highest rating of any city in the contest. The city received a special commendation for “Forestry Practices.”

Community involvement has always been an integral part of Modesto’s tree program. In 1906 the Women’s Improvement Club formed to plant trees for Arbor Day. The Modesto Garden Club has a membership of over 750. Many volunteer organizations participate in tree planting projects.

In 2000, the city received several hundred native oak trees from the National Tree Trust to restore a section of parkland. The tree planting event was planned to honor all babies born in Modesto that year. Another special grove of oaks was planted in honor of those children who had passed away that year. Twelve volunteer groups representing 500 volunteers, as well as 1200 parents of babies born in 2000, participated in the festivities. The event was so successful that Trees for Tots II was held in 2001 and Trees for Tots III in 2002.

The Center’s research became critical when outside auditors began looking for programs to cut. The tree program was validated and shown to be cost effective.

—Peter Cowles

city, decided to consult with Dr. Greg McPherson, Director of the Center for Urban Forest Research.

Because the city maintained excellent records of its street trees, beyond a simple inventory, the job of extracting data from their records was greatly simplified. Their data base included species and date planted, plus management activities over time. This detailed account of management activities allowed our Center to construct a more thorough report of the value of the Modesto urban forest, than if we only had a simple inventory to work with.

Research Results

After considerable crunching of data, we produced a report that showed the benefits obtained from Modesto’s public trees exceeded management costs by nearly a factor of 2. In other words, while the city spent \$2.6 million per year on their urban forestry program, the total annual benefits to the community were \$4.8 million. This translated into a net annual benefit back to the city of \$2.2 million – a value the city manager couldn’t ignore.

Budget Cut Avoided

Peter Cowles used the findings to convince the city manager and other city policy makers to retain full funding for the tree program while funding for most other programs was cut. The budget crisis for the tree program was over. He also set out on a campaign to increase public awareness about the benefits of street and park trees. One utility company was so impressed that they contributed \$20,000 to establish the Modesto Tree Foundation.

Management Implications

While our Center’s benefit-cost analysis helped the tree division avoid a budget cut, the report is now used as an ongoing management tool. It continues to provide insights into the community forest and directs future planning efforts.

Besides the quantitative numbers, our report pointed out some management issues that could affect the future of Modesto’s community forest. Many of the largest, most beneficial trees were planted in the 1940s and will die within the next 10-20 years. That means that Modesto will lose a significant percentage of its canopy at about the same time, and net annual benefits will be reduced. In addition, older trees are more expensive to maintain and will require an increasingly larger share of the budget as these trees age.

The city has responded to this knowledge in a number of ways. New plantings are more diversified – various species are planted with differing longevity and growth rates so that they will mature at different

(continued on page 3)



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Station, USDA Forest Service. For more information, contact the Center at the Department of Environmental Horticulture, University of California, 1 Shields Ave, Suite 1103, Davis, CA 95616-8587. (530) 752-7636

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Fact Sheet #5: How to Prepare for a Budget Cut

Here are some things you can do if you find that budget cuts are imminent.

Conduct a Needs Analysis

Review your tree program goals to determine the level of service desired by citizens and city leadership. This is your baseline. Then:

- Identify the funds needed to provide that desired level of service.
- Document the level of service you currently provide with funds available.
- Determine the reduced level of service you would be providing with a smaller budget.

Project Future Consequences

Determine the consequences on the future of tree health, as well as management costs and benefits for different funding levels. The steps include:

- Identify the backlog of needs that will develop without funding to maintain the required level of service determined by your needs analysis.
- Determine what funds will need to be spent in the future on this backlog.
- Describe how the budget cut will impact the future condition of trees that will receive a lower level of service.
- Determine the increased cost of maintenance when the funds are restored, taking into account the additional time required to play catch-up.
- Estimate the amount of emergency funds that will be needed for costs of storm cleanup, increased hazards and risks, and other expenses that are expected to result from deferred maintenance.

Here are some things you need to do on an ongoing basis to be better prepared for future budget cuts.

