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A Southern Region Conference on Technology Transfer and Extension

*Hot Springs, Arkansas
August 2-4, 2006*



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A Southern Region Conference on Technology Transfer and Extension

Hot Springs, Arkansas
August 2-4, 2006

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FOREWORD

Forests cover approximately 212 million acres in the Southern United States. This equates to 40 percent of all timberland in the United States. These forests provide raw material for a vital, domestic forest products industry; habitat for countless species of plants and animals; and contribute immensely to environmental values and quality of life for residents and visitors. Urban and wildland-urban interface forests also provide critical ecosystem services and quality-of-life benefits for residents. Appropriate management and use of these various forest resources depends upon continuous research and education efforts that respond to changing human and naturally occurring pressures on the forest.

A synthesis of southern forest science was published in 2004 to describe the contributions science has made and continues to make to the care and management of southern forests (Rauscher, H.M.; Johnsen, Kurt, eds. 2004. *Southern forest science: past, present, and future*. Gen. Tech. Rep. SRS-75. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 394 p.). However, the production of useful scientific knowledge is only part of creating and maintaining sustainable forest ecosystems in the South. Getting this knowledge to people who need it to effect positive changes in the forest landscapes is just as important as producing it in the first place. The function of science delivery/technology transfer is to (1) synthesize scientific knowledge into larger, more meaningful units; (2) translate this knowledge into the language and style that appeals to forestland owners and managers; and (3) connect scientific results, conclusions, and forecasts of impacts in a timely manner with the needs and issues of forestland owners and managers.

For the first time in recent memory, specialists in natural resource technology transfer and science delivery from throughout the Southern United States gathered together in conference in Hot Springs, AR, in August of 2006 to share experiences, identify common issues and problems, create a sense of group identity, develop a common vision, and craft working relationships and partnerships that can help us help each other do the best job possible. Of the over 100 participants at this conference, 50 percent represented extension; 30 percent came from the Forest Service; and the remaining 20 percent were members of State forestry organizations, environmental nongovernmental organizations, and other Federal Agencies. The conference participants were extension workers, natural resource specialists, teachers and professors, technology transfer specialists, and many others who work tirelessly to put new science and technology into the hands of users where that knowledge can make a difference.

Because our forestland owners and managers have different needs and preferences, it is important to use a multifaceted science delivery/technology transfer program to reach them. Multifaceted science delivery programs offer similar content in a wide range of products including printed publications, face-to-face workshops and training sessions, satellite-based and pod-casting-based distributed learning courses, and a wide range of Internet-based products. These proceedings from the Southern Region Conference on Technology Transfer and Extension in Natural Resources contain 4 keynote papers, 18 papers on various technical and procedural aspects of science delivery, and 9 papers describing successful technology transfer efforts. As a collection, these papers describe the state of activities and thinking in Southern United States natural resource science delivery and technology transfer.

The proceedings of this Southern Region Conference on Technology Transfer and Extension in Natural Resources, coupled with the proceedings of the status of southern forest science (Rauscher and Johnsen 2004) provides the best existing snapshot of natural resource science and technology transfer that exists today.

For more information on southern regional extension forestry and technology transfer products, please visit <http://www.sref.info>.

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PLENARY PAPERS

PAST, PRESENT, AND FUTURE OF THE EXTENSION SYSTEM

Bill Hubbard and Larry Biles¹

Abstract—The Cooperative Extension Service is often referred to as the third arm of the Land-Grant University System; the other two being the research and teaching arms. The Extension Service has been officially operating since the adoption of the Federal Smith-Lever Act in 1914 and is a unique partnership including Federal, State, county and volunteer forces. In these almost 100 years of operation, Extension has provided leadership in the areas of agriculture, natural resources, 4-H, family and consumer sciences, and other educational areas. Extension's success has been largely due to the relationships it develops with and between those who do research and those who use research. These multiple communication processes have been enhanced over the years through technology, improved delivery mechanisms, and a better understanding of effective teaching and learning tools. Extension's future lies in how well it can provide educational services to a largely urban audience that is more than ever dependent on a safe, inexpensive food supply; an abundant, sustainable natural resources system; safe and productive families; and our youth, who will soon become caretakers and leaders of this country.

INTRODUCTION AND HISTORY

This paper focuses on the Extension System, its history and impact over the past 100 years, and where it is heading in the future. The Extension System has been referred to as the largest non-formal education network in the world (Forest 1989). It is unique in nature—designed to help people help themselves by using research-based knowledge and information to improve their lives. Extension's history, a very rich history, dates to the late 1700s, with the creation of many universities in the South and throughout the country. The purpose of many of these universities includes teaching and research, but also Extension and outreach to farmers, ranchers, and homemakers, the citizenry of the United States of America.

Extension was at least a 50-year-old concept in practice by the time it was formalized in 1914 with the Smith-Lever Act. This Act was the Federal legislation that created the U.S. Department of Agriculture (USDA) Extension Service, a unique partnership involving Federal, State, and county partners that effectually works as the third arm of the university. It is located at each of the 1862 and 1890 universities in the country (Rasmussen 1989). In addition, the 1994 Land-Grant Institutions have become key players within the Extension Service. These are Native American tribally controlled colleges and universities that were granted land-grant status under an Act of Congress in 1994. There are more than thirty 1994 Land-Grant Institutions, most of which operate in the western United States (http://www.ascr.usda.gov/faq/faq1994_cr.html. Date accessed: July 14, 2007).

Extension, therefore, has a presence in every State, every county or parish, and even in most territories. Some offices, due to budgets, are combining their efforts; even so, there is a very large presence of > 15,000 county-based employees, 5,000 State-based (either administrative- or specialist-based), and another 10,000 that are support staff or clerical

staff. If volunteers are added into the total, the numbers expand even greater. These include for example 4-H, Master Gardener, and Master Woodland Owner volunteers.

PEOPLE AND PROGRAMS

Extension's programs are based on audience needs. County advisory councils and committees provide direction for those programs delivered by specialists and agents. Similarly, at the State level, the Renewable Resource Extension Act and other committees provide direction to State specialists. State specialists will spend a certain percentage of their time answering questions, responding to emails, but also, identifying needs, developing programs, and evaluating those programs. It is a fairly complex system, involving both proactive and reactive programming.

From a discipline perspective, the Extension Service has traditionally focused their efforts on agriculture, family and consumer sciences, and 4-H programs. In recent years, there has been an increase in the amount of programming taking place in the forestry and natural resources areas. Figure 1 shows the Southern Region's capacity to develop and deliver programs in the natural resources programming area (Hubbard 2006). More universities, however, are hiring split appointments. New professors are hired with contracts that include a mix of teaching, research, and/or Extension. The most difficult appointments are the 3- and 4-way splits: teaching, research, Extension, and/or administrative duties.

According to a survey conducted by the Southern Regional Extension Forestry office, there are approximately 145 professionals conducting natural resources Extension programs in the South: 53 percent are in forestry, which includes traditional forest management areas;

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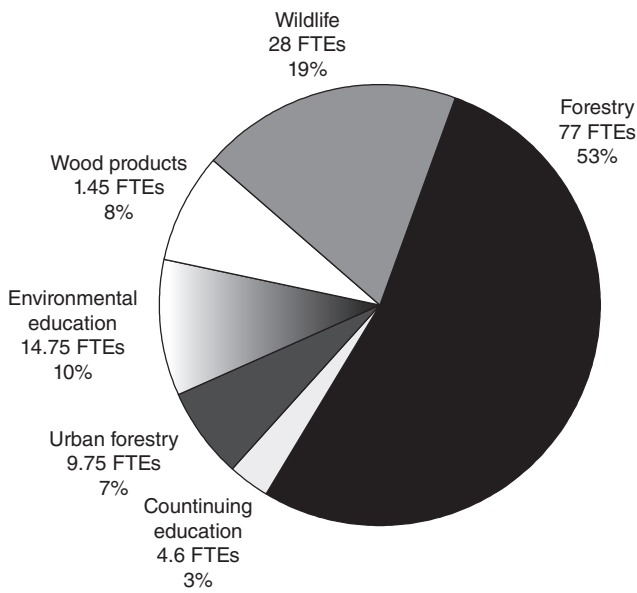


Figure 1—FTEs by discipline - Southern Region.

approximately 20 percent are conducting wildlife-related programming; 10 percent are in wood products; 8 percent are in urban forestry; 7 percent are in environmental education; and 3 percent are in continuing education for professionals. These numbers add up to slightly more than 100 percent due to rounding (Hubbard 2006).

Figure 2 shows these disciplines from a State-by-State comparison across the South. There is a fairly large variation by programming area. The dark shaded areas at the bottom of each column represent forestry Full Time Equivalents (FTEs); those successively stacked on top show other related natural resource activities (Hubbard 2006).

In Figure 3, natural resources Extension FTEs are delineated by their administrative structure. These categories are State, paraprofessional, area (multi-county), and county levels (Hubbard 2006). Predominantly, natural resources Extension is State-based versus county-based. This is different than most other Extension programming areas, such as agriculture, 4-H, and family and consumer sciences. Some States have developed multi-county or area specialists. Louisiana, for example, has had a longstanding productive regional structure that other States have emulated. Virginia is the most recent to have created regional specialists. Alabama recently created a regional, multi-county natural resource-based structure. These regional positions are key because they have the ability to work more closely with local constituents, such as State forestry agencies, non-government organizations (NGOs), and State natural resource agencies to communicate science-based information. They also aid with State-level program development and general natural resource education.

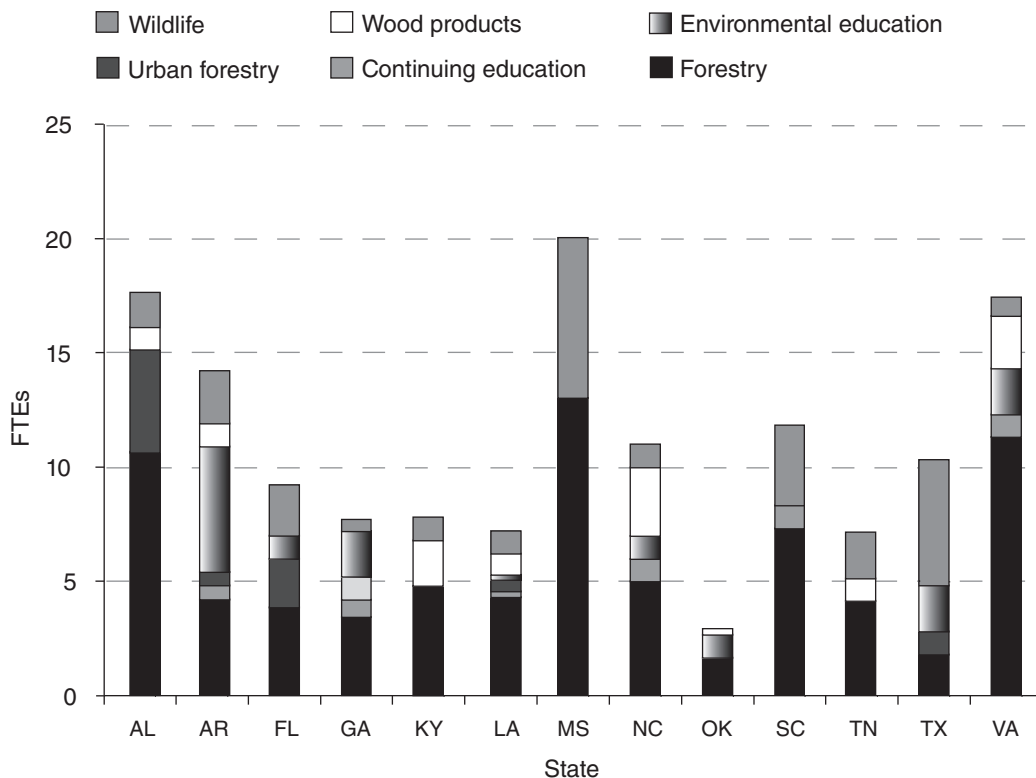


Figure 2—Natural resource FTEs by State.

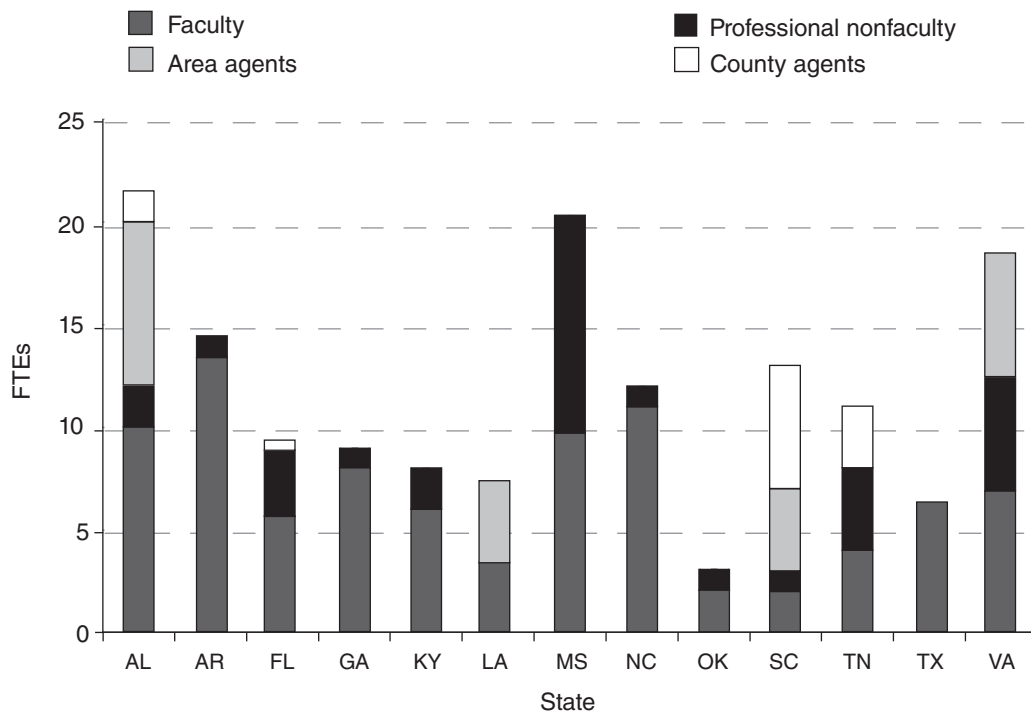


Figure 3—FTEs by professional status.

INNOVATIVE AND TARGETED DELIVERY MECHANISMS

From a delivery perspective, Extension uses a number of programming techniques and technologies depending on various factors, such as cost, available technology, interest, and experience of the Extension professional, among other variables. Examples presented throughout these proceedings include “coached planning,” “peer-to-peer,” and other programs that involve the student to a greater extent than traditional workshops or one-on-one instruction do. The belief is that by getting students involved in developing management plans or practicing management—wildlife, forestry, or any other natural resource-based activity on the land—they will become more actively engaged and become better stewards of their property. These programs have been successful in many parts of the country.

There are also leadership institutes that empower people at the local, regional, and national level to speak out about proper, science-based forest management in an effort to move forestry leadership forward. The Kellogg Foundation, for example, funded North Carolina State University’s Extension Forest Resources Department to develop a Natural Resources Leadership Institute. Their prerequisite for funding this effort was to invite other States to participate in the planning and development of the program. In this manner, the program would be adopted in several States over the years. To date, several States such as Florida, Virginia,

and South Carolina have adopted this program. Volunteer recruitment and training, again as in Master Gardener and Master Tree Farmer programs, also teach leadership skills.

Another fairly new delivery mechanism is satellite distance learning and internet-based programming. The Master Tree Farmer/Master Wildlifer Series, for example, takes advantage of satellite-based programming, via the county delivery systems of Extension and State forestry agencies. Extension has had astounding results with the Master Tree Farmer and Master Wildlifer Series and satellite programs reaching over 15,000 landowners and wildlife enthusiasts between 2001 and 2006. Extension works closely with the USDA Forest Service State and Private Forestry Agency in the Southern United States to deliver these programs. Other satellite-based programming includes professional development training in urban forestry and wildland/urban interface training. Finally, an introduction for certification programming via satellite was conducted at the regional level. These and other programs have been digitalized, and links to them can be found on the Southern Regional Extension Forestry homepage (<http://www.sref.info>).

Southern Extension natural resources professionals are also involved in several web-based programs. These Internet solutions have been a boom for agencies such as Extension whose business is information and education. Extension is moving into whole new areas. There is the national initiative “eXtension” by which Land-Grant Institutions in all fifty States and territories are working together to provide more

unity in delivery of information. If a homeowner, landowner, or whomever needs information, they may locate it much easier from a nationally-based, branded website; they may enter from several entry-points on the web, such as Google®, and they will get a very localized solution that has been developed by a national team of experts. This is all based on an innovative computer technology called a content management system (CMS) whereby much more access to websites is given to several content contributors rather than one “web-master.”

Another example is the National Learning Center for Private Forest and Range Landowners, found at <http://www.forestandrange.org>. This is a USDA initiative in partnership with the University of Tennessee. This online center contains several modules that have national significance across the wildlife, range, and forestry arenas. One more example is Virginia Tech’s online Woodland Options program (<http://www.cnr.vt.edu/forestupdate/pages/courses.htm>). These are online short courses that meet the needs of several of today’s busy forest owners and future forest owners. Finally, one more of many examples includes Texas Agrilife Extension’s online continuing education website for natural resource professionals to participate and obtain continuing education credits.

Other regional initiatives include the Forest Encyclopedia Network (<http://www.forestryencyclopedia.net>); the Southern Regional Extension Forestry portal (<http://www.sref.info>), and the forestry videos and forestry webinars

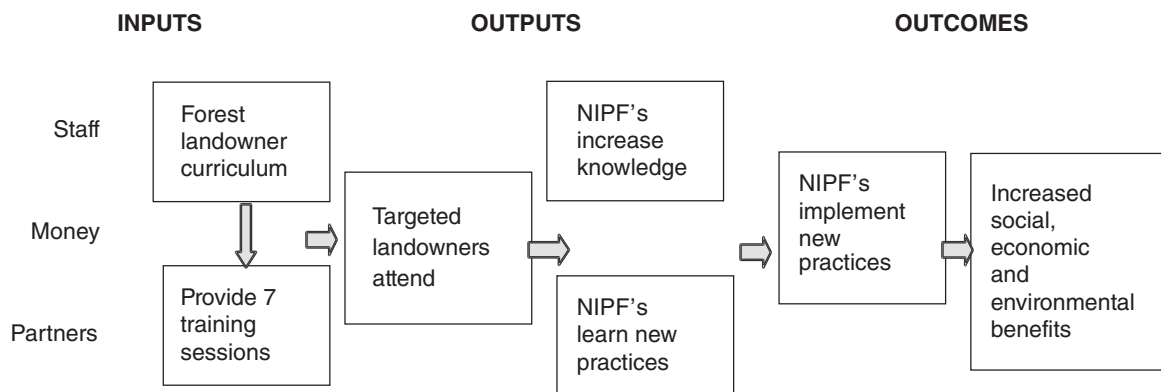
portals (<http://www.forestryvideos.net> and <http://www.forestrywebinar.net>). There is also a general forestry index website found at <http://www.forestryindex.net>.

Recently, a hardcopy publication, funded by USDA CSREES, has been “morphed” into a CD-based tool by Kris Irwin of the University of Georgia Warnell School of Forestry & Natural Resources. In turn it has become an Internet product. The Forest*A*Syst program (<http://www.forestasyst.org>) provides entry-level information for landowners and farmers alike. Additionally, Extension still develops correspondence courses for those who prefer to take a book home with them and read it in the comfort of their living room rather than going to a workshop or spending time online. One final project worth mentioning is the Southern Regional Extension Forestry peer review extension publication system that incorporates peer review and reduces duplication of efforts across the region. These publications are an excellent way to provide State-level Extension specialists with regional recognition.

PROGRAM IMPACT AND EVALUATION

Extension has developed several means by which to measure impact. One of the newer methods is the use of the Logic Model (W.K. Kellogg Foundation 2001). Figure 4 is an example of how Extension might use the Logic Model to evaluate a forest landowner short course. Another method was used to evaluate the Master Tree Farmer Series. Over

Where does evaluation fit?



EVALUATION: What do you want to know? How will you know it?

Quality of curriculum	# of NIPF attending sessions	Increase in knowledge/skill-	Actual use - follow-up	Long-term follow-up,
# of sessions delivered	% of total demographics	post session survey	phone interview	modeling, forecasting

Figure 4—Evaluation.

15,000 landowners, foresters, and others have attended these courses over the last 5 years. Starting in 1999 in the State of South Carolina with 200 participants and reaching over 4,800 in 2003, the Master Tree Farmer/Master Wildlifer Series is unparalleled. This was most likely the largest live Extension event that has ever occurred in the South. Four thousand eight hundred people taking a 7-week course with 21 hours of contact is over 100,000 contact hours. The acreage figures are astoundingly higher. The Master Tree Farmer program impacted over 1 million acres in just 5 years; the Master Wildlife program impacted several times that in managed and leased lands. In addition to pre- and post-testing, the instructors queried participants in one State as to their knowledge retention and application of tools and principles on the ground. Results were encouraging; over 90 percent of the participants who responded to the survey had completed at least one forestry practice on their property since participating in the course (unpublished evaluation report).

CONCLUSIONS

In conclusion, the natural resources Extension System in the South is about people, programs, technology, change, and impact. Extension strives to teach people how to think, not what to think, so that they can make informed decisions regarding their lands. With decreasing budgets, and increasing audience needs, Extension's role in the future remains challenging. Newer technologies and developing better evaluation tools will be important if Extension is to survive and prosper.

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SCIENCE DELIVERY AT THE SOUTHERN RESEARCH STATION

Carol Whitlock, Zoë Hoyle, Rodney Kindlund, Livia Marqués, Randy McCracken, Claire Payne, H. Michael Rauscher, Perdita Spriggs, Louise Wilde, and Alan Salmon¹

Abstract—The Southern Research Station, Forest Service, U.S. Department of Agriculture is responsible for developing and distributing timely, credible, and pertinent science products that contribute to forest sustainability in the South. These products are developed collaboratively by the scientists of Station’s Research Work Units, other cooperating scientists, and the Station’s Science Delivery Group. The Science Delivery Group and the Research Work Units continue to improve their performance in the area of science delivery. In response to a changing customer base, the scientific and science delivery staffs are working together to shift the Station’s scientific product line to incorporate more information about natural resource issues, better access to expert advice, practical tools, and syntheses of research results. Web-based products are supplementing and at times replacing paper for research reports and conference proceedings. Where material works best in paper format, more effort is being placed on tailoring products to specific customer groups. Color photographs, maps, and graphics are being used more extensively in these products. The need for customer testing of products is becoming generally accepted. As the Station moves forward in its effort to develop a truly interactive science delivery program, the Research Work Units and Science Delivery Team seek opportunities to develop new partnerships, share resources, and improve customer service.

INTRODUCTION

Until late in the 20th century, science delivery almost always meant publishing in scientific outlets aimed at specialist readers. The two Forest Service, U.S. Department of Agriculture research organizations in the South, the Southern Research Station and Southeastern Forest Experiment Station, each had eight employees concentrating on technical editing, styling manuscripts and submitting them to journals, and publishing the manuscripts the scientific journals could not use. In keeping with the university approach to research, Forest Service scientists learned to think it was their job to produce the research findings and somebody else’s job—possibly that of someone in our Agency’s State and Private Forestry program—to extract or develop practically useful material from those findings and present it to the lay public. Although some did present their findings in forms that were more accessible and useful to landowners and managers, such efforts were ad hoc, rarely supported by Station headquarters, and often judged by peers as diversions from “pure” science. People needing information could order in-house series publications or journal articles from the Stations. These publications were highly credible but with low levels of accessibility for non-scientist audiences. There was scant accommodation for those who did not have the time or the inclination to read and digest the primary scientific literature.

The close of the century brought the consolidation of the two experiment stations to form the Southern Research Station (SRS) as well as new challenges and expectations in the area of science delivery. Congress became less inclined to spend dwindling natural resource dollars to fund science for the sake of science. The Office of Management and

Budget questioned our ability to demonstrate the value of our research to the public. Our own U.S. Department of Agriculture expressed frustration with a science organization that could raise questions, but could not provide practical answers. And customer surveys conducted in the mid-1990s showed that our science, though still highly credible, was becoming less relevant to the needs of the South. The old model of conducting narrowly focused, hypothesis-driven studies in association with a relatively small number of cooperators was losing relevance.

At the same time that demand for usable science was growing, capacity within the forestry community was diminishing with shrinking Federal and State budgets. And due largely to the Internet, the potential users for research had grown from a handful of professional foresters to the millions of landowners whose individual holdings were small but who collectively comprised the best hope for forest sustainability in the South. For a variety of reasons, only a small percentage of these landowners received services from a forestry professional.

In the early 2000s, the SRS embarked, with our national forest counterparts and other Federal and State organizations, on a project that required us to approach science delivery in new and better ways. The Southern Forest Resource Assessment (Wear and Greis 2002) was a landmark event for several reasons. The Assessment leaders used a question-based approach to define scope and organization: the questions were proposed by experts from the forestry community and vetted in a series of open forums with the public. Credibility of the science was ensured in a blind peer review process, in which reviewers’ identities were unknown to authors and substantive comments were

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refereed by the Assessment leaders. The conclusion of the Assessment identified urbanization as the greatest threat to forest sustainability in the South, which was presented in a communications effort that reduced polarization and involved the public in serious discussion about this issue. The result was a changed communications environment—one characterized by an increased public and media appetite for accessible forest science information.

Shortly after completion of the Assessment, scientists, communications professionals, and research administrators from the six regional research stations and the Forest Products Laboratory convened in St. Paul, MN to identify measures of success in science delivery. Those sessions produced two results that are of interest here. The first was an affirmation that the Forest Service research program has a responsibility to ensure that its findings are adopted. The second was the development of a behavioral model that would increase the likelihood of adoption. This behavioral model has four elements:

- Engaging users and partners in identification of research needs, priority-setting, and program delivery planning
- Providing information seekers with understandable, rapid response answers synthesized from current and past findings
- Developing products that meet users needs, are easy to locate and apply, and are supported throughout their life cycle
- Building user confidence through an effective branding protocol that associates the agency's research products with the established credibility of its research program. By branding, we mean a uniform way to identify Forest Service science products servers to assure users that proper quality control has been applied to the available information

As a result, a new science delivery environment has been implemented in the SRS. In many of the Research Work Units, recognition of the importance of science delivery has been translated into a commitment to fund communication of study results. At headquarters, a revamped Science Delivery Group has added capacity in marketing, Web presence, customer service, and design—partly through a modest increase in funding and partly by redirecting resources freed up by a reorientation of its publications processes. These new investments have strengthened our Web outreach with products like TreeSearch and the Forest Encyclopedia Network (FEN), and have allowed us to refocus our editorial and design efforts on products for the user community.

The objective of this paper is to describe the science delivery program of the SRS; a \$6 million per year effort that

represents a little more than 10 percent of the SRS budget. The first part of the paper describes the Station's Science Delivery Group, its programs and products. The second part of the paper summarizes the science delivery work being performed by the Research Work Units of the SRS. The paper concludes with a discussion of steps the SRS is taking to reorganize its scientific staff for improved research planning and delivery, and other plans underway to improve delivery and adoption of SRS research findings.

SOUTHERN RESEARCH STATION SCIENCE DELIVERY GROUP

The SRS's Science Delivery Group collaborates with Research Work Unit scientists and others to develop timely, credible, and pertinent science products that contribute to forest sustainability in the South. These products address current conditions and emerging issues, reflect the capabilities of our scientists and partners, and are made available through a large variety of delivery mechanisms preferred by different audiences in the South. The Science Delivery Group has a total annual budget of \$1.5 million for salary and operating expenses.

Our staff of 18 specialists and assistants work in formal and ad hoc teams to:

- Edit and design publications, posters, fact sheets, brochures, and other hard-copy products
- Disseminate published material and provide customer services of all kinds
- Prepare and publish COMPASS, a quarterly magazine about important natural resource issues in the South
- Deliver research products by means of Internet services
- Synthesize and deliver scientific knowledge in the FEN

Editing and Publishing

The editing and publishing group helps authors prepare high-quality manuscripts by providing editorial support for authors for those manuscripts destined to be published by scientific journals. For those authors that wish to publish manuscripts through the SRS, the Science Delivery Group also provides design, layout, and printing support resulting in high quality published material for consumption by different audiences.

The SRS produces several different types of publications:

- General Technical Reports (GTR)—convey technical information but do not contain original study results. Examples include field manuals, computer programs, educational posters, regional assessments, restoration

guides, and annotated bibliographies. Conference proceedings of all types also fall under this category

- Resource Bulletins—present information of permanent value about timber and other forest resources or their utilization
- Research Papers—cover the results, analyses, and conclusions of formal studies or experiments
- Research Notes—present information about incidental discoveries or how-to information about new techniques, instruments, or equipment developed during the course of an experiment
- Miscellaneous Publications—special purpose publication that are often aimed more specifically at landowners and other non-scientific audiences.

Over the last 3 years, the SRS has published significantly fewer research papers as scientists have increasingly brought that material to scientific journals (table 1). In contrast, the SRS has published more miscellaneous publications aimed at non-scientific audiences. A significant portion of the SRS Science Delivery budget is used to support in-house publications (table 2).

Direct Customer Services

The Customer Services Team of the Science Delivery Group provides many services directly to customers through a variety of channels. Customers may walk into the SRS headquarters in Asheville, NC and physically ask for information. More frequently, customers request publications by phone, through publication ordering cards distributed as part of the SRS marketing effort, and through the Internet. In 2006, the Customer Services Team filled more than 42,000 requests for hard-copy publications and CD's with weekly shipments of 600 to 800 publications being fairly common. Internet requests through the publication request inbox (pubrequest@fs.fed.us) average between 40 and 60 requests per week. Requests for multiple copies of a single publication, bulk mailings of the COMPASS magazine, and bulk mailings to national and international libraries are routinely executed by a contract

vendor who is required to meet stringent delivery time schedules. Currently, the single most popular publication is “Nonnative Invasive Plants of Southern Forests” (Miller 2003) with over 150,000 copies of this book in circulation.

All SRS publications include a customer feedback comment card. Customers use the card to evaluate the relevance of the topic presented; the publication's writing style, organization, and graphics; the packaging of the material relative to its intended audience; and the publication's usefulness. This information is used to evaluate how well customers are being served and how to improve the SRS's published products. Each feedback comment is carefully examined and routed to the authors of the publication for consideration.

The publication order cards contain a request that users identify which of 15 audience groups that they belong to. The audience group choices are:

University faculty	U.S. Forest Service
High school faculty	Other Federal agency
Student	Non-government organization (NGO)
Recreation user	Forest industry, recreation
Forest consultant	Forest industry, wood products
International agency	Non-industry forest landowner (< 100 acres)
State agency	Non-industry forest landowner (> 100 acres)
Other	

The Customer Service Team is therefore able to identify which publication was ordered by which customer audience group (fig. 1). Furthermore, using this response data, it is possible to identify how the customer base is changing. For example, the landowner category has grown more than 30 percent in 2006. Information such as the articles that most

Table 1—Number of publications published by the Southern Research Station by type for the last three fiscal years

Fiscal year	GTRs	Resource bulletins	Research papers	Research notes	Miscellaneous	Total published
<i>number</i>						
2003	17	10	16	1	5	49
2004	10	10	1	0	8	29
2005	19	8	5	0	9	41

Table 2—Total number of copies of all publications printed and total printing cost for the last three fiscal years

Fiscal year	Total number of copies printed	Total printing costs in dollars
2003	126,758	256,422
2004	75,644	167,880
2005	140,311	263,347

Note: Printing costs do not include editing, layout, or formatting costs.

appeal to categories of customers and how many copies of a specific paper have been requested and by which customer groups are also readily available and useful for evaluating the impact of the science program of the SRS.

Internet Services

The commitment of the SRS Science Delivery Group to embrace technology that delivers its research products to the widest possible audience is best demonstrated by the Station Web site (www.srs.fs.usda.gov). This Web site offers in-depth information about the Station's areas of research, its scientists and their publications, and special projects and programs. Customer response has been excellent: the customer base has risen from an average of 200 requests per day in 1998 to over 20,000 requests per day in 2005 (fig. 2). In 2005, the Web site was accessed by an average of

2,000 distinct hosts each day. Traffic patterns and customer feedback showed clearly that research publications are our most sought-after products and that demand for them is always increasing. To meet this demand the Internet Services Team designed TreeSearch, a Web-integrated database to automate the delivery of research publications via the Internet.

Uploading electronic documents into TreeSearch is time consuming and requires great attention to detail. Relatively inexpensive student workers are used to create electronic versions of hardcopy publications. This conversion is then checked for quality by an Internet Services Team member before the records are released to the public. Since this TreeSearch was released in January 1999 it has grown to over 5,500 SRS records with links to over 23GB of full-text publications in PDF. These records contain both Station series publications and journal articles. Users have the ability to view and print PDF versions of these publications and are given the option of ordering hardcopies of our Station series publications.

The Internet Services Team redesigned the original version of TreeSearch to accommodate other Forest Service research stations that wanted to participate in this effort. This improved database now serves as the platform for the entire Forest Service Research and Development TreeSearch Web site. TreeSearch (treesearch.fs.fed.us) is the Forest Service Web site for one-stop acquisition of research products. Containing over 14,000 records with links to full-text publications, it is the largest known collection of forestry research publications available at no cost. This project, originally created and now administered by the SRS, relies on each of the participating Forest Service research stations to produce and maintain content. The information contained within TreeSearch maintains its Station identity but is presented in a unified delivery system for all Forest Service research products.

The SRS Web site also supports science delivery in many areas other than delivery of publications. For example, an online database of all Station scientists is available to give our users access to experts in a wide range of sciences that serve forestry. Users are able to browse or search for scientists by area of expertise, title, or Research Work Unit and view a summary of each scientist's education, current and collaborative research, and a dynamic link to his or her publications. The Congressional Corner provides a State-by-State summary of forest research in the South with information about current projects, awards, and budgets for each Research Work Unit and program.

The Forest Encyclopedia Network (FEN)

The FEN project began in 2000 with funding from a U.S. Department of Agriculture National Research Initiative competitive grant to facilitate the transfer of

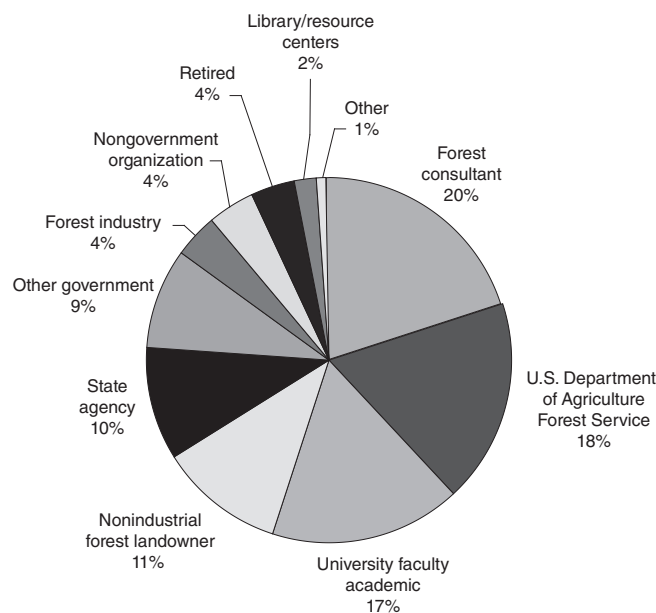


Figure 1—Southern Research Station publication orders by customer category, June 2005–2006.

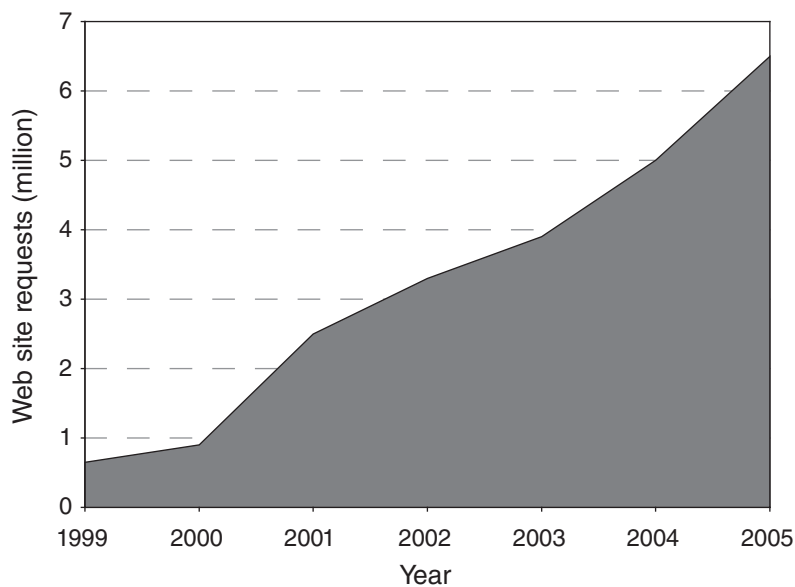


Figure 2—Information requests received at the Southern Research Station Web site, 1999–2005.

usable knowledge from scientific experts to managers, policymakers, and other natural resource professionals. The network has been a joint project of the SRS and the Southern Regional Extension System (www.sref.info) from its inception. Users of the network are offered what adult educators call a self-directed learning tool that enables individuals to obtain information on an as-needed basis. The FEN currently includes six ongoing encyclopedia projects in various stages of development (www.forestencyclopedia.net). As of the summer of 2006, the system contained 3,260 encyclopedia pages, 2,457 images, 450 tables, and 13,444 citations. The network attracts approximately 76,000 unique visitors per year.

The Encyclopedia of Southern Appalachian Ecosystems was the first and is the most mature. It has been peer reviewed, published, and has moved into the continuous updating mode. The Encyclopedia of Southern Fire Science has been published and is accepting continuous updates. The Encyclopedia of South-wide Forest Science is currently being written from two publications offering a combined 1,000 pages of peer reviewed content (Rauscher and Johnsen 2004, Wear and Greis 2002). Content has been written for the Encyclopedia of Southern Bioenergy, it has been peer reviewed and is accepting continuous updates. The content for the Encyclopedia of Forest Environmental Threats has been written and peer reviewed and is currently being edited, with publication expected in July 2008. The Encyclopedia of Southern Pine Beetle is the most recent FEN project. Content is currently being written with publication sometime in 2009.

A typical encyclopedia project begins with the development of the “core material.” It is directed by one or more subject

matter experts who act as the managing editors. These editors are responsible for creating an information architecture, identifying the content, and engaging authors to write needed synthesis pages. They are also responsible for guiding the peer review process for each section. Assistant editors work with the managing editors to ensure that the content material gets properly placed into the hypertext encyclopedia and that the figures, tables, and citations are all properly linked. Finally, technical specialists are responsible for maintaining the common computing infrastructure and making improvements in page design, workflow, and system function.

The encyclopedia projects share the same computing infrastructure to reduce implementation costs. Once the core material for an encyclopedia is in place, the encyclopedia moves to a continuous update mode in which volunteer authors submit new or revised material to keep the content current and expanding. This continuous contribution of new content functions much as a scientific journal system does. For example, authors are rewarded by their employing agencies for getting content published in the FEN much as they are rewarded for publishing in a scientific journal. The main difference is that the network is interested in results, conclusions, and expected impacts of new science knowledge rather than in methods and detailed mathematics. The network peer review process also focuses more on utility and understandability to management and lay audiences than do most scientific journals.

Creating and maintaining encyclopedias takes a great deal of effort and thus requires contributions from a wide array of institutions and individuals. As the FEN expanded, the southern forestry university community and the Forest Service, U.S. Department of Agriculture State

and Private Cooperative Forestry Program also became active participants. This multi-agency collaboration draws on the strengths of all parties to improve the synthesis of scientific information and its delivery to the broader forestry community. Funding from these sponsoring organizations has been augmented by grants from U.S. Department of Agriculture's National Research Initiative and Bioenergy Program, the National Fire Plan, the Joint Fire Science Program, and the National Forest Threat Assessment Centers of the Forest Service, U.S. Department of Agriculture.

Compass Magazine

The SRS's quarterly science magazine, *Compass*, is designed to address issues affecting Southeastern forests and to showcase pertinent research by Station scientists and collaborators. The magazine's intended audience includes the general public, elected officials, media, educators, land managers, researchers, cooperators, private landowners, and engaged citizens.

Compass represents an upgrade from a publication of the same name that featured short articles followed by an annotated list of products (reports, scientific articles, proceedings, other media) recently published by the Station. In summer 2004, the Science Delivery Group decided to reformat the smaller publication and convert it into a full-fledged magazine. An editorial board was formed and format, topic selection, review, and approval procedures put in place.

Each issue of *Compass* is built around a topic identified as being of pressing interest to the intended audience. Each issue consists of one to three feature-length articles, two to five shorter articles and sidebars, a profile or interview with a Station researcher, a profile of an experimental forest or important research site, recommended readings related to the feature article, a landowner's toolbox, news from around the Station, and the annotated list of new products. The products listings are chosen and written to complement the focus of the issue, and represent another way that the Station markets newly published scientific publications. Readers can use a card enclosed in the magazine to order hard copies of publications they select from the list. The card also has a section readers can use to subscribe to future issues of the magazine.

The focus topics for the first six issues were: biomass and bioenergy (Winter 2005), invasive plants (Spring 2005), longleaf pine restoration (Summer 2005), forest fragmentation (Fall 2005), forests and water quality (April 2006), and the restoration of hardwood forests in the Lower Mississippi Alluvial Valley (July 2006). The next two issues will cover pressures related to the wildland-urban interface, and methods (agroforestry, constructed wetlands, and

others) used to restore the ecological functions of forests to degraded areas.

Currently, 5,000 copies are printed of each issue of *Compass*. These are distributed through a growing mailing list, through research units, and at meetings across the Southeast. Current and archived issues of *Compass* are also available in both PDF and html format from the Station Web site at <http://www.srs.fs.usda.gov/compass/>. Readers can also subscribe to the magazine from the Web site and use links in the products list to access full text versions of the listed publications. Articles and sidebars from the magazine will be used to build a content database that will further interconnect Station projects, which are in fact highly collaborative. Because of the long-term nature of most Station research, the stories in *Compass* have a much longer shelf-life than those of popular magazines, and are written to provide usable blocks of information for other science delivery projects.

SCIENCE DELIVERY EFFORTS BY SOUTHERN RESEARCH STATION RESEARCH WORK UNITS

One hundred twenty-nine scientists, organized into 15 Research Work Units, conduct scientific studies and develop technical tools used by the Station's customers. The scientists and Units work to transfer this technology to our customers through publications and presentations and by providing formal and informal training. The science delivery activities outlined in this section are in addition to those discussed in previous sections of this paper.

Organizational Structure

The Research Work Units have recently been reorganized to enable them to better serve the changing needs of their customers. The 28 Units that existed previously have been realigned and now form 15 Units. Based on their primary research focus, the 15 individual Units have been organized within 5 broader science areas identified in the SRS strategic plan. Management functions of the Units have been consolidated for increased efficiency, and the Station maintains its full research capacity.

A Science Delivery Coordinator leads the Outreach and Science Delivery Team within the Science Delivery Group and works directly with the Research Work Units to facilitate the transfer and adoption of research findings. The principal function of the Outreach and Science Delivery Team is to identify the relevance and applicability of research results to the unique needs of the Station's diverse customer base.

Resources

As in many government offices, human and financial resources are a limiting factor for the Research Work Units. Inadequate staffing, or lack of time, was identified as one of the top barriers to science delivery at the Unit level.

The scientists must continuously strive to strike the proper balance between doing the research and transferring the technology. Six of the 15 Units have a technology transfer specialist on staff. According to the Unit project leaders, the availability of these specialists significantly increased the ability of their units to implement comprehensive science delivery programs.

The Unit technology transfer specialist organizes and coordinates the overall planning of technology transfer activities. This work takes a significant amount of time and was previously done by the research scientists or not done at all. The specialist also plays a central role in outreach and partnership activities by making and keeping local contacts and developing working relationships.

Products and Activities

Due to funding constraints, it is not expected that the total number of Research Work Unit technical products and activities will change significantly over the next couple of years (table 3). However, the types of products and delivery methods will likely change. Some changes are being initiated to overcome barriers to science delivery. For example, several Units will pursue videotaping or

live broadcasting of training sessions to overcome space limitations at their facilities. Other changes, such as developing more interactive web-based tools and DVDs, are being considered to meet customer requests.

Customers

The SRS has historically had a large customer base of private landowners. This customer base is rapidly changing and growing. Due to many factors in the Southeast, changing ownership patterns for privately owned forests, including industrial forests, is increasing. Along with this, there is an increase in the fragmentation of large tracts of land as more private, industrial forests are sold in response to economic pressures. If this trend continues, there will be a significant increase in the total number of landowners, making outreach efforts more challenging, and a decrease in the average size of land units, making large-scale studies more difficult.

In addition to private landowners, the Research Work Units have customers from universities, state and local governments, Tribal governments, other federal agencies, State agencies, and numerous non-governmental organizations. Although the Units share several customer groups, each Unit also has unique groups of customers based on the nature of its research.

The SRS serves a broad range of customers; this is a major challenge partly because it requires striking a proper

Table 3—Technology transfer products and activities of Southern Research Station Research Work Units, fiscal years 2003–2005

Products and activities of research work units	Fiscal year		
	2003	2004	2005
	<i>number</i>		
Nonrefereed publications	522	616	508
Journal articles (refereed publications)	275	381	336
Presentations to scientific and professional organizations	646	697	668
Presentations to lay organizations	199	206	205
Tours to educational and professional organizations	287	240	267
Short courses/training to educational or professional groups	108	119	136
Videos and slide presentations developed on research findings	141	121	74
Technology transfer activities (e.g., scientists helping other stations understand research, training in new techniques, research findings on the Web)	766	929	1128
New inventory technologies (i.e., sampling methods, software, models)	8	10	29
Research tools and technologies	106	48	47
Total	3,058	3,367	3,398

balance of resources. The Science Delivery Group assists the Research Work Units in developing state-of-the-art tools and delivery methods required by some customers while ensuring that less technologically savvy customers are not excluded. To truly meet the needs of our customers, it will be essential to provide the same information in multiple formats by targeted delivery methods.

Sample Success Stories

SRS researchers have engaged in many successful science delivery activities, which benefit a variety of internal and external customers. These successes include:

The Center for Bottomland Hardwoods Research succeeded in gaining the inclusion of a new silvicultural technique, researched and developed by our scientists over the last 10 years, into the Conservation Reserve Program (CRP). Dr. Ted Leininger and Dr. Emile Gardiner worked with Farm Service Agency policymakers to include the technique of incorporating hardwood species between rows of Eastern cottonwoods. The resulting two-species planting provides landowners with multiple income sources above and beyond the annual CRP program payments, making the conversion of agricultural land to forests an attractive option. After this technique was adopted by the Farm Service Agency, program enrollment increased 200 percent in 6 months with indications for future increases.

The Southern Center for Wildland-Urban Interface Research and Information has been particularly successful in developing tools to help reduce the risk of wildfire around homes in the wildland-urban interface (WUI). One example is the decision support systems (DSS), which was developed based on the Center's WUI fire research, and is available on the Center's Web site, InterfaceSouth. One DSS, the wildfire risk assessment, helps the homeowner to assess risk from wildfire around their home. The other, a flammability key, helps resource professionals to develop flammability plant lists of local species used in landscaping.

The Southern Forest Inventory and Analysis (FIA) Unit leads the Nation in client response and contacts. In 2006, they conducted 52 percent of the data requests and received 44 percent of the FIA data Web retrievals in the United States. Having a variety of users, the majority of these contacts are with forest industry (29 percent) and academic (19 percent) users covering an array of projects that assess the status, trends, and sustainability of Southern forests. FIA data was used for rapid assessment from catastrophic events such as Hurricane Katrina and the Georgia wildfires in 2007. With increased concern regarding global change (population, climate, and markets), FIA data is used to monitor forest health and invasive species, assess wood supply for bio-energy and forest sustainability, assist decisionmaking activities for public policy and private enterprises, as well as predictive models for land-use change and forest fire

dynamics. Maintaining close contact with the users, the Southern FIA team seeks innovative ways to integrate additional data sources to assess current forest conditions and predict potential risks to the forest resources.

CONCLUSIONS AND OUTLOOK FOR SCIENCE DELIVERY

The SRS recently consolidated its 28 Research Work Units into 15, grouped into five science areas—threats to forest health, management and restoration, watershed science, technology and social science, and inventory and monitoring—and outlined a research planning process that shifts the planning focus from the Unit to the science area. The goal is to transform research planning into a broader, more integrated, and more inclusive process. As the leaders of the newly created science areas work through questions of mission, issue identification, objectives, and problem definition, they will be looking for input and guidance from a broad spectrum of stakeholders, both for their unique perspectives and for their grasp of what is needed to ensure the sustainability of Southern forests. We expect that this approach will help the SRS involve stakeholders in identifying emerging issues and will allow us the flexibility to shift scientific and science delivery resources as new issues emerge.

The SRS's Science Delivery Group is actively involved in the science delivery aspects of the science areas. The Science Delivery Group is helping to coordinate stakeholder engagement, identifying products that have potential for delivery, and working with partners inside our Agency, in the Extension Service, and in State forestry organizations to craft well focused, user-friendly products. We expect that these products will take many forms including science syntheses, virtual tours and short-courses, podcasts, interactive learning, and decision tools.

The SRS has a long history of credible science publications, both in journals and in Station series. In response to a changing customer base, the scientific and science delivery staffs are working together to shift the Station's product line so that it incorporates more information about natural resource issues, direct contact with experts, practical tools, and syntheses of research results. Web-based products are supplementing and, at times, replacing paper for research reports and conference proceedings. For material that works best in paper format, more effort is being placed on tailoring products to specific customer groups. Color photographs, maps, and graphics are becoming more common for these products. The need for customer testing of products is becoming generally accepted.

Many of the answers to today's problems and issues can be found in the research findings of the past. What is missing

is the capacity to form rapid responses, whether a simple answer to a landowner question or a multi-agency effort to pull together information needed in an environmental crisis. For this, networks and systems must be in place to provide user-friendly processes for receiving, managing, and responding to customer needs for information and solutions to problems. A region-wide commitment is required to organize available information, improve access and retrieval, and dedicate the human and financial resources to gather, compile, interpret, and synthesize existing data. Web-based science synthesis products such as the FEN are likely to play a central role in rapid-response delivery of scientific knowledge. A rapid-response project might start with an existing scientific synthesis in the FEN and quickly update and expand that section to ensure that answers to current critical questions become available in a timely manner.

Too often, scientists develop decision tools and other products that represent cutting-edge research, but are difficult to use or are out of the mainstream in terms of software compatibility and support. We intend to work with partners and stakeholders to identify products that have the potential to meet user needs or solve sustainability problems, and then invest the resources required to fully develop their potential for accurate and clear usability.

The advent of the Internet has revolutionized access to information without providing enough guidance about the credibility of information sources. In this new environment, astronomy and astrology are perceived to have equal credibility. Anyone can post a version of science findings that supports special interests. Without consistent branding, useful research products are submerged in a welter of competing ideas, opinions, and proposals that Web surfers encounter in their search for answers to significant questions. To avoid being just another voice in the cacophony, each science partnership needs to find subtle ways of consistently and clearly identifying the contributions of its individual members.

In summary, the SRS brings to the table the credibility of our science, some knowledge of landowner preferences, and a high level of writing, publishing, design, and computer expertise. We look to our partners for expertise in science delivery, identification of priorities, and hands-on work to develop and evaluate joint projects that respond to user needs and create impacts.

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CHANGING PUBLIC BEHAVIOR WITH HELP FROM TARGET AUDIENCE RESEARCH

Elaine Andrews¹

Abstract—This paper summarizes the purpose and sample results of a meta-analysis study to describe a body of information that water educators can use to guide their work and to identify what questions to ask when considering work with a particular target audience. The study compiles best education practices (BEPs) for 14 different audiences that have been shown to be more effective in studies of water and environmental outreach. These BEPs will make it easier than in the past for educators to apply the most appropriate information when designing initiatives that build citizen skills and motivation to address complex water management scenarios. The meta-analysis applied rigorous and documented procedures to identify and organize research-based information. The process identified a number and diversity of studies available to guide water educator efforts, but also indicated large gaps in research. Recommendations and products are based on findings reported in 96 research articles. Farmers were the most widely studied audience and landowners the next most studied group. Based on the quality of research, we believe that the findings reported in the analysis and in related reference pieces are reliable. The study pointed to the complexity of identifying and practicing effective outreach techniques which respect citizen decisionmaking processes, but lead to a more universal commitment to careful management of the water resource and its related human and natural ecosystems. Building educator skills in implementing effective practices will make a difference. Research that amplifies these results will increase understanding for how to make that difference.

INTRODUCTION

Water scientists and educators strive to address a demanding range of environmental management needs. They aim to provide citizens with information, skills, and motivation to maximize the quality of water and to manage water quantity. Ultimately the goal is to “protect and enhance the nation’s natural resource base and environment” according to a USDA Research, Education, and Economics (REE) strategic goal (2003).

Researchers and educators work to improve environmental management by transferring information to relevant audiences, by providing tools and techniques, and by facilitating the decision process. But what does “transferring information” actually accomplish, and how do we do it effectively? What does it mean to “provide” tools and techniques? Are educators under any obligation to ensure that techniques are used, once they are provided? Any decision process is multifaceted. Personal qualities, group dynamics, politics, economics, and social structure all play a role. What kind of decision-support system must educators design to address this level of complexity? How do educators objectively facilitate citizen decision processes with the protection of the natural resource in mind?

Educators need resources, training, and support to tackle the challenging tasks suggested by these questions. The REE strategic goal provides a laudable benchmark, but implementing outreach techniques that lead to measurable

impacts is not a simple or straight-forward process. Some parameters that educators need to consider include:

- Defining the problem in specific terms
- Understanding the critical factors that affect the likelihood that an individual will adopt an environmentally significant behavior
- Identifying behavior goals that the targeted audience can achieve
- Selecting outreach techniques most relevant for facilitating behavior change by a particular audience
- Determining how to measure whether the individual achieved the behavior goal

As these parameters imply, the most effective outreach initiatives focus on specific audiences; they do not merely try to communicate with the “general public.” A given audience is selected according to the probability that its current practices impact the environmental condition. Educators collect information about that audience and use the information to design a program that closely relates to that audience’s needs and preferences (Andrews and others 2002, McKenzie-Mohr and Smith 1999, Tetra Tech, Inc. 2003).

This paper describes a meta-analysis study of water outreach research that provides findings about audiences of strategic interest to water educators. Results can also inform outreach for other stewardship education and outreach topics. In this

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paper, the term “outreach” is used to encompass all the roles of the natural resource educator described above, including training, technology transfer, formal education, information transfer, group facilitation, and communication.

USING TARGET AUDIENCE INFORMATION IN DESIGNING AN OUTREACH INITIATIVE

A target audience is a segment of the population with potential to effect desired change, a segment that is likely to be affected by the change, or both. Segmenting a market by specific audiences is considered an essential technique in the process of promoting, selling, and distributing a product or service. Segmenting audiences for the promotion of targeted behaviors is also central to development of social marketing strategies (McKenzie-Mohr and Smith 1999).

The value of targeting an audience lies in: (1) identifying the particular benefits of and barriers to the targeted and competing behaviors for the specific audience; and (2) optimizing the message and method to accomplish the educational objective, that is, to be most effective in effecting the desired change in behavior. Studies of teaching and of human learning, development, and motivation show that ways of thinking and learning vary among individuals, and also with variations in the context of the learning situation (American Psychological Association 1997, Andrews and others 2002, Falk and Dierking 2002, Holsman 2001, Horton and Hutchinson 1997, Knox 1993, Merriam and Caffarella 1999, Sgroi and Cavaliere 1992).

Stern (2000), summarizing two decades of research about adoption of environmentally significant behaviors, identified

four critical factors that affect individual willingness to change: attitudinal, contextual, personal capability, and habit and routine (fig. 1).

Assessment techniques allow educators to determine which of these factors may influence a particular behavior choice for a selected audience, and provide details about how the specific factor is likely to affect the individual’s willingness to change. As illustrated in figure 2, educators can also use assessments to clarify the particular environmental situation and to determine what indicators to use to measure change. Information resulting from these assessments allows educators to select one or more “interventions” that are most likely to lead to desired short and/or long-term outcomes.

For example, Burger and Waishwell (2001) wanted to test a fish fact sheet. They wanted to know:

What message did the audience obtain from the fact sheet?

Who should be the target audience for the fact sheet?

Who should be concerned about risks of fish consumption?

What are the best methods of disseminating this kind of information?

To answer their questions, Burger and Waishwell surveyed people fishing along a certain river, in person, and asked about their response to information on a fish fact sheet. Their audience could be described according to various critical factors: literacy (personal capabilities), ethnic backgrounds (contextual factors), and attitudes about health and the environment (attitudinal factors). Querying people on a personal level (intervention technique) established almost 100% interest in receiving information or sharing the

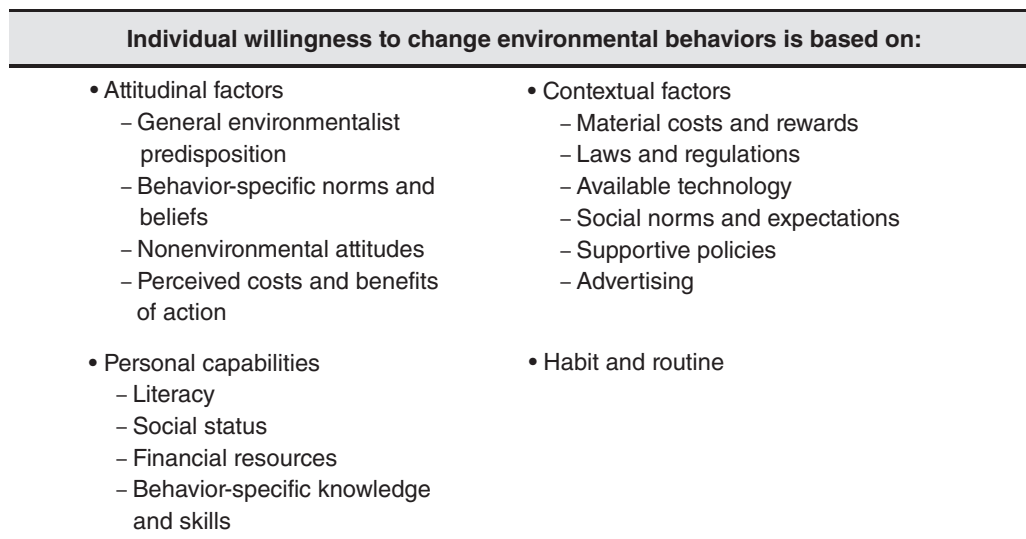


Figure 1—Factors that affect individual willingness to change environmental behaviors (Stern 2000).

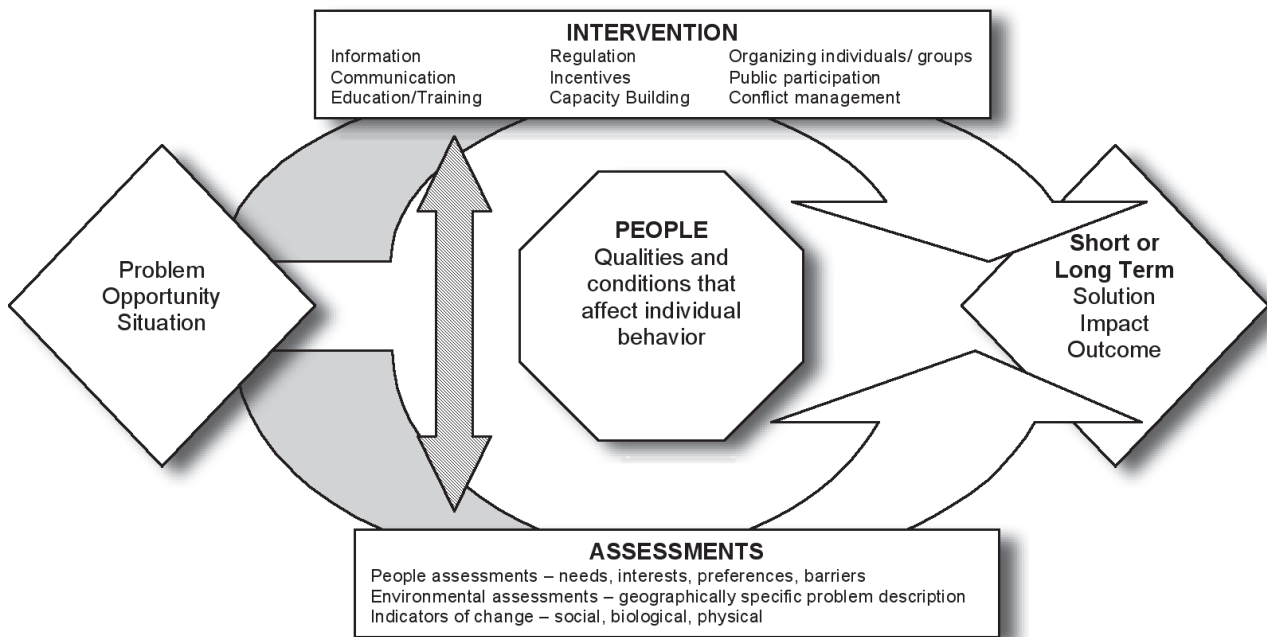


Figure 2—Connecting the situation with the people.

information with others. The majority of people understood at least one message correctly from the fish fact sheet. But audiences had different content interests. African-Americans were interested in health risk levels from contaminated fish and wanted to know where to get more fact sheets. White Americans were interested in the level of contamination in the fish.

Recent efforts to encourage educator use of tested communication techniques, such as *Getting in Step: A Guide for Conducting Watershed Outreach Campaigns* (Tetra Tech, Inc. 2003), provide guidance for how to build motivation and skills to change behavior. Figure 3 summarizes typical

steps for planning an outreach initiative identified in *Getting in Step* as well as other resources (Andrews and others 1995, Seng and Rushton 2003, Simmons and others 2004). Recommended steps clearly rely on information about the targeted audience at many points in the process. Best choices for how to work with the target audience depend on the particular situation and the particular audience. Making these choices is the art of the outreach educator’s work and requires experience, coupled with opportunities to share ideas with other educators.

A nationwide need to provide a more consistent focus for education as part of the work to improve water management

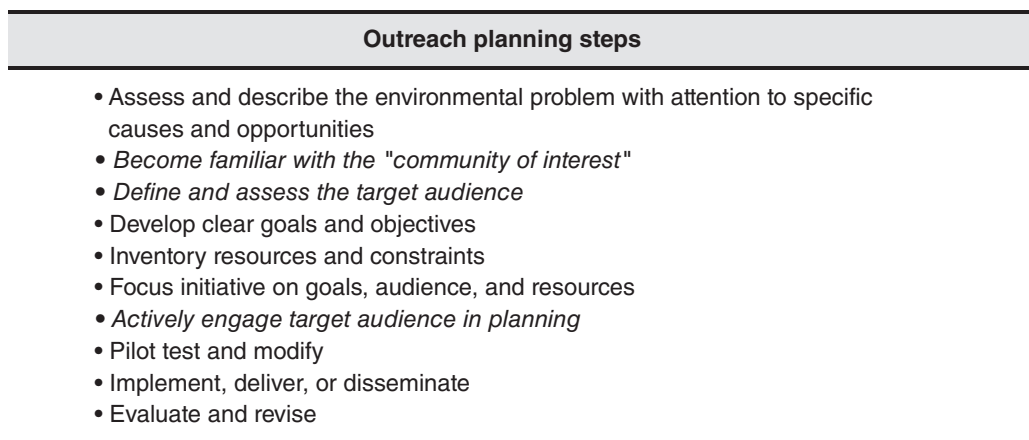


Figure 3—Typical steps for planning with audience components italicized.

has been recognized as a national goal for many years. Several efforts each emphasized the need for research about targeted audiences, training, communication strategies, and local partnerships (Stevens and Andrews 2006). With the exception of Getting in Step (Tetra Tech, Inc. 2003), which provides general guidance for development of communications initiatives, there are no readily accessible summaries of research about behavior change that focus on water-related behavior, or presentations of audience-specific, behavior-change research in a form useful to water educators.

USING BEST EDUCATION PRACTICES IN DESIGNING AN OUTREACH INITIATIVE

Stevens and Andrews (2006) recently completed a meta-analysis of target audience research to help close the gap between research about behavior change and research about water-related behavior by specific audiences. To accomplish the meta-analysis, Stevens and Andrews conducted an extensive review of research published from 1988–2004 to identify methods for water education and outreach that were shown to be best practices for educating specific target audiences.

A meta-analysis is a system for transforming a body of individual research results to category summaries which can be analyzed to determine a range of impacts, or to learn about generalities and trends. Methodologies for conducting a meta-analysis agree in principle but vary in application according to the type of data available. Meta-analysis is most frequently defined as “a set of procedures for summarizing the quantitative results from multiple studies.” Relevant studies are reviewed for key characteristics. Findings from “moderate” to “strong” methodologically are included, and quantitative comparison methods are applied (Campbell and others 2000, Cooper and Lindsay 1998, Hines and others 1986).

The need for some kind of process to enrich educator understanding of how to work effectively with specific audiences led to the effort described in this paper to identify best practices. Many authors have described the need for quality water education (Fedler 2001a, Siemer and Knuth 2001), and have identified elements required to improve its effectiveness (Fedler 2001b, Zint and others 2002). Among these, authors conclude that effective outreach planning requires that education lead toward a specific purpose, and that educators apply essential skills, such as those identified as best practices (Andrews 2007). Fedler (2001b) defined best practices for stewardship education as clearly defined practices or programs that have been “refined through repeated delivery and supported by a substantial body of research.” In the water outreach meta-analysis, Stevens and Andrews (2006) further explain that to call an education practice a best education practice (BEP) is to say it is better

than all other practices to which it has been compared using some standard or criterion of comparison.

In the simplest terms, applying best practices means: knowing your goal; knowing how to achieve that goal; and knowing how to measure effectiveness. The concept of best practices can easily be demonstrated through a fishing analogy. Visualize a young man, fishing pole in hand, lying on his stomach at the edge of a hole in the ice. It’s clear to the observer that the young man has a goal—he is determined to catch a fish. He knows something about how to achieve the goal—he’s dipped his line into the cold lake waters, through a hole in the ice. Finally, we can measure the effectiveness of his technique, and whether he picked the best spot, by noting whether or not he catches a fish. If his goal is simply to have fun on a winter’s day in Wisconsin or to exercise his curiosity, his strategy for how to achieve each of those goals and how to measure their effectiveness might be different (Andrews 2007).

Andrews (2007) has provided a detailed discussion describing the foundation for BEP recommendations arising from environmental education, stewardship education, youth and adult education, and new understandings about how people learn. Stewardship proponents such as the North American Association for Environmental Education, the Recreational Boating and Fishing Foundation (RBFF), the American Fisheries Society, the U.S. Fish and Wildlife Service, the Association of Fish and Wildlife Agencies (AFWA), and the Institute for Learning Innovation (Falk and Dierking 2002) have each proposed refinements suited to their particular goals.

The Water Outreach project itemizes BEPs that relate to water and stewardship education (University of Wisconsin 2006a). The project presents BEPs in two ways: according to theory, and as a summary of research about specific audiences. In Essential BEPs, which are derived from education theory, BEPs are grouped according to typical ways that the educators think about learners, as: individuals, groups, communities, or units beyond the size of a single community. Essential BEPs summarize education theory (such as provided by the American Psychological Association 2002), and incorporate key findings from other summative initiatives such as the RBFF initiative (Fedler 2001b), work by Holsman (2001), and studies that analyze what makes youth nonformal or informal education successful (Horton and Hutchinson 1997).

Target audience BEPs are grouped according to the purpose of the education practice under investigation. The practice could relate to the audience, message content, message delivery, outreach design, outreach implementation, public participation, or evaluation. Study-specific recommendations for 14 audiences are reported on the water outreach website (Stevens and Andrews 2006). Additional audience recommendations are derived from a national symposium to

further analyze what we know about audiences of strategic interest to water educators (Reilly and Andrews 2006). A new study is underway to identify BEPs from 2004–07 research about water outreach and education (University of Wisconsin 2006b).

Recommendations provided either as Essential BEPs or target audience research results confirm the benefit of focusing on the learner and on learning contexts.

METHODS

The meta-analysis described in this paper reviewed existing research about specific audiences of interest, and compiled audience-specific BEPs identified through the analysis (Stevens and Andrews 2006). This investigation helps to define what practices are shown by research to have an impact on knowledge change, skill development, or behavior change. This study is provided, along with other resources, on the National Extension Water Outreach Web site (University of Wisconsin 2006a).

The meta-analysis results describe a body of information that water educators can use to guide their work and to

identify what questions to ask when considering work with a particular target audience. Fourteen different audiences are considered in detail. The study compiles BEPs for each audience. These will help educators apply the most appropriate information when designing initiatives that build citizen skills and motivation to address complex water management scenarios.

To find those education practices that were shown as best for educating audiences important for water management, we reviewed research literature on water information, communication, outreach, and education programs for each of 21 audiences identified as particularly significant to water management activities by a project advisory committee. We reviewed 15,082 references and abstracts (when abstracts were provided) and found 117 references that met our criteria (fig. 4).

We considered different meta-analytic approaches to synthesizing our research findings in useful ways. A standard approach uses quantitative methods, like those described in Cooper and Lindsay (1998) and Wolf (1986), to capture patterns in results across multiple quantitative studies. The studies we reviewed were not conducive to meta-analysis using quantitative methods. We chose

Target audience	No.	Target audience	No.
Adults ^a	1	Local decision and policy makers	4
Agricultural commodity groups	0	Loggers	2
Aquaculture producers	1	Neighborhood organizations	1
Environmental/conservation NGOs	0	Recreational water users	7
Farmers	41	Retailers of water recreation equipment	0
Government agency professionals	4	Service clubs	0
Homeowners	8	Soil and water conservation districts	0
Households	11	Specific ethnic groups ^b	1
Industrial water users	6	Water-related recreational businesses	0
Landowners	10	Youth and college educators	9
Land development businesses	0	Youth and college students	11
		Total	117

^a Adults was not one of our original audience category, but we found one extension-education study that used university employees working in positions that ranged “from grounds maintenance to upper administration” to identify effective methods for conveying information to working people and retirees on environmental and public policy issues resulting from growth and development jams and Marion (1991). Working people and retirees are a large percentage of the adult population in the United States. We read the results as applying generally to all adults.

^b We identified only one study that was primarily and exclusively targeted to ethnic groups. However, when analyzing the studies, we also considered two studies of Farmers and one of Recreational water users that also related to specific ethnic groups. As a consequence of this duplication, subsequent tables will identify four studies with application to Ethnic Groups.

Figure 4—Distribution of relevant references by their application to target audiences.

instead to organize and discriminate our findings by narrative categories following on the examples of Fien and others (2002) and Holsman (2001). We modified some of Holsman’s categories and added several of our own to accommodate the wider scope of our interests and research. Ultimately we evaluated 14 categories of information in our review of each study (fig. 5).

Our evaluation and characterization of research methods relied on four schemes (Campbell and others 2000, Holsman 2001, Leach and Pelkey 2001, Runkel and McGrath 1972). We combined the research characteristics captured by the four schemes into a unified scheme that rated the quality of each study on six characteristics: sample size; subject selection; presence and timing of observations; group comparisons; characteristic comparisons; and description.

We based the findings, conclusions, and recommendations of our study on 96 of the 117 studies and reports we originally considered relevant. We dropped the other 21 studies from consideration when, after careful review, we observed that they did not provide evidence-based recommendations for audience-specific education or outreach. Considering only the 96 studies or reports that were retained for analysis, research-based evidence for audience-specific BEPs was moderate or strong for all 15 audiences. Our confidence in the evidence for audience specific BEPs is highest for households and farmers because of the combination of a

higher number of references with higher overall research quality for these two audiences.

Stevens and Andrews (2006) provide a more detailed description of study methodology in *Outreach That Makes a Difference: Target Audiences for Water Education—A Research Meta-Analysis*.

RESULTS

The meta-analysis findings are reported according to:

- What the finding had to recommend for working with specific audiences
- What patterns or themes emerged from the data across audiences
- How the research findings related to classic education practices

Stevens and Andrews (2006) found that research findings could be grouped according to seven themes:

- Audience information
- Message content
- Message delivery vehicle
- Outreach techniques
- Role for public participation
- Support for outreach professionals
- Evaluation strategies and uses

Taken as a group, the studies described a purpose for each theme and suggested research questions that could help define success or failure for activities with that goal. Figure 6 provides examples of definitions and questions for three of the themes. Figure 7 provides an example of landowner findings for one of the themes, “message content.” Figure 8 provides examples of research about “message content” summarized across all audiences reported in the analysis.

As mentioned earlier, Andrews (2004) summarized classic education techniques through previous work. These Essential BEPs are grouped according to the type of learning experience:

- For the individual
- For the group
- For Web-based learning
- For the community
- For beyond the community

Figures 9 and 10 provide examples of how research findings illustrate these classic techniques for the farmer audience.

Water outreach literature review and summary categories
<ul style="list-style-type: none"> • Supporting reference • Study location • Resource issue
<ul style="list-style-type: none"> • Target audience • Education/outreach theory • Education provider
<ul style="list-style-type: none"> • Education purpose and behavior change method
<ul style="list-style-type: none"> • Type and quality of evidence (research method) • Concept comparison • Research purpose • Measure
<ul style="list-style-type: none"> • Significant findings
<ul style="list-style-type: none"> • Body of literature • Search source

Figure 5—Categories used for the literature review and summary.

Theme	Definition	Applicable research questions
Message content	What information to provide	1) Specific content to convey 2) Content frame or perspective
Public participation	How participation in environmental decision-making contributes to measurable change	1) When to use 2) What type to use in given context
Evaluation	How to develop and use evaluation to improve the quality of water outreach	1) What to measure 2) How to use results

Figure 6—Sample outreach themes identified through a target audience meta-analysis (Stevens and Andrews 2006, table 15).

Landowner best education practices Message content research recommendations
<ul style="list-style-type: none"> • Include information that shows: <ul style="list-style-type: none"> – How the message affects landowners personally – What specific actions landowners can take to improve the situation • Acknowledge landowner interest and concern for the quality of their land • Provide regular feedback about how well goals and plans have been achieved

Figure 7—Sample “message content” research findings for landowners (Stevens and Andrews 2006, table 16).

Best education practices for all audiences Message content research recommendations
<ul style="list-style-type: none"> • Specific content to convey <ul style="list-style-type: none"> – Cost savings or improved economic benefit – Ease of doing the right thing – Explicit instructions about what to do – The exact nature of the problem; what information is important to know and why • Content frame or perspective <ul style="list-style-type: none"> – Tailored to address specific audience circumstances – Easy to understand – From a trusted source – Up-to-date – Addressing: attitudes, knowledge, intentions, behaviors

Figure 8—Sample “message content” findings summarized from research across all audiences (Stevens and Andrews 2006, table 24).

Essential BEP	Farmer BEP example
<p>The learning experience for the individual:</p> <p>Can be adapted to individual differences in learning strategies and approaches.</p>	<ul style="list-style-type: none"> • Link education to production decisions to reflect the fact that operators prefer to make production decisions based on their own farm records and advice from on-farm employees. • Work with operators to review farm records in order to consider potential impacts of proposed changes <ul style="list-style-type: none"> - Increase knowledge of on-farm advisors - Collaborate with many groups/organizations to convey important information - Work with farmers individually to determine participation level

Figure 9—Research about the learning experience for farmers learning as individuals (Stevens and Andrews 2006, appendix C).

Essential BEP	Farmer BEP example
<p>The learning experience for the group:</p> <p>Promotes active engagement and real world problem solving.</p>	<ul style="list-style-type: none"> • Provide information to farmers in three stages: <ul style="list-style-type: none"> – Information to stimulate farmer interest – Personal contact with farmer to provide new farming practices that are viewed as solutions to their problems – Work collaboratively and cooperatively with the farmer in the adoption of new practices • Design outreach to address farmers' preferred learning styles <ul style="list-style-type: none"> – Provide farmers with opportunities to solve a problem, in addition to providing other standard hands-on outreach techniques such as opportunities for talking with specialists, field days, demonstrations, etc. – When training new farmers, focus on problem-solving and production agriculture skill development

Figure 10—Research about the learning experience for farmers learning in a group (Stevens and Andrews 2006, appendix C).

DISCUSSION AND CONCLUSIONS

The meta-analysis results provide evidence to support the promotion and use of specific education practices. Findings add audience-specific examples for classic education techniques, and they amplify information about how to most effectively accomplish various outreach strategies, both for specific audiences and for water education as a whole. They indicate that water educators have begun to develop sophisticated techniques that couple dissemination of significant information with citizen goals to achieve improvement in water management. The Essential BEPs

applied in organizing findings for the report are applicable to environmental stewardship and management education in general. Audience BEPs reported in the meta-analysis are research-specific. Study findings provide useful guidance for any educator working with these audiences, but need to be validated for any specific situation.

The study identified a number of needs. There is a need for careful attention to research techniques for judging outreach effectiveness. For example, we were unable to use results from several studies due to their failure to carefully associate outreach impacts with specific audiences or

techniques. While there is adequate diversity in research about impacts of water outreach, there is a need for more research about selected audiences and a need for research that more comprehensively addresses the complexity of the outreach effort for all audiences. In particular, educators would benefit from more studies about ethnic groups, local decisionmakers, students in higher education, and volunteers. Educators could also use more audience-specific findings that describe effective use of “message delivery vehicles,” “public participation,” “support and motivation for professionals,” and “evaluation.” There is a need for more research investigating the effectiveness of Web-based learning strategies. Finally, there is a need for research which highlights best practices for training policymakers, organization leaders, and agency administrators who promote or supervise water education and management activities, as well as facilitating their own groups’ knowledge-development strategies.

No study can do or cover everything. For instance, as much as we endeavored to be comprehensive in our review of current literature, we are confident that we missed research that might have added to the quality of our results. The following are other study strengths and weakness of which we are aware (Stevens and Andrews 2006):

- We were as transparent as possible with our procedures so that critical readers can know how and where we drew the boundaries of our research and know its limits.
- Meta-analysis recommendations are based only on literature published in journals cited in the databases in the study. We did not make an exhaustive effort to find research literature published elsewhere, nor did we search for “grey” literature. We did, however, make repeated checks with specialists to attempt to discover literature of interest to this study.
- The quantity of supporting research is quite limited for several target audiences considered in this study. As a result, some audience-specific findings are not as robust as they might have been had we found more primary research and literature reviews relevant to the study.
- We faithfully documented the schemes we used for rating the quality of research. We used schemes drawn from multiple sources to maximize their objectivity. However, no rating is completely objective. No matter how objective the scheme, its implementation is always, to some degree, subjective.
- We rated the quality of each study and report as a whole. We did not attempt to rate differences in the quality of individual findings within each study. Individual findings may differ in their strength and quality, but we report them here as if they were equal in validity and veracity.

To do otherwise was beyond the scope and resources of the project.

- We report recommendations and references for each target audience as a group. A new resource, the Target Audience Database, allows users to identify a citation for each specific finding. Please see at <http://wateroutreach.uwex.edu/cpb/tad/index.cfm>.
- We engaged in an interpretive process to convert study findings and recommendations to BEPs. While we made every attempt to faithfully mirror the research finding in the BEP statement we created, it is likely that we missed some relevant points or that, in some cases, we made an interpretation not fully validated by the research.

Recommendations in this meta-analysis are based solely on the research described in the 96 studies we considered in the analysis. We did not attempt to compare recommendations about a specific topic, such as message content or message delivery strategies, with other research conducted on that specific topic when it was derived from studying applications that lay outside the water outreach parameters defined for our analysis.

Extension professionals are committed to providing new information while respecting citizen decisionmaking processes. This study points to the complexity of identifying and practicing effective outreach techniques that respect that goal while facilitating a commitment to careful management of the water resource and its related human and natural ecosystems. It also points to the strength of work in progress.

Building educator skills in implementing effective practices will make a difference. Research that amplifies these results will increase understanding for how to make that difference. A new study initiated shortly before the conference, *Changing Public Behavior: Increasing Citizen Involvement using Target Audience Information*, is exploring techniques for building educator skills in using results of this study, and for developing location-specific information about specific audiences when developing an outreach plan (University of Wisconsin 2006b). The project is pilot testing in-person and online training resources. Elements include a seven-step process described in an online self-study module. The module specifically emphasizes how to assess audience interests and select outreach techniques that reflect results.

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A FRAMEWORK FOR OUTREACH ACTIVITIES

Martha C. Monroe¹

Abstract—A variety of activities fall under the broad heading of “outreach.” The diversity of programs, procedures, skills, and models can make it difficult for those who conduct outreach to communicate with each other. This presentation proposes a model of four types of outreach skills that vary by audience motivation, engagement, and purpose of the outreach. At the core of all categories is providing science-based information. If audiences are seeking this information, providing it is all we need to do. If audiences are not seeking it, however, we must understand the audience needs well enough to provide relevant and meaningful materials and programs. These two nested categories form the foundation for the remaining two. If there is agreement that the agency should promote a change in behavior, the third category includes the skills and models that enable us to create effective programs. If there is not yet agreement, outreach experts can be engaged in facilitating stakeholder discussion groups that aim to find common ground and directions for next steps in the fourth category. Because of the variation in audience and purpose, the evaluation questions in each category can be different.

INTRODUCTION AND SITUATION

In 2004, I attended a Technology Transfer conference in Troutdale, OR that I believe was an inspiration for this gathering. Although I am an extension specialist and educator, I spent the whole first day trying to figure out if I did technology transfer, if they did education, and what the difference might be, if any. Most confusing was the fact that we used similar words and had similar goals, but didn't appear to be using similar strategies or even reaching the same types of audiences. Outreach means many different things.

In the end, I decided we did share much in common, but as we stray from that common core, we use different words and have different techniques that have the potential to contribute interesting and unique strategies and practices.

