
Review of Forest Service Technology Transfer in Urban and Community Forestry

A comprehensive examination of the research and technology transfer process, the Technology Transfer Team, and other partners, and a recommendation for improving delivery.

December 2007

Our knowledge of urban and community forestry is expanding daily as research increases our knowledge base and demonstrates the important role that urban forests play in improving our quality of life and the environment in urban areas. This document defines the current state of urban and community forestry technology transfer in the Forest Service, U.S. Department of Agriculture (USDA), by describing the research and transfer/delivery process, listing key products, identifying gaps in product development and delivery, and presenting strategies for improvement.

What Is U&CF Technology Transfer?

Urban and Community Forestry (U&CF) Technology Transfer is the development and dissemination of products and technical information that interpret relevant research for States, communities, practitioners, and other users (customers). Technology transfer's role is to effectively share new science-based knowledge and new technologies to facilitate improved management and long-term sustainability of our urban ecosystems.

U&CF's Technology Transfer's objective is to accomplish the following:

Encourage the wise use of innovative, cutting-edge technology and science-based resources that results in improved management and sustainability of urban ecosystems.

The U&CF Technology Transfer strategy is to improve access to research findings and overall service to forestry professionals, practitioners, end users, and the public and to ensure

the stewardship of natural resources where people live, work, learn, and play. This strategy includes special emphasis on increasing State and municipal program capacity, quantifying forest functions and benefits, expanding partnerships, managing impacts of urban sprawl, and strengthening applied research and technology transfer beyond the current level.

Role of the National Technology Transfer Team

The National Technology Transfer Team was established to strategically integrate research and technology transfer activities that address regional U&CF issues and provide practical results at the local level. The team provides a shared vision, focuses resources across regions, and identifies needs and key opportunities. The key technology transfer issues that were identified as part of their recent 5-Year Plan are as follows:

- **Increase our partnerships beyond the U&CF community. (Customers)** Collaboratively use U&CF technology to include green infrastructure in sustainable community planning.
- **Improve delivery of U&CF products and information. (Delivery)** Use market research to develop and disseminate user-friendly U&CF material.
- **Implement feedback process to determine success of technology transfer. (Feedback)** Ensure that the right messages and products reach intended audiences.
- **Introduce marketing to the U&CF community. (Marketing)** Promote the use of market research and marketing strategies to improve delivery of U&CF products and knowledge for targeted audiences.

Why Is U&CF Technology Transfer Important?

Technology transfer ensures that urban and community forests are better understood and that important principles are shared with and used by practitioners, community leaders, local residents, and others. Technology transfer provides a mechanism to further enhance the viability and sustainability of our urban ecosystems through more effective delivery of science-based knowledge and state-of-the-art technologies.

Of no lesser importance is the impact U&CF Technology Transfer can have on creating healthier forests. With increasing population growth and urbanization, U&CF programs are now more mission critical than ever and well positioned to not only help mitigate natural resource issues within urban and suburban areas but also influence attitudes about all forestry practices. A healthy and sustainable urban forest is a frontline solution to helping manage other natural resource problems. Through greater awareness and understanding, fostered by U&CF Technology Transfer, a broader base of support will result in more sustainable ecosystems, whether rural or urban.

Forests can no longer be treated as discrete parcels that are independently managed, given rampant landscape change and urbanization. Forests are now a continuum of variable types and health in many U.S. regions, distributed from the urban core to suburbs, rural areas, and wildlands. All forested landscapes are linked by both ecological and social dynamics. For instance, invasive species may enter a region via urban trade destinations such as ports. Rapid detection and eradication is needed to prevent invasive species movement into wildland areas.

Current U&CF Research

As Jim Clark concluded in 1997 in his paper on *A Model of Urban Forest Sustainability*, urban trees and forests are consid-

ered integral to the sustainability of cities. Sustainable urban forests do not arise at random, however, but result from a communitywide commitment to their creation and management. This success may represent our most significant challenge: to provide science-based knowledge that creates commitment and guides action. See the entire article at <http://www.cfr.washington.edu/research.envmind/Policy/ClarkSstnabtyModel.pdf>.

Urban forest sustainability has been an intense focus of research since 1997, as evidenced by the primary areas of research at the various Forest Service research stations across the country. See **Appendix A** for detailed information on research station staff, primary areas of research and current research emphasis.

Pacific Southwest Research Station, Center for Urban Forest Research, Davis, CA

Dr. Greg McPherson, Lead Scientist

The primary areas of research include quantifying the ecosystem services that urban trees and forests provide including benefits and costs, energy conservation, air quality, and water quality and quantity. In some pioneering research, the center is examining the vegetation component in the wildland-urban interface to determine what landscaping choices will make communities more firesafe while still retaining benefits like beauty, shade, privacy, and wildlife habitat.