Reduce Program Costs

Reduce up-front and establishment costs. Cost-effectiveness is influenced by program costs as well as benefits:

$$\text{Cost-effectiveness} = \text{Total Net Benefit} / \text{Total Program Cost}$$

Improve planting practices and young tree care. Cutting costs is another strategy to increase cost-effectiveness. A substantial percentage of total program costs occur in the first five years and are associated with tree planting (McPherson 1993). Some strategies to reduce these costs include:

- Plant bare root or smaller tree stock
- Use trained volunteers for planting and pruning of young trees
- Provide follow-up care to increase tree survival; reduce replacement costs
- Select and locate trees to avoid conflicts

Use less expensive stock where appropriate. Where growing conditions are favorable, it may be cost effective to use smaller, less expensive stock or bare root trees to reduce costs. However, in highly urbanized settings and sites subject to vandalism, large stock may survive the initial establishment period better than small stock.

Develop standards of “establishment success.” During the first five years,
(continued)

Some benefits of the urban forest

Research has shown that healthy city trees:

- Create cleaner, healthier and more breathable air.
- Cool parking lots and parked cars.
- Mitigate the impacts of urban heat islands.
- Shade homes and buildings making them cooler and more energy efficient.
- Block winter winds.
- Retain rain on their leaf and branch surfaces, lessening the impact of storm runoff.
- Increase real estate values.
- Provide neighborhoods with a sense of place.
- Attract more shoppers and more money to business districts.
- Attract new business, homeowners and tourism.
- Reduce domestic violence and crime.
- Improve children’s performance in school.
- Shorten hospital stays and reduce need for medication.
- Lessen exposure to damaging solar radiation.
- Provide restorative experiences that ease mental fatigue and stress.

Visit our website at <http://cufr.ucdavis.edu> or <http://www.treelink.org> for additional sources of information on benefits of urban forests.



Cont.: How to Prepare for a Budget Cut

Additional Information

Information on urban and community forestry program design and implementation can be obtained from:

An Introductory Guide to Community and Urban Forestry in Washington, Oregon, and California. World Forestry Center, Portland, OR. 1987.

A Technical Guide to Urban and Community Forestry in Washington, Oregon and California. World Forestry Center, Portland, OR. 1989.

Costello, L.R. 2000. *Training young trees for structure and form.* Videotape Number: V99-A. University of California, Agriculture and Natural Resources, Communication Services Cooperative Extension Service, Oakland, CA. Telephone: 800-994-8849.

Hildebrandt, E.W.; Kallett, R.; Sarkovich, M.; Sequest, R. 1996. *Maximizing the energy benefits of urban forestation.* In: Proceedings of the ACEEE 1996 summer study on energy efficiency in buildings, volume 9; Washington DC: American Council for an Energy Efficient Economy. 121-131.

McPherson, E.G. 1993. *Evaluating the cost effectiveness of shade trees for demand-side management.* The Electricity Journal. 6(9): 57-65.

McPherson, E.G.; Maco, S.E., Simpson, J.R.; Peper, P.J.; Xiao, Q., VanDeZanden, A.M., Bell, N. 2002. *Western Washington and Oregon Community Tree Guide: Benefits, Costs and Strategic Planting.* International Society of Arboriculture, Pacific Northwest Chapter: Silverton, OR. 76 p.

Miller, R.W. 1997. *Urban Forestry: Planning and Managing Urban Greenspaces.* 2nd Edition. Upper Saddle River: Prentice-Hall. 502 p.

Urban and Community Forestry: A Guide for the Interior Western United States. U.S. Forest Service, Intermountain Region, Ogden, UT. 1990.

investing in the resources needed to promote tree establishment will generally pay huge dividends later on. Develop standards of “establishment success” for different species. Perform periodic inspections. Replace dead trees as soon as possible, and identify ways to improve survivability.