This presentation introduces a framework that may provide a common language and give us a way to talk to one another. I will suggest the theoretical foundations for this framework and provide some examples. I welcome questions and challenges and other ways of thinking about our work.

PROGRAM

Providing Information to Interested Audiences

At the core of much of our work in technology transfer and extension is providing information. This is typically science-based information that our audiences want to know. One speaker at the Troutdale conference compared this work to that of interpreters or translators—taking technical, scientific

reports and making them understandable to those folks who need that information. This is exactly how most agriculture extension specialists define their jobs—conveying research findings to farmers (see for example, <http://edis.ifas.ufl.edu/PI043>). Farmers need research-based information to efficiently and economically grow crops or manage livestock. Similarly, much of the tech transfer work of the Forest Service, U.S. Department of Agriculture is aimed at forest managers (see, for example, <http://www.fs.fed.us/pnw/publications/index.shtml>). Our audiences are so keen to have this information that we don't worry much about how it looks; the text is the most important thing. We remove academic jargon, we explain the context, we simplify the outcomes, but we make sure the information is still accurate, not over-reaching the conclusions, and appropriately generalizable.

Some extension and tech transfer specialists, however, are aiming to reach audiences who are slightly less motivated to plow through the straight information, or who may get so many newsletters and flyers that there is competition for their attention. Publications may have color photographs, bulleted lists, and interesting comparisons. The text is even more readable, and the graphic design is appealing and interesting. Large clever titles grab attention, but the mailing list is still a rather defined and narrow audience (Outen 2006).

There is an extensive body of literature in the field of communications that supports our work in this area, primarily around text readability, visual communication, and graphic design.

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Providing Information to Audiences Who Are Not Motivated to Seek It

Our publications, such as wallet cards and brochures, may also be designed to reach and educate an audience who is not looking for information. If these materials are successful at attracting attention and conveying information, it is because we take steps to understand their values, ideas, concerns, and motivations. In this category are the social science skills for audience analysis and a number of models that guide our efforts to introduce people to new issues, create awareness, and build mental models that will create understanding.

Because we know it is important to link our message to strongly held values and concerns, we often focus on issues that reduce risk to both human and ecological communities. We have to understand our audience to be able to communicate with them effectively. We do this with literature reviews, interviews, focus groups, surveys, and observations, typically. We look for:

- Initial conceptions of the issue or problem
- Potential misconceptions of the issue or problem
- Concerns and attitudes about issue
- Values that conflict with solutions to problem

In addition to text material, we often design interactive programs and presentations to engage the audience so we can immediately check for understanding, provide feedback, and make sure that they understand. A recent streamtable display at the Smithsonian Festival in downtown Washington D.C. that allowed members of the audience to design a stream and then witness the water flow is a good example of engaging people with concepts to further their understanding (Personal communication. 2006. A. Bartuska, Deputy Chief, U.S. Forest Service, Washington, DC 20024).

The theories that guide our communication activities with this information relate to cognitive dissonance, relevance, interestingness, misconceptions, and experiential learning (Petty and Priester 1994). We create more readable text, more vivid descriptions, interactive programs, and use the concerns that residents have to introduce a topic. Once we have a handle on how our audience perceives this issue, we can communicate information and suggest ways they can use our topic to meet their goals (Monroe 2005).

Changing Behavior

In many circumstances, of course, we communicate with audiences not because their life will be better if they know about native trees, but because we want them to do something, such as plant native trees in their yard and remove invasive species. Just as the second category

encompassed and added to the initial core of providing information, so too does this category build on the second and first. In addition to translating science-based information and using audience analysis to craft messages and programs, outreach programs in this category use the power of persuasion and social marketing to encourage audiences to adopt new practices. In rare cases information alone can change behavior, but only when the lack of information is the barrier to action (Schultz 2002).

There are clearly some situations that are appropriate for social marketing and some that are not. When the message is clearly within an agency's jurisdiction, it is reasonable that staff would promote it, such as water conservation, habitat protection, and air quality. When the message is urgent, you also expect a government agency to safeguard life and property and provide persuasive information, as with wildfire, evacuation, and toxic waste. When the message is not controversial but merely makes life better, it is reasonable to use social marketing, to encourage boater safety or promote birdwatching, for example. When the community is in agreement that a new practice should be employed, social marketing is acceptable.

We should not use social marketing when the issue is controversial and the outcome is not yet determined by the agency, community, courts, or stakeholders. Prior to resolution, a government agency probably should not be advocating for one side or another. The outreach activities for such issues belong in the fourth arena.

A variety of social marketing tools are possible to nudge audiences toward an agreed upon goal (McKenzie-Mohr and Smith 1999). Purposive communication campaigns could use techniques such as persuasive communication, reminders at the point where the behavior happens (called prompts), incentives and disincentives, demonstrations and modeling, feedback about how the campaign is progressing, opportunities to practice the behavior without fear or risk, and commitment. The Theory of Planned Behavior (Ajzen 1985), Diffusion of Innovation (Rogers 1995), Reasonable Person Model (Kaplan 2000), and others (De Young 1993, De Young 2000, Hungerford and Volk 1990, Stern 2000) are widely used in the development of these programs.

Engaging in Deliberation

Many of our communities have important questions facing them about sustainable resource management as they look to a future of more people, greater diversity of expectations, and more demands for the goods and services our resources provide. There is uncertainty and there is conflict. When there is not clear agreement about how to proceed, outreach programs can be used to help find common ground.

A variety of experiences have been used within the area of natural resource and environmental decisionmaking to

bring both the experts and the citizens together to learn from each other (Wondolleck and Yaffee 2000). It may be called collaborative learning, reaching informed judgment, public deliberation, or adaptive collaborative management. The facilitator of this process could easily be an extension or technology transfer specialist. It would require of them skills that bring groups together, create an atmosphere of trust and acceptance, engage people in an exploration of the known and unknown, mediate or negotiate, and allow information to come forward from multiple perspectives (Allen and Kilvington 1999, Daniels and Walker 2001). In the case of conflicts, the outcome of such a process may be a proposal that has broad acceptability. In the case of proposed management strategies, the outcome may be citizen-established indicators of acceptable standards for management.

This process really only works when the decisionmaking body (agency or municipality) believes that their next move should be with stakeholders and in pursuit of common ground. Such an attitude seeks and rewards citizen participation. This process will not work if participants believe the agency is not bound to follow their recommendation, or if the decision was already made and public involvement is merely a required activity.

EVALUATION

Regardless of the type or purpose of our outreach activities, we plan, pilot test, implement, and evaluate them according to the measures of success we have identified. Each of these four categories uses evaluation to answer slightly different questions.

Within this first category, we typically evaluate success with the number of brochures and newsletters distributed, because they are picked up by people who want this information. We equate obtaining with reading with understanding. Occasionally we send a survey to this motivated audience and ask if they read our materials, if they find them useful, and what other topics they would be interested in. We know these audiences fairly well—they are closely connected to our work: they are forest managers, forest landowners, farmers, and natural resource professionals. They look to us to provide them with information they need to do their job better, more efficiently, more economically, or with more desirable outcomes.

In contrast, we evaluate the materials and programs produced in the second category by determining if materials were designed to meet the audience’s needs, by testing for understanding, and by documenting shifts in attitude or knowledge. We stop short of measuring change in behavior because we acknowledge that there are many variables that determine or prevent behavior; providing good information is only one piece in that puzzle.

We evaluate behavior change programs, the third category, by measuring intent to change, perception of barriers, acceptance of the new idea, and actual behavior change. Sometimes we can measure changes to the resource, such as improvement in water quality indicators, increase in acres under a new management scheme, or population increases.

Finally, programs that create discussions that allow parties to understand each other can be evaluated by measuring change in perceptions, increased understanding, establishment of indicators to measure management outcomes, and change in positions among conflicting parties.

CONCLUSION

There are four distinctly different types of skills and activities within our worlds of extension, outreach, and technology transfer (fig. 1). Although some of us may tend to be in one arena most of the time, any given issue may demand that we work across these lines and tap the skills in several arenas to create and facilitate communication.

For example, a team at the University of Florida’s School of Forest Resources and Conservation is working in three of these four categories in a new Wood to Energy community outreach program. To those who are motivated, we provide a General Technical Report with a review of the literature, case studies of supply curves, and feasibility studies. We have also conducted studies to better understand public perceptions, concerns, and notions about energy resources and forest management. A very carefully crafted set of fact sheets will explain carbon-neutral energy sources, compare wood to fossil fuels, discuss forest management on private lands, and explore air quality emissions from open burning and controlled incineration. These fact sheets will be readable and attractive, and they will present advantages and disadvantages of wood in the context of the South and rising energy demand. We are not likely to promote the social

- 1 = Providing information to interested audiences
- 2 = Providing information to uninterested audiences
- 3 = Changing behavior
- 4 = Engaging in deliberation

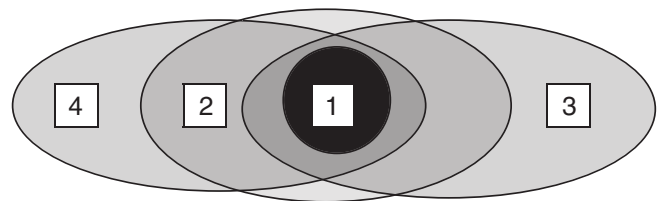


Figure 1—Four types of outreach activities and skills.

marketing category because we don't honestly know the best energy resource for every community. We believe they need to determine that for themselves. In some cases, burning old tires or construction debris will be economical. In others, waste wood from forest operations can be used. In both cases we think the community should be involved in setting criteria of acceptable limits on forest management, forest harvest, transportation, air emissions, and any of a number of concerns they might have. To that end, we are promoting citizen workshops that will introduce information, ask for questions, and generate a vision of what an acceptable energy future might be.

This is a rather long answer to the questions of who are we and what do we have in common. I hope this framework gives us a common language and enables us to talk about our projects in a way that we can all understand, rather than in words that are unique to one agency or another.

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BUILDING ON OUR STRENGTHS FOR BETTER SCIENCE DELIVERY

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Clearly the whole issue of research and science delivery is a concern of all the different organizations that are represented here: Research and Development (R and D) and State and Private programs of the Forest Service, U.S. Department of Agriculture, Forestry Extension, State Forestry communities, the NGOs that are here, as well as the academic sector of the Extension Service. So all of us have different roles that we play, and I think part of our challenge is figuring out a delivery mechanism that allows us to take advantage of each of our strengths and abilities and start working in a seamless fashion.

In one of my first meetings after starting this job, my boss challenged me, “So what does that mean, how do you work with Extension?” I don’t think we’ve come up with an answer yet, but I do think there are some real opportunities in front of us. Being here with members of the Extension community I think is really an especially important accomplishment for us, because it is an organization that has been around for a long time and therefore has networks that could help our Agency’s science delivery efforts. These networks extend deeper into the communities than we in the Federal Government, especially our research organizations, typically can do. So a partnership among us really has the makings of a world class communications network. Such a network must be flexible enough to encourage new players as they emerge, but formal enough to enhance communications, set priorities, and secure resources.

I’m not going to spend much time now on the mechanics of all this; that’s maybe something we can talk about later, but I think one of our challenges in science delivery is that the dollars available to do the job are woefully inadequate. Not a surprise, I think everybody here knows that. One of the strengths of the community in issues like this is we can leverage each others funds and capitalize on our connections, and maybe stretch those dollars even further. And so I think that you have real opportunity in your conversations during this meeting to discuss this important question: How do we leverage the different skills and abilities that we all have?

That leveraging of funding is certainly something the Forest Service community is trying to do. What I want to do is spend the rest of my time talking about what we’re doing in the interest of stimulating further conversation about whether we are on the right track and what more could we be doing.

When I came into this job, we began talking about different science themes that the Forest Service has been promoting as we look toward the future. One of those themes, “science you can use,” has become almost a little trademark or brand for the R and D program. And if you haven’t seen that phrase in some of our documents, then we’re not giving them and showing them appropriately. But it is something that we are trying to make a part of the way we do business by having it in front of us all the time. Although we all know that not every bit of science is going to directly link to useful products, it seems to me that we’ll be on a better track if we’re always thinking about the applications step in the research process and the opportunities we have to contribute to that step. So the issue of “science you can use” is something that I hope will become part of every research station’s vocabulary.

The Forest Service R and D Program is committed to playing a larger role in science delivery. And I think one of the things that we have recognized for a long time is that we need to learn the language of our customers and to understand who makes up that customer base and what products and delivery mechanisms will help us be more responsive to their needs.

Clearly a big challenge is technology, which is changing so quickly that we are in danger of failing to keep up with our research collaborators and the communities we are serving. One of the strengths of a science delivery partnership would be to open technological options and to advise the Federal component on where we need to become more flexible. For example, a few days ago somebody was telling me “So we just hired some 18 year-old to just set a blog up about Forest Service research and if you really want to reach people, blogging is the way to go.” I don’t know the first thing about blogging, but I do recognize that it is the kind of new mechanism that we could be taking advantage of. In recognition that we want to take advantage of emerging technologies, our station directors have agreed to set aside funding that will be dedicated to the electronic environment and to making materials both more understandable and more readily available. Starting by making our Web sites searchable in formats that people can more readily use, we ultimately want to move beyond organizational structures and begin organizing our materials by topics that interest our customers. A couple of examples that come to mind include the Southern Regional Extension Forestry Portal and our own TreeSearch database of online publications.

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We know that there are many different mechanisms that we can be using to establish a mass multi-faceted science delivery effort. Printed publications are still a priority for us, even in the midst of all the electronics; they have just gotten more sophisticated, with more graphics, accompanying tools, and interactive displays. Also, we are aware that face-to-face meetings provide opportunities for linkages with the customer base that will help us talk about our products and understand how customers want to use it.

We are increasingly recognizing that science delivery is more than just products coming out as a by-product of research and that it extends to how we do science and how we communicate with customers and potential customers about the science we are planning and doing. For many of you that's obvious, but to go beyond that recognition and to figure out how a scientist or a research unit could translate those approaches into a different way of bridging the gap is an important and difficult challenge for us. We know that we have special people in our work force who just do a really good job at that particular task. We also know that there are others who are doing fundamental research that is unlikely to yield immediate products but holds the promise for giant leaps in science. So our job as research administrators is to develop a system that nourishes both ends of the spectrum, both sets of skills and everything in between. This is the strength of any effective research organization and I think it's a potential strength of this community of interest.

The move toward a more integrated research and science delivery program is an evolution from a couple of years ago, when the President's budget examiners gave us a wake-up call and said, "Okay we want you to do 22 million dollars of science and technology and application, and by the way you're taking the money out of your budget to do that". And I said, well, let's rethink that. We really don't want to unfund programs that are already stretched thin, but we can still deliver on science and technology if you will give us some flexibility on how to proceed. And in fact we were listened to as one of the examiners said, "Okay prove it to me," so, the last couple of years, we've been proving it, and I think increasingly successfully.

Our first step was to establish a Science Application Partnerships Initiative. We have asked the stations to set aside some funds for partnerships that deal with incorporating research applications into science planning and delivery. I think there are some really excellent examples where these partnerships have been successful. Just a few here in this region are the Southern Center for Urban Forestry Research and Information and the Southern Center for Wildlife Urban Interface Research and Information. And I'd be remiss if I didn't mention the Forest Encyclopedia Network. Those southern examples are being replicated all across the country that we have used to give ourselves permission to change how some in our workforce look at the way we deliver our science.

What else are we doing? We don't want the concept of research applications and science to become an initiative or a program, but to become the way we do business for all the programs that are in place. One of those examples is the National Fire Plan, which is a source of funding for many researchers in the South. At the national level, we have set aside and developed fire fuel strategy that is composed of four programmatic areas. Each of the programmatic areas has a science and technology piece. So instead of setting science delivery aside as a separate entity, we have concluded that it is our responsibility to integrate applications efforts within the research process, and we have set up processes to ensure that expectations for delivery will be tracked. So building that into the way that we manage our programs and holding ourselves accountable will be something that you will increasingly see.

And we're also looking into how we reward our scientists for their technology transfer and application efforts. Those of you in this room who do research know the challenges involved in acknowledging science delivery in the research panel process, our way of evaluating and promoting scientists that mirrors promotion in tenure at the university level. We are exploring the possibility of establishing a new career track for employees specializing in science applications. But we also have employees in the research cadre who spend a large part of their time in science applications; for them we will need to take advantage of the tools that we have in the human resources which we almost never use, but we know the authority exists to advance people's careers based on increased knowledge. We just need to be more deliberate about recognizing the skills that we have out in our workforce.

Many of those employees are coming together in our newly formed National Science Applications Team, which consists of representatives from all of our stations and has become an incubator for new ideas on how to get our science and our formats and products to better meet our customers' needs. And I think in just a very brief life that the team has done a great job in serving as the liaison with the rest of the workforce. If we're doing it right, there's going to be a continual feedback mechanism among the team members and the rest of the science workforce so that they know they have a voice to bring some new ideas forward and eventually try new technologies and new opportunities. So I think it's an idea that really works organizationally. Again, we are a very large organization so some of these structural changes are necessary to give horsepower and recognition to leadership. I'm really pleased at the extent of to which they really jumped on that idea.

Among the projects the National Science Applications Team is considering for the next 5 years is a short-term project on a 100 years of science applications, which would gather, in one place, all of the projects that answer the age-old question, "So what have you all done for us lately?"

Another effort that I think is especially timely is an approach for dealing with large scale disturbances; whether brought by fires, hurricanes, or biological invaders. Last week some of us were looking at the aftermath of Hurricanes Katrina and Rita in Mississippi and we asked ourselves, “Where is science in all this?” The public recognizes science can play two roles, first in helping to respond to those emergencies, and second, to better understand the forces at work. And so the National Science Applications Team has adopted the idea of forming rapid science assessment teams or a rapid response team out West to mobilize resources and rapidly get information into the hands of others. They are not thinking in terms of publication, which take several years to produce, but merely a format that helps people learn quickly how to be better prepared for the next event. I think it’s also important for us to recognize that we’re living in a large scale disturbance world which seems to be continuing unabated, so having science right at the table to advise and contribute would be incredibly valuable.

This idea of using technology to improve science delivery is becoming more important as travel costs increase. Examples include online symposia, video conferencing, and even the possibility of a central call-in service for fielding customer questions, something like 1-800 RESEARCH. I can’t help thinking that the call-in service would be useful for customers who can’t necessarily get online all the time or who need in-depth information about a particular subject.

So those are some of the ideas of the National Science Applications Team is considering. Many of them, in fact in all of them, are not limited to just the Forest Service, but will have to involve the larger forestry community so that we can take advantage of the work that’s already being done and the information that’s already available.

The last thing I wanted to talk about is a mechanism for knowing whether we’re doing what needs to be done and how well we are doing it. This idea of customer service goes back to our discussions with the President’s budget examiner who asked the question “So, not only, what are you producing, but also, how good are you at it?” It is an issue not only for Forest Service R and D, but for the National Science Foundation, National Institutes for Health, and the entire Federal research community. We are now being called on to report how we’re performing and what we’re producing with the tax dollars we’re spending. And so part of the challenge is that our traditional metrics of science delivery—number of citations, number of publications, number of our talks given—are not effective for those who are interested in what science produces, which leaves us struggling to come up with metrics that make sense. The metrics we choose must take into account the reality that science doesn’t happen in a nice annual cycle, that only with long term investments will we achieve those “Aha!” moments—a process that takes 30 years, or 40 years, or 50 years to really know what you know from the science you’re doing.

What is a short term way to assess performance? Based on input from the forestry community, we decided that one measurement is customer satisfaction that we have served their needs well. And so we decided to establish a customer service survey that would supplement the anecdotal information we have with regular feedback and collect statistics to track where we are on the spectrum and whether we’re getting better or getting worse. We contracted with a highly experienced marketing firm to develop and send out a survey instrument to about 11,000 names. The response rate was 12 percent, which I’m told was reasonable, in fact above average for surveys of this type. I actually got a few personal emails like “Is this a spam?” “What is this coming from?” For some reason, my personal inbox showed up as the address to reply. There weren’t too many, I think somewhere around 12, but still, they gave me an interesting perspective on how people respond to surveys.

Their final reports from the survey are not out yet but the preliminary data suggest an overall customer satisfaction index of 72, which is the average rate for equivalent surveys that the contractor has done with other groups, especially in the Federal sector. Interestingly enough, when we compare across the different programmatic areas, such as fire versus invasive species versus recreation versus wildlife and fish, there was really no difference in customer satisfaction. And the reason I point that out is, I’ve tracked what The Nature Conservancy has done—in fact every 3 months or so, they measure what the community is thinking about in certain conservation issues—and they’ve consistently found a much higher recognition of fire versus other conservation issues, especially wildlife which is always on the lowest end of the interest spectrum. I’m not quite sure what to make of that difference between these two sets of results, except that ours measures satisfaction survey, which would suggest that we’re providing materials equally in all the different areas of the strategic work that we do.

When we look at whether or not we’re doing well at delivering those materials, our scores rise into the 80s, which is an above-average response to the specific statement that customers are “highly satisfied with products, services, and courteousness and helpfulness”. So we are in fact doing not too badly in the delivery of certain things. As we look at which products and services to improve we will need to be aware of how demands are changing relative to those products.

But we also have scores that are down in the 60s. One is in the perceived usefulness of the information we’re providing, either in terms of actionable solutions where users can easily comprehend what to do to apply our information, or in terms of users getting answers that are workable within an existing resource, which I assume to mean money, time, and people. And so that’s really an interesting perspective to incorporate when we’re looking at how we’re producing information and what we’re doing with it as we translate it for a broader community.

Our other below-average score was in communications and in informing users about the availability of our products and services. Improvements in this area will have to come from an understanding of both the delivery systems that are available and the way in which our customers prefer to access information. For example, I can say for myself that when I want to find information on what the Forest Service is doing, I don't go to the Forest Service Web site, not because I won't find it, but because I—like most people—can find what I need a lot faster on Google or Google Scholar in the case of science information. This recognition of how people access information will help us make significant improvements in how we communicate now that we have a metric on where we are, where we could be going, and how our work is valued by the public.

I believe that we've taken some important first steps that demonstrate our commitment to bringing our science and our products forward. I also believe that your enthusiastic attendance at this conference demonstrates that effective and efficient application of our science findings is a critical part of the work we do. It's critical to becoming a high performance organization and to fulfilling our responsibilities in government's performance reporting. But more importantly, it's a commitment to taxpayers that we will provide information that people can actually use and that they can put to use in the work they do. This is what the public expects and what we can do if we all work together.

We have an opportunity to raise the profile of science to a higher level. A revamping of the Forest Service strategic plan is underway now. In it will be a new strategic goal, number seven, that is all about technology application, which we will use to hold ourselves accountable not only to ourselves but to Congress and the American public. If we can work together on developing and measuring the effectiveness of new science tools, we will never again be stumped by the perennial question "Well what are you doing this year and what budget are you putting to it and what resources are you putting to it?" If we can rethink how to get science and technology applications into the hands of users and address some of the bigger issues of sustainability both of lands and communities, we will have provided great value to the public.

So again thank you very much for giving this opportunity to be a part of this conference. We still have a little time for a few questions now, and I hope that you will not hesitate to contact me with follow-up ideas and questions.

Questions and Answers

Q: It seems to me that in light of some of the internal Forest Service decisions about trying to outsource or compete our Web development and production services, there's a dichotomy between retaining control of the scientific

information that is presented on the Web and the actual posting of pictures and documents. I wonder if any thought has been given to parsing those responsibilities such that Forest Service R and D and our cooperators could retain the science component in ways that address the changes we expect to see in Web delivery of science.

A: It's one thing to outsource quality Web design but you can't export the content of that web design. There's no question in my mind that whoever does Web design and refreshing will be turning to us for the content and creating the network that allows us to provide that content. So it will be the job of research administrators to ensure that science delivery be left in the hands of the people who understand the science, not somebody whose only skills are in design and production.

Q: Back 25 years or so we had what they called technology transfer and it involved Extension, Service, State Forestry agencies, and the science application sponsorship initiative of the Natural Resource Conservation Service. Do you envision that degree of involvement or is this effort strictly internal to Forest Service R and D?

A: The science partnerships are designed to be broader than just internal. The National Science Application Team is an internal team and I think that to avoid violating the Federal Advisory Committee Act (FACA), we probably need to keep it an internal team, but I think there are plenty of opportunities to involve others. It will be a challenge to ensure that the community of interest is involved without violating FACA, but I believe there are many mechanisms for us to do that. One obvious solution is for partners to develop an organization and invite Federal employees to participate. With every station director and the R and D program as a whole viewing science applications as a priority it should not be difficult to figure out how to best make use of existing networks so we have the skills that we need, recognizing that there's always going to be some variability. An example here in the South is the networking opportunities when the Extension Service created the position, currently occupied by Bill Hubbard, which is dedicated to adding leadership and focus throughout the 13 Southern States.

Q: You know the Extension Service has evolved over the years and today we think a lot more about our role being not necessarily the link between the research community and the end user, but a more integrated function, that earlier in the process becomes part of the research process itself. Maybe to pull a little bit of money out of the research effort and make it available for extension work as the research is progressing, but certainly to involve the extension function much earlier in the process. You do the research project and when it's all over, and the papers are published, you say "Okay, now what do we do with it?" The application of science should be part of research project planning and

implementation all the way through. So my question is, have you given any thought to having internal technology transfer people or maybe having extension partners involved earlier in the process?

A: We've been talking about those kinds of activities since I came into the job and that's what I meant when I talked about starting a new career track, making it easier for a particular research work unit or science community to identify people who are explicitly charged with bridging technological gaps, using networks seamlessly, and connecting to their counterparts in the Extension Service. Part of the problem with some positions that we have is that the employee starts as a GS-9 and then the only way to be promoted is to take another job in another location. If we made better use of current authorities to promote employees in place, then they actually could stay within their unit and acquire additional experience and knowledge. In effect, we would be growing our own specialists in the applications arena. It's one of the goals of the National Science Applications team to more regularize that opportunity.

Q: I am curious about the Forest Service R and D program on the Web. Aside from products like the TreeSearch database of online publications, would you say R and D is going more towards a national Web presence or maintaining separate Web identities for individual stations?

A: There's always going to be a station identity because there will be place-based needs, people will want to look for their favorite station, but for those who don't know us already, whether they are visiting the Southern Research Station or the Forest Products Laboratory is irrelevant. They are looking for information regardless of its source, which can only be achieved through national Web presence. My belief is that if we minimize the organizational "clutter," we can focus more on the "science you can use." If customers want information about fuel research or invasive species, our job is to get them to that information and the involved scientists as quickly as possible. When congressional appropriation staffers say they can't find anything on our Web site, so they always Google it, that bothers me because it means that we do not have a unified Web presence. One thing I want to do is make "science you can use" the first thing that comes into view when a visitor lands on our Web site, and to feature 10 stories that visitors can scroll through and click on one to get the rest of the story. The stories would be freshened up on a quarterly basis, so we're always bringing new information forward in a way that matches the way customers are searching.

Q: Here's a little bit of a challenge. I'm from out West in Oregon and I see some great research happening at the Pacific Northwest Station and the Pacific Southwest Station but there's really no integration at all between them and the Extensions Service. I get the sense that, here in the South, the fact that this meeting is taking place means that there's some integration, which is pretty impressive to me. But I'd like to see more of that in our region out West.

A: Different stations have different histories and different types of associations. In the West, because we've been so linked to the national forests, our customers have been internal to the Forest Service and it's been easier to deliver our information to them. Lately there has been more focus on external customers by the three western station directors, all of whom are relatively new to the job. They are working together and all were in the national office when we developed the "science you can use" theme, so if you don't start seeing a change I would be surprised. In fact I've already heard of a lot more connections being made between station headquarters and the universities.

Q: You were talking about integrating extension and Forest Service research; are you describing the creation of an Extension Service within the Forest Service?

A: That's not something I would want to do. Here's an example of what I'm thinking. A research work unit would continue to have research grade scientists and forestry technicians, but would also have a technology application specialist. This would be somebody who was hired for that job, would have good communication and research skills, and would become "best friends" with Extension Service specialists at the local university or wherever opportunities exist for collaboration. The goal would be to maintain direct contact between the research unit and the delivery mechanisms offered by Extension Service. This would regularize the linkage to Extension Service, not waste resources by trying to duplicate a system that already exists. In conversations with representatives of other USDA agencies in Washington, the focus has been on seamless and integrated delivery.

ANDRAGOGY'S CHALLENGE: DIFFERENT GENERATIONS OF LEARNERS

Ben Jackson and Matthew Howell¹

Abstract—We begin by discussing the meaning of andragogy or learner-focused education. In this framework, learning objectives must be precise and give each learner an understanding of the instructional outcome. There are different types of learners and they may reach understanding by different avenues. The four learning styles discussed are visual/verbal, visual/non-verbal, tactile/kinesthetic, and auditory/verbal. There are generational differences that are significant in adult learning. Summarized here are some of the characteristics of four different generational groups from traditionalist, to baby-boomers, x-gers and millennials. Also presented are some effective ways to reach each group in educational programs.

INTRODUCTION

As Extension educators there are two general issues we face. The first is to provide information delivery that is relevant to adult learners interested in forestry and natural resources. The second is to provide information delivery to adult learners who have no particular interest in forestry and natural resources. The current delivery models most commonly used, static web pages and face-to-face lectures, may limit us in reaching our potential audiences, especially younger adult learners. Quite often educators do not consider the needs of their audience resulting in the educational experience not being as rewarding for the learner as it could be.

The first purpose of this paper is to remind educators or maybe even introduce them to recognizing the differences in learners and how they learn. Adult learners share a similar set of learning objectives even though they have a number of different learning styles. It is also true that there are significant generational differences among learners. Dealing with these differences can be a challenge so recognizing them is most important. All of these differences are discussed here. The second purpose is to offer several suggestions for effectively incorporating teaching methods and tools to improve educational programs and make them rewarding for all learners regardless of age or learning style.

What is andragogy? It was first defined as the art and science of helping adults learn (Knowles 1984). A broader meaning has evolved since Knowles first introduced the word. Now it refers to learner-focused education for anyone. The model asserts that five issues are to be addressed. The first three include letting learners know why something is important to learn, showing learners how to direct themselves through information, and relating the topic to the learners' experiences. In addition, people will not learn until they are ready and motivated to learn. Finally, often this requires helping learners overcome inhibitions, behaviors, and beliefs about learning.

Knowles' assumed adult learners need to know why they needed to learn something before attempting to learn it. Adults need to be responsible for their own decisions and be self-directed. Readiness to learn means that adults are ready to learn those things they need to know in order to cope effectively with life situations. In their orientation to learning, adults are motivated to learn to the extent that they perceive that it will help them perform tasks they confront in their life situations (Atherton, 2003 and Hoffman 2006).

Who is and who is not an adult learner? Adults tend to seek out learning opportunities. Often life changes serve as the motivation for the adult to seek new learning opportunities (Cross 1981). They usually want to learn something that they can use to better their position or make a change for the better. They are not always interested in knowledge for its own sake. Learning is a means to an end, not an end in itself. These adults bring a wealth of information and experiences to the learning situation. They generally want to be treated as equals who are free to direct themselves in the education process (Zemke 1984).

Hoffman (2006) offers some tips and techniques for teaching adults. Using problem-oriented instruction, case studies, simulations, problem solving groups make the instruction relevant to their situation. Instruction should be about tasks not memorization of content. Instructors should not be afraid to have ideas and instruction challenged. Make the environment comfortable and leave time for breaks (every 45-60 minutes). Instructors should use open-ended questions to bring out the experiences of the adult learners.

There are four keys to adult learning. Let adults direct themselves in the instructional process. Integrate new information with previous experiences. Make sure the information is relevant and make sure the information is readily useable for the learner (Hoffman 2006).

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LEARNING OBJECTIVES AND LEARNING STYLES

Objectives should identify a learning outcome, what the learner is to perform, not how the learner learns. They should be able to explain the principles in their own words. Objectives should be consistent with what the learners need to know. Finally, objectives should be precise and give different people the same understanding of the desired instructional outcome (Clark 2000).

It is possible to consider that there are four learning styles: visual/verbal, visual/non-verbal, auditory/verbal and tactile/kinesthetic (Miller 2000). Below is part of Miller's summary of these styles and approaches to reaching the different learners.

Visual/Verbal Learning Style

They function best when information is presented visually and in writing. In a classroom, they benefit from instructors who use the whiteboard to list the essential points of a lecture, or who provide them with an outline to follow during lecture. They benefit from information obtained from class notes and they tend to like to study by themselves in a quiet room. They often see information "in your mind's eye" when they are trying to remember something.

Visual/ Nonverbal Learning Style

They learn best when information is presented visually and in a picture or design. In a classroom, they benefit from the use of visual aids such as film, video, maps and charts. They benefit from information obtained from the pictures and diagrams in textbooks. They tend to like to work in a quiet room and may not like to work in study groups. When trying to remember something, they can often visualize a picture of it in their mind. They may have an artistic side that enjoys activities having to do with visual art and design.

Tactile/Kinesthetic Learning Style

They learn best when physically engaged in a hands-on activity. In the classroom, they benefit from a lab setting where they can manipulate materials to learn new information. They learn best when they can be physically active in the learning environment. They benefit from instructors who encourage in-class demonstrations, hands-on student learning experiences, and field work outside the classroom.

Auditory/Verbal Learning Style

They learn best when information is presented auditory in an oral language format. In a classroom setting, they

benefit from listening to lecture and participating in group discussions. They also benefit from obtaining information from audio tape. When trying to remember something, they can often "hear" the way someone told them the information, or the way they previously repeated it out loud. They learn best when interacting with others in a listening/speaking exchange.

Regardless of a person's learning style it is important to remember the significance of active versus passive learning. Over time learners tend to remember ten percent of what they hear (very passive) and 30 percent of what they see (passive). Learners remember 70 percent of what they figure out and do. Finally, learners remember 90 percent of what they figure out and verbalize. This is very active learning. This is the beginning of subject mastery (Anon 2006).

DIFFERENT GENERATION OF LEARNERS

Generational differences can be defined many ways. For our purposes we will include four categories. The first are traditionalists who are over 60 years old in 2007. The next are the 75 million baby boomers ages 60 to 42. The final two groups are the 51 million X-Geners, age 41 to 26, and 42 million Millennials, ages 25 to 16 (Ibsen 2006).

Included here are some ways to bridge the generation gap or steps to be taken for success (Ibsen 2006). Be aware of the differences, acknowledge that everyone is different. Appreciate the strengths instead of harboring frustration over differences, focus on the positive attributes. Manage the differences effectively. For example, once X-Geners have acknowledged the differences and taken time to consider the strengths, find ways to interact with them that will be mutually beneficial (Mayo Clinic 2005).

Below are some characteristics of each group as identified by the Mayo Clinic (2005).

Traditionalists

They were born between 1900 and 1945. Sometimes referred to as the World War II generation, traditionalists have worked longer than any of the other generations. Experiencing two world wars and the Great Depression taught most members of this generation how to live within limited means. Traditionalists are loyal, hardworking, financially conservative and faithful to institutions. Many are approaching retirement or are retired and now working part-time jobs.

Baby Boomers

They were born between 1946 and 1964. When the baby boomers entered the work force, they felt compelled to challenge the status quo, and they're responsible for many of the rights and opportunities now taken for granted. Their boundless optimism led many to fight for change. Because of their large numbers, they faced competition from each other for jobs. Baby boomers all but invented the 60-hour workweek, figuring that demonstrated hard work and loyalty to employers was one way to get ahead. Their sense of who they are is deeply connected to their career achievements.

Generation Xers

They were born between 1965 and 1980. Generation Xers are technologically savvy, having ushered in the era of video games and personal computers during their formative years. In contrast to the baby boomers' overtime work ethic, generation Xers believe that work isn't the most important thing in their lives. They're resourceful and hardworking, but once 5 o'clock hits, they'd rather pursue other interests.

If you are a baby boomer, here are some strategies to use with generation Xers. Get to the point. State your objectives clearly when communicating with generation Xers. Use e-mail. Take advantage of technology in your correspondence with them. Save meetings for issues which require face-to-face communication, and use e-mail when the matter can be handled via a well-worded, concise written message. Give them space. Do not micromanage generation Xers. Generation Xers crave autonomy. Give them direction and then allow them to figure out the best way to get results.

Generation Xers are used to getting things done on their own, so they tend to be independent problem solvers and self-starters. They want support and feedback, but they do not want to be controlled. Because many of them grew up with computers, Generation Xers are technologically literate. They are familiar with computer technology and prefer the quick access of Internet, CD-ROMs, and the World Wide Web as their sources for locating information.

Expecting immediate gratification, Generation Xers are responsive. They want stimulation and expect immediate answers and feedback. As learners, they do not want to waste time doing quantities of school work; they want their work to be meaningful to them. "They want to know why they must learn something before they take time to learn how" (Caudron 1997). Generation Xers are lifelong learners. They seek continuing education and training opportunities (Hornblower 1997).

According to Brown (1997) there are 14 million college students in the United States. There are several effective ways to improve X-gen learning experiences. They are as follows:

- Focus on outcomes rather than techniques
- Make learning experiential.
- Give students control over their own learning
- Highlight key points
- Motivate learning - engage students in creating their own learning environments
- Provide challenges - engage learners in projects that demand new skills and the application of existing skills to new situations

Millennials

They were born between 1981 and 1999. Many in this generation are still in school, but the oldest millennials are recent college graduates just now entering the work force. These are kids who have had access to cell phones, pagers and personal computers all their lives. Millennials are eager to learn and enjoy questioning things. They are confident and have high self-esteem. They are collaborators and favor teamwork, having functioned in groups in school, organized sports and extracurricular activities from a very young age. They reject the notion that they have to stay within the rigid confines of a job description. Expect them to keep their career options open. As opposed to generation Xers who change jobs, millennials are more likely to make entire career changes or to build parallel careers.

Here are some characteristics of millennials derived from National Center for Education Statistics (2006).

- 14 million college students in the United States
- 55 percent are female
- 30 percent are students of color
- 44 percent over the age of 25
- 75 percent are considered nontraditional
- 27 percent have dependents
- 44 percent enrolled in 2 year programs
- 80 percent are employed
- 39 percent are part-time students

The following are key observations about millennials

- The Internet is better than TV
- Computers are not technology
- Reality is no longer real

- Doing is more important than knowing
- Learning more closely resembles Nintendo than logic
- Multitasking is a way of life
- Typing is preferred to handwriting
- Staying connected is essential
- There is zero tolerance for delays
- Consumer and creator are blurring

Here are ways to enhance working with millennials with these tactics: Challenge them. Millennials want to work on things that really matter. Offer more responsibility as a reward for their accomplishments. Ask them their opinion. Millennials love to collaborate and be team players. They respond less enthusiastically to a dictatorial chain-of-command style of management. Find them a mentor. Millennials have an affinity and great respect for traditionalists. Establish mentor-mentee relationships between these two groups, and both parties will benefit. Provide timely feedback. Millennials are used to getting feedback instantaneously.

Oblinger (2003) observed that there are important elements to remember in understanding new students or millennials.

- Gravitate toward group activities
- Feel close to parents/values
- More time doing homework/housework than watching TV
- Cool to be Smart
- Fascinated by technology
- Racially Diverse—1/5 immigrant parent
- See doing as more important than knowing—the ½ life of information is quite small
- Nintendo Learners—use trial and error process to eventually be successful (win the game)
- Zero tolerance for delays
- Believe if it is in digital form it belongs to everyone
- Believe they deserve excellent customer service

Here are more ideas on millennial learning preferences (Raines 2002): teamwork, technology, structure, entertainment and excitement, and experiential activities. Millennial communication preferences include being positive, respectful, respectable, motivational, electronic, and goal-focused.

Below are the results of Astin's survey of 275,000 students in 2003 (Faculty Center for Teaching and Learning 2006)

- 75 percent highest value to raise a family
- 73 percent financial success as high priority
- 39 percent develop a meaningful philosophy of life (86 percent in 1967)
- 74 percent volunteered in last year/ 65 percent in last month
- 45 percent drink weekly—down from 74 percent in 1982
- Only 6 percent smoked cigarettes in H.S.
- 25 percent discuss politics—up from 19 percent in 2002
- 94 percent use Internet for school work
- 78 percent indicated Internet helped them with their school work
- 81 percent use E-mail to talk with friends
- 56 percent prefer E-mail to telephone
- 56 percent said Internet improved relationships with teachers
- 89 percent got some information from their teachers via the Internet
- 19 percent would rather use E-mail than face to face interaction to talk with teacher

Heathfield (2006) has eleven tips for managing millennial learners. They are as follows:

- Provide structure
- Provide leadership and guidance
- Encourage the millennial's self-assuredness
- Take advantage of the millennial's comfort level with teams
- Listen to the millennial
- Millennial are up for a challenge and change
- Millennial are multi-taskers on a scale you've never seen before
- Take advantage of the millennial's computer, cell phone, and electronic literacy
- Capitalize on the millennial's affinity for networking

Roberts (2005) says that in order to build suitable training for today's learner, you must tailor training by addressing key characteristics of this new breed. Research reveals that today's younger learners value relevant development, rich experiences, flexibility, community, technology, and instant results.

How do these values translate into tailored learning programs? The goal-oriented segment of your workforce is eager to learn and apply new skills. As long as they perceive the objectives as relevant, they're willing to go for it. Provide multiple channels to allow these learners to seek out more information. It's no longer viable just to gather a group of learners in a classroom for multi-day training programs. Learning needs to occur in smaller chunks of time, and, at least to some degree, be available at varying times. Consider blending self-study modules, web-based training, virtual classroom sessions and face-to-face workshops to provide a comprehensive, blended curriculum.

Roberts (2005) continues to say younger workers grew up with technology, making them a natural fit for any blend of remote training. Whether it's mobile learning on a wireless phone or iPod, web-based learning on your intranet, online discussion forums or remote virtual classroom experiences, younger adults are ready to embrace it. Layers of content, interaction and fun are the secrets to using technology to its greatest advantage in a learning application. They value speed, efficiency, gratification and results. What does this mean when they're learning? They need a variety of activities and interactions and they need to move at a brisk clip. They want instant feedback and rewards, so be sure to let them apply new knowledge immediately, and let them know how well they've performed.

What could on-demand learning look like? You might want to combine the following:

- Self-study learning guides
- Web-based training
- Web-based discussion forums
- Online workshops
- Mobile wireless courseware
- Face-to-face workshops

In conclusion, Roberts (2005) says a purposefully blended training strategy is a key to success. By keeping step with changing technologies and an evolving workforce, you can meet the training demands. You can show them that you're committed to growth and achievement.

CONCLUSIONS

Andragogy is a valuable concept for Extension educators to be aware of and incorporate in their training and education programs. It is vitally important to try to provide an educational experience that is valuable and enhances learning for all four learning styles. Millennial learners and

x-gen learners have different expectations associated with the learning experience as compared to baby-boomers and older learners. To effectively reach each learner generation, regardless of the educator's age, the program must be tailored to the learner's needs.

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**NON-TRADITIONAL AND
UNDERSERVED AUDIENCES**

IN THEIR OWN WORDS: PERCEPTIONS OF FORESTRY AMONG AFRICAN-AMERICAN FOREST LANDOWNERS IN ARKANSAS DELTA

Caroll Guffey, Eric Heitzman, Richard Williams,
Tamara Walkingstick, and Pat Stephens Williams¹

Abstract—Focus group meetings were held with African-American forest landowners in the Arkansas Delta to determine how participants viewed their forests and sought and accessed forestry information. Most landowners inherited their forests or acquired them while purchasing agricultural land. Many landowners viewed their forests negatively or indifferently. They typically received forestry information through friends or relatives, direct mail, or local businesses. Many participants distrusted the U.S. Department of Agriculture (USDA) because of perceived racial discrimination by local USDA employees. However, the few landowners who had participated in forestry cost-share programs were satisfied with their experience.

INTRODUCTION

The Mississippi River Valley is a broad floodplain that extends from Illinois to the Gulf of Mexico and encompasses seven states. One of these states is Arkansas, where the valley is known as “The Delta.” Today, the fertile soils of the Delta support an agricultural economy based on cotton, rice, and soybeans. Although most of the bottomland hardwood forests have long-since been converted to row crops, about 2.1 million acres in the Delta, or about 23 percent of the land, remain forested. Over 90 percent of these forests are oak-gum-cypress, oak-hickory, and other hardwoods, and 70 percent are owned by nonindustrial private forest (NIPF) landowners (Rosson and others 1997, Stanturf and others 2000).

A number of studies have examined various characteristics of NIPF landowners in the Delta (Greene and Blatner 1986, Kluender and Walkingstick 2000, Montgomery 2002), but none have focused specifically on African-Americans. There has been no research on African-American NIPF landowners in the Delta concerning their views about, and uses of, their forested land. In fact, only from North Carolina and Alabama has information about African-American NIPF landowners been reported (Hilliard-Clark and Chesney 1985, Gan and Kolison 1999, Crim 2003, Gan and others 2003).

The objectives of this study were to use focus groups to describe the attitudes and forest practices of African-

American NIPF landowners in the Arkansas Delta; to identify barriers to African-American participation in extension sponsored opportunities; and to identify content areas for future program and education opportunities to serve the African-American forest landowner. We wanted to learn how these landowners view their forest land, why they own forest land, how they use their forest land, and what problems they face. African-American landowners in general have not taken advantage of government assistance/incentives programs in farming or forestry (Kalbacher and Rhoades 1993, Jones 1994, Grim 1996). The lack of participation by this particular group of forest landowners indicates that this group is being underserved; therefore, what type of information they need, where they go to get that information, and how they learn about educational opportunities is important for future program development and service.

METHODS

The study involved African-American NIPF landowners in seven counties in the Arkansas Delta, including Lonoke, Prairie, Monroe, Phillips, Lee, Woodruff, and St. Francis Counties (fig. 1). These counties were selected because of the relatively high population of African-Americans. On average, 36 percent of the population in these counties is African-American, compared to the 16 percent statewide average (IEA 2005).

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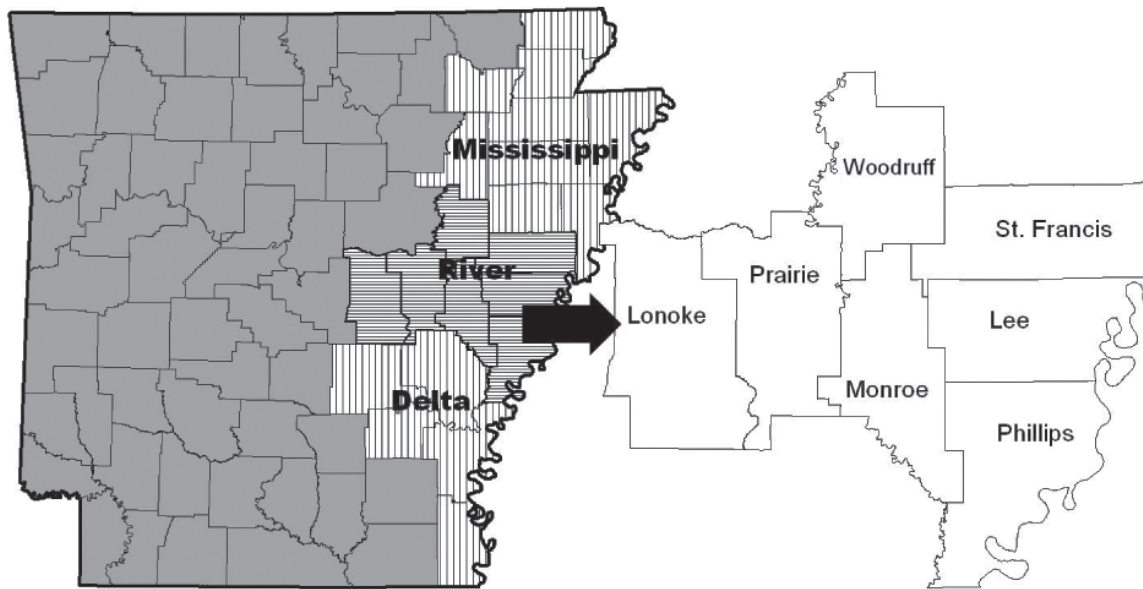


Figure 1—Study area in the Arkansas Delta.

From December 2001 to December 2002, five focus groups were conducted in four counties (Lee, Monroe, St. Francis, and Woodruff); participants came from within the seven counties in the study area. Participants were selected with the help of the group organizers based on the knowledge that they owned forest land. In keeping with standard focus group methodology (Krueger 1994), each group met once and consisted of a set of African-American NIPF landowners from the surrounding local area. Groups were organized with the help of county extension agents, a local community development organization, the University of Arkansas Small Farm Outreach Program, and a local acquaintance. A total of 42 African-American NIPF male and female landowners participated in this study in groups of 2, 6, 7, 12, and 15 persons. Females were present in three of the five focus groups. No subject participated more than once. Although the recommended size for focus groups is 4 to 12 participants (Krueger 1994), the largest and smallest groups did not differ in participation dynamics or content outcome from the other groups. The meeting locations included community centers, a Cooperative Extension Service work center, a restaurant, and a local convenience store/diner.

We developed a short survey that was given to participants after the meeting and seven open-ended questions to facilitate discussion during the focus groups. The survey requested basic information such as age, size of property ownership, and other information that would be helpful for comparisons with other studies. We ran descriptive statistics from the survey. Focus group and survey questions were pre-tested with an African-American NIPF landowner from the Delta (but from outside the study area) to ensure question and desired information clarity.

The focus group meetings lasted from 1 to 2 hours and were recorded for transcription at a later date. Field notes were also made to the extent that they did not interfere with the discussions. The same researcher collected data and recorded field notes from all five focus groups. The seven question set was delivered to all of the focus groups. After a question was asked, all participants gave their thoughts, with discussion between participants being encouraged. When the discussion on one question came to an end, the next question was introduced.

Analysis of the meeting transcripts, as well as notes taken during and after the meetings, was done in two steps. First, the responses to individual discussion questions were examined to identify the specific issues raised by the question. This was accomplished by taking all the responses to the same question from each focus group and combining them into a single set of responses. These comments could then be used to show the overall reaction of the participants to each individual question. The second portion of the analysis classified the themes that arose based upon the responses given by the participants. This was done by coding individual thoughts into specific response categories (Strauss and Corbin 1990, Krueger 1998). Similar thoughts were then reassembled to develop concepts or themes (Strauss and Corbin 1990, Bryman and Burgess 1994). One example of these themes would be the desire of the landowners to produce income from their forests. Some focus group participants mentioned this during the question about growing and harvesting timber, while others mentioned it during the question about nontimber uses of their forests. Identification of themes allows for a deeper understanding

of some of the underlying reasons for landowner attitudes toward their forest lands.

The focus group method does not lend itself to statistical analysis. It is useful for working with small populations; however, care should be taken not to generalize the results to larger populations.

RESULTS

Survey Results

Descriptive statistics from the written survey indicated that most of the participating landowners were 50 years or older (70 percent). Thirty-eight percent were over 60 years of age. These landowners were on average younger than the 60-year average age of forest landowners in the South (Butler and Leatherberry 2004). Of the participants, 28 percent owned 10 acres or less of forest land, and 68 percent owned 40 acres or less of forest land. Eighty-three percent of the participants in this study also owned farmland. Only 5 percent of the Arkansas participants had a written forest management plan for their property; this is similar to other landowners in the South (Moulton and Birch 1995, Butler and Leatherberry 2004). While most did not have management plans, most were interested in such a plan. Timber had been sold at some point of ownership by 60 percent of the participants. Only 28 percent of the landowners we surveyed were familiar with U.S. Department of Agriculture (USDA) forestry cost-share programs, and only 18 percent had participated in them.

Focus Group Question Set and Discussion Results

Types of activities on forest land during the last 10 years—The purpose of the initial question was twofold: to serve as an “ice breaker” to get the landowners participating, and to get them thinking about their forest land and its past uses. About one-third of participants indicated that no activities had taken place on their property. One response was, “It is not timberland and not farmland—just brush land. I do not know whether to cut the timber off of it or get timber growing on it. I do not do anything with it—I just own it.” One-third of the landowners stated they had harvested timber in the past decade. Hunting and fishing were also commonly mentioned uses of the forest lands on the property.

Reasons for owning forest land—Although the reasons for owning forest land varied, there were two common responses. First, the land was passed down through the family. As one landowner stated, “I inherited my little bit I got. I kind of like it and I do not really know what to do with it about cleaning it up.” The second common response was that the forest came with the farm when it was purchased. An example was, “I am just a plain old country boy and I

like living in the country. It was there when I purchased the land and there it is. I just enjoy it and appreciate hunting it.”

In three of the focus groups, participants had forest land because they could not clear it for farmland or pasture. Most of these landowners were prevented from clearing land by “the government” because it was classified as a wetland. These landowners were disappointed in owning forest land because they were not able to convert it to other uses.

Use of the property for hunting and fishing was another reason given for acquisition and ownership. Forest land was also held for the production of firewood for personal use. As one older landowner explained, “As long as I was cooking with wood, I used it for my personal use....” Owning forests for environmental reasons was also mentioned, “They came in and cleared the land now the clearing has spread erosion and chemical runoff that was detrimental to the water, now they are trying to get people to put a percentage of their land into production for growing trees.”

Growing and harvesting timber—When asked how they felt about growing and harvesting timber, the overwhelming majority of comments were positive. Examples of these comments were, “That is why I am here—to figure out how to get the water off, grow trees, cut them, and grow some more.” Many of the negative views expressed were not necessarily against harvesting trees but rather were directed toward growing trees; some people would rather clear their forest land for farming. One older landowner stated, “But at my age it [growing timber] don’t seem like it would benefit me a whole lot. I need something now. I feel alright about harvesting timber.” A few landowners were opposed to harvesting timber. Overall, only a few individuals had negative attitudes toward both growing trees and harvesting timber.

Nontimber sources of income—Participants were questioned about their interest in using their forest lands to produce income from nontimber sources. Many of the participants were interested in producing income from their forest land. While the interest level on this subject was very high, the landowners still wanted to maintain control of the forest land. One comment was, “Yes, as long as it does not strip or drain the land. As long as it is not going to hurt anybody or the property, that would be fine.” Other landowners wanted to make sure that these practices did not interfere with their other activities on the property. Some forest landowners were interested in leasing only certain parts of their lands for hunting and keeping other parts for their own use.

In some areas of the Delta, leasing hunting rights was well known. In other areas, the practice was not common. Although interest was high, few participants indicated that they currently leased their land for hunting. One interesting

comment came from a landowner who had earlier discussed having beaver problems on his forest. He said, “Well, if you can make money on the beavers, leave them out there.”

In addition to hunting, wildlife watching was mentioned as a possible source of income. There was also discussion about making money from producing nuts. Most of this discussion centered on growing pecans and walnuts, or collecting acorns to sell to nurseries that grow hardwood seedlings.

Forestry-related sources of information—In general, participants stated they would either ask friends or family, or did not know where to go for forestry information. Of those sources that were mentioned one source of information was the University of Arkansas, Cooperative Extension Service (UACES). However, the fact that individuals from the UACES helped to choose participants and locations for three of the focus group meetings could have influenced this reply. The Natural Resources Conservation Service and the Arkansas Forestry Commission were also mentioned less commonly as sources of information. There was almost no mention of fact sheets, brochures, or other literature, suggesting that participants either were not familiar with or did not receive this type of information.

Notification of forestry meetings—Over one-half of the participants preferred to be notified about upcoming forestry meetings (e.g., workshops, field days) by mail. Many were already on mailing lists of some of the State and Federal natural resource management agencies. Another important preference was using local contacts such as a community business or church for holding meetings or workshops. Leaving notices or handouts about meetings at local businesses was also mentioned, such as the community grocery store. Using local businesses and churches as points of contact has not appeared in previous NIPF landowner studies.

Less popular ways of finding out about meetings were newspapers and radio. Elaborated upon in two of the meetings, most of the participants lived in small communities outside the larger cities, did not view the newspaper and radio as being of local interest, and therefore did not subscribe or listen. The only contact with the newspaper was second-hand by seeing someone else’s copy, often at a later date. Consequently, landowners typically found out about advertised meetings too late. As one person remarked, “A newspaper is alright, but a letter is better.”

Experience with USDA programs—Although there are several separate agencies under the USDA umbrella, the landowners in this study did not seem to differentiate among them. Instead they lumped them all under the USDA name. Most of the participants were not familiar with and had not used any of the USDA forestry cost-share programs. However, all seven of the landowners in this study who

had previously participated in such programs were satisfied with them. An example, “We planted some trees 8 years ago through the USDA program; they had their rules, but they helped us.” Many of the comments received in the focus groups centered on landowner dissatisfaction with the rules or the processes in the various programs, or problems relating to various USDA agencies in the past. In particular, participants related personal experiences of unfair treatment they attributed to being a minority.

As one person said, “Over the last 5 years, a lot of minority folks just started getting information on the USDA programs. Part of the problem was the administration that was in the White House at that time. Part of the problem was as a result of the legal issues on the part of USDA. Minorities were totally left out of the system and were not allowed to participate or get any money on these programs. At the same time, a lot of minorities had things literally jerked out from their feet. Even though they were not participating in these programs, a lot of times if you were not in compliance, the next thing you know your land is going up for auction or your house is getting ready to be auctioned. So this is something that has happened all these years. It has just started changing in the last decade. I am being quite candid about it.”

Although there were negative feelings and experiences with the various programs, there was also much interest in the possibility of participating. For example, participants from three of the focus groups recommended holding meetings to discuss and explain the various USDA programs associated with forest land. These comments relate closely a study (Gan and others 2005) that found minority landowners felt that some USDA programs excluded poor farmers, and that assistance from government agencies was inadequate.

Common Themes

Negativity and indifference toward forests—The African-American participants in this study often viewed their forest land in a negative context. These negative views were expressed in several ways. First, many comments concerned the landowner being denied the opportunity to clear the forest to create agricultural land. One farmer’s comment summed up this feeling: “I bought the land with the intentions of farming it, but they [U.S. Government] said I could not farm it. I could not do anything to pay for it, just let it sit there.” This situation arises in many cases from the land being classified as a wetland and government [USDA and U.S. Army Corps of Engineers] regulations preventing the clearing of wetlands for farming. Second, many older participants remembered clearing forest land to convert it to farmland when they were young. This experience still influences how these landowners view forest land and the possibility of converting cropland back to forest land. Said one landowner, “I picked up enough chunks and helped

clear the land, I could not plant trees back there.” Third, participants had negative views of forest land because of their unfamiliarity in managing forests as opposed to row crops.

Racial discrimination—The subject of racial discrimination was alluded to in most of the focus groups; however, it was explicitly brought out in two groups. Past negative experiences caused some participants to feel they had been unfairly treated when dealing with some of the local USDA offices. This sentiment was expressed in the comment, “I can guarantee you that 75 percent of the minorities will tell you there have been instances when people in the USDA offices approach you with an attitude. They look at you and wonder what you are doing there.” Another landowner said, “Recently there was a person [USDA employee] calling minorities telling them that they did not qualify for the program [EQIP].” Other participants felt they were deliberately left out of government programs creating distrust of the USDA in general. One person remarked, “You might get in on the tail end of a program, maybe you get a little out of the end of a program, but it is over before you even know it. Maybe things could have been gotten, but you don’t know and nobody is going to tell you.” In addition, there was the perception that most minorities are not informed about new funding opportunities, thereby preventing them from using a particular program. This feeling was expressed in the comment, “If you miss a meeting that you did not hear about then it is your fault if you don’t go in and sign up.”

Producing income—The desire to produce income from forest lands was a prevalent theme throughout the study. Some participants had harvested timber in the past. One retired farmer said, “I am still into trees. Trees are valuable; most people do not know that. I’m having trees cut right now.” The opportunity to sell timber in the future was discussed by many participants. One landowner remarked, “We have been logging and running a [saw] mill since 1950. That is how we make our extra money to subsidize our farming.” Yet many landowners were concerned about their lack of knowledge concerning timber values and the timber sale process. One example was, “I really want to know what it’s worth first.” Another landowner was in favor of harvesting trees with the caveat, “As long as cutting is kept to a minimum.” These apprehensions related to the landowners’ feelings of loss of control over what will happen to their forest during the harvesting operation. One landowner stated, “I do not like to deal with timberland. I really do not want any more timberland, except to hunt on.” Another example was, “It’s not timberland or farmland, just brush land. I don’t know whether to cut the timber or get the timber growing on it.”

Importance of forest recreation—Most of the landowners in this study did not own their forest land solely for producing income. A place for recreation was the main

reason some acquired their forest land. One landowner explained, “[The forest land] mainly came down through the generations for deer and duck hunting. Duck hunting is a way of life for us and the main reason we keep our timberlands.” Others owned their forest land for less tangible reasons such as, “[To] walk in the woods and relieve aggravation,” and “It’s just there, you know, but it is good to have.”

DISCUSSION

The limitations of the focus group method again should be considered before applying these findings to larger populations. However the findings will hopefully give some perspective of this particular group and may offer ideas or insights when seeking to reach other underserved populations.

The majority of African-American NIPF landowners in this study were farmers who did not own forest land because they purposefully set out to do so. Rather, most inherited their forest land or acquired it as part of farming property they purchased. In general, they did not attach high financial importance to their forests, especially those landowners who had purchased the land with the intention of clearing the forest and converting it to agricultural land. Many were also somewhat dubious about converting crop or grazing land back into forest land. Participants often used their forest land for personal enjoyment and to pursue such activities as hunting, fishing, viewing wildlife, and walking in the forest.

Although timber production was not a priority, the majority of landowners had sold timber in the past, and about one-half planned to sell timber in the future. Most were very interested in learning more about the different aspects of selling timber, such as how to determine value before sale, how to contact timber buyers, and how to sell timber. In fact, participants were searching for any way to make money from their forests, including leasing the property for hunting or producing acorns and other nuts. Yet most landowners did not actively manage their forest lands, and only 5 percent had a written forest management plan. Furthermore, there was a decided lack of knowledge regarding where to go or whom to contact for forestry-related information. These landowners are not familiar with fact sheets and other literature that many agencies use as primary means of disseminating information.

Unfortunately, there was a strong distrust of the USDA and of its handling of the various agricultural cost-share programs. This distrust had spread into the forestry-related programs, even though most of the landowners in this study had not used them and were unfamiliar with most of them. This distrust, as well as participants’ perception of racial discrimination inherent in such programs, had not promoted the use of these programs in the African-American

community. Much of the knowledge landowners had about programs was second-hand, and in many cases incorrect. This distrust and misinformation kept many landowners from pursuing information about these programs. The few landowners who had used forestry-related programs expressed satisfaction with their experience, indicating that more African-American NIPF landowners would probably enjoy similar results if they participated. In fact, many of the landowners indicated an interest in using these programs in the future.

Clearly, greater effort should be made in reaching these landowners with information about government programs in general forestry and wildlife management. Technology transfer approached appropriately in identified content areas of interest and need would create high levels of interest, and possible participation, among participants in this study. This informational need was regularly mentioned in the focus groups despite the distrust of the USDA. These programs might provide the incentive for many African-American NIPF landowners to see their forest lands in a more positive sense. Indeed, the opportunity to get assistance with some forestry or wildlife management practices could be the factor that would influence some landowners to begin management of their forest lands.

Special efforts are required if Delta landowners are to be reached. We must recognize how these landowners find out about meetings and their preferences for being notified. Putting articles in local newspapers or on the radio is not the way to reach them. Targeting African-American NIPF landowners by mail, phone calls, or advertising at local businesses and churches will produce better results in reaching this group of traditionally underserved landowners. Their informational interests centered on timber harvesting and how to contact timber buyers, as well as determining timber value and volume. These needs come at a critical time in managing forests (harvest); poor decisions made here will impact the years of growth up to this point. The overall goal should not be having all forest land owners managing their forests, but to provide them with information that will allow them to make choices that suit their needs.

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BACKYARD WOODLOT OWNERS: A GROWING ISSUE AND NEW APPROACH

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Abstract—As populations expand into rural areas, the Eastern United States, particularly, is experiencing forest fragmentation and parcelization. This process creates major challenges for natural resource managers, as rural forest and agriculture land convert into suburban developments. Meeting the diverse ownership objectives on these smaller forest land parcels, which do not often focus on timber production, requires innovative and sophisticated methods of communication to convey both the benefits and responsibilities associated with land stewardship. Landowners with less than 10 acres of forest own 59 percent of forest properties in the Eastern United States. While the overall acreage of this audience is still relatively small (8 percent), they represent a growing underserved audience and a significant political base that could provide support for forestry programs. Forests in this changing landscape can provide myriad environmental benefits to society as well as raw materials for forest industry. Landowners who believe non-management is the best management practice do not think about their connection to natural resources, or they have insufficient information for making informed decisions about improving the ecological function of this evolving urban landscape. As a result, landowners do not understand the intrinsic benefits gained from managing their forest land, no matter how small. A new educational tool and approach entitled, “The Woods in Your Backyard” is available to encourage small acreage landowners to understand their role in conserving forest values and to lead them to more active involvement with their natural resources.

INTRODUCTION

Today’s most underserved forest landowner audience is the majority. Small acreage forest owners account for the vast majority of owners in the United States and especially in the Northeast and Southeast Regions. Landowners with less than 10 acres of forest own 59 percent of forest properties in the Eastern United States (Butler and Leatherberry 2004). While the overall acreage of this audience is still relatively small (8 percent), they represent a growing underserved audience that could be a significant political base in support of forestry programs (Eagan and Luloff 2000, Hull and others 2004). At the rural/urban interface, the percentage of land held in small ownerships can be significant. A recent study in Pennsylvania found that 54 percent of the forest land in Berks County near Philadelphia was in ownerships smaller than 10 acres. Statewide average ownership sizes previously estimated that Berks County had 9,400 owners; newer, more precise estimates suggest there are nearly 27,000 forest owners in this urbanizing county (Metcalf and others, unpublished).

Traditionally, natural resource professionals have stood on the sidelines watching as private forest landowner (PFL) characteristics have gradually but drastically changed. We have a “new” type of landowner and new resource challenges.

The “New” Landowner

Most forest land in the United States is owned by private forest landowners (PFLs). In the 17 Southern States, for example, 59 percent of the 215 million acres of forest land is in PFL ownership (Butler and Leatherberry 2004). Historically, these PFLs have met most of society’s fiber needs. However, as our Nation’s population has become increasingly affluent and older, many people have chosen to follow the American Dream of land ownership. Through this process, the finite supply of land is under increasing pressure, and we find that parcelization is rampant.

In the Southern Region, for example, the average forested tract size in 1978 was 45 acres, and by 1994 the average dropped to 38 acres (Birch 1996). The next 10 years dropped another 10 acres from the average. In a 2004 survey by Butler and Leatherberry, the average forest ownership size was 28 acres for PFLs in the Southern Region (2006).

In general, small acreage landowners compared to larger landowners cite ecologic and amenity values as ownership objectives more frequently. This differs little from the common ownership objectives of forest owners nationally, which are aesthetics, privacy, and family legacy. One major difference is that, when those who harvest firewood are excluded, the less forest land owned, the less likely it is that the owner will harvest trees for timber (Butler and

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Leatherberry 2004). This reinforces the contention that education for smaller acreage owners should focus less on timber production and extraction, and more on the other values mentioned above.

Kendra and Hull (2005) found that new, small acre, forest owners in Virginia were most motivated by lifestyle concerns such as living simply, near nature, and escaping the urban stress. They have interests in growing their own food and recreating on their land. They express less interest in financial considerations when deciding what to do with their property. Yet, they are not necessarily preservationists desiring to leave the land “pristine.” For example, management tools such as herbicides, tree pruning, and harvesting are options these landowners would consider using to improve wildlife habitat, forest health, and scenic views. Kendra and Hull (2005) found that landowners cite many reasons for not managing their land, such as, they never thought about it, time and money limitations, parcel size, and lack of knowledge. Many of these can be addressed through information, demonstration, consulting, and outreach programs.

Clearly, segments of the new forest owner generation offer new challenges and opportunities for resource managers and educators. While these individuals most likely tend to look inside their boundaries, the decisions they make have ecologic, economic, and social impacts across the landscape. In this regard, resource professionals should recognize they have a role with this new clientele. Scaled down traditional forest management approaches may work in some cases, but there is a need to restructure both our ideas and approaches. Hull and others (2006) suggest that the management of these lands is important for the environmental services they provide and because these owners are politically active. If educators and professional foresters are to remain relevant, they must be proactive in making the changes necessary to serve this growing audience and the resources they control.

The Issue

Unfortunately, land parcelization in general and forest parcelization specifically are legacies of our heritage. The settlement of our country was largely driven by the individual desire for land, which was readily within the reach of the commoner. Our transportation systems, recreation demands, economic success, and individual needs and social expectations exacerbate land consumption. Numerous studies and reports document, quantify, and articulate the potential threats of our land resource consumptions (Egan and Luloff 2000, Macie and others 2002, Sampson and Decoster 2000, Vince and others 2005, Wear and Greiss 2002).

Resource professionals have the training to understand the effects and ramifications of landscape fragmentation—the breaking apart of systems as we impose varying land

uses. These same professionals find frustrations in the parcelization of the land—the separation of land into different ownerships where objectives, if not land use, change and vary by owner wants and needs. Whether we fragment or parcelize the land, the potential to adversely affect forest and ecosystem health, economic structures, and future management is enormous. Resource professionals need to respond by encouraging responsible stewardship to traditional owners and to the new tenants of the land.

The Void

There are voids to address. In the East, less than 5 percent of PFLs have a written management plan, and only about 14 percent have sought management advice in the past 5 years (Butler and Leatherberry 2004). Without a plan or professionally offered advice, the likelihood of any management, let alone sustainable management, decreases. The statistics for small ownerships, < 10 acres, is not explicitly known; however, we do know that large acreage owners are more likely to have a written management plan and seek advice (Butler and Leatherberry 2004). Perhaps a larger question is the necessity of written forest management plans for small acreage landowners where timber harvesting and large-scale disturbance is unlikely. It is more likely that a better understanding of basic ecological and management techniques along with a local support network may result in the implementation of better stewardship practice.

The importance of private forest land ownership is indisputable. Increasingly, stakeholders from diverse perspectives recognize the role they play in providing ecological services to the public. The traditional economic benefits remain, but often there is increasing recognition of the social and ecological values forests provide. Because of ownership patterns in the East, this places a large emphasis on the private forests. In the past, governmental incentive programs focused on the timber base encouraging forest owners to manage for products. Recent programs expanded the discussion to wildlife, water, and recreation. The Forest Stewardship Program, launched in 1991, is one of the most recent Federal initiatives to assist PFLs with management. A principle stewardship goal is to provide PFLs with management plans to guide their decisionmaking. In the first 6 years, 329,000 forest owners, controlling 16.5 million acres, received help to reach their goals through economic assistance in planning and education (Esseks and Moulton 2000). Unfortunately, this valuable program targets forest owners owning > 10 acres, leaving smaller acreage owners with no publicly supported source of technical or cost-share assistance.

Why was the threshold set at 10 acres? Resource professionals (read that as foresters) argued that smaller ownerships are too difficult to manage—it is inefficient. Can we afford this luxury? Weir and Greis (2002) argue that we have to change our perspective and reach out to the

landowner of smaller forests if we are to continue to meet societal needs. The reliance on the one-on-one model of technical assistance presently used to assist forest owners is not plausible for the multitude of owners in the fragmented landscape.

With the current base of service providers and assistance programs, small acreage landowners rarely come in contact with resource professionals. This void calls for a variety of new tools, including educational material for small acreage forest owners that, to begin with, enable them to develop their own plan. Also needed are educational resources and opportunities to assist them with implementation of practices. Cooperative Extension and agency partners are well situated to meet this educational void of small acreage landowners with some of the new tools becoming available. Perhaps the more challenging part is the current lack of service providers adept at working with the audience.

While ‘train the trainer’ programs can provide local education delivery and mentoring, and it is a proven cost-effective way to leverage limited forestry resources for landowner education, something different is needed to train potential service providers. New forestry education programs targeting professionals currently working on these types of properties, such as home/landscape and arborist professionals, can equip them to take advantage of the business opportunities that servicing this clientele can provide. Along with training opportunities for existing forest professionals such as loggers, foresters, and other natural resource professionals, a whole new cadre of service providers can be developed to fill this void.

METHODS

The objective behind the Woods in Your Backyard project was to reach small acreage landowners (1–10 acres) with research-based information to help them create or enhance natural areas while meeting their personal goals and improving their property’s contribution to ecosystem health.

The initial grant from the U.S. Fish and Wildlife Service developed a team approach by Maryland, Virginia, and Pennsylvania Cooperative Extension systems along with a professional writer and targeted the Mid-Atlantic region. The authors initiated the project in early 2003 with publication of the manual in September 2006. While there was one initial meeting of the authors in early 2003, all other communication was done by conference call and email.

Approach

The first step was to define an approach to reach small acreage woodlot owners. Knowing that there are increasingly more of them, and relatively, if not actually, fewer of us, we adopted a train-the-trainer model. The

Master Gardener and the newer Master Naturalist programs are excellent examples of extension programs using this approach. Even in the forestry field there are excellent examples of success using this model (i.e., Coverts, Master Woodland Owners and Forest Steward Volunteers) which have had significant success reaching a greater number of PFLs through a trained volunteer network than by solely relying on trained professionals.

The train-the-trainer model simply attracts interested citizens to participate in training programs with the agreement that they will share information with others in a peer learning approach. Efforts are made to select individuals who are opinion leaders in their communities, have a record of volunteer involvement and are willing to commit some time to the effort. In practice, these individuals have access to networks and opportunities that cannot be accessed by trained professionals, resulting in information dissemination by credible citizens in the community that is more highly valued and therefore more likely to be implemented. Additionally, peer-to-peer modeling has an additional advantage in that well-respected peers have more credibility than the “professional” who usually comes in as an outsider.

Tool

After choosing an approach, the authors began crafting the “tool” for training volunteers. However, we soon realized that the product envisioned would also serve as a stand alone product for independent use or self-assessment. “*The Woods in Your Backyard: Learning to Create and Enhance Natural Areas Around your Home*” is the end result (fig. 1). Development proceeded using the following principles:

- Utilize a case study approach
- Focus on better management of existing natural areas and conversion of lawn into forest
- Focus on nontimber values
- Require no forestry tools or previous knowledge, and utilize user-friendly jargon
- Provide support materials for volunteers responsible for delivery and mentoring
- Include a separate workbook for personal assessment of the user’s property
- Design the publication to be used as a guide for group education and outreach efforts with new extension audiences
- Assume the user has Internet access to retrieve needed resources and make those resources available at a specific website

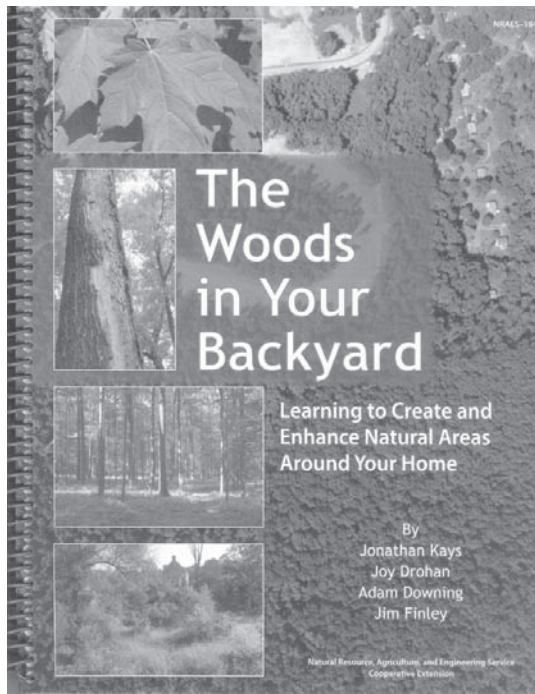


Figure 1—Front cover of *The Woods in Your Backyard*.

Before publication, we sought input from landowners in forestry volunteer programs and State agency foresters and wildlife biologists in Maryland, Pennsylvania, and Virginia. Using a focus group format, we found support for the case-study approach used in the publication and received many useful comments on perceived gaps in the presentation. We found this investment of time to reach out to potential users generated great excitement by those involved and was a huge success. The publisher, the Natural Resource, Agriculture, and Engineering Service Cooperative Extension (NRAES), orchestrated a more formal peer-review to further refine the manuscript with input from volunteers and professionals representing a cross-section of the Eastern United States.

RESULTS

The Woods In Your Backyard (Kays and others 2006) uses a case-study approach to guide users through a process of creating their own plan while learning basic forest stewardship concepts. Table 1 presents the headings for the four major parts of the publication and incorporated workbook in part five.

While there are three case-studies in the publication, the users follow the Nelson’s story (a case-study) throughout the manuscript. When we introduce activities which could become homework assignments, if the trainer chooses to deliver the material as part of a multi-day program. “The Nelsons” serve to demonstrate the results of their activity. For example, Activity 1 is to draw a property map, and the publication highlights the Nelsons. For Activity 2, we ask

the user to describe property features using a worksheet and present the Nelson’s example to help the user become more comfortable completing the activity for their property in the workbook portion of the publication.

Users who work their way through the material will have, in the end, a self-designed plan with research-based input to help them accomplish their goals in a sustainable and ecologically sound manner. It is likely that users may only complete the parts of the plan they see as relevant, but regardless, there are adequate case studies upon which they can make their assessment.

To date, this material has been used to train over 600 volunteers in Virginia, Maryland, and Pennsylvania. Early follow-up results from trainings indicate the volunteers are using the materials for their own properties and for working with others.

Because each group trained is different, we created tools for customizing training. Experience suggests that professionals gain familiarity with the material quickly (under an hour), while lay audiences usually require 1.5–2 hours of training to reach a comfort level with the publication and training materials. The training materials consist of the publication and a CD that includes an overview PowerPoint presentation that can be adapted for different audiences, as well as

Table 1—Publication contents

Part	Theme	Lessons
1	Introduction	Identify interests and mapping Family involvement Constraints to management
2	Property inventory	Landscape view Management unit identification Tree and plant identification
3	Ecological processes	Succession Principals of forestry Water resources Wildlife ecology
4	Putting knowledge to practice	Recreation and aesthetics potential Choosing projects Land management techniques Timetable of activities Recording progress
5	Workbook	Twenty activities completed while working through the first four sections and in tandem with a case study

individual PowerPoint presentations that break the materials into five classes and provide additional photos and information above that found in the manual. All these presentations can be used as is or edited by the individual, as long as they have the PowerPoint software.

The CD also includes a press release, brochure, ordering information, fact sheets from Maryland, Pennsylvania, and Virginia Cooperative Extension and other organizations, as well as web-links to other resources. One component of the manual is a resource list with websites for more information on specific topics (pages 131-138). This resource list is found on the website as a Word document with all the websites hyperlinked. The CD is only provided at certain trainings, and is not included with the publication when purchased. All resources found on the CD are available free for download at www.naturalresources.umd.edu.

While targeted to the Mid-Atlantic region, the manual has application to most areas of the country. Extension and other natural resource professionals can use the core manual and adapt the resource list, PowerPoint presentations, and other CD resources to suite their respective area.

DISCUSSION

Research into adult learning and the use of information by adults suggests that self actualization—wanting to learn and to solve their own problems—is important and leads to higher levels of implementation (Knowles 1984, Allman 1983). Extending these concepts is central to adult learning, which is also known as androgogy. We believe it is useful to engage landowners in developing their own plans, which should lead to higher implementation levels. We set out to create a tool for owners of smaller tracts that they would find useful in a guided planning process. We believe that we have a need to reach out to the “new” landowner to provide educational materials that they can use to guide their stewardship of land. We also believe that we lack the capacity to lead this process using traditional materials and approaches. Therefore, we offer “The Woods in Your Backyard” as an approach that people will find useful and provide us the means for guiding decisions that will affect economic, ecological, and social returns from the forests in a changing landscape.

“The Woods in Your Backyard” is a tool for reaching a currently underserved audience with both management information and mechanisms for designing their own plan and putting it into action. Planning leads to more informed decisionmaking and on the ground practices embedded in stewardship (Esseks and Moulton 2000). The hopeful ecologic outcome of this initiative is to stitch back together natural systems interrupted by fragmentation with more seamless, though still parcelized, landscapes. Economically,

service provider opportunities and a supply of forest-based resources may yield jobs and niche manufacturing.

Serving constituents/clients/stakeholders/etc. is the most basic premise of public programs. The challenge is in how to do this with limited resources. Does it make sense to divert already limited funds dedicated toward traditional landowners that, although they are few in number they own the majority of the land, toward this rapidly growing landowner segment? They only control a very small percentage of the overall acreage, and ownership turns over rapidly. Can we really expect to affect change? Research by Kendra and Hull (2005) suggests this “new” landowner is very receptive, even “primed” to management input. Perhaps some moderate support in programs targeting backyard woodlot owners would have a duplicity effect. Diffusion of adopted innovations may spread more easily and faster through this community. Secondly, with the sheer numbers of this community, the result may actually translate into increased funding for government programs beyond the small amount initially diverted from existing programs.

CONCLUSIONS

While “The Woods in Your Backyard” is a step forward reaching out to small acreage landowners, it is only one step. We do need to train service providers. The audience’s socio-economic traits suggest they would be willing to pay for professional assistance to achieve their management objectives (Hull and others 2004). Trained service providers might have credentials and experience in a variety of areas such as raw material extraction (logging), resource management (forestry and wildlife), and home landscape care (arboriculture and/or horticulture). There is a clear need for individuals with a mix of skills who can work in the context of myriad ownerships and objectives. We need individuals with the traditional natural resource management skills, but in the situation where we see value for “The Woods in Your Backyard,” they require a set of new skills. They must have the ability to build trust (Hull and others 2004) with this new clientele.

Professional training to prepare the different groups of professionals with the skills they need to work with this audience are not yet available. It will require that forestry, wildlife, and logging professionals partner with home/landscape care professionals to develop targeted professional training to educate this diverse group of potential service providers, as well as utilize existing pesticide recertification programs when possible. The approach must include an assessment of business, marketing, and economics that will help convince professionals that serving this audience improves their existing business model and profits. This will require more assessment of small acreage owners to see how much, and for what services, they are willing to pay

professionals. A followup survey of users of “The Woods in Your Backyard” manual can help to provide this information and gain more insight that will help answer questions that potential service providers will want to know.