The center's current research emphasis is being placed on the Sacramento Urban Forest for Clean Air Project, Oakland Watershed Restoration and Protection, Green Streets—Stormwater Management for Paved Areas, and the San Francisco Bay Canopy Cover Project. Center models being developed are Street Tree Resource management and Analysis Tool for Urban forest Managers (STRATUM), included in the i-Tree suite of tools; ecoSmart Design Software; and Tree Growth Visualization.

“Ways must be found to successfully transfer research knowledge to field applications where they can have a real and measurable effect.”*

*National Urban and Community Forestry Advisory Council's Ten-Year Action Plan for 2006–2016

Northern Research Station, Syracuse, NY**Dr. Dave Nowak, Lead Scientist**

The primary areas of research in Syracuse include quantifying urban forest structure and change; quantifying changes in basic ecological functions due to urbanization; and quantifying urban forest functions, benefits, and values. The station is also conducting research on urban forest health monitoring, effects of urban development on soil formation, effects of urban forest on air pollution and their role in State Implementation Plans, and urban forests' effects on reducing greenhouse gases. Recently developed products include the Urban Forest Effects (UFORE) model, included in i-Tree, and OUTCOMES (OUTdoors COMfort Expert System) for urban forest effects on outdoor human comfort.

Northern Research Station, Burlington, VT**Dr. Mark Twery, Lead Scientist**

The primary areas of research include Urban Tree Canopy (UTC) Analysis, Forest Opportunity Spectrum (FOS), environmental justice, ecosystem services, and stewardship. The research involves social structures and processes that will help improve the understanding of relationships among social institutions and organizations, forest management, and forest ecosystem processes to achieve their policy and management goals.

Their current research emphasis is in two areas. The first is the Baltimore Ecosystem Study, which is part of the [National Science Foundation's Long-Term Ecological Research Program](#) focusing on watershed management issues in an established urban area. The unit's focus is on human ecosystem and landscape studies, particularly the Forest Opportunity Spectrum (FOS) for urban and community forestry. Their second research emphasis is the New York City Urban Field Station project, which focuses on New York's urban tree canopy, ecosystem services and social impacts, ecosystem disturbance, public health and well-being, urban livability, ecological literacy, and stewardship.

Note: The Baltimore Ecosystem Study is under the general supervision of the [Institute of Ecosystem Studies](#), Millbrook, NY. The Forest Service is involved as site manager and supplies several permanent and temporary staff from both the Burlington, VT, and Syracuse, NY, units. Also visit the Long-Term Ecological Research Web site at <http://www.lternet.edu/>.

Northern Research Station, Evanston, IL**Dr. Lynne Westphal, Lead Scientist**

The primary area of research is on natural environments for urban populations that will help improve the understanding of how natural resources affect quality of life in urban and urbanizing areas.

Current emphasis is being placed on landscape and demographic change, management and restoration of natural landscapes, environmental perception and values, rustbelt landscape of the Calumet region, and fire management.

Southern Research Station, Gainesville, FL**Dr. Cassandra Johnson, Acting Lead Scientist for both Centers*****Southern Center for Urban Forestry Research and Information, Athens, GA***

This unit's research focus is on understanding the biophysical relations and human dimensions of urban forests. Their primary areas of research are an assessment of the potential for urban carbon markets, assessment of the economic value of conservation subdivisions in urban and suburban areas, examination of the interactive effects of turf and tree cover on suburban property values, forecasting future recreational use on urban proximal national forests, and examining spatial modeling of economic values associated with urban amenities.

They are also examining/comparing Hispanic with non-Hispanic attitudes/knowledge/meaning of the urban forest in Gainesville, FL, and conducting a study of the rural/urban interface in South Carolina.

Southern Center for WUI Research and Information, Gainesville, FL

This unit's research focus is on understanding changing social and natural systems. Their primary areas of research are an analysis of urbanization effects on forest vegetation along with a study of the cultural dimensions of landscape change in the Florida Panhandle and one that monitors how the urban forest changes over time in Gainesville, FL.

They are also studying the flammability of natural vegetation and home landscapes, fuel reduction options for landowners, and postfire assessment of interface landscapes.

**Southern Research Station, *National Agroforestry Center*,
Lincoln, NE**

Dr. Michele Schoeneberger, Lead Scientist

The center's primary areas of research focus on ecological functions of buffers to understand how riparian and upland tree buffers protect water quality, enhance aquatic and terrestrial environments, and sequester carbon; site design and management to determine how to design and manage individual buffers to attain desired production and conservation benefits; and landscape integration to develop an improved basis for decisionmaking relative to design criteria and expected water quality benefits, along with other resource considerations, from tree-based buffer systems.