Prune early. Pruning during the establishment period should result in safer trees that require less care in the long-term. Training young trees will provide a strong branching structure that requires less frequent thinning and shaping (Costello 2000). Ideally, young trees should be inspected and pruned every other year for the first five years after planting. As trees grow larger, pruning costs may increase on a per-tree basis. The frequency of pruning will influence these costs, since it takes longer to prune a tree that has not been pruned in 10 years than one that was pruned a few years ago. Although pruning varies by species and location, a return frequency of five to eight years is usually sufficient for older trees (Miller 1997).

Match tree to site. Carefully select and locate trees to avoid conflicts with overhead powerlines, sidewalks, and underground utilities. Time spent planning will result in long-term savings. Also consider soil type and irrigation, microclimate, and activities occurring around the tree that will influence its growth and management.

Add up all benefits. When evaluating the bottom line—whether trees pay—do not forget to consider benefits other than the stormwater runoff reductions, energy savings, atmospheric CO₂ reductions, and other tangible benefits. The magnitude of benefits related to employment opportunities, job training, community building, and enhanced human health and well-being can be substantial. Moreover, these benefits extend beyond the site where trees are planted, furthering collaborative efforts to build better communities.

Increase Benefits

Work to increase survival rates. Improved stewardship to increase the health and survival of recently planted trees is one strategy for increasing cost-effectiveness. Higher survival rates increase energy savings and reduce tree removal costs. Tree survival rates have a substantial impact on projected benefits (Hildebrandt et al. 1996).

Target tree plantings with highest pay back. For example, conifers and broadleaf evergreens intercept rainfall and particulates year-round. Also, they tend to have relatively more leaf surface area than similar sized deciduous trees. Locating these types of trees in yards, parks, school grounds, and other open space areas can increase benefits.

Customize planting locations. Further increase energy benefits by targeting more trees for locations that produce the greatest energy savings, such as opposite west-facing walls and close to buildings. By customizing tree locations to increase numbers in high-yield sites, energy savings can be boosted.

Find lots of information at our website <http://cufr.ucdavis.edu>

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(continued from page 2)

times. Neighborhoods with uniform older trees are given special attention to minimize the aesthetic impact of future tree loss.

Large vs Small

The city is trying to introduce more large trees into the community. According to Cowles, there was a trend for a while to plant smaller-stature trees like crape myrtle. Those trees don't have some of the problems of larger trees, but they don't provide the benefits of the large trees either. Because of the new awareness of the value of trees, the city has gone back to the 1940s way of thinking and is taking any opportunity to plant large trees.

Limitations

The approach that we took to place a value on the public trees in Modesto has some limitations. The value of benefits found in Modesto can not be directly transferred to municipal trees in other cities because of the differences in tree management practices, air pollution concentrations, air conditioning use, stormwater runoff control measures, and average residential sales prices. Moreover, it requires detailed information on trees, environment, and management costs. Many cities currently lack this information.

New Software Product

But stay tuned. A new software product that we will launch later this year will enable any community to conduct a street tree assessment. The results will help generate support to avoid a budget cut, secure future funding, and provide baseline data that can be used to improve management of the tree program. See the article on our STRATUM software on page 4.

—L.L.



Santa Monica reaps the benefits of its urban forest

Santa Monica is a small coastal city in the heart of the south bay of Southern California. The region is home to nine million people, one fourth of the state's population. Climate is highly influenced by proximity to the ocean.

When the Center for Urban Forest Research was looking for information for a study on coastal southern California communities, they went to Santa Monica because of its excellent planting records dating back to the 1940s. These records allowed Center researchers to date trees and identify age and leaf growth patterns.

The primary purpose of the Center's study was to find out if the total benefits from Santa Monica's urban forest justify their annual budget of over \$1.5 million. The results were positive. Residents of Santa Monica receive benefits from the urban forest that exceed management costs by nearly \$1 million. The millions of dollars invested in the community forest are coming back to residents in the form of increased property values, enhanced scenic beauty, air pollutant uptake, cooling and heating savings, lower summertime temperatures, and reduced stormwater retention.