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CHALLENGES AND POTENTIAL FOR HISPANIC LABOR TRAINING: INSIGHT FROM NORTH CAROLINA'S CHRISTMAS TREE INDUSTRY

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Abstract—Christmas tree production is a \$110 million dollar per year industry in North Carolina. Hispanic workers now make up over 80 percent of the industry's labor force. Many studies indicate that Hispanic farm workers receive inadequate pesticide safety training, which presents risks to these workers and the environment as well as increased public and regulatory scrutiny of agricultural operations. A number of advocacy groups, agencies, and health care programs actively engage growers and farm workers on pesticide safety issues. However, Extension Agents might often be in a better position to reach this demographic group due to established networks and rapport with employers of Hispanic labor. This study uses a qualitative approach including interviews and a mail survey to investigate employer familiarity with worker training requirements, the impact of the language barrier among industry participants, and preferences for training delivery for Hispanic farm workers. Results indicate a predictable language barrier and knowledge gap regarding immigration rules and training requirements and policies. While bilingual publications are becoming more prolific for use by Hispanic workers, this study also points to the need for more Spanish-speaking personnel capable of training delivery. Recommendations are presented concerning Cooperative Extension's potential role in the development and delivery of training programs for employers within this industry and others reliant on Hispanic labor.

INTRODUCTION

Christmas tree production is a \$110 million dollar per year industry in North Carolina. From a handful of entrepreneurs in the mid 1950s, the industry has grown to over 1,600 Christmas tree growers who produce approximately 20 percent of Christmas trees in the United States (North Carolina State University Christmas Tree Genetics Program 2001). Hispanic workers, primarily from Mexico, make up over 80 percent of the labor force in this industry (Hamilton 2004). While a number of policies and regulations have been implemented for the health and safety of farmworkers, the language barrier and unfamiliarity with worker training requirements among employers puts workers and the environment at risk. This issue plays a large role in regulatory and advocacy scrutiny of individual operations and affects public opinion regarding the predominantly Hispanic labor force in this and other agricultural industries.

Many advocacy efforts and health care programs actively engage farmworkers on pesticide safety issues. However, Cooperative Extension is often in a better position to reach this demographic due to established networks and rapport with employers of Hispanic farmworkers. This study investigates employer familiarity with worker training requirements and the impact of the language barrier among industry participants. Recommendations are presented concerning Cooperative Extension's potential role in the development and delivery of training programs for employers in this industry and perhaps others reliant on Hispanic labor.

The EPA mandated Worker Protection Standard (WPS) requires that all farmworkers receive basic pesticide safety training. Yet many reviews of occupational health issues address pesticide exposure risks and the need for more effective pesticide safety education implementation among Hispanic farmworkers (Wilk 1986; Villarejo and Baron 1999; Von Essen and McCurdy 1998). In North Carolina, for example, a study by Arcury and others (1999) of 270 Hispanic farmworkers on 35 sites in 8 counties, found that only 35 percent of these workers reported receiving information or training on pesticide safety while 24 percent reported training during the current season or year. The survey also found that approximately one-half of the workers indicated that they had no source of information about pesticides on the farms despite training and fewer than 4 percent could name any chemical around which they had worked.

Another study by Elmore and Arcury (2001) on exposure beliefs among workers in the Christmas tree industry found that among the 20 study participants, all knew how to reduce pesticide exposure—some had received training from the employer they worked for, and some had not. Attempts have been made over the years to improve the training and certification of workers; however, several studies indicate that training is still inadequate or ineffectual (Larson 2000; Perry and Difonzo 1998; Larson 1998; Davis and Schleifer 1998; Mines and others 2001). This paper examines the results from a recent study of labor dynamics within North Carolina's Christmas tree industry (Hamilton 2004).

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METHODS

To better understand the worker training dynamic in this industry, employers and workers in the industry were interviewed. To assist in identifying potential study participants, County Extension Agents who work closely with Christmas tree growers were contacted in three counties to provide names of employers with different farm sizes and workforce compositions. Selections were based on employers experienced with Hispanic labor, while workers were chosen for their willingness to participate in the study. Interview questions were developed then reviewed by industry participants and County Extension Agents to verify relevance and tailor the language of the questions to address themes that participants felt would result in positive outcomes for future program development. Semi-structured interviews took place on individual farms in three western North Carolina counties with 20 Christmas tree growers and 35 workers for a non-predetermined duration. Interviews consisted of open-ended questions that allowed participants to elaborate on training, communication, and other themes concerning labor within the industry.

Based on themes generated from the interviews, a mail survey questionnaire was developed, peer reviewed, and sent to 850 Christmas tree growers in 2002. Address lists of growers from six major Christmas tree producing counties were provided by Cooperative Extension and used as the sampling frame. Questionnaire booklets were mailed to every other contact listed in these county databases and consisted of 37 questions addressing hiring, training, and other labor issues within the Christmas tree industry. The questionnaire mailing and additional correspondence followed a modified approach to Dillman's tailored design method (Dillman 2000).

RESULTS

Overall usable returned surveys totaled 185 (or 22 percent) which represents 13 percent of the estimated 1,400 Christmas tree growers in western North Carolina (NCDA 1997). Survey responses indicate that 68 percent of Christmas tree growers who hire Hispanic workers are most concerned about occupational and pesticide safety issues (table 1). At the same time, 78 percent are either somewhat familiar or not familiar with many of the laws and policies governing the required training of their workforce (table 2).

Language is a barrier and has the most immediate and influential impact on training. Less than 7 percent of employers indicated the ability to communicate comfortably in Spanish. Survey results also indicated that over 50 percent of the total workforce speak little to no English. Christmas tree growers felt that the language barrier restricted the extent to which they can effectively train workers. During the interview process, workers indicated that training is

Table 1—Frequency of concern related to common migrant labor policy issues among employers who hire labor

Level of concern regarding the following types of policies/regulations	Very concerned/ concerned	Somewhat concerned	Not concerned
	----- Percent -----		
Occupational safety/ pesticide safety regulations (n=102) ^a	68	22	10
Hiring and wage policies (n=104) ^a	69	21	10
Migrant housing regulations (n=99) ^a	50	21	28

^a n varied as some growers either declined to answer certain questions or questions were not applicable.

Table 2—Familiarity among employers regarding legal requirements for migrant labor training

How familiar are you with laws and requirements for training of migrant labor	Very familiar	Somewhat familiar	Not familiar
	----- Percent -----		
Hiring growers (n=125) ^a	22	50	28
Non-hiring growers (n=52) ^a	3	25	72

^a n varied as some growers either declined to answer certain questions or questions were not applicable.

conducted in a number of different ways through hands-on or hands-off (videos or brochures) approaches by the employer. However many workers mentioned that they relied on fellow workers, who either understood English better or had prior experience in the job-related task, to more fully explain their tasks or the employers' wishes (table 3).

When asked "Would you be interested in training related to employer requirements regarding training of Hispanic labor?" 19 percent responded yes, 49 percent responded maybe, and 32 percent responded no. The survey noted that the North Carolina Cooperative Extension Service was overwhelmingly indicated as the preferred training agent (table 4). During the interview process, employers mentioned that rapport with their county extension agents and the type of educational programming offered was more appropriate for meeting their needs. They often added that they trusted Extension Agents, with whom they maintain long-standing relationships, over other organizational representatives due to perceived regulatory and advocacy group scrutiny regarding their use of Hispanic workers. This trend may or may not be consistent across all States.

Table 3—Frequency of Spanish language skill level among employers

Which of the following best describes your ability to speak Spanish? (n=120)	Number	Percent
I don't speak Spanish	43	36
I know how to say a few work-related words/phrases in Spanish	53	44
I can handle very basic conversation in Spanish	16	13
I feel comfortable conversing in Spanish	7	6
I am fluent in Spanish	1	0.8

Table 4—Preferred training delivery for migrant labor programs

Who would you most prefer to conduct employer training related to migrant or Hispanic labor?	n=129
Department of Labor	5
Employment Security Commission	2
North Carolina Cooperative Extension (County Extension Agents)	43
NC Christmas Tree Growers Association ^a	19
A private consulting group	5
The employer should be responsible for his own training	12
A non-profit organization	2
No preference	12

^aA majority of NC Christmas Tree Growers Association educational programming is carried out by Cooperative Extension specialists and agents.

DISCUSSION

Frustration with communication due to the language barrier is a problem among employers and workers in North Carolina's Christmas tree industry. This problem poses serious health and occupational environmental implications. Employers, even with the best intentions, are not equipped with the language skills and sufficient knowledge of regulations to properly train their workforce. Unfamiliarity with pesticide safety regulations among growers influences the extent to which workers receive proper pesticide safety training. Employer and worker awareness regarding pesticide and occupational safety has immediate and long-term impacts on the welfare of the workforce as well as the industry's image.

Employers preferred the Cooperative Extension Service over other educational programming resources for issues related to labor. In many regards, Cooperative Extension is uniquely positioned to reach employers as well as the underserved farm worker demographic by capitalizing on the rapport and respect established by county agents that work with these industry participants. While bilingual publications are becoming more prolific for use by Hispanic workers, this study also points to the need for more Spanish-speaking personnel capable of training delivery.

CONCLUSION

Improving worker and employer understanding of regulatory and occupational safety issues within this industry (and others) can be achieved by quality training efforts. Offering training in Spanish is imperative for reaching the Hispanic farmworker demographic. Employers must also improve their personal knowledge of pesticide safety and provide proper WPS training to their workers to assure that their workers are following proper procedures. This will reduce short-term and long-term risks to themselves, their workforce, and the environment, while improving public perceptions and regulatory risks facing their operations.

Research-based educational programs such as those offered by Cooperative Extension and others who have established greater rapport with employers would be appropriate and participant-friendly delivery mechanisms for this type of information. Other educational entities would benefit from networking with Extension and using this established rapport to reach industry participants with whom agents traditionally have worked. In 2004 and 2005, extension agents and specialists in several western North Carolina counties used results of this study to develop an Integrated Pest Management training program in Spanish for Hispanic workers in the Christmas tree industry. This training, which also incorporates pesticide safety, was advertised among employers, conducted exclusively in Spanish, and received overwhelmingly positive feedback from all participants.

Expectations that a majority of the industry's Hispanic workers and growers will become bilingually proficient should be modest. More formalized, standardized, and frequent pesticide safety training should be implemented to improve grower and worker understanding of regulatory and safety issues. Employers are ultimately responsible for providing adequate occupational safety education of their workforce. However, while employers and workers often develop their own strategies for managing difficulties with the language barrier, improved training in Spanish with an entity with which rapport has been established offers a greater chance for improving education and reducing risk of on-farm injuries and pesticide exposure.

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MULTI-AGENCY COLLABORATION

EDUCATING LANDOWNERS FOR SOUTHERN PINE BEETLE PREVENTION IN MISSISSIPPI: A COLLABORATIVE PROJECT WITH THE FOREST SERVICE AND MISSISSIPPI STATE UNIVERSITY

Andrew J. Londo, James R. Meeker, and T. Evan Nebeker¹

Abstract—The southern pine beetle (SPB) is the most destructive pest in southern pine forests, accounting for millions of dollars of damage annually across the region. Since most of the forest land in the South is owned by Non-Industrial Private Forest landowners (NIPF) and they are the likely to sustain the largest losses during beetle outbreaks. This group is the target group for performing SPB prevention activities as they are likely to sustain the largest losses during beetle outbreaks. This project was initiated to provide educational programs relating to the SPB and pine plantation thinning to NIPF landowners and professional foresters in Mississippi. Funds provided by the Forest Service were used to conduct 37 educational programs statewide for 1,245 participants. Follow up surveys will be conducted with these participants to determine if they have implemented any SPB prevention activities on their property as a result of the programs. Additional follow-ups will be conducted with those who have performed prevention activities so their information can be added to the overall project database. Future plans for this project will also be discussed.

INTRODUCTION

The southern pine beetle (SPB) is the most damaging of all pests in southern pine forests. The SPB and its associates (ips engraver beetles and the black turpentine beetle) cause millions of dollars of timber damage every year in high-hazard condition stands (Mayfield and others 2006). As SPB spots grow, the potential to cause widespread timber damage to all pine stands, regardless of stand condition or ownership boundaries increases.

Most of the forestland in the South is owned by private non-industrial forest landowners (NIPF) (Birch 1996). It is with these landowners that the SPB and its associates pose the greatest threat. Targeting these NIPF landowners for SPB prevention has gained a lot of interest in recent years across the southern region (Mayfield and others 2006).

The Forest Service, Southern Region, Forest Health Protection has joined in collaborative efforts with all the southern states to conduct SPB prevention activities on NIPF forest lands. The overall goal is to reduce the overwhelming negative impacts the SPB can have on NIPF timberlands.

The 2006 Mississippi SPB prevention project is among the SPB pine prevention programs in that the Forest Service is working directly with the Mississippi State University Extension Service and the Departments of Forestry and Entomology and Plant Pathology, rather than the state forestry agency. This project is based entirely on the education of NIPF landowners across the state, rather than cost share programs employed by many other southern states.

This paper will describe the activities being conducted as part of the 2006 Mississippi Southern Pine Beetle Prevention project. In addition, future activities for this project for 2007 and beyond will be discussed.

METHODS

The education program is being conducted primarily by the extension forestry group in the Department of Forestry, with support from the Department of Entomology and Plant Pathology at Mississippi State University (MSU). MSU Extension forestry has a long record of conducting educational programs for NIPF landowners, as well as professional foresters across Mississippi and the southern region (Londo and Monaghan 2002). The SPB educational program consists of county forestry association (CFA) meetings, workshops, publications, and mass media.

County Forestry Associations (CFAs)

CFAs are county based landowner groups, affiliated with the Mississippi Forestry Association. These groups have provided ready made audiences for extension forestry programs for years. For the SPB prevention project, individual CFAs were contacted to determine their interest level for such a program. Funds provided by the Forest Service were used to sponsor the meal at these programs. This encouraged 100 percent participation by those CFAs contacted.

The hour-long program given at these meetings was comprised of a comprehensive review of the biology,

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identification, and management activities for the SPB and its associates. Proactive management activities (namely pine plantation thinnings, and planting the right species on the right site) were emphasized during these meetings as being the best way to reduce the overall threat of the SPB. In most cases, 4-6 weeks following the CFA program, a pine plantation thinning workshop was conducted in the same county, as a follow up for the CFA meeting.

Pine Thinning Workshop

Forest landowner workshops were designed to provide more intensive, hands on training in specific subject areas (Londo 2004). The most popular of the workshops taught by MSU Extension Forestry is "Are My Pine Trees Ready to Thin"? This workshop begins with an hour long indoor "lecture" covering the basics of pine ecology, growth, thinning techniques, and the southern pine beetle. Following the indoor lecture period, is an outdoor laboratory session where participants are taught to collect some basic forest measurements information. Information collected includes average DBH, total heights, heights to natural pruning, and stems per acre (Traugott 2000, Londo and others 2002). The equipment needed to conduct the workshop (clinometer, D-tape, loggers tape, height pole, and increment borer) is provided by project funds. The equipment is made available to CFA members through their County Extension Office. Data on how often this equipment is being used will be collected in late 2006.

Although the overall goal of the region wide project is to get actual acres thinned on the ground, a survey will be sent to all CFA meeting and Pine thinning workshop participants to determine if they have undertaken any SPB prevention activities (namely thinning) on their property. Site visits will be held with those who indicated that they have thinned their stands as a result of the program they attended. Acreages thinned, as well as GPS point data will be collected for addition to the overall southern region database.

Publications

The preferred method for Mississippi NIPF landowners to obtain information is through publications (Gunter and others 2001). At all programs, a folder with publications on the SPB along with pine plantation thinning are provided. In addition, these publications are also made available on the MSUCares.com/forestry web page. To date, approximately 9,000 publications have been distributed statewide.

Radio

The MSU Extension Service has a daily radio program called Farm and Family. This program is available on a number of radio stations statewide, as well as on the internet at MSUCares.com. Friday has been called forestry Friday for over two decades. Many of these forestry Friday radio

shows in 2006 have discussed the SPB and pine plantation thinning. While the actual impact of these programs is difficult to determine, they do help improve the awareness of the SPB and its implications for forest management in Mississippi.

RESULTS

To date, a total of 37 SPB prevention programs have been conducted for 1, 247 participants. These programs can be broken down as follows: 18 CFA meetings, 16 workshops, 1 short course, 1 Society of American Foresters chapter meeting, and one extension service in-service training program. There are 6 remaining programs to be conducted for the remainder of FY 2006, and early FY 2007.

We have directly distributed approximately 9,000 publications through these programs. In addition, 1,300 SPB landowner packets are being sent to select counties throughout the state for a total publication distribution of approximately 10,300.

Program participants will be surveyed during the fall of 2006 to determine if they have implemented any SPB prevention activities since attending the educational programs. Participants, who indicate that they have done some prevention activities, will be contacted for a follow up site visit. The site visit is needed so that acreages and GPS locations for those properties will be collected for incorporation in the region wide data base.

FUTURE DIRECTIONS

For 2007 and beyond, Mississippi will follow the lead of many other southern states by implementing a cost share program for NIPF landowners. This cost share program will encourage landowners to conduct pre-commercial and first commercial thinnings on high hazard pine stands. This will be done again in conjunction with the Forest Service, as well as the Mississippi Forestry Commission. While the guidelines for this have yet to be developed, the Mississippi guidelines will be modeled closely after the Texas Forest Service program (Billings 2005).

CONCLUSION

The 2006 Mississippi SPB prevention project is a collaborative effort between the Forest Service and the Departments of Forestry and Plant Pathology and Entomology at Mississippi State University. The project is designed to provide educational programs in SPB biology and management and pine plantation thinning for NIPF landowners across Mississippi. To date, 36 programs have

been conducted for 1,245 participants statewide. In addition, over 9,000 publications have been distributed.

Surveys will be sent to program participants to determine if they have implemented any prevention activities on their property as a result of the programs. These surveys will be sent out in the fall for 2006.

2007 will see a continuance of the educational program, as well as the addition of a cost share program for pre-commercial and first thinnings for pine stands and plantations. We will be collaborating with the Forest Service as well as the Mississippi Forestry Commission.

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CHANGING ROLES: WILDLAND-URBAN INTERFACE PROFESSIONAL DEVELOPMENT PROGRAM

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Abstract—A number of communication and technology transfer techniques can be used to bring about change. When dramatic change is needed, however, some techniques are more powerful than others. Changing Roles: Wildland-Urban Interface Professional Development Program was designed to train natural resource professionals who work with interface issues in the South. The southern U.S. is experiencing unprecedented population growth and has the greatest amount of privately-owned land of any part of the United States. The need for this program was evident from focus groups conducted as part of the Southern Wildland-Urban Interface Assessment, which revealed that natural resource professionals felt unprepared to tackle the complex challenges associated with managing resources in a rapidly changing landscape. This program includes a training manual that allows natural resource agencies to design professional development for their staff that will enable them to work more effectively in the southern wildland-urban interface. There are four modules, each containing trainer's guides with background information and interactive exercises to be used with workshop participants. A total of 39 exercises were created and pilot tested with students and resource professionals. Much of the information in the modules is presented in 28 fact sheets that can be distributed as reading material or used with other audiences as handouts. Twenty-three case studies provide vivid examples of interface issues across the South and how they are being resolved. PowerPoint® presentations are provided to help introduce concepts, discuss exercises, and engage participants in exploring case studies. Evaluation materials and additional resources are also provided. This paper demonstrates how a program can be developed to help bring about institutional change. This was done by helping agency leadership to understand the need for change, by carefully pilot testing and reviewing the draft materials for relevance and application, by training agency staff to adapt the program to meet their needs, and by supporting trainers with web-based suggestions and outlines.

INTRODUCTION

The wildland-urban interface is any area where increased human influence and land-use conversion are changing natural goods, services, and management (Macie and Hermansen 2002). The Southern Wildland-Urban Interface Assessment by the Forest Service, Southern Research Station, found that natural resource professionals often feel frustrated and sometimes powerless in the face of rapidly changing land use in the interface (Macie and Hermansen 2002). The complex issues in the interface affect how interface forests can be managed, how natural resource professionals communicate and work with interface residents and community decision makers, and how managers respond to and assist the development of local land use decisions and regulations that affect natural resources. To help natural resource professionals work more effectively in the wildland-urban interface, Changing Roles: Wildland-Urban Interface Professional Development Program was developed by the University of Florida in partnership with the Forest Service, Southern Research Station, Southern Center for Wildland-Urban Interface Research and Information (now the Centers for Urban and Interface Forestry). The Southern Group of State Foresters provided guidance and funding for the project.

SITUATION

In 1998 severe wildfires in Florida demonstrated the complexities of natural resource management in the wildland-urban interface. Following these fires, the Chief of the Forest Service declared the wildland-urban interface one of the major challenges facing the Forest Service in the southern United States (Roussopoulos 2002). In the summer of 2000, a series of focus groups was conducted in six wildland-urban interface communities across the southern U.S. The focus groups were part of the Southern Wildland-Urban Interface Assessment which aimed to better understand interface issues, challenges, and opportunities, as well as research and training needs (Monroe and others 2003). Participants included Federal and state agency staff, public officials, community and transportation planners, private landowners, educators, extension agents, and other stakeholders. The focus groups revealed that natural resource managers feel hindered and sometimes helpless when addressing issues created by rapidly changing land use in the interface (Macie and Hermansen 2002). Because population and development pressures are increasing in the South and there is less publicly managed land than in other regions (such as the West), southern natural resource managers often play a different role in interface land and resource management. Managers often work across multiple properties and jurisdictions, and must communicate with a variety of stakeholders to effectively manage resources in the interface.

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The issues and needs identified in the Southern Wildland-Urban Interface Assessment prompted the development of Changing Roles. The Southern Wildland-Urban Interface Council, the advisory council for the Southern Center for Wildland-Urban Interface Research and Information, requested that the program be developed for use at the state and local levels. The professional development program includes four modules: (1) Introduction to the range and complexity of wildland-urban interface issues, (2) Tools for effectively managing natural resources in the wildland-urban interface, particularly for enhancing forest health and meeting multiple landowner objectives, (3) Strategies for understanding and influencing the development of policies and plans that affect natural resources, and (4) Communication skills for working with interface residents and community planners and leaders. The U.S. Fish and Wildlife Service produced a video supplement to introduce training participants to wildland-urban interface issues. The video also serves as an outreach tool for resource professionals working with interface residents.

Each of the training modules include a trainer's guide; PowerPoint® presentations; fact sheets with important points for participants; and interactive exercises that enable participants to apply what they learn. The program also includes case studies with examples of interface challenges and success stories from across the South; adaptable evaluation materials; and a resource list including literature, websites, fieldtrip and guest speaker suggestions relating to module topics. The program is designed to be flexible, allowing trainers to select materials that meet their needs and enable them to design programs of various lengths. The program has been distributed to state forestry agencies and other natural resource agencies across the southern United States. Trainers can put together an introductory two-hour program or a more comprehensive week-long course, depending on audience needs and the time available. Many of the materials are also suitable for use with other audiences such as extension agents, landowners, or community leaders.

The program materials are available on the InterfaceSouth website (the SCWUIRI's website) at http://www.interfacesouth.org/products/training/changing_roles.html. The website also provides trainers and participants with additional opportunities to provide feedback and a forum to share how the materials are being used. This tool is designed to encourage trainers to exchange ideas, learn from other's experiences, and maximize the value obtained from using the materials.

Changing Roles is designed to provide essentials skills to enable natural resource professionals to respond to the challenges of a rapidly changing landscape. By working with landowners and assisting local leaders with community development and resource management decisions, resource professionals can help reduce interface problems.

IMPLEMENTATION

Changing Roles is designed to encourage natural resource agencies and professionals to become more involved in WUI issues by expanding management activities, communicating with interface residents more effectively, and assisting planners and policymakers by providing science-based information about natural resources. To accomplish these objectives, the program materials incorporate communication and behavior change techniques. Following is a description of how three specific communication and behavior change strategies were incorporated into the program: the Experiential Learning Cycle, Social Marketing, and the Theory of Planned Behavior.

Experiential Learning Cycle

The Experiential Learning Cycle, made popular by David A. Kolb in 1984, is often depicted as a four-part process (fig. 1) that suggests that learning occurs when people: 1) experience something, 2) reflect upon their experience critically, 3) generalize what they learned from the experience, and 4) apply what they learned to new situations (Leck and Watson 1996). The activities that trainers are given in Changing Roles engages participants in a variety of experiences; walks the trainers through exercises and discussions to help the participants evaluate their experiences critically, both as individuals and in groups; encourages participants to generalize what they learned by drawing their own conclusions based on the program's content; and allows them to apply their new knowledge to a variety of interface challenges. Several of the program exercises present participants with "what if" scenarios where they must apply the concepts they have learned to perplexing situations.

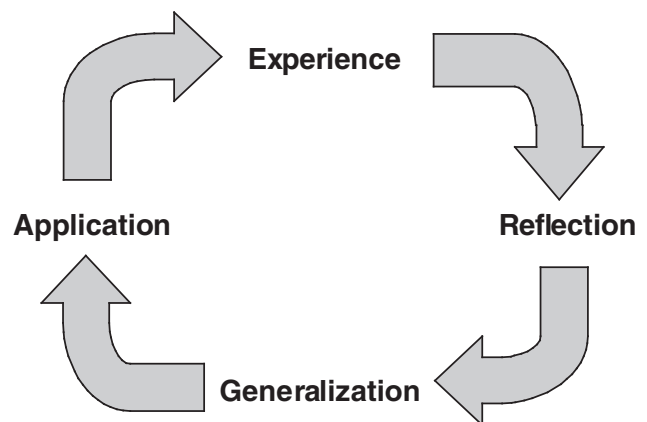


Figure 1—The Experiential Learning Cycle (Leck and Watson 1996).

Social Marketing

Another communication model used in the development of Changing Roles is Social Marketing. In this model, McKenzie-Mohr and Smith (1999) suggest that identifying barriers and benefits for desired behaviors are key steps in fostering behavior change. Barriers may be internal such as the lack of motivation or knowledge, or external, such as the lack of supporting infrastructure. For natural resource professionals working in the interface, major barriers are a lack of knowledge and a lack of skill to work with policy makers. Changing Roles is designed to increase knowledge by providing basic information about interface issues, connections, solutions, and available support often through examples of communication where problems have been resolved. While knowledge alone does not change behavior, it is one prerequisite for behavior change. Module 3 in Changing Roles provides information and land use policy and several exercises to practice engaging in the policy making process. Participants are encouraged to discuss appropriate strategies for their agency and their context.

Social marketing also emphasizes the importance of norms; social standards that help define acceptable behavior (McKenzie-Mohr and Smith 1999). Norms provide boundaries for human behavior by supporting and encouraging certain actions while discouraging others. Norms are illustrated in the program through case studies of natural resource professionals collaborating with local leaders, citizens, and planning professionals to address interface issues. The case studies help create and support social norms that suggest that resource professionals should be involved in planning and policy decision-making processes where they can add value. The program helps resource professionals realize that they may have an important role to play at the decision-making table.

Theory of Planned Behavior

Another model that shaped Changing Roles was the Theory of Planned Behavior. Ajzen (1985) suggests that a person's behavior is determined by their intention. Intentions are formed by three factors: attitudes toward the behavior, subjective norms, and perceived behavioral control (Ajzen 1985). Attitudes define how a person thinks about and values the consequences of performing a given behavior. Subjective norms are the perceived social pressures to perform or not perform a behavior. They are usually based on norms established by people whose opinion is important to an individual. For instance, if a person cares about a friend's opinions and that friend insists that driving a hybrid car is the only right thing to do, the individual is more likely to drive a hybrid car. Perceived behavioral control is a person's perception of his or her ability to perform a certain behavior (Ajzen 1985). For example, if someone demonstrates how to build and use a compost bin, onlookers may feel more capable of doing it themselves, thereby increasing

their perceived behavioral control. These concepts were considered during the development of Changing Roles.

The program emphasizes how natural resource professionals' involvement in addressing WUI issues can reduce challenges and enhance opportunities in their region. The program also models how resource professionals can begin to fill these "changing roles," by providing examples of how resource professionals can offer expert knowledge, ideas, and support during processes that influence natural resources in the WUI. By addressing the positive consequences that could result from working in the interface, natural resource professionals may be more likely to do so.

Ajzen states "people intend to perform a behavior when they evaluate it positively and when they believe that important others think they should perform it" (Ajzen 1985). It is safe to say that natural resource managers probably value what their employers care about. Changing Roles was approved by agency leaders, establishing subjective norms for resource managers. To encourage state and federal agency staff to use the program, the regional directors of five partner organizations signed a cover letter that conveys the importance of changing the way natural resource agencies operate in the interface. Agency support will be needed to facilitate the transition of resource professionals into increasingly influential roles.

Finally, the program addresses perceived behavioral control by providing information about how natural resource managers can reduce problems in the interface. By including success stories it demonstrates that the behavior can accomplish what it intends to. Since the program was designed to be flexible and adaptable, trainers can customize their workshops to provide skill-building in essential areas, thereby increasing the perceived behavioral control for their participants. Although the program emphasizes the importance of manager support in interface communities, it cannot ensure it. Agency history, supervisor priorities, local government and community support are external factors that could influence success.

In addition to the use of these communication and behavior change models, other strategies were used to make the Changing Roles materials as useful and effective as possible. Materials include technical background information and references well as clear and simple directions. Trainer's Guides use icons to refer to the supplementary resources for ease of use. Suggested agendas demonstrate how the materials can be reorganized and adapted. Each module includes a variety of exercises that help trainers engage participants in exploring and applying the concepts being conveyed. The video and case studies highlight communities that have invested in communication and planning processes to manage WUI issues. The following guidelines were used to develop each module:

- Trainers need accurate and current information supported by documentation.
- Trainers need a variety of tools to give them options for presenting information. We provide presentations, fact sheets, and background information.
- Trainers need to be able to adapt, change, revise, and recreate materials to meet their audiences' needs. Most of the activities or concepts are designed to be used in any order; many are adaptable so that examples and issues can be altered. Handouts are provided in MS Word® files to make it easier for trainers to create their own versions. The website encourages trainers to share their adaptations with each other and models this behavior by providing some examples.
- Participants learn from each other. Case studies and exercises provide discussion questions to help trainers engage participants in meaningful conversation.
- New skills are learned through practice in safe environments. Many of the exercises give participants a chance to try new ways of working in the interface during training workshops.
- Clear directions and icons help trainers who just want a cookbook of presentations, materials, and activities that they can do without much preparation.
- Adaptable presentations and materials on CD make the program flexible for trainers who want to invest more time customizing their trainings.
- Experts reviewed each module for accuracy and applicability across the region. Pilot tests of the materials helped improve the directions and the flow of the exercises.

A training-of-trainers (TOT) workshop was conducted for 50 participants, including state forestry personnel, extension specialists, and other natural resource professionals, to introduce the materials and help them begin the process of designing workshops for their colleagues. Feedback from the training workshop suggests that Changing Roles accomplished the desired goals. Workshop participants commented on the usefulness of the exercises, fact sheets, and case studies. Most recognized that it will take time to become comfortable with the material; but they also acknowledged that some sections are easy to use immediately. The material is perceived as relevant and not similar to existing materials. Participants rated the materials 4.6 on a 5-point scale where 5 is "very relevant to the work of my agency or organization." They also rated the materials 2.6 on a 5-point scale where 5 is "very similar to resources I already have." Workshop participants are likely to use the materials with others, share them with other trainers, and help train their staff. Respondents rated these latter three questions 4.2, 4.3, and 4.2 respectively on a 5-point scale where 5 is "very likely."

Respondent comments also reinforced our belief that state agencies have different needs and capacities for using this material. Some states may wish to participate in a follow-up regional workshop put on by local trainers. Others, such as Alabama and North Carolina, are planning to team up with extension faculty to organize a training program.

Currently, 233 copies have been distributed to southern state forestry agencies, 150 to Cooperative Extension Service, and another 19 to various other organizations and individuals. Recipients of the training materials were surveyed and many of them have used or are planning to use the materials. Several state forestry agencies are holding trainings with their personnel. Extension specialists and agents are organizing workshops with local leaders, extension agents, other natural resource professionals, and community residents. Some agencies have created planning committees to help determine how the program can best benefit their region. In 2008 the Centers for Urban and Interface Forestry planned to announce a new position that will enable them to support broader implementation of the program.

Assessment of Use

A series of evaluations were conducted in May 2006, October 2006, and April 2007 of those who received Changing Roles either from the TOT or by request. The goal of these evaluations was to determine if and how trainers used the material, future plans for using the material, and provide an assessment of the materials' effectiveness. Summaries of these three evaluations are provided below to show how the use of the program has increased over time.

In May 2006 each participant that had attended the TOT three months earlier was contacted regarding their use of the materials within their agency or organization. A general questionnaire was developed including questions about use of the materials, plans for future use, assessment, and current agency needs. Thirty-six percent of the Changing Roles recipients replied to the questionnaire. Of those who responded, 17 percent had already given a presentation or workshop, 33 percent were planning a workshop for later in 2006, 62 percent were planning a workshop to be held at an unspecified date, and four percent did not plan to use the materials due to conflicts with current job duties.

In Alabama, a presentation on Interface Issues was given to the Alabama TREASURE Forest Association (ATFA). The trainer distributed Changing Roles notebooks to the Alabama Wildland-Urban Interface Advisory Council, the Alabama Forestry Commission, and Alabama State Forester. The Alabama Forestry Commission referenced the materials in four publications. In Florida, the Cooperative Extension Service led a one day workshop in the Natural Resource Leadership Institute aimed at empowering and enabling participants to understand the complexity of the WUI and the opportunities that effective land-use planning can

provide. The North Carolina Division of Forest Resources used the materials in a training program and distributed Changing Roles notebooks to the agency's Management Team. The Oklahoma Forest Service Department introduced the State Forester and his staff to the program and provided them with notebooks. In South Carolina Changing Roles notebooks were given to WUI coordinators, regional foresters, and other personnel.

There is a wide range of materials to choose from. It will be possible to use the materials with several target audiences. I think the material will be useful in programs to the general public as well as resource professionals.

May 2006 Evaluation Respondent

All of the participants who responded to this questionnaire provided a positive assessment of the materials. These respondents also said that the program materials met their needs.

A follow-up survey was administered in October 2006. Individuals who attended the TOT and those who otherwise received the Changing Roles notebook were contacted again to learn how they were using Changing Roles in their agency or organization. A questionnaire similar to the one sent in May was developed and sent to individuals via email. Individuals were asked to respond via email. Twenty-two percent of the individuals contacted replied to the survey. Of those that responded, 65 percent had already given a presentation or workshop, 43 percent are planning a workshop for later this year, and 21 percent did not have plans to use the materials. Since all notebook recipients were surveyed again, this response rate may reflect repeat respondents.

Basically, it is a very thorough program that really does a good job of explaining the multiple components of WUI. I would think that this is the most complete set of information and training activities within the nation, and will probably be copied or developed into a national program if you find it is used a lot.

May 2006 Evaluation Respondent

Respondent feedback provided new information about training activities. A member of Arkansas University faculty incorporated the Changing Roles materials into her 2006 summer forestry camp curriculum and engaged students in using the materials to develop a workshop for interface residents. The Alabama Extension Service had to cancel their previously planned workshops, but was hopeful that workshops might be rescheduled in the future. The Georgia Forestry Commission, Sustainable Community Forestry Program held district training sessions and used Changing Roles slides to introduce WUI issues. They also used the materials to train foresters and district chief rangers. In

Mississippi, notebooks were distributed to appropriate Forestry Commission personnel and a partnership was being developed with the state RC and D Council. Respondents from the Mississippi Forestry Commission also said several ideas from Changing Roles were used in their Firewise Awareness Field Days. The South Carolina Forestry Commission conducted two 2-day workshops in September 2006 for about 90 employees who ranged from forest technicians and supervisors to program managers. The Tennessee Division of Forestry held a WUI training session at their Annual Meeting.

The University of Florida performed a final survey in April of 2007 (a complete list of evaluation questions can be found in Appendix A). All TOT participants were contacted and at least one person from each of the 13 state forestry agencies was contacted by phone to assure their responses. The survey was done by phone and email and was designed to capture information regarding the programs usage, adaptability, impact, and assessment of the materials. The goal was to receive feedback about the Changing Roles materials from each of the southern state forestry agencies. A list of notebook recipients was created and emails were sent to each individual informing them that the final Changing Roles evaluation was being conducted, their participation would be helpful, and that the survey would soon be emailed to them. A second email with an attached copy of the survey was sent to the individuals and each participant was given the choice of whether they would like to complete the questionnaire via email or as a telephone interview. The email requested the best time to call if the participant preferred a phone interview. Several weeks later, a reminder email with the survey attachment was sent to those individuals who had not responded. The majority of respondents chose to complete the survey via email.

Survey results revealed once again a variety of workshops had been held across the South. The Florida Extension Service used Modules 1 and 3 to conduct a two-day training for extension agents in February 2007 on land use, growth management, and understanding interface residents. The Georgia Forestry Commission successfully completed all ten of the planned district training workshops between October 2006 and January 2007. These half-day workshops had an average attendance of 25-30 individuals and participant feedback on the trainings was positive. North Carolina State University used the Changing Roles materials in presentations given to the North Carolina Society of American Foresters and a statewide teleconference to over 105 participants. The Texas Forest Service coordinated a week-long training for 85 participants in December of 2006 to tackle WUI issues.

With forest industry leaving Texas, large tracts of land are being sold and often fragmented. Urban citizens are also moving outside the city limits to where it is more affordable and they can own small tracts of land. As a result ... the

forestry profession is quickly changing. Traditional forestry still exists in Texas and yet at the same time there is a need to provide services to this new landowner to ensure that there are healthy forests in the future for Texans. The Changing Roles materials directly address these issues and provide natural resource professional the tools needed to contend with the changing face of forestry. Since training 85 members of our personnel in December, “Changing Roles” has become a common phrase in our agency that means addressing these challenges.

April 2007 Evaluation Respondent

The Texas Forest Service wrote a successful proposal for a \$40,000 grant that was used to train other agencies: Consulting Foresters, the U.S. Natural Resource Conservation Service, Texas Cooperative Extension, and Texas Parks and Wildlife.

Rather than holding an independent workshop, the Virginia Department of Forestry incorporated the Changing Roles program in a breakout session as part of a larger training academy. This approach was successful and a similar session is planned for an upcoming agency personnel conference. The Virginia Extension Service is planning additional workshops to emphasize the interconnected nature of interface issues and management for fragmented forests. The Forest Service worked with The Conservation Fund (CF) to blend Changing Roles into the CF course on Green Infrastructure. The one-week course was offered to Southern Forestry agencies and community members in May and July 2007 at the U.S. Fish and Wildlife Service, National Conservation Training Center in Shepherdstown, WV.

Some organizations have also been able to incorporate the Changing Roles materials into their existing training programs. Participants have stated that “this is a good mix of material that can be just used as is or added to other material to put programs together or work with groups to address issues.” In North Carolina fact sheets and PowerPoint® presentations have already been used in other presentations and programs, future plans include incorporating some of the materials into woody biomass training materials. The Texas Forest Service expects the Changing Roles materials to be incorporated into other programs. In Kentucky, the Division of Forestry has incorporated materials from the program into their Stewardship training.

Many agencies found it useful to customize presentations and materials to their area and specific audience. “The program provides a great overview of the regional situation and a broad, basic foundation. It requires adaptation for specific and local programs.” Many agencies and partners plan to update fact sheets with local information and to adapt other materials to agency specific and local needs.

Most feedback was quite positive, such as, “We felt the materials were of great help and liked the case studies especially since they all related to Southern issues,” and “The land use and policy module is extremely useful in our state. More of our staff should be exposed to this material.”

Most agencies that responded to the evaluation found the materials to be user-friendly, “with printed materials, PowerPoint® presentations, exercises, fact sheets and activities, it is nice that everything is there.” One respondent also mentioned that the Changing Roles section of the InterfaceSouth.org Web site provided useful adaptations from trainers and workshop agendas that could be used as guides to structure a variety of presentations. Currently five agendas are available for reference on the “Trainer’s Corner” page of the website; these have been provided by trainers of workshops held in Florida, Texas, Tennessee, and South Carolina. When asked what barriers other than time and money prevented the use of the Changing Roles materials, participants still responded with lack of time as well as conflicts with other work priorities. One Changing Roles trainer had two programs scheduled but “had to cancel due to dry weather and fire suppression activities.”

The evaluation data also seemed to indicate that the Changing Roles program is meeting the needs of agencies trying to deal with a “new type of forestry.”

It (the WUI) really impacts all natural resource professionals since demographics and land-use keeps changing and Changing Roles is proactive in performing natural resource management.

April 2007 Evaluation Respondent

Since the evaluations, Changing Roles has continued to be used across the South. In August 2007, the Tennessee Cooperative Extension Service used the program materials in three in-service trainings for a total of 26 county agents. Evaluations from the trainings revealed that 74 percent of participants considered WUI issues to be very or extremely important in their county, 89 percent expect Extension’s role in WUI issues to increase, and 100 percent of the participants thought the in-service training increased their awareness of WUI issues. In December 2007, the Texas Forest Service hosted a two-and-a-half-day event for a group of approximately 80 natural resource professionals. The workshop elicited so much excitement that a series of follow-up meetings were scheduled by the leadership to develop plans for future activities.

In summary, most state forest agencies are using the materials to complement their own training programs, some agencies are partnering with extension to deliver workshops, and others are using the materials to build WUI expertise with other agency staff. One respondent said, “The (Changing Roles) program provides one of the first

comprehensive training packages to incorporate all of the various components of the WUI issue in the South.” The trainers agree that the materials are well organized, easy to follow, informative, and provide creative instructional tips. Case studies are popular and additional examples were requested. Some trainers suggest that they are not as comfortable delivering the programs as they would like to be. State agencies are also developing ancillary materials that are more locally specific to complement the Changing Roles materials. Surveys created and administered by agencies after their training workshops show that some of the information provided by the program is starting to be practiced in the field. These findings suggest that the delivery, content, and organization of the Changing Roles materials have been, at least in part, successful in achieving their purpose.

[Http://www.interfacesouth.org/products/training/feedback_page.html](http://www.interfacesouth.org/products/training/feedback_page.html) features adaptations and suggestions for Changing Roles created with information from trainers. Modified and new fact sheets and exercises, and tips are posted for all trainers to view and download.

Recommendations for Materials

The development of the original Changing Roles: Wildland-Urban Interface Professional Development Program represents the beginning of a process. It was designed to be a living, growing resource that can be built-upon and customized to meet a variety of needs. There are many potential opportunities for improving and adapting the program including the following:

- Adapting the program to address issues and conditions in different regions (besides the South),
- Creating a national version of the program,
- Adapting the program to better meet the specific needs of cooperative extension,
- Revising pieces of the program to create high school or college curricula,
- Developing additional modules that address other important WUI issues (e.g., a module strictly about wildfire issues),
- Adding materials to existing modules (e.g., more case studies, or a fact sheet specifically about soil issues),
- Simplifying the materials for the public, perhaps for use in town hall meetings or community forums,
- Organizing a subset of the materials specifically for congressional committees or other elected officials.

Additionally, evaluation data from recipients of the program provided the following recommendations:

- Reduce the amount of detail in each lesson because important points get lost in over explanation,
- Modify the book to be less confusing and cluttered with unnecessary detail and of little reference value, and
- Modify the puzzle exercise concepts into a presentation for trainers with limited time.

Respondents also recommended some additions including:

- Fact sheet templates for individual states,
- More case studies that provide solutions to problems,
- Sections on ecosystem services, policy, aesthetics and zoning, and
- A module to introduce the Southwestern Fire Risk Assessment product and how individuals can use this information to promote wildfire issues in the South.

CONCLUSION

The wildland-urban interface is a dynamic area where changes in land use and human influences are affecting natural resources. Population growth and demographic and land-use changes in the South are affecting development trends and natural resource use. The roles of natural resource professionals who work in the wildland-urban interface are rapidly changing and expanding. Resource professionals need new information and skills to enable them to effectively communicate with interface residents, work with community planners and policy makers, and manage and conserve natural resources in the interface. Changing Roles: Wildland-Urban Interface Professional Development Program aims to provide these skills and information.

ACKNOWLEDGMENTS

A project of this complexity is only possible with the contributions of a great number of people. We have had the good fortune to work with many talented and thoughtful individuals who care about the future of forest ecosystems in the South. We are particularly grateful to our the Southern Wildland-Urban Interface Council for having a bold vision for natural resource agency professional development, to our authors who applied their expertise to the changing landscape of the wildland-urban interface, to all the reviewers who added suggestions that improved these materials, to pilot-test participants who helped us refine the program, and to the production team of research assistants, editors, designers, and web support specialists who converted the information into this useful product. We would also like to thank the Southern Group of State Foresters, the Forest Service, the University of Florida, and the U.S. Fish and Wildlife Service for their financial and in-kind contributions that made this program possible.

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WOOD TO ENERGY: TECHNOLOGY TRANSFER AND EDUCATION PROGRAMS FOR SOUTHERN UNITED STATES

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Abstract—The goal of the Wood to Energy outreach program is to help communities at the wildland-urban interface in the thirteen southern states decide whether to use woody biomass for electricity production. The overall objectives of this project are to: 1) increase awareness and knowledge about using woody biomass for energy production; 2) enable community leaders, potential woody fuel users, biomass suppliers, and forest managers to discuss the possibilities in their region; 3) provide tools and resources as communities begin to plan for new opportunities. In preparation for the development of these outreach materials, we have explored public perceptions about woody biomass with a series of interviews and surveys. Respondents' opinions in the South appear to be consistent with perceptions in other parts of the world. People are concerned about the environmental impact of the facility, the future of nearby forests, and the trustworthiness of facility managers and information providers. The development of the outreach materials and the process for making this information available to the public will use the results of this perceptions research.

INTRODUCTION

The southern United States produces nearly sixty percent of the nation's wood, and projections show that it will continue to be the leader into the future. The climate is well suited for fast-growing pines and hardwoods, and as a result, the timber industry has played a large role in the economic development of the region. The southern United States is also the region of the U.S. with the fastest growing human population. As urban centers spread, large areas of once primarily contiguous forestland are increasingly influenced by humans and surrounded by or intermixed with urban development. The South already has more cities with forests within 50 miles than any other part of the United States (Dwyer and others 2000).

The southern forests located in the wildland-urban interface, where increased human influence and land use conversion are changing natural resource goods, services, and management (Macie and Hermansen 2002), are particularly well-suited for taking advantage of woody biomass for energy. Because transportation costs tend to be a limiting factor for using wood energy, communities with a nearby source of wood have a distinct advantage over other communities. Not only can forestry activities provide waste wood, but urban forest debris can contribute a significant amount of wood.

Unlike other areas of the United States, most of the southern forests are privately owned by industry and individuals. To the extent that the public recognizes this ownership pattern, they understand that forest landowners make economic decisions about harvesting and forest management. Pine plantations are common along the coastal plain and pulp mills convert these trees to boxes, fabrics, and other products.

The public may react quite differently, however, to a proposal to use wood for energy. Because woody biomass facilities are being suggested for communities with significant wildland-urban interface development in order to reduce transportation costs, we can assume that a sizable population of the public (and primarily urban dwellers) will be affected by the proposal. A number of studies (Hargreaves 1996, Upreti 2004, van der Horst and others 2002) cite public perception as playing a pivotal role in the success or failure of proposed biomass energy plants. According to a series of polls conducted by utilities companies across the United States, individuals have favored renewable sources of electricity for twenty years, with the majority of residential customers showing a willingness to pay more per month on their electric bills for power from a renewable source (Bang and others 2000, Farhar 1999). The public, however, is focusing on the zero-emission energies of wind and solar, not wood (Farhar 1999, Upreti 2004). Concerns about air quality, health and safety, aesthetics, noise, and traffic are important to citizens near proposed biomass energy facilities and parallel those regarding any other industrial development (Khan 2004, Rosch and Kaltschmitt 1999).

Even those who will not be affected by a plant directly express concern that forests will be poorly managed or destroyed to supply a continued quantity of fuel. Several national environmental advocacy groups (Environmental Defense Fund 2005, Greenpeace 2005, Natural Resource Defense Council 2003) express support for biomass energy, but emphasize that such support is contingent upon sustainable sources of biomass. National Sierra Club policy opposes harvesting federally owned forests for electricity generation (Sierra Club 2007).

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The concern about forest management and the tendency to value preserved forests more than working forests may be an outgrowth of demographic change across the Southeast. The human population of the South is rapidly increasing with northern migrants often bringing greater wealth and education to their new communities (Macie and Hermansen 2002). Quite apart from the regional demographics, however, is the notion that our culture promotes and maintains a set of values about nature that favor preservation.

In some areas of the South, however, non-industrial private forest owners' attitudes are undistinguishable from their urban counterparts (Bliss and others 1997, Tarrant and others 2002). A 2001 telephone survey of 1,423 urban, near-urban, and rural residents of the thirteen Southern states revealed that the majority believe the most important value of forests is clean air, while the least important was wood production (Tarrant and others 2002). This shift over the last twenty years away from an economic approach to timber management is likely due to the migration between rural and urban areas, an increase in economic growth, and greater technological innovations (Tarrant and others 2002).

A number of researchers suggest that public acceptance of information about forest management, air quality, and source sustainability is contingent upon the level of trust citizens have in the developer and management of the proposed facility (Kunreuther and others 1996, Rosch and Kaltschmitt 1999, Sinclair and Lofstedt 2001). A report on several case studies of biomass energy plant proposals in the U.K. attributes the failure of attempts to site a biomass energy plant to "a mistrust of the validity of the statements about environmental impacts which the developers have prepared as part of the planning application" (van der Horst and others 2002, 123-124). But the level of trust placed in various stakeholders can vary. For example, trust in the government or large institutions may be different from the more specific and personal trust in a particular developer or manager. Some degree of distrust can be overcome by a developer who is able to gain citizens' trust on a personal level (Ibiatayo 2002). Including the public early in the decision-making process is perhaps the most effective way to establish trust and address public concerns (Ibiatayo 2002, Sandman 1987).

Wood to Energy Outreach Program is a community education program about woody biomass, funded through the USDOE/USDA and developed through a partnership between the Southern Research Station of the Forest Service, the University of Florida's School of Forest Resources and Conservation, the Southern Region Cooperative Extension Service, and the Southern States Biobased Alliance of the Southern States Energy Board. Prior to developing outreach materials about using wood for electricity production, it is essential to better understand public perceptions in the

South. This project has used several techniques for assessing public opinion and will use this information to develop an outreach process and outreach materials.

METHODS

To assess public perceptions we first selected counties in the thirteen southern states that were likely candidates for using woody biomass: those with a rapidly growing wildland-urban interface area and a forest cover. Eight different variables (e.g., population density, forest cover, population growth rate) were added together in a formula that ranked all 1300 counties. Phone calls to regional foresters, energy specialists, and community leaders in the top communities in each state confirmed that our selection process identified likely counties. We then conducted interviews in two communities (Oconee County, South Carolina and Clay County, Florida) by asking the County Extension Agent to identify from five to ten community members who could represent various perspectives: business, environment, homeowner, and development. The interview results (n=11) allowed us to better understand the types of perceptions and concerns the public might have about using wood for energy. In addition, interviews with three City Commissioners in Alachua County Florida provided insights to their concerns.

The interview responses led to the development of a survey which was pilot tested with community residents. The final version contained nine demographic questions, 22 closed biomass questions and three open-ended questions. The biomass questions include the following sections: three questions on general awareness of the topic, four questions about trust, five on attitudes about using wood for fuel, four on beliefs about advantages and disadvantages of wood, three questions on sources of wood, and two questions that cover public participations in decisions about woody biomass (appendix A).

The survey was posted on the web using SurveyMonkey, an online survey host that organizes data. We contracted with a marketing company to send an introductory request by email to 218,000 addresses of people who live in 11 selected counties (each in a different southern state) asking them to complete the web-based survey. The sample was stratified by income to match the census data to avoid contacting only the wealthier members of the community. Unfortunately, very few of the 450 respondents were actually from the selected counties. Email responses from disgruntled respondents indicated that the sample did not have 218,000 different email addresses and at least some people received the request more than once. A second attempt was authorized using city residence rather than county, adding more communities, and not stratifying the sample by income. Unfortunately we again experienced an extraordinarily low

response rate (less than 1 percent) and a number of these were from another continent, suggesting the firm's selection mechanism was not as refined as they believe.

We believe it may be possible to obtain a reasonable response rate by using a more reliable list. To that end, we launched a comparison study, using the County Extension email list of people interested in home horticulture in one county and a mailed survey to a random sample drawn from the tax assessor list of that county. After one reminder postcard to the mailing list we received 302 responses (20 percent). A comparison of early respondents to late respondents to understand whatever bias the low response rate causes suggests the only significant difference is that non-responders probably believe they know less about the topic than respondents.

Interviews were reviewed for themes and similar ideas were clustered. Frequencies were obtained from the survey results. The results from both the web-based survey and the mailed survey paralleled those from the interviews. Consequently, only the results from the mailed survey will be reported in detail.

RESULTS

Interview data suggest that attitudes in the South mirror those expressed in the literature. The public is concerned with the environmental impact of biomass burning on air quality and forest harvesting on forest sustainability. In addition, residents and city commissioners question implementation details and source sustainability: increased truck traffic near the facility, increased entry-level job opportunities, and long-term forecasts of forestry in an area that is rapidly converting farms and forests to developments. Several interviewees believe that even at present levels, local forests do not produce enough wood to sustainably fuel a power plant. Nevertheless, interviewees are open to the idea in general and willing to believe that woody biomass could be an economically smart resource for energy and recognize the growing need for energy in a rapidly developing region if the environmental concerns are addressed.

The mailed survey suggests there are significant misconceptions about energy resources in general and woody biomass in particular. Respondents believe wood is worse than fossil fuels regarding environmental impact, even climate change. Over 50 percent of the respondents admit to not knowing about wood fuels, and only 18 percent are aware of local discussions to build a wood-burning facility, despite public discussions for several years. A minority of respondents are very fearful of woody biomass (23 percent) and express negative attitudes toward having a wood to energy power facility in their neighborhood (32 percent).

For all respondents, the loss of local forests is rated as their most important concern, followed closely by concerns about air quality. Respondents believe woody biomass use is less feasible in their community than large-scale use of solar power. They would find local foresters and environmental groups more trustworthy sources of information about woody biomass than government, utilities, industry, or media sources.

DISCUSSION

The disappointing results from the web-based survey suggest that purchasing lists of email addresses may not be a reasonable way to obtain reliable responses from the public in a specific geographic area. Using existing lists from organizations and government agencies to contact people, despite the non-random nature of the list, may be preferred.

The results indicate there may be a significant gap between public knowledge and expert opinion about the value and promise of using woody biomass for electrical power generation in the South. Basic misconceptions about air emissions and carbon-neutrality could easily prompt citizens to discount and ignore information that conflicts with their understanding (Monroe 2005). A lack of trust in the typical messengers of information about energy—government, utilities, and industry—will not help the process of public education. Forestry agencies, extension agents, and environmental organizations are perceived as trustworthy, however, and therefore may have the greatest chance to successfully share information.

Concerns about forest sustainability in the wildland-urban interface may be more difficult to mitigate. Most residents have direct evidence that forests are not sustainable in the face of expanding development. In Florida, even the development potential of publicly owned conservation lands has been debated (Ponte Vedra High School Coalition 2006). In parts of the South, controversy over chip mills has strained public tolerance for large scale wood harvesting, particularly scenarios that take both large and small diameter trees (Appalachian Voices 2002; Rembert 1999); a woody biomass facility may be construed as a similar endeavor. Our supply curves were generated with existing harvest data and residue material from logging, enabling concerned individuals to understand the quantity of biomass currently extracted (Langholtz and others 2007). Of course if the public does not trust managers to limit harvest to existing rates, even this explanation is not helpful.

It is difficult to protect nearby forests in a rapidly developing region where private forest landowners balance an unstable timber market with the long-term need for wood products.

The most realistic solution may be the development of guidelines, policies, and contracts that are managed by municipal foresters to guarantee sustainable forest management and a sustainable supply of wood. If these guidelines are negotiated by all stakeholders, the process to create them and the documents themselves may create trust.

The development of outreach materials and outreach activities should lean heavily on data about public perceptions. Both the materials and activities will be pilot tested in several southern communities to determine how well they communicate information, build trust, and generate a common understanding about using woody biomass. A group of regional experts will be invited to review draft materials and to participate in pilot testing. The materials and outreach activities will be designed to achieve these goals:

- Seek citizen engagement
- Dispel common misconceptions about woody biomass
- Answer common questions about using woody biomass
- Build or renew trust in responsible utility or agency
- Invite citizens to define their fears and concerns
- Jointly develop management strategies that could mitigate citizen concerns
- Jointly develop indicators of a successful woody biomass project

Materials will be revised and produced after the pilot process and distributed to a group of woody biomass ambassadors to use in their states and communities (Monroe and others 2007).

CONCLUSIONS

Public perceptions of an issue are important to understand before creating education and outreach materials. Misconceptions must be addressed carefully to help citizens listen to and understand the new information even though it conflicts with what they already believe. An outreach program may help to build trust if it does not advocate a particular outcome, but creates an opportunity to ask questions and explore current technology.

The ultimate expression of a utility's trust in the public would be accepting the negotiated recommendations for forest management, noise and traffic control, air quality

protection, and other concerns. Extension agents and forest managers could be among the most trustworthy sources of information and could play a key role in the exploration of whether woody biomass energy is appropriate in southern communities.

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Appendix A: Survey questions to assess public perceptions of using woody biomass for power generation

A recent study indicates that North Central Florida has a sufficient supply of wood to generate some electricity from wood. We would like to know your initial reaction to this information. How strongly do you feel each of the possible emotions? (Please answer for each row.)

	Not at all	Somewhat	Very much
Curious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skeptical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fearful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are you aware of any local discussions about using wood for producing electricity?

- Yes
 No

How knowledgeable do you consider yourself regarding the use of wood to generate electricity?

- Very knowledgeable
 Fairly knowledgeable
 Slightly knowledgeable
 Not at all knowledgeable

Which of the following characterizes your level of confidence in local government's ability to regulate a power plant that uses wood?

- Very confident Fairly confident
 Slightly confident Not at all confident

Which of the following characterizes your level of confidence in your local utility company's ability to effectively manage the daily operations of a power plant that uses wood?

- Very confident Fairly confident
 Slightly confident Not at all confident

Sometimes, an institution other than the utility company (e.g. hospital, school, factory) will develop their own power plant that uses wood to produce electricity. Which of the following characterizes your level of confidence in letting an institution other than the utility company manage a power plant that uses wood?

- Very confident Fairly confident
 Slightly confident Not at all confident

How much would you trust the following sources to provide you with accurate information about a proposed power plant that uses wood? (Please answer for each row.)

	Not at all	Somewhat	Very much
Chamber of commerce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local newspaper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
City mayor/commissioner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
County commissioner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Utility Company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local extension agent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local forester	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Private industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How influential do you feel local citizens would be in the decisions regarding a proposed power plant that uses wood in your area?

- Not at all influential
- Slightly influential
- Fairly influential
- Highly influential

How interested would you be in being involved in the decision-making process regarding a proposed power plant that uses wood in your area?

- Not at all influential
- Slightly influential
- Fairly influential
- Highly influential

About how far is it from your house to the Deerhaven power facility at the intersection of Route 441 and NW 43rd Street?

- 0-3 miles
- 4-10 miles
- 11-20 miles
- Don't know

Which of the following characterizes your feelings about having a power plant that uses wood developed 0-3 miles away from your home?

- Highly negative
- Negative
- Neutral
- Positive
- Highly positive

Which of the following characterizes your feelings about having a power plant that uses wood developed anywhere in Alachua County, FL?

- Highly negative
- Negative
- Neutral
- Positive
- Highly positive

Some of the wood to fuel the power plant could be waste wood from land clearing already occurring for development. How supportive are you of using this wood source to produce electricity?

- Not at all supportive
- Slightly supportive
- Fairly supportive
- Highly supportive
- I really don't care

Some of the wood to fuel the power plant could be waste wood from forest thinning to reduce the risk of wildfire or to improve forest health and productivity. How supportive are you of using this type of wood source to produce electricity?

- Not at all supportive
- Slightly supportive
- Fairly supportive
- Highly supportive
- I really don't care

Some landowners may decide to grow wood for biomass power plants instead of wood for the paper industry. How supportive are you of using this wood source to produce electricity?

- Not at all supportive
- Slightly supportive

- Fairly supportive
- Highly supportive
- I really don't care

How do you think wood compares to coal as a source of energy in terms of the following characteristics?

	Wood is worse	About the same	Wood is better	I have no idea
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Worker safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entry level jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other local economic benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
National security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How do you think wood compares to natural gas as a source of energy in terms of the following characteristics?

	Wood is worse	About the same	Wood is better	I have no idea
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Worker safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entry level jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other local economic benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
National security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Some people believe the following concerns are associated with power plants that use wood. How important are each of these concerns to you?

	Not at all	A little	Somewhat	Fairly	Extremely
Increased air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased truck traffic for wood delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Higher cost of electricity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased noise from plant operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased competition for wood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of local forests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What other concerns do you have?

Some people believe the following benefits are associated with power plants that use wood. How important are each of these benefits to you?

	Not at all	A little	Somewhat	Fairly	Extremely
Addition of entry level jobs to the area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keep dollars in the community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduce dependence on foreign energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide better markets for wood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not contribute to global climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Renewable energy source	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use wood that would otherwise go to waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintain local forests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If Alachua County, FL needs additional power, how **COMFORTABLE** are you with the following solutions?

	Not at all	Slightly	Fairly	Very
Use more fossil fuels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use wood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use solar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use wind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conserve energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Look at new technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If Alachua County, FL needs additional electric power, how **FEASIBLE** do you think the following solutions are in your community?

	Not at all	Slightly	Fairly	Very
Use more fossil fuels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use wood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use solar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use wind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conserve energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Look at new technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please indicate if you agree or disagree with each statement:

	Strongly disagree	Disagree	Agree	Strongly agree
As long as waste wood is being burned, we should collect it and use the energy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We should not remove waste wood from forestry operations because that requires the input of more fertilizer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planted pine trees, like corn, are grown in rows for human consumption. It doesn't matter what we do with them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If we are going to use wood for energy it is most important that we manage the forest sustainably for wildlife, water quality, and wood production.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Without a viable market for pine trees, forest owners will sell their land for development and urban sprawl will eventually cover north and central Florida.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Healthy forests are precious ecosystems and should be left to nature.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Now we'll close with a few easy questions, which are included to ensure that the survey respondents represent the diversity of people that live in Alachua County.

What is your residential zip code? _____

How old are you?

- < 18 years
- 19-24 years
- 25-34 years

- 35-49 years
- 50-64 years
- 65-79 years
- > 80 years

How long have you lived in Alachua County?

- 0-5 years
- 6-10 years
- 11-15 years
- More than 15 years
- I don't live in Alachua County.

What is your gender?

- Male
- Female

What is your race or ethnicity?

- White
- Black/African American
- Asian
- Native Hawaiian/Pacific Islander
- Native American
- Latino/Hispanic (of any race)
- Other (please specify) _____

What is your household income?

- \$0-\$24,999
- \$25,000-49,999
- \$50,000-\$99,999
- \$100,000-\$149,999
- More than \$150,000

Please check the highest level of education you have attained.

- Less than a high school diploma
- High school diploma or equivalent
- Some college credit
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate

Please complete the following sentence: Where I live is mostly:

- Rural
- Suburban
- Metropolitan

If you answered "Rural" above, do you see your neighborhood as distinct from Gainesville, or as an extension of that area?

- Distinct
- Extension

Is there anything else you would like to add?

Thank you for participating in this survey. Please return it in the envelope provided by September 15.

**OUTREACH AND TECHNOLOGY
TRANSFER TOOLS**

CONNECTING NON-TIMBER FOREST PRODUCTS STAKEHOLDERS TO INFORMATION AND KNOWLEDGE: A CASE STUDY OF AN INTERNET WEB SITE

James Chamberlain, Matt Winn, and A.L. (Tom) Hammett¹

Abstract—Many products are harvested from forests that are not timber-based but are based on plant materials. These non-timber forest products (NTFPs) have not been fully incorporated into economic development programs, yet they provide significant monetary benefits for rural entrepreneurs. Interest in NTFPs as alternative forest enterprises and sources of additional income has increased tremendously over the last decade. Unfortunately, information on their potential is not readily available when and where it is needed. With the use of the Internet, people have greater and easier access to information and those in remote rural areas may benefit tremendously from this access. People living in rural communities near forests are particularly attracted by the potential for growing and processing NTFPs for added income. The products in which they are interested range from herbal medicines, culinary items, crafts, as well as components to floral arrangements. The Forest Service U.S. Department of Agriculture Southern Research Station and Virginia Polytechnic Institute established one of the first Web sites dedicated to getting timely information to entrepreneurs interested in the market potential of NTFPs. The Web site provides a multitude of resources to help stakeholders learn more about NTFPs. This case study examines and analyzes various aspects of use to the Web site to better understand which product areas are of most interest to NTFP entrepreneurs, how much attention different knowledge formats get, as well as trends in accessing various media that indicates changes in topic interests. The presentation discusses challenges and opportunities of connecting stakeholders to information and knowledge about NTFPs that will affect their efforts to integrate these important products into livelihood and forest management strategies.

INTRODUCTION

Forests provide plant-based resources that are gathered from the canopy, the understory, the forest floor, and even below ground. Interest in these non-timber forest products (NTFPs) has increased to the point where they are being promoted as alternatives to timber. Astute landowners, willing to make the effort, may improve their forest-based incomes by gathering and marketing these products. Although, the markets for many NTFPs are well established and have formal channels through which the products flow, they remain unknown and mysterious to many forest landowners. Some segments of the NTFP industry have grown rapidly over the last decade, and some have great potential for continued growth. To realize the full benefits from harvesting NTFPs, forest landowners need high-quality and timely information such as marketing opportunities and production matters.

Chamberlain and others (1998) defined NTFPs as products originating from plants, parts of plants, fungi, and other biological material harvested from within and on the edges of natural, manipulated or disturbed forests. These may include fungi, moss, lichen, herbs, vines, shrubs, or trees. Plant parts harvested include the roots, tubers, leaves, bark, twigs and branches, fruit, sap and resin, as well as unique shaped wood.

Products made from these resources are classified into four major categories: culinary, wood-based crafts, floral

and decorative, and medicinal and dietary supplements (Chamberlain and Predny 2005). Culinary forest products include sap, mushrooms, fruits, ferns, greens, as well as roots and tubers. Wood-based crafts are produced from trees or parts of trees, but exclude those made from wood which is cut from timber. Forest plants and parts of plants that are used in decorative arrangements complement and furnish the backdrop for flowers, as well as for the main component of dried ornaments. The end uses for many forest harvested floral greens include fresh/dried flowers, aromatic oils, greenery, basket filler, wreaths, and roping. Plants that have been tested for safety and efficacy and meet strict U.S. Food and Drug Administration (FDA) standards are marketed as medicines or drugs. Plants and plant products that do not meet the strictest FDA standards are marketed as dietary supplements in the United States.

In late 1997 colleagues in the Department of Wood Science and Forest Products of Virginia Tech and the Missouri Department of Conservation became acutely aware that there was a significant shortage of information on NTFPs and their markets. Working together, the collaborators developed and presented a prototype for a Web site (Hammett Jones and Araman 1997). Working through the Top of the Ozarks Resource Conservation and Development (RC and D), the collaborators secured support from the Forest Service, U.S. Department of Agriculture State and Private Forestry to prepare a series of fact sheets, which formed the foundation for the Web site. The Web site's original intent was to provide materials in user friendly formats for the general

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public and to link buyers and sellers. The Web site was launched to serve as a clearinghouse of information for NTFP harvester, growers, marketers, processors and end-users.

SITUATION

To visitors, the Web site <http://www.sfp.forprod.vt.edu> “is your place to learn more about the use and markets for non-timber forest products” (Hammett and others 2001). These introductory words greet the visitor to this collaborative site and set the stage for what they will find behind the cover page. They rest under a banner of images depicting various NTFPs. Introduction to the Web site recognizes that there “are numerous efforts to increase awareness of these products, their management and market potential.” But, the justification for this site is in the statement: “. . . there is a shortage of information available and there are few means effective in disseminating the information necessary for the sustainable management and marketing of these resources and products.” To that end, visitors enter and explore a Web site dedicated to providing pertinent NTFP-related information and materials.

Figure 1 presents an overall layout of the Web site, with directories, sub-directories and possible paths visitors can

follow through the site. Examination of the Web site’s home page reveals a list of directories down the left side of the home page. These directories cover a variety of technical matters including: product areas, buyers, sellers, publications, fact sheets, tutorials, links, and workshops. Also along the left-hand border is a window that scrolls time sensitive items and noteworthy information past the visitor.

Clicking on one of the directories takes the visitor into that area of interest and subsequent directories. For example, entering the “product area” the visitor must choose from several product categories to explore. There are “hot-buttons” for medicinal and herbal products, decorative products, specialty wood products and edible products. The visitor also can choose from several searchable databases on specific species (i.e., bloodroot, goldenseal, and galax). Exploring deeper into this product area, visitors can enter the particular product area where they will find brief explanations of the product area (e.g., definition of edible products, common products, harvesting and marketing) and links to technical information.

Visitors interested in buying or selling products can click on the master “hot button” and go to these pages. There they are asked to enter pertinent data to make it possible for others to find their products. They can enter a brief description (up to 50 characters), which will be the initial display on the page.

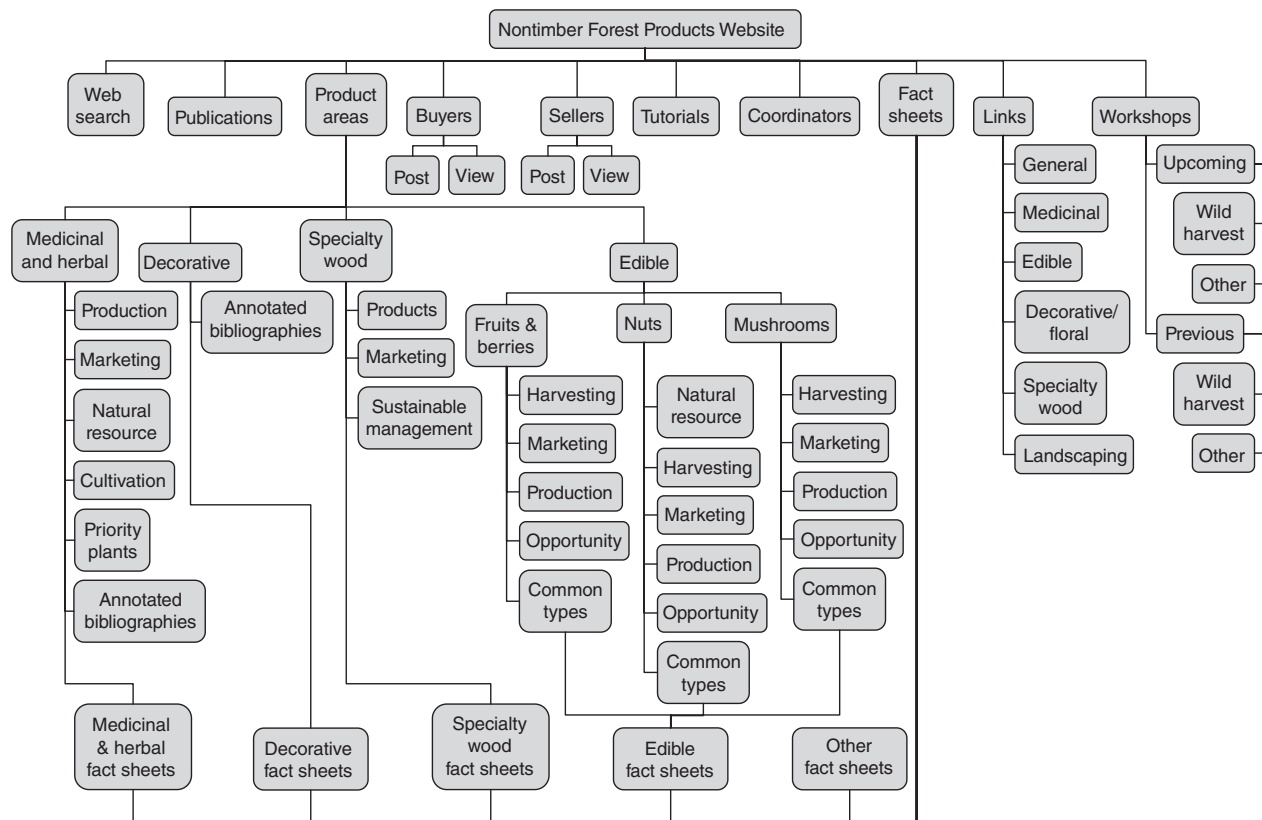


Figure 1— Web site structure with directories and sub-directories.

They are then encouraged to enter a more detailed (up to 250 characters) explanation of what they are buying or selling. The visitor can either search the database by product, or browse the entire list. The visitor who chooses to browse the list is taken to a page with “hot buttons” for each product.

Visitors can get technical information directly through the publications or fact sheet sections of the Web site. The publication section provides documents produced by the site coordinators as well as colleagues working with NTFPs. Documents are presented as portable document format (PDF) files that can be directly downloaded to a visitor’s computer. Web site organizers have summarized pertinent information on species and products into easy-to-read useful documents, which are accessible through the fact sheet section. Within this section documents are organized by product category. Again, documents are presented as PDF files for direct downloading. Visitors are encouraged to communicate to the Web site coordinators ideas and suggestions for new fact sheets.

To help landowners and entrepreneurs assess NTFP production or marketing opportunities, the Web site coordinators installed tutorials to provide simple economic, production and conservation information about important NTFPs and related issues. Tutorials provide sources of information to assist in the development of NTFP enterprises. Two tutorials are available: “Writing Business Plans for Wild Harvest Sector” and “Growing Slippery Elm.” Visitors are encouraged to comment on the tutorials and to suggest topics for other tutorials.

Visitors to the NTFP Web site have several other portals to explore. The Links section of the Web site provides visitors access to other useful Web sites. This section is organized by different groupings: Associations/Organizations working with NTFPs; Universities and Government Agencies; markets and vendors; reference materials, and; media and legislation. Another portal takes visitors to a listing of workshops, conferences, and trainings.

RESULTS

To provide a sense of the Web site and its role in technology transfer, we analyzed its usage with the software package “WebLog Expert” (WebLog Expert 2006). This software is a powerful log analyzer that provides information on Web site usage. This software presents statistics on Web site activity, accessed files, paths traveled through the site, information about referring pages, search engines, and more. The software generates reports on general activity usage: by day, by hour of day, by day of week, and by month. It provides access statistics (i.e., pages, files, images, directories, entry and exit pages), as well. The flexible and dynamic software also provides statistics on visitors: hosts, domains, and countries, States, and cities of origin. The software was selected because of its versatility and flexibility.

Although “number of hits” seems to be the most often quoted statistic as an indicator of usage, we find it is a deceptive statistic which does not adequately portray usage. The number of hits reflects the total number of requests for any file, image, or page (WebLog Expert 2006) and will fluctuate with the number of images found on a page. “Page View” provides a better representation of site usage as it is an actual request for a page file. The software used to analyze site usage determines the number of “visitors” by the Internet Protocol (IP) address. A request from the same IP address is received after a “timeout” period of 30 minutes is considered to be a new visitor.

Page views are a measure of the overall traffic to the Web site. Trends in page views can be used to show increases or decreases in total site usage over time. Web designers can use page views as a measure of interest in the Web site content. A steady decrease in interest may indicate that Web site content needs to be updated. Conversely, a positive trend indicates continuing interest in a piece of the Web site.

The number of visitors to a Web site can be used to determine the size of the client base. Low or decreasing visitor numbers can indicate that more outreach needs to be done to promote the Web site. It may also indicate that the Web site needs to be modified to attract a broader audience.

Combining the number of visitors with page views gives a measure of the length of stay for a visitor to the Web site. If the ratio of page views to number visitors is low, it indicates that visitors are leaving the Web site shortly after entering. This may alert the web designer to update the content or to change the navigational structure of the site.

Table 1 presents general usage statistics for the Web site covering the 5-year period from June 2001 through May 2006. The total page views increased every year, except in 2004, and suggest steady growth in usage. On the other hand, the marginal annual growth in page views indicates fluctuation in usage. From 2001 to 2002, total page views increased 139 percent. The percentage change for the next year (2002–03) was about 32 percent. The following year, usage decreased almost 20 percent. Proportional page views increased 87 percent from 2004 through 2005. And so far in 2006, the site has experienced 74 percent growth in page views.

The average page views per day also indicate steady growth, yet an examination of the marginal changes (i.e., incremental changes between years as a proportion) in page views per day suggest otherwise. From 2001 through 2002, page views per day increased almost 41 percent. The following period (2002–03), proportional page views per day declined to about 32 percent. From 2003 through 2004, proportional page views declined 20 percent. Proportional page views per day rebounded during the period of 2004

Table 1—General use statistics for NTFP Web site (June 2001—May 2006)

Description	2001	2002	2003	2004	2005	2006
Total hits	198,824	580,022	713,249	720,960	823,756	498,236
Average hits per day	929	1,589	1,954	1,969	2,256	3,299
Average hits per visitor	9.99	9.48	8.86	8.96	6.63	3.24
Total page views	31,568	75,599	99,877	80,207	150,274	261,968
Average page views per day	147	207	273	219	411	1,734
Average page views per visitor	1.59	1.24	1.24	1	1.21	1.7
Total visitors	19,906	61,187	80,478	80,433	124,283	153,827
Average visitors per day	93	167	220	219	340	1,018

through 2005, increasing 87 percent. From 2005 through May 2006, the site has experienced proportional growth in excess of 320 percent.

The average page views per visitor decline or remained steady for the first 3 years. From 2001 through 2002, the page views per visitor declined 22 percent. Page views per visitor were steady over the next annual period. From 2003 through 2004, page views per visitor declined 19 percent. This trend changed over the next period (2004–05), as the site realized a 21-percent increase in page views per visitor. The positive trend continued through May 2006, with a 40 percent increase in page views per visitor.

Except for the period 2003–04, the total number of visitors has increased each year. Between 2001 and 2002, the total number of visitors to the site increased 207 percent. The following period saw an increase of almost 32 percent. Total number of visitors declined during the period 2003–04 by about 0.06 percent. The site realized a 54 percent increase in total number of visitors during 2004–05, and almost 24 percent growth through May 2006.

Figure 2 presents the average Web site activity by hour of the day. While the horizontal axis tracks hourly usage, the vertical axis shows the percentage of total visitors during the time periods. By presenting the usage as a percentage of total visitors we are able to stabilize the figures to alleviate partial year differences. The site is least visited during the very early hours of the day. Visitation declines from midnight to about 0600 when visitation begins a steady and significant increase. Visitation climbs until about 1500 (3 p.m. eastern standard time), when it starts a slow and slight decrease until 1900. There is a slight increase in site visitation during the evening hours, until around 2200.

An examination of daily visitation provides insight into when people are visiting the site, as well. Approximately, 45 percent of visitation occurs Monday through Wednesday. Visitation starts to decline on Thursday and reaches the low point on Saturday. On Sunday, visitation begins increasing, yet not significantly more than Saturday. About 12 percent of total visitation occurs on Saturday, while Sunday realizes

just 13 percent of total visitors. These trends were consistent throughout all years.

Figure 3 presents monthly Web site activities over the 5-year period. The Web site attracted a steady stream of visitors over the last 5 years. The number of monthly visitors doubled during the first 4 years. An increase in visitation occurred during the period of August through November 2003, which coincided with our involvement in organizing the NTFPs side event to the World Forestry Congress. Visitation dropped after this event, but continued at a slow and steady growth. A drastic spike in monthly visitation occurred in September of 2005. From August to September 2005, the number of visitors per month increased 40 percent. Over the next month, visitation increased another 50 percent. From October 2005 through May 2006, monthly visitation to the site increased 123 percent.

The software used to analyze the site had the capability to track visitation to each page within the Web site. This information allowed for identification of those pages that visitors preferred. Next to the default page (i.e., the site home page), the most popular page, overall, was the page that introduced product areas. The pages that introduced visitors to publications and fact sheets ranked third and fourth, respectively. Within the product area, the page dealing with specialty wood products was the fifth most popular page, while the page presenting information on ramps (*Allium tricoccum*) was the sixth most popular page. The page introducing visitors to medicinal forest products ranked as the seventh most popular page. The edible forest products page ranked seventh in 2001, but dropped in visitation each year. In 2006, this page did not rank in the top 10 pages. The pages dedicated for buyers and sellers of NTFPs ranked in the top 10 every year. In fact, the buyers' page ranked third and fourth as most visited pages in 4 of the 5 years.