Current emphasis is being placed on the need for "green infrastructure." Communities see that trees can be put to work to meet their environmental, social, and economic goals. Agroforestry helps connect the urban community to the surrounding rural landscape. This connectivity helps filter stormwater runoff, provides travel corridors for wildlife, creates recreational space, and improves air and water quality for the whole watershed. Cumulatively, these functions contribute to the overall health and sustainability of a community and its neighbors.

Important Non-Forest Service Research Centers

It is important to mention two research centers that are not Forest Service organizations but have had a significant impact on U&CF research in recent years and, in fact, many of their results are used in Forest Service technology transfer products. See **Appendix A** for a detailed listing of their research and technology transfer products.

**Human Dimensions of Urban Forestry and Urban Greening,
College of Forest Resources, University of Washington,
Seattle, WA**

Dr. Kathleen L. Wolf, Lead Scientist

Dr. Wolf's primary areas of research are urban forestry and human services benefits, trees and transportation, nature and consumer environments, policy and planning, and civic ecology.

**Landscape and Human Health Laboratory, University of
Illinois at Urbana-Champaign, Urbana, IL**

Dr. Frances E. Kuo, Lead Scientist

Dr Kuo's primary areas of research are on impacts of the urban forest on individual health and healthy functioning and impacts of the urban forest on neighborhood health and functioning.

U&CF Technology Transfer Centers

U&CF Technology Transfer is being conducted by all U&CF staff, and through specialists in seven centers located across the country. See **Appendix B** for information on what each center does along with a complete listing of their most recent and successful products. **Appendix C** has a detailed description of each Key National Product produced by the centers. **Appendix D** has a detailed description of Key Regional Products produced by the centers.

Pacific Southwest Research Station

Center for Urban Forest Research, Position Vacant, Davis, CA
<http://www.fs.fed.us/psw/programs/cufr/>

Northeastern Area (State & Private Forestry)

Midwest Center for Urban and Community Forestry, Jill Johnson, St. Paul, MN
<http://www.na.fs.fed.us/urban>

Mid-Atlantic Center for Urban and Community Forestry,
Donna Murphy, La Plume, PA
<http://www.na.fs.fed.us/urban>

Northern Research Station

Urban Natural Resources Institute, Dave Bloniarz, Amherst, MA
<http://www.unri.org/>

Southern Research Station

Centers for Urban and Interface Forestry

- Urban Forestry South, Dudley Hartel, Athens, GA
<http://www.urbanforestrysouth.org/>
- InterfaceSouth, Annie Hermansen-Baez, Gainesville, FL
<http://www.interfacesouth.org/>

USDA National Agroforestry Center, Richard Straight,
Lincoln, NE

<http://www.unl.edu/nac/>

How Is New Technology/Knowledge Being Transferred?

Many different methods are currently being employed by technology transfer staff, including Web sites, newsletters, fact sheets, press releases, and displays. And rightly so, because psychological research has shown that the more different ways people get a message, the more likely it is to stick with them; in addition, the more times they receive the same message, the better.

With the advent of new computer technologies, the opportunities for technology transfer have been greatly expanded. Even though staff has a more challenging and complicated role in this expanded technological environment, it provides the opportunity to get our messages to more people with less effort and money. The biggest challenge seems to be in keeping up with, and affording, all the new advances that are constantly becoming available.

Over the last several years we have seen blogs, Webcasts, LISTSERVs, and online forums appear for the first time. Some of the technology transfer staff have embraced these technologies while others have held to the tried-and-true methods or are working to incorporate them into their communications arsenal.

What is important to note is that the word is getting out. The Internet and computers are giving many more customers access to Forest Service research and technology transfer. A great number and variety of products have been produced, but that does not necessarily spell success. What we also know is that there is no one right way. Nor do all methods lead to success. One of the keys is finding the right combination of methods and strategies that make the biggest impact on our customers and result in the biggest positive changes to our urban forests. Another key is to identify the target audience and develop key messages that compel the audience to want to use the technology, even if it costs them money to implement. We cannot pay them to use it, however, with decreasing budgets we need to

spend money and time wisely targeting those who will use it or influence others to use it.

A goal of the Technology Transfer Team for 2007 is to implement a feedback process to determine success of technology transfer. Coupled with a new National Urban and Community Forestry Advisory Council (NUCFAC) recommended U&CF challenge cost-share project to evaluate the effectiveness of U&CF Technology Transfer, this effort by the team should enable them to effectively establish benchmarks for production and distribution of future technology transfer products and methods.

Currently, the methods described below are the ones being used to transfer U&CF research technology. A listing of the most recent and successful products for each technology transfer center can be found in **Appendix B** along with a description of their key national (**Appendix C**) and key regional products (**Appendix D**).