How has the city used the report? According to Walter Warriner, Community Forester for Santa Monica, "the study takes away the subjectivity and adds a scientific basis to decisions." This helps in everything from tree species selection criteria to educating other city departments as to the

values of trees. It also helps defer homeowner complaints.

For example, the city has over 3000 ficus trees, "the tree that people love to hate," declares Warriner. These trees displace the hardscape, requiring sidewalk repairs every 3–4 years. They drop berries, attract birds, and need to be pruned every other year.

No one appreciated the environmental value of these trees until the Center's study identified it as the number two beneficial tree in the city. Says Warriner, "Now when people complain I quote from the study 'did you know these trees have all these benefits...?' They still hate them though."

The number one beneficial tree in Santa Monica is cedar. However, this tree species is in decline in the city. The new awareness provided by the report gives the city a way to explain the trees' value to developers and others.

The report also found that while the most common tree in the city is palm, that species comprises only 5% of the leaf surface and thus is less beneficial.

The benefit-cost report is a tool for working with developers, the city council, the public, and city departments that deal with sidewalk repair and utilities.

Warriner has now created a presentation that has been very useful in helping people understand the benefits of trees. "When the cold wind blows or the sun is baking, they can make connections with the urban forest. It has been an eye-opener for them."



New urban forest management software coming this year

The Center for Urban Forest Research is developing STRATUM (Street Tree Resource Analysis tool for Urban forest Managers), a software program that facilitates street tree assessment. It will be piloted in the summer of 2003.


STRATUM allows communities to evaluate the current benefits, costs, and management needs of their urban forest. The program will help answer the important question: Do the total benefits of street trees outweigh their management costs? In addition, it will help in management decisions to determine what kind of trees should be planted to maximize canopy cover and benefits important to the community.

The program is customized for the eight climate regions of the western states with regional climate data, building construction and energy use patterns, fuel mix for energy production, and air pollutant concentrations. This information is used to model the environmental benefits and costs—as well as effects on property value.

STRATUM was designed to either

incorporate an existing street tree database or, for communities without an inventory, there are directions for performing a rapid sample inventory. Other community-specific information such as program management costs, city population, and price of residential electricity are input by the user.

After data is input, STRATUM calculates the structure of the resource, net annual benefits and costs, and indicators of management sustainability. Reports compare canopy cover for different neighborhoods, species diversity, conflicts with powerlines and sidewalks, and species performance. These data can be displayed using tables, charts, and histograms at the city or neighborhood level, by general tree type or species.

STRATUM will be available for Windows-compatible systems with Access and Excel software. The Center for Urban Forest Research will conduct a two-day training seminar on the program; dates and locations will be announced in future newsletters and on the website. 

Staff changes

Dr. Lisa deJong, fire scientist, and Sabrina Mathis, ecologist, have recently left our Center. Both will be greatly missed. We are in the process of seeking replacements.

Our Center's 10th anniversary is coming

April 2003 marks our 10th anniversary. The opening of the Center in April of 1993 was inspired by Dr. Rowan Rowntree, USDA Forest Service Research, retired, who had the vision of a research center in the west. It was his vision and the support of Ray Tretheway, Sacramento Tree Foundation; Dr. Jim Harding, UC Davis Department of Environmental Horticulture; Dr. Enoch Bell, USDA Forest Service, Pacific Southwest Research Station; and former Congressman Vic Fazio that made it all happen.

On Monday, April 7, 2003, we will hold an open house from noon to 2 p.m. to celebrate this very special milestone. A short ceremony will recognize the vision and inspiration of those who made our success possible. Culminating our celebration will be a presentation by Dr. Greg McPherson, Center Director, who will reveal our Center's "vision" for the next 10 years.

Upcoming presentations

April 24, 2003

Urban forest research and quality of life in communities, Jim Geiger, Placer County Planning Commission, Auburn, CA.

May 6, 2003

Highlights of street tree management research, by Greg McPherson, Western Chapter ISA Annual Conference, Las Vegas, Nevada.

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