Another way of assessing the Web site is to examine the most downloaded files. This differs from the most popular pages, as these are files that people actually transfer from the Web site to their computers. Whereas the “most popular pages” are those that people visit, the “most downloaded

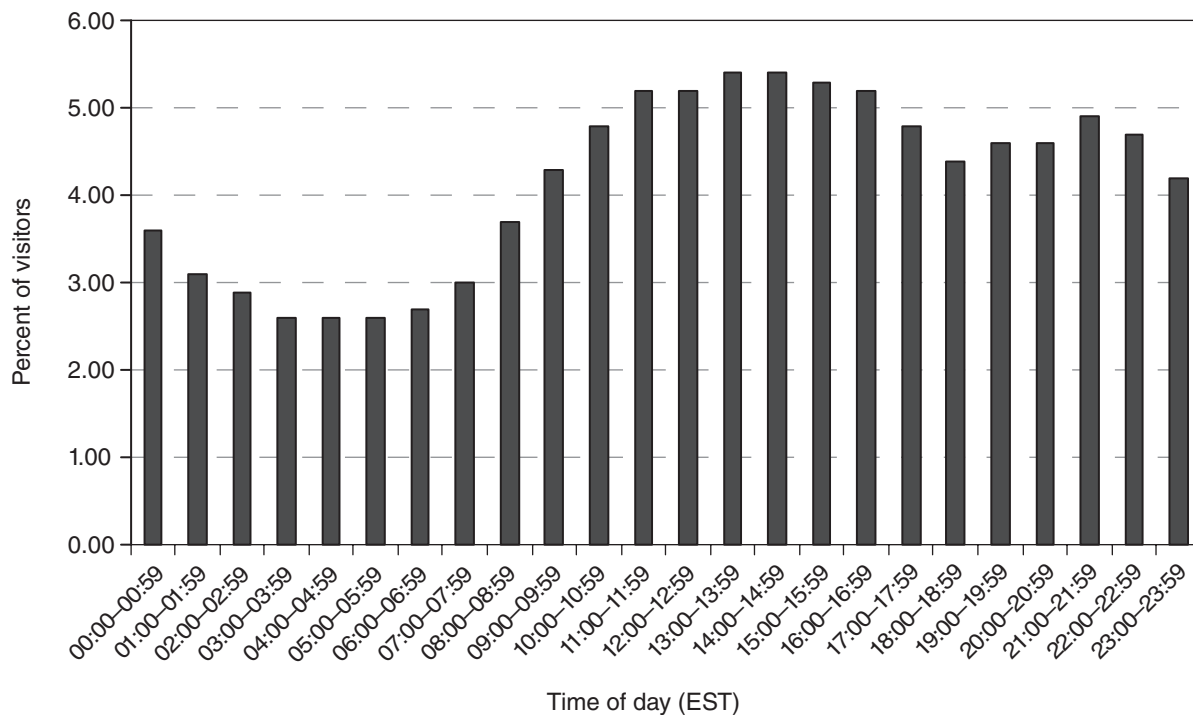


Figure 2— Average Web site activity by hour of day (June 2001—May 2006).

files” indicate what people take away from the site. Interestingly, the fact sheet on walnut (*Juglans nigra*) was the most popular downloaded file, overall. Ranked 12th in most downloaded files in 2001, the walnut fact sheet jumped to number 1 and remained the most downloaded file for the rest of the 5-year period. The fact sheet on sweetgum (*Liquidambar styraciflua*) ranked eighth in 2001, and climbed to third the following year. It ranked second or third every year since, and overall it was the second most downloaded file from the Web site. The fact sheet dealing with goldenseal (*Hydrastis canadensis*), a popular medicinal plant, ranked 25th in 2001, but for the 5 years it ranked 3rd overall. The fact sheet presenting information on vines and their use in making crafts was the fourth most downloaded

file, overall. It ranked sixth in 2001 and second most popular in 2002. In subsequent years, the vines fact sheet ranked fifth for most downloaded file. Other favorite downloaded files include fact sheets on persimmon (5th overall), Echinacea (6th overall), catnip (7th), pecan (8th), and beeswax (10th). Interestingly, a publication from a Canadian colleague on NTFPs was the ninth most downloaded file, overall.

The most requested directories indicate which areas of the Web site visitors are most interested. It provides an indication of those areas that people consider important. Awareness of this can help to provide focus on which aspect of the site should be enhanced. Obviously, the root directory (i.e., Web site home page) is the most requested directory as

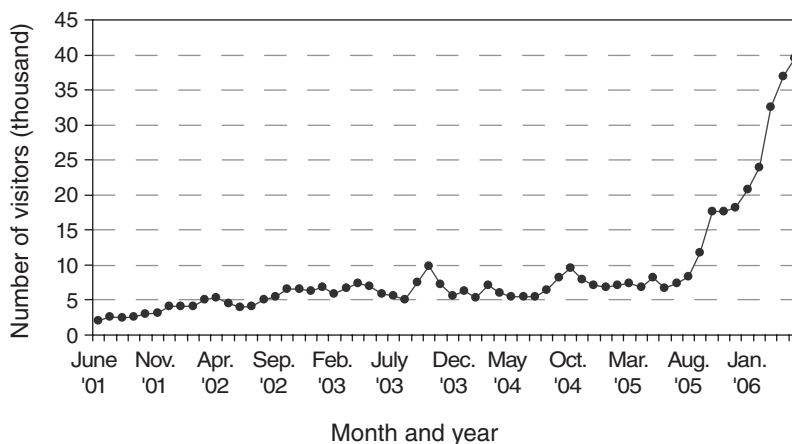


Figure 3— Web site activity by month (June 2001—May 2006).

this contains the main page by which people enter the site. It is similar to the cover of a book, which most people examine first. But, beyond that, the most requested directory allows us to better understand what areas visitors feel are important. Fact sheets ranked second, overall, to the home page as the most requested directory. The directory for “product area” was the third most requested directory every year except 2006. At the same time, the directory for publications ranked fourth, overall for the most requested directories. Other much requested directories include: Links (5th overall), Workshops (6th), Buyers (7th), Tutorials (8th), Regions (8th), and Sellers (10th).

The pages from which visitors entered and exited the Web site provide insight into the amount of exploring that people do of the site. For example, the product area dealing with ramps was the most frequently entered and exited page, next to the Web site’s home page. The product area dealing with wood was the fourth most frequently entered page, and the fifth most frequently exited page. The publications page was the sixth most frequently entered page, but the fourth most exited page, suggesting that visitors explored the site further. Interestingly, the fact sheets page was the 17th most entered page and the 6th most frequently exited page, which suggests people entered the site from another page, found the fact sheets, explored them and then exited the Web site.

Visitors from all regions of the world have accessed the Web site during the last 5 years (fig. 4). As expected most visitors have come from North America (N.A.), accounting for 59 percent of the total visitation. For the first 3-1/2 years (2001–04), N.A. accounted for 82 percent of the total visitors. This proportion dropped in 2005 to 63 percent, with a major increase in visitation from Asia. So far, in 2006, N.A. accounts for only 20 percent of the total visitation. Africa and the Middle East account for approximately 1 percent of the total visitation. Over the 5-year period, Asia accounts for about 31 percent of the visitation, even though visitation from this region in 2006 is 74 percent of the total. For the years 2001 through 2004, visitation from Asia accounted for 6 percent of the total visitors. In 2005, visitation from this region increased to 28 percent, and topped 74 percent in 2006.

In all, people from 194 countries have visited the Web site. People from 60 African and Middle Eastern countries visited the Web site over the 5 years. Inquiries from Israel ranked number 1 from this region, yet visitation also came from South Africa, Turkey, as well as Iran. Visitors to the Web site came from 29 Asian countries, including China (number 1), India (number 2), Japan (number 3) and the Philippines (number 4). People from 47 European countries visited the Web site. Within this region, the Web site had the most visitors from the United Kingdom, followed by Germany, France, and the Netherlands. Visitors from 39 Latin American countries explored the Web site over the 5 years.

Brazil ranked number one, followed by Argentina, Chile, and Bolivia. Unquestionably, the Web site had more visitors from the United States than any other North American country, but Canada was well represented. Australia and New Zealand were the two leading countries from the Oceania region, although the Web site had visitors from 15 Oceanic countries.

DISCUSSION

The number of pages viewed by visitors appears to have grown at a steady rate, over the past 5 years, although looking at the marginal change from year to year, indicates significant annual fluctuations. The tremendous growth from 2001 through 2002 was followed by less growth the next year. There was an actual decrease in pages viewed from 2003 through 2004. Since then annual page views has increased significantly. Overall, the average number of page views per annum has increased through the 5 years.

Average Web site activity by hour of the day shows how visitation changes throughout the day. The trend indicates an increase in usage during business hours in the United States. After a brief decline, visitation increases during the evening, suggesting that people are “surfing” the web after work hours. As the Web site has a great deal of international visitation the increased evening activities could be visitors from other regions. For example, some of the evening activities may be explained by visitors from China, Philippines, and Japan who have approximately a 12-hour time difference from the server location.

The days of the week, as well as the hours of the day when visitations occur can indicate the best timing for the introduction of new materials. For example, introducing new information on Monday morning would attract more visitors than Friday afternoon. As more site traffic is taking place on Mondays through Wednesday, during office hours, launching new materials during these hours would receive greater immediate attention.

Monthly visitation rates increase steadily over the first 4 years. During the period of August through December 2003 monthly visitation increased and then dropped back to a steady growth state, which was caused by our involvement in the World Forestry Congress. During that period, we hosted an Internet-based discussion on critical issues that affect management of non-timber forest resources in preparation for the side event to the Congress, which we co-hosted. In August 2005 another spike occurred in the monthly visitation, which has been sustained over the last year. Although it is not possible to determine the exact reasons for this tremendous growth in monthly visitation, the increase could be due to more effort to publicize the site, and/or the recent introduction to the Web site of

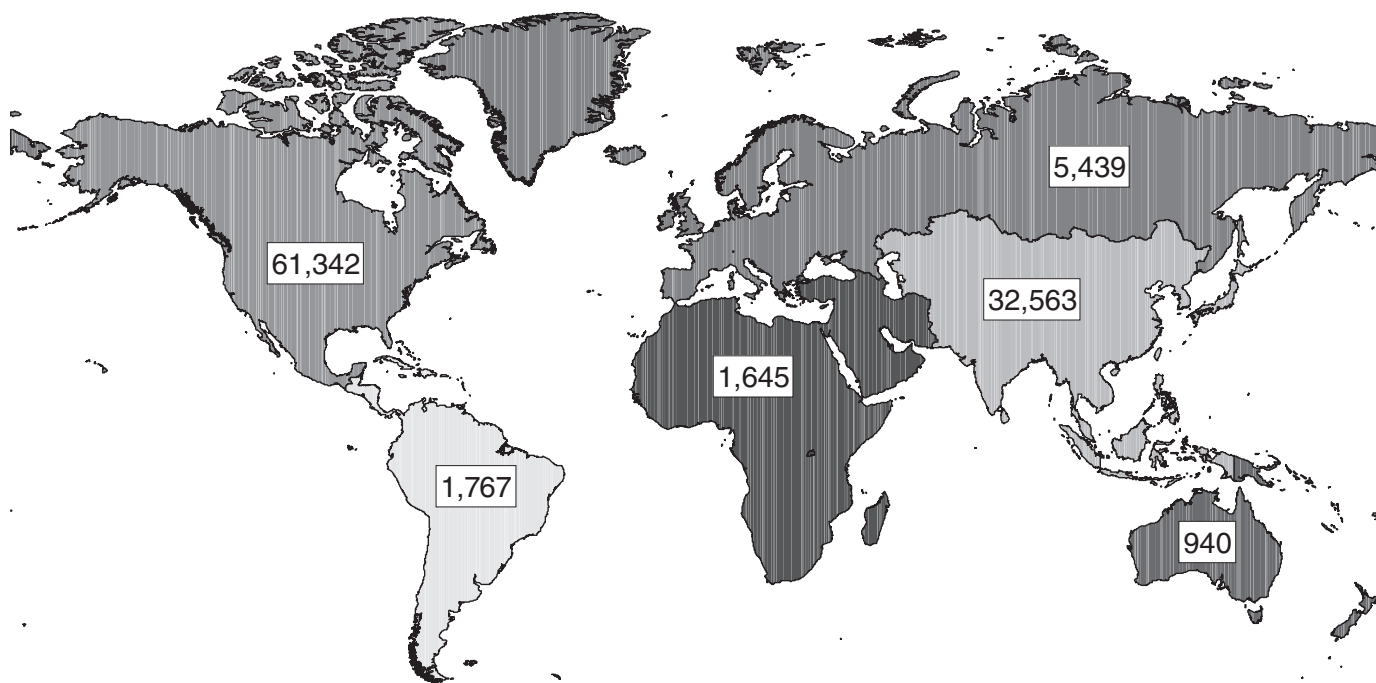


Figure 4— Web site usage by region of the World (June 2001—May 2006).

three searchable annotated bibliographic databases. Site coordinators routinely distribute promotional materials describing the Web site and its contents.

Examining which pages visitors go to can tell a great deal about what users want. By far, visitors to the Web site are looking for technical information about products. Their first choice is the fact sheets, followed by research publications. Visitors to the Web site have been most interested in non-timber wood products, as evidenced by requests for walnut and sweet gum. Product areas dealing with ramps and medicinal forest products also have received a great deal of attention. In general, interest in ramps and medicinal plants has increased over the last 5 years, which is reflected in the visitation to respective Web pages. People also have been interested in procuring or selling products. A continued effort to provide this type of information and materials would enhance the Web site.

The pages by which people enter and exit the Web site indicate if visitors travel through and explore the Web site. A visitor that enters and exits by the same page is less exposed to information and materials than a visitor who explores different pages. The fact that someone explores the Web site suggests that there is more information of interest. Conversely, if the entry and exit pages are the same, suggests that the visitor either found what they were looking for, or did not and exited without looking further. Web designers would want visitors to explore the Web site to find new and different information. Browsing may indicate that the site has piqued the interest of visitors beyond their original intent. Clearly, people interested in ramps found this

Web site of particular use, as they entered and exited by the same portal. Conversely, many users browsed the Web site until they came upon the fact sheets.

People from all regions and more than 190 countries have visited the Web site. The proportion of international visitors continues to increase, suggesting that interest in NTFPs continues to grow around the world. Interest from Asia, appears to be growing the fastest. Continued efforts to provide information and materials relevant to international visitors are paramount to keeping the Web site attractive to this clientele. Active participation in international NTFP efforts by the coordinators is crucial to achieve this. There are many useful lessons for domestic stakeholders in the international materials presented.

Web site visitors have provided a steady stream of requests for information and suggestions, which indicate that they are interested in other matters not included on the site. Visitors, who can not find what they are looking for on the Web site, often send requests to site coordinators. Often questions posed relate to products or species not included on the site, or for cultivation or management information unavailable elsewhere. The Web site also generates a significant amount of telephone inquiries directly to the site coordinators.

Spam, the abuse of electronic mailing systems that sends unsolicited, bulk messages affects the Web site, as well (Wikipedia 2006). It has created serious problems, particularly in Web sites that have discussion forum or message posting. Spamming an Internet forum occurs

when a user posts a message that is off topic or has little relevance to the subject being discussed. The usual intent is to provide a direct link to the spammer's Web site. Many spam messages are posted using spam robots (or spam bots) that automatically search for vulnerable sites and submit information. On the NTFPs Web site, spamming has been problematic in the buyers and sellers forums. In the postings by buyers and sellers, some are nothing more than scrambled letters with embedded links to spammers' Web sites. Periodic inspection and maintenance of the forums is necessary to control unwanted posts.

CONCLUSIONS

Visitors to the NTFP Web site are looking for technical information that will help them realize opportunities to use NTFPs. Visitation increased over the 5 years, although this growth was not smooth, nor steady. The proportion of international visitors is increasing at a tremendous rate, demonstrating a need to keep adding information for a wider audience. Changes in visitation rates throughout the day and week indicate that the best time to introduce information and materials would be early in the work day and early in the week. There is clear evidence that major events in which the coordinators are involved effect visitation to the Web site. Clearly, more efforts are needed to keep adding new, fresh, and useful information and materials to the Web site.

This type of analysis is crucial to making a Web site relevant and interesting to users. It provides critical insight into when new materials should be introduced. New information introduced early in the week received more exposure than that which was put on the Web site later. The analysis confirmed that a major focus of the Web site should be on fact sheets and market information. Downloaded files indicate to the Webmaster which information users find most interesting and suggests that more emphasis should be placed on trees that produce wood and non-wood products. The analysis also exposed that there are many international visitors to this Web site and care should be taken to make the Web site interesting and relevant to that audience.

When the Web site was launched the set of stakeholders was fairly limited. With time, the community of stakeholders has grown as knowledge and awareness of different constituencies has increased. Getting the word out to new and different stakeholders takes constant attention by the coordinators and results in an increase in the number of visitors. At the same time, regular and diligent monitoring of all aspects of the Web site is essential to deal with the ever increasing problem of spam.

The data provides quantitative analysis of the Web site, although more user feedback would offer greater insight into what visitors want. The Web site could be further improved by including an online user survey that would allow for real-time assessment of the Web site. This would provide timely and useful suggestions on what users would like to have on the Web site.

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A LOOK AT GIS DISTANCE LEARNING

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Abstract—GIS (Geographic Information System) is a relatively new technology that has quickly become important in today's computer-based environment. There has been a rapid adoption of it in many fields of work, resulting in a great need for trained GIS technicians. Colleges and universities are not currently training enough new technicians to meet the demand. With the shortage of trained workforce, many working professionals feel the need to get trained in GIS to augment their work skills. Distance learning has become a popular way to do this. Many government agencies and private companies offer tuition reimbursement for employees that wish to train in GIS. This has encouraged many employees to search for continuing education possibilities. However, existing programs vary significantly in content and method of teaching. How does someone who knows nothing about GIS evaluate these methods, let alone find out about the myriad of possibilities? This paper is an attempt to address this issue by presenting an overview of GIS distance education possibilities with reference to issues in learning that affect the quality of education for working professionals seeking training in GIS. Characteristics of the GIS distance learning student, student needs in education style and format, and rationale for a GIS distance learning pedagogy (the art and science of teaching) that is student-centered are discussed. A case study is presented featuring the student centered pedagogy of the Louisiana Tech University GIS Distance Learning Program. The Louisiana Tech program is compared to other university GIS distance learning programs with the hope that prospective students can determine which form of training is best for them and where to look to find appropriate training programs in GIS.

INTRODUCTION

In the 80s and 90s, Geographic Information Systems (GIS) were used by highly specialized technicians working in a limited number of fields of application. Today, however, with increased functionality of the software, a greatly simplified user interface, and an increasing awareness of the value of GIS, professionals from almost all fields are beginning to use GIS on a regular basis. A GIS consists of tools and services necessary to allow one to collect, organize, manipulate, interpret, and display geographic information (Bettinger and Wing 2004). Some people think of it as mapping software, others as software for geographic analysis, and some people regard it as a geographic database system. Actually, it is all of these and can be used in many ways. GIS can be used as a cartographic tool to produce maps such as subdivision maps, school district maps, sales area maps, or utility distribution maps. It can also be used as a database and analysis tool for managing timber reserves, designing highways, analyzing server networks, determining optimal placement of services such as restaurants and medical centers, visualizing the distribution of population over an area, analyzing surface runoff patterns, and studying the landscape in 3D view. In fact, any data that has a geographic component can be placed in a GIS for analysis. The National Academy of Science estimates that 80percent of the world's data on the internet has a spatial component and can be used in a GIS (Committee on Beyond Mapping 2006).

With the volume of geographic data and extremely broad range of uses of GIS, interest in learning to use the tool is

increasing. In fact, the demand for GIS technicians is so high that universities can not graduate enough students to fulfill the need (Committee on Beyond Mapping 2006). But there are many ways to learn GIS without attending a college class: Attending seminars and workshops, obtaining onsite training by a consultant, signing up for continuing education programs, and even working on GIS tutorials on the web.

Office personnel have often learned GIS "on the fly" as they worked at their desks since attending class was unrealistic. But with the advent of the internet with its ease of information transfer, distance learning has become a viable solution to education needs for the working professional. It has become a popular way for professionals to learn GIS or increase their skills in the tool (Smith 2004). However, there are so many programs of study for GIS that a person can easily get frustrated over the variety of course formats, costs, time scheduling, requirements, and pre-requisites involved. Finding the best course of study can be very difficult. Internet searches can be time-consuming with high probability of missing good sites.

The intent of this paper is to:

1. List the various ways of training people in GIS technology outside the traditional classroom
2. Present a case study of a GIS distance learning program that has been successfully implemented at Louisiana Tech University

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3. Compare several existing GIS distance learning programs in an effort to aid potential students in selecting an institution and appropriate educational format for learning

THE SITUATION

The introduction of internet technology has dramatically changed distance learning from a correspondence course format to computer-based online instruction. Online education programs have become common for adult continuing education. These programs differ greatly in class format and method of teaching.

Class format is the heart of any online program. The format of classes ranges from synchronous, two-way video classes to asynchronous, self-paced online classes where you can work at your own pace. The vast majority of the GIS internet courses, though, are asynchronous (Wright and DiBiase 2005). Courses vary in the amount of involvement required by the student. Some classes require students to log in on certain days and times. Others require conference calls or net discussions, implying that students must plan their time so they can participate in the activities. Never the less, online classes have potential for tremendous freedom and flexibility for the student to arrange coursework around busy home and business schedules. This requires a pedagogy (the art and science of teaching) that is less rigid than the one used for a classroom.

An active pedagogy, one that is suited for GIS distance learning, is student-centered, involving students actively in their learning (Wright and others 2004). It teaches skills for problem-solving rather than simply providing information to be remembered for a test. Data sets used for study should be relevant to the student's world. A distance learning student will be much more motivated and retain more if exercises or projects involve data sets that relate directly to their jobs or personal interests. This implies that the instructor needs to know the students and prepare lessons appropriate to their experiences. This is of course an extremely challenging task. However, there are some generalizations that can be made about distance learning students.

In general, continuing education students are older and have jobs and families. They must coordinate different areas of their lives that influence each other such as jobs, families, spare time, and studies (Gottschalk 2006). Their motivation is different than in-class students. They may want to work for a job promotion, or add new technology to their business. They have well defined goals and are highly motivated (DiBiase 2000). They do not, or should not need the motivation factors of competing students or a teacher present in the room. Teaching techniques for adults are very different than for younger students. The older distance

learning student probably has been away from formal school for many years. It can be intimidating going back to school. Besides the anxiety that this may cause, adults have more at stake, particularly at their jobs if they are taking the course for work-centered technical training. The results of their study may influence their position in the institution. Their success or failure in the class can effect their relations with coworkers, adding more motivation to excel. Thus they will more likely take errors personally and allow them to affect their self-esteem (Potter and Heineke 2006).

CASE STUDY

The Louisiana Tech University GIS certificate program has moved toward an adult education model in its teaching philosophy following the work of Malcolm Knowles. Malcolm Knowles, a recognized professor of adult education, pioneered the theory of andragogy (the art and science of helping adults learn) (Potter and Heineke 2006). His model centered on four assumptions. Adult learners have:

1. A trend toward self-motivation

We have found that distance learning students have a higher desire to learn due to the immediacy of their GIS instruction needs. They put more time on map products and prepare much larger term papers and projects than in-house university students. They have problems in their work life to solve that can be addressed by GIS. They also have experience on the topic and often have access to necessary data sets. The results of the class translate directly to their working environment.

2. A growing reservoir of experience

Most likely, the working professional knows more about his or her job than the GIS professor. After the initial GIS training, exercises should allow students to build on their existing knowledge rather than simply providing them with "the facts". This is extremely difficult when students from many different disciplines come online. We emphasize individual projects in the classes where each student proposes and works on a project of personal interest. Most students propose projects related to their work. Thus, they receive the added benefit of a useful product for their job when the project is completed.

3. A developmental readiness to learn

Many of our students are looking for job promotion or a transfer into a GIS position. They want to see results of their study that can be directly related to their situation. That is why there are no assigned topics for projects in the curriculum. All projects are proposed by the student. The

professor's main job is to make sure the projects are doable with the student's current knowledge of GIS and its tools.

4. A problem-centered and performance-motivated desire to learn

Since the students are motivated to learn for the utilization of GIS in their jobs, there is low probability of cheating or plagiarism. Emphasis is taken away from tests and placed on exercises and project work.

The Louisiana Tech GIS Distance Learning Program is just one of many offered in the United States. The thing that sets it off from the other programs is its high flexibility in course schedule. All of our courses are self-paced. This means a student can work as fast or slow as their situation allows. Feedback from the instructor is fast (usually within 1 or 2 days), so the student can accelerate the courses if there is a need for rapid completion of the program. If a student has to go over-seas for several months on a business trip, then the student simply starts up again with the next assignment after returning from the trip.

The self-paced program at Louisiana Tech University resembles an electronic form of a correspondence school. The difference is in speed of transfer of the assignments over the internet instead of through slow mail and in that the whole course is posted online with all lessons available for the student from the date of registration.

This last point is useful for the student not only for getting a "feel" for what is ahead in the course, but it allows a student to work ahead on the next assignment if there is a problem to work out on the current one. For example, if an internet site that has needed data sets for an assignment is down, the student can work ahead on the next assignment while waiting for that internet site to come back up. Also, at times the professor must be out of town (especially during the summer for research and on holiday breaks). Students can keep working through these periods turning in two or three assignments before receiving a reply from the professor.

Of course, this means that the professor can not make comments between these lessons. This can create a problem, if the student is making a mistake that is continued into each following lesson. However, this flexibility is important to the student who needs to complete the courses as fast as possible. Most students are not in this much of a hurry and wait for the instructor's comments before going ahead on the next lesson.

This freedom in class format has its drawbacks, though. Many students are not self-disciplined enough to keep up with the course work. Without due dates, they let work schedules slide by leading to inactivity in the course and eventually dropping out. For many distance learning programs the attrition rate is 25 to 35 percent. The Louisiana

Tech University GIS distance learning GIS program with its open class schedule experienced closer to 40 percent attrition rate. However, comments from the course evaluations showed that many students preferred this class format. One distance learning student allowed his name to be given to a perspective student who wanted to interview a current student about the program. The following is an excerpt from the interview.

1. Have you finished the course?

I have three more lessons to go to finish.

2. If so, how long did it take?

I can give you some very exact data on this.

Intro to GIS took 75.25 hours of time to complete; I started the course on 16 March and completed on 27 May 2004.

Data Integration took 73.25 hours of time to complete; I started the course on 7 June and completed on 11 Aug 2004.

ESRI Course on Spatial Analysis of Geohazards took 27.75 hours to complete; I started on 12 Aug and completed on 3 Sep 2004.

Advanced GIS has taken me 84.25 hours so far; I started on 30 Sep 2004 and am still working on it (I've been swamped at work for the past two years!)

3. Did you have previous GIS experience?

I had no previous GIS experience.

4. Have you used your education in your current career?

Yes. My company integrates ESRI ArcObjects into our software; it really helped me by taking these courses!

5. Have you listed this certification in a resume?

I list my course work on my CV online. When completed, I will list on my printed resume also.

6. Any comments or response from interviewers?

Yes. When I interviewed at ESRI for a position, the gentleman asked me a lot about the coursework and how I felt about it. I told him it was extremely valuable and I'd recommend the course to anyone.

7. Did you find working an on-line course difficult?

Yes. I think you have to be motivated and dedicated and self-starting to get the work done. I liked the way it was originally scheduled to start courses during the LaTech regular school year. We had 10 weeks to complete the course. This gave me a hard deadline, which I find easier to work toward. When they went to a had-to-be-completed in 9 months, I lost the drive. But, to be honest, my workload really took a toll on my time in 2005.

The response to the above questions is consistent with course evaluation comments received over the years. Most people who comment on the course schedule mention that they like the self-paced format because it allows for flexibility needed due to their work schedules.

In any online course there are positive and negative elements. A prospective student must weigh these according to his or her situation and learning styles. The following program descriptions show the variability of training formats available.

Penn State World Campus GIS

Penn State's World Campus GIS (www.worldcampus.psu.edu/GISCertificate.shtml) is one of the nation's oldest online GIS programs. The GIS certificate program courses are the same as the first year courses in the Penn State Online Masters Program in GIS, so a certificate student can apply for the masters program and skip the first year of study. Course format is semi-asynchronous: instructor led with weekly assignments and tests but students can work any time they wish during the week. E-mail, group discussions, and one on one discussion with the instructor are part of the course. Entrance requirements are a baccalaureate degree. Classes start four times a year and last 10 weeks. They cost about \$1700 per course. Each course is about 100 hours of student activity, or roughly the same as a regular college course.

A typical class is 50-60 students from all over the US and North America. Due to the English only classes, few international students apply. Students are encouraged to get to know each other and interact in discussion groups. They create e-portfolios and publish them on the web to describe themselves. Students are encouraged to work together and help each other as a team. Due to time zone differences no "real time" communications are required. Students take four courses over a period of a year. Three are required, the fourth can be chosen from three optional courses.

University of California, Riverside

In contrast, the University of California, Riverside, Extension GIS program (<http://www.extension.ucr.edu/certificates/gis/index.html>) has a few online GIS classes, but for most classes, people must come to the campus for the hands-on courses. There are three focus tracks available: GIS Management, GIS Data Collection/Data Generation, and GIS Data Analysis and Presentation. The only prerequisite course is Introduction to ArcGIS. In order to graduate with the certificate, a student must take 24 credits of courses. Classes cost about \$400 per course. A student will pay between \$2000 and \$3600 in registration fees depending on the courses taken and the track selected.

A GIS Summer School is offered which is an intensive two month study of GIS. It is the full 24 units required for the GIS certificate. All classes are on campus for this summer school option.

University of North Dakota (UND)

The UND Online Graduate Certificate in Geographic Information Science (<http://www.conted.und.edu/ddp/gis/index.html>) fits somewhere in between the above two programs. It is designed for the working professional. All work can be done at home or the office and the program can be completed in 1 year. It consists of four courses taken one per semester totaling 12 hours of university credit (about \$5,700 in tuition and fees for out of state students). Web-based tools are used to access course materials, submit assignments, take tests, communicate with the instructor, and participate in class discussions. A Bachelor's degree with a GPA of at least 2.75 is required for admission.

University of Melbourne

The University of Melbourne has developed a self-study GIS tutorial and placed it on the web to enhance the teaching of GIS at the university. This is not designed to substitute for a GIS course, rather to aid a student's understanding of the topics learned in class. The modules do not allow hands on use of a GIS software package, but through text and interactive modules, present GIS concepts for beginning through advanced topics. This is a great way for a person to get a feeling about what GIS is before taking any formal courses. People who are managers, or who talk with GIS technicians, but do not actually do the GIS work themselves can greatly benefit from working on GIS modules such as these from the University of Melbourne.

DISCUSSION

The GIS programs described above are different in format, content, cost, and teaching methodology. Each is preferred by different students depending on their working situation and educational needs. In most cases, travel time and cost is not an issue because the courses are delivered over the internet. Thus, a student has every school on the internet to choose from. How then, does someone find the best program for their situation? This daunting task can be simplified by reducing the list of GIS programs to those that match the student's specific needs. The following are some of the criteria to look for:

Class Format

Check if the classes are synchronous or asynchronous. If you have an irregular work schedule or have to be out to town for extended periods. Then you will want to make

sure the classes are asynchronous, that you will have some flexibility on when you have to turn in assignments. Also, check the class length and the amount of your involvement that will be required (are conference calls required, group discussions, live video, etc.).

Admissions Requirements

Some programs require a bachelors degree, others require some previous GIS knowledge. Most are English only, so a TOEFL (Test Of English as a Foreign Language) score may be required.

Technical Requirements

You will need your own PC with internet connections, a certain amount of RAM, and perhaps, peripheral devices. Software is a major concern. GIS software is expensive and most universities will not allow students to use their software off campus. Some universities provide highly stripped down GIS software for beginning classes, others require you to buy your own software. It is often possible to purchase a student license for GIS software at a reduced cost. The trend now seems to be for universities to provide a student license as a part of the GIS courses. If you use GIS at work, then it is logical to make sure the university program that you choose uses the same software as your office.

Tuition/Financial Aid

Tuition is highly variable (less than \$100 to \$2,000 or more per course). Much depends on whether you will be receiving university credit for the courses or not. Financial aid may be available, but for non-degree programs it is very unlikely.

Transfer Credits

It is always a plus if the credits earned can be transferred to other programs. Continuing education credits do not transfer to university credits. Even if the course you take has university credits, they may or may not be accepted for a degree program. The Penn State program is an excellent example of credits being able to be transferred to another program.

Reputation/Quality of Instruction

Big name schools should have excellent quality of instruction, but will cost more. Try to find out if regular tenured professors are teaching the courses or if non-professor instructors are used. See how long the program has been running. Ask for information on the attrition rate. For many programs it is between 25 and 35 percent. A higher rate may indicate a problem with the program.

The following tabulation of institutions offering online GIS courses is just a sampling of the institutions available. New programs are created every year and existing programs change, so the student must contact each institution of interest in order to receive up to date information. Table 1 is intended simply to give a perspective student a starting point in the search.

Table 1—Partial list of institutions offering online GIS courses

Institution	URL	Credit	Approximate cost per course
Penn State	http://www.worldcampus.psu.edu/GISCertificate.shtml	College Credit	\$1,700
University of California Riverside	http://www.extension.ucr.edu/certificates/gis/index.html	College Credit	\$1,700
Louisiana Tech University	http://www.latech.edu/ans/gisc-certification/	No College Credit	\$500
University of North Dakota	http://www.conted.und.edu/ddp/gis/index.html	College Credit	\$1,000-\$2,000
Saint Mary's University of Minnesota	http://www.smumn.edu/sitepages/pid2572.php	No College Credit	\$1,800
North West Missouri State University	http://cite.nwmissouri.edu/nwonline/view-book/programs.aspx	College Credit	\$1,200
University of Montana	http://www.cfc.umt.edu/academics/giscertificate/default.htm	College Credit	\$1,200
University of Southern California	http://college.usc.edu/gist/home/	College Credit	\$1,200
Antelope Valley College	http://avconline.avc.edu/faculty/swelsh/	College Credit	\$600
University of West Florida	http://uwf.edu/gis/GISonline/	College Credit	\$700
Elmhurst College	http://public.elmhurst.edu/adult/2730436.html	College Credit or No	Contact the school for costs
University of Northern Alabama	http://www.una.edu/conted/gis.htm	College Credit	\$532
Mountain Empire Community College	http://www.me.vccs.edu/programs/gis/index.html	College Credit	\$1,000
University of Colorado Denver	http://www.cuonline.edu/acad_hm/program_gis.shtml	College Credit	\$1,500
Eastern Michigan University	http://www.ce.emich.edu/gis/	College Credit	\$1,900

The following net sites may be of value in your evaluation and decision making process.

Lists of schools:

- GeoCommunity: http://spatialnews.geocomm.com/education/distance_edu/
- World Wide Learn: <http://www.worldwidelearn.com/science-degree/geographic-information-systems.htm>
- Urban and Regional Information Systems Association(URISA): http://www.urisa.org/prev/Career_center/college_certif_programs.htm
- ESRI database query shows 83 GIS distance learning programs, 57 of which give GIS Certificates: <http://gis2.esri.com/university/online/db.cfm>
- ESRI Training: <http://training.esri.com/gateway/index.cfm>

GIS Tutorial Lists:

- <http://www.skidmore.edu/help/gis/tutorials.htm>
- <http://gislounge.com/tutorials-in-gis/>
- <http://www.acadweb.wvu.edu/gis/links/gis.htm>

CONCLUSION

There is a great need for GIS education especially with the distance education environment. Many universities and colleges have developed GIS distance education programs in an effort to address this need. However, due to the large variety of programs with varying costs and class formats, it can be frustrating finding the best GIS training for an individual's needs. The net sites provided in this paper are good places to start the hunt.

A prospective distance learning GIS student should consider his or her learning style before signing up for a program. Distance learning takes a certain amount of self discipline to keep up with the course work. The case study of Louisiana Tech University GIS distance learning program showed that often the more freedom you have in class structure, the harder it is to keep up with the work. But for those who can maintain the discipline of the distance learning environment, GIS education opportunities are plentiful.

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THE FOREST ENCYCLOPEDIA NETWORK: DELIVERING SCIENTIFIC KNOWLEDGE TO FOREST PRACTITIONERS

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Abstract—Forest science, like any science, is a continuous process of discovering new knowledge, re-evaluating existing knowledge, and revising our theories and management practices in light of these changes. The forest science community is still struggling to find better solutions to the problem of efficiently and effectively sharing continuously changing science with forest practitioners. The Forest Encyclopedia Network (FEN) www.forestencyclopedia.net represents a new approach to the synthesis and delivery of forest science knowledge. The Forest Service, U.S. Department of Agriculture Southern Research Station, the Southern Regional Extension Forestry system, the Forest Service State and Private Cooperative Forestry Program and the Southern Forestry University community are all engaged in building and testing this new science delivery concept. The network currently has six encyclopedias in various stages of completion: The Encyclopedia of Southern Appalachian Forest Ecosystems, the Encyclopedia of Southern Fire Science, the Encyclopedia of Southwide Forest Science, the Encyclopedia of Southern Bioenergy, the Encyclopedia of Southern Pine Bark Beetle Impacts, and the Encyclopedia of Forest Environmental Threat Assessment. This paper presents the overall concepts of knowledge management, how one form of knowledge management—scientific synthesis—is being developed and used, and some details on how science information has been incorporated into the FEN.

INTRODUCTION

Delivering scientific knowledge to a diverse audience has always been a challenge. New knowledge is typically produced by forest scientists using the time-honored scientific method. It is the nature of the scientific process that progress is made in small increments that add to, corroborate, or dispute existing knowledge at the margins of the field. These incremental results are then reported in scientific journals as primary research papers that seek to explain the methods used and justify the conclusions reached. The focus of these primary science contributions is typically very narrow in scope and quite detailed because the objective is to convince a scientific peer group of the validity of the new conclusions. In other words, the audience for journal articles in the primary scientific literature is other scientists familiar with a particular field of study—the scientific peer group. Attempting to use such published scientific journal articles to deliver scientific knowledge to a nonscientist audience composed of management practitioners, policymakers, and even the lay public is clearly to be avoided.

The process of science delivery is defined as the need to (1) synthesize scientific knowledge into larger, more meaningful units; (2) translate this knowledge into the language and style that appeals to a nonscientist audience; and (3) connect scientific results, conclusions, and forecasts of impacts in a timely manner with the needs and issues of a nonscientist audience. In the past, the forest science community relied primarily on conventional, print-based vehicles such as

managers' handbooks, technology transfer bulletins, how-to leaflets, and articles in journals that address natural resource managers and the lay public to deliver scientific knowledge. Lectures, workshops, videos, and field trips are examples of conventional nonprint-based science delivery methods that have also been successfully used. With the recent widespread availability of extremely capable computer hardware and software and the Internet, electronic methods to supplement the conventional methods of science delivery have become practical.

Until recently, many people did not think in terms of systematically “managing knowledge.” They felt that knowledge was a personal asset accumulated from experiences, education, and trusted colleagues (Plunkett 2001). As computer technology improved and became cheaper in the early 1990s, researchers began to explore the gains that could be made by organizing knowledge, codifying it, and sharing it more widely. The field of knowledge management (KM) slowly emerged. KM can be defined as the systematic strategy of creating, conserving, and sharing knowledge to increase performance (Plunkett 2001, Heinrichs and others 2003). As the Internet became more popular, it was obvious to some that KM systems using web-based hypertext had an enormous competitive advantage over other science delivery methods. Universally available access and inexpensive updating appear to be the critical elements for making web-based KM an attractive alternative to traditional, paper-based methods. This realization led to a proliferation of web-based knowledge management services for science delivery of many different

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kinds. Table 1 provides a partial listing of groups of methods that are currently being used for KM and science delivery in the natural resource field.

Scientific content management sites (table 1) attempt to improve the communication of research results to user audiences (Kennard and others 2005, Rauscher and others 2007). The cornerstone for high-quality scientific content management is the scientific literature, which contains published, peer-reviewed, primary research results. Sites that provide access to this literature in electronic format are called library service sites (table 1). Many of these research papers are primarily useful to the scientist audience itself. A good example is the Forest Service, U.S. Department of Agriculture's TreeSearch system www.treesearch.fs.fed.us. The next step toward a scientific content management system is to offer audience-specific versions of the published scientific articles. For example, the Waldwissen project, a consortium of forest research institutes from Germany, Austria, and Switzerland, offers a collection of scientific research articles grouped by themes www.waldwissen.net. Each of these articles has a summary written for a nonscientist audience by a professional science editor to make the article more interesting and more understandable. These summaries are often available in five languages: German, English, French, Italian, and Slovenian. In Waldwissen, the granularity of the basic science article is maintained, meaning that several articles on the same topic such as "forest fire" are not synthesized by the site. Finally, there are the encyclopedia sites that provide a seamless synthesis of the fragmented scientific literature (table 1). There are two versions of encyclopedia sites: (1) those that are not peer reviewed and open to anyone to author new material such as www.wikipedia.org, and (2) those that are peer reviewed and open only to accredited and vetted authors such as www.forestencyclopedia.net.

The objectives of this paper are to describe the Forest Encyclopedia Network (FEN) project, provide a brief overview of the six encyclopedias it currently contains, explain the software infrastructure and authoring workflow, and discuss the role of FEN in a comprehensive science delivery process.

THE ENCYCLOPEDIAS

FEN currently contains six ongoing encyclopedia projects in various stages of development www.forestencyclopedia.net (table 2). The selection of encyclopedia topics has been strictly based on the availability of funding. This tends to focus development time and energy around current important topics and issues. The FEN system contains approximately 5,236 encyclopedia pages, 2,302 images, 3,912 tables, and 10,903 citations. FEN attracts approximately 2.5 million requests per year which equates to an average of 6,800 requests per day.

The Encyclopedia of Southern Appalachian Ecosystems was the first and is the most mature. It has been peer reviewed, published, and moved into the continuous updating mode. The Encyclopedia of Southern Fire Science has been published and is accepting continuous updates. The Encyclopedia of South-wide Forest Science is currently being written from two publications offering a combined one thousand pages of peer reviewed content (Rauscher and Johnsen 2004, Wear and Greis 2002). Content has been written for the Encyclopedia of Southern Bioenergy; it has been peer reviewed and is accepting continuous updates. The content for the Encyclopedia of Forest Environmental Threats has been written and peer reviewed with publication expected in July 2008. The Encyclopedia of Southern Pine Beetle is the most recent FEN project. Content is currently being written with publication sometime in 2009.

THE APPROACH

The FEN project began in 2000 with funding from a U.S. Department of Agriculture National Research Initiative Competitive grant to facilitate the transfer of usable knowledge from scientific experts to managers, policymakers, and other natural resource professionals. Users of the site are offered what adult educators call a self-directed learning tool where individuals can obtain information on an as-needed basis.

A typical encyclopedia project begins with the development of the overall outline, which becomes the navigational structure of the encyclopedia. The development of the content is directed by one or more subject matter experts who act as managing editors. These editors are responsible for creating the outline and structure, identifying the content that is needed and engaging authors to write needed synthesis pages. They are also responsible for guiding the peer-review process for each section. Assistant editors work with the managing editors to ensure that the content material gets properly placed into the hypertext encyclopedia and that the figures, tables, and citations are all properly linked. Finally, technical specialists are responsible for maintaining the common computing infrastructure and making improvements in page design, workflow, and system function.

Providing scientific synthesis for a broad audience of readers ranging from the general public with only a basic interest or level of understanding of forestry, through private landowners who have a greater degree of interest and understanding, to professional practitioners of forestry is indeed a challenge. To meet this challenge, the pages in FEN are written differently depending upon the level of the hierarchy in which they appear. Very high-level pages, that introduce major sections or subsections, are written so that the general public and many private forest landowners can readily understand the material. As readers dig deeper

Table 1—A classification of types of knowledge management tools

Class of KM Tool	Description	Links
Knowledge maps	Establish a classification scheme called a taxonomy of knowledge, provide a frame of reference for many knowledge management products, and serve as a critical first step for identifying available knowledge.	forest.cse.ogi.edu/portal cmap.ihmc.us
Electronic yellow-page directories	Aid in finding hard-to-access tacit knowledge resources by providing access to experts. They also organize existing web sites and serve up a variety of explicit knowledge assets in understandable ways.	sref.info/ www.forestryguide.de/ www.srs.fs.usda.gov/
Apprenticeship programs	Are typically one-on-one type relationships where an expert coaches a less experienced person in various ways.	www.treeguide.com/forum/
Communities of practice	Support groups of individuals with similar work responsibilities but who are not part of a formally designated work team. Many communities of practice communicate through a web-based system.	groups.yahoo.com/group/dead_wood/ dss.boku.ac.at/
Best practices and lessons learned	Typically present the situation, the options, choices taken, and the results for a typical decision problem. They are widely used in natural resource management and can be extensively found on the internet.	www.kyphilom.com/www/wood/bmp.html www.forestrybmp.net
Lectures and story telling	Allow people to gain more understanding and have greater recall than they do from written reports. Stories can be used to capture lectures on a particular topic, to capture after action reports, to record difficult to codify tacit knowledge, and for many other purposes. Web-based software systems exist that support this knowledge management tool.	www.fsl.orst.edu/geowater/morphology/
Frequently asked questions	In the course of performing a job, people naturally identify questions that their coworkers or their clients ask repeatedly. It is worthwhile to document and develop useful and standardized answers for these types of repetitive questions. Web-based systems also exist that specialize in the management of these questions.	www.answerlink.info
Web-based learning	Allows translations of a typical classroom experience to an online media to offer students the opportunity to learn codified knowledge in a structured way at their own pace.	www.forestandrange.org waldbau.boku.ac.at/lehre/
Scientific content management sites	Collects knowledge in some kind of web-based content management system. First, the knowledge has to be found, organized, synthesized, reviewed for quality, and uploaded for availability. Second, the knowledge content has to be updated and maintained so it keeps its currency. Software systems exist that support both of these functions.	forestencyclopedia.net www.waterontheweb.org www.cabi.org.compendia.asp

continued

Table 1—A classification of types of knowledge management tools (continued)

Class of KM Tool	Description	Links
Simulation models	Popular method to organize specific problem solving knowledge and provide precise, quantitative answers to guide natural resource managers. Most such models have not yet been converted to execute over the internet, however, many simulation models can be downloaded from the internet and then executed on a stand-alone computer.	www.fs.fed.us/fmsc/fvs/ www.cnr.usu.edu/online/simulation/
Free-content information collaboratories	Create and distribute free information content, e.g., encyclopedia. Articles are edited by volunteers and are subject to change by nearly anyone. They cover a wide range of topics, but lack the authority of traditional materials and lack the chance of a quality control regarding the content.	wikipedia.org
Timemaps	A visual-matrix index of the events, research topics, people, and publications, organized by time, for a specific area. An electronic zoomable canvas allows embedding a large amount of information in a single plane.	http://www.fsl.orst.edu/geowater/timemaps/lter/
Databases	A common way to organize original source material in a database structure. It is irrelevant whether the data is numeric or graphic or computer files. Web-based methods have been developed to manage database online.	www.archives.gov/aad/
Library services	Managing and making accessible published books and scientific journal articles has long been the province of science libraries. These services are now available on the internet often free of charge.	www.treesearch.fs.fed.us www.waldwissen.net
Online scientific journals	More and more scientific journals have placed all or part of the content of their original research articles online. Search engines allow users to find relevant articles and the number of citations referring to them.	www.fbmis.info/ www.scirus.com
Web portals	Provide links to many other sites that can either be accessed directly or can be found by following an organized sequence of related categories. The provider of a web portal is responsible for structuring and filtering of web-addresses relating to a special theme.	frames.nbio.gov

KM = Knowledge management.

into the FEN hierarchy, the pages contain more and more technically challenging content that is aimed at helping inform professional practitioners.

All of the various encyclopedia projects share the same computing infrastructure to reduce implementation costs. Once the “core material” for an encyclopedia is in place and reviewed, it moves to a “continuous update mode” where volunteer authors submit new or revised material to keep the content current and expanding. These volunteer authors can be any qualified author and are typically not the same

authors as those developing the original core content. This continuous contribution of new content functions much like a scientific journal system in that authors are rewarded by their employing agencies for getting content published in FEN much the same way that they are rewarded for publishing in a scientific journal. The main difference is that FEN is interested in results, conclusions, and expected impacts of new science knowledge rather than methods with their supporting analyses and statistics. The FEN peer-review process also focuses more on utility and clarity to nonscientific audiences than do most scientific journals.

Table 2—The six encyclopedia projects within the Forest Encyclopedia Network

Project	Started	Published	Status
Southern Appalachian Forest Ecosystem	January 2000	November 2004	Continuous updating
Southern Fire Science	March 2002	November 2005	Continuous updating
South-wide Forest Science	June 2003	Pending	Core content development
Southern Bioenergy	September 2004	September 2006	Continuous updating
Forest Environmental Threats	October 2005	July 2008	Peer review completed
Southern Pine Beetle	September 2006	Pending	Core content development

CONTENT DEVELOPMENT

FEN offers concise, authoritative syntheses of knowledge tied to the scientific literature on which it is based and organized to meet user needs. The content for the encyclopedia “core material” is usually developed in one of three ways:

- Content already exists in peer-reviewed form. A recent scientific synthesis may be available in peer-reviewed and printed format, for example, Ware and Greis (2002). One or several editors then convert the print style to the encyclopedia style of presentation. They make sure that similar content is synthesized in the same pages of the encyclopedia and check the result with the original authors who receive authorship credit for their own content. The result is published in FEN.
- Content is obtained from authors that have been specifically engaged to perform literature reviews and write encyclopedia-style pages. Editors work with the authors to help them learn how to write for FEN and conform to FEN style requirements.
- Content is obtained from a scientific conference specifically planned to synthesize an area of science. It is often the case that both a printed publication and an encyclopedia results from the same content. One or several editors then convert the print style to the encyclopedia style of presentation, making sure that similar content is synthesized in the same pages of the encyclopedia. The result is then checked with the original authors who receive authorship credit for their own content, and the result is published in FEN.

Content can be in several forms, including narrative text pages, citations, data tables, and figures. Content is arranged as a set of narrowly focused Web pages, each linked to a set of related information. Arranging content into a large set of tightly focused Web pages makes it easier for users to find specific content relevant to their needs. A search for the term of interest brings the user to a particular page, and the navigation pane places the page in context and identifies pages with related content. Arranging content in this way also makes it easier to delegate authoring and revision processes, speeds downloading of content by the user, and makes it easier to reuse the same content in different contexts.

Quality of content is ensured through the same means used in more traditional scientific publications. All content includes author attribution and full citations. All content must also pass anonymous peer review before being published on the Internet. Updates to the content must undergo the same peer and editorial review as original content.

A hierarchical information architecture organizes this wealth of information. Every page clearly displays to the user where the current page resides in that hierarchy and offers navigation options to other portions of the hierarchy. These supplement the hyperlinks provided in the body of the content. The hierarchy is easily extended and modified to adapt to evolving content and user needs. Although not yet implemented, the system will eventually permit users to select alternative architectures, rearranging the navigation structure to better suit particular needs. Alternative

architectures could be offered to facilitate reuse of the same content for specific workshops or courses, for special-purpose collections, or to highlight specific topics.

THE CONTRIBUTORS

Creating and maintaining encyclopedias takes a great deal of effort and thus requires contributions from a wide array of institutions and individuals. FEN was created as a collaboration of the Forest Service Southern Research Station and the Southern Regional Extension Forestry System. As FEN expanded, the Southern Forestry University community and the Forest Service State and Private Cooperative Forest Program also became active participants. This multi-agency collaboration draws on the strengths of all parties to improve how scientific information is summarized and delivered to the broader forestry community.

Funding from these sponsoring organizations has been augmented by grants from U.S. Department of Agriculture's National Research Initiative and Bioenergy Program, the National Fire Plan, the Joint Fire Science Program, and the National Forest Threat Assessment Centers of the Forest Service.

THE CONTENT MANAGEMENT SYSTEM

Specialized software tools and efficient project organization are needed to coordinate the efforts of numerous editors and authors across diverse organizations and locations. FEN uses a customized content management system (CMS) based on the content management framework of Zope, an open source Web development environment. Jordin and others (2003) provide technical details.

Customized CMS software simplifies Web authorship and citation management, standardizes page design and display, enforces role-based security, and manages the flow of work from content creation through peer review, editing, and publishing.

FEN leverages Web technology and the Internet not only for distributing its content but also for managing it. Editors, authors, and peer reviewers can all perform their tasks from anywhere on the Internet using commonly available browsers. This capability makes it easier to recruit talent regardless of their location.

Role-based permissions allow editors to perform tasks different from those of authors or peer reviewers. They also control access to information. For example, to ensure the anonymity of the peer-review process, editors can see the identity of peer reviewers but authors cannot. Each individual can be assigned authority over portions

of content. Identities are confirmed by ID and password combinations.

The CMS manages content as an object-oriented database, assembling Web pages dynamically when requested. This allows the navigation options to dynamically reflect existing content and makes it much easier to change the information architecture. The system automatically generates a table of contents and lists of figures and tables, as well as, a search index. Improvements to the user interface are applied easily and consistently across the site.

Predefined workflows ensure that content moves from authoring through peer review and editing, with editorial approval prior to publishing on the public Web site. Task lists are generated for each individual with email notification of newly added tasks. Published pages that are undergoing revision remain visible to the public until the revised content is approved for publication.

Hyperlinks are automatically adjusted when content is moved in the information hierarchy to prevent dead links. Advanced portal tools permit construction of alternative displays and functions for different user groups or preferences.

EVALUATION

The FEN site provides a feedback option that is available to readers at all times. In addition, the FEN team looks for every opportunity to proactively elicit critical review and evaluation. Since 2003, we have obtained feedback from 121 natural resource management practitioners from the Southern United States. This group included State service foresters, forestry consultants, extension and outreach specialists, and educators. They were asked to rate the FEN system according to the frequency with which they expect to use FEN, the relevance of the topics covered as related to their work, and the usefulness of the content covered as related to their work:

- Expected frequency of use: 50 percent daily, 35 percent monthly, 15 percent rarely
- Relevance of topics covered in FEN: 45 percent very relevant, 55 percent moderately relevant
- Utility of content covered: 45 percent very high, 31 percent high, 17 percent moderately high, 7 percent low

On February 1, 2006 in College Station, TX, the FEN encyclopedia team organized a formal review of the Southern Bioenergy Encyclopedia. Fourteen forestry Extension and outreach professionals from throughout the Southern United States attended. This group spent 1 1/2 days discussing the navigation and content of the

Bioenergy Encyclopedia. A representative sampling of their concluding comments best reflects the group thinking of the individuals in the group:

- The subject matter covered is timely and important. Its about time we put it all in an organized fashion in one place.
- Some pages are clearly at the landowner level and some are at the professional level. The project needs to work hard to reconcile how FEN is intending to meet the needs of different audiences.
- The scope and depth of the coverage on Bioenergy is terrific.
- FEN is important from an information point-of-view but also as a public relations tool.
- There is a lot of useful information in FEN but most of it is static. There is a need to achieve more reader involvement through interactive tools.
- The navigation system takes some getting used to. It is too easy to get lost in the depth of this system.

On May 25, 2006, the Bioenergy Resources Encyclopedia of FEN received a formal program review from the U.S. Department of Agriculture, the funding Agency of the competitive grant program for developing this encyclopedia. Dr. David Brune, Department of Agricultural and Biological Engineering at Clemson University, who headed up this review team, summarized his opinion of this project in his final report as follows:

“The reviewers feel the potential contributions of this extension and outreach development activity may extend far beyond the immediate goal of biomass utilization. The internet based modules represent the future direction of outreach education in general. The discussions among the group to develop “templates” to allow for “on demand” construction and printing of fact sheets by cooperating field agents represents, in our opinion, the next generation of extension activity. Further discussions to add links to detailed scientific papers would potentially offer a technical depth to the website, not typically available to the public in conventional outreach programs and activities.”

DISCUSSION

FEN is a new approach to the delivery of scientific knowledge to users. Project members have successfully launched six encyclopedias on various topics and guided the software infrastructure through three major revisions. Many challenges have been overcome to prove that the encyclopedia approach is indeed a viable scientific knowledge management and delivery mechanism. Some challenges remain.

One continuing challenge is motivating scientific experts to synthesize scientific information and provide it in appropriate form to the editors. FEN must find ways to demonstrate the worth of the contributions of authors and editors in a way that is recognizable and valued by their peers. Writing style is another challenge. Most scientists are more familiar with writing in the lengthy, linear style common to traditional journals than the “punchy”, conclusion-first style needed in the hypertext world of the Internet. Just as writing styles need to change, so too must content. Procedures must be developed to identify obsolete content, enlist authors to update it, and provide proper attribution to what in some cases may be minor revisions. One option FEN is exploring is an archiving system that would allow visitors to “peel back” current contents to reveal previous versions, showing what previous authors wrote on the subject. This could show visitors how scientific understanding and its expression in the encyclopedia have changed over time. Most Web sites focus on delivering current information. Designing an interface that shows change in content over time without confusing the audience would be a substantial achievement.

The use of the Internet as a source of knowledge has been increasing rapidly in the United States. This may be termed a “high tech” science delivery approach. A recent survey concluded that 63 percent of American adults overall, and 59 percent of rural people, used the Internet (Pew Internet and American Life Project 2005). On any given day, 70 million Americans are online. The Pew report indicated that Internet use was highest among younger people, with rates declining with each advancing age category. This data suggests that future generations of landowners will be increasingly likely to look for and use Internet-based knowledge. People want the freedom of access to knowledge whenever and wherever they wish. Web-based science delivery, such as FEN, can thus be expected to reach an increasing number of landowners in the future.

There is likely to always be a substantial proportion of consumers of scientific knowledge that prefer traditional science delivery methods rather than Internet-based methods. Howell and Habron (2004) indicated that 57 percent of agricultural landowners who responded to their survey preferred face-to-face personal communication about important topics. A study in Connecticut found that workshops ranked second, behind printed publications, as the preferred method of receiving information related to land use planning and sustainable economic development (Westa and others 2005). Unfortunately, such “high touch” programs are typically expensive and reach a small percentage of the potential audience.

A multi-faceted science delivery program is likely to be more effective than one that relies exclusively or primarily on either a “high tech” or a “high touch” approach. Multifaceted science delivery programs offer similar content

in a wide range of products: (1) printed publications, such as fact sheets, brochures, and posters; (2) face-to-face workshops and multiday training sessions; (3) satellite distributed learning workshops and training sessions; (4) computer-based structured learning courses available both on CD-ROM's, DVD, and on the Internet; and finally, (5) Web-based syntheses of science such as FEN. Two examples of recently developed multifaceted science delivery programs in the Southern United States exist. One is the science delivery program of the Forest Service Southern Research Station (Whitlock and others, in press) and the other is the Forest Bioenergy Systems program of the Southern Forest Research Partnership (Gan and others, in press).

FEN is intended to be an ongoing scientific synthesis project. Imagine how broad and deep in scientific knowledge the FEN system could be if we were to gradually expand its coverage over 10, 20, or 30 years. FEN could evolve into the premier source of natural resource science knowledge in the World with millions of users accessing it from all parts of the globe every day.

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USING THE WEB TO FACILITATE EXTENSION PROGRAM DELIVERY AND MANAGEMENT

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Abstract—Needs Assessment; Program Development/ Delivery/ Evaluation; Documenting Impact – These phrases are well-known to Extension professionals. Successful Extension professionals must conduct all these activities in a time of shrinking resources and increasing demand. Maintaining a website can be seen by Extension professionals as ‘just one more chore’ on top of already busy schedules. But busy schedules are only part of the ‘technology challenge’ facing Extension faculty. Recent research has shown a lack of preference for computer-based communication (Howell and Habron, 2004; Radhakrishna and others, 2003) among some traditional Extension clientele. At the same time, the Web is a good way to reach new, and perhaps younger, audiences. Increasing pressures for accountability further complicate the matter - how can the impact of Web-based educational materials be assessed when often the only information available is the number of website visits or ‘hits’ for materials? This paper highlights uses of the Web to ‘lighten the load’, broaden the reach, and improve the effectiveness of Extension faculty. The development of an automated ‘user registration and material delivery’ system is discussed. A case example is presented to give an overview of the development and evolution of the system and the results of a user survey. The system is applicable to any Extension or Technology Transfer professional wanting to track and survey users of Web-based materials.

INTRODUCTION

Extension professionals must balance a multitude of responsibilities including periodically assessing the needs of clientele; finding resources to develop and maintain programs; developing, delivering, and evaluating educational programs; and documenting impact. Successful Extension professionals must conduct all these activities in a time of shrinking resources and increasing demand. Maintaining a website can be seen by Extension professionals as ‘just one more chore’ on top of already busy schedules.

But busy schedules are only part of the reason that many Extension faculty members seem reluctant to devote significant energy to using the Web for delivering programs and materials. Other challenges include the preferences of how Extension clientele want to receive information, demands to reach new audiences, familiarity with the technology itself, pressures to document impacts, and how to reward Extension professionals.

Extension professionals know that they must tailor their approaches to program delivery based on the needs and preferences of the target audience. Recent research has shown that many Extension clientele still prefer ‘traditional’ modes of communication (face-to-face or telephone) over email or websites (Howell and Habron, 2004; Radhakrishna and others, 2003). This is certainly not surprising to anyone that has worked in Extension – long-term clientele value Extension as the place they can come and talk to a ‘real live person.’ At the same time, however, there are pressures to broaden the reach and ensure Extension is relevant to the next generation. While Howell and Habron (2004) found a general lack of preference for receiving information via

the Internet, the preference was much higher for younger audiences than for older audiences.

This preference among younger audiences likely coincides with their experience and comfort level using computers. Extension faculty are no exception in this regard; faculty that have not grown up using computers cannot be expected to be as familiar, or as comfortable, with using the Web for educational programming as younger, more computer-savvy faculty. And even for those that invest time and energy in learning the technology, frustration soon sets in when rapidly changing technology makes their newfound skills obsolete.

Another challenge is the increasing pressure for Extension faculty to document the impact of their educational programs and materials. In traditional face-to-face settings such as workshops, gathering participant information and conducting post-session evaluations to assess behavior change are pretty straightforward. However, the Web presents unique challenges – website visitors are typically anonymous, and it is easy to speculate that they prefer to remain so given constant reminders not to divulge personal information over the Internet. Without knowing who the clientele are it is nearly impossible to assess how educational materials impact their lives.

A final challenge is related to the well-established rewards systems for faculty. Traditional performance evaluation systems focus on publications, presentations, and workshops. Thus, the old axiom holds true, “tell me how you’ll measure me and I’ll tell you how I’m going to behave.” It is difficult for an Extension professional to justify devoting significant energy to Web-based

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programming knowing that their supervisor may not perceive such outputs as being as valuable as traditional outputs.

Given these challenges, one might conclude that the underlying message here is that the challenges to using the Web and other technology outweigh the benefits for Extension professionals. This is not the intent. Rather, the intent is to consider ways to use technology while taking into account the challenges that face Extension professionals.

Therefore, the goal of this paper is to demonstrate how Extension faculty can use the Web to not only lighten their workload and broaden their reach but also as a means to be able to document impact. A case example is used to describe how to achieve these objectives.

METHODS

Case Example - Background

The case example presented here describes the development, delivery, and evaluation of a software program for estimating shrink and swell in wood products. The most common challenges faced by anyone that works with wood – from the home hobbyist to personnel at large-scale industrial sawmills – are related to wood’s tendency to shrink and swell with changes in ambient relative humidity. The calculations for estimating shrink and swell in wood can be intimidating for some users as they must take into account variables including wood species, wood grain orientation, size of the piece, and magnitude of change in ambient conditions. The software was developed in response to clientele expressing the need for a simple tool to do these calculations.

The first version of the software was distributed by Oregon State University’s (OSU) Extension and Experiment Station Communications office in a binder containing a hard-copy user’s manual and diskette at a cost of \$15. While the publication looked very professional, the packaging greatly increased the cost and likely limited distribution and usage. After three years and a major revision of the software (from MS DOS® to MS Excel®), the author decided to ‘embed’ the user manual in the software (i.e., as one of the tabs in the spreadsheet) and distribute it free-of-charge via the Web.

Tracking Usage and Users of Web-Based Materials

When the OSU Extension Communications office distributed the software it was relatively simple to determine who was using (or at least purchasing) the material; one simply needed to contact the office and request how many copies had been sold and to whom. However, distributing the software on the Web resulted in the loss of the ability to easily track users and hence the ability to contact them for impact assessment.

The ability to track website hits and usage of materials has improved greatly in recent years. Web statistics services such as Urchin® (now Google Analytics®) provide a wealth of data on website traffic. Data provided include number of hits (in total and by individual page), number of unique visitors, search phrases entered by users to find your site, downloads of individual files, and dozens of other statistics. The author was able to use Web statistics to determine how many visitors had downloaded the wood shrink/swell software each month.

‘Webstats’ are useful data for documenting usage of materials; however they do not provide information on users. Thus, they do not provide sufficient detail for assessing impact. To assess impact, user contact information is needed. This presents a challenge for Web-based materials – How can contact information be obtained from website visitors? Further, will requesting such information lead to steering website visitors away, i.e., will they seek another source rather than provide personal information?

The author developed a simple user registration system for the wood shrink/swell software. The system used a standard Web form to collect user data. When website visitors completed the form and clicked ‘Submit’, an email message was sent to the author. User information was then copied-and-pasted into a spreadsheet and the software was emailed, or a diskette was snail mailed to the user in the event an email address was not provided.

It didn’t take long before the disadvantages of this approach became apparent. Even moderately popular materials result in quite a bit of additional email messages; and it is fairly time-consuming to copy-and-paste user data and email/mail materials.

To lessen the time commitment involved, a simple change was made to the system - when visitors filled in the form and clicked ‘Submit’, the auto-generated response message they received provided a direct link to the software. This eliminated one step in the process (i.e., emailing or snail mailing the software to users); however tracking user information was still time-consuming. Further, providing a direct link to the software resulted in two distinct disadvantages:

1. Shortly following the change to the system, Web statistics showed far more downloads than user registrations. Thus, it seemed users were simply finding (or being provided – perhaps by another user) the direct link to the software and bypassing the registration form; and
2. Several users provided incorrect contact information. This fact became clear by the number of undeliverable email messages in follow-up surveys and/ or by users providing email addresses (sometimes quite humorous) such as `u_cant_have_my_email@no_way.com!`

It seemed the optimal solution to these problems was an automated system for collecting user information and delivering the software. Web-based databases such as MySQL® allow for storing user information without requiring the additional step of transferring data to a program like Microsoft Excel® or Access®. There are computer scripts (short blocks of programming code) in the PHP programming language available to accomplish tasks such as sending emails with attachments. The author used the book *PHP and MySQL for Dummies* (2002) to develop an automated ‘user registration and educational material delivery’ system. The system works as follows:

1. Website visitors fill in a standard Web-based form to request the wood shrink/swell software (email address is a required field)
2. Upon clicking submit, a computer script is executed that automatically sends a copy of the software as an attachment to the email address provided;
3. The user information is automatically entered into a Web-based database

The entire system is ‘hands-off’; user contact information is entered into a database and the software is sent via email attachment 24 hours a day, seven days a week without any involvement by the faculty member. Conducting a survey to assess impact merely involves visiting the Web-based database and copying-and-pasting user email addresses into an email message.

To address the question of potential reduction in usage due to requiring user contact information, visitors were told that they would be contacted only once by email to evaluate the software. An anonymous download system was also created realizing that the ‘only one contact’ assurance would likely alleviate concerns for some, but not all visitors. An option was added for users to click a button to ‘Skip this Form’ and be taken directly to a link to the software without providing their contact information. Clicking the button results in incrementing a counter so that the author can compare the number of users that skipped the form to those that provided contact information.

Users were surveyed in 2002, 2003 and 2004² and asked if they had used the software; if so, the specific situation where the software was used and the outcome; whether or not the instructions were clear and the examples provided were helpful; and suggestions for improvement. Requests to complete the survey were sent by email and the survey itself was a Web-based form (see Appendix). Responses to the survey were received by email and were copied-and-pasted into the Web-based database and linked to the respondent’s contact information.

RESULTS

Since January of 2002, over 1,270 users have downloaded the software, although this figure does not include visitors that bypass the registration form. Users have come from nearly every U.S. state and 60 countries. In total, approximately 11 percent (n=144) of the users responded to the survey.

Information useful for impact documentation include the fact that all but one of the respondents that had used the software to solve a problem (many simply downloaded the software out of curiosity) said it had helped them to solve a particular problem. Useful quotes included descriptions of how the software had been used such as:

- “When designing furniture and cabinets I use it to calculate wood movement and design accordingly. It’s a very good program and very useful to me.”
- “Possible shrinkage to allow for in oak floor”
- “I was curious how much wood shrinks in our hot dry climate. Some drywallers had stated that lumber shrinkage was causing drywall cracking in newly built homes. It was our conclusion that the lumber shrinkage was not the probable cause. The most likely cause was that the drywallers were not following their own guidelines for drywall installation (No expansion joints installed, not curing the mud before finishing, not heating the buildings in winter, not cooling them in summer.) We have also learned that drywall is not always dried to proper moisture content prior to installation.”
- “Change in width of lumber and timbers cut on portable sawmill for use before dry”
- “Determine amount of shrinkage I could expect in a Maple table top that I was building”

With respect to the potential reduction in usage due to requiring user contact information, surprisingly, 60 percent provided contact information (i.e., 40 percent clicked ‘Skip this Form’ and downloaded the software anonymously). It was expected that this figure would be much higher given frequent warnings about providing personal information on the Internet, particularly considering that visitors had the option not to provide information.

²As promised, users were only surveyed once - the 2002 survey was addressed only to those that downloaded the program in that year and similarly for the 2003 and 2004 surveys. Further, no follow-up messages were sent to non-respondents.

DISCUSSION

Given the very full schedules of Extension professionals, creating and maintaining a website can be seen as just one more chore. Alternatively, Extension professionals can see the Web as one of many useful tools for delivering educational materials and assisting with program management tasks of tracking users of educational materials and assessing impact. The automated 'user registration and educational material delivery' system described in this paper is working well to lighten the burden on one Extension professional and is applicable to anyone wanting to track and survey users of Web-based materials.

For the approach to be more widely used however, the system must be standardized and streamlined in some way that it can be used by those without computer programming experience (or the inclination to become programmers). There have been discussions at Oregon State University regarding developing a Web-based template that would allow any Extension faculty member to simply complete an on-line form to upload the material they wish to track, specify the information they want to obtain from users, and write the survey questions they plan to ask. A software program would then function behind-the-scenes to develop the user registration form, email script to deliver the material to users, Web-based database, and the user survey.

Future improvements planned for the system described here include automating the survey response process. That is, instead of having survey responses come to the author, they would be automatically inserted into the user database for the appropriate user. Another valuable improvement would be to automate the survey process itself. That is, based on the date a user downloads the material, a message would be sent to them within a specified time frame (e.g., 3 months, 6 months, etc.) requesting that they visit a website and respond to a survey.

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Appendix A: User Survey

Our records show that you downloaded the wood.xls program for estimating shrink and swell in wood. We would greatly appreciate if you would take a few minutes to provide us with feedback so that we can assess how you are using the program and how we might improve the program.

We will not contact you again unless you specifically ask us to do so. Thank you.

Name: _____

Company Name: _____

E-mail address: _____

1. Have you used wood.xls since downloading the file?

Yes No

If no, skip to question 7.

2. Please describe the specific question or problem you were hoping to address.

3. Did wood.xls help you to answer your question or solve the problem?

Yes No

4. Was the Instructions worksheet understandable and helpful?

Yes No Not applicable/can't remember

5. Was the Introduction and Example worksheet helpful?

Yes No Not applicable/can't remember

6. Please provide any suggestions or comments you have for how the program might be improved.

7. If you downloaded the file but did not use it, was there some problem with the program?

Yes No

If yes, please describe the problem (for example, were there compatibility issues with your software?)

NEW KNOWLEDGE AND EDUCATION SYSTEMS FOR DEVELOPMENT OF FOREST BIOENERGY SYSTEMS

Jianbang Gan, Larry Biles, Daniel Cassidy,
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Abstract—Among the current challenges facing outreach and extension forest professionals in North America include high diversity among clients, rapid advances in knowledge, and changes in markets associated with new products, new buyers and sellers. These factors create an urgent need for a versatile, yet responsive and effective technology transfer system. Meanwhile, advances in information technology have enhanced our ability to meet such a challenge. This paper describes the development of a knowledge base and a delivery system for forest biomass and bioenergy development. Under the framework of the Forest Encyclopedia Network (www.forestencyclopedia.net), the knowledge base, the Encyclopedia of Southern Bioenergy, is developed into seven interrelated modules representing the key components in the forest biomass and bioenergy supply chain. These modules can be further rescaled, integrated, and tailored to meet various educational needs. A variety of tools/means ranging from the Internet to printed materials and to workshops will be employed to disseminate the knowledge to different groups of audiences. Building on the strengths of the Southern Forest Research Partnership and the Southern Regional Extension Forestry office, we expect to effectively integrate research and outreach to help meet the educational needs for forest biomass and bioenergy development in the South.

INTRODUCTION

Current and emerging changes in clients, markets, and technology present both opportunities and challenges for technology transfer in the forestry and related professions. The major clients for forestry outreach/extension programs have traditionally been private forest landowners. These landowners are very diverse (Butler and Leatherberry 2004), and such diversity has evolved and will continue to evolve with demographic and socioeconomic conditions. Driven by globalization, increasing environmental concerns, rises in energy prices, and other factors, society's demand for forest products and services has changed dramatically in recent years. This has been reflected by recent alterations to the forest products industry and markets, including divestiture of industrial timberlands and increasing global linkages of forest products markets. These changes call for a versatile, yet responsive and effective technology transfer system. Fortunately, advances in information technology have tremendously improved our ability to gather, organize, and disseminate educational materials and information. As a result, it is now possible to develop such a technology transfer system.

This paper describes a systematic approach to the development, synthesis, and dissemination of forest biomass and bioenergy knowledge (fig. 1). The system consists of four interrelated components: information and technology producers, education and training products, extension and education professional, and information and technology consumers. The system is developed and utilized

via a partnership among the Southern Forest Research Partnership, Texas A&M University, the University of Georgia, Forest Service, and Southern Regional Extension Forestry office. Such a partnership between the forestry research and outreach communities ensures the effective integration of research and technology transfer.

The focal area of this system is forest biomass and bioenergy. Biomass offers America a tremendous opportunity to use sustainable, domestic plant resources to enhance its fuel, power, and chemical needs. The Biomass Research and Development Act of 2000, the Healthy Forests Restoration Act of 2003, and the Energy Policy Act of 2005 all point to the importance that Congress and the American people place on the national bioenergy resource. We need to capitalize on domestic bioenergy resources to (1) improve our national strategic energy security, (2) create new jobs and new higher-valued products and technology for export, (3) significantly decrease annual trade deficits, and (4) maintain the health and productivity of our forests. To accomplish these objectives in a way that is economically viable, environmentally sustainable, and socially acceptable, there is an urgent need to both create new knowledge and make the best use possible of what we already know. In other words, it is essential for us to get the best scientific and technical knowledge into the hands of those people who can make a difference (e.g. the forestry community and rural and economic development practitioners).

The Southern US is in a unique position for forest biomass and bioenergy development. It is one of the most

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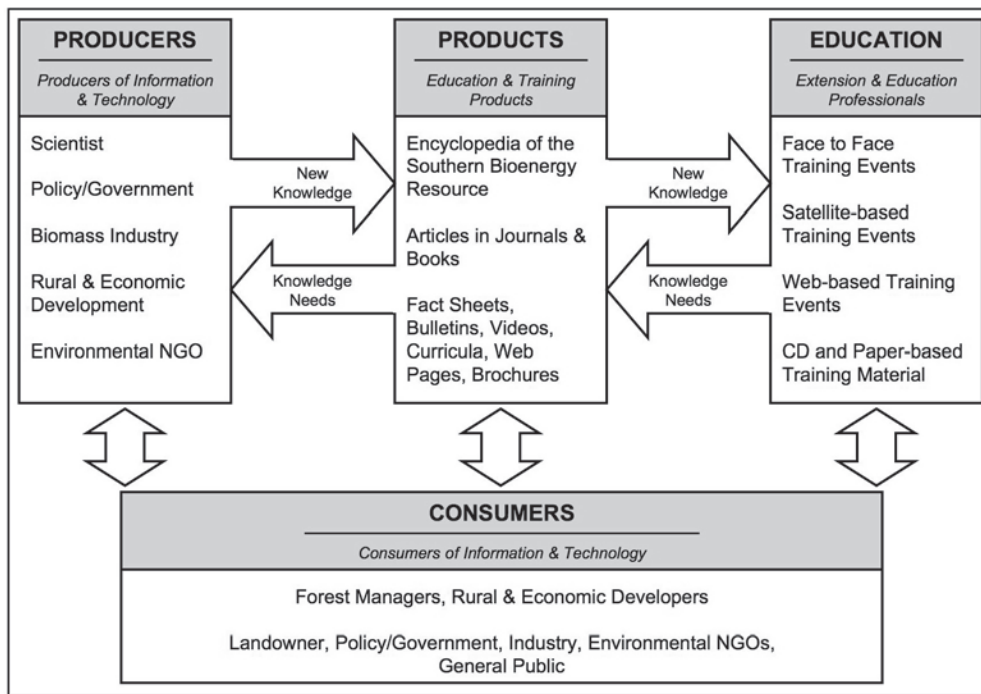


Figure 1—The integrated system of knowledge production, synthesis, delivery, and use in forest bioenergy.

productive forest regions in the country and the world (Wear and Greis 2002). This region provides 60 percent of the nation's timber supply and by association a very high percentage of the nation's timber harvesting and processing wood waste residues. The Appalachian Hardwood forests of the mountains, the abundant Bottomland Hardwood forests of the many large river floodplains including the Mississippi River system, the mixed Pine-Hardwood forests and the southern pine plantations of the Coastal Plain all provide abundant potential biomass products that could be economically utilized. The development of forest biofuels and other bio-based products is particularly timely because the forest products industry, especially the pulp and paper products sector, in the Southern region has been negatively impacted in the last decade by global shifts in supply and demand. The impact to private forest owners, forestry rural communities, and the health of the nation's forests has been severe. The South's forestlands now predominately produce small diameter, low quality trees with weak market potential from the traditional wood products perspective. In addition, improvements in tree genetics and better competition control in pine plantations have allowed for planting more trees per acre. These have led to overstocked forests, increasing the threats of fire, pest, and disease outbreaks (US Congress 2003). As a result, forest managers and rural communities in forested areas are facing new challenges in providing treatments for forests to achieve improved ecosystem health and to create jobs and income for these communities.

Better utilization of small diameter trees, logging residues, and wood processing residues is a key component to a

sustainable forest-based economic and environmental system in the South. Converting timber harvest residues and dedicated energy crops into biofuels and other bio-based products offers outstanding benefits to the region and to contemporary national interest. These benefits include improved strategic energy and economic security, healthier rural economies, improved environmental quality, and greenhouse emission mitigation. To realize this potential, it is important to immediately concentrate our efforts towards organizing what we already know and disseminating resultant knowledge products to rural community business leaders, and persons involved in growing, harvesting, transporting, and processing woody biomass. With this in mind, we developed a knowledge and education system to facilitate the educational needs for forest biomass and bioenergy development in the South. The rest of this paper focuses on the description of the two key elements of the system--the development and delivery of the knowledge products.

THE KNOWLEDGE BASE

The Forest Encyclopedia Network

The Forest Encyclopedia Network (FEN) project began in 2000 with funding from a USDA National Research Initiative Competitive Grant to facilitate the transfer of usable knowledge from scientific experts to managers, policymakers, and other natural resource professionals.

Users of FEN are offered what adult educators call a self-directed learning tool where individuals can obtain information on an as-needed basis.

FEN currently contains six ongoing encyclopedia projects in various stages of development (www.forestencyclopedia.net) (table 1). As of the summer of 2006, the FEN system contained 3,260 encyclopedia pages, 2,457 images, 450 tables, and 13,444 citations. FEN attracts approximately 300,000 page views per year.

The Encyclopedia of Southern Appalachian Ecosystems was the first and is the most mature. It has been peer reviewed, published, and has moved into the continuous updating mode. The Encyclopedia of Southern Fire Science has been published for general viewing but is still undergoing the final peer review for many of its sections. The Encyclopedia of South-wide Forest Science is being written from two publications offering a combined one thousand pages of peer reviewed content (Rauscher and Johnsen 2004; Wear and Greis 2002). Content has been written for the Encyclopedia of Southern Bioenergy. It was published for public viewing in September 2006. The content for the Encyclopedia of Forest Environmental Threats has been written and peer reviewed and is currently being edited, with publication expected in July 2008. The Encyclopedia of Southern Pine Beetle is the most recent FEN project. Content is currently being written with publication sometime in 2009.

A typical encyclopedia project begins with the development of the “core material” and is directed by one or more subject matter experts who act as the managing editors. These editors are responsible for creating an information architecture, identifying the content and engaging authors to

write needed synthesis pages. They are also responsible for guiding the peer review process for each section. Assistant editors work with the managing editors to ensure that the content material gets properly placed into the hypertext encyclopedia and that the figures, tables, and citations are all properly linked. Finally, technical specialists are responsible for maintaining the common computing infrastructure and making improvements in page design, workflow and system function.

All of the various encyclopedia projects share the same computing infrastructure to reduce implementation costs. Once the “core material” for an encyclopedia is in place, it moves to a “continuous update mode” where volunteer authors submit new or revised material to keep the content current and expanding. This continuous contribution of new content functions much like a scientific journal system in that authors are rewarded by their employing agencies for getting content published in FEN much the same way that they are rewarded for publishing in a scientific journal. The main difference is that FEN is interested in results, conclusions, and expected impacts of new science knowledge rather than methods and detailed mathematics. The FEN peer review process also focuses more on utility and understandability to management and lay audiences than do most scientific journals.

Creating and maintaining encyclopedias takes a great deal of effort and thus requires contributions from a wide array of institutions and individuals. FEN was created as a collaboration of the Forest Service Southern Research Station (srs.fs.usda.gov) and the Southern Regional Extension Forestry Office (www.sref.info). As FEN expanded, the Southern forestry university community

Table 1—Summary of existing Forest Encyclopedia Network (FEN) projects

Project	Started	Published	Status
Southern Appalachian Forest Ecosystem	January 2000	November 2004	Continuous updating
Southern Fire Science	March 2002	November 2005	Final peer review ongoing
South-Wide Forest Science	June 2003	Pending	Core content development
Southern Bioenergy	September 2004	September 2006	Continuous updating
Forest Environmental Threats	October 2005	Pending	Core content development
Southern Pine Beetle	September 2006	Pending	Project organizing

(Southern section of the National Association of University Forest Resources Programs or NAUFRP) and the Forest Service State and Private Cooperative Forestry Program also became active participants. This multi-agency collaboration draws on the strengths of all parties to improve how scientific information is summarized and delivered to the broader forestry community. Funding from these sponsoring organizations has been augmented by grants from USDA's National Research Initiative and Bioenergy program, the National Fire Plan, the Joint Fire Science Program, and the National Forest Threat Assessment Centers of the Forest Service.