- **Assessment Summaries**

- **Municipal Forest Resources Analyses**

These reports provide detailed information on a particular city's tree resource. They include urban forest structure, function, and value along with resource management needs. A summary of annual benefits is provided that includes energy conservation, air quality, stormwater runoff control, and property value increase.

- **Urban Tree and Forest Risk Assessments**

Risk assessments can be used after a particular storm event to assess tree damage and report back to the community. During the assessment, trees on both public and private property are evaluated that represent a risk. The outcome is often a report of recommendations designed to help communities reduce or eliminate tree risk.

- **Blogs**

A blog is a Web site in which entries are made in journal style and displayed in a reverse chronological order. Blogs provide customers with a commentary or news on a particular research project or related subjects and they are something that they can visit at any time. A typical blog combines text, images, and links to other blogs, Web pages, and other media related to its topic. The term "blog"

is a contraction of “Web log.” Use in the Forest Service might be considered a type of e-journal.

- **Books**

Often a research finding or a new U&CF technique is best distributed as a book that can be periodically referenced. The importance of the credible reference in the literature justifies the extra expense.

- **Brochures/ Booklets**

Brochures/booklet most often provide a general overview of a unit, research project, or technology transfer activity. They are generally short, inexpensive items printed in large quantities for a wide distribution. A specific booklet is—

- **Tree Guides**

Tree Guides identify and describe the benefits and costs of planting trees in a specific climate region to assist community officials and tree managers increase public awareness and support for tree programs.

- **Case Studies**

A case study examines or tests a limited number of variables and involves an indepth examination of a single instance or event: a case. They provide a systematic way of looking at events, collecting data, and analyzing information. As a result, the researcher may gain a sharpened understanding of why the instance happened as it did and what might become important to examine more extensively in the future or refine a particular product.

- **Customer Service**

Research and technology transfer staff respond to individual requests from homeowners, reporters, urban forestry professionals, etc., by providing verbal or written answers to questions and often send other information products that help them to do a better job or extend research and technology transfer knowledge to their customers. Such client-specific knowledge transfer can place key information where and when it is needed most.

- **Decision Support Systems**

Decision support systems are computerized systems for helping make decisions. They are user-driven tools that take local input to generate a series of choices. A decision is a choice between alternatives based on estimates of the values of those alternatives. Supporting a decision means helping people working alone or in a group gather intelligence, generate alternatives, and make choices.

- **Displays**

Displays are designed to get the attention of customers and encourage them to pick up literature and/or talk to the presenter for more indepth information. Eye-catching visuals in the display are key to drawing in customers. In today’s competitive conference environment, a polished, professional display that is easily portable is an important technology transfer tool.

- **DVDs/CDs**

These products offer the ability to use new information in a real setting. The customer can see and/or hear the instruction on their own terms on either a DVD or CD that describes a process or technique in detail. Their application or use of the principles in the DVD/CD becomes a positive transference or learning experience.

- **e-Learning Webcasts**

Webcasts are periodic, online educational presentations on timely topics and current research and development initiatives. Any number of national or global customers can join in.

- **Fact Sheets/Leaflets**

One- or two-page fact sheets provide a quick reference to urban forestry research facts. They are designed to be easily photocopied and distributed.

- **LISTSERV e-mailing**

Subscription to these electronic mailing lists provides customers with periodic contact from the research or technology transfer unit regarding new products such as publications, electronic newsletters, periodic news briefs, presentations, and press releases.

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- **Management Tools**

These tools are developed and packaged to address a specific issue or problem, or provide individualized education. These tools are often adapted from science to be applicable to field situations.
 - **Manuals**

Manuals are a compilation of the best, most up-to-date information and are generally designed as a hands-on tool for resource professionals and those who work with communities on urban forestry issues. They are often used for self-guided learning, provide specific information on a topic, or are used to develop workshops and presentations.
 - **Models/Software**

These are computer models/software that can be used by communities, individuals and private consultants to make informed decisions regarding urban forest management. They often require input of data about local conditions to provide summaries of current conditions of a resource, or provide projections of future conditions.
 - **News Briefs/Bulletins/Notes**

News briefs, bulletins or notes are sent electronically to customers when things occur that are newsworthy but not lengthy enough to justify creating a newsletter.
 - **Newsletters/Updates/e-News**

Periodic newsletters, updates and e-news are produced that discuss current research findings, regional activities, and other timely products or events. Some are printed but most are now distributed electronically to save the costs of printing and mailing.
 - **Photo Galleries**

Photo galleries contain pictures that depict a variety of U&CF activities that can be browsed and downloaded, including tree planting, tree care, and volunteers. Images are effectively used to portray desired practices as well as the negative consequences of poor practices.
 - **Posters**