Bioenergy Module Contents

The Encyclopedia of Southern Bioenergy contains seven interrelated modules: Understanding Bioenergy Resources, the Southern Bioenergy Resource, Forest Management, Introduction to Harvesting and Transportation, Utilization, Economic, and Environmental Sustainability. These modules are organized based upon the value chain of forest biomass and bioenergy production (Richardson and others 2002). This section summarizes the contents in each module.

Module 1—Understanding Bioenergy Resources

The purpose of this introductory module is to provide a background on the global bioenergy situation. Specific objectives include: (1) defining forest biomass and bioenergy, and (2) describing the role of forest biomass as a sustainable, renewable energy source in the Southern United States and worldwide.

In this first module, “Understanding Bioenergy Resources,” the opportunities and challenges related to bioenergy development are discussed. The discussion is not limited to forestry biomass and bioenergy, but focuses on the bioenergy industry as a whole. Special attention is given to international experiences, including supply and utilization of biomass worldwide. In the European Union, 46 percent of the harvested timber was used for fuelwood in 1990 according to Hakkila and Parikka (2002). Biomass is also considered one of the most important renewable energy sources, comprising 10.4 percent of the total use of renewable energy globally (Silveira 2005). The promotion of bioenergy and discussion of the challenges facing bioenergy industry development are addressed separately within the module. Challenges include market formation, creating synergies with agriculture and the energy sector, and managing competition (Silveira 2005). The purpose of this section is to acquaint the audience with bioenergy and its use around the globe. The status of biomass in the United States is discussed with special consideration given to environmental, social, economic, and energy issues. For example, 46 percent of the renewable energy used in the United States is attributed to biomass.

Module 2—The Southern Bioenergy Resource

The purpose of the second module, “The Southern Bioenergy Resource,” is to introduce the audience to the characteristics of the Southern United States, the Southern forest, and its potential for bioenergy production. This module provides background information on the Southern United States and the Southern forest. In addition to describing the economic and social conditions of the South, the Southern forest ecosystem is also described. Topics include forest types, physiographic regions, climate, soils, and forest health. The bioenergy potential of the Southern forest is portrayed by describing the classes of biomass, including residues, small diameter woody biomass, short-rotation woody crops, and low value species, available from the Southern forest and the potential supply of readily available biomass.

Module 3—Forest Management

The purpose of the “Forest Management” module is to provide an understanding of the forest management practices utilized in the production of biomass for bioenergy. Specifically, the module discusses how natural resource professionals and landowners can successfully integrate biomass production for bioenergy into the forest management plan. To accomplish this goal, the module content is arranged around four topics: (1) deciding to produce bio-based products, (2) forest management and silviculture, (3) biomass production by forest type, and (4) best management practices (BMPs).

The first section discusses factors to consider and questions to ask before deciding to produce biomass for bio-based products. These factors include landowner objectives, site characteristics, and the profitability of producing bioenergy feedstocks on a site. For example, if wildlife management is a long-term landowner objective, biodiversity and wildlife habitat should be considered before removing biomass from the site.

The “Forest Management and Silviculture” section describes the concept of sustainable forest ecosystem management. Sustainable production, or sustained yield, is the amount a forest resource that can be produced while maintaining the viability of the specific forest ecosystem. It is important that biomass for bioenergy be produced at a sustainable rate to be considered a renewable natural energy source.

Best management practices are designed to mitigate the effects of harvesting and other management techniques on the forest. BMPs are mentioned in this section since they are an important component of forest management, but they are covered in more detail in the “Environmental Sustainability” module.

The primary emphasis of the Forest Management module is the discussion of biomass production by forest type. Each of the five identified forest types, along with short-rotation woody crops, are described in detail. These forest types include planted pine, natural pine, mixed oak-pine, upland hardwoods, and lowland hardwoods. Information on biomass potential and biomass production is provided for each forest type. For example, planted pines have a high biomass potential because silvicultural strategies for these forests tend to produce large volumes of harvest residues. Hardwoods may not be as desirable for biomass production because of limiting site characteristics [i.e. topography for (upland hardwoods) and wet sites (lowland hardwoods)] and forest management techniques.

The Forest Management module is designed with the natural resource professional and the forest landowner in mind. Material is presented to allow individuals to decide if the production of biomass for bioenergy production fits their forest management objectives. Information is presented related to the biomass potential of each forest type. The primary purpose of this module is to provide information about how the production of biomass for bioenergy production can be incorporated into the forest management plan.

Module 4—Introduction to Harvesting and Transportation

The objectives of the module about harvesting and transportation of woody biomass from the forest for use as energy are to demonstrate how to cut and collect biomass according to demand, prepare it and then transfer it in a cost-effective manner to the end-users according to their needs. All biomass harvesting and delivery systems consist of collecting the material, off-road hauling, on-road hauling, and storage prior to ultimate use.

Featured in this module are woody biomass coming from the forest that includes logging residues, non-merchantable trees from thinning operations, wood from short-rotation woody crops or energy plantations, dead and dying wood from mature stands, excess small-diameter trees from overstocked stands, insect or disease-damaged trees, and trees damaged by hurricanes and tornados. Of these, recovered residues from logging operations have the greatest potential for providing biomass for bioenergy production. This wood can be processed for delivery and storage either as composite residue logs (CRL) or reduced to small pieces (comminuted) by chippers or other similar machines. Almost exclusively, trucks equipped with chip vans, containers, or conventional log trailers transport the material from the woods to the end use site.

Probably the most common harvesting configurations are integrated one-pass systems where all recoverable material is harvested in a single operation. This system can take

on many forms as can the less commonly used two—pass system where the biomass is harvested separately from the conventional products like pulpwood, sawlogs, and veneer.

There are two components considered in establishing a woody biomass for energy production or energy harvesting and transportation system. The first explores the technical aspects of the gathering, processing, storage and delivery systems, while the latter explore the economic, regulatory and environmental issues pertinent to harvesting woody biomass for energy. Included throughout are the costs associated with harvesting woody biomass.

Module 5—Utilizing Biomass for Bioenergy, Biofuels, and Bio-based Products

This module centers on the concepts of utilizing and processing woody waste from harvesting practices, industrial by-products such as sawdust and black liquor, and secondary products such as chips and pallets into energy, fuels, and chemical products. The module introduces the user to the components of wood, such as lignin and cellulose, as well as factors that hinder utilization such as moisture and ash content. Processes for creating bio-based products and energy are divided into thermochemical and biochemical conversion systems and presented so that users can evaluate and choose the best technological alternative for their particular situation. Process schematics and links to sites where the processes are being utilized are also provided. The module presents information on energy production via various processes as well as in-depth discussion of the creation and use of ethanol, methanol, and bio-diesel while incorporating successful case studies and research. Chemical extracts, their uses, and the research that is currently underway are also covered in this module. The concept of an integrated, multi-product biorefinery is presented as an example of the potential for utilizing woody biomass. The processing and utilization module houses comparisons between the use of bio-based energy and products in the United States versus nations in Europe, Asia, Africa, and South America with case studies.

The module was constructed by researching the expansive literature in the fields of chemistry, physics, engineering, wood products, and biology. On-site visits to a multitude of conversion facilities and discussions with leading researchers and project managers have helped build the complex and confusing material into a form that can be understood by the Forest Encyclopedia's target audience—natural resource professionals.

Module 6—Economics

This module addresses the socio-economic issues associated with forest biomass and bioenergy development. The information presented in this module is intended to aid forestland owners and practitioners in understanding

economic potential and barriers for forest biomass and bioenergy production and relevant policies. It contains four sections: supply of forest biomass, cost competitiveness, community impacts, and policy factors and incentive programs.

The supply section describes factors affecting supply, sources and quantify of supply, location of supply, and uncertainty and the long-term supply. An array of factors could be attributable to forest biomass supply. These factors include the availability of forest resources, recovery limitations imposed by accessibility and environmental concerns, and economic considerations. Forest biomass can be derived from a variety of sources including logging residues, mill residues, thinnings (traditional forest management and fuel treatments), stands damaged by natural disturbances (fire, windstorm, pest outbreaks, etc.), energy plantations, and urban wood wastes. Trees that are traditionally harvested for pulpwood can also become a potential source for bioenergy if the price is right. Among these supply sources, logging residues are perhaps one of the most economical sources of forest biomass that have not been extensively used. There are approximately 40 million dry tons of logging residues that can be recovered in the U.S. About 50 percent of the nation's logging residues are located in the South. The long-term supply of logging residues would be relatively stable for the South and the nation as a whole whereas slight variations would exist across regions. Though biomass resources in the South are promising, biomass production costs, competing uses of forest resource, and environmental concerns may influence biomass supply. In addition, large buyers of forest biomass have not emerged region-wide.

The ability for forest biomass and bioenergy to realize a greater share of energy and other products markets will largely depend on their cost competitiveness relative to their substitutes. The second section of this module delves into the production costs of forest biomass and bioenergy and their cost competitiveness with similar products on the market. In terms of feedstock, the production costs of delivered logging residues are about \$30 per dry ton with a transportation distance of less than 62 miles (100 km), compared to about \$50 per dry ton for short rotation woody crops and \$30-50 per dry ton for fuel treatment thinning. Because of data limitations and the maturity of energy conversion technology, the production costs of secondary energy are analyzed and compared using electricity as an example. The cost of electricity generated from logging residues is estimated at about \$50/MWh, significantly (about 40 percent) higher than that of coal-generated electricity. Yet, electricity generation using logging residues represents an economically viable option for CO₂ emission mitigation (Gan and Smith 2006).

The third section of this module examines the community impacts of forest biomass and bioenergy development.

Bioenergy development can generate a variety of socioeconomic impacts ranging from income and job creation to tax revenue and to community coherence. Of these impacts, the creation of jobs and income is probably most significant. In addition, bioenergy has the greatest potential for employment creation among alternative energy sources. This section also contains several case studies to illustrate the impacts of forest biomass and bioenergy development on local communities. These case studies cover different bioenergy production systems in several states in the United States, with emphasis on the U.S. South. The case studies reiterate the potential role that forest bioenergy can play in rural economic development. While the impact varies from case to case, forest bioenergy development demonstrates strong ripple effects on income and employment.

The last section of this module discusses relevant policy issues. It explains (a) existing incentive programs for biomass and bioenergy production and consumption, (b) incentives needed for making forest biomass and bioenergy competitive, and (c) experience in other countries as compared to the U.S. Website links to existing incentive programs are provided. It appears that existing incentive programs focus more on energy producers (processors) and consumers than on forest landowners. For forest bioenergy to become competitive with fossil fuels, some incentives are necessary. There is also a need for a better integration and coordination of different incentives programs. The experience in other developed countries offers useful implications for bioenergy development in the U.S.

Module 7—Environmental Sustainability

The purpose of the “Environmental Sustainability” module is to provide an understanding of the environmental and sustainability issues related to biomass and bioenergy production in the Southern United States. The module content was developed around five central themes: sustainable forest management, soil values, hydrologic values, biodiversity values, and designing low-impact operations. The goal is to provide a background on environmental sustainability issues while providing the information necessary to put practices into operation that ensure environmental sustainability.

The section on sustainable forest management provides an overview of adaptive forest management along with international agreements and various certification systems. Details are provided about certification systems relevant to the South including the Forest Stewardship Council, Sustainable Forestry Initiative, the American Tree Farm System, ISO 14001, and the American Logger Council Certification.

The next portion of the module focuses on issues related to sustainability of forest soils. Organic matter disturbance,

nutrient management, and soil displacement and compaction are all key practices related to biomass harvesting that can affect the sustainability of the forest soil.

The hydrologic values section of the module discusses water quantity and water quality issues. Special attention is given to the discussion of streamside management zones and their impact on hydrologic processes.

The section on biodiversity provides information related to conservation tools used in maintaining the diversity of species located in a forested area. These tools and concepts include landscape management, “umbrella species” management, complex stand management, and buffer zones (Angelstam and others 2002). Of particular importance for biomass production is the management of deadwood. While this wood is attractive for bioenergy production, it should be maintained as species habitat.

The final section of the Environmental Sustainability module is titled “Designing Low Impact Operations”. Using tools and information from the previous sections, natural resource professionals are provided with information on how to plan a low-impact operation. One of the key aspects of this discussion is focused on Best Management Practices (BMPs). The concept of BMPs is summarized and links are provided to each state’s specific BMPs. Creating streamside management zones, conserving soil organic matter, managing nutrients, habitat creation, and complex stand management are discussed in greater detail. The use of these practices and their effect on environmental sustainability are presented to educate individuals about the proper application of these practices in order to conserve and protect the environmental sustainability of the forest while maintaining productivity as well.

THE DELIVERY SYSTEM

Once completed, the Encyclopedia of Southern Bioenergy will be used as the primary resource in the development of all other outreach tools. A concomitant website (<http://forestbioenergy.net>) also serves as the data distribution center for related images, video, presentations, and templates. Extension specialists and other natural resource educators are able to pull from the encyclopedia, the data distribution center, and other related resources all of the materials required to prepare traditional printed and web-based publications. As a result, the widest audience possible is reached through our efforts.

Tools

Traditional delivery methods include fact sheets, brochures, and posters. These methods have been found to be the preferred method of delivery for some Extension educators (Westa and others 2005; Howell and Habron 2004;

Rodewald 2001) within the project. To maintain a level of quality and recognition, attractive templates have been developed for each of the standard delivery methods. Natural resource professionals are encouraged to use these templates and simply substitute their specific state, region, or county information. Printed publications are easy to produce and distribute and reach a large target audience. By providing basic information in this format, we are able to reach a large audience of not only natural resource professionals, but landowners, community developers, and energy professionals as well.

Workshops will also be utilized throughout the project. This traditional delivery method has been shown to also be a preferred method of receiving information (Howell and Habron 2004). This research indicated that 57 percent of respondents preferred face-to-face personal communication to learn about watershed issues. A study in Connecticut found that workshops ranked second, behind publications, as the preferred method of receiving information related to land use planning and sustainable economic development (Westa and others 2005).

Workshops will be primarily conducted to train natural resource educators and outreach professions in important bio-based products concepts and the proper use of the educational materials, and online tools developed by the project team. These educators will then further disseminate the bioenergy materials to other audiences.

The newest educational technology to be incorporated into the project is E-Learning. E-Learning includes web and computer-based learning, CD-ROMs, DVD, interactive video, and other multimedia tools (Williamson and Smoak 2005). The project uses several adaptations of E-Learning. The most visible is the use of web-based learning modules for the National Learning Center for Private Forest and Range Landowners (www.forestandranger.org). These learning modules are designed after the seven modules in the Encyclopedia of Southern Bioenergy, yet are quite different from those modules. The web-based learning modules are designed with the private forest landowner as the audience. These modules use on-screen text, narrated PowerPoint presentations, links, short audio and video clips, animations, and short quizzes to provide the forest landowner with the information necessary to understand the situation surrounding forest biomass and bioenergy development in the Southern United States. Audio, video, and animations are kept to a level that compliments the content of the modules while not overwhelming the learner. Key points and concepts are stressed through the use of these tools. The quizzes test participants knowledge of the topic area once a lesson has been completed. After completing a module, the landowner will walk away not only having been engaged and entertained, but also more knowledgeable about bioenergy development in the South.

Several of the tools developed for the web-based learning modules will also be used independently of the learning modules. This includes the narrated PowerPoint presentations and the audio and video clips. These tools can be used as supplementary materials for the printed materials and used by natural resource professionals and Extension personnel.

The overall goal of the project is to provide a comprehensive bioenergy education program to natural resource professionals, Extension personnel, community developers, energy professionals, and private forest landowners. Using a combination of traditional and new delivery tools to comprise one delivery system, we hope to provide information to educate all interested parties about forest biomass and its role in the development of a bioenergy industry in the Southern United States.

Partnership with Southern Regional Extension Forestry

The Southern Regional Extension Forestry Office (SREF) was established in 1979 to serve as a liaison role between the Forest Service and the Extension Forest Resources units in the Southern 1862 Land-Grant institutions. Its central mission is to identify, prescribe, and implement a mix of education and technical services that increase the efficiency of forestry programs in the southern United States. Its position has evolved into a regional programming, representation, promotion, and communication role within the forestry and natural resource communities regionally and nationally. Our technology transfer mechanism builds on the extensive and well-established linkages to the end-users of our knowledge products under the Land-Grant universities and SREF. Coupled with the powerful knowledge base and Internet system, this partnership with SREF may generate synergetic impacts on the technology transfer.

CONCLUDING REMARKS

This paper describes a unique and novel system for developing and disseminating educational materials on forest biomass and bioenergy. The system integrates forestry research with outreach via strong partnerships among Land-Grant Universities, Southern Forest Research Partnership, Inc., Southern Region Extension Forestry, and Forest Service. The hypertext Encyclopedia of Southern Bioenergy is a powerful tool to receive, organize, update, and deliver scientific and technical knowledge on biomass/bioenergy. Building on this web-based Encyclopedia, we will be able to develop a versatile and responsive technology transfer system. It will make it possible to develop templates to allow for on-demand construction of education materials to meet the needs of various audiences/learners. Coupled with traditional outreach materials and means, this system is likely to generate a profound impact in forest bioenergy technology transfer.

Though the system is developed primarily for the outreach purposes in forest biomass and bioenergy, it can be extended to other subject areas and educational activities. By extending cooperation with existing and new partners and linking it to other systems, this system could become a new paradigm for forestry technology transfer.

ACKNOWLEDGMENTS

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**NEEDS ASSESSMENT,
AUDIENCE RESEARCH,
PLANNING, AND EVALUATION**

INTERACTIVE VIDEO AS A SHORT COURSE DELIVERY METHOD IN MISSISSIPPI: PARTICIPANT ACCEPTANCE AND LESSONS LEARNED

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Abstract—The Extension Forestry program at Mississippi State University has conducted hundreds of forest landowner short courses over the last 20 years. These short courses have been the staple of the extension forestry program. The advent of interactive video is allowing us to conduct these short courses to more counties at a time, while providing significant savings in travel time and costs. At the same time, interactive video are increasing advertising costs while straining the logistical ability of extension forestry to supply the materials needed for the interactive programs, as well all other programs being conducted state wide. This paper describes the county forest landowner short courses, as well as the response to our use of interactive video with clientele. Benefits, drawbacks, and future directions for the use of interactive video for forestry extension in Mississippi are discussed.

INTRODUCTION

County forest landowner short courses have been the main stay of extension forestry programs at Mississippi State University for over twenty years (Londo and Monaghan 2002). The short courses are offered on a variety of topics and consist of 6-10 hours of instruction each. These short courses are typically offered on a county by county basis in a classroom setting. MSU Extension forestry is moving towards conducting more programs via an in-state interactive video network.

METHODS

Short courses have historically been conducted in individual counties. The county extension director, along with the county forestry association (CFA) would request a particular short course of the area extension forestry specialist. The specialist would schedule the short course, arrange for speakers and publicity. Faculty members from the Department of Forestry typically serve as instructors; however, volunteer instructors (professional foresters from industry, consulting firms, and government agencies) are often used. Each short course has a standardized schedule of sessions. The standardization allows for efficient development and duplication of notebook material as well as scheduling volunteer instructors (Londo and Monaghan 2002).

Short courses are publicized in a number of ways. The county extension office will send a direct mailing to the CFA members, as well as those that have previously attended extension forestry programs in that county. A mail out will also be conducted from campus, utilizing the county tax rolls. In this way, several hundred additional direct mail

pieces advertising the program to forest landowners in the county are mailed (Londo and others 2006). Posters, radio programs, newspaper and television ads, as well as posting on the internet are additional ways in which extension forestry programs are advertised (Londo and Monaghan 2002).

From this point on, the short course is a “turn key” operation for the county extension staff. Teaching objectives have been developed for each session and are provided to all instructors to assist with presentations and to avoid duplication of subject matter covered in other sessions by other instructors. Consistency and similarity have proven to be very important in the development of our short courses. All short course offerings of the same title are virtually identical. This enables us to produce the notebooks in bulk and schedule guest instructors up to a year in advance.

Budget reductions have led to the use of alternative means for conducting short courses. Interactive video is one such method. Interactive video allows participants in a number of different locations the ability to participate in a program live and in person with the ability to ask questions. Our first attempt at interactive video was in 2001 with a timber tax fundamentals short course (Londo and Gaddis 2003). While this program was successfully broadcast to 17 locations around Mississippi, there were many technical difficulties because we were using non-MSU sites. This reduced our use of the technology until recently. Now we are able MSU sites with compatible equipment and technical support.

RESULTS

Evaluations from the first interactive video short course conducted showed that even though there were ample

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technical problems with the broadcast, 95 percent said they would attend another interactive video broadcast. When asked what they would like to see in an interactive format, 80 percent listed programs already conducted by extension forestry, while 20 percent indicated other programs not currently covered (Londo and Gaddis 2003). Reasons for not liking the interactive video program all revolved around technical difficulties experienced.

The results of this survey lead us to believe that there is an unmet or unfelt educational need among our clientele across the state for new subject areas/topics. These topics can be covered through traditional educational programs, or through interactive video. Also, interactive video may allow us to do more and varied programming, increasing our potential client base across the state.

Since 2004, the MSU-Extension Service has been working to establish interactive video capabilities in all 82 Mississippi counties. When this is completed, Mississippi will be the first state in the nation with this capability in all counties. This network has been utilized by all extension programs, and proved to be especially useful following Hurricane Katrina.

During this time of Interactive Video capability expansion, extension forestry has conducted 7 interactive video programs, with an addition program scheduled for October of 2006. These programs have covered a variety of topics including timber harvesting and marketing and wildlife and forest management. The Interactive Video network also allows us the flexibility to conduct programs to a large audience on short notice. An example is the Farm Services Agency Emergency CRP Program.

The Emergency CRP program came about as a way to help forest landowners of the Gulf Coast states with their recovery efforts following the hurricanes of 2005. We used the interactive video network to broadcast a program describing the Emergency CRP program, its requirements, and sign up procedures. This was broadcast to 182 participants in 30 counties. In addition, the program was recorded to DVDs, which were made available to all participating counties, as well as other heavily hurricane-damaged counties in south Mississippi that were unable to participate in the program.

Benefits of Interactive Video

The most significant benefits of interactive video are savings in terms of travel time and costs. The forest and wildlife management for recreation and profit short course was conducted through the interactive video network in the spring of 2006. Conducting this program through the network to 17 counties resulted in a savings of approximately 21,000 miles traveled, \$9,200 in mileage costs, and 460 hours of travel time, compared to

conducting the short course through traditional face to face presentations. In addition to these cost savings, more clientele are reached at one time, further reducing the cost per individual contact. Lastly, interactive video can provide a comprehensive outreach Program with the flexibility to provide educational programs on short notice (Emergency CRP program) or on topics traditionally not covered in our traditional programs. The ability to reach multiple counties at the same time allows us to get information out in a timelier, cost effective manner.

In spite of being at remote locations, participants are able to interact with the presenters through use of an intercom system. With the push of a button, the interactive system switches from the camera on the speaker, to the camera on where the intercom button was pushed. A question can be asked, with all participants hearing the question, as well as seeing who is asking. This allows for more direct interaction with the presenters, as one would find in a more traditional short course presentation.

Clemson University has led the way in this arena with the Master Tree Farmer and Wildlifer programs in recent years. This technology may allow different states to collaborate on programs, thus further increasing the efficiencies of scale associated with interactive video.

Drawbacks of Interactive Video

There are some drawbacks to using interactive video. First and foremost, it shouldn't be used exclusively for conducting all programs. While interactive video provides some flexibility, some topics can not be taught effectively in this format. Field based exercises, site visits, and other similar programs would be difficult to conduct through interactive video. Also, while most clientele like interactive video, many do not. There is the risk of losing some of the traditional clientele base.

We are currently using interactive video technology at sites controlled by MSU. This is necessary since not all equipment is compatible with each other. Also, MSU will provide technical support for MSU controlled sites. This could be a hindrance to using this technology across state boundaries.

While interactive video has saved on travel costs and time, it has increased costs in other areas. MSU Extension Forestry uses county tax rolls for producing mailing lists to advertise programs (Londo and others 2006). The hardwood management short course being offered interactively in October of 2006 had approximately 29,000 direct mailings sent to landowners in the 42 participating counties. That accounts for approximately 75 percent of our annual mailing output and budget. While we have some soft money funds to help defray the costs, this may reduce our ability to advertise other programs in the future.

Interactive video programming places a strain on the overall logistics associated with putting on the short courses and other extension forestry programs. The assembling and shipping of notebooks to the counties from campus is performed by student workers, whose availability is limited under the best of circumstances. The pressure of needing so many notebooks for one program has been difficult, especially since there are other programs and activities going on at the same time, which also need materials and supplies provided from main campus. We have discussed placing the notebooks onto CDs, to reduce handling and shipping costs. However, to do this would increase specialist preparation time. This idea is still being looked at as a viable alternative to using the traditional notebooks.

In addition, mail costs increase significantly as more counties are added to a program. All mail charges are covered in part by state appropriated and extramural funds. We also charge a nominal fee (\$35 per person) for our short courses. This fee could be used to help offset mail costs as well.

Interactive video does offer the opportunity for personal contact with presenters through the use of the intercom button. The system can slow down if too many sites are using the intercom buttons at one time. Also, it takes participants a while to relax with the technology. There is a “fear” of pushing the button.

FUTURE DIRECTIONS

We expect to conduct 4 interactive video short courses a year statewide. This amounts to one a quarter. In addition, these programs will be limited to 20 counties. There are a number of reasons for limiting the number of counties. First, it will ease the logistical pressure on providing mailing lists and other needed materials from campus. Second, the interactive network can get “bogged down” with too many sites online at one time. We hope to be able to limit these kinds of unnecessary technical difficulties. Lastly, we are concerned about market saturation with our clientele. We don’t want to conduct so many interactive programs, that it reduces the overall demand for our short courses and other programs.

In between the short courses, we plan on conducting shorter duration (1-2 hour) programs on assorted topics. These topics could be on virtually any forestry-related topic, and will provide us with new flexibility and opportunity to create new programs. We could do seasonal topics (tree planting tips, why do leaves change color, how to prune your trees, etc...), topics of immediate importance (Emergency CRP, Pine beetles, etc) or topics that are of interest to our clientele.

CONCLUSIONS

County forest landowner short courses have been the bread and butter of MSU Extension Forestry for over 20 years. In recent years, we’ve made a shift from conducting all short courses in a traditional “class room” setting in individual counties, to using interactive video in multiple counties at one time. This has been met favorably by our clientele state wide. Future plans include conducting one short course per quarter through the network, as well shorter programs in between those short courses.

The use of Interactive video provides greater flexibility in conducting programs while reducing travel time and costs and increasing the number of clientele reached at one time, as compared to conducting these programs in the traditional format. However, there is increased postage costs associated with the significant increase in mailings for advertising. There are also logistical issues associated with assembling short course notebooks for multiple counties associated with one program, with other programs needed support from campus occurring at the same time. Improved scheduling for all programs may be the best way to resolve some of these issues.

Interactive video may allow us to collaborate on programs with other states in the southern region. This could further enhance the economies of scale associated with using interactive video, while raising the profile of MSU in the process.

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IMPROVING EDUCATIONAL PROGRAMMING BY UNDERSTANDING THE CLIENTELE

Lance D. Stewart, Laura A. Grace, and Andrew J. Londo¹

Abstract—During the 2002 restructuring of the Mississippi State University Extension Service, several county extension agents were reclassified as regional forestry specialists within their particular geographical area without regard to their experience or educational background. In an attempt to prepare the new regional forestry specialists for the upcoming task, the Mississippi State University Extension Forestry Program randomly surveyed 4,000 non-industrial private forest landowners in five geographically diverse counties in 2004. The survey had a 19 percent return rate with 69 percent of respondents indicating an interest in forestry-related issues. The purpose of the study was to identify educational needs of non-industrial private forest landowners and their preference of educational delivery methods. During the analysis, three barriers impeding educational programming of forest landowners were identified. Awareness of Educational Programs - 47 percent of respondents were unaware of extension educational opportunities. Scheduling of Educational Programs - 49 percent of surveyed landowners reported lack of time as the main reason for not attending programs. Reluctance to Use Technology - less than 10 percent of respondents chose the Internet as either an educational delivery method or a repository of information. To overcome the identified barriers, extension professionals must heighten awareness of education programs through client preferred marketing, schedule programs during client preferred times, and plan each program to integrate practical uses of technology. This study was important because it revealed barriers impeding successful educational programs of forest landowners. As extension professionals we must be aware of clientele needs, attitudes and preferences to successfully reach our constituents. Because forestry landowner needs and preferences change over time forestry programs must be proactive in our educational offerings, and responsive to landowner needs and request.

INTRODUCTION

The State of Mississippi has a diverse landscape considering the relative small size of the state, only 46,907 square miles. Approximately two-thirds of the State of Mississippi is forested with 66 percent of the land owned by over 314,000 non-industrial private forest landowners (NIPF). Forestry ranks second, in terms of Agricultural production, within the state. This large number of NIPF landowners provides a diverse constituent base with wide ranging needs. During the 2002 restructuring of the Mississippi State University Extension Service, several county extension agents were reclassified as regional forestry specialists within their particular geographical area without regard to their experience or educational background. In an attempt to prepare the new regional forestry specialists for the upcoming task, a survey instrument identifying constituent needs and desires was constructed, implemented and results analyzed in 2004. The purpose of the study was to identify short and long range educational needs of non-industrial private forest landowners and their preference of educational delivery methods.

METHODS

The counties of Greene, Lincoln, Tishomingo, Wayne and Yalobusha were sampled (fig. 1).

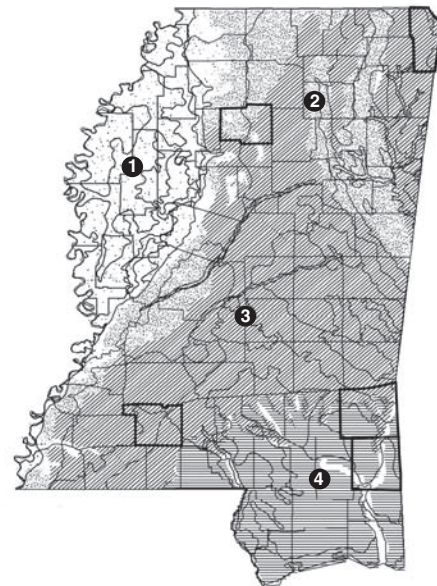


Figure 1—Counties involved in needs assessment survey.

A twenty-four question instrument was created and mailed to 4,000 individuals in five counties. Stakeholders were chosen at random from county tax records and were mailed a survey with instructions to return the completed survey within a two week time period. After the initial two week deadline elapsed, a follow up reminder was mailed to individuals who had not returned surveys and a secondary

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survey was mailed to incorrect addresses. Following the second deadline, responses were then entered into a Microsoft Excel spreadsheet for analysis. After adjusting for incorrect addresses, the total number of mailed instruments was 2,339. Data were summarized based on the five hundred and seven (n=507) individual responses to the survey, resulting in a 19 percent return rate for the questionnaire. The number of responses varied for each question, with some questions receiving multiple answers and other questions left completely unanswered. A comprehensive analysis of all participant responses was calculated. Each participant was grouped by county of origin, total ownership size of forested land, total household income, and respondent age group.

RESULTS

Before educational improvements occur, factors hindering the education process among clients were identified. During the analysis, three barriers impeding educational programming of forest landowners were identified. Those three barriers were awareness of educational programs, scheduling of educational programs and reluctance to use technology.

In the educational topics portion of the needs assessment, participants were asked to identify any and all forestry-related educational programs attended. Eighteen different programs were listed from Best Management Practices to Wildlife Management including a space for non-listed programs to be penciled in. Forty-nine percent of survey participants indicated they had not attended any educational program (fig. 2).

The non-attendance category was anticipated to be high, but we were surprised to find that almost half of all participants had never attended any extension educational programming. The subsequent questions inquired as to the reasons why participants had not attended forestry programs. Forty-five percent indicated they were simply unaware of educational opportunities (fig. 3).

Scheduling educational programs was also found to be a barrier for NIPF. Thirteen percent of participants indicated inconvenient timing of programming (fig. 3) as a reason for not attending forestry educational programs. Thirty four percent identified lack of time as a reason for not attending programs (fig. 3). Anticipating program logistics as an obstacle, question 11 requested participants to identify the day of week and time of day best suitable for educational programs. Survey respondents identified Thursday evenings, from 6pm-till, as the most convenient day and time for educational programs (fig. 4).

The third barrier impeding educational programming was identified as landowner reluctance to use technology. While 64 percent of participants owned a personal computer, only 40 percent reported access to the Internet. Twenty nine percent of landowners reported the Internet as a useful delivery method for information, ranking last on the survey. Only 7 percent of participants chose the Internet as a preferred way to be informed about future forestry-related educational programs.

Participants preferred to receive newsletters for both delivering information and program notification. Findings also reveal that only 3 percent visited the Mississippi State University Extension Service website, only 2 percent visited the Mississippi State University College of Forest Resources website, while just 2 people visited the Forestry Wildlife Research Center website.

DISCUSSION

The barriers identified are significant obstacles in educating the clientele. There are inherent obstacles associated with all adult programs, but these complications can be reduced to mere inconveniences if appropriate and thoughtful educational programming is implemented. The limitations of this study include a small survey of participants in a localized area. The researchers suggest that surveys be implemented by each extension agent within his/her local community to develop ways to improve educational programming within his/her region.

To overcome the barrier of awareness, extension agents should advertise education programs through client centered marketing strategies. Program marketing strategies should be developed during the program planning phase to increase awareness among constituents. The participants of this study preferred newsletter methods of marketing. Increased awareness of educational programming leads to more constituent participation and superior levels of education.

Program scheduling also proved a barrier for busy landowners. Landowners in this study reported little time to attend educational programming. Also, landowners reported educational opportunities to be offered during inconvenient times. To overcome the barrier of scheduling, extension agents should survey their constituents and offer programs during client preferred times. Also, technology related programming should be introduced as a time efficient method for educational opportunities.

Results of this study repeatedly indicated client resistance to technology. Extension agents may have an uphill battle in convincing clients to use this method of education.

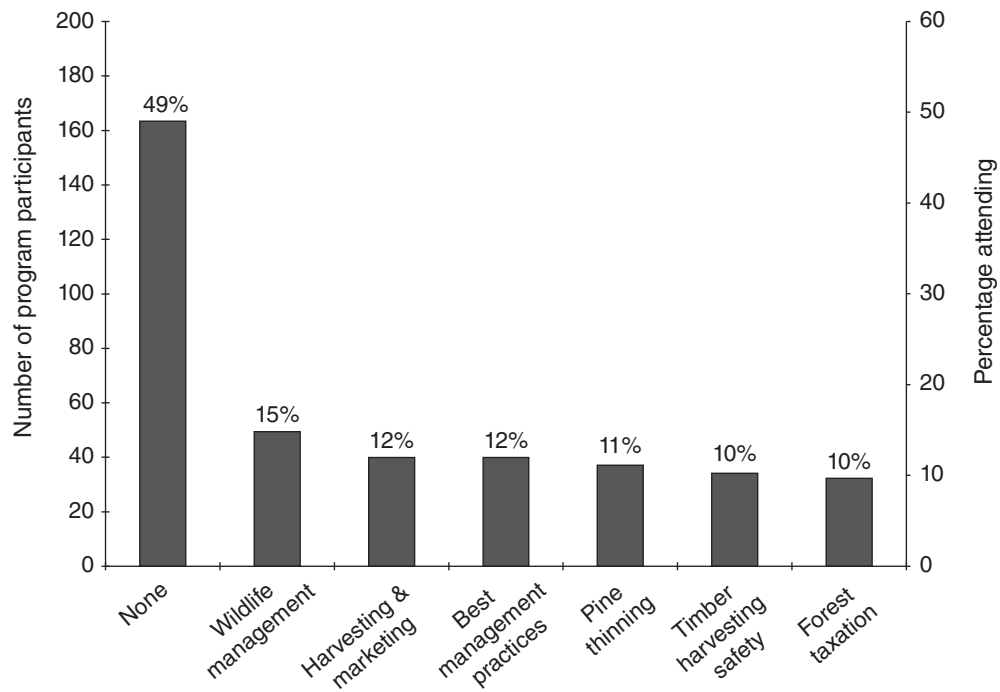


Figure 2—Attendance of forestry education programming.

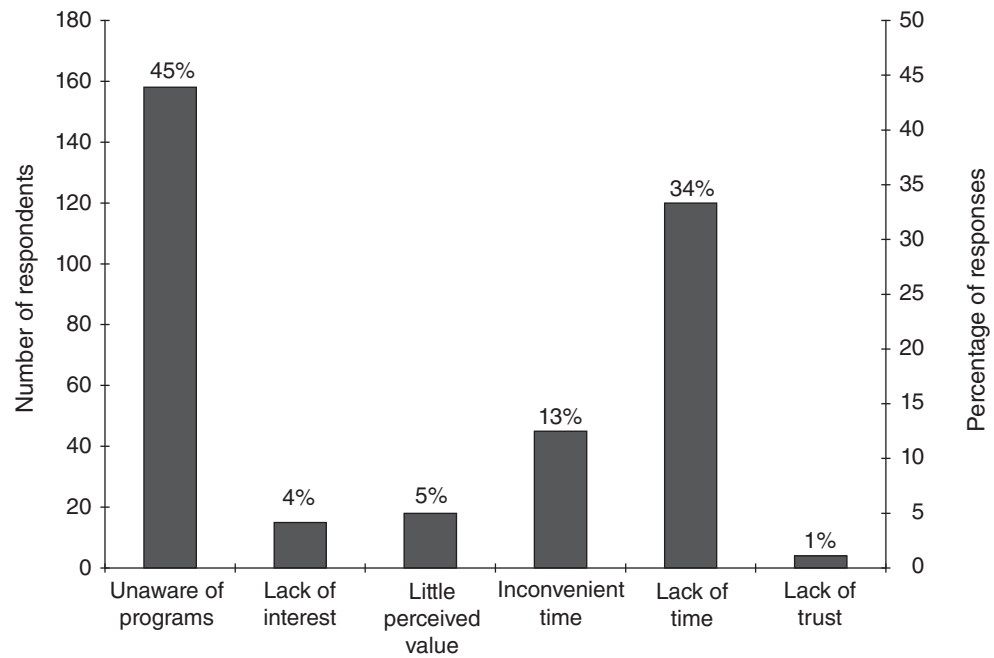


Figure 3—Reasons for nonattendance of forestry educational programs.

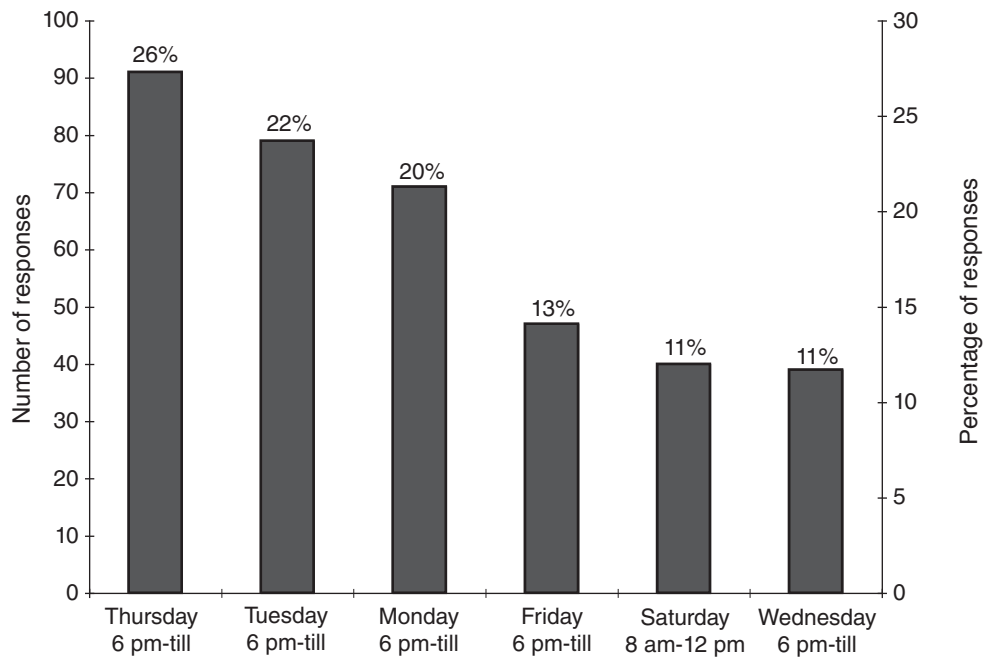


Figure 4—Program day and time preference.

To overcome the barrier of technology, extension agents should plan each program to integrate practical technology uses with positive experiences. Extension agents should demonstrate technology uses as time-saving, client centered and diverse opportunities for educational advancement.

This study was important because it revealed barriers impeding successful educational programs of forest landowners. As extension professionals we must be aware of clientele needs, attitudes and preferences to successfully reach our constituents.

NATURAL RESOURCE PROGRAMMING THROUGH THE COUNTY EXTENSION NETWORK IN TENNESSEE: SUCCESSES, PROBLEMS, AND POTENTIAL SOLUTIONS

Wayne K. Clatterbuck¹

Abstract—A statewide extension program with emphasis on natural resources was implemented in Tennessee during 1995. All levels of the extension service had to be convinced that natural resource programming was relevant to our client's needs. Administration and district program leaders responded by giving natural resources "priority status" within the training schedule. However, county extension leaders remained skeptical because (1) most are trained in traditional agriculture, not natural resources, (2) overloaded county agents found it easier to transfer natural resource questions and educational programs to state agency personnel in forestry or wildlife, (3) the natural resource audience is broader than the typical farmer audience, and (4) justification for natural resource programming was lacking. Once county extension leaders learned that forests are a major land use in many counties that needed their educational attention, that forests and forest industry are an important industry to their county's economy, and farm income could be supplemented by forestry and wildlife activities, county leaders became more inclined to initiate natural resource programming. Acceptance of natural resource programming was extended by incorporating training in best management practices (BMPs), particularly water quality management, with other disciplines such as alternative watering systems for livestock and engineered stream crossings. County leaders were more comfortable using cross-program training in traditional program areas with natural resources. A county leader with strong interests in natural resources was chosen from each extension district to represent the district in state programming meetings. This person was also looked upon internally as a source of information and an instigator for natural resource programming in each district. Presently, 43 county or multi-county forest landowner associations have formed and are operating in Tennessee. These associations are conduits for natural resources landowner education extension programs.

INTRODUCTION

Tennessee Extension has traditionally been farm-related and commodity-based. Little attention has been given to natural resources within Extension until recently. With traditional farm incomes declining and the number of farms decreasing, managing land for natural resources is looked upon as an additional source to enhance or supplement farm incomes. The purpose of this article is to show how natural resource education programming and training have been implemented within extension in Tennessee. The training within the organization is then extended to private non-industrial landowners.

Tennessee is a diverse state that is 800 km from east to west and 230 km from north to south. The state is composed of eight physiographic provinces ranging from the Appalachian Mountains (average elevations of 1250-m) across the Cumberland Plateau (elevation 550-m) to the Mississippi Alluvial Plain. The state has three main river drainages: the Cumberland, Tennessee, and Mississippi Rivers. More than 50 percent of the state is forested (5.4 million ha) with 4.2 million ha (80 percent) owned by some 250,000 landowners. Because of the wide diversity of landforms and vegetation statewide, educational programs should be tailored to local conditions.

The University of Tennessee Extension (UTE) is composed of four levels: administration, resource specialists in each program discipline (e.g., forestry, soybeans, dairy, forage,

poultry, etc.), three districts, and 95 counties. To implement a statewide program for a particular resource subject, the specialist must have support from UTE administration in order to provide guidance to the district program leaders and then to the county leaders. The county extension network is the heart and soul for local program dissemination of resource information. Specialists can assist county personnel, but can not deliver every program in each county.

OBSTACLES

Within the natural resources field, several obstacles must be overcome to have a successful statewide program.

Cows, Plows and Sows

Most county leaders are trained or have degrees in the traditional agricultural fields of crop or animal science. Most do not have experience or specific knowledge on natural resources and are uncomfortable giving programs in these areas. The clientele for natural resources in many cases is different from the traditional farm audience including many absentee and suburban landowners. Marketing of timber products is also a different process than marketing farm products at the local agricultural cooperative.

Little Training or Experience in Natural Resources

The position description for a county extension leader includes an agricultural degree and agricultural education

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background. Graduates in natural resources could not become county extension leaders without “special consideration” and appropriate coursework in agricultural education. Only three Extension county leaders of the 95 counties in Tennessee have a natural resources (forestry or wildlife) degree, but they also have a dual degree in crop science. Thus, the county extension faculty do not have the background to promote natural resource education. Although the county leader position specifications have been changed recently to include those with natural resource degrees with appropriate agricultural education background, the majority of our county personnel are uncomfortable with natural resource programming.

State Division of Forestry and County Extension Workloads

Often, forestry or natural resource questions were easier to refer to professional field foresters employed by the State Division of Forestry than for extension leaders to handle. Every extension specialist in the various commodities tries to get their program implemented on a county level resulting in the county leaders being overloaded with more programs to implement than time allows.

Uncertainty of Forest Landowner Audience

The clientele of most county extension programs is farm-related and agriculturally based. The forest landowner audience is much broader with varying objectives and values which creates uncertainty in preparing county programs and networking.

Long-Term Nature of Forest Management and Investment

Most farm incomes are on an annual basis. Timber crops are much longer, sometimes beyond the life expectancy of the landowner. The impacts of natural resource educational programs are difficult to assess on annual accomplishment reports used to evaluate programs and personnel.

Forest Product Markets

Most markets for forest products are limited in local areas. These markets are most often single commodity (sawlogs, pallets, crossties, or pulpwood) and are not integrated across different products. Forest products must be marketed multi-county, statewide, regionally, and even globally to obtain best prices. Marketing of agricultural products is well-known and established in many counties without fluctuations in price. Wood products markets and prices will vary from location to location due to supply and demand, grades (quality) of logs, species, and the ultimate product use. These varied marketing strategies are difficult to assess within a small county area without substantial experience.

Present Condition of the Forest

Because of limited markets and the long-term nature of growing timber, little management has occurred in NIPF lands. Most timber has been extracted with little provision for improving the forest or providing conditions for regeneration. Thus, most NIPF land has poor quality, low value, and limited desirable growing stock with few economic options making timber an unprofitable enterprise in the short run.

JUSTIFICATION FOR NATURAL RESOURCES PROGRAMMING

Why should UTE have natural resource programming considering the inherent obstacles? Most counties in Tennessee are 50 percent or more forested. With dwindling farm incomes, forests provide an opportunity for increased incomes. Generally, no agricultural land use exceeds the amount of forest land in these counties and recent increases in timber prices and markets are competitive with most other farm incomes. Forest-related industries generate more than \$20 billion in output annually for Tennessee’s economy and compose 6.5 percent of the state’s total economy.

The State Division of Forestry and the Wildlife Agency personnel are not educators, but are partners and cooperators. Their role is technical assistance and giving management recommendations. Extension personnel are the trained educators (most have advanced degrees in education) in these counties and should be provided with the training and materials to teach natural resources principles and management options.

Many landowners have a vested interest in viewing or hunting wildlife. Hunting leases are another opportunity for income and a justification to invest in forest management. Forest and wildlife management in many cases are compatible and integrated with each other.

HOW TO GET NATURAL RESOURCE PROGRAMMING STARTED WITH AN ACTION PLAN

The UTE administration had to be convinced to have natural resource programming as a priority and to endorse training of personnel. In 1995, the establishment of four priority teams was used to re-emphasize certain programs especially considering the declining farm incomes at that time. The four teams were forages, natural resources, environmental stewardship with emphasis on water quality, and management and marketing strategies. Natural resources were recognized as an important subject area where programs would make a difference to our clientele.

With administration support, the priority was communicated among district program supervisors and to county personnel. Funds were provided to have statewide inservice training of county personnel in the fundamentals of natural resource management. A person from each county extension office was required to attend the inservice. County extension personnel were given the tools to provide natural resource education in their county programs. A natural resources priority team was formed composed of specialists and at least one county extension leader from each district to represent issues and needs as well as be the representative that other leaders in that district could call upon to discuss natural resource programs.

Even the most skeptical agents enjoyed the inservice. The design of the inservice was to limit the indoor discussions and provide hands-on outdoor activities to convey natural resource principles and information. Training emphases were on (1) improving profitability (marketing) of forest ownership, (2) improving management of forest resources, and (3) understanding ecology of forest development and succession (planning) through forest health and maintaining water quality. Evaluations indicated that 92 percent of the material presented was relevant to their needs and that they could lead natural resource programs in the county. Some of the programs initiated include how to conduct a timber sale, timber sale contracts, forest products marketing, best management practices, insect and disease control, stewardship plans, measuring trees and inventorying your property. Part of the inservice was to tour a wood processing facility. County personnel learned that touring these facilities could be a program in itself.

We also found that cross-training in some of the traditional agricultural practices could enhance the receptiveness of county personnel to the inservice training. Acceptance of natural resources programming was improved by integrating training in best management practices, particularly water quality management with alternative watering systems for livestock and engineered stream crossings.

Lastly, extension personnel realized that there were many resources from which to draw in their local area that would help in their educational programming. Partnerships were formed with forest industry representatives, state and federal resource agency personnel (forestry and wildlife), private organizations (both profit and non-profit) and other forest landowners to provide additional sources of information and expertise. They also found that landowner testimonies were an effective method of conveying educational messages in natural resource management.

RESULTS

The proof of whether the inservice training had an impact with the county personnel is the natural resource programs that were implemented on the county level. We suggested at the inservice that the extension leader develop and conduct a countywide meeting on any natural resource topic of interest, then poll the audience for future meetings and subjects. A good subsequent meeting would be an outside field day where certain forest practices or activities could be demonstrated. The field days could occur on private land, government land or forest industry land, again partnering with other organizations. Several statewide field days were also developed by extension specialists to supplement programs and forest landowner education activities.

The results of this process are that 43 county forest landowner associations in 48 counties (some associations are multi-county) have been formed and are functioning as of the end of 2005. The county forest landowner associations are led by member landowners with Extension and other organizations providing program support. Tennessee contains 95 counties though it is not expected that all counties will conduct natural resource programming, especially those where forests compose less than 20 percent of the county area. Several more counties have scheduled natural resource programming in the extension work plans. The county leader led most of the programs with little help from extension specialists. One extension district program leader directed that natural resources education would be a top priority program in that district for the next three years.

FUTURE PROGRAMS—NON-TRADITIONAL AUDIENCES AND ABSENTEE LANDOWNERS

The forestry community does not have good access to or contact with absentee landowners or those who reside in the rural/urban interface. Two reasons are postulated: (1) Most natural resource programs for landowners take place in rural areas, and (2) Most natural resources personnel (state, federal, extension) are located in rural areas, i.e., landowners are accessible because they live on the land, or at least that is the assumption.

However, an increasing number of landowners are absentee. We find that these “urban” landowners:

- Are highly educated
- Have access to PCs and internet
- Own larger acreages
- Have resources to invest in forest management

- Are more likely to follow through with sound, sensible advice, especially if larger acreages are owned and income is an objective
- Have limited information about forestry and limited access to forestry professionals

Some of this forest land was the family farm, parents have passed on, children now live in urban areas, but wish to keep and maintain the farm in the family. A major consideration for parents is what will happen to the land once they pass on. They want to keep the property within the family, but the family is living elsewhere. Because most natural resource education programs take place in rural areas, absentee landowners who live in urban settings do not have access to educational programs.

So how do we reach these people with our message and programs? State forestry agencies and the federal Forest Service do not have landowner education and assistance programs in metropolitan areas, but Extension does. Natural resource extension specialists and county extension personnel in Tennessee are planning workshops for absentee and interface landowners in 2007 and 2008 at several locations. A major task is identifying absentee landowners in metro areas. Since these people own forest land elsewhere, the metro county property tax roles are rather useless. Some type of paid advertising (radio and newspaper) would be needed as well as other means of advertising the program.

A few possible subject areas for these more non-traditional landowners include: estate planning, forest taxes, easements/trusts, use of consultants, timber sales, cost-share programs, and wildlife habitat management. Much of this programming is already available and could easily be delivered by state extension specialists and trained county personnel. Partnerships with the state forestry agencies and the private sector are essential. Ultimately, we hope that enough synergism would be generated by absentee landowner workshops that a self-supporting metro/county forest landowner association would be formed and would meet on a regular basis. Our objective is to provide educational and management information about forest resources such that these landowners will be more informed about the management options for their property and they know who to ask when they have questions or seek advice.

Internet

The University of Tennessee Extension is also considering the use of the worldwide web as a potential avenue for natural resource education. The internet provides content through information retrieval from different sources, but we are striving more toward a learning and educational environment with internet programming. Since most internet users learn in different ways, different techniques should be used to enforce the learning objectives and the principles applied, i.e., a structured learning environment rather than just information retrieval.

Assessment and evaluation are problematic with internet sites. How are impacts measured and are recommended practices implemented? However, with the increased availability of the internet and the increased use of the internet by younger generations, we must adjust our natural resource programming toward those non-traditional users.

Several natural resource internet sites are now available with varying objectives. The National Web-Based Learning Center for Natural Resources (<http://www.forestandrange.org>) is an educational website with different subject modules providing activities with learning activities. The Forest Encyclopedia (<http://www.forestencyclopedia.net>), About Forestry (<http://forestry.about.com>) and Southern Regional Extension Forestry (<http://sref.info>) are a few of the information retrieval websites. The nationwide eXtension website (<http://extension.org>) is developing and may have some natural resource information in the future. The internet has great potential as an educational tool and to be accessible to many clients in the convenience of their home. However, the capability to evaluate program impacts has lagged behind.

SUMMARY

Even though we are pleased with the interest in the natural resource initiative and the support within all levels of UTE, we will be most interested whether these programs continue to be self-sustaining from year to year. A few years of a meeting or two annually does not demonstrate an on-going, sustainable program. However, we believe a new excitement has been cultured with the county extension faculty who are conducting their own programs. More landowner contacts are being made and resource management information conveyed. The county landowner associations are vibrant and continuously want more materials and information for management of woodlands for different objectives and values.

UNDERSTANDING WORKING FOREST LANDOWNERS IN NORTH CAROLINA: INTEGRATING PARTICIPANT SURVEY RESULTS IN PROGRAMMING AND DELIVERY

Robert E. Bardon and Mark Megalos¹

Abstract—Nonindustrial private forest owners (NIPFs) control 78 percent of North Carolina's forested resource, an estimated 13.8 million acres. The sustained flow of privately grown forest products to regional, national, and international markets fuels an annual forestry economy valued at \$28.8 billion dollars. North Carolina forests are rapidly diminishing, losing over 1 million commercial forest acres to residential development and other uses from 1991 to 2001. Understanding the needs and pressures facing the owners of North Carolina's private forests is critical to their economic and ecologic sustainability. To better understand NIPFs who actively manage their holdings, the authors surveyed 1,200 attendees at 6 regional Working Forest Summits held in North Carolina during 2005 and 2006. Participants were questioned about their educational, technical assistance, and financial incentive needs. Landowners were asked to rate the effectiveness of various public policy solutions designed to thwart the loss of forestlands. Within the scope of this paper, the authors will discuss the survey results with an eye towards increasing the effectiveness and efficiency of technology transfer and diffusion of information via the N.C. Cooperative Extension county agent network. The authors detail how working forest landowner defined education and technical assistance needs are being used to improve extension programming. The North Carolina Cooperative Extension Service strategic plan emphasizes regional, targeted, multi-disciplinary delivery of issue-based programs. The Working Forest Summits provided a unique opportunity to institute a comprehensive environmental scan to ascertain target audience needs, prior to future program development.

INTRODUCTION

Nonindustrial private forest owners (NIPFs) control 78 percent of North Carolina's forested resource, an estimated 13.8 million acres (Brown 2002). However, only a minority of North Carolina's NIPFs actively manages their land for forest products in the market place (Megalos 1999). The sustained flow of privately grown forest products to regional, national, and international markets helps fuel an annual forestry economy valued at \$28.2 billion dollars (Personal communication, 2006. D. Ashcraft, College of Natural Resources, North Carolina State University, Raleigh, NC 27695).

North Carolina faces rapid residential growth; an estimated 2,800 new citizens arrive each week (North Carolina State Data Center 2006) mostly to bulging urban centers. Land conversion from unprecedented vacation- and second-home development increase land value in rural areas and threaten economic feasibility of forestry and farming. The most recent Southern Forest Resources Assessment (Wear and Greis 2002) (SFRA) identified urbanization as a critical threat to forest sustainability in the Southeast. North Carolina led the nation in loss of commercial forest to urban uses from 1982 to 1997, losing 1,001,000 acres or 5.9 percent of total forest area (U.S. Department of Agriculture 2002). The SFRA predicts an additional loss of 5.5 million forested acres in the state by 2040.

Increased population pressure and forest loss led a consortium of public and private forestry and environmental groups to organize a series of Working Forests Summits to protect North Carolina's working forests through landowner education. Six regional Summits were held in the winter of 2005 and spring of 2006. The daylong sessions included information about tax strategies for timber income, property taxes and estate taxes; and financial opportunities related to wildlife leasing, nontimber forest products, and wood-based energy. Landowner interest guided the program and featured peer success stories. The conference format, with ample time for interaction with peers, has proven to be an effective technology transfer approach (Decker and others 1988), and a preferred format by adult learners (Miller 2006). The Working Forest Summits offered a cost-effective way to reach hundreds of landowners.

A dire sense of urgency brought many Summit cooperators to the table to strategically address landowners' needs and their roles in sustaining the future of forests in North Carolina. Over 25 forestry, resource, and industry organizations contributed to the Summit's success. The Cooperative Extension Service, a key sponsor of the Working Forests Summit, took this special opportunity to canvas the forestry stake holders to ascertain education and assistance needs and to determine priorities that may focus on forest land retention. The use of a formative evaluation system allowed for refinement of conference content tailored

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to the most important landowner topics. The goals of the research were fourfold:

- Establish a profile of working forest landowners and why they own their land
- Identify factors that working forest landowners felt help them retain their land in forest
- Identify education, technical, and financial assistance priority needs of landowners
- Develop and disseminate target audience summary reports and profiles to policy makers, partners, and extension field agents to diffuse the information needed to retain working forest in North Carolina.

METHODS

Survey data was collected from North Carolina NIPF participants of six regional Working Forests Summits held during December 2005 and May 2006. Data were separated into sub-regions based on Extension Districts (fig. 1). Summit participants were mailed invitations or solicited to attend through partner newsletters, local press coverage, and advertisement when available. Because the recruitment focused on Forest Stewards, Tree Farmers, and forest landowners recently served by the North Carolina Division of Forest Resources, timber-commodity interested owners tended to be over-represented in our audience.

All Summit participants received surveys in their registration materials. A raffle drawing of forestry related items was offered as an incentive to those who returned a completed survey. The survey queried respondents on reasons for forest ownership, retention strategies, socio-demographic, and educational, technical, and financial assistance needs. Nine ownership reasons were listed; choices were not mutually exclusive (fig. 2). Forest land retention survey options included eight factors to potentially help stem forest loss. The factors were not mutually exclusive and respondents were asked to rank them on a continuum between “minimal help” and “great help” (fig. 3). The socio-demographic portion of the survey included forced-choice, self-disclosure questions relating to: urban-rural background of the owner, gender, age, acreage owned, residence status, primary location of forestland, education level, employment status, and annual income level. Survey respondents were also queried on their educational, technical, and financial assistance needs for 10 forced-choice options which were not mutually exclusive (figs. 4, 5, and 6). Only those surveys that indicated forest land ownership in North Carolina (with County of ownership identified) were included in the statistical analysis.

All responses were analyzed based on the location of their forest land using sub-regional groups that correspond to North Carolina Cooperative Extension Districts (fig. 1). Contingency tables analysis (SAS 9.1.3) further identified sub-regional differences in reasons for owning forest land; retention strategies for active forest management; educational, technical, and financial assistance needs; and socio-demographic factors. Means comparison tests were conducted using the GLM procedure of SAS and the Bonferroni multi-comparison test (SAS 9.1.3) to determine regional differences.

RESULTS

The survey was provided to 1,200 participants in the Summits in which 590 surveys were returned. Of the returned surveys, 114 were unusable for the analysis because they were either incomplete or indicated that the participant did not own forest land in North Carolina. This resulted in only 476 of the returned surveys being used in the final analysis.

Modal results suggest that a “typical” Summit participant was male (73 percent), had a rural upbringing (63 percent), and resided on his/her land (51 percent). Socio-demographic characteristics of the “typical” respondent include: age 55 years or older (67 percent), retired (51 percent) or fully employed (34 percent), and having at least a college education (college graduates 55 percent, post-graduate 22 percent).

A majority (60.2 percent) of Summit participants indicated that timber income was the top reason for owning forest land (fig. 2). Other ownership reasons suggest that they: own land because of inheritance (43.9 percent), want to leave a legacy (43.4 percent), enjoy owning green space (40.5 percent), own forests as a part of a farm (34.5 percent), reside or have a second home on their forest (34.4 percent), enjoy rural living (34.2 percent), desire wildlife/recreation income (24.7 percent), or are maintaining the land for speculation or investment purposes (14.3 percent).

Results indicate that five out of the nine reasons forest landowners gave for owning their forest land were statistically different ($p < .05$) across the seven sub-regions of North Carolina (table 1). Significant sub-regional differences were noted:

- Landowners in the West were less likely to own their forest land for timber income than landowners in the Northeast, South Central and Southwest sub-regions
- Landowners in the Northeast are more likely than landowners in the North Central, Northwest and the West to have inherited their forest land

- Northeast landowners are more likely than Southwest landowners to have forest land as part of the farm
- Northeast and Southeast landowners are less likely to reside on their land than owners in South Central and West.
- South Central landowners are more likely to own land for wildlife/recreational income than landowners in the Northwest.

Landowners' ratings of factors that promote retention of lands in active forest management are presented in figure 3. The top five retention factors are: favorable tax consideration; more favorable policies, laws and regulations; better and more diverse markets; technical assistance; and education about forest resources. Numerical ratings approaching 5 are deemed to be of great help, while a rating of 1 would likely provide minimal help in retaining land in active forest management. Retention factors that were scored below 4 were: cost-share dollars and alternative income opportunities. The sale or transfer of development rights (conservation easements) was the only retention factor rated below 3.

The 10 educational assistance needs of working forest landowners are presented in figure 4. The top five educational needs were: wildlife management (53 percent), timber marketing (46 percent), taxes and estate planning (43 percent), non-traditional forest products (41 percent), and forest management and economics (41 percent).

The 10 technical assistance needs indicated by forest landowners attending the Summits are presented in figure 5. The top five technical assistance needs were: reforestation/productivity (56 percent), non-traditional forest products (49 percent), conservation easements (44 percent), timber marketing (35 percent), and wildlife management (28 percent).

The 10 financial incentive needs identified by working forest landowners are presented in figure 6. Financial incentives relating to visual appeal/recreation was the top need indicated by a majority of the landowners (62 percent). Landowners also expressed needs for financial incentives related to taxes and estate planning (48 percent); policies, laws, and regulations (39 percent); non-traditional forest products (38 percent); and reforestation productivity (35 percent).

Forest landowners' financial incentives assistance needs varied across sub-regions for 3 out of 10 forced-choice incentives (table 2). The following sub-regional differences were identified:

- Landowners in the Northeast and West were significantly more likely than their counterparts in the Southwest to

indicate a need for financial incentives related to visual appeal/recreational opportunities

- The majority of landowners in the South Central district stated the greatest need for financial incentives to cope with forestry-related policy, law and regulations at nearly 54 percent. Percentages differed significantly across regions, yet paired sub-regional differences were not discernable with the statistical methods employed
- Landowners in the Southwest are significantly more likely than their counterparts in Southeast and West to identify a need for financial incentives related to reforestation and productivity.

DISCUSSION

Ownership Objectives

Previous research has detailed the national ownership objectives of forest landowners (Butler and Leatherberry 2004, Birch 1996) and regional differences among forest landowners within North Carolina (Megalos 1999). Regional landowner differences in ownership reasons exist in this subsample of forest landowners specifically in timber, inheritance, farm, residence and wildlife, and recreation income. Owning land to grow timber and receive timber income is the primary reason identified for owning land by 60 percent of survey respondents, roughly twice the percentage found by Butler and Leatherberry (2004) and Megalos (1999). The high percentage of landowners owning land to grow timber and receive timber income is not surprising since recruitment of the audience was weighted towards forest stewards, tree farmers, and forest landowners recently served by the North Carolina Division of Forest Resources. Summit participants were a fairly homogenous group except in the western sections of the State where landowners were increasingly likely to have purchased their land as opposed to inheriting their land.

In the Southwest portion of the State, landowners were less likely to own forest land that is part of a farm compared to landowners in the Northeast, in which 1 out of every 2 landowners own forest land that is part of a farm. This finding is consistent with the land use differences found in the two regions; the Southwest region is dominated by large metropolitan communities and urban land uses, while the Northeast landscape is dominated by rural communities and agricultural land use (North Carolina Rural Economic Development Center, Inc. 2006). While growing timber and income from timber sales motivate this study group, 4 out of 10 landowners also identified leaving a legacy for heir, and enjoyment (green space and recreation) as reasons for owning forest land. Butler and Leatherberry (2004) noted

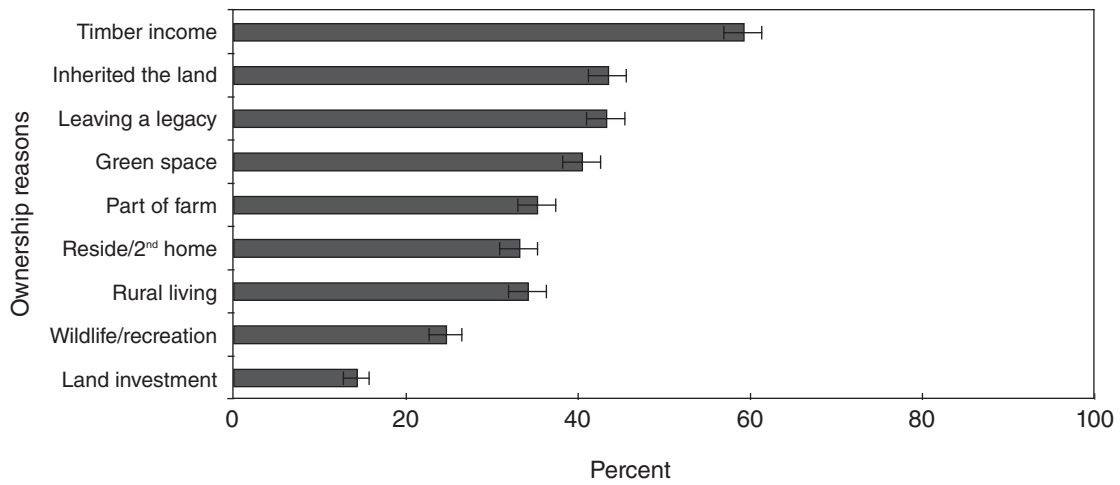


Figure 2—Forest land ownership reasons of North Carolina Working Forest Summits attendees by percent. Error bars represent the standard error of the mean.

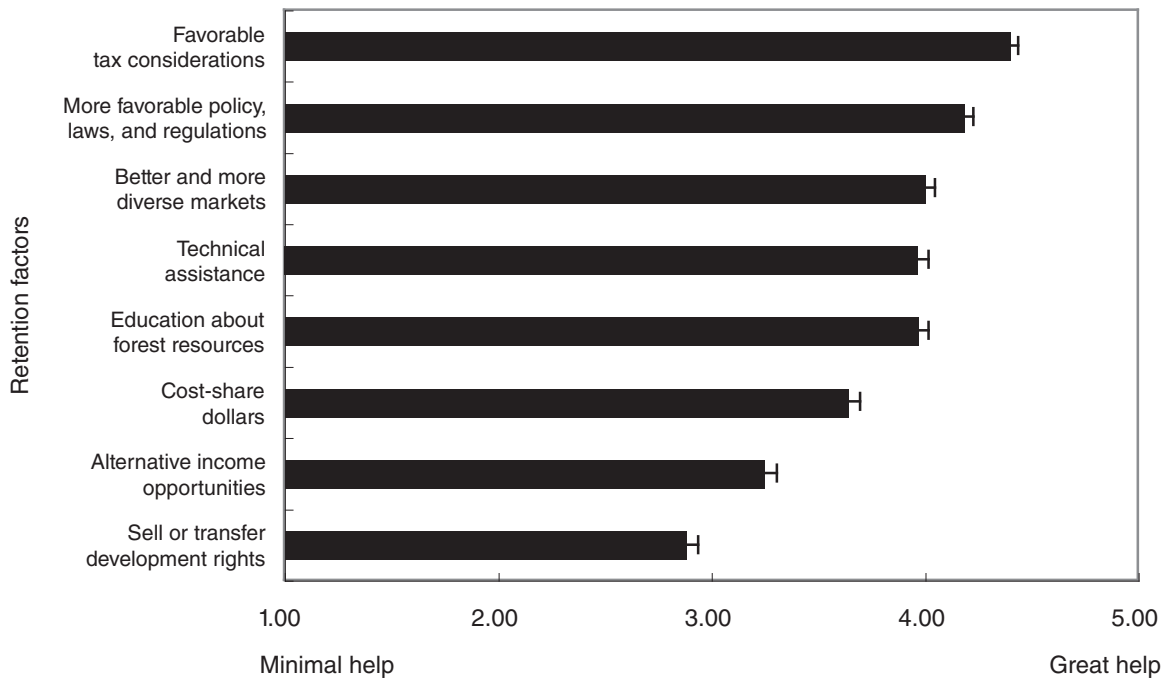


Figure 3—Working Forest Summits’ forest landowners’ ranking of the factor’s helpfulness in retaining their land in active forest management. Value is mean response on a scale of 1= minimal help, to 5 = great help. Error bar represents the standard error of the mean.

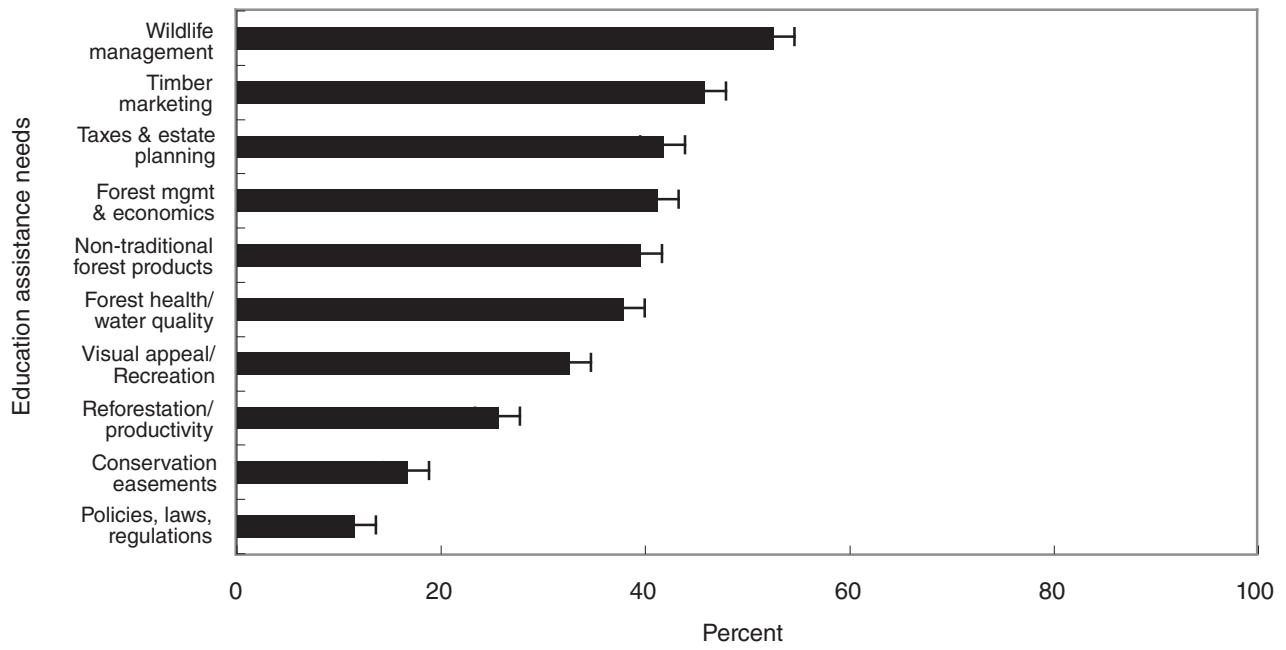


Figure 4—The 10 educational assistance needs indicated by forest landowner participants in North Carolina Working Forests Summit, in percent. Error bars represent standard error of the mean.

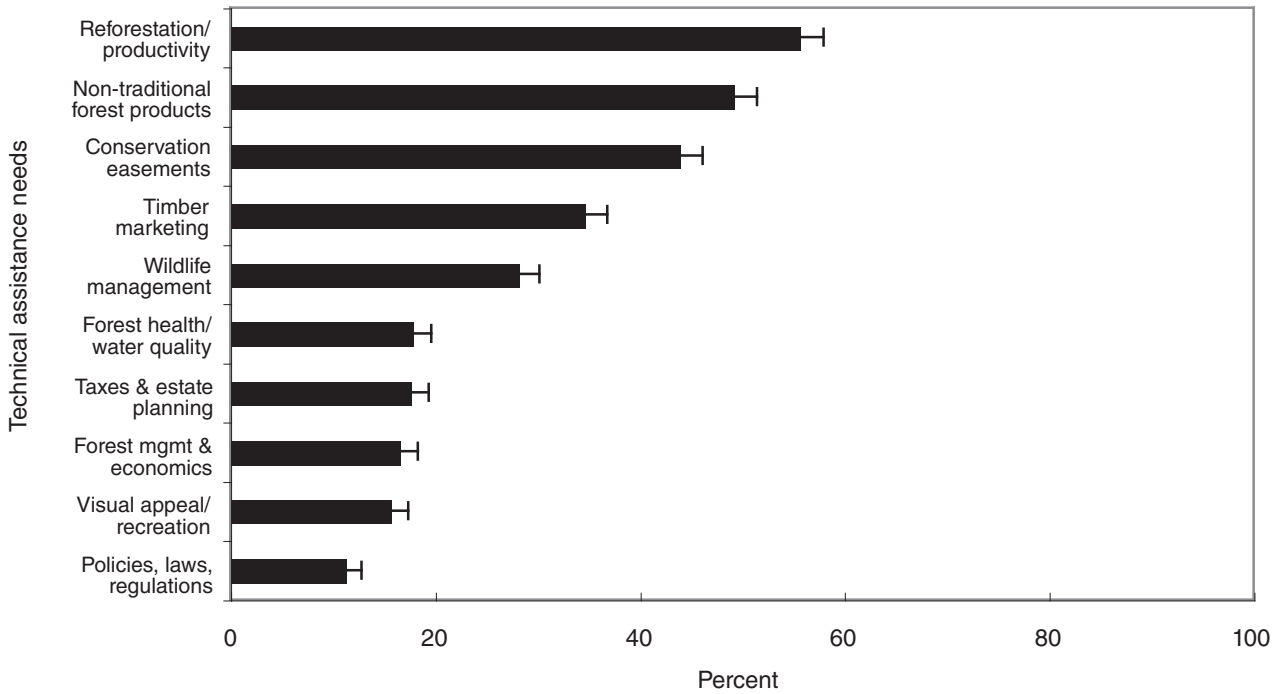


Figure 5—The 10 technical assistance needs indicated by forest landowners who attended Working Forests Summits in North Carolina. Values are represented as a percent responding yes for technical assistance need. Error bars represent standard error of the mean.

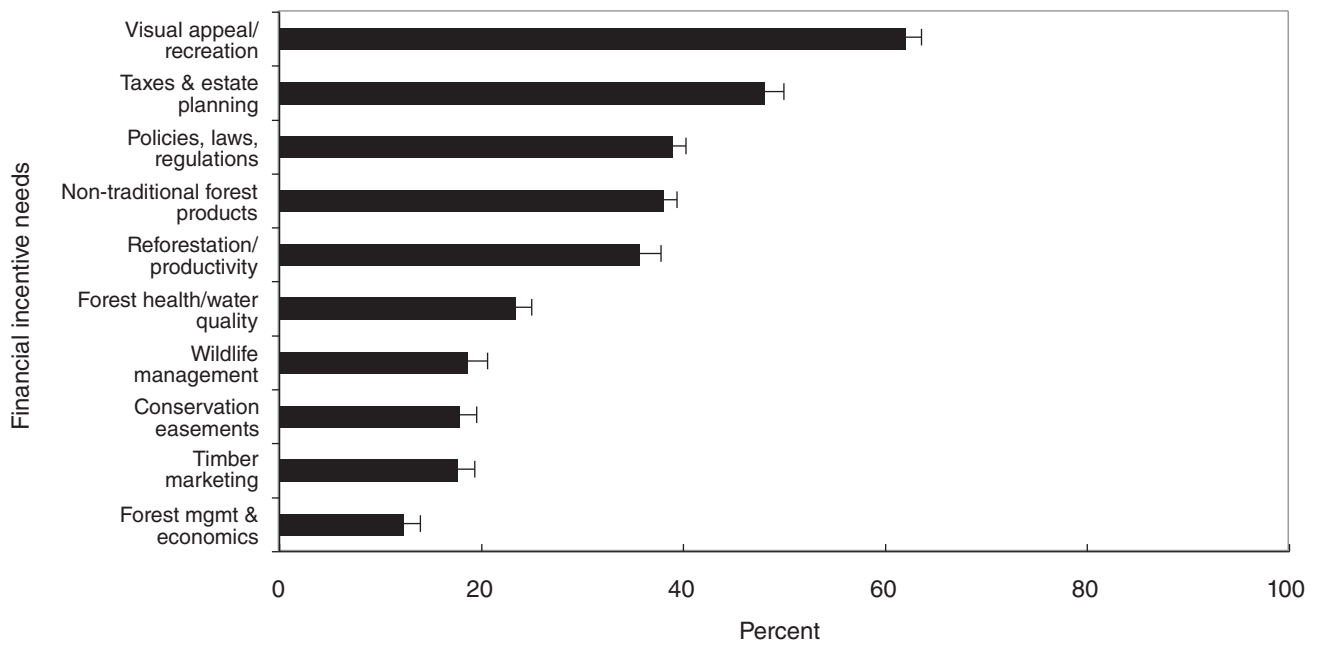


Figure 6—The 10 financial incentive needs indicated by forest landowners who participated in North Carolina’s Working Forests Summits, in percent. Error bars represent the standard error of the mean.

Table 1—Forest land ownership reasons of North Carolina Working Forests Summit attendees, exhibiting statistical difference by sub-regions in percent. ($p < .05$). Sub-region responses labeled with the same letter are not significantly different for the respective ownership reason

Ownership Reasons	Sub-regions							p-value ^a
	North-east n=84	South-east n=66	North Central n=57	South Central n=43	North-west n=105	South-west n=62	West n=59	
----- Percent -----								
Timber income	71.4ab	59.1abc	59.6abc	79.1a	50.5bc	66.1ab	35.6c	0.001
Inherited the land	63.1a	56.1ab	35.1bc	46.5abc	27.6c	41.9abc	37.3bc	0.001
Part of farm	51.2a	36.4ab	36.8ab	37.2ab	35.2ab	17.7b	27.1ab	0.01
Reside/ 2nd Home	21.4a	16.7a	38.6ab	51.2b	38.1ab	29.0ab	45.8b	0.001
Wildlife/ recreation	29.8ab	28.8ab	22.8ab	39.5a	14.3b	22.6ab	15.3ab	0.05

^a p-value for differences across sub-regions.

Table 2—Financial Incentive needs indicated by forest landowners that are statistically different across sub-regions of North Carolina. Values are represented by percent responding yes for reason of ownership. Sub-region responses labeled with the same letter are not significantly different for the respective financial incentive need

Financial incentive need	Sub-regions							p-value ^a
	North-east n=84	South-east n=66	North Central n=57	South Central n=43	North-west n=105	South-west n=62	West n=59	
	----- Percent -----							
Visual appeal/recreation	66.7a	66.7ab	59.6ab	69.8ab	58.1ab	41.9b	71.2a	0.05
Policies, law, regulations	38.1	45.5	31.6	53.5	45.7	27.4	30.5	0.05b
Reforestation/productivity	32.1ab	27.3b	35.1ab	44.2ab	32.4ab	53.2a	25.4b	0.05

^a p-value for differences across sub-regions where p < 0.05.

^b Statistical analysis indicates significant differences across sub-regions, but Bonferroni multi-comparison test could not discern differences among sub-regional means.

the importance of aesthetics (nearly 65 percent) and family legacy (58 percent) to the majority of landowners within their national survey. Leaving a legacy was important to 77 percent of limited-resource, traditionally underserved, landowners surveyed in North Carolina and Virginia (Warren and Sills 2005)

The Western sub-region led all landowners in ownership of their forest land for residential use at 45.8 percent. Whether their land represents a primary or secondary residence is not possible to ascertain from the survey instrument. The residential ownership objective in the west starkly contrasts the low timber income ownership interest (35.6 percent) noted by that group. The importance of residential use by Western landowners may have ramifications for the extent and likelihood of active management as it relates to future retention of “traditional” working forest.

Holding the land for land speculation and investment was identified by the fewest Working Forest Summits survey respondents. A scant 14 percent identified it as a reason for owning their forest land. The 2003 National Woodland Owner Survey (NWOS) identified more than 45 percent of landowners naming investment as a reason for owning forest land, while the 1996 N.C. Landowner survey found less than 30 percent of landowners with that intention. This inverse relationship between growing timber and the desire to develop or sell the land appears strong and clearly has potentially positive implications for future forest retention among working forest owners.

Retention

Economic motivations were clearly important to landowners as evidenced by their top two assistance choices: favorable tax considerations, and more favorable policy, laws, and regulations which received ratings of 4.4 and 4.2, respectively, out of a possible 5. The need for better, diverse markets, technical assistance, and education were solidly judged to be helpful in spurring forest retention with nearly equal landowner ratings of 4 out of 5. Technical assistance has been found conclusively to increase timber harvesting rates, revenues, and the productivity of residual stands (Alig and others 1990). The strong ranking of education and technical assistance, and the positive response to cost share programs, lends credence to the importance of comprehensive, coordinated landowner assistance from public and private sectors. The relationship between awareness of cost share programs and reforestation of private land has previously been documented (Royer 1987, Cubbage and others 1996). Education is a crucial element in addressing the top three retention strategies because landowners need to be aware and knowledgeable about marketing and tax saving options, as well as the policies, laws, and regulations which impact their ability to practice forestry. The North Carolina Landowner survey (Megalos 1999) indicated that only 34 percent of landowners were enrolled in the present-use tax valuation program, a favorable tax treatment for forestry, horticulture, and agriculture lands. To be successful, forest retention assistance must be targeted and developed with the needs of the landowners in mind.

Landowner Needs

Developing effective educational and outreach efforts requires a thorough understanding of NIPF landowner characteristics and needs (Measells and others 2005). The Working Forest Summits were designed to be responsive to participant input and strive for constant improvement. Programming with an eye toward landowner needs has been a constant outreach effort to the more than 2,000 landowner participants reached through the Working Forest Summits held to date. Initial feedback from Saving the Family Forest Summits in 2004 was used to develop the agenda of the 2005-2006 Summit series. The educational content delivered to 2005-2006 Summit participants largely reflected the monetary aspects of forest ownership where timber marketing, taxes and estate planning, alternative forest products, and management and economics were identified as needs for more than 40 percent of respondents. As surveys reflected the need for wildlife management education, this topic was added to the agenda. The positive response to more diverse forest product markets led to the inclusion of a biomass and energy education to the 2006 Summit offerings. Since no significant sub-regional differences were noted in the education assistance needs of Summit participants, a similar format was maintained throughout the six workshops.

Summit participants' technical assistance needs (fig. 5) reflect ownership goals and educational needs, specifically the monetary aspects of forest land ownership and the desire to leave the land as a legacy to their heirs. The fact that reforestation/productivity is the top choice for technical assistance for more than 50 percent of the respondents indicates the importance of the need to seek professional assistance to ensure future productivity and investment returns leading to future enterprise viability. No significant sub-regional differences were noted in the technical assistance needs suggesting a near universal interest in these topic areas across the landowner sample.

It is worth noting that 17 percent of Summit participants indicated a need for educational or financial help as it relates to conservation easements, while 44 percent identified the need for technical assistance in conservation easements. Participant awareness of conservation easement benefits may be strong, but the implementation of such easements may be constrained by the availability of professionals who can provide technical assistance. However, working forest landowners rated conservation easements as the least helpful of all forest retention strategies, suggesting, perhaps, that conservation easements may not be a "silver bullet" solution to the loss of North Carolina forests.

Financial assistance needs identified by Summit landowners can yield insights into potentially imperfect markets, or examples of where the costs of desirable practices are currently beyond landowners' means. The majority of landowners identified the need for financial assistance relating to visual appeal and recreation (fig. 6). More than 7 out of 10 western district landowners indicated such a need, suggesting that there may be a positive relationship between residence or second home ownership, and the desire for recreation or aesthetics to be subsidized by the public. The desire for compensation or relief from taxes; estate costs; and policy, laws and regulations related to forestry were identified by a third of Summit participants. The need for financial help with non-traditional forest products and reforestation are consistent with the technical and educational needs identified previously by more than one third of landowners surveyed. Sub-regional differences related to reforestation and productivity exist; a majority of landowners in the Southwest identified this need (53.5 percent) compared to the other regions (table 2). Recent infestations of southern pine beetle, a land-use shift away from agriculture, or a desire to maintain favorable tax status for forestry may be behind that trend (Personal communication. 2006. D. Brandon, North Carolina Division of Forest Resources, 1933 Mountain Island Highway, Mount Holly, NC 28120.)

Implications for Addressing Working Forest Landowner Sustainability

The ability to survey and educate working forest landowners via a series of Summits has yielded great insights into the ownership reasons and forest land retention strategies for North Carolina. Reaching active forest owners with the information they need in order to make sustainability decisions starts with knowing the type of assistance they need. Coupled with this heightened insight is a responsibility to see that adequate resources are allocated, and delivered, to ensure that the working landscapes are retained and that the viability of rural- and urban- interface economies are sustained (Hubbard 1999). It is imperative that coordinated public/private sector outreach to the landowners is made via a partnership of dedicated resource consultants, industry, and governmental entities. This effort would include, but not be limited to, traditional resource services such as technical assistance related to management planning and management practices, educational programming, and financial incentives in the form of cost-share programs and tax benefits.

The Working Forest Summit approach has yielded multiple benefits and strategic partnerships with agencies, landowner groups, and environmental non-governmental organizations. The potential for a comprehensive strategy to address landowner education and outreach efforts exists. To further

retain and promote forest sustainability the following needs have surfaced from the 2005-2006 Working Forest Summits:

- Reiterate the importance of the present-use valuation property tax program to lower taxes and retain working lands (details for sign-up and program requirements).
- Address the gap between identified needs and the delivery of educational programs to address those needs.
- Focus outreach toward absentee landowners, and address these interests at the appropriate educational level.
- Capitalize on the cooperative partnership that delivered the recent Summits' key landowner audiences.
- Update and expand current education, technical, and financial assistance offerings to reflect needs identified by working forest landowners.
- Evaluate new programs that can address current needs and issues.
- Build upon Summit momentum to organize or revitalize organizations that can influence policymakers to sustain North Carolina's forests and the industries they support, the associated "green" jobs, and overall community economic well-being.

North Carolina Cooperative Extension has benefited greatly from the association with partners and landowners involved in the Working Forest Summits. The opportunity to survey participants, analyze their education needs, generate summary reports for internal and external (partners') use, demonstrate the utility of formative evaluation procedures, and develop regional landowner profiles for future programming are substantial outcomes. Several scholarly presentations and peer-reviewed research publications have resulted from the effort. Perhaps most importantly, the seven regional working forest landowner profiles are currently being disseminated throughout the State to serve as an environmental scan of the major issues facing forest landowners. The profiles are meant to form the basis for educational programming designed to meet Extension's strategic priorities:

- "To strengthen the economy through the profitable, sustainable, and safe food, forest and green industry systems."
- "To protect the environment and natural resources."

Survey analysis by North Carolina Cooperative Extension yielded a baseline profile of working forest landowners across North Carolina, their educational, technical, and financial assistance needs, and programming priorities for forest sustainability. The ultimate success of the 2005-

2006 Summit will depend on coordinated public/private outreach efforts to deliver on identified landowner needs. The formative evaluation approach modeled in this study has set the stage for forest and natural resource needs-based impact programming. The threats to the resource are real and unrelenting. The need to succeed with sustainable forest retention is greater than ever. Future North Carolinians will judge us on our success or failure.

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PREFERRED METHODS FOR DELIVERING EDUCATION INFORMATION TO FOREST LANDOWNERS

Robert E. Bardon, Dennis Hazel, and Kevin Miller¹

Abstract—Researchers have evaluated the efficacy of information exchange methods and have determined overall preferences for these methods, but have focused less on connecting particular information delivery preferences with other characteristics of audiences. The objective of this study was to seek out and describe groups within the population of North Carolina's non-industrial private forestland owners with particular information delivery method preferences and to link these preferences to easily identifiable variables of socio-demographics, land ownership characteristics, and management experiences. A questionnaire was mailed to 2600 non-industrial private forestland owners asking for information regarding socio-demographics, land characteristics, management experience, and preference for methods of information delivery. Five distinct groups were identified using K-Means Cluster analysis and their preference for information delivery methods were linked using Contingency Table analysis with socio-demographic, land, or management characteristics of individuals. Identification of these groups will allow educational efforts to be more directed, making outreach efforts more efficient and cost-effective.

INTRODUCTION

Forestland covers approximately 18.3 million acres in North Carolina, or 59 percent of the total area of the state (Brown 2002). Non-industrial private forestland owners (NIPFs) control 13.8 million acres of this forestland, a little more than three-fourths of the forested area in North Carolina (Brown 2002). According to the Forest Service, there were an estimated 704,900 private forestland owners in North Carolina in 1994 (Birch 1996). More recently, Butler (2006) determined that there are approximately 480,000 family forest ownerships in the state; however, this figure does not include private businesses, corporations, or other non-family ownerships. Thus, the majority of the forest resources of the state of North Carolina are privately controlled, and these lands contribute significantly to the overall health and economic well-being of the state. It is critically important that this diverse group of people is supplied with research-based information and education to ensure the sustainable management of North Carolina's natural resources.

Nationwide, NIPF ownership statistics increased from 1978 to 1994 for white collar workers and retirees, but decreased for blue collar workers with respect to number of tracts and acreage owned (Birch 1996). The greatest increase in ownership, both in number of tracts and acreage owned, was found in retirees (Sampson and DeCoster 1997). Sampson and DeCoster (1997) state that a "significant proportion (35 percent) of the forestland owned by individuals is likely to change ownership within the next decade or so." Getting information to private landowners is more challenging when there is a high turnover rate among landowners (Sampson and DeCoster 1997). Newman, Aronow, Harris, and Macheski (1996) found that in Georgia, new timberland owners differed markedly from traditional landowners in that

they were older, wealthier, better educated, and more rural than expected but were generally unaware of management opportunities and forest laws. Because these landowners are different, it may be more difficult to reach them using the same methods that work for traditional landowners. Webster and Stoltenberg (1959) tried to determine which ownership characteristics are useful for predicting response to forestry programs and found that "acreage owned" and "assessed value of the owner's property" were the only statistically significant characteristics, although their sample sizes were very small. In their conclusions, they called for additional ownership studies to test the relationship between easily recognizable ownership characteristics and response to various types of forestry programs (Webster and Stoltenberg 1959). Knowledge of such relationships would help identify ways to reach landowners who are new or different from Extension's traditional audience.

Dynamic ownership patterns and increased demands for forest products together emphasize the need to deliver relevant forestry information to a growing and changing NIPF population. In addition, after comparing studies from the 1960s (Pomeroy and Yoho, 1964; Muench, 1965) and today (Megalos, 1999; Butler, 2006), it seems that Extension Forestry's impact may be less than it once was. Giving one-on-one attention to each forestland owner would best satisfy their diverse needs, but would be impossible to accomplish. Landowners must be reached with information delivery methods that are effective.

Many researchers (Egan, Welch, Page, and Sebastian, 1992; Rodewald, 2001; Londo and Gaddis, 2003; Radhakrishna, Nelson, Franklin, and Kessler, 2003; Cartmell II, Orr, and Kelemen, 2006) suggest using a diversity of information delivery methods to reach clientele, but particular

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information delivery methods must be matched with target audiences to insure their efficacy. The choice of information delivery method used by an educator may have serious consequences for program effectiveness. Some fear that using one information delivery method may alienate those who prefer another, and particularly that “high-tech approaches may intimidate certain groups of clientele (e.g., older clientele)” (Rodewald, 2001). Because so many delivery methods are available today, the preference of the clientele for a particular method may be difficult to predict.

OBJECTIVES

The objective of this study was to identify preferences for information delivery methods among groups of North Carolina’s non-industrial private forest (NIPF) landowners and to investigate these groups for descriptive socio-demographic, land, or management experience characteristics. If information delivery method preferences can be linked with socio-demographic, land ownership, or management characteristics, educational efforts can be directed at specific groups of landowners using the methods they prefer.

METHODS

Data for this analysis came from a 2005 mail survey of 2600 NIPF landowners in 13 randomly selected North Carolina counties distributed across North Carolina’s seven Cooperative Extension districts, thus ensuring that all regions of the state were represented (fig. 1). Within each county, 200 landowners were randomly selected from the 2004 present use-value tax records. Surveys were mailed to all 2600 landowners with a reminder postcard sent to the recipients three weeks after the original mailing, thanking those who had responded and offering three methods for participating to those who had yet to respond. Late respondents were given the option to send in the original survey, request an additional survey by mail or telephone, or use a web address on the postcard to access an identical copy of the survey that could be completed online. Before another reminder was sent to increase the response rate of the survey, the number of responses surpassed the target sample size (n=384), which is statistically representative of populations up to 1 million individuals (Krejcie and Morgan, 1970).

The survey instrument was designed based on previous studies of NIPF owners (Birch, 1996) and using *Surveying the Social World: Principles and Practice in Survey Research* (Aldridge and Levine, 2001). Before being mailed the content and face validity of the survey was established by six people of various backgrounds (local landowners, graduate students, and natural resource professionals who

work with the public) and reviewed by four North Carolina State University faculty members.

The survey requested information on preferences for information delivery methods, socio-demographics, land ownership factors, and forest management experience. The six information delivery methods included:

- Mail-based material—defined as “newsletters, brochures, compact discs, extension publications, magazine articles, etc.”
- Web-based material—defined as “Web-site reading, downloadable publications, or streaming video”
- Short programs—defined as “evening or less than half-day seminars or workshops at county facilities”
- Long programs—defined as “full day/multiple day field site visits or demonstrations”
- Landowner association—defined as “participation in a landowner association”
- Distance education—defined as “Web-based landowner courses, video-based landowner courses, or textbook-based correspondence courses”

The options were not mutually exclusive. Respondents were asked to rank each information delivery method on a continuum somewhere between “Would never use” and “Would often use”. Socio-demographics factors included: “gender, age, marital status, occupation, number of children below the age of 18, income, and education.” Land ownership factors included: “acreage owned, land ownership tenure, resident or absentee landowner, and primary residence location.” Forest management factors included: “past forest management experience, future plans for forest management, sources from which forestry information is obtained, and income needs from their forestland.” The definition of “past experience” refers to forest management practices previously undertaken and the definition of “future plans” refers to the likelihood that a landowner will practice forest management on their land in the future. Both “past experience” and “future plans” were ranked on continuums with “past experience” ranked some where between “not at all experienced” and “very experienced” and “future plans” ranked some where between “not at all likely” and “very likely”. Nearly all survey questions inherently had categorical responses; the few that did not, age, land ownership tenure, and acreage owned, were categorized using Birch’s (1996) classifications.

A K-means cluster analysis (SAS, 1999) was performed using only respondents’ preference for information delivery methods. To investigate differences among clusters with regard to socio-demographics, land ownership factors, and management experience, Contingency Tables analysis (SAS, 1999) was used. To determine whether or not clusters were statistically significantly different with respect to a given question, Pearson’s Chi-Square was used. A *p*-value of less than 0.05 was considered significant.

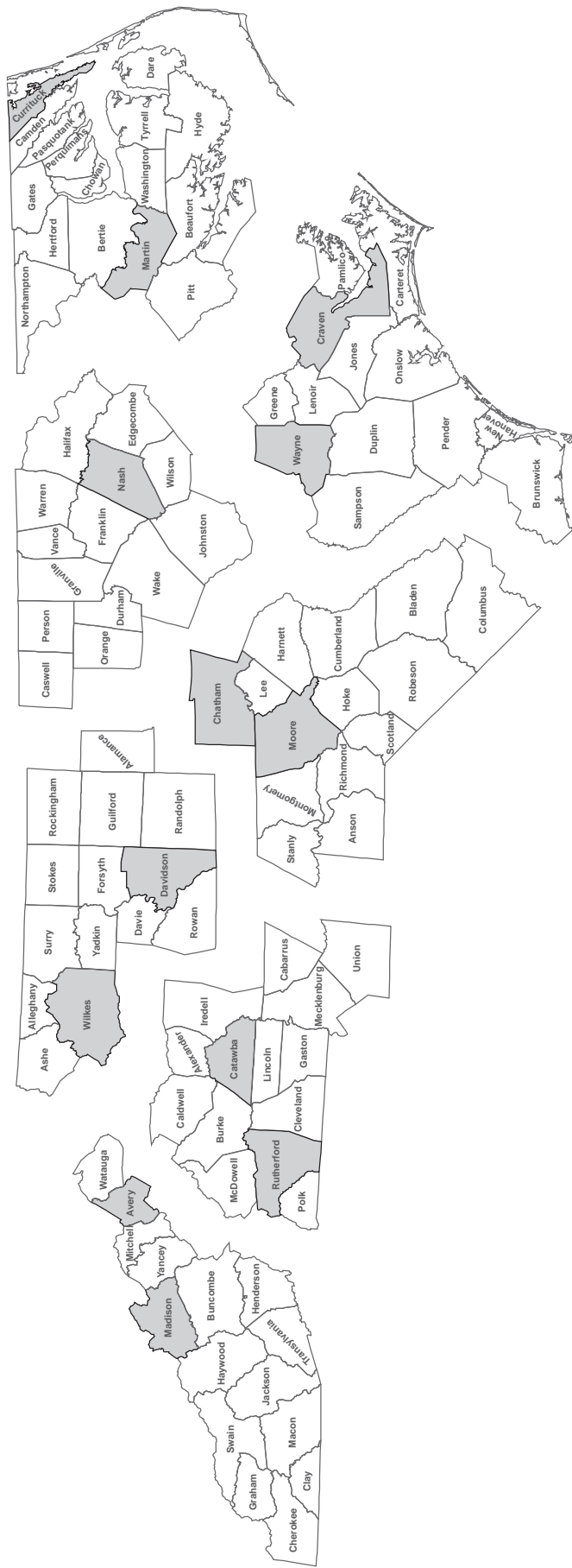


Figure 1—Distribution of 13 randomly selected North Carolina counties (shaded counties) stratified across 7 cooperative extension districts.

RESULTS AND DISCUSSION

The final data set contained 460 landowner observations from a total response of 508 returned surveys. Valid surveys were those in which respondents answered all questions about information delivery methods and claimed at least one acre of forestland.

This study isolated five clusters of landowners with respect to information delivery method preferences in North Carolina (fig. 2). Each cluster has been given a memorable name that helps describe the preferred method of information delivery. One of the clusters, the “Don’t Bother Me” cluster, expressed very little interest in any information delivery method (fig. 2) or in managing their forestland (table 1). Because of this, the “Don’t Bother Me” cluster is likely to be very difficult to reach. They only constitute 7 percent of the respondents, so expending effort to direct educational efforts at this group of people will be costly for the amount of impact that could be expected.

A second cluster, the “Fan Club” cluster, represents 23 percent of respondents. A majority of respondents in this cluster have past management experience, express interest in future management, and have received forestry information from Cooperative Extension, State Forest Service, consulting foresters, and loggers/timber buyers (table 1). These landowners will not require educators to target them with a specific information delivery method in order to be

reached, thus, information delivery methods targeted at other groups will reach this group (fig. 2).

The three remaining clusters, “Snail-mailers,” “Short-mailers,” and “Web-mailers,” which represent 21 percent, 24 percent, and 25 percent of the respondents respectively, have particular preferences for methods of information delivery (fig. 2) and each has characteristics that allow for the identification of these target audiences (table 1). By being able to identify specific audiences among these three clusters and targeting them with their preferred delivery method educators will be most effective in delivering forestry education.

Snail-Mailers

“Snail-mailers” prefer mail-based information over all other delivery methods. Nearly two-thirds of this cluster is over 66 years old. More than two-thirds of this cluster is retired. Compared with “Short-mailers” and “Web-mailers”, the “Snail-mailers” cluster has a smaller percentage of respondents (47 percent) who earned more than \$40,000 in 2004, likely because many members of this cluster are retired (69 percent). “Snail-mailers” are less likely to have past management experience (30 percent) or plans for future management (53 percent). To characterize this cluster, respondents are elderly, receive lower income, retired and are less experienced in managing their forest.

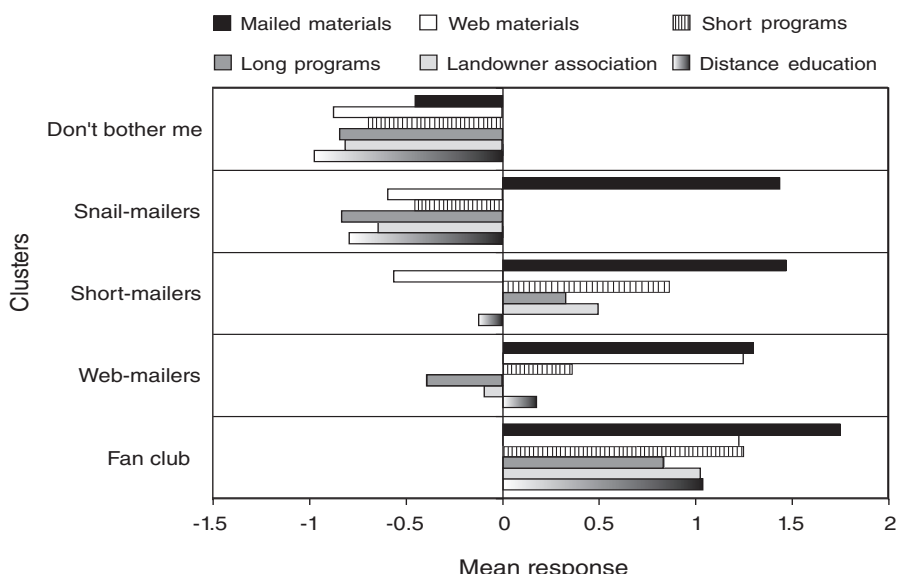


Figure 2—Preferred method of information delivery of North Carolina forest landowners by clusters.

Table 1—Percent respondents within clusters for key sociodemographic, land ownership, and forest management characteristics

Key characteristics	Clusters					Overall average	<i>p</i> < <i>f</i>
	Don't bother me (n = 31)	Snail mailers (n = 95)	Short mailers (n = 111)	Web mailers (n = 114)	Fan club (n = 109)		
----- Percent -----							
Socio-demographics							
Age (% ≥ 66 yrs)	61	64	51	26	26	42	0.0001
Gender (% Male)	58	66	78	75	76	73	0.12
Income (% ≥ \$40,000/yr)	55	47	60	79	77	75	0.001
Education (% ≥ college)	45	45	45	66	57	55	0.0001
(%) White collar	10	12	16	39	34	25	0.05
(%) Retirees	58	69	58	41	35	51	0.0001
(%) Married	68	65	79	90	87	81	0.0001
(%) With children	3	7	9	24	22	15	0.001
Land ownership							
Land (% ≥ 100 acres)	6	25	47	35	48	37	0.01
Tenure (% ≤ 5 yrs)	6	6	6	12	14	9	0.05
(%) Reside on land	39	45	51	44	59	50	0.13
(%) Rural background	58	54	67	58	65	67	0.37
Forest management							
Management experience	23	30	48	40	56	43	0.01
Future plans	39	53	79	90	96	79	0.0001
Require income	23	28	38	33	46	35	0.05
Information source							
State forest service	39	55	71	57	66	57	0.01
Logger/timber buyer	45	44	49	42	51	46	0.74
Extension	29	33	57	37	68	45	0.0001
Consulting forester	26	33	52	47	58	43	0.001

To reach this cluster most effectively, educators should specifically target retirees. Educational information should be developed that can be direct mailed, such as newsletters and information pamphlets. Mailing list can be developed from technical service providers such as state forest service. Other possibilities for getting information out on forest management could include newspapers, magazines, or journals. With more than two-thirds of cluster respondents lacking past forest management experience and a majority expressing plans for future management targeting cluster respondents with information related to beginning forest management, such as sources of assistance, developing

a management plan, and managing your forest financial matters, will likely be well received. Using mail as the preferred delivery method to provide forestry information and teaming with organizations that target retirees may result in the greater impact on delivery of forestry information to this audience.

Short-Mailers

“Short-mailers” are most likely to use mail-based information and short programs such as half-day seminars or workshops. They constitute approximately 24 percent

of respondents. They are somewhat similar socio-demographically to the “Snail-mailers,” but slightly younger and with a lower percentage of retirees. Aside from their willingness to attend short programs, “Short-mailers” have experience with managing their forestland, have future plans for forest management, and many require income from their forestland. Nearly half of this cluster’s respondents own 100 acres or more of forestland. Since many of the “short-mailers” require income from their forest and almost half of this group own large tracts of land, it is likely they are interested in educational programs related to the monetary aspect of forestland ownership. Education programs focused on timber marketing, selling timber, property taxes and estate planning, recreational income opportunities, and non-timber forest products should be considered for this group.

Over 70 percent of “Short-mailers” have received information from the State Forest Service, who traditionally is a technical service provider. Working with the State Forest Service, educators can deliver educational information and market short programs to this cluster through the technical service providers. By collaborating with the State Forest Service educators should be able to increase their visibility with this cluster, resulting in greater program impact.

Web-Mailers

The final focus cluster is the “Web-mailers.” This cluster constitutes 25 percent of respondents and prefers mail-based and web-based information delivery. They are significantly younger, more likely to be married, more likely to have children, and less likely to be retired than members of the other focus clusters. Sixty percent of this cluster makes more than \$70,000 per year and two-thirds of “Web-mailers” have at least a four-year college degree. Ninety percent of this group expressed that they are likely to manage their forestland in the future. Many “Web-mailers” have job or family responsibilities that can limit their ability to attend programs. However, cost-effective, non-traditional methods such as internet-based information delivery may be effective in increasing their knowledge about forestry and forest management. For educators these landowners may be the hardest with which to connect since there is no existing agency or organization with which this group of landowners may be associated. To reach this cluster, areas of high income and high levels of education should be targeted; this would include urban centers, universities, and community colleges. Advertising of internet-based resources through newspapers and professional journals may also increase the chance of reaching this audience.

CONCLUSIONS

Results of this study revealed five distinct groups of landowners with particular preferences for information delivery methods. These groups include landowners who have little desire to receive forestry information, those who prefer to receive their forestry information through the mail only, those who prefer to receive forestry information through short educational programs lasting less than half a day, those who prefer obtaining their forestry information through internet-based resources, and those who are likely to use all forms of information delivery.

This study identified associations between delivery method preferences and other characteristics of landowners, including socio-demographics, land ownership, and management experience. Connecting easily identifiable landowner characteristics with landowner preferences for information delivery methods allows educators to identify delivery methods that are most likely to be effective in reaching their target audience.

Educators can have a greater impact on their audience by delivering information to the audience the way they prefer. By relying upon associations between landowner characteristics and delivery method preferences educators can meet the changing needs of a dynamic NIPF population by matching their audiences with delivery methods most likely to be effective. Educators can save money and time by targeting specific groups of people with specific information delivery methods.

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**CASE STUDIES AND
SUCCESSFUL PROGRAMS**

DELIVERING SCIENCE-BASED INFORMATION TO FOREST LANDOWNERS: THE SOUTHERN PINE BEETLE PREVENTION PROJECT IN EAST TEXAS

Ronald F. Billings¹

Abstract—In 2001, the Texas Forest Service (TFS) initiated the Southern Pine Beetle Prevention Project in east Texas. The goal is to increase public awareness and forest landowner involvement in the prevention of resource losses to the South's most notorious forest pest, the southern pine beetle (SPB), *Dendroctonus frontalis*. A landscape-level hazard map was developed for east Texas and used to identify 25 counties where the next SPB outbreak is most likely to develop. With federal funds provided by the Forest Service, cost share incentives have been offered to private forest landowners in east Texas since 2003 to encourage the thinning of high hazard pine stands, based on recommendations of a technical advisory board. News articles, publications, fact sheets, posters, a demonstration area, and frequent presentations to various forestry- and county landowner groups are being used to promote the program and transfer science-based information. Cost share incentives include up to 70 percent reimbursement of precommercial thinning costs, \$50- \$100 per acre for the first thinning of pulpwood stands, and up to 50 percent of fees for a private consulting forester. Based on a prediction system developed by TFS, annual predictions of SPB activity to expect at the local, state, and regional levels are generated each spring using a network of pheromone traps, with results delivered in a timely manner via the Internet. As of September 30, 2007, some 52,700 acres of high-hazard pine stands in 25 beetle-prone counties had been targeted for thinning, involving more than \$3 million in federal cost shares. By this same date, 67 percent of these cases (35,338 acres) had been completed and nearly \$1.8 million in cost shares paid to 475 small private landowners. The on-going SPB Prevention Project in Texas is serving as a model for SPB prevention projects in other southern states. Results of a customer satisfaction survey and lessons learned concerning information transfer in this project are summarized.

INTRODUCTION

The southern pine beetle (SPB), *Dendroctonus frontalis*, is a bark beetle native to the southern United States, southern Arizona, Mexico and several countries in Central America (Thatcher and others 1980). It is a major threat to southern pine forests with populations attaining outbreak levels almost every year somewhere within its range (Price and others 1998). For example, in 2001 and 2002, the worst outbreak on record was recorded in the southeastern U.S. More than 150,000 infestations (commonly called "spots") were reported on federal, state, and private ownerships in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. For reasons that remain unclear, however, no SPB infestations have been reported in states west of the Mississippi River since 1998 (USDA Forest Service 2004). Due to periodic outbreaks and the impact they may have on commercial pine forests, the SPB has been the target of more extensive suppression efforts than any other bark beetle species in the world (Billings 1980). Nevertheless, foresters have long recognized that prevention by means of silvicultural treatment of beetle-prone stands is the preferred, long-term approach to coping with this bark beetle pest (Bennett 1968, Coster 1977, Hedden 1978). The Texas Forest Service (TFS) initiated the Southern Pine Beetle Prevention Project in east Texas in 2001, with financial support provided by the Forest Service, Forest Health Protection. The development of the Project and accomplishments for the first six years are summarized herein.

SOUTHERN PINE BEETLE HOST PREFERENCES AND SEASONAL BEHAVIOR

The southern pine beetle may complete up to seven generations per year in east Texas and beetles may fly and attack trees whenever ambient temperatures exceed 59° F., the beetle's flight threshold (Thatcher and others 1980). Preferred hosts in the southern U.S. are loblolly pine (*Pinus taeda*) and shortleaf pine (*P. echinata*), although all pine species may serve as hosts during outbreaks. SPB dispersal patterns, reproductive capacity, attack behavior, and ability to initiate multiple-tree infestations differ from those of other *Dendroctonus* species (Fettig and others 2007) and are known to vary with the season (Thatcher and Pickard 1964, Hedden and Billings 1979). Most large, expanding infestations (fig. 1) are initiated in the spring following emergence and dispersal of overwintering broods.

During summer months, newly-established infestations may expand rapidly as multiple generations of SPB attack additional trees on the periphery of the same infestation from which they emerged in response to aggregation pheromones (Gara 1967, Hedden and Billings 1979). If these expanding spots are not controlled, beetle populations may kill even healthy pines and devastate entire forests (Clarke and Billings 2003) as a result of this unique "spot growth" phenomenon (Cameron and Billings 1988).

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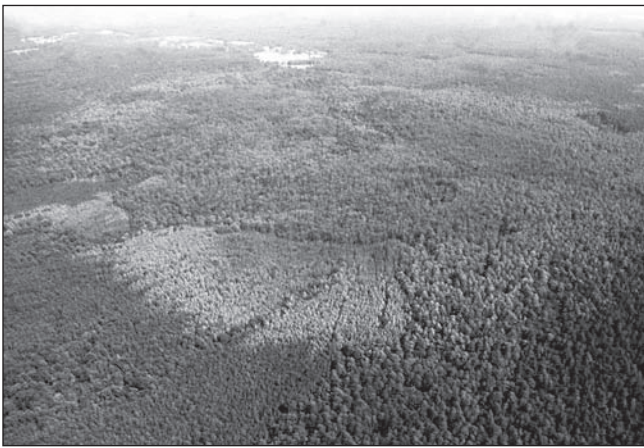


Figure 1—Example of a large, expanding SPB infestation on Turkey Hill Wilderness, Sabine National Forest in east Texas, 1993. (Photo by R. Billings.)

A portion of the SPB population may leave established infestations as temperatures cool in the fall to infest scattered host trees or initiate new spots nearby. This seasonal behavior serves to redistribute the beetle population in pine-forested landscapes prior to winter (Thatcher and Pickard 1964).

SITE, STAND, AND HOST CHARACTERISTICS OF SPB

In the western Gulf states, unmanaged and overcrowded stands of loblolly or shortleaf pines, particularly those on poorly-drained, bottomland sites, are most susceptible to SPB (Coster and Searcy 1979). Longleaf pine (*P. palustris*) is considered more resistant to SPB infestation, due to abundant production of oleoresins which may ward off attacking beetles (Hodges and others 1979). Recognizing those tree, stand, and landscape factors that predispose pines to beetle infestations is the first step in a prevention program (Billings and others 2006).

The susceptibility (hazard) of pine stands in east Texas to SPB infestation can be identified as high, medium or low, based on average height (or diameter at breast height), pine basal area per acre (a measure of stand density), and landform (ridge, side slope, or bottomland). In general, pine stands with basal areas exceeding 120 square feet per acre, particularly those on bottomland sites (clay soils), are considered high hazard for SPB infestation (Billings and Bryant 1982, Mason and others 1985).

The likelihood of resource losses during a SPB outbreak will vary depending on the abundance and spatial distribution of high hazard stands within a county or other geographical area (Hedden 1978). For example, certain TFS grid blocks

(18,000 acre units) historically have supported more SPB infestations than others. Using historical SPB detection records and aerial photographs, the Texas Forest Service developed a system to rate grid blocks in east Texas for hazard to SPB, based on the abundance and distribution of susceptible pine forests (Billings, Bryant and Wilson 1985). The 1996 distribution of very low, low, moderate, high, and extreme hazard TFS grid blocks is shown in figure 2.

Forest management is the preferred method for preventing losses to SPB (Bennett 1968, Coster 1977). Thinning of overly dense, slow-growing pine stands will stimulate growth and vigor in young stands and reduce the likelihood of SPB infestation (Brown and others 1987, Nebeker and others 1985). If an infestation does occur, as a result of lightning (Hodges and Pickard 1971) or other predisposing factor(s), the infestation is less likely to grow to a large size in stands of low density (e.g., those with basal areas of less than 100 square feet per acre) (Cameron and Billings 1988, Gara 1967, Hedden and Billings 1979).

SPB PREVENTION PROJECT IN TEXAS

In 2001, the USDA Forest Service, Forest Health Protection, Region 8 initiated the Southern Pine Beetle Prevention Program. Federal monies are being offered to southern state forestry agencies to promote SPB prevention projects at the state level. As part of this cooperative effort, federal cost shares are being made available to private non-industrial forest landowners in participating states for various SPB prevention and restoration practices. This paper describes the SPB Prevention Project established in east Texas and efforts to identify SPB-prone pine stands and promote thinning as the recommended prevention measure. The long-term goal is to reduce the susceptibility of east Texas forests to future SPB outbreaks.

Development of the SPB Prevention Project involved several steps. The SPB grid block hazard map, first developed in the mid-1980s (Billings and others 1985), was updated using current aerial photography (fig. 2). Initially, a technical advisory board was formed to develop the guidelines for the cost-share project. Members included representatives of state and federal forestry agencies, consulting foresters, county landowner organizations, and other stakeholders. Once the technical guidelines were developed and agreed upon, fliers and posters describing the SPB cost share project and advertising the availability of cost share funds for SPB prevention were prepared and distributed to all TFS District forestry offices and other forestry-related outlets. To assure effective record keeping, a computerized information system was developed for recording each submitted prevention case, client names and contact information, funds encumbered, acres approved and treated, and cost-share payments made. This system has proven useful for generating frequent and

Southern pine beetle hazard rating—1996

Legend
1996 SPB hazard rating

- Extreme
- High
- Moderate
- Low
- Very low

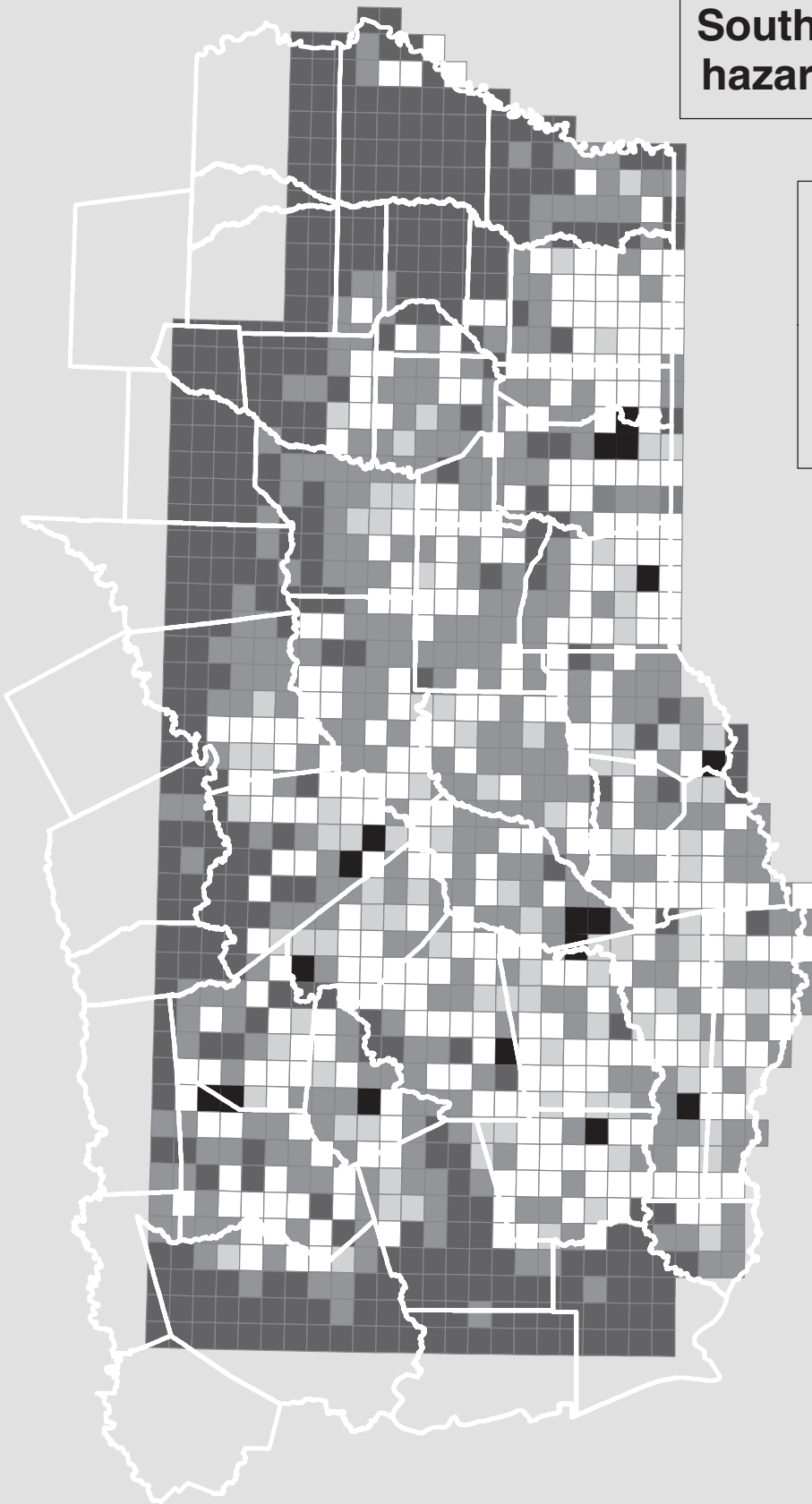


Figure 2—Southern pine beetle area-wide hazard map for east Texas, based on 1996 aerial photography (Billings and others 1985). Each rectangle (grid block) represents 18,000 acres.

timely accomplishment and status reports for state and federal administrators and field foresters involved in the Project.

Private forest landowners are encouraged to work with a Texas Forest Service forester or private consulting forester to develop a management plan for their property. If dense pine stands are present, this plan should incorporate SPB hazard rating and stand management practices to protect forests from future SPB outbreaks. In the case of bark beetles, good forest management is good pest management (Fettig and others 2007, Hedden 1978, Nebeker and others 1985).

Recommended forestry practices to recognize and reduce susceptibility to SPB include the following:

- Hazard rate existing pine stands to determine their susceptibility to SPB (Billings and Bryant 1982, Mason and others 1985).
 - In young (6-12 year old) stands with > 700 stems per acre, consider precommercial thinning to reduce stand density to equal or less than approximately 400 trees per acre (optimal density will vary with site conditions) (Billings and others 2006).
 - Thin moderate or high hazard pine plantations or natural stands to reduce the basal area to ≤ 80 square feet per acre (Hedden 1978, Nebeker and others 1985) as a means to increase tree vigor and radial growth (Coulson and others 1974).
 - Harvest pine stands at maturity and reforest (Bennett 1968, Fettig and others 2007).
 - Where feasible, give priority for thinning or harvesting to those stands located within TFS grid blocks rated as moderate, high or extreme hazard to SPB (see figure 2).
 - Reforest or plant containerized seedlings of longleaf pine, known to be more resistant to SPB (Hodges and others 1979), on suitable sites.
 - Favor mixed stands of pines and hardwoods on suitable sites if compatible with forest management goals (Schowalter and Turchin 1993).
 - Promptly remove lightning-stuck trees (Hodges and Pickard 1971) or other damaged trees from the stand.
 - Minimize damage to residual trees during road building and thinning operations (Nebeker and others 1985).
 - Monitor pine stands for SPB activity with pheromone traps (Billings 1988) and/or periodic aerial surveys (Billings and Ward 1984).
- Upon detection, groups of dead or dying pines should be evaluated on the ground to identify the causal agent and to set control priorities (Billings and Pase 1979).
 - Promptly treat expanding SPB infestations when they occur (Billings 1980, Swain and Remion 1981).

REQUIREMENTS FOR FEDERAL COST SHARES

Beginning in 2003, federal funds were made available to help reduce the susceptibility of pine stands to SPB in east Texas and several other southern states. In Texas, these cost share funds, administered by the Texas Forest Service, are allocated to qualified private landowners as reimbursement for specific silvicultural practices designed to reduce SPB hazard (Billings and others 2006). The cost-shares are provided to private landowners as an incentive to thin dense pine stands and as a means to offset current low pulpwood prices (Texas Forest Service 2006).

Landowner Qualifications

The cost shares are offered only to small private landowners and are not available to forest industry, State or Federal agencies, or landowners owning more than 5,000 acres of forestlands. The cost shares are available for landowners within 25 beetle-prone counties in east Texas (Anderson, Angelina, Cass, Cherokee, Gregg, Hardin, Harrison, Houston, Jasper, Liberty, Marion, Montgomery, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler, and Walker), based on abundance of susceptible host type (Billings and others 2006).

Stand Qualifications and Cost Share Rates

To qualify for federal cost shares for SPB prevention, the pine stand must be located within one of the 25 counties listed above, contain > 70 percent pine (loblolly, shortleaf, or slash pine (*P. elliotii*) and rate as moderate or high hazard to SPB. Pine stands located outside these counties may qualify only if the stand ranks as high hazard to SPB (Billings and Bryant 1982).

Stands must be 6-20 years of age, unthinned, and be at least 10 acres in size. Then, to participate in the SPB prevention program, the landowner must submit a 2-page SPB application form prepared by a TFS- or consulting forester for his/her property.

Practices that qualify for these cost share funds are defined below.

Precommercial Thinning: To qualify for 50:50 cost shares for precommercial thinning, existing loblolly or shortleaf pine stands must be more than 6 years of age and have an average of more than 700 stems per acre at the time of thinning. Cost shares will be reimbursed to the landowner to cover up to 50 percent of the thinning costs, not to exceed \$75 per acre. In August 2007, cost shares for precommercial thinning were increased to 60 percent of actual costs, not to exceed \$90 per acre, in 10 counties in southeast Texas (Hardin, Jasper, Liberty, Montgomery, Newton, Orange, Polk, San Jacinto, Tyler, and Walker) that have historically supported SPB outbreaks.

Due to longer rotations, an abundance of overmature pine forests, and presence of wilderness areas where direct control of SPB infestations is constrained, National Forests in Texas have supported major SPB outbreaks in the 1980s and 1990s and are likely to do so in the future (Clarke and Billings 2003). This situation greatly increases the likelihood that SPB populations will spread to unthinned pine stands on nearby private lands during outbreaks. Accordingly, cost shares for precommercial thinning were increased in August, 2007 to 70 percent of actual costs, not to exceed \$105 per acre, for pine stands on private, non-industrial lands located within five miles of a National Forest.

First Thinning of Pulpwood Stands: To encourage first thinning of loblolly, shortleaf or slash pine stands having trees of marginal market value (pulpwood), landowners were initially given cost shares of \$50 per acre if the pine stand rated as moderate or high hazard within the 25 counties described above. Pine stands outside this area qualified only if they rated as high hazard to SPB (Billings and Bryant 1982). In May, 2007, cost-share rates for the first thinning of pulpwood stands were increased to \$80 per acre in the ten counties of southeast Texas listed above and to \$100 per acre for pine stands within five miles of a National Forest. For cases that qualify, cost shares are provided in addition to any profit the landowner may make on the sale of pulpwood from the treated stand. The cost share match in the case of pulpwood stands is covered by the average state-wide cut-and-haul rate for pulpwood in Texas (e.g., \$18 per ton, equivalent to \$100 - \$600 per acre). This cut-and-haul rate reflects the average cost to hire a logger to thin the tract.

Consulting Forester Fees: In addition to the cost shares described above, participating landowners also may claim 50 percent of costs, up to \$10 per acre, to employ a consulting forester to hazard rate the stand and oversee the thinning operation.

Cost-share Maximums: In any federal fiscal year (October 1 – September 30), cost shares are available up to a maximum of \$8,500-\$10,000 for single landowners or

\$17,000-\$20,000 for partnerships and trusts having two or more partners. The higher maximum amounts correspond to those counties or properties that qualify for the higher cost share rates (e.g., those stands located in one of the ten counties of southeast Texas listed above or in proximity to a National Forest).

SPB PREDICTION SYSTEM

As part of the SPB Prevention Project in Texas, TFS pest management specialists administer the South-wide SPB Prediction System. This system provides annual predictions of SPB infestation trends (increasing, static, declining) and levels (high, moderate, low) for specific counties and National Forest Ranger Districts in 16 states (OK, AR, TX, LA, MS, TN, KY, AL, GA, VA, FL, SC, NC, DE, MD, and NJ). The system utilizes funnel traps baited with SPB aggregation pheromones and pine turpentine placed in pine forests for 4 weeks in the spring (Billings 1988).

Data on numbers of adult SPB per trap as well as those of a major predator (the clerid, *Thanasimus dubius*) from 170 -180 locations in 16 states are compiled by the author and used to make predictions for the current year. SPB outbreaks are likely when mean numbers of SPB per trap per day exceed ca. 25 and the ratio of SPB to the total catch of SPB and clerids (defined as percent SPB) exceeds ca. 30 percent. Trap catch data from all localities surveyed within a state are averaged to determine SPB infestation forecasts for the entire state. These data and predictions are then made available to cooperators and the general public via the TFS web page at <http://texasforests.tamu.edu>. State-level predictions of SPB infestation trends and levels have proven accurate 75-80 percent of the time since the prediction system was implemented in 1987 (Billings and Upton in press). When SPB populations are forecasted to remain low, as they have since 1998 in those southern states located west of the Mississippi River (AR, LA, OK, TX), forest landowners are encouraged to focus on prevention measures, before the beetle populations return to high levels.

INFORMATION TRANSFER EFFORTS IN TEXAS

To increase public awareness and transfer SPB prevention information to small, private landowners in east Texas, TFS foresters and entomologists are using a variety of methods. Frequent articles describing SPB prevention practices and the availability of federal cost shares for thinning are prepared and published in the Texas Forestry Association newsletter *Texas Forestry*, as well as in local newspapers and in county landowner and forest stewardship newsletters throughout east Texas. In turn, the publication entitled *How to Prevent Southern Pine Beetle Infestations: A Guide to Cost Sharing Thinning Operations in East Texas* (Billings

and others 2006) was published and distributed to TFS and private consulting foresters. This publication describes in detail how to recognize SPB-prone pine stands and how to thin stands to reduce their susceptibility to SPB. Simple procedures for applying for federal cost share funds, including the required application forms, are included.

To further promote the Project, two SPB prevention foresters were hired, one to cover counties in northeast Texas and the other for counties in southeast Texas. These foresters increase public awareness by giving presentations on the Project to county forest landowner groups, forestry groups, civic groups, and other potential stakeholders throughout east Texas and in the larger metropolitan areas (where many absentee landowners reside). To remind forest landowners of the destructive potential of SPB during outbreaks, color photos of large, expanding infestations taken from the air are used. In the early 1990s, ample opportunities were available to photograph uncontrolled SPB infestations on federal wildernesses in east Texas (see figure 1), when 40 percent of the host type was destroyed as a result of no control (Clarke and Billings 2003). The impact of uncontrolled SPB infestations on federal wildernesses and how to prevent similar losses through suppression and prevention programs have become routine topics of discussion in frequent “Forest Awareness” tours and “Walks in the Woods” for school children.

In 2006, a five-acre tract of dense loblolly pine on the Jones State Forest near Houston was established as a demonstration area. Four acres were thinned, while one acre was left untreated. To promote SPB prevention awareness, a display was set up adjacent to the thinned and unthinned stands to describe SPB biology and impact and explain how thinning can be used to reduce the susceptibility of pine stands.

COST SHARE ACCOMPLISHMENTS

Since the SPB Prevention Project began offering cost shares to small private landowners in 2003, accomplishments have been substantial. As of September 30, 2007, a total of 731 cases for thinning had been approved, involving 52,733 acres and \$3,123,362 in federal cost shares. Of these, 3,742 acres and \$255,099 in cost shares had been approved for precommercial thinning while 49,009 acres and \$2,868,263 in cost shares had been approved for the first thinning of pulpwood stands (fig. 3A). Eighteen months are allowed to complete the thinning, once a case is approved. In federal FY 2006, thinning operations in southeast Texas were hampered by poor markets, wet ground conditions, and a temporary lack of loggers, due to Hurricane Rita in September, 2005. Despite these adverse factors, 475 cases (65 percent of total) had been completed covering 35,338 acres (fig. 3B) and \$1,793,484 in federal cost shares had been distributed to participating landowners by the end of federal FY 2007.

CUSTOMER SATISFACTION

A questionnaire was developed to monitor customer satisfaction with the program. The two-page survey form, with return postage paid, is sent to each participating landowner upon completion of his/her cost-share case. As of September 30, 2007, 163 of 475 survey forms (34 percent) had been returned. Comments have been overwhelmingly positive. Most landowners heard of the program via their consulting forester (50 percent), a TFS District or SPB Prevention Forester (26 percent) or the Texas Forestry Association newsletter (14 percent). Sixty-seven percent of respondents used a consulting forester, and 26 percent

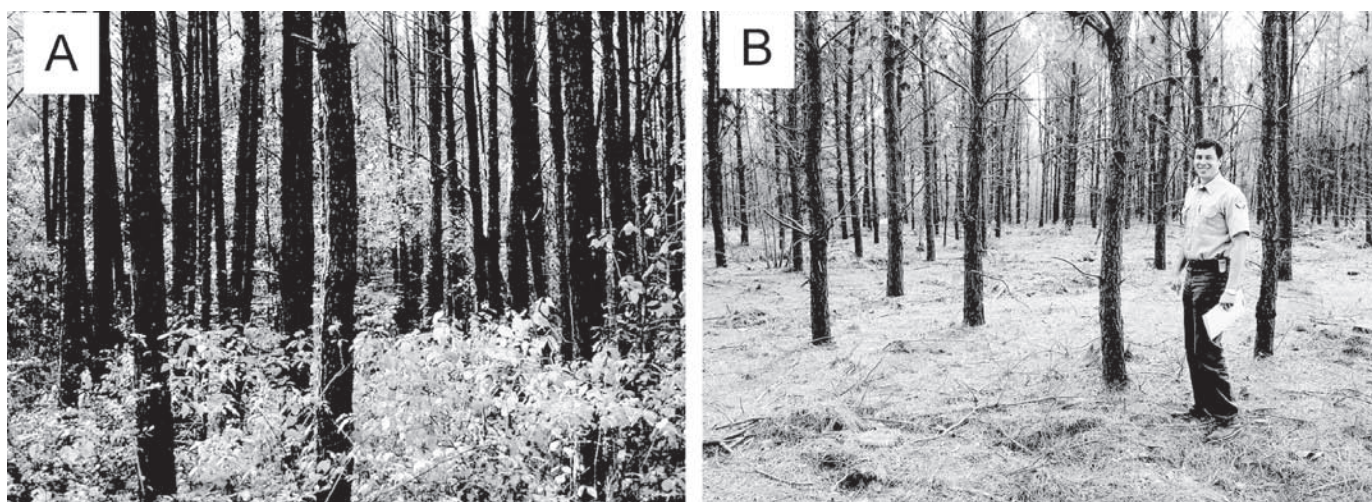


Figure 3—Unthinned (A) and thinned (B) stands of loblolly pine in east Texas. Thinned stands are less susceptible to SPB infestation occurrence and subsequent expansion. (Photos by R. Billings.)

decided to employ a consulting forester because their fees were cost shareable. Ninety-two percent of responding participants found that SPB cost shares were simple and easy to apply for and many appreciated the prompt payment. Sixty-five percent rated the project as better than other cost-share projects in which they had participated, while only 5 percent rated it as worse. When asked whether they would have thinned their pine stand at this time if federal cost shares were not available, 42 percent said they would not have. Presumably, the other participants at least have learned that SPB prevention is one of the many benefits of maintaining a vigorously growing pine stand through periodic thinning.

LESSONS LEARNED

Several lessons about successful information transfer have been learned as a result of the SPB Prevention Project and similar efforts in forest pest management over the years. These include the following:

- You must have information, a product or service to transfer that meets a landowner's specific need.
- The information/technology must be simple, practical, and "user-friendly."
- Word of the new information must reach stakeholders (private landowners, TFS and consulting foresters). In recent years, increasing use of the Internet has facilitated public awareness efforts.
- Involving private consulting foresters spreads word of the program and increases accomplishments.
- Cost-shares need to be paid promptly, following satisfactory completion of an approved practice. Satisfied customers tend to spread the word and help to generate more clients.
- Selectively increasing cost share rates is an effective method to boost interest and accomplishments in high-priority areas.

The Southern Pine Beetle Prevention Project has been deemed a success because it meets the criteria stated above. Nine southern states (TX, AR, LA, AL, GA, TN, FL, NC, VA) offer federal cost shares for SPB prevention. While all nine states subsidize pre-commercial thinning for prevention purposes, Texas was the first state in the nation to offer federal cost shares for thinning pulpwood stands. This practice has now been adopted by at least four other southern states – Florida, Arkansas, Alabama, and Mississippi. Clearly, the Texas SPB Prevention Project is serving as an example for other state forestry agencies of how to successfully transfer science-based information to private forest landowners.

ACKNOWLEDGMENTS

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THE IMPLEMENTATION OF A TECHNOLOGY TRANSFER PROGRAM FOR SILVOPASTURE IN THE SOUTHEAST—OUR PERSPECTIVE

Jim Robinson, Sid Brantly, Greg Ruark, Bruce Wright, and Richard Straight¹

Abstract—Research indicates that silvopasture, growing of forage and trees in an intensive management system for the production of livestock and timber products, is a viable option for landowners in the Southern Pine Belt. However, limited adoption of silvopasture technology suggests there is a need to develop a technology transfer program to provide training and field support for delivering technical assistance in planning and application of silvopasture systems. In 2000 the USDA National Agroforestry Center, a partnership between the USFS and NRCS dedicated the primary staff time of one technology transfer specialist to solicit support from its conservation partners to identify barriers to implementation and to develop a technology transfer program targeted principally for Georgia, Florida, Alabama, South Carolina, and Mississippi. The resulting targeted technology transfer program provided: training to over 500 agency personnel and about 50 consultants, support for landowner workshops or field days, silvopasture demonstration plantings in 4 states, increased silvopasture application, increased emphasis at universities in silvopasture. Not all the progress made in the targeted states is a direct result of the emphasis provided by the National Agroforestry Center. However, the multi-agency cooperation stimulated by NAC's focused efforts, while often difficult to fully achieve, has resulted in additional dividends of subsequent independent program implementation. Many barriers continue to exist. Some are real and others are perceived. Nevertheless, conservation stakeholders, working together, can make an impact in overcoming these barriers. The real proof will be on the land.

INTRODUCTION

In 1995 the Forest Service (USFS) and USDA Natural Resources Conservation Service (NRCS) formed a partnership through the National Agroforestry Center (NAC) in Lincoln, Nebraska. The Center staffed with six researchers, eight technology transfer specialists and five support staff consists of a research component and a technology transfer component. The USFS provides the Director, the support staff, researchers and four technology transfer specialist while the NRCS provides three technology transfer specialists.

The technology transfer arm of the National Agroforestry Center was charged with the promotion and technical support for five identified agroforestry practices. The five primary agroforestry practices were forest farming, alley cropping, riparian forest buffers, windbreaks and silvopasture. This paper focuses on the NAC's silvopasture technology transfer initiative.

BACKGROUND

Early silvopasture research in the 1980's by Dr. Cliff Lewis, USFS, and later research by Dr. Henry Pearson, USFS, Agricultural Research Service (ARS) and Dr. Terry Clason, Louisiana State University, indicated that silvopasture, the growing of forage and trees in an intensive management

system for production of livestock and timber products, was a viable option for landowners in the Southern Pine Belt. Silvopasture promotion by conservation agencies and implementation by landowners was, however, lacking.

In August 1997, NRCS Grazing Lands Technology Institute and the National Agroforestry Center partnered with the Louisiana State University Agricultural Center, Louisiana Agricultural Experiment Station, Hill Farm Research Station and Dr. Terry Clason to develop grazing and timber yield demonstrations and to support additional silvopasture research. That same year, Dr. Catalino Blanche, ARS, formed a multi-agency team to investigate silvopasture and its economic potential for the South/Southeastern United States. Members of the team were Dr. Catalino Blanche, ARS, Dr. Clarke Baldwin, USFS, and Jim Robinson, NRCS/NAC.

This team visited New Zealand in 1998 to look at their technology transfer program for silvopasture and the successful implementation of silvopasture on the ground. Dr. Leif Knowles, the team's host, had traveled extensively throughout the US investigating some of the research on silvopasture in the US but observed very little on the ground. He took that knowledge back to New Zealand, refined it, and proceeded to increase their knowledge of the benefits of silvopasture promoting it to farmers through research, education and technical assistance. This trip energized the NAC and its partners to believe silvopasture had a future in America.

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In 1998 the National Association of Resource Council and Development Councils with assistance from NAC did an assessment of the potential for agroforestry practices across the United States. This assessment, published in 2000, showed that silvopasture had very good potential in the South and Southeast.

About this same time Sid Brantly, NRCS regional grazing specialist for the Southeast, and Jerry Johnson, NRCS State Staff Forester for Alabama, requested a long-term technical assistance commitment from Jim Robinson, an NAC silvopasture technical transfer specialist. They submitted a technical assistance proposal that included training program funding for the states of Alabama, Georgia, Florida, Mississippi and South Carolina. The training program would target— state forestry agencies, university experiment stations, state cooperative extension services, 1890 Universities, NRCS state offices, soil and water conservation district offices, private consultants and landowners.

In March of 2000 a “Dixie Trip” to the South was conducted to allow NAC personnel a first hand opportunity to assess the value and potential of a multi-year technology transfer initiative and to meet some of the important the players in the potential development of a silvopasture technology transfer program. During this Dixie Trip, the group met with Dr. Cliff Lewis, a retired researcher and the father of silvopasture as we know it, and George Owens, a rancher and owner of probably the oldest silvopasture system in the Southeast. Their enthusiasm, combined research and practical knowledge of working silvopasture systems were a key factor in convincing NAC to move ahead with a significant commitment to promote silvopasture systems. A key contact was made during this trip with Rhett Johnson, Director of Auburn University’s Solon Dixon Center and Co-Chairman of the Longleaf Alliance. Although this stop in the agenda was originally viewed as “while we are in the area we should stop”, it turned out to be the beginning of an important long-term relationship with Auburn University and the Longleaf Alliance.

In the fall of 2000, Jim Robinson submitted a silvopasture technology transfer initiative proposal to the NAC recommending that the priority of his time and information assistance go to this effort. This plan targeted the states identified in the proposal submitted by Jerry Johnson and Sid Brantly.

PLAN

- Solicit support from conservation partners, principally state foresters, state conservationist and extension leaders as well as consultants and non-government organizations.
- Develop tools and technical notes, to assist field staff, in applying silvopasture technologies.

- Develop technical workshops and a workbook on silvopasture for technical personnel.
- Fund demonstrations and provide research support.
- Encourage and support landowner field days through state activities.
- Direct technical assistance to state and local offices.
- Work with Sustainable Agriculture Research and Education (SARE) to fund agroforestry proposals.
- Work with 1890 Universities to conduct studies and research in silvopasture.
- Provide training to 1890 University professors on agroforestry including silvopasture applications.

IMPLEMENTATION

In March of 2001, NAC met with Region 8 USFS staff in Atlanta, GA to explain the proposal and solicit their support. It was agreed upon to hold an initial workshop for conservation partner representatives from each targeted state. Region 8 USFS agreed to fund the training for state forestry and extension representatives, and NRCS agreed to fund, through the NAC, the representatives from NRCS and other conservation partners. Prior to the initial workshop, NAC staff contacted State Foresters and State Conservationists in the targeted states to explain what was being proposed. The pre-workshop communication was intended to warm up key decision makers to the potential of silvopasture fitting into their agency goals and to garner support for their agency’s appropriate staff to attend the workshop. This first workshop was held in Chipley, Florida and was attended by staff from each agency in each targeted state. George Owens, silvopasture landowner, hosted the group on a tour of his farm.

Over the next two and a half years an additional twelve workshops, sponsored by the NAC, were held in Florida, Georgia, Mississippi, South Carolina, and Alabama with approximately 700 people in attendance that included state and federal conservation agencies, universities, extension, and consultants. Workshop participants received training in forage and livestock management, forest management and wildlife issues as they pertain to silvopasture systems. The NAC also produced a workbook containing research references, technical notes, and management guides for the application and management of silvopasture systems. Four technical notes were produced by the NAC which included: “From Pine Forest to A Silvopasture System”, “From A Pasture to A Silvopasture System”, Silvopasture Tree Pruning and “Silvopasture And Eastern Wild Turkey”, “Silvopasture Water And Fencing Systems For Cattle”. A guide was created for “Estimating canopy relationship to trees per acre and basal area” for loblolly pine, as well as how to use a spherical densiometer for estimating tree

canopy in the field. One “Inside Agroforestry” newsletter was principally dedicated to silvopasture along with a large 10’ X 8’ floor display poster. All of this as well as other informational materials and posters were made available for free access and use by anyone who wanted to promote silvopasture technology.

Four demonstration projects were established in the targeted states. One is located at the Solon Dixon Center of Auburn University, Alabama. Another is located at the Jimmy Carter Plant Materials Center, and the other two are located on private lands in Mississippi. These projects are:

- Used to demonstrate to technical people and landowners the establishment and management of silvopasture systems
- Used as study areas to collect data for research proposals
- Used in conjunction with a university’s education program

Dr. Mary Goodman, Auburn University, used the demonstration areas as focal points for her silvopasture project research proposal which was funded by the Southern SARE Research and Education Grant Program. The purpose of this project is to better understand the ecological interactions which are the foundation of sustainability in Southern-pine silvopasture systems. Research will focus on how changes over time in the plant community structure of grazed silvopastures modify belowground pasture productivity, the resulting impacts on pasture soil quality (i.e. soil health or the capacity of the soil to function), and components related to water infiltration and retention. This understanding will be achieved by monitoring the interactions of plant, soil and livestock responses to management strategies designed to sustain forage productivity and soil quality through enhanced soil organic matter capital.

Many of the 1890 Universities have engaged agroforestry technologies within the last six years. The interest has gone so far as to establish the 1890 Agroforestry Consortium to stimulate and promote research, education, and outreach on agroforestry practices. Because silvopasture systems transition well into small land management operations the Consortium has focused attentions in this area. In particular, the member universities have focused their attention on silvopasturing goats for meat production. Successful research grant proposals and outreach efforts are seeking to advance the understanding of the unique aspects of goat management in silvopasture systems in the south.

Grazing management schools in the southeast have been extremely popular for well over ten years. NRCS, university specialists, extension agents, and grazing land coalitions have teamed up to prepare and host these one to three day schools. They often deliver “hands-on” education in plant physiology, livestock physiology and needs, forage management, facilitating practices, and grazing systems.

Schools have been sprinkled across Mississippi, Alabama, Georgia, South Carolina, and Tennessee, training well over a thousand land users in some of the more detailed aspects of grazing management. Since the beginning of the silvopasture program, these schools have incorporated silvopasture into their curricula whenever trained presenters are available. This has served to increase the awareness level or silvopastoral knowledge of grazing land professionals in these states, as well as introducing landowners across the south to this viable, and under represented technology. Landowner workshops have now been held in each of the original five targeted states sponsored by the partnering federal and state agencies and NGO’s as well as some of the bordering states in the Southeast.

BARRIERS AND PITFALLS

- According to Lewis, his research did not initially receive a lot of attention in the United States. However, it was more readily accepted overseas, usually in the tropical and semi-tropical areas of developing nations. Lewis believes the major barrier to acceptance in the U.S. is “the fear of the unknown.” “People are afraid that they don’t have enough expertise in the new discipline.”
- Lewis said, “Cattle producers do not want to become foresters, and forest managers do not wish to learn about livestock production and the interactions of mixing these disciplines.” (Inside Agroforestry-Summer 1998)
- Cattle verses Trees - Everybody “knows” cows and trees and especially cows and wildlife don’t mix. The discussion had to be centered on “how does management provide the desired results.”
- Tree quality verses forage quality. There are all kinds of concerns about quality. In almost all cases management changes can take care of these concerns.
- Trust and miscommunication: While every effort was made to be open and to get input from everyone, we heard that we were not advocating some things that were important to another’s interest. For example it was reported that one agency did not support the silvopasture technology training because we only wanted to use introduced forages in our silvopasture training and were not interested in using native warm season grasses. At this same time we had a demonstration system using warm season grass and were providing guidelines for warm season grass management. Of course not everyone wants to work with all government agencies. Some trust Extension but not NRCS or USFS and visa versa in any combination you can imagine. These problems are best solved with partnerships.
- Agency and personnel changes can have a profound impact on the continuity of a technology transfer program. During this time we have had priority changes at Louisiana State University Agricultural Center, Louisiana Agricultural

Experiment Station, Hill Farm Research Station and the ARS Dale Bumpers Small Farms Research Center in Booneville, Arkansas that created a redirection of the research focus and changes in personnel. NRCS had a reorganization that also reassigned some of the principle individuals to different areas of responsibility and for a time severe impaired its relationship with the National Agroforestry Center thus effectively slowing, progress of the Center's silvopasture technology transfer effort. Jerry Johnson, forester, a supporter of silvopasture technology, and friend and one of the original authors of the silvopasture proposal passed away. Each time one of the lead agencies makes a change that impacts key personnel, the glue that holds the program together is weakened and it takes time to rebuild the same level of commitment.

- Fear of change and the impacts on the status quo. Questions like “you are going to convert all of our pasture back to trees and we have been fighting brush all our lives.” Or “You are going to be converting all our woods to pasture when we are already losing forests to land use conversion, this will only accelerate it.”
- In our experience, landowners seem to be very receptive, but it is more difficult to get the agencies to present a coordinated response. Perhaps it is because agencies or organizations are bureaucracies and it takes them much longer to make policy changes. The university extension system, seemed, to be much more receptive to change than were the other agencies. Perhaps it is because it is fruitful ground for continued study, research and education.

RESULTS

Probably one of the significant outcomes is that most of the universities in the south now have research activity related to some aspect of silvopasture systems. When this project began there was very little activity. While it would be foolish to say the technology transfer project was wholly responsible for this increased activity, it is safe to say that the project played an important part in the growing awareness of silvopasture potential.

Research isn't the only area of increased attention to silvopasture systems. Several of the original states now have included silvopasture in their state and federal cost share programs. Efforts are being made to associate silvopastures with other agency and program goals in order to utilize other program dollars to support silvopasture establishment. Programs that promote fire hazard reduction, forest health and insect management are discussing the role silvopasture technology may play in managing these concerns.

It is difficult to provide exact statistics of on the ground implementation because none of the agencies we have worked with have a land use accounting system that captures silvopasture activities. However, our best estimate of acres established in silvopasture since the start of the silvopasture activities is approximately 10,000 acres. Interest in silvopasture is also spreading into several of the other Southern states and throughout the Pacific Northwest and Midwest.

WHAT WE HAVE LEARNED

- Communication. You can not communicate too much with your conservation partners. In a few instances misinformation about silvopasture activities caused an agency or discipline to be less than enthusiastic supporters. Frequent discussions may have averted misinformation.
- Don't miss a major player. Wildlife development people should have brought in on the ground floor. Many landowners select silvopasture as part of their wildlife management program but the discipline leaders are often hesitant to promote silvopastures.
- Committed funding is extremely helpful in organizing training and landowner workshops. It can be very counter productive to stimulate new ideas and then not follow through with additional information and assistance as a result of limited funds.
- There are many discipline leaders and landowners who are risk takers and are not afraid of getting behind something new. Find Them!
- You must have local leadership and advocacy. It matters less which agency or organization is the advocate or leader for silvopasture. It just matters that there is somebody willing to invest the time and staff. However, it is best when many agencies and organizations are involved.
- Follow up assistance and mentoring is just as important as the initial training. NAC's strength was that we would work with all agencies and organizations and often provided follow-up assistance for implementation.
- Strong organizational support is a must. If support wanes the infrastructure begins to crumble. It is extremely difficult to get support without solid top leadership commitment.
- If it is new be willing to take the heat.

CONCLUSION

It takes key people to begin a technology transfer program. There were many people who were instrumental in working with the NAC to carry out the program from state forestry agencies, NRCS and university and extension offices. There were a few, however, that put forth an extra dedication to the effort often without just recognition or compensation. They were, Dr. Mary Goodman and Dr. David South from Auburn University who were instrumental in helping us with almost all of the training sessions and George and Pat Owens of Chipley Florida who so graciously allowed us to use their farm as a field training location and spoke to agency leaders, farm groups, forestry groups and anyone else who would listen about the benefits of silvopasture systems.

Will the agencies continue to work together and invest in training and technical assistance to support this activity or will barriers and fear of change retard the further expansion of what is a sound conservation program? Only time will tell.

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DECISIONS FOR MANAGING STORM DAMAGED TIMBER

Walter M. DeLoach and Stephen G. Dicke¹

Abstract—In response to the devastation and need of forest landowners, Mississippi State University Extension Forestry Department developed the Timber Stand Salvage Decision Model, which is a timber management decision model that assists landowners with making difficult salvage vs. management decisions. The focus of the model is on the remaining undamaged timber. This timber is what is available to the landowners for future management and must be the primary focus. A decision tree for using the model was published using three questions landowners must address about their timber stands. The model was distributed using a variety of media sources and presentations. This model was published in printed form and also part of a PowerPoint presentation delivered in 33 affected Mississippi counties to approximately 2,500 landowners. The Timber Stand Salvage Decision Model was also posted by the Mississippi Forestry Association on their Hurricane Katrina Recover blog site. The model was also the subject of radio shows and news articles. Additionally this information was sent to the LSU Agricenter and Texas Cooperative Extension Service for their use in the aftermath of Hurricanes Katrina and Rita.

INTRODUCTION

Hurricane Katrina launched her assault on the Mississippi Gulf Coast on August 29, 2005, and when the day was over Katrina would be known as one of the worst natural disasters in United States history. Besides the billions of dollars of damage done to personal property, infrastructure and buildings, Katrina dealt the timber industry in Mississippi a severe blow. The estimated value of damaged timber was \$1.3 billion. The commercial volumes of damaged timber were 14.6 million cords of pulpwood and 3.2 billion board feet of sawtimber. This damage occurred on 1.3 million acres of timberland in 38 Mississippi counties. Non-Industrial Private Forest landowners (NIPF) own 68 percent of the timberland in Southeast Mississippi (Hartsell 1995). Following the storm landowners were left trying to determine whether to salvage or manage damaged timber and to decide if there was enough timber damage to warrant a salvage operation. In response to these needs, a Timber Stand Salvage Decision Model was developed to guide landowners through the decision process of managing their damaged timber stands.

The first phase in the recovery process for landowners was to develop a damage recovery plan for their timber stands. The first step in the recovery plan is a damage assessment. During the initial evaluation landowners should focus on two issues, the amount of undamaged timber in these stands and the different types of damage that occurred. The amount of undamaged timber provides the baseline for determining future management of that timber stand. The types of damage such as broken trunks, twisted trunks, root damage, and bent trees, will be important in deciding which trees need to be salvaged and which trees may recover. The types of damage will also indicate the product class for damaged timber. For example, twisted trees will only be suitable for

pulpwood because of the internal separation of the wood fibers. The final phase of the recovery plan is to make management decisions and take actions.

SITUATION

The Timber Stand Salvage Decision Model is a stand-based model that evaluates commercially manageable timber stands. A commercially manageable timber stand is defined as 10 acres of manageable land (MFC 2003). This model uses three questions about the timber stand to determine the management options available to the landowner. Standing undamaged timber is the focus of the model because this is the timber available for future management. Table 1 shows the three questions the Timber Stand Salvage Decision Model is based on and the information needed to answer these questions.

Table 1—Questions facing landowners with salvage and management decisions

Questions	Information needed for answer
Do I have a manageable stand of undamaged timber?	Basal area (density) of undamaged timber
Will I be able to make a timber sale in the future when prices are better?	Volume (tonnage) of standing undamaged timber
Do I need to conduct a salvage operation?	Volume (tonnage) of standing damaged timber

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Question 1: Do I have a manageable stand of undamaged timber? This question can be answered by looking at the basal area of the residual stand. Basal area is defined as the cross-sectional area (in square feet) of the trunk at breast height (4 ½ feet above the ground). For example, the basal area of a 14-inch diameter tree is about 1 square foot. Basal area for a forest is the sum of the basal areas of the individual trees on the area. A well-stocked pine stand might contain 80 to 120 square feet of basal area per acre (Londo 2005). The Timber Stand Salvage Decision Model uses three thresholds of basal area for decision-making (fig. 1).

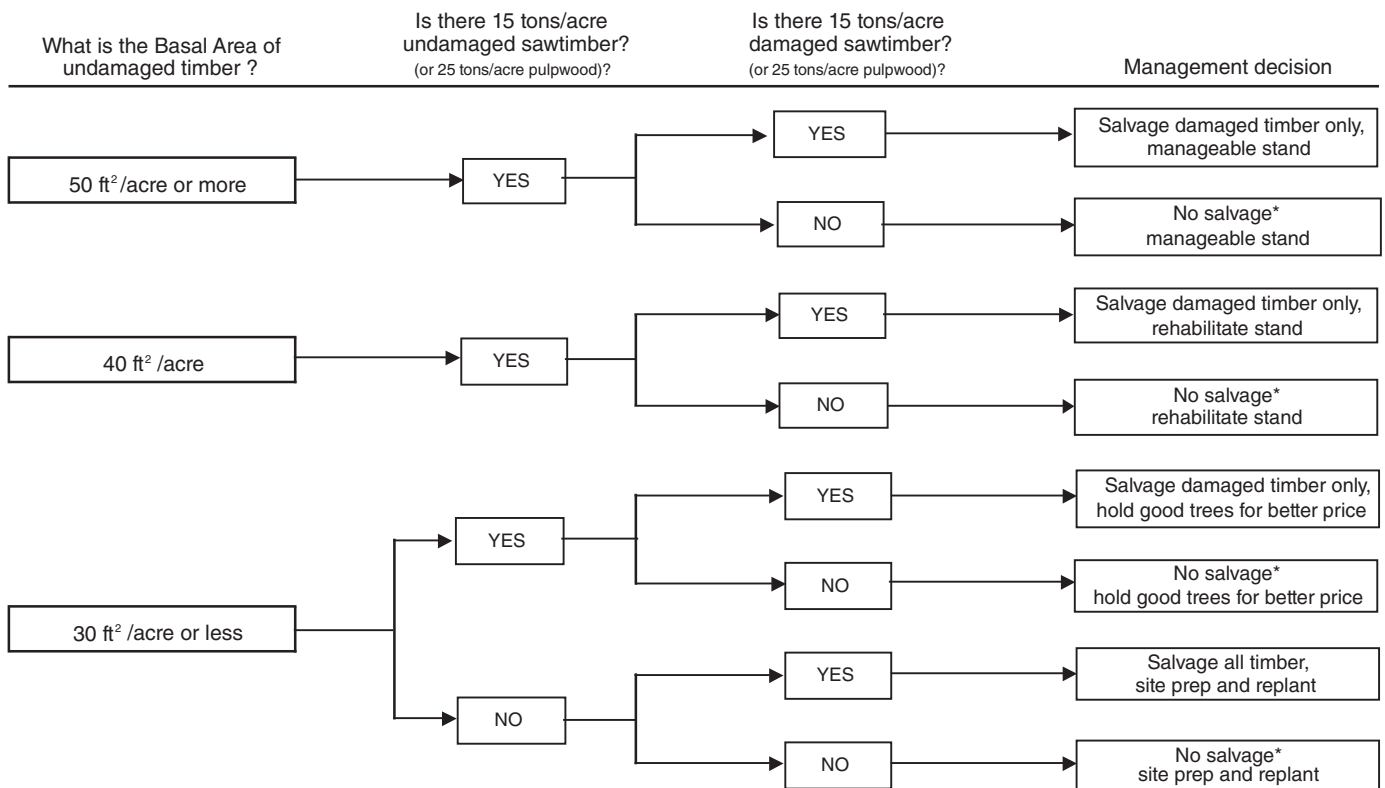
In the model 50 ft² per acre or more is deemed to be acceptable for management. It can be assumed for these stands that there is enough undamaged timber to continue managing this stand. Existing management plans should be adapted to changes in stand condition. This could include delaying thinning or harvest operations.

The threshold of 40 ft² per acre is the area of concern. These stands are borderline stands on management of the residual trees. Baker and others (1996) suggest that the lower limit of acceptable basal area for managed uneven aged stands is 45 ft² per acre. Stands with borderline residual basal area may be rehabilitated. Rehabilitation practices include but are not limited to, prescribed fire, fertilization, and herbicide release. All of these practices reduce the amount of

competition that the residual trees face in nutrient and water acquisition. Existing stand conditions, projected recovery rates (based on site quality and timber growth rates), landowner characteristics, and economic considerations can be used to make the decision between rehabilitation and management. If trees are of good form and vigor, then the stand might be rehabilitated and managed at lower initial costs that starting over with a pine plantation (Baker and Shelton 1998).

The threshold of 30 ft² per acre or less is deemed as unmanageable. The residual timber on these stands is considerably below the 45 ft² per acre basal area level that Baker and others (1996) recommends as the lower limit. The residual timber on these stands can be held for better prices or it could be harvested during a salvage operation.

Question 2: Will I be able to make a timber sale in the future when prices are better? This question can be answered by determining the volume (tonnage) of undamaged standing timber per acre. In order to have enough tonnage of undamaged standing timber there should be approximately one truckload to the acre. A truckload of timber/acre is approximately 15 tons of sawtimber or 25 tons of pulpwood. A minimum of one truckload per acre will make this a commercially feasible harvest operation.



* Insufficient tonnage to commercially harvest

Figure 1—Timber Management Decision Model.

Question 3: Do I need to conduct a salvage operation? The volume (tonnage) of damaged timber per acre needs to be approximately one truckload per acre (15-tons per acre sawtimber or 25 tons/acre pulpwood). Having at least this amount of damage will make a commercially feasible timber salvage operation. However due to many factors (limited logging force, limited time frame, increased logging costs, distance from mill, etc.) not all sites will be salvaged.

When evaluating timber stands, landowners should consider how residual trees are spread across the tract. One management option would be to create new stands in areas with low density of residual trees. New stands should be approximately 10 acres in size so that a commercially manageable stand is created. Healthy trees should be avoided during salvage operation, so that they can be sold later when prices have rebounded.

RESULTS

This information was considered time sensitive due to the fact that salvage operations should be conducted as quickly as possible. The Timber Stand Salvage Decision Model was disseminated to landowners using as many different media forms as possible. Media outlets included printed publications, PowerPoint presentations, radio programs, Internet sites, and news articles. The goal was to reach as many people as quickly as possible.

The first outlet of distribution was through a series of workshops that were conducted in 33 south Mississippi counties. Thirty-six workshops were held from mid-September to November. Workshops were attended by 2,245 landowners who owned 217,396 acres of timberland in Mississippi. Each person attending these workshops was shown a PowerPoint presentation detailing the model and given a printed copy. Landowners responded favorably to this model on workshop evaluations.

In addition, 4,400 copies were mailed to landowners as part of Hurricane Damage Recovery packets. The difficulty with this type of dissemination was many people were without mailboxes or regular postal delivery. However further north and west of the coast, this was an effective way of disseminating the model to landowners.

Better Farming Radio shows aired on October 6 and 11, 2005, which discussed the model and salvaging timber. Better Farming is a 5-minute radio program produced by the Mississippi State University Extension Service that is aired on 29 radio stations throughout Mississippi. These radio shows are also archived on the MSU-ES webpage.

In an effort to continue to reach landowners, Mississippi State University Extension Service published this information on their Disaster Recovery webpage. Another

Internet source that used this model was the Mississippi Forestry Association's Timber Recovery Blogspot. The weblog is an interactive message board that proved to be a very effective way to get timely information in the hands of landowners.

A news article was released on October 27, 2005; from the Mississippi State University Office of Agriculture Communications that discussed the steps landowner take in deciding what to do with their timber stands. This article was submitted to newspapers in Mississippi for their use.

Because Hurricane Katrina affected neighboring states and was closely followed by Hurricane Rita, this model was sent to the LSU Agricenter and the Texas Cooperative Experiment Station.