Technology transfer staff sometimes use posters to display a particular research topic or new technology at a large event or conference. The posters generally express points in graphical terms with main headings stating the message and the theme supported by “visual grammar.”
 - **Presentations**

Presentations are generally PowerPoint talks that researchers and staff give at various conferences, workshops, etc. They provide either technical knowledge or promote technology transfer resources that are available to the audience.
 - **Press Releases**

Press releases are designed for the press corps to alert them of new research or technology. They are also given to customers to use with their local media when research is conducted in their city.
 - **Promotional Items**

Researchers and technology transfer staff take advantage of opportunities to get the word out when approached by reporters, national newsletters, NPR, etc. Promotional items can be used with displays at national conferences with a take away message the customers can use in their daily life.
 - **Scientific Reports**

Research findings are published in journals, conference proceedings, and periodicals as well as General Technical Reports and dissertations. These reports describe the research methodology, present the findings, and discuss the value of the results to urban forestry and can be referenced in the literature.
 - **Repackaged Information**

The number one job of some of the technology transfer centers is repackaging of scientific findings in a form or format that is appealing, accessible and useful to their target audience. Repackaged products also present facts within a local or specific context and can include tool boxes and handbooks.

- **Research Summaries**
Research summaries are one- to four-page documents that provide a quick look at a research project, and its findings, in an easy-to-read comprehensible format.
- **Trade Publication Articles**
Researchers or technology transfer staff publish articles in journals and magazines targeted at practicing professionals. Scientific findings and facts are translated into ideas and practices that are practical for everyday needs and can be applied in resource planning and management.
- **Training/Workshops/Conferences**
Hands-on training on new technology or applications is provided so that customers can obtain a better understanding of how to apply the research or technology transfer knowledge and/or product to their unique situation in their community or consulting practice.
- **Web-Based Exchange Forums**
These Web-based bulletins and discussion boards promote the timely exchange of information related to U&CF. Participation in the Exchange Forum provides the opportunity to share interests, questions, research, and thoughts with other urban natural resource practitioners and interested partners.
- **Web Sites**
Online information is the global standard for technology transfer, allowing immediate news and knowledge to be transferred and updated.

What Is Working?

From this investigation, it is quite clear that Forest Service U&CF Technology Transfer is very active and successful. Over the last decade in particular, customers have benefited from an increased number of quality products, as well as an increase in the diversity of transfer methods. This increase in products has led to a vastly improved understanding of the benefits of trees and urban forests nationwide throughout the urban forest community, especially local elected officials. It is safe to say that without the presence of U&CF Technology Transfer and

the role it has played in the advancement of the benefits of urban forests and the connection they have to our quality of life, U&CF awareness would not be what it is today.

Technology transfer programs have operated with limited staff and budgets, and yet they have been extremely productive. This success is due largely to the staff's ability to innovate, adjust quickly to changing customer needs, and work extremely well with partners. Together, the various staffs and their partners produce hundreds of new products that benefit millions of people every year. Especially encouraging are new initiatives to bring together Forest Service Research and Development, State and Private Forestry, and for-profit and not-for-profit organizations to combine talents and resources to improve delivery and support of Forest Service Research tools in the community.

This report accounts for more than 30 different technology transfer methods being used by Forest Service staff to get U&CF research and informational products into the hands of customers. The following four methods, however, stand out over the rest for a number of reasons:

- **Center Web Sites**
Web sites are essentially warehouses or clearinghouses of all the products and information that have either been produced by a center or have significant value as a resource to those serviced by a center. Each site is available to any customer at any time and requires only minimal staff time for input and maintenance.
- **e-Mail/LISTSERVs**
The use of e-mail lists has greatly expanded the ability of staff to reach a large number of customers instantly with new products or important information. Referrals and hyperlinks to the center Web site, which are important steps in this process, help keep customers accustomed to using the Web site for new items.
- **Speeches/Presentations**
Nothing is more efficient than the transfer of technology in person and to many people at one time. Technology transfer staff members have taken advantage of every opportunity to speak to audiences, regarding this method of delivery a high priority.

- **e-Learning Webcasts**

The Webcasts being delivered through the Urban Natural Resources Institute (UNRI) are well attended and effective. UNRI could provide this service for the national team.

Where Could Changes Be Made?

As listed above, many great products and delivery mechanisms have been developed by the U&CF Technology Transfer staff. In addition, U&CF customers have benefited tremendously from this service. What has become apparent while inventorying the various research and technology transfer units for this report, however, is that technology is rapidly changing and some specific areas in our delivery process are outdated. We need to stop doing some things, adopt new methods, and refocus to reach our full potential or we will become irrelevant. The future of U&CF depends on making these changes. The Internet and Google have opened up a new world of instant access, but people have become more impatient and expect to have links and information at their fingertips.