CONCLUSIONS

This model was developed to provide landowners with a guideline for making timber stand management decisions following a hurricane. The model was well accepted because of its simple process and ease of use. The other goal was to disseminate this information to as many people as quickly as possible. Using a wide variety of media sources and face-to-face meetings, needed information was quickly and effectively delivered to clientele in need.

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TIMELY RESPONSE TO NATURAL DISASTER HAS HUGE IMPACT

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Abstract—A “Timber Damage Recovery and Taxes” workshop was developed and delivered in response to one of the worst natural disasters in U.S. history, Hurricane Katrina. In Mississippi alone, this storm damaged \$1.3 billion worth of timber. Thousands of forest landowners were left trying to salvage the damage and estimate their casualty loss. In order to be effective, informational programs following such disasters must be delivered locally. The workshop included two parts: “Timber Damage Recovery” and “Timber Casualty Losses”. Presentations and packets of information were developed quickly so that within 3 weeks, programs were being presented. Over the next 6 weeks, 36 workshops were held in 33 counties throughout the hurricane-damaged area. Over 2,245 landowners, foresters, accountants, and other participants attended these programs. Landowners attending owned a total of 217,316 acres of forestland. Participants estimated that the information provided would help them earn an additional \$6.6 million from their forestland.

INTRODUCTION

Hurricane Katrina, the most expensive natural disaster in US history, landed on the Mississippi Gulf Coast on August 29, 2005. In Mississippi alone, Hurricane Katrina damaged \$1.3 billion worth of timber. The commercial volumes of damaged timber were 14.6 million cords of pulpwood and 3.2 billion board feet of sawtimber. This damage occurred on 1.3 million acres of timberland in 38 Mississippi counties. Non-Industrial Private Forest landowners (NIPF) own 68 percent of the timberland in Southeast Mississippi (Hartsell 1995). These landowners were left trying to salvage the damage and determine their casualty loss. In response to the needs of clientele a “Timber Damage Recovery and Taxes” workshop was developed.

The objectives of the “Timber Damage Recovery and Taxes” workshop were to present timely information to landowners in need, to be present in each county to show support, and meet landowners face to face giving them some hope of a better future. The workshop included two parts: “Timber Damage Recovery” and “Timber Casualty Losses”. Presentations and packets of information were developed quickly so that within 3 weeks, programs were being presented. A focused program that delivered the same message in each county allowed for a large number of workshops to be conducted in a short period of time.

METHODS

The “Timber Damage Recovery and Taxes” workshop was developed as a two hour, two-part workshop. The first part of the workshop “Timber Damage Recovery” was focused around salvage decisions and management of damaged timber stands. The second part of the workshop “Timber

Casualty Losses” was focused around timber taxes and casualty. The primary goal of this workshop was to provide clientele with as much information as quickly as possible following Hurricane Katrina. The second goal was to disseminate this information in as many different media sources and outlets as possible in South Mississippi.

Timber Damage Recovery

Landowners suffered a variety of types and amounts of timber damage in their forest stands. To begin the recovery process, landowners had to shift their attention from the damaged to the undamaged timber. The first major step in recovery was to develop a timber recovery plan. This plan challenged landowners to first and foremost evaluate the amount of undamaged timber on their stands, then assess the amount and types of damage, and finally develop their action plan.

While the destruction was the easiest things to see, landowners needed to focus their attention on undamaged timber in order to develop a recovery plan. The amount of standing timber was used to make future management decisions or determine if complete salvage operation was needed. Ultimately it was the undamaged timber that would dictate the future management options, and thus was the more important consideration.

Accessing the types and amount of damaged timber was extremely difficult. Types of damage (broken, twisted trunks, uprooted, and bent trees) had to be determined to effectively merchandize the damaged trees. Conducting the damage assessment as quickly as possible was paramount in order to preserve the value of the damaged trees.

The Timber Management Decision Model (fig. 1) was used to determine the need for a salvage operation. Based on

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past experiences with storm damaged timber in this region, landowners were given an estimated six to nine month window to complete salvage operations before drying and blue stain fungus degraded wood merchantability. Various species of “blue stain” fungi (*Chlorociboria* spp.) cause the wood of southern yellow pines to have a bluish stain reducing the lumber grade because of appearance. Since there was a limited time window to conduct salvage operations, landowners were encouraged to harvest the highest valued products first, followed by the stands with easiest access. Landowners were encouraged not to harvest their undamaged timber at salvage prices unless it was absolutely necessary. During this time timber stumpage prices fell to approximately half their pre-Katrina value due to the amount of timber available, limited logging force, and higher fuel and insurance costs (Daniels 2005).

Landowners were encouraged to revise existing management plans to incorporate rehabilitation practices for damaged stands. Prescribed fire, herbicide application, and fertilization were presented as possible options for landowners to increase growth on remaining timber stands.

Creating new stands and lumping heavily damaged areas together was another option that landowners could use

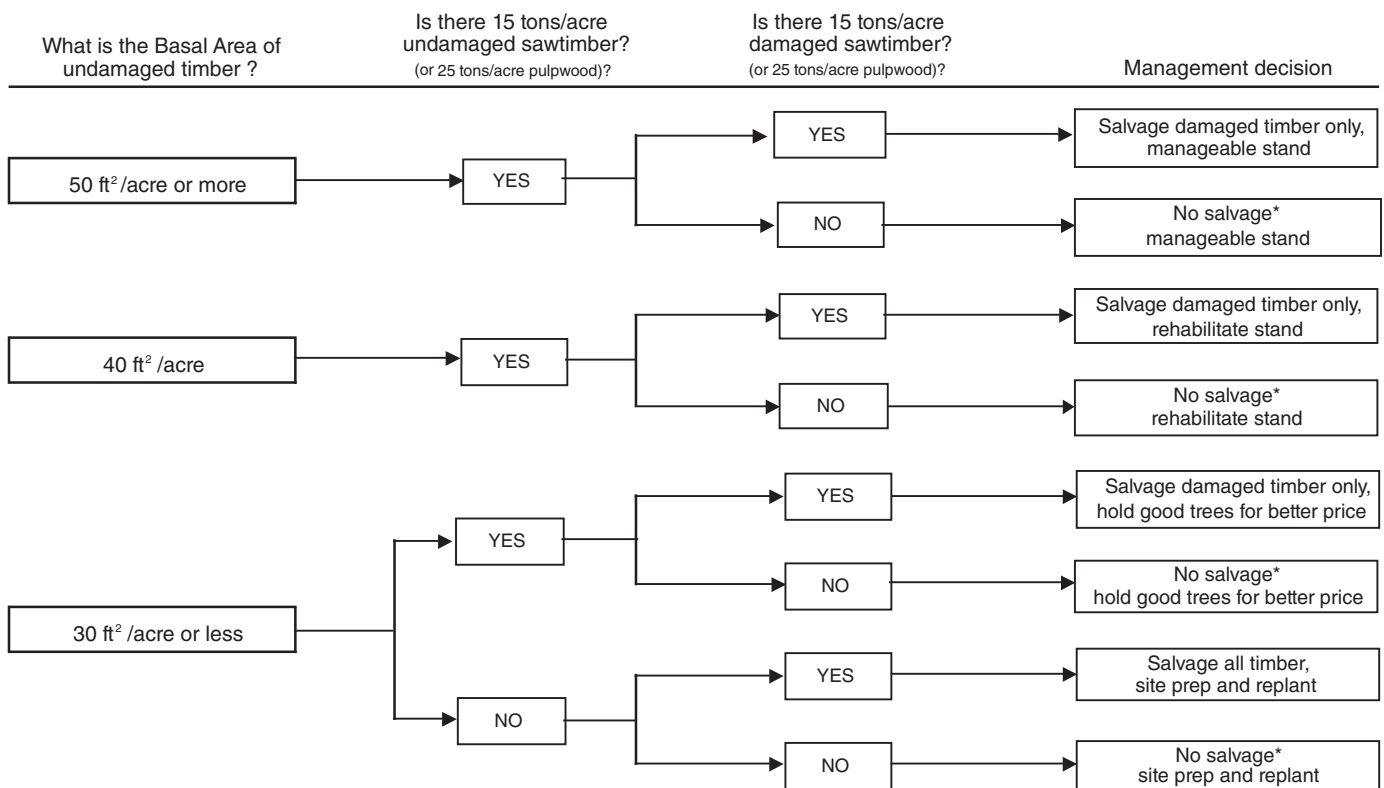
in continuing to manage these stands. Reforestation was encouraged on all areas that were completely harvested. Best management practices were recommended for all operations.

Timber Casualty Losses

Due to the incredible losses suffered by these landowners the second part of the workshop dealt with timber taxes and casualty losses. Casualty losses are defined as sudden, unexpected, or unusual losses resulting from natural or external events that leave the assets unfit for use (IRS 2005). Recovery of those losses is a three-part process that was covered during this part of the workshop.

The first step in determining the casualty loss is to determine the fair market value before the loss occurred. This can be accomplished by several methods. If the stand was completely salvaged the tons removed could be multiplied by the pre-Katrina price. An inventory of the damaged timber stands could be used with pre-Katrina prices. This will produce the fair market value of the timber before the storm.

The second step was to determine the fair market value of the timber after the loss occurred. This value is the stumpage



* Insufficient tonnage to commercially harvest

Figure 1—Timber Management Decision Model.

price paid for salvaged wood plus the decrease in market value of the undamaged timber (IRS 2005). Due to the reduction in timber prices, standing timber suffered a loss by approximately half its original value. To calculate the fair market value loss, subtract fair market value after the loss from fair market value before. Fair market value loss is the actual amount of a landowner's casualty loss.

The final part that the landowners needed in order to claim a casualty loss was his or her timber basis. A basis is simply the amount a landowner has invested in timber, or the fair market value at time of acquisition. If landowners were unsure of the timber basis for their property it was recommended that they use a forestry consultant to assist them in determining their basis.

Once the basis and fair market value loss are determined, a landowner can claim their casualty loss. The casualty loss is the lesser of the basis or the fair market value. Landowners were also encouraged to treat any salvage income as involuntary conversion and defer taxes through purchasing replacement property.

At the conclusion of the workshops landowners were asked to complete a simple evaluation of the program. Evaluations asked landowners for the number of acres owned and if this workshop would help them to earn or save money from their timberland. Evaluations across the region were compiled to produce the overall impact of the programming.

Upon completion of developing the programs, meetings had to be scheduled to present this information to landowners. In order to assist as many landowners as possible, all affected counties were contacted as soon as the situation would allow and the program was offered through the Mississippi State Extension Service's county offices. The local county personnel were responsible for providing a location and a team of Extension Foresters took turns conducting the workshops. All available media sources were used to advertise these programs. Scheduled programs were listed on the Mississippi State Extension Service website (msucares.com) and Mississippi Forestry Association's blogspot (msforestry.blogspot.com).

RESULTS

Hurricane Katrina caused significant timber damage (1 percent of county total timber inventory) in 38 of Mississippi's 82 counties. The Timber Damage Recovery

and Taxes workshop was conducted in 33 counties (87 percent) that sustained significant timber damage. Table 1 lists the dates, counties, number of attendees, acres owned, and estimated value of workshops to landowners. Beginning in mid-September, 36 workshops were conducted, with the last one occurring in late November. Over 2,245 landowners attended these workshops. Attendance per workshop ranged from 20-185 with a mean of 62. The landowners that attended the programs owned an average of 97 acres each. Total number of acres owned by all attendees was 217,396. The participants valued the information they received at these workshops at \$6,651,040 or an average of \$2,962.60 per attendee.

DISCUSSION

The Timber Damage Recovery and Taxes workshop was hugely successful for several reasons. The primary reason for the success of this program was the timeliness of the information that was delivered. Because most (68 percent) Mississippi timberland owners are non-industrial private landowners; they were particularly unprepared to deal with the most expensive natural disaster in US history and were left searching for answers on what their first step should be. The first workshop was held approximately three weeks after the storm. This delay was necessary because landowners' initial priorities following the storm were life and homes rather than timber.

Another reason that this workshop was successful was the personal, face-to-face method in which the meetings were conducted locally. During a time when technology enables distance learning and satellite classes, the importance of face-to-face programs cannot be measured. During and especially following the presentations, landowners asked many personal questions that could not have been addressed over a network system.

The landowners valued the information they gained from the workshop at \$6.6 million. The vast extent of the disaster and the large losses these landowners faced greatly increased the value of this workshop. Because of the many timber management and casualty loss decisions landowners faced they placed a high value on this information that guided them through the difficult recovery process.

Table 1—Questions facing landowners with salvage and management decisions

Date	County	Participants	Acres owned	Workshop value
				<i>dollars</i>
Sept. 15	Newton	30	NA	NA
Sept. 20	Scott	32	4,768	66,000
Sept. 27	Wayne	179	NA	NA
Oct. 4	Stone	30	NA	NA
Oct. 4	Greene	20	NA	NA
Oct. 4	Perry	35	NA	NA
Oct. 4	Jasper	110	NA	NA
Oct. 4	Lawrence	60	8,460	199,500
Oct. 6	Forrest	109	NA	NA
Oct. 6	Smith	91	10,389	404,000
Oct. 10	Simpson	68	6,942	362,500
Oct. 11	Wilkinson	37	11,992	224,500
Oct. 11	Jones	133	23,603	508,000
Oct. 13	Jackson	52	13,199	117,040
Oct. 13	Lincoln	185	18,217	576,500
Oct. 17	Hancock	23	3,153	150,000
Oct. 18	Pike	45	5,348	116,000
Oct. 18	Marion	80	NA	NA
Oct. 18	Jeff Davis	32	8,880	225,000
Oct. 18	Walthall	185	18,745	1,115,500
Oct. 20	George	49	4,840	181,000
Oct. 20	Covington	109	5,752	147,000
Oct. 20	Franklin	12	1,615	42,500
Oct. 24	Amite	20	3,600	94,500
Oct. 24	Lauderdale	49	11,724	164,500
Oct. 25	Pearl River	68	7,058	320,000
Oct. 27	Lamar	55	3,784	181,000
Oct. 27	Clark	48	5,705	388,000
Nov. 1	Harrison	26	1,982	205,000
Nov. 2	Neshoba	33	7,041	157,000
Nov. 3	Lamar	24	958	100,000
Nov. 7	Stone	62	5,633	57,000
Nov. 10	Leake	23	NA	NA
Nov. 15	Rankin	52	10,459	138,500
Nov. 17	Lamar	39	5,757	278,500
Nov. 29	Copiah	40	7,792	132,000
Total		2,245	217,396	6,651,040

CONCLUSION

Timber Damage Recovery and Taxes workshops were extremely successful because they provided the information many landowners were searching for as they began to recovery from a disaster. This information was presented at a critical stage when many people were searching for answers, and it was presented locally across the effected area. The 36 workshops helped over 2,245 landowners recover approximately \$6.6 million from their devastated forestland.

Natural disasters will at sometime impact every one of us. Being prepared and developing this information prior to the event would have allowed for a quicker response time. Disaster recovery information is something that each state should have prepared to allow for a quick response to the needs of clientele.

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PROVIDING SUCCESSFUL LEARNING OPPORTUNITIES THROUGH FORESTRY EXTENSION: AN INTERNATIONAL COMPARISON

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Abstract—In 1994 the International Union of Forest Research Organizations (IUFRO) created the Extension Working Party (EWP) uniting forestry extensionists from around the world. The IUFRO Extension Working Party hosted an international symposium in Troutdale, OR in 2003 entitled Building Capacity through Collaboration. As part of this symposium, 35 papers were presented from 11 countries, each focusing on a specific project or collection of methodologies that led to program success. In November 2004 a mail survey was sent to the 500 members of the IUFRO Extension Working Party, representing 70 countries, to determine the degree of use by working party members of the 45 successful strategies identified from the symposium. Sixteen strategies were identified as being important with regards to learners, who are made up primarily of forest owners and farmers. Of these sixteen strategies, seven were found to differ significantly across regions. With regards to the seven strategies most of these differences were seen in the developing countries of Asia, Africa, and Latin America. It is possible that socioeconomic conditions in this region demand a greater focus on programs in which learners are motivated towards meeting an immediate need for livelihood security.

INTRODUCTION

Cooperative Extension in the United States is the primary provider of informal education programs, which are available to all citizens. Extension is unique in that it is a public agency administered at the state level through land-grant universities; so most extensionists in the U.S. are members of an academic community. In other countries, extension is administered through government agencies, such as a national forestry agency (Baumgartner and others 2003). In the U.S. extension links education and research institutions with local communities through non-formal education (Seevers and others 1997). Much of extension's success lies in the fact that its programs are based upon the needs and expressed desires of people, and that the experience of learning is an important component. Learner-centered experiential education is an essential precept of extension education (Green and others 1993, Seevers and others 1997). A meaningful learning experience must have a clear purpose with well-defined outcomes, emphasize real-world problem solving, allow for the linking of new with existing knowledge, and build critical thinking skills, all of which culminates in the demonstration of a new behavior or skill (Andrews 2004, Etlng 1993). For adult learners, such as those who participate in extension education programs, it is the opportunity for direct application of knowledge and the personal empowerment that follows that affords meaning to the experience.

The theoretical framework of learner participation originates from Abraham Maslow's classic model of human behavior, the "Hierarchy of Needs" (1970). Maslow posits that human beings are creatures of perpetual need, and once they have satisfied one need (i.e. food, water, personal safety) they

become motivated to acquire another (i.e. social interaction). Within this framework, the desire to seek educational opportunities can be predicted. Extension education helps learners meet these needs in many ways such as teaching citizens to grow food or raise livestock, how to properly dispose of hazardous materials, or by providing volunteer opportunities that benefit the community (Seevers and others 1997).

The Maslow model of need-seeking behavior is often used as a guide for predicting participation in extension programs by helping educators understand learner motivations (Houle 1961, Seevers and others 1997). However, the foundations of human behavior and learning upon which extension is built does not always translate across cultures. Maslow's Hierarchy of Need may be applicable in developed countries, but in developing countries the values and meanings associated with meeting these needs is often quite different (Youmans 2005). There are a number of extension systems throughout the world, and though they all share some basic educational tenets, such as the non-formal transferring of information to voluntary participants and the promotion of a behavioral change, philosophical differences exist. These differences are often based upon socioeconomic considerations such as natural resource exploitation, poverty, and food supply (Lele 2002, Seevers and others 1997).

Extension has traditionally had a strong agricultural focus worldwide (Warner and others 1996). However, with growing international markets in environmental services such as biodiversity, clean air and water, timber products, and carbon credits, the health and sustainability of the world's forests has emerged as a significant international issue (Lele 2002). Growing out of the traditional agricultural focus (van den Ban and Hawkins 1996), forestry extension

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has emerged as a critical service to improve the management of forests and improve the livelihoods of forest owners and forest-dependent communities around the world (FAO 1986, Sim and Hilmi 1987).

For many forest-rich industrialized nations, forests are both a source of biodiversity and revenue, equally cherished for their intrinsic values as well as their commodity potential (Lele 2002). In contrast the emphasis that developing countries give their forests are often seen through a lens of socioeconomic development, and the conservation objectives are dependent on many factors including the level of resource exploitation, pressure from increasing populations, and economic development (Lele 2002, Walker and Peters 2001). For example, in India an estimated 200 million people are dependent upon forest resources for their livelihoods, yet severe poverty and an increasing population are resulting in rapid degradation of the nation's forests (Kumar and Saxena 2002). In Malawi, rural communities rely heavily on forests and forest products to meet their basic needs. But like India, chronic poverty coupled with a high birth rate and expanding population, puts incredible pressures on the country's forests (Walker and Peters 2001). The consequences of such socioeconomic conditions often lead to the use of unsustainable management practices, and ultimately to the loss of vital environmental services (Lele 2002). Given the global importance of forests, it behooves extension educators around the world to share ideas and strategies that have yielded success with the intention of expanding natural resource programs (Josiah 2001).

In 1994 the International Union of Forest Research Organizations (IUFRO) created the Extension Working Party (EWP) uniting forestry extensionists from around the world. The primary goals of the EWP are to serve as a forum for information exchange, promote the concept of extension through the transfer of knowledge and technology to improve the lives of people, improve the quality, quantity, and effectiveness of extension programs worldwide, and advance the quality and impact of research on extension methodologies (Johnson 2003). The EWP is comprised of extensionists from all over the world, each with responsibilities for educational program development and delivery, and very few in administrative roles.

The IUFRO Extension Working Party hosted an international symposium in Troutdale Oregon in 2003 entitled Building Capacity through Collaboration. As part of this symposium, 35 papers were presented from 11 countries, each focusing on a specific project or collection of methodologies that led to program success. From these papers 45 successful strategies were identified and placed into one of three categories: strategies associated with extensionists, with the educational approach, or with the learner. For discussions of those successful strategies associated with extensionists and with the educational approaches, see Johnson and others (2006) and Johnson and others (2007). This paper

will discuss those strategies associated with learners as described in the symposium papers. The learners are made up primarily of forest owners and farmers.

METHODS

Initially the intent of the Troutdale symposium was to develop a set of "best practices for forestry extension," however, the concept of best practices implies that the practices have been tested with different audiences and replicated over time. Instead, the 35 papers presented at the 2003 symposium were reviewed and a set of 119 "successful strategies" compiled. Through a process of combining similar themes the original set was reduced to 45 strategies in three categories: strategies associated with the learner (16), strategies associated with the extensionist (7), and strategies associated with the educational approach (22). The emphasis on successful strategies indicates that the strategy was featured in the paper, and in some way led to success of the program. Each category was then measured for reliability using a Cronbach's alpha (SAS 2000). The grouped strategies proved to be reliable measurements of consistency in the responses (Cronbach's alpha = 0.8273 for strategies associated with learners; Cronbach's alpha = 0.8024 for strategies associated with extensionists; Cronbach's alpha = 0.8739 for strategies associated with educational approaches).

Following the symposium, in August of 2004, an advisory group of representatives from the following agencies convened in Washington, DC, to provide additional advice and guidance to the project: Inter-American Development Bank; US Agency for International Development; Peace Corps; USDA Cooperative State Research, Education, and Extension Service; USDA Forest Service – International Programs; Virginia Tech (1862 Land Grant University); and Tennessee State University (1890 Land Grant University). This advisory group was comprised of individuals with both outreach and international experience, and served to identify any potential cultural and social biases on the part of the researchers. Through this group the concept of successful strategies was developed.

In November 2004 a mail survey was sent to the 500 members of the IUFRO Extension Working Party, representing 70 countries, to determine the degree of use by working party members of the 45 successful strategies identified from the symposium. The survey was implemented through two timed mailings: an initial mail contact including a cover letter and the survey and a reminder letter sent to non-respondents three weeks later along with another copy of the survey instrument.

Data were compiled into three regions: region 1 – United States and Canada; region 2 – Europe and Australia; and region 3 – Asia, Africa, and Latin America. The purpose

for these groupings was to combine areas together, based on geography, socioeconomic status, culture, and extension approaches. Country by country responses were often too limited to allow for robust comparisons.

Respondents were provided with the list of 45 strategies and then asked to rank whether they use the strategy often or sometimes, do not use the strategy but would like to, do not use the strategy because it does not apply, or have no opinion on the use of the strategy. Likert scale response data were analyzed using the contingency Chi square, with a significance level set at 0.05 (SAS 2000). Respondents were also asked to indicate what barriers existed for those strategies that they didn't use but would like to. Only those strategies and barriers associated with learners are discussed in this paper.

RESULTS AND DISCUSSION

Of the 500 survey questionnaires mailed, a total of 139 completed questionnaires were returned, for an overall response rate (completes/sample size) of 28 percent. There are any number of reasons for this low response rate. Language barriers, English language reading skills, cultural differences in idioms and expressions, and problems associated with international mail delivery are all potential pitfalls. Ordinarily a telephone survey of non-respondents would be carried out to determine any existing bias within the survey instrument. However, this was beyond the capacity of this project, given the differences in time zones and the costs associated with making International telephone calls. In addition, the availability of email communications and computer technologies are not consistent among all members, especially in developing countries. Therefore no attempt was made to reach non-respondents beyond the 3rd week follow-up letter. Nonetheless, we felt that enough responded to provide the foundation for a preliminary discussion of successful extension strategies used by those who responded. Certainly more research is warranted in order to make inferences beyond our respondent pool.

Demographics by Region

Region 1—North America

Respondents from North America comprised 50 percent (n=69) of the respondents across all regions. The majority were male with a mean age of 47 years (table 1). Eighty-eight (88) percent indicated that they were currently employed in extension forestry or a related field, and had been working in same for a median of 17.5 years. An overwhelming number of respondents had a Ph.D. (63 percent), and only 19 percent indicated any formal training in extension.

Table 1—Characteristics of survey respondents

	U.S. and Canada (n=69)	Europe and Australia (n=36)	Asia, Africa, Latin America (n=34)
Male (percent)	90	86	76
Female (percent)	9	14	24
Mean age (years)	47	46	47.5
Employed in forestry extension or related field (percent)	88	78	94
Median years employed (years)	17.5	11	15
Highest education degree (percent)			
High school/secondary	2	3	3
Bachelors	9	22	9
Masters	25	36	29
Doctorate	63	39	59
Formal training in extension (percent)	19	36	39

Region 2—Europe and Australia

Respondents in region 2 made up 26 percent (n=36) of all survey respondents. Eighty-six (86) percent were male with a mean age of 46 years (table 1). Approximately three quarters of the respondents in this region were employed in forestry extension or related field, for a median of 11 years. Thirty-six (36) percent indicated a M.S. as their highest level of education, and 39 percent had received a Ph.D. Of all respondents in region 2, 36 percent had formal training in extension.

Region 3—Asia, Africa, and Latin America

Respondents from Asia, Africa, and Latin America accounted for 24 percent (n=34) of the respondents across all regions. Seventy-six (76) percent were male and 24 percent female (table 1). Mean ages were similar to regions 1 and 2, at 47.5 years. Ninety-four (94) percent were currently working in forestry extension or a related field for a median of 15 years. Over 50 percent of region 3 respondents had a Ph.D., and 29 percent indicated a M.S. as their highest level of education. Thirty-nine percent of respondents indicated they had received formal training in extension.

In North America, 74 percent of all respondents were employed at a College or University, as opposed to 25

percent and 39 percent from Regions 2 and 3, respectively (table 2). For Europe and Australia, 55 percent indicated employment with a research institution and 39 percent for a government agency. Region 3 was similar to region 2, with 48 percent employed at a research institute and 27 percent with the government. Employment in a non-governmental organization (NGO), as a consultant or in industry made up less than 20 percent of respondents for all regions.

Successful Strategies

Sixteen strategies were identified as being associated with the learner and of these 16, responses did not differ significantly between regions for 9 of the strategies presented (table 3):

- Partition a broad audience into distinct learners groups based upon education, experience, and need.
- Involve learners as partners in the project.
- Allow opportunities for feedback from learners to extensionists.
- Engage learners in participatory objective-setting for programs.
- Focus initial efforts on early adopters.
- Engage learners in applied research.
- Build capacity of learners leading towards self-sufficiency.
- Empower learners to participate in policy developments.
- Formalize responsibilities of partners through agreements.

To our knowledge, these strategies have not been replicated with different audiences by any of the respondents; therefore we can not infer that these specific nine are time-tested best management practices for which one can predict success for all extensionists within each region. We can only observe that the responses did not vary across regions to any

Table 2—Employers of survey respondents

	Percent of cases		
	North America	Europe/Australia	Asia/Africa/Latin Am
Government agency	12	39	27
Research institute	6	55	48
College/university	74	25	39
NGO/consultants/industry	11	16	15
Total cases by region	72	51	47

significant degree. However, the Likert scale results suggest that these nine strategies were used often or sometimes by the majority of survey respondents. This assumes some consistency of success or the approach would not persist to the degree the data indicates. Conversely, seven of the strategies presented to survey participants appear to differ significantly by region (table 3). These strategies include:

- Hiring learners to work on local projects
- Making use of indigenous technical knowledge
- Emphasizing human welfare in educational programming
- Surveying target audiences to determine educational needs and barriers to adoption
- Facilitating peer-to-peer learning opportunities within target audience
- Using land owner-to-land owner training approaches where trainers are paid a fee
- Fostering a community-level involvement in programs

In order to facilitate discussion, and given that some strategies overlapped in their conceptual foundations, these seven were assigned to one of two categories that best described the relationship between extensionists and learners: 1) trust between learners and extensionists and, 2) facilitating learner adoption (table 4). Running a contingency analysis revealed the region that was contributing the most towards the calculated Pearson Chi-square, allowing for a more in-depth exploration of where the observed differences might lie.

Trust Building

The strategies associated with building trust between extensionists and learners were used more often by respondents from region 3; Asia, Africa, and Latin America (table 3). Forestry extension programs in developing countries are often driven by socioeconomic factors associated with poverty (Polansky and Heermans 2004, Smith and others 2003) and livelihood security, defined as the ability of a farmer to meet their nutritional needs, provide educational opportunities to their children, have good housing, good health, and access to quality water and a livable environment (Kaudia and Omoro 2001). The emphasis of human welfare within an extension program would certainly be an important consideration for the user in this case. In Maslow’s Hierarchy of Need, the drive to meet one’s basic physiological needs provides the foundation of the hierarchical pyramid. For someone in a developing country the assurance that a program will directly allow them to better meet this need is crucial. Building trust between educator and learner may encourage a willingness to participate in educational opportunities that lead towards self-sufficiency.

Table 3—Relative frequencies of the use or nonuse of strategies by respondents for each region

Strategy	Region ^a	----- percent response -----				Pearson χ^2	<i>p</i>
		Use often or sometimes	Don't use but would like to	Don't use not applicable	No opinion		
Hire learners to work on projects to build trust and spend funds locally.	1	23	26	41	10	23.31 ^b	0.003
	2	33	29	29	9		
	3	56	32	12	0		
Partition a broad audience into distinct learner groups based on education, experience, and needs.	1	62	15	17	6	5.92	0.656
	2	54	20	17	9		
	3	79	12	6	3		
Involve learners as partners in the project, not just as receivers of information.	1	78	12	7	3	6.40	0.602
	2	64	25	5.5	5.5		
	3	76	15	9	0		
Allow opportunities for feedback from learners to extensionists.	1	96	3	0	1	9.15	0.165
	2	89	8	0	3		
	3	82	18	0	0		
Engage learners in participatory objective setting for educational programs.	1 ^a	70	22	3	4	7.35	0.691
	2	64	20	8	8		
	3	74	23	3	0		
Make use of indigenous technical knowledge.	1 ^c	58	12	23	6	23.80 ^b	0.008
	2	61	14	11	14		
	3	97	3	0	0		
Emphasize human welfare in programs, such as improving the household standard of living.	1	54	9	28	9	24.35 ^b	0.002
	2	56	19	14	11		
	3	79	18	3	0		
Focus initial efforts on early adopters.	1	84	6	6	4	8.031	0.430
	2	75	19	3	3		
	3	73	18	9	0		

continued

Table 3—Relative frequencies of the use or nonuse of strategies by respondents for each region (continued)

Strategy	Region ^a	----- percent response -----				Pearson χ^2	<i>p</i>
		Use often or sometimes	Don't use but would like to	Don't use not applicable	No opinion		
Survey target audience to determine their needs, wants, and desires, and barriers to adoption.	1	91	9	0	0	25.33 ^b	0.001
	2	92	5	3	0		
	3	94	0	3	3		
Facilitate peer-to-peer learning opportunities within the target audience.	1	81	17.5	1.5	0	25.91 ^b	0.001
	2	61	17	3	19		
	3	82	15	3	0		
Engage learners in applied research.	1	69	16	15	0	10.63	0.223
	2	69	17	11	3		
	3	82	18	0	0		
Use landowner-to-landowner training approaches in which the trainers are paid a fee.	1 ^c	17	28	49	4	21.02 ^b	0.020
	2	39	17	27	17		
	3	41	23	30	6		
Foster community-level involvement of the learners.	2	54	20	19	7	26.01 ^b	0.020
	3	47	14	17	22		
	3	82	15	0	3		
Build capacity of learners to lead toward self-sufficiency.	1	81	9	6	4	13.68	0.090
	2	59	22	11	8		
	3	91	9	0	0		
Empower learners, so that they may participate in the development of policies that affect them.	1	72	13	12	3	5.71	0.679
	2	74	14	6	6		
	3	62	23	12	3		
Formalize the responsibilities of partners through agreements.	1	53	16	25	6	13.50	0.095
	2	47	8	39	9		
	3	70	3	18	9		

^a Region 1 = North America; Region 2 = Europe and Australia; Region 3 = Asia, Africa, and Latin America.

^b Significant at alpha = 0.05.

^c Missing value due to nonresponse.

Table 4—Categories of strategies describing extensionist and learner relationship

Building trust between extensionists and learners	Facilitating learner adoption
Hire learners to work on projects	Survey target audience for needs, wants, and barriers to adoption
Make use of indigenous knowledge	Facilitate peer-to-peer learning
Emphasize human welfare in programs	Use land owner-to-landowner training, in which trainers are paid a fee
	Foster community level involvement

Leading towards the building of trust, the hiring of local learners to work on extension projects that benefit the local community, not only encourages local spending of funds, but also creates the potential for future collaboration between extensionist and learner. Although the data suggest this strategy was more important for respondents in the developing world, it has also been used successfully in reaching indigenous communities in the United States (Bardon 2003).

Closely related to targeting underserved indigenous communities with extension programming is the integration of indigenous knowledge into natural resource management. The use of indigenous knowledge in educational program development is quickly moving into the mainstream. Indigenous knowledge has emerged as a significant component in sustainable natural resource management, as well as increasing community capacity (Ball 2004, Nemarundwe 2004, Ross and Pickering 2002, Tarun-Acay 2003), and designing indigenous community-focused research projects (Gibbs 2001, Menzies 2004). Over 90 percent of all Asian, Africa, and Latin American respondents indicated the importance of using this strategy, while about 60 percent of respondents in North America and Europe and Australia indicated the same (table 3). As a matter of fact, 23 percent of respondents in North America said that it was not an applicable strategy. This does not necessarily indicate that the strategy isn't considered an important one, given the specific circumstances there may be little indigenous knowledge available in the areas served by these respondents. Nonetheless, this is an approach that has traditionally played more of a role in developing countries, given the nature of extension in these locations. But even in the developing world the use of indigenous knowledge has been overshadowed by a decidedly Western science paradigm. As the integration of indigenous knowledge into the domain of education and technology transfer continues,

new practices and approaches will undoubtedly emerge, strengthening the relationship between the learner and the educator (Polansky and Heermans 2004, Ross and Pickering 2002).

Facilitating Learner Adoption

Over 90 percent of respondent in all regions indicated the use of surveying target audiences to identify needs, wants, and barriers to adoption (table 3). However, the statistical analysis suggests a significant difference between regions. A contingency analysis suggests that the U.S. and Canada are contributing most significantly (cell Chi-square = 15.69). All respondents in this region specified the importance of this strategy, although some did not use it, but indicated that they would like to. This strategy appears to be very important for the vast majority of respondents, suggesting that educational programs based upon learner needs and desires are the most effective across all regions.

Peer-to-peer learning opportunities are generally successful under many socioeconomic conditions, especially in areas with rapidly dwindling resources (Muok and others 2001). Part of the success may be the integration of indigenous knowledge, its ability to directly address local needs, and the relevance to the local economy. A distinct advantage of peer-to-peer approaches is that local landowner "trainers" can often provide necessary information to learners who may be reluctant to depend on "outsiders" as a reliable source of information (Muok and others 2001).

The provision of peer-to-peer learning opportunities was a well-used strategy for respondents in the U.S. and Canada (81 percent) and Asia, Africa, and Latin America (82 percent), and just over 60 percent in Europe and Australia. Yet 19 percent of respondents in Europe and Australia indicated they had no opinion regarding the use of this strategy. A relatively large percentage of respondents in this region were employed with a research institute (55 percent) or a Government agency (39 percent). There is some research that suggests the attitudes of the scientific communities in Europe and Australia towards the validity of indigenous knowledge are not necessarily favorable, and that these attitudes are reinforced through government policies (Ross and Pickering 2002). This might result in the perspective that peer-to-peer learning might not be a successful or even an appropriate strategy. Indeed, many rural communities in the developing as well as developed countries are familiar with top-down approaches towards natural resource management, but as institutional structures and policies surrounding extension change, there may be a shift in the direction of programs towards more community-based approaches (Gibbs 2001, Kaudia and Omoro 2001, Nemarundwe 2004). Participatory approaches to decision-making are thought to be the most effective in terms of the acceptance, ownership, and accountability of stakeholders (Singletary and others 2000, Weber 2000, Wondolleck and

Yaffee 2000). The same has been shown for collaborative approaches to program planning in extension (Bardon 2003, Beck and Krafft 2003, Sisman and others 2003). Tarun-Acay (2003) suggests that "...local communities, when organized, trained, equipped, empowered and provided with security of tenure over public forests develop a stake in the forest resources and are motivated to protect and manage them." Whether this shift from a top-down to a more grassroots approach to facilitate adoption will develop in Europe and Australia is unknown.

Fostering community-level involvement was an important strategy for 82 percent of the respondents from Asia, Africa, and Latin America (table 3). Again, it appeared to be the least successful approach for respondents in Europe and Australia (47 percent), for perhaps some of the same institutional reasons mentioned previously. For respondents in the U.S. and Canada, even though just over 50 percent designated this strategy as being one they practice regularly, 20 percent indicated that they did not currently use it but would like to. There may be a number of obstacles to encouraging community-level involvement in developing extension programs. One constraint might be the availability of resources, both financial and human, to effectively organize and implement such an approach (Sisman and others 2003). Or it may be difficult for the extensionist to gain trust and develop a rapport with the community (Tarun-Acay 2003). Bardon (2003) experienced this with the Potawatomi Nation because of a negative experience the community had with a previous extensionist. It took some time, but eventually he was able to rebuild the trust and establish a successful collaboration with the tribe.

Barriers to Strategy Success

In the field of extension, barriers are often defined in terms of how they impact the adoption of new management practices. For example, barriers to adoption might include the perceptions of local communities to the superiority of a new technology, how easy it is to use, and how it fits in with local customs, values, and experiences (Josiah 2001). Through open-ended questions we asked survey respondents to indicate what barriers, if any, they had to using any of the strategies we presented. Responses were quite varied across all regions. Most of the barriers cited were situational in nature, involving time or money constraints. The most commonly mentioned strategies for which respondents experienced barriers centered around the hiring of learners to work on projects to build trust and spend funds locally. Barriers included the lack of funds to pay learners, the mistrust that funds would indeed be spent locally, and the lack of educated learners that could do the work. In fact, a lack of available resources and disagreements over how available funds should be spent were very common barriers

identified for many strategies. Other general barriers include lack of trained personnel and time constraints.

CONCLUSIONS

A primary goal of the IUFRO Extension Working Party is to improve the quality and effectiveness of extension programs world-wide, and to share those ideas and strategies that have yielded success. Using this goal as a foundation, this study sought to identify whether there exist a suite a successful strategies that might be applicable for extensionists world-wide.

It appears that many strategies for engaging learners in extension programs derived from the IUFRO symposium held similar importance for many of the respondents, regardless of region. For nine out of the original sixteen, there were no observable differences. These strategies were strongly focused on program development and included the identification of different learner groups and learning styles, using participatory methods for developing program objectives, allowing opportunities for feedback from learners to extensionists, focusing programs on early adopters, and building capacity of learners towards self-sufficiency. These strategies are fundamental to nonformal adult education and are focused towards the learner. Revisiting Maslow's Hierarchy of Need, these approaches might be associated with more learning oriented objectives of social affiliation and self-esteem. In contrast, with regards to the seven strategies for which there appeared significant differences, these were primarily program delivery methods that focused on facilitating adoption. Many of these differences were seen in the developing countries of Asia, Africa, and Latin America, where the socioeconomic conditions may demand a greater focus on programs that help to meet an immediate need for livelihood security – approaches that more closely address the foundation of Maslow's pyramid. Contrast this with the United States; where the classic model of innovation adoption provides the foundation for adoption strategies. This model, formally named innovation diffusion, describes the adoption process as starting with a small number of landowners who are quick to adopt innovative technologies or products. The innovation is then diffused from these initial users out to other landowners, especially neighbors. The model assumes a certain degree of equity among landowners and that the benefits stemming from the innovation spread out equally among all involved. This may be an invalid assumption for developing countries where the distribution of wealth may not be equitable.

We must caution that the degree of success of these strategies is being determined by the perceptions of one set of actors (the extensionists) regarding the predicted behaviors of another (the learners). Without actually

surveying the learner population, we can only make loose inferences regarding the actual effectiveness of the strategies. Nonetheless, we assume that the repeated use or non-use of a strategy is based upon its demonstrated effectiveness and/or situational appropriateness; and although we can identify successful strategies we cannot determine the way in which success is measured within each region, or within each individual country, or by each individual respondent. Measured success may depend upon the socioeconomic conditions, cultural norms and political institutions of the location, as well as the entity responsible for administering extension programs.

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THE SEVEN BASINS PROJECT: A CASE STUDY OF EXTENSION LEADERSHIP IN COMMUNITY WILDFIRE PLANNING

Max Bennett and Gail Perrotti¹

Abstract—Extension plays an important role in reducing the threat of wildfire through design and delivery of educational programs targeting wildland-urban interface (WUI) residents. A complementary role, utilizing Extension’s expertise in community organizing, is to assist stakeholders in developing community wildfire protection plans. This paper presents a case study of community fire planning, the Seven Basins Fire Planning Project. The Seven Basins is a populous 250,000-acre watershed in southwestern Oregon with a long history of wildfire. The project was initiated and led by local Extension faculty. We began by convening a steering committee of key stakeholders, including federal and state agencies, fire protection districts, and a local watershed council. We secured funding for a half-time project coordinator. We held a series of community meetings, facilitated 85 neighborhood meetings, published five issues of a newspaper on wildfire-related topics, and developed a Community Wildfire Protection Plan (CWPP). Project outcomes have included on-the-ground fuels reduction, improved neighborhood cohesion, and greater interagency coordination. Conservatively, the neighborhood meetings have directly stimulated several hundred acres of fuels treatments, based on results of a follow-up survey of neighborhood meeting participants. Several cooperative fuels reduction projects involving BLM and adjacent private owners have been completed or are underway, and more than \$400,000 in grants from the National Fire Plan and other federal sources have been obtained. A third party evaluation of the wildfire newspaper revealed that 35 percent of those who recalled receiving it (representing over 700 people) said they took specific fire prevention/fuels reduction measures after reading it.

INTRODUCTION

Wildfire has played an integral role in the development and maintenance of forests and other ecosystems for millennia. In much of the United States, however, decades of fire exclusion have resulted in a substantial buildup of fuels. When fires occur, they are often uncharacteristically severe compared to those of the pre-exclusion era. In addition, many fire-prone areas have experienced an influx of new homes and other developments. Minimizing the threat of wildfire to lives and property in this wildland-urban interface (WUI) zone has become a major public concern (National Fire Plan 2002).

Extension plays an important role in educating WUI residents about steps they can take to protect their homes and properties through fuels reduction, firewise landscaping, and use of appropriate housing materials. Typical educational programs and products have included brochures, videos, publications, toolkits, and workshops (Monroe, 2000; Monroe, Jacobson, and Bowers, 2003; Creighton, Baumgartner, and Gibbs, 2002). A complementary role, building on Extension’s strengths in facilitation and convening diverse interests around a common problem, is to lead community-based efforts to develop a wildfire protection plan. Community fire planning involves a variety of local stakeholders and is widely viewed as critical to improving preparedness for wildfire in the WUI (National Fire Plan 2004). The Healthy Forest Restoration Act (HFRA) of 2003 provided a major stimulus to such planning efforts. Under HFRA, communities can significantly

influence fuels reduction activities on federal lands and adjacent private lands through development of a Community Wildfire Protection Plan (CWPP). A CWPP provides a blueprint for prioritization and coordination of hazardous fuels reduction activities. Potential benefits include improved coordination and collaboration and accelerated fuels reduction. Increasingly, communities must have a CWPP in order to secure grant funds for fuels reduction. In addition, under the HFRA, federal agencies such as the Bureau of Land Management (BLM) have incentives to consider local community priorities, as reflected in a CWPP, “...as they develop and implement forest management and hazardous fuels reduction projects” (SAF 2004). This paper reports on a case study of Extension involvement in a community wildfire protection planning effort, the Seven Basins Project.

SITUATION

The Seven Basins is a 250,000-acre watershed in Jackson County, Oregon, one of the state’s most fire-prone areas. The watershed is characterized by rugged topography, heavy fuels, and a checkerboard ownership pattern, with alternating sections of federal and private land. There are about 3,300 rural households in the watershed and two small incorporated towns of approximately 2,900 people. Since 1970, the Seven Basins had experienced more than 1,400 wildfires, including three over 5,000 acres in size (fig. 1). During these fires several homes were destroyed,

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many hundreds were threatened, and one life was lost. In addition, large areas of the watershed suffered significant resource damage, including loss of trees and wildlife habitat, accelerated soil erosion, flooding, road damage, and so forth. The majority of the fires were human-caused, with a few originating from arson.

Prior to the initiation of the project described in this paper, several wildfire protection activities were taking place in the Seven Basins watershed. The watershed's largest landowner, the Bureau of Land Management, had completed a number of hazardous fuels reduction projects, mostly involving brush and understory thinning, adjacent to WUI neighborhoods. The State Forestry Department, which provides fire protection to private, state, and BLM lands in the watershed, had recently secured National Fire Plan funds and helping local residents create defensible homesites through a cost-share program. Three fire prevention districts also provided service to the area, although about 10 percent of the residences were outside fire district boundaries and thus had no formal structural fire protection. Despite these important efforts, there was no coordinated effort to engage

residents, neighborhoods or the community as a whole in wildfire protection planning. Perhaps this was because area residents had a reputation as being some of the most difficult to reach and engage in the county. Our experience was that Seven Basins residents placed a high value their privacy and were often suspicious of agency "agendas."

The Seven Basins project was begun with the idea that community wildfire planning should be a "bottom-up" process rather than "top-down." We hoped to engage watershed residents at the neighborhood level, inviting them to participate in planning efforts that would directly benefit them. Nevertheless, involving agency stakeholders was crucial. Consequently, we convened a steering committee with representatives from the state forestry agency, the Bureau of Land Management (BLM), and the Seven Basins watershed council, a local citizens group. The three local fire districts were invited to participate but were unable to due to staffing limitations. Nevertheless, we solicited their input throughout the planning process. In addition, we secured a grant for a pilot project and hired a half-time FTE project coordinator.

Seven basins wildlife assessment

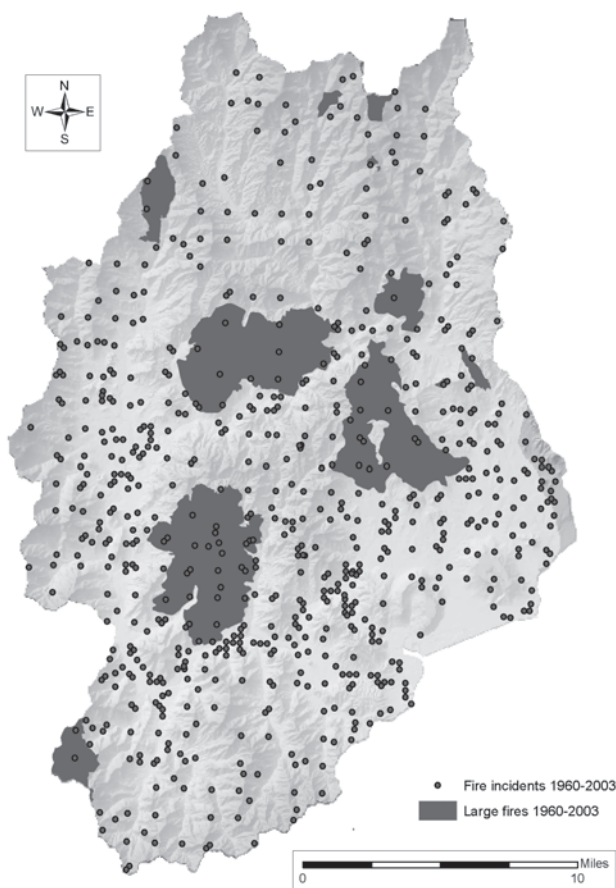


Figure 1—Recent (1970 to present) fire history, Seven Basins watershed. The area has experienced more than 1,400 fires since 1970, including 3 greater than 5,000 acres in size.

The Project's goals were to:

- Educate rural homeowners in the watershed about fire-safe practices
- Improve wildfire preparedness and emergency communications within neighborhoods
- Promote fuels reduction and coordinate projects on a neighborhood level
- Improve interagency coordination

PROJECT ACTIVITIES

Getting Started: Community Outreach

In February 2003, we mailed a newspaper on wildfire-related topics to all 3,300 rural household in the watershed, informing them of the project and inviting them to participate in a one of three community meetings. The meetings were held at local schools during weekday evenings. After introductory remarks and a brief presentation regarding defensible space, participants were invited to break into neighborhood groups to discuss common concerns and interests around wildfire. Neighborhoods were defined in most cases by small watershed boundaries (e.g., all residents in the Sardine Creek canyon) and consisted of anywhere from a dozen households up to about 300 households. These larger neighborhoods were later split into sub-groups. For a few residents, this was the first time they had met some of their neighbors. Volunteers from the watershed council and agencies were recruited and trained in advance to facilitate the groups. Attendance at the meetings

ranged from about 25 to 75, a low, but not unexpected, turnout. It was enough to recruit about ten neighborhood “hosts” for subsequent fire planning meetings. We also recruited a few hosts who responded to an article about neighborhood fire planning in the wildfire tabloid.

Neighborhood Outreach

Thus began an intensive round of neighborhood outreach. Working with the host, the project coordinator convened a series of informal meetings with neighborhood residents, sometimes at a resident’s house, often in a neutral location such as a fire station or school. The meetings were advertised through a flyer and/or phone calls to neighbors. Neighborhoods ranged in size from a few households up to several dozen. There were no formal criteria related to size or other factors – we worked with whoever was interested. Participation ranged from a smattering of neighbors up to about 50 percent of the households in a given neighborhood. Usually a core group of neighbors could be counted on to attend most of the meetings (three to four were held in most neighborhoods). These were often the neighborhood “sparkplugs” – individuals or couples who were vocal, well known in the neighborhood, and typically had a strong interest in wildfire-related issues.

What happened at the neighborhood meetings? Typically, the Project Coordinator started by helping residents identify values at risk and hazardous fuels concerns. The concerns were typically homes, power lines, bridges, steep slopes, brushfields, and so forth. In many cases, fuel loads on adjacent BLM lands were identified as major issues. Specific areas of concern were identified on aerial photos and taken back to the project steering committee. When possible, staff from the state forestry agency, fire districts, and/or BLM was invited to attend the meeting and interact with residents. In several cases, this resulted in initiation of new fuels reduction projects on BLM lands. These are discussed in more detail below. Individuals were also asked to sign up for homesite consultations made by the state forestry agency. Many of these consultations subsequently resulted in cost share fuels reduction projects with homeowners.

Communications during wildfires, both between neighborhood residents and between residents and agencies, was also a major topic at neighborhood meetings. Typically, the Project Coordinator assisted residents with creating neighborhood phone trees for use in wildfire (and other) emergencies. She also recruited neighborhood dispatchers, who would maintain the phone lists as well as a list of neighborhood resources such as pump chances and fire equipment. Phone lists were passed on to the state forestry agency as well as the local fire districts.

Other wildfire related issues were addressed and solutions found whenever possible. Examples included developing plans for evacuation of animals, concerns about the spread

of wildfire from campfires on BLM waterfront property, and forgotten burn piles in a railroad right of way.

From spring 2003 through spring 2005, 85 neighborhood meetings were held. Twenty-one neighborhoods were involved in planning, representing nearly 400 residents owning more than 6,000 acres. Thus about 10 percent of the rural households in the watershed participated directly in some level of neighborhood planning. The 6,000 acres managed by neighborhood meeting participants represented only a small fraction of the total acreage of the watershed (250,000 acres), but did include a significant portion of the more densely populated areas within the WUI. A large percentage of the watershed includes forests managed by BLM or private timber companies without any homes.

Wildfire Education: Diverse Approaches

We wanted to reach the many watershed residents who did not participate directly in neighborhood planning. Our primary tool was an 8-page newspaper. We published five editions of the newspaper over a two-year period and mailed them to all rural households in the watershed (except those on farm land, where wildfire hazard was not an issue), about 3,300 in all. Each issue focused on a theme (e.g., “getting ready for fire season,” “taking care of hazardous fuels”) but featured short articles on a variety of topics. We wrote articles ourselves and solicited pieces from agency partners as well as community members. To increase appeal, we used many photos, maps, and other graphics. After publishing the fall 2005 issue, we conducted a phone survey to assess the impact of the newspaper on resident awareness of fire issue and behavior. Results of the evaluation are discussed below.

In addition to the newspaper, we sponsored more than a dozen workshops on fire-related topics, such as fire safety and piling and burning 101. We also delivered two train-the-trainers session for fire plan volunteers and neighborhood dispatchers.

Creating a Community Wildfire Protection Plan (CWPP)

The Seven Basins project partners focused initially on neighborhood-level outreach and planning, not creating an over-arching fire plan. Their intent was to promote strong community involvement, support, and ownership for localized fire planning and fuels reduction in the watershed. However, it became apparent a CWPP was need in order to (1) facilitate a more strategic approach to fuels reduction in the watershed, (2) improve interagency coordination and collaboration with private organizations and individuals, and (3) increase proficiency in securing fuels reduction grants through the National Fire Plan and other sources.

The CWPP was written by the Seven Basins steering committee, under the leadership of Extension. It

incorporated data and expertise of the Oregon Department of Forestry and the Bureau of Land Management. All three fire districts gave important input both through meetings to study risk assessment data and through field surveys. Residents' concerns and other data were gathered at the 85 neighborhood fire planning meetings. Additional input was collected through reviews from a variety of agency personnel, the Seven Basins Watershed Council, and community members.

To facilitate the prioritization process, we conducted a risk assessment incorporating a variety of spatial data such as fire hazard (fig. 2), ignition risk, and locations of completed treatments, using GIS software (ArcMap). The risk assessment helped identify neighborhoods within the watershed where limited resources can be most effectively focused to reduce the threat of wildfire. The plan was reviewed and signed off by Jackson County, the State Forestry Agency, and the three local fire districts.

Seven basins wildlife assessment

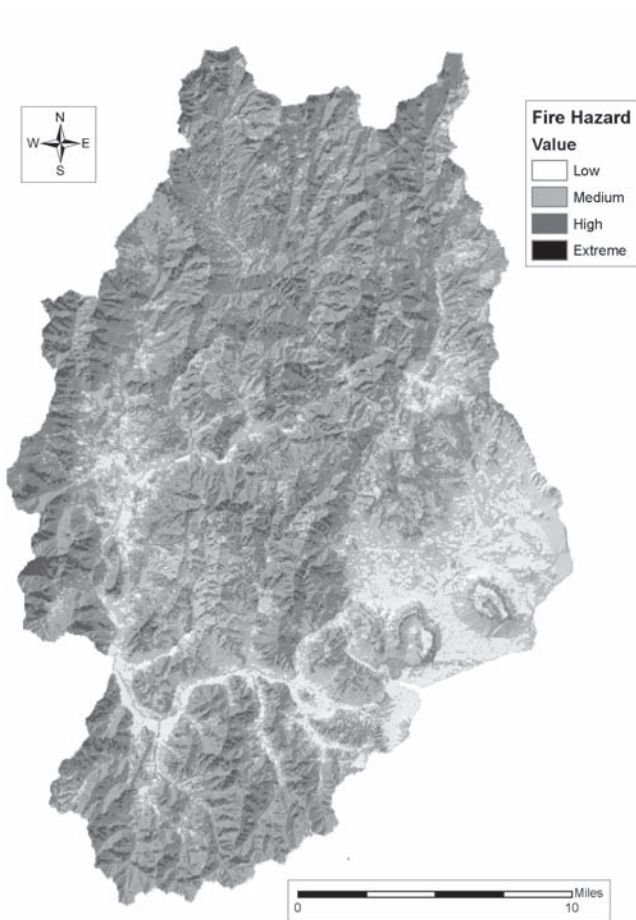


Figure 2—Relative fuel hazard in the Seven Basins watershed, based on vegetation, slope, and aspect. Data such as these were critical in prioritizing areas for fuels reduction treatments.

Getting Funded

We secured grants to support the outreach, planning, and education components of the project as well as for on-the-ground fuels reduction. The project coordinator's salary and costs associated with the newspaper and developing the CWPP were funded with three grants from Jackson County, totaling approximately \$90,000. Working with the Southwest Oregon RCD, a non-profit, we obtained a \$130,000 federal grant to fund fuels reduction in high priority neighborhoods in the watershed. In addition, the steering committee worked with the State Forestry Agency, the applicant, to secure two National Fire Plan (NFP) grants totaling over \$300,000, also for fuels reduction. The fact that we were developing a CWPP and prioritizing areas for treatment was critical to our success in obtaining NFP funding.

EVALUATION AND IMPACT

Evaluation of Neighborhood Fire Planning Meetings

In August 2005, 100 of the meeting participants were mailed a letter inviting them to participate in an on-line survey about their experience with the process. 35 surveys were completed by the deadline (response rate of 35 percent). No effort was made to contact non-respondents. We suspect that respondents were more likely to perceive the fire planning process favorably than non-respondents. Notable results included the following:

95 percent of respondents agreed or strongly agreed with the statement that “participation in the neighborhood fire planning meetings has helped me to make more informed judgments about fuels reduction treatments.”

81 percent agreed or strongly agreed that “participating in the neighborhood fire planning meetings has helped me to feel more confident in the ability and desire of government agencies to implement fuels reduction programs in my neighborhood and the surrounding area.”

82 percent said the neighborhood fire planning meetings were a moderately or very important factor in motivating them to complete defensible space or other fuels reduction work. Of this 82 percent, 45 percent had removed or reduced hazardous fuels since the meetings, totaling 87 acres. An additional 33 percent were planning to do so. 73 percent had talked to their neighbors about hazardous fuels problems in the neighborhood of mutual concern. 39 percent had removed hazardous fuels along roads or driveways, and 24 percent had cleaned gutters, moved woodpiles, screened vents, and completed other key fire prevention activities.

Not all neighborhood planning efforts were successful, but of the 21 neighborhoods we've worked with, at least 16 are

still meeting, updating their phone and resource lists, and many are continuing with hazardous fuels reduction.

Survey comments included:

“My husband and I thought this was an extremely valuable program or we wouldn’t have gotten involved and gotten neighbors involved....a big THANK YOU...”.

“[A] strong network has been developed because of neighborhood meetings, working on getting reluctant neighbors to be more involved.”

“This is a great program. It’s a very effective way to motivate people like me to take action.”

“It has been invaluable in educating us for fuel reduction and safety.”

Other comments we’ve received on neighborhood fire planning include the following:

“We have lived here for 9 years and really haven’t had the opportunity to meet many of our neighbors until our neighborhood fire meetings. Hopefully the day will never come when we have an emergency such as a wildfire, but we would not be on our own now that we have seen how many neighbors are willing to help each other out in that time of need. With a communications link and wonderful neighbors will to help we have a good start if a disaster strikes.”

“Neighborhood fire planning was very beneficial to our sense of community and awareness of the fuel load problem.”

Evaluation of Wildfire Issues Tabloid

An important aspect of our educational strategy was the publication of five issues of an 8-page newspaper tabloid focusing on wildfire-related topics. We worked with agencies and a local newspaper publisher to develop a product that was focused and informative. The use of many photos and graphics and color on four of the eight pages increased the visual appeal. As an example, topics in a recent edition included “Don’t Wait Until The Last 15 Minutes,” “Understanding Fire Behavior: A Key to Defensible Space,” and “Wildfire – Are You Prepared?” We served as editors and contributed several articles for the newspaper. The tabloid was distributed to all rural watershed residents (around 3,300).

We hired the OSU survey research center to conduct a telephone survey of a random sample of 100 watershed residents who were sent the newspaper. Three hundred one call attempts were made to get 100 completed interviews. Unsuccessful call attempts fell into several categories such as no answer, busy signal, bad phone number, and refusal. Of the 100 individuals surveyed, 55 percent recalled getting

the newspaper. Of this 55 percent, about 80 percent read at least some of it and 26 percent read all of it. Eighty-three percent found it somewhat or very useful, 50 percent discussed it with others and 50 percent saved it. Notably, 35 percent said they took specific fire prevention/fuels reduction measures after reading it.

We also asked neighborhood meeting participants about the newspaper in the on-line survey (this represents a group more likely to be interested in wildfire issues than the average watershed resident). When asked about the newspaper, 94 percent of the respondents recalled getting it. Of this 94 percent, 94 percent found the content moderately or very useful, 68 percent discussed it with friends and neighbors, and 74 percent said they took action as a result of reading the newspaper. These actions include starting or completing defensible space (38 percent) or other fuels treatments (34 percent), and contacting the Department of Forestry to request a homesite consultation (19 percent).

ODF, BLM, fire districts, and other agencies have requested multiple copies of each issue to distribute to their clientele. The Medford fire district requested permission to reprint the winter 2005 edition of the tabloid in its entirety to send to all of the rural residents in its district; another fire district wants to reprint articles from the tabloid.

Other Project Impacts

We have coordinated one neighborhood fuelbreak project (a fuelbreak is an area where hazardous fuels have been reduced, although a forest canopy is typically maintained), totaling nearly 400 acres, involving both private and Bureau of Land Management parcels. Two additional projects are underway, and more are in the planning stages. This has involved bringing neighbors together, including many who were strangers at the start of the process, and getting residents to work cooperatively with BLM, overcoming, in at least a few cases, significant distrust. These are the first projects of their kind in the Seven Basins watershed. Another cooperative effort initiated and coordinated through the project includes fuels reduction adjacent to five private access roads, completed in conjunction with Job Council youth crews. The project enjoys strong support from partners:

“The biggest benefit [of the project] to the BLM is the trust we have built in the area...When we first went into neighborhoods, the perception was that it’s all BLM’s problem....Now, there’s a perception that it’s everyone’s problem, and BLM is willing to do something. We’ve built some trust – that wasn’t there before.” - Fuels Planner, Medford District, Bureau of Land Management

“An excellent project in community and public agency cooperation...the planning process has generated support from the community for fuels reduction projects and enhanced fire fighter safety.” – Fire Planning/Grants Coordinator, SW Oregon District, Oregon Department of Forestry.

CONCLUSIONS AND REFLECTIONS

The Seven Basins Project addressed several important needs in one of southern Oregon’s most fire-prone watersheds: reducing hazardous fuel, improving neighborhood collaboration, and improving interagency coordination. Through a variety of educational tools, intensive neighborhood outreach, development of a Community Wildfire Protection Plan, and facilitation of an interagency team, we have seen impacts both on the ground and in terms of the less tangible, but still critical dimensions of communication and cooperation among residents and between residents and agencies.

However, not everything worked well. For example, some of the neighborhood planning efforts simply failed to jell or fell apart after a couple of meetings. This was due, perhaps, to personality conflicts, turf battles, suspicion about agency “agendas,” and all the other factors that go along with working with people. In other cases, residents’ interest in fuels reduction was aroused, but the slow pace of projects, miscommunications, or occasional failure of key personnel to show up at meetings resulted in a loss of interest in pursuing projects. In addition, many residents were frustrated at the perceived lack of action taken by their federal neighbor, BLM. While BLM was actively developing and implementing landscape-scale fuels treatment projects in the watershed, they manage literally hundreds of individual parcels, many adjacent to private lands with homes, and not every one can be treated in a short timeframe. Within the steering committee itself, challenges included personnel changes, confusion about roles, and lack of time, especially when participation in the project was not part of a member’s job description. Finally, despite the activities of the steering committee and substantial outreach, the project as a whole was not as visible as it could have been, both within the agencies and in the local community. A key oversight was our failure to work with the local media to get the word out about the project, initially, and as the project evolved.

Following are some thoughts about working with rural landowners on neighborhood-scale planning.

Owner Concerns and Perspectives

- Owners respond most to perceived threats, not opportunities to collaborate – with other neighbors, or with agencies.

- So, many will take action to reduce risks from wildfire on their own properties – but fewer will work together to create a neighborhood fuelbreak, unless the benefits can be clearly communicated. Many don’t necessarily want to cooperate with neighbors (or even talk to them).
- Privacy is a huge issue. Owners don’t necessarily want to give out information about their property, or have other people come on it. Keeping it “in the neighborhood” is important.
- Privacy concerns are also important in fuels reduction. For example, in many cases it would be optimal from a fuels standpoint to treat vegetation along roads and driveways. However, these strips of vegetation are also visual screens, and keep out noise and dust.
- Desire for privacy can outweigh need for safety (both in terms of fuels and communication).
- Many owners are not too fond of “government” and often don’t understand why agencies do what they do - there is a built-in suspicion that must be overcome. But, with patience and perseverance, agency staff can build productive relationships with local residents. Face to face contact and consistency are important.

Working with Neighborhoods

- Many neighborhoods have a “sparkplug” - a person who knows everyone else, is energetic, and vocal. Getting this person involved in a neighborhood fire planning project is extremely helpful.
- In every case, we only worked in neighborhoods where we were invited in, at least by one resident. The process worked best when this person fit the “sparkplug” description.
- Some neighborhoods are simply more cohesive than others; these make the best candidates for neighborhood fire planning.
- The process can be slow, cumbersome, and time consuming. The same things may need to be explained again and again, especially as new neighbors become involved. There are meetings and more meetings. Agencies work slowly; projects may take a long time to materialize. Being realistic, not overly optimistic, about these timeframes is important.
- A skilled outreach person is essential. Ideally, this person is a local resident and is not perceived as an outsider. The outreach person must be assertive and a skilled facilitator, flexible, and a good listener. When the process works well, this person becomes a trusted advocate for the neighborhood.

- Although outreach is time consuming and potentially expensive, it is essential. Unfortunately, it is harder to get funding for outreach and education than for on-the-ground work, even though the latter depends on the former.
- Despite these hurdles, the process can work very well. The results are not only evident on the ground or in the forest, but also in the sense of community and spirit of cooperation can develop.

ACKNOWLEDGMENTS

We thank the other members of the Project Steering committee for their commitment to and perseverance with this project: Leanne Mruzik, Bureau of Land Management, Teresa Vonn and Travis Ryan, Oregon Department of Forestry, Bill Collins, Paul Howell, and Marty Burreson, Seven Basins Watershed Council, and Amy Wilson, Southwest Oregon Resource Conservation and Development Council. The success of the project would not have been possible without the many Seven Basins residents who participated in the neighborhood planning process.

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GETTING SCIENCE OUT—A BOSTON MOUNTAINS FOREST UNDERPLANTING TOOL ONLINE

Martin A. Spetich, Daniel C. Dey, and Jim Lootens¹

Abstract—Scientists typically publish research results in scientific journals in formats, language, and styles that are not always useful to many professional and general public users. To address this gap in technology transfer, we developed a method to get research published in journal articles out to a broader spectrum of users. This paper uses a study of oak regeneration to illustrate how scientific information can be conveyed to the user in a more useful, applied way. Due to the quantitative and complex technical nature of the published model, its usefulness was limited mainly to scientists and others who have skills in statistics and computer programming. To communicate these research results to non-scientists we developed an interactive, Internet-based version of the oak regeneration model which we named the Oak Underplanting Success (OAKUS) model. Foresters can use OAKUS online to evaluate combinations of alternative silvicultural treatments (i.e., shelterwood harvest, underplanting oak seedlings and controlling competition) before they actually start the regeneration process <http://ncrs.fs.fed.us/oakus/>. Using the OAKUS model can reduce the need to invest in post-harvest remedial measures. It also can be used to teach the fundamentals of regeneration ecology and to introduce silvicultural methods. This work represents a major technology transfer effort, delivers research results to resource managers on demand, and provides a management decision tool that can improve the quality of resource decisions. Between January 2003 and January 2008, there were 13,844 successful page requests for OAKUS.

INTRODUCTION

As scientists, we are encouraged to report results primarily in scientific journals. However, due to the complex nature and importance of scientific work we need to make greater effort to get this science out to the public in a more useful format. In this paper, we explain how we did that through a simple process that we used to transfer results from research on oak regeneration. The result is an accessible Internet-based program managers can use to predict planting success under different conditions.

The example research that we use examined the success of northern red oak (*Quercus rubra* L.) seedlings that had been underplanted in shelterwoods. In 2002 we developed a model of oak regeneration for the Boston Mountains of Arkansas, which was published in *Forest Science* (Spetich and others 2002). The model explains the dynamic and complex relationships of hardwood reproduction following stand disturbances. However, due to the quantitative and complex technical nature of the published model, its usefulness was limited mainly to scientists and others who have skills in statistics and computer programming. We felt that a new way to effectively communicate these research results to non-scientists was needed. With an easily accessible and interactive model, foresters would be better able to evaluate combinations of alternative silvicultural treatments (i.e., shelterwood harvest, underplanting oak seedlings and controlling competition) for regenerating oak before actually initiating the regeneration process. We developed an interactive Web-based tool we named the Oak Underplanting Success (OAKUS) model.

METHODS

We developed and followed a simple 4-step approach to technology transfer. This consists of (1) doing the science and publishing results in an appropriate journal, (2) developing technical transfer presentations of the work and obtaining feedback, (3) developing a technology transfer publication of the research, which practitioners can easily understand and use, and (4) for complex models, developing an interactive management decision tool that is widely accessible (this incorporates results of steps 1 through 3).

Our study examined the relationship of northern red oak seedlings and competing vegetation over an 11-year period in Arkansas' Boston Mountains forests. Planted oaks were considered successful if they became dominant or codominant trees in the developing forest stand 11 growing seasons after planting (8 growing seasons after shelterwood removal). The study was implemented with shelterwood creation in the fall of 1986 and subsequent underplanting of over 4,000 northern red oak seedlings in April 1987. Planted trees and their competitors were remeasured after 11 growing seasons as well as in intervening years. For study details, see Spetich and others (2002) and Spetich and others (2004).

RESULTS

Original study results were published in *Forest Science* (Spetich and others 2002). Those results are expressed as the

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probability that a planted tree will successfully compete with other trees to attain a dominant or codominant position in the future tree canopy. In summary, this dominance probability depends on initial seedling stem caliper (diameter) before planting, site quality expressed as site index, weed control intensity, and shelterwood percent stocking. The probability of success increases with decreasing shelterwood stocking, decreasing site quality (measured as site index), increasing initial stem caliper, and increasing intensity of woody competition control. The reciprocals of the dominance probabilities provide silviculturally useful estimates of the numbers of trees that would need to be planted to obtain, on the average, one competitively successful tree in the future.

To further refine our understanding of the needs of resource specialists, we presented results at ten meetings through oral presentations and at one meeting using a poster. Through feedback from conversations at those meetings, we determined that managers needed and wanted more information to help them implement the underplanting method. In response we developed a technology transfer publication that presents this information in more accessible language and with new graphics (Spetich and others 2004). In the recommendations section of that publication, we provided practical management methods for optimizing success of underplanted northern red oak seedlings and to reach future stocking goals. In part we accomplished this through a simplified six-step process that practitioners can use to implement the underplanting method. Although this provided more accessible information for practitioners and specific steps to implement the method, it did not fully address the complexities of the oak regeneration model.

Due to the complexity of the oak regeneration model, its application was only completely available to scientists and others who had skills in statistics and computer programming. A new design was needed to more effectively deliver these results to managers and others who wanted to use this model to develop plans for oak underplanting. To address this need, we developed an interactive, Internet-based version of the models that we term the OAKUS model. OAKUS is available from the Internet site <http://ncrs.fs.fed.us/oakus/>. The introductory page of the site briefly explains oak underplanting, introduces OAKUS, and provides links to related publications (fig. 1).

Users desiring a more immediate interactive experience of the OAKUS interface can go directly to the OAKUS program by clicking on “Start using OAKUS” (fig. 1). For those who prefer further information, we provide greater detail on the study, as well as an example scenario to help users understand the applicability of OAKUS (figs. 2 and 3). For non-practitioners, we also provide a glossary and hyperlinks to terms throughout, thus broadening the usability of the site. The page describing how to use OAKUS was deliberately kept brief to accommodate quick use of the program (fig. 4).

The OAKUS interface requires only six essential input variables that describe site quality (site index), seedling quality (initial stem caliper), the degree of woody competition control (competition control), shelterwood density (percent stocking), desired number of successful trees per acre and whether or not the shoots will be clipped (shoots) (fig. 5).

After entering the six variables, the user clicks on the “submit” button to run the data through the OAKUS model. For example, if the input variables were site index = 55, initial stem caliper = 1, competition control = two herbicide treatments, 40 to 60 percent stocking, the target trees per acre = 100 and shoots are clipped, then OAKUS would return the window in figure 6 below.

The “management suggestions” in figure 6 are brief and to the point. Based on the input variables, in the last paragraph the program reveals that 134 trees would need to be planted in order to obtain the target number of successful trees per acre that she entered (100) 11 years after planting. The field practitioner can combine that information with planting recommendations also provided on the OAKUS Web site. The Web site also includes links to find related publications, a search box, and other Forest Service, U.S. Department of Agriculture links. Instructors can use the OAKUS interface to teach the fundamentals of regeneration ecology and to introduce students to silvicultural methods.

The potential impact of this work has been exhibited by the interest in the OAKUS model. For instance, from January 2003 through January 2008 there were 13,844 successful page requests for OAKUS. Nearly one-half of the page requests originated from commercial search engines while searches through Federal Web sites were the second most used search tool (fig. 7).

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Oak Underplanting Success Program

Search

- ▶ North Central Research Station
- ▶ Introduction
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- ▶ How to Use OAKUS
- ▶ Examples
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St. Paul, MN 55108

Southern Research Station
200 W.T. Weaver Blvd,
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www.srs.fs.usda.gov

Introduction

Planting oaks under shelterwoods is an important but often overlooked tool for maintaining and restoring oaks in eastern forests. Studies in several regions have demonstrated the potential usefulness of the method. In an 11-year study of the growth and survival of planted northern red oak (*Quercus rubra*L.) seedlings (2-0 bare-root), we found that survival and growth increased with decreasing shelterwood stocking, increasing initial stem caliper, and increasing intensity of woody competition control.

One result of this study is an interactive Web-based program (OAKUS) that tells you how many trees to plant in order to produce one successful tree at a specified future time. All you need to do is enter specific tree information, treatment information, and site-specific environmental variables

Forest Science Article:
Spetich, M.A., Dey, D.C., Johnson, P.S., and Graney, D.L. 2002. Competitive Capacity of *Quercus rubra* L. Planted in Arkansas' Boston Mountains. For. Sci. 48:504-517.

A Technical Transfer "How To" Article:
Spetich, M.A., Dey, D.C., Johnson, P.S., and Graney, D.L. 2004. Success of underplanting northern red oaks. In Spetich, Martin A. (ed.) Proceedings, Upland Oak Ecology Symposium: History, Current Conditions, and Sustainability. Gen. Tech. Rep. SRS-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 206-211.

Start using OAKUS

[Study >>](#)


Figure 1—Introductory OAKUS page. All blue, underlined text is hyperlinked.

- ▶ North Central Research Station
- ▶ Introduction
- ▶ Study
- ▶ How to Use OAKUS
- ▶ Examples
- ▶ OAKUS
- ▶ Glossary
- ▶ Planting
- ▶ Recommendations

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Study

Results of an 11-year study of the growth and survival of planted northern red oak (*Quercus rubra* L.) seedlings (2-0 bare-root) in the Boston Mountains of Northern Arkansas are presented. More than 4,000 seedlings were planted under shelterwood overstories that were harvested 3 years after planting. Results are expressed as planted-tree dominance probabilities.

Dominance probability is the probability that a planted tree will live to attain a favorable competitive position (i.e., at least 80 percent of the mean height of dominant competitors) at a specified year. We interpret the resulting probability as a measure of the competitive capacity of an individual seedling, i.e., its potential of attaining dominance in a specified environment.

Based on our logistic regression analysis, we found that dominance probabilities increase with time after shelterwood overstory removal for any given environment and initial seedling characteristics. At any specified time, dominance probabilities depend on initial seedling stem caliper before planting, site quality, intensity of competition control, and shelterwood percent stocking. Dominance probabilities increase with decreasing shelterwood stocking, increasing initial stem caliper, and increasing intensity of competition control. Other factors being equal, top clipped seedlings have higher dominance probabilities than unclipped seedlings. The reciprocals of the dominance probabilities provide silviculturally useful estimates of the numbers of trees that would need to be planted to obtain, on the average, one competitively successful tree.

For example, if clipped seedlings averaging 1/4 in. in stem caliper were planted where oak site index was 79 ft, shelterwood stocking was 80 percent, and the site was given no competition control before or after planting, obtaining one competitively successful tree 11 years after planting (8 years after shelterwood removal) would require planting 144 seedlings. April 28, 2006 caliper to 7/8 inch would require planting only 5 trees to obtain one competitively successful tree. For the same size (7/8 inch) and type of seedling planted on site index 60 ft under a shelterwood at 40 to 60% stocking and given two competition control treatments, only 1.4 trees would need to be planted. Results emphasize the sensitivity of competitive capacity, and thus the silvicultural potential, of planted northern red oaks in the Interior Highlands to the joint effects of field environment and initial seedling characteristics.

Through the use of logistic regression, we examined the struggle between planted seedlings and their competitors, and evaluated the importance of seedling size, site quality and intensity of competition control to seedling success in order to develop

Figure 2—Part of our one-page explanation of the study.

- ▶ North Central Research Station
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- ▶ Study
- ▶ How to use OAKUS
- ▶ Examples
- ▶ OAKUS
- ▶ Glossary
- ▶ Planting
- ▶ Recommendations


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Examples

Dominance probability is the probability that a tree will survive and become a [dominant](#) or [codominant](#) tree a given number of years after planting or shelterwood removal. For example 0.6 means that 60 percent of the trees will survive and become [dominant](#) or [codominant](#) trees.

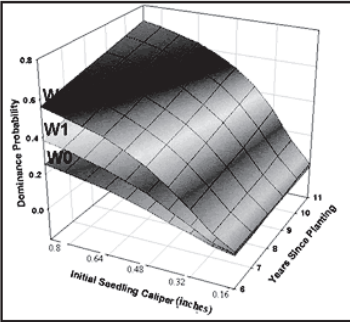
Example Scenario

A forester is regenerating a stand using the [shelterwood](#) method. She would like to have 100 stems of reproduction per acre that are free to grow ([dominant](#)) in the new stand 11 years after planting (8 years after the shelterwood overstory removal). The red oak [site index](#) is 62. The [percent stocking](#) for the [shelterwood](#) will be 40 - 60%. She wants to know how many seedlings of what [stem caliper](#) she should use to achieve her desired number of trees per acre. Using OAKUS, she obtains the following results:

	No Competition Control					
	Not Clipped			Clipped		
	0.25	0.5	0.75	0.25	0.5	0.75
Stem Caliper (in.)	0.0385	0.191	0.2989	0.0469	0.2248	0.3438
Required Number	2597	524	335	2132	445	291

	With Competition Control Twice					
	Not Clipped			Clipped		
	0.25	0.5	0.75	0.25	0.5	0.75
Stem Caliper (in.)	0.1321	0.4728	0.6183	0.1576	0.5243	0.6656
Required Number	757	212	162	635	191	150

By selecting larger seedlings and top clipping them, she can dramatically decrease the number of seedlings needed to achieve her target trees per acre. Start using [OAKUS](#)



How Management Affects Dominance Probabilities

Example of the relationship of years since planting, seedling stem caliper and dominance probability for a shelterwood at 40 to 60 percent stocking with clipped seedlings, and a site index of 60 ft.

W0 - No Competition Treatment
W1 - One Competition Treatment
W2 - Two Competition Treatment

Start using [OAKUS](#)

<< Hot to use Oakus | OAKUS >>

Figure 3—An example page with an example scenario of using OAKUS. For more numerically oriented users we provide summary tables and for the graphically oriented user we provide a graphic summary.

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Oak Underplanting Success Program

Search

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How to use OAKUS

To use OAKUS, you will need the following information:

- [site index](#) – your forester or county soil survey can provide this information. For OAKUS, acceptable values are 52 to 79 ft. This is the range of site indices in which the study was conducted.
- Initial [stem caliper](#) of the seedlings you will be planting. Acceptable values are 0.15 to 1.0 in. This is the range of calipers in which the study was conducted.
- [Competition Control](#): two herbicide treatments, one treatment, or no treatment.
- [Percent stocking](#) – the residual stocking left when the shelterwood was created.
- Shoots – whether or not you will top clip the seedlings prior to planting. [Top clipping](#) gives the trees a slightly higher probability of success.
- Target Trees Per Acre – the number of successful trees you would like to have by year 11. A successful tree is one that survives and attains at least 80 percent of the height of dominant competitors.

Just enter this information into the designated boxes in OAKUS then click on the Submit button. Your stand and management specific information will be processed and the program will generate a recommendation window for your use.

Start using [OAKUS](#)

Figure 4—Brief introduction on using OAKUS.

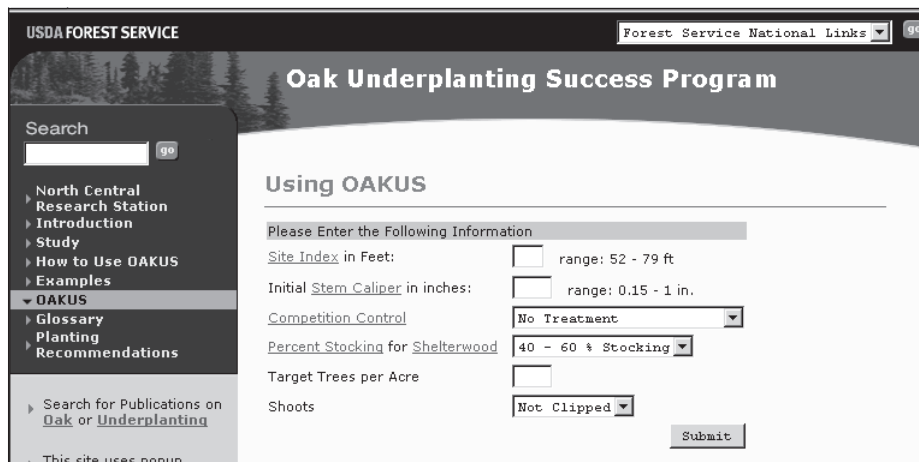


Figure 5—The OAKUS program interface.