Because of these extremely rapid changes in technology and the way people want or get information, U&CF Technology Transfer must continually adapt its approach to transferring research technology or risk weakening its ability to influence positive changes to urban forests.

The specific areas in which gaps exist and improvements could be made include the following:

- **National Technology Transfer Team Leadership**

The team needs to be specifically chartered, have quarterly meetings to review and catalog new products, and assure the best use of available funds nationally to coordinate and enhance ongoing work internally and in partnership with universities. The team also needs to coordinate their efforts with NUCFAC to ensure that more of the right research is being conducted and that technology transfer is brought more to the forefront.

- **Performance and Feedback Measures**

U&CF should take the lead in establishing methods that measure success and help track progress and improve products and technology transfer methods over time. These should be based on outcomes (changed behavior) over time (months or years). Partner organizations should be encouraged to submit progress reports to U&CF/NUCFAC on an annual basis. We also need a standing, online survey to facilitate feedback on all products developed for specific target audiences and purposes.

- **Reaching All the Right People**

We are creating terrific technology transfer products, but, because of limited e-mail contact lists, inadequate downline sharing, and missing links in some networks, many good products are not reaching some of the intended audiences. Contact lists need to be shared, downline contacts encouraged to forward on material, and missing links established, particularly with partner organizations. In addition, TechNet (discussed below) needs to be created.

- **Cobranded Products**

U&CF needs to begin cobranding all of products developed with industry to ensure the products are peer reviewed and supported by professional groups who will ultimately pay for reprints and sell successful products to sustain and update them over time.

- **TechNet**

Right now, all the technology transfer specialists keep their own mailing lists and, as technology transfer products are distributed, many customers get multiple copies or none at all if products are not forwarded on. It is a haphazard approach to distribution. The creation of TechNet will rectify this situation by establishing a Web-based mechanism that will allow access to all Forest Service U&CF mailing lists and with the push, of “one button,” distribute products to all customers while eliminating duplicates. It will also have a customizing feature that will enable senders to choose specific lists for targeted audiences.

- **Application Programming Interface (API) Update Tool**

Two kinds of updates are needed. First: every week new technology transfer products are developed, added to Web sites, and distributed. This new update tool will ensure that new products are added to the UFind catalog, TreeLink, and any other selected site. The process will be Web-based and act in conjunction with the product developer's Web site uploading mechanism—an API process that automatically “pulls” new products from the developer's site to the destination site. Second: every day staffing changes, etc., occur in partner organizations (State coordinators, State foresters, extension, nonprofit) that appear on their Web site but are not transmitted to Forest Service sites (e.g., regional Forest Service, TreeLink). An API system is needed that connects/links computers together so that simultaneous updates occur to all Web sites.

- **UFind**

UFind is an electronic catalog, a central repository, of all U&CF science-based knowledge and education material. It needs to be marketed to gain exposure. It is a great resource and will need ongoing support to keep it current and maintained. One feature that is critical to keeping the Web site catalog current is an automated update process. See API Update Tool.

- **Treesearch**

Treesearch is a database of Research and Development Publications authored by Forest Service personnel. Research publications by Forest Service urban scientists do not seem to be well represented. Scientific products recommended by NUCFAC should also be included.

- **TreeLink Web Site**

TreeLink should remain the predominant Web site for U&CF customers, but it needs to be upgraded with new features, special areas for State U&CF coordinators and State foresters, “hot topics” corner, “Google-like” search, the latest links, direct links to Forest Service U&CF pages, etc. In addition, a search mechanism, using RSS (Really Simple Syndication) feeds, needs to be added that will search for new items of interest in a particular topic/

category (e.g., tree benefits, water quality, urban climate) that is, selected by the user/customer—a by-permission-only agreement. TreeLink will then send them the links of new items as they become available. These items could be newsletters, research documents, research summaries, etc.

- **NUCFAC and the U&CF Challenge Cost-Share Projects**

Currently, none of the U&CF challenge cost-share completed projects are electronically available on TreeLink or UFind. A camera-ready copy needs to be obtained from the project administrator and loaded on both sites. Duplication of projects funded over the past 10 years also exists. NUCFAC and the research community should be required to coordinate types of projects funded and methods for transferring the technology.

- **LISTSERVs**

LISTSERVs like URBNRNET are already providing a real service to U&CF customers, but the audience is limited. The concept is good, but it needs to morph into specialized LISTSERVs like arboriculture, urban forest management, and nonprofits, as well as State-specific LISTSERVs. They could all be hosted by TreeLink. In addition, an archive of the LISTSERV discussions, by topic, needs to be created.

- **U&CF Web Site Inconsistencies**

An inconsistency in the way technology transfer material is presented on the various U&CF Web sites could possibly lead to confusion and frustration when customers are searching for items on different sites.

- **Marketing**

Marketing goes hand in hand with the feedback process. It is a continuous loop process that first finds out what our customers need (market research), filling that need while letting them know they “can't live without it” (marketing), and then following up to find out how effective it was (feedback). And then doing it all over again. Dr. Kathy Wolf recently received a U&CF challenge cost-share grant that will enable her to conduct new market research. The results should be available next year, providing critical

knowledge in the quest to persuade local elected officials to invest in urban forests. Dr. Wolf's work will go hand in hand with the Technology Transfer Team's fourth objective of promoting the use of market research and marketing strategies to improve the delivery of U&CF products and science-based knowledge for targeted audiences.

- **U&CF Partnerships**

Forest Service U&CF needs to be more aggressive in its efforts to collaborate with States that have community development programs by providing resources to State coordinators and/or extension, etc. that will assist them in including green infrastructure in their sustainable community planning processes.

- **Webcasts**

The generally accepted use of the term Webcast is the "transmission of linear audio or video content over the Internet." The Northern Research Station currently uses this technique, which enables the staff to reach a large audience without all the associated time and travel costs that come with traditional in-person conferences and workshops. The technology provides an unlimited customer base with a valuable, real-time experience with a presenter at no cost. Some Webcasts can be made available in real time via live streams with question and answer sessions; they can then move to OnDemand. Others can be made available for post-event viewing via OnDemand.

- **Podcasts**

A podcast is a media file that is distributed by subscription over the Internet using syndication feeds for playback on mobile devices and personal computers. The publish/subscribe model of podcasting is a version of push technology, in that the information provider chooses which files to offer in a feed and the subscriber chooses from among available feed channels. Although the user is not "pulling" individual files from the Web, a strong "pull" aspect is suggested because the receiver is free to subscribe to (or unsubscribe from) a vast array of channels. None are currently distributed.

- **Environmental News Services**

Environmental news services are daily international wire services on the environment. They exist to present late-breaking environmental news in a fair and balanced manner. The audience is far reaching and includes most environmental news reporters. Forest Service research technology should use these news services to get the word out. Examples include the following:

- Environmental News Service.
<http://www.ens-newswire.com>
- Environmental Media Services.
<http://www.ems.org/>
- Earth Vision.
<http://www.earthvision.net/>
- Greenwire.
<http://www.eenews.net/gw/>

- **Webinars**—Webinar is short for **Web**-based seminar, a presentation, lecture, workshop or seminar that is transmitted over the Web. A key feature of a Webinar is its interactive elements—the ability to give, receive, and discuss information. Contrast this feature with the format of a Webcast, in which the data transmission is one way and does not allow interaction between the presenter and the audience. None are currently being conducted.

- **Teleconferences**—A teleconference is a "virtual meeting" via television. A teleconference can be received simultaneously by people, especially small groups, in various sites around the country, or even the world. A teleconference is also live and interactive; the audience can communicate with the presenters, via phone, fax, or e-mail, while the teleconference is being broadcast. Teleconferences can also be taped for viewing later. This technique is underused.

- **Blogs**—A blog is another name for a Web log, which is really a simple Web site in which items are posted on an ongoing basis. New items show up at the top so visitors can read what's new, comment on it, or link to it. Only one blog has been developed so far. It was developed by the National Agroforestry Center. Blogs could provide

U&CF customers, especially the younger ones, a much more personalized look at the research process as well as findings. It is important to consider this media, because younger users are accustomed to communicating in it. In addition, blogs increase search engine popularity and attract new customers.

- **Privatization of Software**—U&CF research and technology transfer staff are good at fundamental research and transferring the technology but lack the expertise to develop software products. This specialty is best left to software development companies. Too much time and money have been spent attempting to perfect software products internally.

Recommendation for Improvement

The following recommendation is offered as the next step to ensure that the right combination of strategies is implemented. Given the ever growing complexity of communication technology, it is increasingly more important to partner with communications and technology experts when assessing various alternatives. The right combination of strategies will meet future needs, make more efficient use of resources and partnerships, capitalize on new technologies and opportunities, avoid duplication, and streamline the way the Forest Service does business. These solutions will significantly improve the ability of technology transfer specialists to deliver technology to all U&CF customers.

Recommendation: Convene a Technology Transfer Summit

Convene a Technology Transfer Summit that invites key Forest Service U&CF staff, Sustainable Urban Forest Coalition members, U&CF partners, and technology and communications experts from the high-tech industry to strategize the best approach to bringing better efficiency and effectiveness to Forest Service U&CF Technology Transfer. This summit could potentially become a biennial event that is structured to maintain the quality and integration of new material.

The Summit's deliberations should be guided by the following questions:

- Has the U&CF audience changed and, if so, who is the intended audience of Forest Service U&CF Technology Transfer?
- What combination of new strategies will improve technology transfer?
- Should a procedure be implemented to review proposed technology transfer products before they are developed?
- Are the National Technology Transfer Team Goals still relevant?
- What should be the role of NUCFAC, TreeLink, UFind, and Treesearch?
- Where should technology transfer plug in (timing) for products that are in the Research and Development pipeline?
- How can duplication in research and technology transfer be avoided?

The following possible strategies for improvement should be considered during deliberations:

Highest Priority

- Provide leadership through the National Technology Transfer Team.
- Establish performance and feedback measures.
- Reach more of the right people.
- Cobrand products/develop product format templates.
- Create TechNet.
- Create Application Programming Interface (API) update tool.
- Manage UFind.
- Upload all urban forestry scientific publications on Treesearch.
- Upgrade TreeLink Web site.
- Upload completed U&CF challenge cost-share projects on UFind and TreeLink and coordinate new project funding with the research community.

High Priority

- Morph existing LISTSERVs.
- Create consistency among U&CF Web sites.
- Introduce marketing to the technology transfer process.
- Increase U&CF partnerships beyond the U&CF community.
- Centralize and continue Webcasts.
- Create podcasts.
- Implement the use of Environmental News Services.

Priority

- Conduct Webinars.
- Conduct teleconferences.
- Add blogs to the repertoire.
- Privatize development of all software.

Important Partners

It is important to note that many key entities and organizations assist in delivering technology transfer products and information. Some, as with the National Technology Transfer Team, assist in setting the direction for the entire U&CF Technology Transfer program.

National Technology Transfer Team (Appendix E)

The National Technology Transfer Team of 23 members is composed of urban forestry professionals, technology transfer specialists, research scientists, university professionals, not-for-profit organizations, and other external partners. The team's ongoing role is to periodically review the technology transfer activities of the Forest Service U&CF Program, establish new directions and goals as needed, and provide project leadership in accomplishing the team's various objectives.

The team currently serves at the pleasure of the director of U&CF and is administered by the National Technology Transfer Team Leader (Jim Geiger, Acting). An annual face-to-face meeting is held in conjunction with periodic conference calls and special subgroup meetings as needed.

National Urban and Community Forestry Advisory Council (Appendix F)

The 15-member National Urban and Community Forestry Advisory Council was established to advise the Secretary of Agriculture on the national U&CF Program. The purpose of the Council is to develop a comprehensive national U&CF action plan, evaluate the implementation of that plan, and to develop criteria for and submit recommendations for funding the U&CF challenge cost-share program. More than 160 projects have been completed in the 15 years since NUCFAC was authorized.

The U&CF challenge cost-share program directly supports national level projects that intentionally translate and apply science to local situations. The U&CF challenge cost-share program is also an unusual grant source in that investigators are expected to do technology transfer as part of their research outcomes. This technology transfer component has encouraged a direct link between knowledge building and fact sharing.

Sustainable Urban Forests Coalition (Appendix G)

The Sustainable Urban Forests Coalition (SUFC) is a national coalition to advance a unified urban forest agenda for our Nation's communities. The Coalition views urban forests as the aggregate of all vegetation and green spaces within communities that provide benefits vital to enriching the quality of life.

In a time of both increasing demand for urban forest benefits and tightened budgets, Coalition members seek to work together to enhance the impact of urban forest organizations on communities nationwide. They have prepared concise, science-based products that are intended to inform national policy and budget leadership. SUFC also encourages or develops products that are suited for the leadership and members of a coalition of organizations with interest in urban greening.

Individually, each Coalition member organization is strong and serves its constituencies well. However, a unified national coalition will strengthen relationships, take better advantage of synergies between like-minded organizations, and raise the national profile of urban forests, their benefits, and the people who help keep urban forests healthy.

More than 100 local and State organizations signed on in support of the SUFC's FY 2007 funding recommendations for Federal investments in urban forests, a reflection of the broad nationwide support for U&CF.

Select List of Partners (Appendix H)

The partners listed in the appendix represent not only many of the traditional partners but also new alliances that are just being made or need to be forged to create more sustainable urban forests for the future. Some of these partners have turned out very attractive secondary and tertiary products that conscientiously report the science and address concerns and issues specific to very influential audiences.

Even though these partners are not directly generating the science or knowledge, they are instrumental in placing it before the people who can act on it. Most of them help connect the research to the language and issues that are important to local leadership. Many invite scientists to their regional and national meetings, enabling direct sharing and interaction. This networking often results in further partnering and even future research collaborations.

The list of partners is representative of nongovernmental organizations, trade associations, the green industry, and Federal agencies. Contact information, Web addresses, and descriptions of each partner are provided in the appendix.