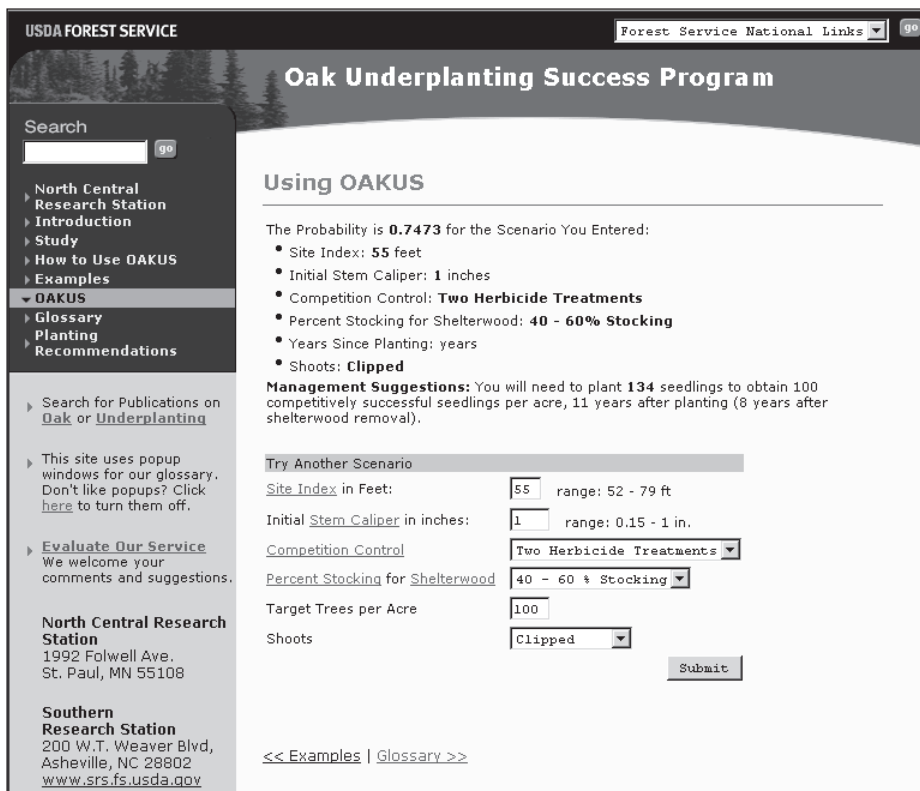


Figure 6—An example of information returned from OAKUS after submitting: site index = 55, initial stem caliper = 1, competition control = two herbicide treatments, 40 to 60 percent stocking, the target trees per acre = 100 and shoots are clipped.

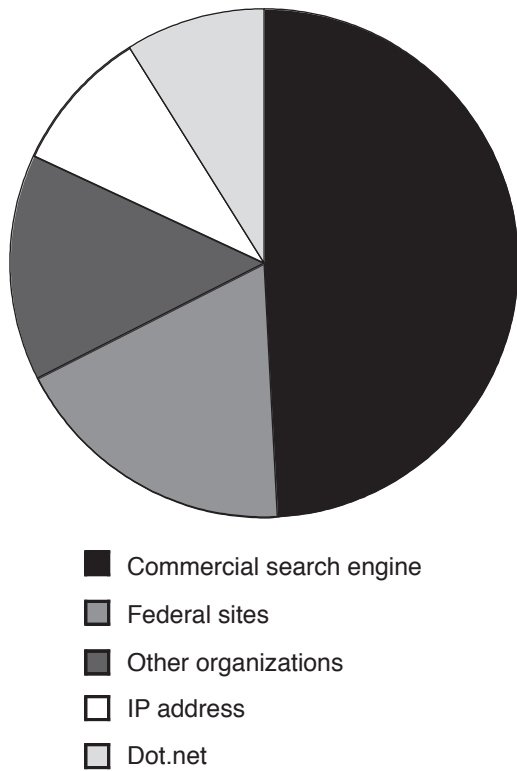


Figure 7—Of the 13,844 successful page requests for OAKUS 6,824 were commercial (.com) search engines, 2,526 were Federal Web sites (either ending in fs.fed.us or .gov), 2,001 were other organizations—there were 361 organizations, 1,272 were linked to Internet Protocol (IP) addresses and 1,221 were search engines ending in .net.

CONCLUSIONS

We used published research results to introduce a simple 4-step process that resulted in OAKUS, an interactive Web-based product for managers to use to reach oak regeneration goals. OAKUS represents a relatively new technology transfer effort, delivers research results to resource managers and others on demand, and provides a flexible management decision tool that can improve the quality of resource decisions. The Web site includes information explaining the study and terminology for new users, provides examples, and introduces an accessible program interface.

Resource managers (and others) can use the Web-based model to evaluate alternative silvicultural treatments for regenerating oak—before shelterwood creation and underplanting—and predict the future success of various underplanting options. Use of the OAKUS model can reduce the need to invest in post-harvest remedial measures. OAKUS also can be used to help teach the fundamentals of regeneration ecology and to introduce students to silvicultural methods.

Through this process we not only get science done in a way conducive to scientific progress, but we also are getting science out to non-scientists in a useful, practical, applied way!

ACKNOWLEDGMENTS

We thank all of the meeting participants that provided feedback during technical transfer presentations.

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THE CROSSETT EXPERIMENTAL FOREST—72 YEARS OF SCIENCE DELIVERY IN THE SILVICULTURE OF SOUTHERN PINES

James M. Guldin¹

Abstract—The network of experimental forests and ranges within the Forest Service, U.S. Department of Agriculture has unique attributes for research, demonstration, and technology transfer. Public forest lands experience a slower rate of ownership change than private forest lands, and this provides greater stability for long-term research studies and demonstrations over time. Experimental forests provide an ideal way to view, test, and display new technologies and tactics for different silvicultural practices. Few experimental forests in the South embody these attributes more than the Crossett Experimental Forest in Ashley County, AR. It was established in 1934 from a donation of 1,680 acres of land by the Crossett Lumber Company to the Southern Forest Experiment Station. The mission was to study new silvicultural practices to restore and manage second-growth loblolly and shortleaf pine stands, and to share that knowledge with forest managers and landowners throughout the South. This approach has been unusually effective at Crossett Experimental Forest, where U.S. Forest Service researchers have published more than 1,000 articles on forest management and silviculture, and hosted more than 45,000 foresters, students, landowners, and university staff in tours of its renowned demonstrations and research studies.

INTRODUCTION

The Forest Service, U.S. Department of Agriculture, supports 77 experimental forests and ranges across the United States and its territories (Adams and others 2004) with 19 in the territory of the Southern Research Station (fig. 1). These facilities were established at varying times over the past 100 years by Forest Service chiefs, as lands were made available for experimentation in major forest types to support research and demonstration in ecology, management, silviculture, wildlife, hydrology, and other fields. These experimental forests, to varying degrees, have become outstanding models of science delivery and technology transfer over time, supporting field days, short courses, workshops, and visitors that collectively number in the hundreds of thousands. The ability to maintain long-term research studies and then also to deliver the science from these studies to the public is a unique feature of this network of Experimental Forests and Ranges. This is due to several attributes these sites generally share.

Stability of Ownership

Over time scales measured in decades, lands in the Federal domain have greater stability of ownership than lands in either the industrial or non-industrial private forest sector. Long-term studies often face an initial threat to their continued maintenance and measurement when land ownership changes. Scientists who are responsible for long-term studies often find that ongoing study plans require modification when the land on which a study is located changes owners, to better conform to the ownership goals of the new landowner. At the extreme, new forest landowners may decide that continued cooperation in maintaining a

long-term study is not in their best interest, in which case the study would be closed. The comparative rate of change in land ownership over six decades in two well-known silvicultural studies in Ashley County, AR (table 1) reveals a rate of ownership change on the forest industry land base that is not uncommon for studies of this duration in the region.

The permanence of the Federal commitment to experimental forests and ranges also allows the Forest Service to make investments in mission, budget, and staffing at these locations that, while not guaranteed in perpetuity, nevertheless offer greater stability than in the private sector in three key elements. The first is the stability of the research mission conducted by the research work unit with which the experimental forest is associated, which in itself provides a scientific basis to justify long-term investment. The second is the infrastructural investment by the supervising research stations—capital-intensive facilities such as gauging stations, weirs, canopy measurement structures, and other in-the-woods experimental infrastructure. The third is the ability to manage structures and associated facilities to meet research and/or science delivery needs such as labs, offices for permanent or visiting scientists, up-to-date conference rooms; some experimental forests even have lodging facilities such as dormitories and kitchens for use by visiting scientists and professional or technical support staff.

Administrative Organization

Experimental forests and ranges on Federal lands are managed as a subset of the National Forests and Grasslands with which they are affiliated. This gives rise to three issues that merit special attention from an administrative perspective. The first is to ensure that research use of

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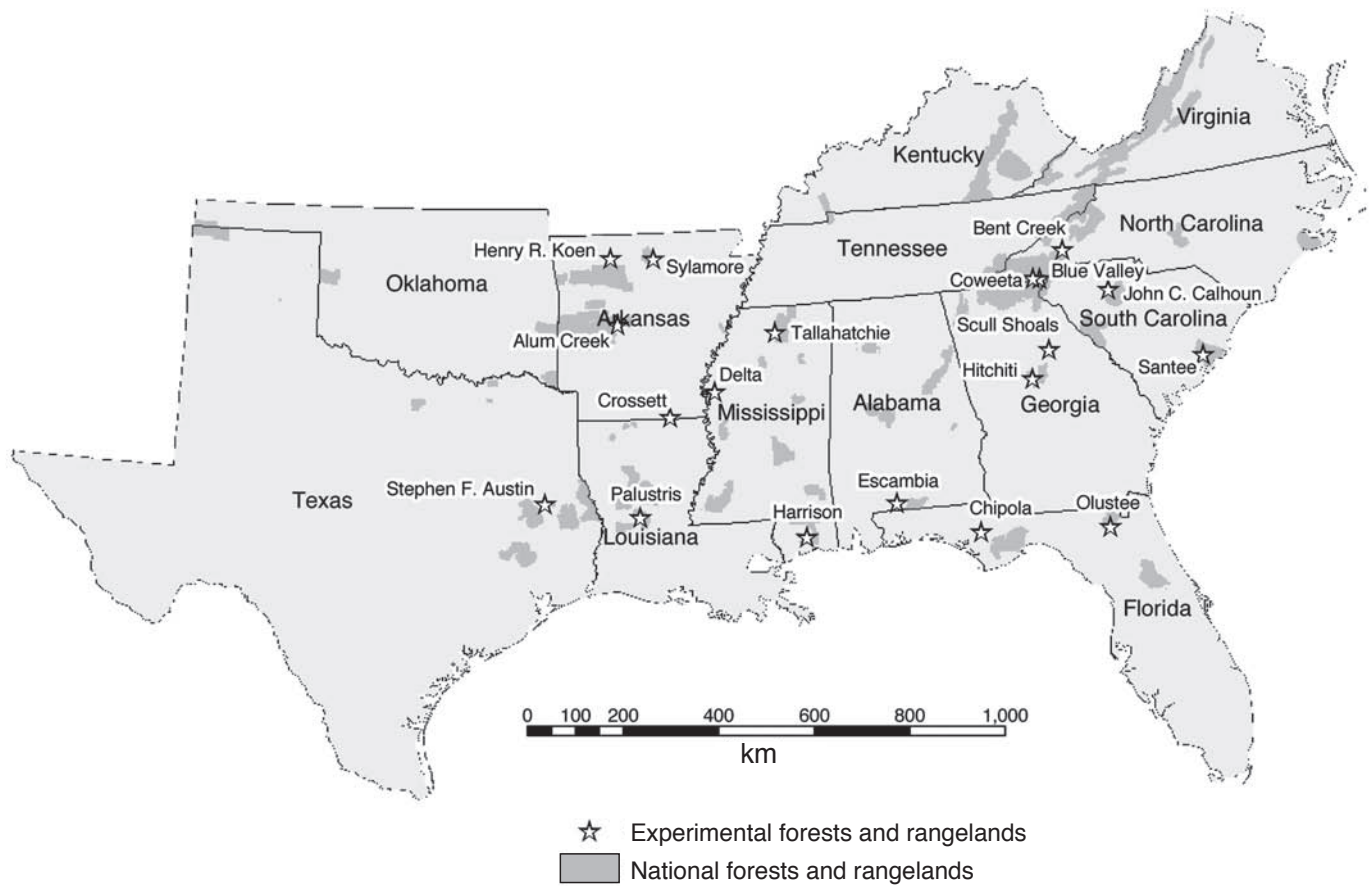


Figure 1—Experimental forests in the Southern Research Station of the U.S. Forest Service (Adams and others 2004).

Table 1—Forest ownership by decade for the Crossett Farm Forestry Demonstration Study and the Sudden Sawlog Study, both located in Ashley County, AR.

Year	Landowner, Crossett Farm Forestry Demonstration Study	Landowner, Sudden Sawlog Study
1940	U.S. Government	Crossett Lumber Company
1950	U.S. Government	Crossett Lumber Company
1960	U.S. Government	Crossett Lumber Company
1970	U.S. Government	Georgia-Pacific Corporation
1980	U.S. Government	Georgia-Pacific Corporation
1990	U.S. Government	Georgia-Pacific Corporation
2000	U.S. Government	The Timber Company
2005	U.S. Government	Plum Creek Timber Company

experimental forests and ranges remains the priority. A major challenge on some experimental forests and ranges is the encroachment of non-research uses such as hunting or mountain-biking, which can conflict with the primary research mission. National policy has recently been clarified to ensure that the line officers in both the research side and the management side of the Agency work together to ensure that research sites are protected and research activities are not compromised by non-research use.

The second issue is associated with planning research activities; project planning for research activities on experimental forests must proceed under the same system of environmental analysis and public involvement as do activities on national forests. The timeframe of this planning process can occasionally constrain the initiation and the completion of research treatments. Here again, the answer is for scientists and managers to work together to ensure that the planning activities do not adversely affect the implementation of time-sensitive research projects on experimental forests and ranges.

The third issue is that timber harvests on experimental forests are handled in a similar manner as those on national forests. When harvesting activity occurs, proceeds from the harvest go to the U.S. Department of the Treasury rather than to the research unit, according to the standard practices of Forest Service operations as codified in Federal law and Agency manual direction. Existing timber sale authorities allow the unit to retain a portion of harvest proceeds for improvement of the sale area under provisions of the Knutsen-Vandenberg Act of 1933—but, specifically, not for research. Essentially, this means that harvest activities on experimental forests can be implemented operationally, but that research activities to study and quantify the operational treatments are funded separately from the harvest. This has two important implications: (1) it increases the likelihood that the treatments being implemented for a research purpose are done realistically, which makes the research data and findings more applicable to users, and (2) it limits any incentive that research scientists might have to overcut their experimental forests so as to directly fund their research program.

Science Delivery at Experimental Forests and Ranges

A small number of Forest Service experimental forests have become prominent regional models of working, sustainable forests in a given forest type. The Crossett Experimental Forest (CEF), established in 1934 and located 7 miles south of the town of Crossett in Ashley County, AR, is an archetypal example. It was the first field station

in the Southern Forest Experiment Station, and was set up to study problems associated with rehabilitation and management of second-growth southern pine stands. The challenge was to determine whether it was possible to simultaneously rehabilitate cutover loblolly-shortleaf pine stands while providing landowners with an acceptable return on their investment. As such, silvicultural research at the CEF emphasizes neoclassical silvicultural practices, especially even-aged and uneven-aged reproduction cutting methods that rely on natural regeneration, which abundantly occurs in this forest type. This research continues to be important after seven decades in three ownerships: (1) public lands where alternatives to clearcutting are sought, (2) nonindustrial private lands where owners seek low-cost stand establishment and trees of large size and high quality, and (3) elements of the forest industry land base not suited to intensive plantation forestry, such as streamside management zones. In 1934, the goal of research at the CEF was to determine if large high-value saw logs could be produced from these cutover understocked second-growth southern pine stands. Today, that goal has been modified to encompass continuous-cover forestry (Guldin 2002) that meets a diversity of ownership objectives through development of trees of large size.

The layout of the CEF is somewhat unique in that the 1,680-acre property is essentially 42 contiguous compartments, each of which is approximately 40 acres in area. There are six compartments from east to west and seven compartments from north to south, with fire protection lanes between each compartment and a road network that can access at least one side of each compartment on the property (fig. 2). Each 40-acre compartment is numbered. This layout promotes operations and access on a compartment basis, allows comparisons to be made among compartments, and simplifies administration, management, experimentation, and science delivery.

SCIENCE DELIVERY AT CEF—A CASE STUDY

Background

The CEF essentially serves as a living example of a working forest. The highest priority for ongoing harvest operations is to maintain research and demonstration areas that relate to specific silvicultural practices that landowners can apply on their own lands. These include natural regeneration, site preparation and release treatments to promote pine regeneration, intermediate treatments to control stand density and growth, and reproduction cuttings that show landowners how to harvest mature trees in sustainable systems. This diversity of practices is concentrated in space and time, which provides unusual opportunities for professional interaction.



Figure 2—Aerial photo of the Crossett Experimental Forest; the regimented structure of the area and the individual 40-acre compartments can be easily seen from aerial imagery. The image is oriented along cardinal directions with north at the top of the image; the image is approximately 8,580 feet east to west and 9,900 feet north to south. Source: www.terraserver.microsoft.com; image located using latitude 33.03368 degree North, longitude 91.93829 degree West. [Date accessed: February 14, 2007]

Our Intended Audience

Over the decades, scientists and staff at the CEF have had an ongoing relationship with foresters from three different categories—forest industry, forestry consulting firms, and forestry educators. Of these, the relationship with forest industry foresters has changed most notably. When the CEF was established, forest industry foresters were interested in producing large high-quality saw logs for production of dimension lumber and, later, for plywood. But as industry outputs have shifted to smaller products and to chip-based panel products, forest industry landowners have increasingly been enamored with intensive approaches to forest management. Those approaches rely silviculturally on clearcutting and planting, featuring intensive site preparation and capital-intensive amendments to enhance stand growth, and harvest at relatively young ages. Despite this, even forest industries that practice the most intensive plantation-based silviculture retain a portion of their forest land in forest conditions that will not be clearcut, such as streamside

management zones or other sensitive areas that require continuous forest cover. Management of those areas requires specialized applications of sustainable silvicultural practices that retain forest cover, and as a result there continues to be interest within forest industry in CEF research and demonstrations.

Consulting foresters in the region continue to practice even-aged and uneven-aged silviculture as a means to economically produce large high-quality sawtimber for the landowners or clients they serve. One can speculate that major growth in the consulting forestry sector will be centered on the divestiture of large forested holdings to landowners seeking forest land for multiple uses such as timber income, outdoor recreational opportunities, and aesthetic reasons that preclude the use to clearcutting and planting. The research at the CEF is extraordinarily useful for such foresters and the clients they serve.

The varied distribution of studies and demonstrations within close physical proximity make the area ideal for education and training, both for college classes and for continuing education of professional resource managers. Foresters and students alike can observe silvicultural treatments that are properly conducted according to rigorous standards, and the resulting stand structure and the relative homogeneity or heterogeneity of treatment application and forest conditions can be easily seen.

Landowners in particular enjoy the opportunity to examine forest stands at the CEF, as a way to visualize the stands they would like on their own lands. Foresters occasionally have difficulty translating the general objectives of ownership that landowners have into a quantitative set of standards and guidelines for imposing silvicultural practices on the landowner's domain. Tours of the stands on the experimental forest can help foresters and the landowners they advise to broaden their understanding of the silvicultural potential of their lands, and can also help the forester obtain the technical details required to manage stands according to the landowner's goals.

Methodology for Science Delivery

Because of these features and clients, science delivery at the CEF has devolved into a series of interactions that emphasize not only the distribution of publications, but also putting on boots and walking around. Sessions typically involve a combination of indoor and outdoor presentations. The indoor presentations take advantage of an updated conference room at Crossett that accommodates 40 people in table setup and 100 people in theater style seating, and boasts state-of-the-art projection, sound, video display, and wireless Internet capabilities. The outdoor presentations are limited only by the weather; and there are few more pleasant ways to spend time in the woods than a sunny, springtime day at the CEF. Thus, Station scientists and visiting lecturers

have a variety of instructional resources and opportunities at their disposal.

Participation of the University of Arkansas Cooperative Extension Service has been especially important in the program delivery at the CEF. For a period of about 10 years in the late 1980s to the early 1990s, the late Dr. R. Larry Willett, an extension forestry professional located at the School of Forest Resources at the University of Arkansas at Monticello, organized and conducted field days, tours, short courses, and training sessions (including some that were videotaped) at the experimental forest. A portion of the salary for Willett's position was provided by the Forest Service, which was an unusual arrangement at the time but an effective one. This assignment of a professional extension forestry specialist in close proximity to the CEF is a model to be considered elsewhere. Today, an equally important element of the role that extension forestry professionals provide at the CEF is the ability to execute financial arrangements for program delivery that Federal employees are constrained from making, such as collecting registration fees from private individuals and defraying the costs of field days or short courses from those collected funds.

Publications and Presentations

The foundation for all of the research and demonstration activities at the CEF is the bibliography of publications and presentations that have been produced by scientists with the Southern Research Station and the academic cooperators who have worked there. Publications in the refereed scientific literature remain the coin of the realm in academic and government research, and the record of publications and supporting presentations has been substantial. For example, a recent tabulation shows that from 1979 to 2005, CEF scientists had authorship on 432 publications with a total of 5,903 pages; that is a yearly average of 17 publications and 276 pages. Of this total, 151 publications (1,406 pages) were in refereed journals; 276 publications (2,905 pages) were in books, proceedings, and series; and 6 publications (1,592 pages) were proceedings that were edited or compiled by CEF scientists.

That body of scientific literature—built on the work of unit scientists from the 1930s to the 1970s—forms the core of the corporate knowledge base on the silviculture of naturally regenerated stands of loblolly and shortleaf pine managed using even-aged and uneven-aged reproduction cutting methods in the West Gulf region. But research papers that are intended for scientists and professionals fail to provide the breadth and depth of information that many users seek as they apply the newly research practices and methods in the woods. Different approaches with a practical approach are called for in delivery of that science to users, and a number of these methods have been extremely successful at the CEF.

Crossett Forestry Field Days

The earliest public activity for science delivery at the CEF has been the “Forestry Field Day”. At this annual event, foresters and landowners gather on the CEF for a program that concentrates on a few specific elements of the science program there. In the 1950s, Field Days focused on showing the potential for timber production from well-managed second-growth forest stands, in which the annual cut was made so as to equal the annual growth from the property. To show this, Station scientists would physically lay out the harvested logs and pulpwood to illustrate the annual growth, and thus the sustainable volume, that could be produced from a managed 40-acre stand under scientific principles of management (fig. 3). Today, scientists and professionals prepare handouts with a compact disc of supporting materials, and engage in lectures and dialogue while standing with tour participants in those same stands whose data were used to illustrate concepts and principles under discussion.

During the Field Day, tours are usually subdivided so that one group contains landowners, and the other contains foresters or resource managers; the level of technical detail is made more rigorous for the professionals. Between 1978 and 2006, the unit has conducted 19 Field Days with an estimated attendance of 3,000 participants. Reaching the target audience remains the big challenge; in recent years, mailed and e-mailed announcements about the Field Day have been sent to past participants as well as distributed through common resource management mailing lists, with the goal of having both landowners and foresters attend. While this ensures attendance numbers that are logistically feasible at the Field Day, new techniques are needed to reach new or underserved clients.



Figure 3—Annual growth represented by harvested logs in a 40-acre stand managed using uneven-aged methods in 1956 from the Good Farm Forestry Forty Demonstration at the Crossett Experimental Forest. (USFS photo)

Field Tours

Specific field tours on detailed subjects are commonly and easily arranged through informal contacts with scientists or staff at the CEF. Scientists maintain an up-to-date summary of each demonstration and research study suitable for use as handouts, so that tours can be customized for specific topics, interests, and with an appropriate level of technical detail for visiting groups. The most common tour groups are visiting student groups in the region, but student groups from distant locations such as the University of Wisconsin and Yale University have visited. In addition, international guests have taken advantage of the opportunity to see the neoclassical alternatives to clearcutting in southern pines at the CEF; recent guests have included university faculty from Russia and Sweden.

A subset of the field tour approach that merits specific mention is the opportunity for an individual level of engagement between CEF scientists and visitors. For example, in the past decade, Crossett has entertained visits from company vice presidents and woodland managers as they evaluated their company's forestry philosophy and practices. Similarly, Crossett scientists have hosted tours for major forestry consulting organizations, not only for owners and staff of the consulting firm but also for key clients as they mutually consider management decisions on family estates and forest land holdings. However, unit scientists rarely hear about the outcome of such tours with respect to choices in management tactics and strategy that are taken because of the privileged nature of some of these conversations, and because management decisions rely on multiple sources and considerations. But as it should be in the practice of forestry, where the responsibility of the forester (and the forestry research scientist) is to advise, not to make decisions for, the private forest landowner. At the CEF, advice is abundantly provided as a Federal service by the scientists and staff who work there.

Continuing Education Short Courses and Workshops

The CEF is home for the Southern Pine Module in the Forest Service National Advanced Silviculture Program (NASP). Silvicultural certification is required for Forest Service employees who approve silvicultural prescriptions on Federal lands. Successful completion of the NASP course provides this certification. A key element of the overall program is a 2-week module in the forest type within which candidates are currently working. In addition, standards require that Forest Service employees from one region to another participate in the appropriate local forest type module. Elements of the program at the CEF are provided by Station scientists and outside experts from across the East. Participating students received an in-depth exposure to silvicultural principles and practices appropriate and applicable for management of naturally regenerated

stands of southern pines, and a bibliography of supporting publications and technical data applicable to the forest types of the region.

CHALLENGES AND OPPORTUNITIES

Though the programs at the CEF have developed an outstanding regional reputation, ample opportunities remain for improvement of science delivery, especially in the realm of personal computer and Internet-based technologies. This experimental forest is located in a remote part of south Arkansas, and high-speed Internet capability has only recently been established there. Station scientists and others who lead the technology transfer programs there now have opportunities to develop materials for lectures and short courses that include access to materials available on the Internet, such as scientific publications and digital image libraries.

There may be additional technological opportunities in the future to bring the outdoor element of field tours and short courses to online clients, such as real-time video conferencing, podcasts, and similar highly evolving technologies. The underlying goal would be to allow users to enjoy a customizable field tour of studies and demonstrations at CEF at any time from any Internet access portal, linking to a database containing the latest appropriate measurements, videos, still photos, lectures, and publications.

Scientists at the CEF also need to develop better ways to quantify the delivery of scientific information through the various methods that are applied there. While evaluation forms are distributed and collected immediately following field days, short courses, and training sessions, the real test of successful science delivery is whether the principles discussed during activities at the experimental forest are applied by landowners and the foresters who advise them. This suggests some sort of reevaluation of attendees, perhaps a year or two after their attending an event at the experimental forest, to ask whether the information provided during the event was subsequently applied on the forest lands they own or manage.

There will always be a place for the "in-the-woods" approach to science delivery, where an expert scientist, professional, or technician stands in front of a group of people interested in management of forest stands, where specific subtleties in the silvicultural condition can be identified and examined as a walk through the woods is made. But clearly, scientists at the CEF have not yet mastered the potential application of Web-based and Internet capabilities in the science delivery mission. As the 75th anniversary of the CEF approaches, the opportunities and challenge for current unit scientists will be to better integrate the traditional field-based methods of science delivery with the powerful new tools available to support information dissemination capabilities of the 21st century.

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FOREST EDUCATION WITHOUT FORESTS: OVERCOMING OBSTACLES

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Abstract—Understanding our environment is critical to making good decisions about natural resources. One solution is to reach youth through educators. The Project Learning Tree (PLT) program provides educators with hands-on activities to use with students in grades pre-kindergarten through twelve. The challenge is helping Florida teachers use PLT if they do not have access to forests. Needs assessments have provided clues about why urban educators do not attend Florida PLT workshops. Standards-based materials and distance education options top educators' list of requested professional development opportunities. To increase the success of our program we established innovative partnerships, created new educational resources, and provided professional development opportunities for educators. This presentation will describe the activities that are increasing teacher interest in PLT in South Florida. Taking the time to develop a program that meets the needs of the audience and combining that with community support is proving to be a successful endeavor.

INTRODUCTION

Forests provide a variety of benefits such as peaceful retreats away from everyday worries, wildlife habitat, and cleaner air. To maintain the existing forested areas in Florida, it is important to educate the citizens about their value and management requirements. There are many agencies and organizations that offer public programs to all ages to increase awareness of nature in their backyard. Environmental education (EE) programs, in particular, incorporate needed communication and analytical skills in addition to knowledge. EE refers to educational efforts that increase public awareness and knowledge about environmental issues while providing critical thinking, problem-solving, and effective decision-making skills (National Education and Environment Partnership 2002). This combination of information and skills allows the public to make informed and well-reasoned environmental decisions. There is clearly a need to provide natural resource education opportunities to urban, as well as rural citizens; existing efforts should be continued and accelerated with Florida's increasing population. The Project Learning Tree (PLT) program provides educators with hands-on, forestry-based activities to use with students in grades pre-kindergarten through twelve. PLT also provides a balanced approach to current issues, and as a result, has won recognition from conservation groups and industry throughout the nation. Florida's PLT program is working to be relevant and meaningful to Florida's population.

The majority of Florida's forested land is in the Panhandle, North, and Central Florida. Some counties in South Florida have a forest, but often these are located on the outskirts of town or in an area considered rural. Florida's population increased from 13 million in 1990 to 18 million in 2006. Between 2000 and 2006 the net migration into the state was 1,863,728 people (U.S. Census Bureau 2008). Florida has the most number of fastest growing counties than any state. Using U.S. Census Bureau population projections,

Zwick and Carr (2006) estimate that Florida's population will increase to over 35 million in 2060, with an annual population change rate of 330,537 people. Counties with populations currently over 1 million include Broward, Hillsborough, Miami-Dade, Orange, and Palm Beach, with over 500,000 residents living in Brevard, Duval, Lee, Pinellas, and Putnam Counties (U.S. Census Bureau 2006). With the exception of Duval, these counties are all in South Florida, where there is little natural forest.

This increase in population is causing a reduction in natural areas statewide, but the development is more noticeable in South Florida. This region naturally includes more open ranch land than forests. To the extent that urban areas have urban forests, they may not be managing or restoring them because of fears of hurricane damage. Education can play a large role in informing the citizenry about the multiple benefits of the urban forests.

Traditionally, forestry education is limited to areas with large forested areas, such as national or state forests. Increased development and reduced forest cover means that most teachers in Florida do not have access to natural forests. They do, however, have their own unique urban forests. Florida PLT is helping urban teachers use their urban forests by providing special resources.

SITUATION

Project Learning Tree reaches a growing number of educators throughout Florida. The nationwide program was introduced to Florida in 1977 and has been offered to thousands of educators. Since 2002, over 3,300 new educators received training. These PLT-trained educators use PLT activities in the classroom to teach students the importance and benefits of our forest resources. On average, each teacher who uses PLT influences 42 students per year

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with approximately six activities (Easton and Monroe 2002), making PLT's impact small but extensive. The use of PLT throughout Florida is not uniform. The southern region has fewer workshops and lower attendance than the rest of the state. The challenge is helping teachers use PLT if they do not have access to forests and are not familiar with PLT.

Environmental education programs as a whole are challenged in Florida because of the increased emphasis on accountability. Florida education reform mirrors national efforts (No Child Left Behind) to assure that all youth attain basic reading, writing, and math skills. The movement strives to increase teacher accountability by standardizing the curriculum content (with Sunshine State Standards and benchmarks), assessing student achievement (with Florida Comprehensive Achievement Tests), providing funding to schools where student test scores increase, and reorganizing schools that repeatedly score poorly (Monroe and others 2005). Teachers acknowledge that the changes are reducing their time and interest in environmental education (Easton and Monroe 2002). Achievement test scores for Florida youth in underserved urban areas are alarmingly low in reading, writing, and math. Teachers of these students are more likely to attend professional development workshops that focus on these subject areas in which their students scored low. Many schools in Florida are focusing their school improvement plans on strengthening reading and writing skills.

A needs assessment of South Florida educators was conducted from November 2005 through February 2006. Sixteen urban counties in South Florida were selected based on the definition of urban by the U.S. Census Bureau (2005), "An area consisting of a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together have a minimum residential population of at least 50,000 people." Counties in the assessment included Brevard, Broward, Charlotte, Collier, Hillsborough, Indian River, Lee, Manatee, Miami-Dade, Orange, Osceola, Pinellas, Polk, St. Lucie, Sarasota, and Seminole. School district professional development directors, their staff, and active PLT Facilitators located in the designated counties were surveyed with questionnaires and phone interviews. The needs assessment pinpointed four issues, distance learning, target standards-based skills, name recognition, and audience buy-in, that can help improve the PLT program.

Due to travel costs and limited time available during the school week to allow teachers to leave class, school districts are encouraging their faculty to take online courses. Online courses designed to meet professional development standards allow previously unreachable educators, due to time constraints, location, and availability, the opportunity to obtain our resources.

While school districts turn to distance learning courses to provide opportunities to their faculty, the resource or topic of the workshop is also important. Name recognition is what encourages educators to register for a particular course. A workshop focused on tips for improving students' reading scores is a "hot topic." Teachers are less likely to register if they are unfamiliar with the program's organization or instructor(s). By promoting the PLT program as a way to help strengthen students' critical thinking and writing skills, educators will see the workshop as a way to gain useful knowledge, resources, and training they need to help their students. Increasing familiarity of the program with the audience will in turn increase audience buy-in.

PROGRAM ACTIVITIES

To increase the success of the Florida PLT program, we increased audience buy-in through establishing innovative partnerships with PLT Environmental Education Centers. To increase familiarity with locally available forests, we created a Florida urban forests supplement. To provide easier access to professional development opportunities, we launched an online distance course for educators.

PLT Environmental Education Centers

The PLT Environmental Education Centers (EE Centers) serve as regional sources of information, field trips, and professional development centers for educators. The PLT EE Center designation provides a link between teachers and these important community environmental education resources. Approved PLT Centers have at least one staff member or volunteer who has attended a PLT Facilitator Training Workshop. Funding from Florida Ag in the Classroom enabled us to train representatives from centers in Spring 2005. Each center received tools and resources necessary to lead workshops.

These EE Centers help market the PLT program effectively because they are local, established voices for environmental education in their community. Centers demonstrate their commitment to education through existing educational programs and host at least one PLT educator workshop per year. Our seven inaugural centers in South Florida include: Brevard Zoo, Brooker Creek Preserve Environmental Education Center, Calusa Nature Center and Planetarium, Environmental Center at Miami-Dade College, Merritt Island National Wildlife Refuge, Nature's Classroom, and Weedon Island Preserve Cultural and Natural History Center.

Florida Urban Forests Supplement

While some of the PLT activities are well suited to urban areas, few of them convey the many benefits of urban forests

to city residents. The Florida PLT Urban Forests Supplement is a companion document for educators who have the PreK-8 PLT Activity Guide. This supplement is based on three themes: urban forest ecology, benefits of an urban forest, and strategies for improving urban forest health. The activities for youth in grades three through eight help them to see their community's urban forests as significant, valuable, and worth sustaining through science-based investigations. For example, one activity focuses on the links between tree health and placement, hurricanes, and a tree's level of wind resistance to help explain what happens to trees during hurricanes.

Florida Horticulture and 4-H Extension Agents received a copy for their county office through the mail in March 2006. A pilot workshop was held for educators in Miami in March 2006. Urban forest workshops are planned for the 2006–08 school years in urban areas. Partners for the workshops include the Florida Division of Forestry County Foresters, county parks and recreation departments, and county extension agents.

The supplement is posted on the Florida PLT web site for educators to download. Advertisements about the availability and objectives of the supplement have been printed in state environmental education newsletters and in listserves. PLT Facilitators received the revised supplement at our facilitator retreat in 2006.

Online Distance Course

Florida PLT is developing an online asynchronous distance course for secondary educators as an alternative to an in-person Places We Live workshop. This secondary unit focuses on a sense of place and community change particularly at the wildland-urban interface. The course will include case studies, internet searches, activity modeling, videos, and slide presentations. Participants will have the opportunity to immediately take what they learn during the course and apply it to classroom lessons. Ideas and thoughts on applying the information learned during the online module to the classroom and information on local issues and resources will be submitted in a completion handout. An online learning community for all PLT workshop participants is in development to allow successes and challenges with the materials to be shared among educators.

This strategy for professional development is strongly encouraged by the Florida Department of Education. This course conforms to their professional development standards (Monroe and others 2005). The course was pilot tested in Fall 2007 and will be available to educators statewide in Spring 2008.

EVALUATION AND IMPACT

Because all of these activities are newly launched, it is too early to conduct a summative evaluation. Nevertheless, on-going reflection and observation of our activities is confirming information gleaned from the needs assessment and providing insights that can strengthen our program. We are heartened by reports from Oil City Elementary Magnet School in Oil City, Louisiana (Haines and Kilpatrick 2007) which increased student achievement scores by using PLT activities. No doubt a number of factors worked together to increase student interest in learning, but using engaging environmental education activities was most certainly one.

Low test scores and low enrollment were reasons Oil City faced closure by the school district. Faculty declared environmental science as the emphasis for the school and created a new school curricula based on a model from the book *Closing the Achievement Gap. The Environment as an Integrating Concept* model supports using environmental education to integrate subject areas (Lieberman and Hoody 1998). Each year, grade-level teams choose a schoolwide environmental theme. Teachers incorporate PLT activities to cover the multiple subject areas. Students apply math skills planning a garden or charting tree growth; creative writing happens on the school's nature trail; and research occurs to determine what plants and flowers would attract a particular species of butterfly (Irvin 2007). The result is improved test scores. In 1999, the schools's score on the Iowa Test of Basic Skills was 26 points below the state school performance score average and now they are at 89.0 score improving by 48.6 points and surpassing the state average (Haines and Kilpatrick 2007). Today, the school is recognized for significant improvement in test scores at all grade levels.

PLT Environmental Education Centers

Prior to 2004, the average number of workshops in South Florida per year numbered four. Increased presence in South Florida through the PLT EE Center program and marketing efforts in urban areas last year expanded workshop numbers in this region to 23. Facilitators reached 560 teachers who were new to PLT. Of these, 42 educators attended one of three workshops at a PLT EE Center. Evaluations collected at the end of each workshop from all 560 participants suggest that 90 percent strongly agree the materials are appropriate to their needs. When surveyed about their confidence in using PLT activities with youth, 97 percent agreed they are confident they will be able to use the new resource. Ninety-five percent agree PLT activities will likely increase student achievement.

Of course more workshops were held outside the new PLT EE Center system, but they might have benefited from

the regional marketing that the EE Centers did for their three programs. The increase in willingness to attend PLT workshops may also be due to the growing concern about the environment, the local interest in Everglades restoration, or improved marketing to focus on state standards with PLT.

Some PLT EE Centers have been unable to launch teacher workshops, though many have incorporated PLT activities into their programs. We find four barriers to successful workshop implementation:

- Centers need administrative support to host new workshops. A meeting between the staff PLT facilitator, center manager, and PLT state coordinator could help everyone focus on how the PLT program meets the center's goals and objectives for outreach education.
- The PLT program should build a larger local support system for the centers. Traditionally workshops have at least two facilitators. Centers are in locations with few trained PLT facilitators in the area. A stronger facilitator mentoring program to include travel funding for veteran facilitators to travel to workshops outside their county, and increased opportunities for advanced facilitator skills building workshops will strengthen the EE Center's staff comfort level in leading workshops.
- The PLT program's alignment with the teacher professional development protocol (Monroe and others 2005) and the center's ability to offer quality professional development workshops and school programs should attract teachers. School district personnel will remember the center is a valuable resource and may be more willing to advertise future workshops.
- Centers need to offer grant funds to provide teacher substitute pay or teacher stipends. Substitute pay allows teachers to attend a workshop during the school day. Teacher stipends pay the educator for their weekend or evening time and usually require a project or lesson plan. Either of these options would allow the PLT Program to match offers by other educator-focused workshops.

Florida Urban Forests Supplement

Expert review and teacher feedback on the Urban Forest Supplement was strongly supportive. Responses from workshops suggest that the materials will be easy to use and will enhance existing curriculum efforts. A full scale evaluation project has not yet occurred. An urban forest workshop was held in March 2006 with 48 attendees. When asked a month later about their use of the supplement we received the following comments:

"The supplement contains easy to follow activities and uses easy to find materials. I plan to incorporate the activities into a lesson utilizing the trees on the PE [physical education] field and potentially starting a project where the students create an arborization plan."

—*Middle School Teacher, Miami*

"I plan to use the supplement to expand activities to show a comparison to interrelationships between the urban forest vs. the forest when working with students. I incorporated the mapping and inventorying and water wonders activities with teachers at a recent workshop. It was great to have activities that allowed me to demonstrate how compaction plays a role in the city regarding runoff, irrigation, and storm and drainage systems. The mapping activity gave us a chance to utilize the school grounds and show the teachers how they can do this activity with their students."

—*Arborist, Orlando*

Florida PLT plans to contact educators one month after attending future urban forest workshops to ask a series of reflection questions about their use of the activities in their place of work. Additional plans include contacting all Florida 4-H and Horticulture Extension Agents in Fall 2006 to ask them if they have used the supplement, if not, do they plan to use the activities, and how we can assist them in the use of PLT in their county.

A national review of EE curriculum materials conducted by the North American Association for Environmental Education rated the Urban Forest Supplement as meeting the guidelines for excellence. The review guidelines are based on the Environmental Education Materials: Guidelines for Excellence (NAAEE 1996), a set of recommendations for developing and selecting environmental education materials. The recommendations include six key characteristics with indicators for determining high quality environmental education materials. Reviewers concluded the supplement met all six characteristics: fair and accurate, depth of topic, emphasis on skill building, action oriented, usable, and instructional soundness.

Online Distance Course

Distance learning courses are not a new phenomena, but in utilizing the technology for teacher professional development it is still in its infant stages. As part of the Monroe County Professional Development Conference (Key Largo, FL), a PLT in-person workshop combined with a one-month online component was offered to educators and we pilot tested the Places We Live Module with secondary educators recruited from conference presentations. Of the

33 educators in the workshops, 40 percent completed all sections of the course. The design of the course prompts the following conclusions:

- Teachers are capable of interacting online and using the required technology.
- Interactive features such as video clips and audio commentary engage the learner.
- Additional time is required of the facilitator to monitor online discussions, provide project reviews, and handle technological mishaps during the course.
- New ways of participating in a course are not embraced readily by educators.

Overcoming misconceptions and fears of using computers is a barrier for some educators to embrace this option for training. At the same time learning how to design an online course can be a challenge for the instructor since teaching and learning strategies are different online than at in-person workshops. Examination of online learning, regarding effectiveness, quality, and structure is still required to develop good online courses (Dede 2006).

CONCLUSION

Extension programs face new challenges as audience needs change. Successful extension programs should be guided by clientele advisory groups and needs assessments, to best define and address these audience needs. In Florida, the PLT program is realizing success from the investment that was made to understand audience needs and develop new programs.

The rising population combined with the pressure to develop natural areas leaves few opportunities for teachers to access forests. Connecting urban tree education to classroom lessons gives educators tools for becoming familiar with local trees. Our assessments suggested that using local partners, emphasizing local resources, addressing curriculum standards, and using technology to provide resources to educators instead of an in-person workshop are valuable directions for our program.

For Florida PLT, the challenges of attracting teachers in South Florida have led us to:

- Help teachers see urban trees as part of a forest.
- Support local environmental facilities that have urban trees around them.
- Meet educator's professional development needs by creating an online distance course.

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FINDING EFFECTIVE WAYS TO PROVIDE KNOWLEDGE TO FOREST MANAGERS ABOUT NON-TIMBER FOREST PRODUCTS: A CASE-STUDY OF DISTANCE LEARNING APPROACHES

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Abstract—Many who grow or collect non-timber forest products (NTFPs) have been under-served in traditional forestry educational programs. It has often been difficult to determine the needs of this disparate group of stakeholders as collectors and growers are widely dispersed across the landscape, and not recognized as important stakeholders in formal cost forest management or forest products outreach programs. In most cases they may not attend or participate in traditional forestry education programs. Forest managers and extension agents, who serve this clientele, lack information and knowledge concerning NTFPs and are challenged to serve these stakeholders' needs. Distance learning methods may be an efficient and low cost way to teach collectors, growers and the extension agents that serve this group of stakeholders about how to manage and utilize NTFPs in a sustainable way. We examine, here, distance learning methods such as two-way television (video conferencing) and on-line courses to determine if they are appropriate for training those who harvest and utilize NTFPs.

INTRODUCTION—WHAT IS DISTANCE LEARNING?

Universities have been seeking methods to better reach students across great distances, and to offer courses that are more convenient for a more mobile group of students. Students who lived and worked at great distance from their chosen educational institution and/or did not have the time or resources to attend educational programs were left with few alternatives. Many enrolled in correspondence courses. Assignments were mailed to students, who returned them to instructors for grading and comments by mail. This system was slow and had little flexibility to offer educational pedagogies that fit the needs of the student or the content of the course. Night classes or weekend-based courses followed and were more expensive, but offered learners who are job bound opportunities for continuing their education. However, these are less desirable if students have trouble traveling great distances to attend. Distance learning education techniques build on these needs; providing campus-based instruction and doing so at the convenience of both the instructor and student.

Instead of assembling students from dispersed locations in one place, distance learning courses reach students wherever they wish to live or study (Guri-Rosenblit 2005). Mobile life styles and working environments mean that educational programs offered need to be flexible in timing and location. As the costs of delivering and receiving traditional, in-person on-campus educational programs increased, cheaper methods, especially those that serve more geographically diverse audiences, became more desirable. Distance learning utilizes cost effective, electronic and on-line media to provide courses and bridges the gaps between the teacher (and educational institution) and students.

Within the past decade technologies have become available that enable institutions to meet these needs.

Distance learning can now match the needs of students and educational institutions and use technologies that are appropriate technologies to the learning opportunities. A variety of media may be used or adapted to the learning group needs and range from add-on functions in classrooms replacing face-to-face meetings with on-line learning encounters.

The instructor is positioned in a central location—no need to travel to serve the audiences. This technology seems appropriate for Federal agencies, such as the military, Forest Service and other Federal and State agencies with a high percentage of their personnel stationed in rural areas, but needing training for career development and to meet changes in the workplace. Distance learning seems to be a good fit for these students.

Earlier distance learning technologies included teachers distributing video tapes (now replaced by DVD) by mail to students, and the students reviewing them and then returning them with completed exams. A simpler method is the use of conference phone calls. These are being replaced using on-line (web-based) connections which enable one or many users to join a discussion. Recently a variety of web-based phone and video phone systems (i.e., SKYPE) offering inexpensive or free connections through the web have begun to be offered. These are making communication between students, and students with their teacher easier and more affordable.

In the past few decades, a variety of distance learning technologies, primarily web-based, have been introduced. One of the most common is interactive video-conferencing (“two-way television”). Students sit in a classroom served by cameras and monitors linked to similar equipment in other locations. The instructor(s) can work from a remote location. In addition to the live broadcast, the technology

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allows for use of slides, video and overhead projector. This has been a very effective way to involve several groups to discuss and work simultaneously.

Another common tool is the virtual chat room which gives the students the opportunity to conduct live conversations. It also serves as an on-line repository where the responses to all questions can be posted and referred to later by all the students. Many courses utilize a virtual library that has the capacity to store on-line numerous case studies, reading materials, video clips and other resources ready for easy access.

Internet or on-line discussion board messages are posted over time for future use. These “synchronous chats” can be live or have delayed participation. These are accessed through web sites at any time to review the discussion. Internet-based course management systems assure that all students have 24 hour access to materials and can add materials, participate in discussions, and retrieve and submit documents (including quizzes).

We also need to define the NTFP stakeholders. Knowing who they are and how they might be reached through educational programs is critical to our examination of distance learning techniques. Non-timber forest products include all the flora and fauna of the forests, except for timber, pulp and other wood products. NTFPs are collected usually in small quantities from forest land and may include edible forest products (berries, nuts, etc.), floral or decorative products (dried flowers, vines, bark, etc.), medicinal or dietary supplements (ginseng, black cohosh, etc.), specialty wood products (carvings, turnings, and products made from lesser known timber species), and ecosystem services (recreation, ecotourism, agro-tourism, etc.). Each product has differing seasons for production, processing, and marketing, and different product qualities that dictate individual production, and marketing strategies.

With this diversity of products and markets, NTFP stakeholder training needs differ greatly between regions. The training needs of NTFP stakeholders are varied—i.e., how to learn how to start a NTFP business for those who do not have access locally to a business school, or how to produce NTFPs without a specialty crops program in the area. In addition, some stakeholders lack higher education, and many can't afford computers or lack adequate access to the Internet. NTFP stakeholders are most likely geographically spread out, often living and working in remote, rural areas. They are not often able to relocate to pursue study opportunities due to the distance from educational institutions or training centers. Many have differing and non-traditional learning needs—some wish to learn skills to grow or propagate NTFPs, while others want to learn about marketing or business establishment.

This is an expanding group of learners. The number of people interested in learning more about NTFPs is expanding. Many landowners who recently, as an investment in a future residential or vacation home spot, have invested in a small piece of forest land and have looked for new and expanded sources of income to support these investments. Distance learning seems appropriate for these NTFPs stakeholders, as it can serve single students or engage in small groups and is very effective for large dispersed groups of students.

The goal of this paper is to explore different methods of distance learning and reflect on which ones might be most applicable to address NTFP stakeholder needs. What follows in the next section is a review of distance learning programs with the emphasis on those that might be most useful for technology transfer to NTFP stakeholders.

BACKGROUND

Efforts of Virginia Tech to transfer knowledge about NTFPs began with involvement in traditional workshops and extension publications in the mid-1990s. In 1997, a Virginia Tech/Forest Service collaboration made its first venture into distance learning specifically focused on NTFP stakeholders when it installed tutorials on the NTFP (special forest products) website (Hammett and others 2001) providing simple instructions on the economics, production and marketing of important NTFPs. The plan was to provide a series of tutorials that help landowners manage and entrepreneurs utilize common and economically viable NTFPs (Hammett and Jones 1998). Two test tutorials “Writing Business Plans for Wild Harvest Sector” and “Growing Slippery Elm” were posted, with plans to post others after evaluation of the first two. While both tutorials were well visited the level of user response was not up to our expectations, and we decided not to add others. However, this experience helped us see the potential for on-line education in the NTFP sector. Many users provided comments on these tutorials and a few suggested topics for additional tutorials (see paper by Chamberlain and others in these proceedings), but additional tutorials seemed unnecessary.

What is the history of the use of distance learning in natural resources? To find this out we first did a literature review to locate information and research associated with the use of distance learning in natural resources and more specifically as it had been used with NTFPs. Our search yielded few pertinent papers and reports that offered examples that may be appropriate for the needs of NTFP stakeholders. Downing and Finley (2005) surveyed landowners to assess their preference in delivery of educational programs and found that video conference delivery was the least desirable of the “passive” methods of delivery.

Next, we sought to find those in the natural resources field that are working with distance learning. Many of the examples in our search were found in the agriculture sector (i.e., Lippert and others 1998), but we tried to focus our attention in the natural resources sector. Such examples in forestry and forest management seem to have merit when looking for programs that might be appropriate for NTFP stakeholders.

Many Forest Service personnel are dispersed across the country and often posted in rural areas far from the nearest college campus. Many of these personnel seek, in the short-term, courses that raise their skill levels, while others wish to earn a masters degree. Virginia Tech is collaborating with the Forest Service in a major distance learning project that provides on-line courses taught by Virginia Tech faculty. For many Forest Service employees distance learning seems very reasonable for serving those working in outlying areas without access to college campuses or other learning sites (Evans 2006). We formed a consortium of several universities to provide courses not available at Virginia Tech. This example will be examined in more detail later in this paper.

Over the past several years Virginia Tech has been involved in developing and presenting several types of distance learning activities; both through its regular academic programs and offering a wide range of non-credit courses. Virginia Tech's Institute of Distributed and Distance learning (IDDL) was set up to provide the course development, management, and other support to VT faculty that match the needs of their audiences (in this case, the students) (Evans 2006). This group is representative of other technology assistance organizations that can provide support to NTFP specialists wishing to use these new technologies for training programs.

Early distance learning techniques included sending out content on tapes of lectures to students for their review (more recently CDs or DVDs have been used). Experts were hired (as they are still) to give lectures which were then sent out to subscribers on tape. This technology continues to be used by accreditation agencies to keep professionals skilled or up-to-date on current issues. Earlier methods included broadcasting the lessons through traditional television stations and with the instructors receiving questions through telephone—much like current talk shows are operated. Newer, web-based technologies have replaced many of these programs. The concept is the same, only the delivery mechanisms have changed.

We queried several universities that offer natural resource courses on-line, and decided to stick with examining our own experience for lessons learned which appear to be appropriate for possible development of NTFP on-line training. We selected three examples from Virginia Tech's distance learning experience to help us examine the benefits

of distance learning for NTFP stakeholders. The first highlights the Virginia Tech - Forest Service joint venture which offers a graduate degree program through distance learning. The second example is The Global Seminar which uses distance learning technologies to reach students worldwide. The last one examines the Royal Roads/Virginia Tech collaboration to offer an on-line NTFP course.

SELECTED DISTANCE LEARNING ACTIVITIES

We learned of several institutions in the region, at varying levels of emphasis, which are beginning distance learning programs. Few offered courses that included content focused on non-timber forest products. However many may provide lessons for the NTFP community.

Enabling two-way communications between forest managers and NTFP stakeholders is also a concern. Each distance learning technique was reviewed to better understand its effectiveness and looked for ways to improve access to information for NTFP stakeholders. Technology transfer programs will be more successful if they first ascertain NTFP stakeholders' needs to help design and implement technical assistance that is appropriate. The case study discusses issues, opportunities, challenges and potential for distance learning methods to get information and knowledge to this diverse clientele. What follows is a review of selected distance learning techniques in use today that serve the forestry, forest products, and related natural resource communities.

Regular teaching of courses on-line and through other distance learning methods has been a regular feature at Virginia Tech over the past decade. Several courses in many disciplines have been modified to be presented through distance learning (i.e., Global Issues in Natural Resources), while several new courses have been developed for distance learning delivery. The course offers skills in decision making for mid-level managers in natural resources.

Reaching tree farmers through video conferencing using two-way television events are cost effective. During 2000, Virginia Tech, several other academic institutions, and forestry agencies organized a major video conference discussion on forest certification that reached practitioners across the country. The Master Tree Farmer Program has used video conferencing to reach hundreds of subscribers. The most recent included a segment on NTFPs during the spring of 2004. Both programs simultaneously reached scores of participants in dozens of locations. In each case recording and distributing the conference extends the benefit to others who may not have been in attendance at the live conference.

Academic institutions are moving quickly to distance learning as a more cost effective and niche market for their

course. Business and then Engineering programs were first to embrace distance learning. They were proactive, especially in filling the needs of mid-level professionals who wished to sharpen or update their skills with a few courses, or gain advancement with an additional degree (i.e., a professional certificate or a master's degree). As the educational market got more competitive, distance learning was found to be an effective tool to widen the geographic area from which universities could recruit students. They no longer had to recruit students only within commuting distance. Another advantage is that students could take the courses when they wished, or from home. With new technologies, students can join a video conference from their home, or be part of on-line courses that include streaming videos and on-line video chats so that students no longer need access to video conferencing equipped space.

Courses may be separated into those for degree granting programs and non-academic or professional programs. Land grant institutions are mandated by law to provide outreach programs for landowners and natural resource practitioners and skill development programs for foresters and other natural resource professionals. It seems appropriate for some of the outreach programs to serve as models for training NTFP stakeholders.

North Carolina State University (NCSU) has widely publicized several graduate-level courses it offers through a combination of on-line and video conferencing methods on subjects such as wood chemistry and wood anatomy (but no courses as of yet are offered on non-timber forest products). NCSU has also developed and now offers several on-line courses in forestry and related subjects (www.distance.ncsu.edu).

Several technologies are used in distance learning. Delivery modes include on-line courses, video conferencing courses, DVD/Video, or audio CD courses. Video conferencing involves holding a class meeting using video to connect the students and the instructor and is becoming quite popular. Students congregate in a class room that is equipped with television and cameras with sound equipment rigged for two-way or multi-location broadcast. The instructor can be in his or her office or with another group of students. Technology now also allows for individuals in some cases to join such a video conference from their own computers. This method is closest to traditional, in-person, extension programs (workshops and short courses) and thereby may hold much promise for providing courses to NTFP stakeholders.

The Instructional Technology Council (ITC), which provides leadership, information and resources to expand and enhance distance learning through the effective use of technology, defines distance education as "the process of extending learning, or delivering instructional resource-sharing opportunities, to locations away from a classroom,

building or site, to another classroom, building or site by using video, audio, computer, multimedia communications, or some combination of these with other traditional delivery methods". ITC proposes that users of distance education opportunities are older and most work during the traditional classroom hours. Distance Education students require flexible learning schedules and demand professional development opportunities and classes to help them keep up with today's ever-changing work environment. ITC indicates that the main reason for students to select distance education as a delivery method is that they want to learn at their own pace, and at times and locations that are convenient (Instructional Technology Council 2006).

Of the universities delivering any natural resource courses on-line, only one provides a course with focus on non-timber forest products. However, several of our colleagues are developing or have offered courses in natural resources. For instance, at the University of Tennessee, one faculty member is coordinating a group of on-line courses in forestry. The University of Florida has offered a set of interstate courses on-line to the natural resources community. And Clemson University and Mississippi State have offered courses in taxation using distance learning.

At Virginia Tech traditional outreach programs such as the Master Logger Training Program and other similar programs have been increasing their web presence. We have also used video conferencing to connect two or more classes around the state to interact on subjects related to sustainable natural resource management and utilization. On-line chats (incorporated in earlier versions of the web site as bulletin boards) have been found as good ways to have "live" discussion about methods and issues related to forestry and forest products.

Distance learning seems to be an effective way for instructors that have niche course or teaching specialties to provide these when they can't travel to serve students groups. NTFPs are a good example of such a niche subject. Through distance learning we can incorporate guest speakers from other locations and not be solely dependent on the local instructors. What follows are three distance learning experiences at Virginia Tech that may offer examples for setting up an on-line training for NTFP stakeholders.

Natural Resources Distance Learning Consortium

The Natural Resources Distance Learning Consortium portal was initially developed by the College of Natural Resources, Virginia Tech and the Forest Service. It was designed to deliver course information to web-based learners, particularly those at non-campus locations especially those working on remote areas of the National Forest System (Natural Resources Distance Learning Consortium 2006). It has expanded to include web-based courses from many

natural resource programs, from Land Grant, McIntire-Stennis designated, and other universities. The Consortium provides upper-division undergraduate and graduate distance learning education to anyone interested in natural resources and managing their uses. The consortium offers full college credit graduate courses, certificates of study, and graduate professional degree programs (Evans 2006). The consortium will include a course on NTFPs currently being developed at Virginia Tech reflecting interest shown by the students in the program.

The Consortium offers courses originating at those institutions that specialize in particular subject areas (i.e., VT offers eastern hardwood courses, The University of Idaho teaches forest ecosystem and wild land fire management courses, and Northern Arizona University offers through the Consortium courses related to recreation). Each of the universities working together with the others offers the courses it can best provide. These institutions are spread across the US, offering collaboration opportunities with several Forest Service units, and other government agencies. This widens the geographic presence of the Consortium and makes it more effective in serving students across a wide range of needs.

An initial survey at VT found a low percentage of universities offering natural resources courses on-line. Only 4.5 percent of universities with an on-line presence delivered natural resource education courses (Personal communication. 2006. Dr. Gary Evans, Director of the Natural Resources Distance Learning Consortium, Northern Virginia Center, Virginia Tech, Falls Church, VA.). Over three thousand courses were reviewed, only one had substantial NTFP content—Alternative Forest Products offered at Oregon State University. Another course entitled Non-timber Forest Products Culture and Management has recently been introduced at Oregon State (Oregon State 2006). Neither of these courses addresses the needs of those interested in NTFP marketing and business development or the NTFPs found in the Eastern US.

The Consortium offers three options for learning: individual courses, as needed; courses clumped into Certificates of Accomplishment (usually 9 – 12 credits); and a degree, Master of Natural Resources (30 - 33 credits). Both these options may not be appropriate for NTFP stakeholders.

The Forest Service and other government agencies that post personnel in remote areas are the initial target audience. The consortium works closely with the target agency to ensure courses fit needs of personnel, and seeks to serve other agencies across large areas (Personal communication. 2006. Dr. Gary Evans, Director of the Natural Resources Distance Learning Consortium, Northern Virginia Center, Virginia Tech, Falls Church, VA). Based on these contacts with agencies an on-line NTFP course is being developed and will be offered during the fall of 2007.

The Global Seminar

The cornerstone of our distance learning experience at Virginia Tech is The Global Seminar, a course that combines on-line and video conferencing techniques through which teams of students discuss four to six cases (focused on topics such as biodiversity conservation, forest-based livelihoods, and natural resource sustainability) during a semester. This course has been an excellent way to get several of our faculty and students exposed to the potential of distance learning. It has also exposed teams of students in agriculture and natural resources to key issues in natural resources, and to connect them with teams across the globe ranging from China to Africa.

A course using distance learning technologies focused on environment and sustainability now is being taught at VT. The Global Seminar started 1997 at Cornell, now is based at the Virginia College of Osteopathic Medicine (VCOM), and Virginia Tech. The course is active at a total of 35 universities, community colleges, and high schools—located worldwide in Africa, Asia, Australia, Europe, and the Americas. Student teams within clusters of 4-6 schools (across regions, languages, and cultures) study and discuss the same set of cases. The course utilizes a variety of distance learning technologies including video conferences, on-line chats, email, an on-line library (case studies, resource materials, etc.) and sharing documents through a web site.

Once the schools are grouped in clusters, one school's team is selected to lead each one of the cases to be discussed. There is ample opportunity for interaction as each team leads the discussion of a case, choosing the questions for and leading an on-line chat, and setting up and leading the video conference. The class web site is shared between members of the group where background materials are posted. The virtual chat, virtual library, discussion board and all other on-line features are managed on the Blackboard platform. These collaborations across schools and cultures offer an example of what may be possible in a course for NTFP stakeholders.

Instructors select from the long list of cases and resource materials posted on-line and may add other materials to the web site so they are accessible to the students. The Global Seminar virtual library of cases includes several that deal with issues associated with NTFPs (i.e., biodiversity, bio-prospecting for the pharmaceutical industry). In particular, the case on agro-forestry examines the use of NTFPs in the Chesapeake Watershed as part of the discussion on water quality and resource sustainability.

On-Line for-credit Courses

While there are now hundreds of natural resource related courses taught on-line, we found very few examples of

using distance learning techniques for NTFP related subject areas. An on-line NTFP course designed to improve forest managers' skills was one of several international NTFP outreach programs examined. In 2004 Canada's Royal Roads University in British Columbia with Virginia Tech organized the first on-line course on non-timber forest products. Representatives from Canada, Germany, India, Nepal, Russia and the United States assisted in pioneering this on-line course designed for foresters, forest students and managers around the world. Led by Royal Roads University in British Columbia in collaboration with Virginia Tech and the International Forestry Students Association (IFSA), the team developed a pilot for a new international course on management of NTFPs. The development phase was funded by the International Partnership for Forestry Education and Canada's International Development Research Centre through the University of British Columbia. The project's steering group includes representatives of the Government of India, the Georg-August University in Goettingen, Germany, and the IUCN, The World Conservation Union, representative in Moscow. As with any course development effort, such cross-agency input will help ensure that the course is appropriate for the target stakeholders.

This regional on-line course "An introduction to non-timber forest products in sustainable forest management" is planned for worldwide application, but the pilot will be delivered in India. It is designed to provide those responsible for forest management with a broad perspective on the social, economic, and environmental issues that surround the sustainable utilization of non-timber forest products (NTFP), also known as "non wood products". NTFPs are of major importance in tropical and sub-tropical countries and are being recognized as a significant contributor to rural economic diversification and forest conservation in temperate and boreal regions, as well. The course is designed in a modular format so that elements can be "mixed and matched" to meet the needs of specific audiences. The first is generic worldwide (what are NTFPs, trade in NTFPs, etc.). The second is generic to a bio region (tropical, sub tropical etc.)

The third is specific to a geographic region (India and Nepal) and focuses on the problems and opportunities in that region. For example, the pilot course's three modules address "global", "tropical/sub-tropical" and Indian sub-continent issues. Other versions of the course could include "temperate/boreal" and a variety of regional modules, such as Northern Europe, China, North America or Sub-Saharan Africa. Testing of this course will provide experience that helpful in developing on-line NTFP training in the US.

This semester-long (16 weeks) course is directed to students who are field technicians. Each student completes a project that is focused as much as possible on a situation at their

work sites (i.e., market study or a production study for NTFP in their working area), and will hopefully contribute to their work. This approach might offer content appropriate for a US-based course.

Few other US-based for-credit courses were found in our search that may serve as example NTFP courses. As previously mentioned, at Oregon State University a new one credit course, SNR 533: Alternative Forest Products, covers the integration of "non-timber forest product (NTFP) management into the broader context of sustainable natural resource management" in the Pacific Northwest region (see course syllabus, Oregon State University 2006). Virginia Tech is proposing an on-line course in NTFPs for undergraduate and graduate credit. The course will focus on issues relevant to NTFPs in the Eastern US with some Pacific Northwest and International Examples.

DISCUSSION—CHALLENGES AND OPPORTUNITIES

The challenges to offering courses on-line to NTFP stakeholders are many. First and most important is the technology may not be appropriate for this group of students. The "digital divide or lack of access by students to computers and the Internet may prevent students from participating in on-line classes. This may be a particular problem in rural areas and makes offering courses for many NTFP stakeholders problematic. In addition, technology failures can impact the effectiveness of courses. Computers and software are not foolproof. A key obstacle to presenting NTFP related courses on-line is the lack of acceptance by many stakeholders to using the Internet. The Internet is just not for everyone. Reluctance to use computers in general or the Internet as a learning tool is not well documented, but is difficult to overcome. Lastly, even with the growing amount of technology in place, still many landowners prefer hands on and face to face or interactive methods such as traditional short courses (Johnson and Baker 2006).

Many NTFP stakeholders find live discussion and more traditional methods such as face to face sessions best suited to meet their learning needs. One method that may be most suitable for NTFP collectors and processors is to present content through a "hybrid course" – one that combines both distance learning techniques and in-class (in person) sessions. The possibility of offering content through face-to-face activities on-line is improving (McCray 2000). Centra and other communication programs now available offer great potential for on-line class interaction at low cost. For example, we use it at Virginia Tech to teach technical writing (in English) to Chinese speaking students in Taiwan. Another example is The Global Seminar where video conferencing (face-to-face contact) is used on an occasional basis (4 to 5 times) each semester.

There are many technical improvements on the horizon that will lead to more Internet access and at reasonable cost. Wireless technology is increasingly available in smaller towns and through cell phone companies. Libraries, airports, and other public buildings are often venues for free wireless Internet access. This will make courses more accessible and cheaper to provide.

Technology transfer serving NTFP stakeholders will grow with the increased collaboration between organizations (i.e., forestry schools, on-the-ground groups that are working in NTFPs). These collaborations will help bridge gaps and offer “help course” technical areas where there are few resources or instructors available in that technical area (Evans 2006).

What do programs that operate on-line courses use to evaluate course effectiveness? On-line efforts to supply content may be effective for NTFP stakeholders who have regular access to the Internet. The concern is the lack of Internet access (or “digital divide”) for many NTFP stakeholders. In short these participants may be difficult to reach without regular access to the Internet. Reaching them through computer hook ups in local libraries or other public institutions may be the answer.

What are the constraints that we found to development and use of distance learning courses by NTFP stakeholders? The technology may be expensive to purchase and install and needs regular technical servicing (Walstad and others 2003) and this not always available especially in rural settings. This “high tech” equipment is quickly becoming part of mainstream educational programs, but still is not appropriate for remote settings. Access to small regional academic institutions (i.e., community colleges) may be the answer to bridging these gaps. This is compounded when you consider that funding and other resources for purchasing computer equipment, or paying to support building new on-line courses, or conversion of existing traditional courses into on-line courses is beyond the budgets of smaller colleges.

CONCLUSIONS

Distance learning is a significant part of the menu of available learning methodologies and offers great potential for technology transfer to NTFP stakeholders. However, this comes with some additional costs that educational institutions and students must be willing to bear. North Carolina State University suggests that their on-line students have ready access to adequate computers with the proper browser and audio capabilities, and the ability to communicate via e-mail (Southern Regional Extension Forestry 2006). Instructors need also learn how to use these technologies increasing the frequency of their e-mail use and providing important course materials on-line.

Distance learning seems very applicable for NTFP stakeholders (i.e., landowners, and forestry extension practitioners). But these stakeholders must commit to access to and to the use various distance learning methods. This seems very possible when looking at examples where distance learning techniques have successfully served difficult to reach students over great distances. There are many examples of distance learning applications that are successful in spite of slow access to the Internet, less than fluent English speaking capacity, timing trouble due to various time zones, and gaps in access to technology. Most of the participants in The Global Seminar course do not speak English as their native language yet they are successful in this course which is based entirely on cases and discussion in English. With the proper teaching pedagogies NTFP courses can cater to the needs of most NTFP stakeholders.

Technology is developing quickly to facilitate access to courses in an increasing number of venue types. Voice transmission programs (such as Centra) are also becoming easier to use, and less costly to operate. With reasonable Internet access, on-line classes can be conducted utilizing slides, voice and in some cases short videos.

There is great need to evaluate current systems to learn which aspects would be appropriate for NTFP courses. Learner preparedness, access to delivery systems, communications and interaction with faculty and peers are all concerns when developing effective on-line courses (Lockee and others 2002).

Size and location of organizations providing educational opportunities is no longer an issue. Larger universities are now “competing” with smaller colleges for students not just in their own back yard or within commuting distance to campus, but across the country. Small forest landowners and service providers (harvesters, workers, etc.) can now access courses in many regions (i.e., New England, see Foster and Cranch 2001).

Several international examples of distance learning should be used for guidance. Beginning in 1996 The Global Seminar, formed as a consortium of educational institutions that are concerned with the future of our planet in terms of the environment and a sustainable food supply. The Global Seminar engages students in key issues pertaining to the sustainability of our environment and food system and uses on-line communication tools to support discussion among students, faculty and international leaders across several cultures and languages. The course fosters discussion of open-ended cases are designed to impart critical thinking skills and could have application for an audience of NTFP stakeholders.

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POSTER ABSTRACTS

LINKING USER NEEDS AND SOIL RESOURCE INFORMATION: A CASE STUDY IN MISSISSIPPI

W.L. Kingery, D.B. Johnson, and M.E. Lilly¹

Soil Surveys show soil characteristics, distribution, and capabilities. They help people better understand soils and their use and conservation. An important tool for community planning, soil surveys are regularly requested by consultants, land use planners, and appraisers. Recently, NRCS instituted a new policy discontinuing hard-copy publication of the county soil survey text. This has been made possible through the development of GIS-based soils information, of which the Soil Survey Geographic Database (SSURGO) is a prime example. The availability of spatial and tabular information as well as soil interpretations creates a first-time opportunity to 'customize' soil survey-related products to meet user needs. This may take one of several forms including the ability of users to access, acquire, and develop soil survey information to satisfy individual requirements. In many other cases it will be necessary for those involved in the Cooperative Soil Survey to identify and assess needs in light of current and planned database characteristics and available technologies amenable to connecting information and users. In this poster presentation we show brief profiles of stakeholders in Mississippi and their needs; summarization of current soil survey databases; technologies that allow these products to be formed in ways to meet various stakeholder needs; and, an example of specific stakeholder and potential soil survey products designed to meet that need.

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WARNELL SCHOOL'S MODEL FOR DISTANCE LEARNING IN FORESTRY AND NATURAL RESOURCES

Ben Jackson, Morgan Nolan, Eugene MacIntire, Jason Derifaj¹

With the rapid changes in demographics and land ownership in Georgia, the School wants to remain viable to the public's information needs. This involves providing current, real-time information about forestry, wildlife, fisheries, recreation, and water resources. Paper publications, print on-demand publication, CDs, and other such media now longer satisfy the information needs exclusively. The new standard is instantaneous information on demand through distance learning technology.

The School recognizes this new information demand and has created a system to supply the resources needed. Our multimedia group has developed a network of online resources like PSAs, blogs, podcasts, independent and distance learning courses, faculty introductions, lecture series, and other products. We will discuss these products, what it took to develop them, what it takes to keep them going. We will also review the public's perception of the value of the system.

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WHEN NATURE IS AT YOUR DOORSTEP: THE MAKING OF AN EFFECTIVE OUTREACH VIDEO

Lauren McDonell, Martha C. Monroe, Annie Hermansen-Báez, Edward A. Macie¹

Population growth and changing land use in the Southern United States are influencing natural resources in the wildland-urban interface (WUI), creating challenges for natural resource agencies, residents, and local governments. In response, a multi-agency initiative developed between the University of Florida School of Forest Resources and Conservation, the U.S. Forest Service Southern Center for Wildland-Urban Interface Research and Information, and the U.S. Fish and Wildlife Service National Conservation Training Center. These agencies developed a video outreach tool for natural resource professionals, *When Nature is at Your Doorstep*, to use with people living in the southern WUI. The video is a component of a professional development program for resource professionals working in the WUI.

The objectives of the video are to (1) define the WUI, (2) provide examples of interface issues and how they are interconnected, (3) explain how these interconnections provide unique challenges and opportunities, and (4) encourage residents and resource professionals to work together to address problems. The video's audience and objectives guided the script's development and expert reviews helped ensure that the information was accurate and relevant. Information from behavior change and environmental communication literature helped shape the script's messages.

In order for the video to be relevant to audiences across the South, a wide range of southern communities and ecosystems had to be visually represented. Also, the video needs to appeal to an increasingly diverse population. Consequently, the footage includes a variety of ages, ethnicities, and housing types was included.

The video is available in VHS and DVD formats and portions will be featured on the InterfaceSouth website to help make it accessible for a wide range of users. Discussion questions and evaluation materials will be provided to facilitate conversations between resource professionals and WUI residents and to determine if the video has achieved its objectives.

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USE OF COUNTY TAX ROLLS FOR MARKETING EXTENSION PROGRAMMING

Andrew J. Londo, J.D. Kushla, and P. Smallidge¹

Contacting prospective clientele about upcoming and ongoing extension programs is one of the most important and sometimes difficult activities facing extension professionals. There is abundant evidence, especially for forest landowners, that the potential audience changes regularly and that many are outside the normal channels reached through Cooperative Extension programs. Current methods of marketing extension events may not reach audiences who lack a traditional connection to extension programs.

Existing mailing lists developed from past program participants are commonly used, however the clientele served are typically those already reached through programming. While this works, and provides the needed program numbers and contacts, it leaves one “preaching to the choir”. It can be challenging, and somewhat risky to try to expand the clientele base. Further, while some programs attempt to significantly change the ability of a client to perform a specific task, other program objectives seek a less dramatic behavior of simply being aware of educational resources or management philosophies.

The extension forestry program at Mississippi State University and Cornell University Cooperative Extension in New York have developed a way to expand the number of potential clients reached for any given program and to deliver targeted content information on specific subjects. This method uses mailing lists developed from county tax rolls. We describe the methods used to obtain and manipulate these lists, and identify problems and pitfalls associated with their use.

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TECHNOLOGY TRANSFER ACTIVITIES OF THE SOUTHERN CENTER FOR WILDLAND-URBAN INTERFACE RESEARCH AND INFORMATION

Annie Hermansen-Báez and Edward A. Macie¹

The Southern Center for Wildland-Urban Interface Research and Information (Center) is a research work unit of the U.S. Forest Service Southern Research Station. The Center's mission is to develop and communicate guidelines, models, and tools needed by natural resource managers, policymakers, planners, and citizens to reduce risks to ecosystems and human communities in urban and urbanizing landscapes. The emphasis on packaging and delivering science for end users is thus an important component of the Center's work.

There are four main methods that the Center uses to disseminate and exchange information about interface issues. They include (1) electronic media (e.g., website, listserv), (2) publications, (3) professional development courses and conferences, and (4) model projects/demonstrations.

The InterfaceSouth website (www.interfacesouth.org) provides information about Center products, research, and training projects, plus serves as a clearinghouse of information about interface events, publications, weblinks, and much more. Information and pictures about a demonstration project in which a Florida home was retrofitted to make it Firewise can also be found on the website. The Center's listserv, SWUINET, distributes the InterfaceSouth Update and Post (electronic newsletter and announcements respectively) to natural resource professionals across the South.

The Center produces several kinds of publications for natural resource professionals, including fact sheets, general technical reports, journal articles, and books. One example is the "Fire in the Interface" fact sheet series (http://edis.ifas.ufl.edu/TOPIC_SERIES_Fire_in_the_Wildland_Urban_Interface) which provides information about fire issues relevant to the WUI in the South and is produced cooperatively with the University of Florida.

The Center develops professional development courses, outreach programs, and conferences in cooperation with several partners. One example is the "Changing Roles: WUI Professional Development Program", which was developed with the University of Florida to help resource professionals design and implement in-service trainings and that will enhance their work in the WUI.

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FOREST CERTIFICATION AND NONINDUSTRIAL PRIVATE LANDOWNERS: ASSESSING AWARENESS, ACCEPTANCE, AND EDUCATIONAL PREFERENCES

David C. Mercker and Donald G. Hodges¹

As forest certification has grown as a tool to foster sustainable forest management, questions have arisen about the potential and suitability of forest certification for nonindustrial private forest (NIPF) ownerships (Lindström and others 1999, Newsome and others 2003, Rosenberger and Huff 2001, and Vlosky, 2000). This ownership category is particularly important in the southeastern United States where it comprises the majority of the forest land and contributes the greater part of the region's annual timber removal. Little is known of who among this diverse and sizable group will adopt forest certification on their lands and why. This information is important if viable certification programs are to be developed and implemented by Extension professionals. NIPF owners in western Tennessee with 40 acres or more of forest land were surveyed to evaluate their awareness, acceptance, and educational preferences toward forest certification. Mail surveys were utilized for data collection and 50.7 percent of the participants responded. The results indicate that the largest majority of NIPF landowners had very little knowledge of forest certification. Even so, when provided with a definition of certification, the preponderance seemed willing to consider it. Those willing to consider certification agreed that it could improve forest management and that it would lessen the need for forestry regulation. They were more likely to be well educated, professionals, that were new to land ownership. Those who have received information or advice about forestry were most accepting of certification, and they trust the State Division of Forestry and consulting foresters as potential third-party certifiers. Ten methods of learning about certification were examined. Participants preferred the passive methods of visiting a website and viewing a video tape at home, and the active methods of attending an on-site forestry field day, and talking with professional and other landowners.

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WEB-BASED TREE CROWN CONDITION EVALUATION TRAINING TOOL FOR URBAN AND COMMUNITY FORESTRY

Neil Clark, Matthew Winn, and Philip Araman¹

Volunteers are getting involved more and more, particularly in monitoring applications within the context of urban and community forestry. Training numerous volunteers becomes a substantial task given the numbers of people, time available, and a multitude of other projects. Hundreds of different individuals may be involved in a single field season. These individuals may only be able to spare a few days of volunteer time. The more of this limited time that is spent on on-site training, the less time available for meeting the project goals. This paper deals with using web-based training (WBT) to address some of these issues relating to the specific application of tree crown condition evaluation, which is a particularly challenging element to explain. It is also inherently difficult to find representative trees at a single field location, so images created by 3D graphical modeling software are used to generate virtual trees with desired characteristics.

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PARTNERSHIPS OF THE SOUTHERN CENTER FOR WILDLAND-URBAN INTERFACE RESEARCH AND INFORMATION

Annie Hermansen-Báez and Edward A. Macie¹

The Southern Center for Wildland-Urban Interface Research and Information (Center) is a research work unit of the U.S. Forest Service Southern Research Station and was conceived and developed through strong partnerships, both internal and external to the Forest Service. Internal partners include Region 8 State and Private Forestry and the National Forests. External partners include the University of Florida, School of Forest Resources and Conservation (UFL), the Southern Group of State Foresters (SGSF), and the Southern Wildland-Urban Interface Council (SWUIC), which is composed of members from State Forestry Agencies, the U.S. Forest Service, Academia, Cooperative Extension, and non-government organizations.

One key example of the effectiveness of the Center's partnerships is the guidance that SWUIC provides the Center. SWUIC serves as the advisory council for the Center and provides critical guidance on all technology transfer activities and products. This ensures that products meet the needs of the Center's stakeholders.

There have been many products produced through these partnerships. Examples include:

Changing Roles: WUI Professional Development Program commissioned and financially supported by SGSF, developed by UFL and the Center. www.interfacesouth.org/products/training.html

"Wood to Energy: A Training Program to Utilize Interface Fuels for Bioenergy", a partnership between the UFL, the Center, the Southern States Energy Board, and Cooperative Extension.

Electronic delivery of science applications through the InterfaceSouth website and Interface South Updates and Posts (www.interfacesouth.usda.gov). SWUIC helps guide website content.

"Fire in the Interface" fact sheet series, partnership between the UFL and the Center (http://edis.ifas.ufl.edu/TOPIC_SERIES_Fire_in_the_Wildland_Urban_Interface)

"Forests at the Wildland-Urban Interface: Conservation and Management", partnership between UFL and the Center. (http://www.crcpress.com/shopping_cart/products/product_detail.asp?sku=L1602&parent_id=&pc=)

Effective partnerships have helped the Center since its inception, resulting in an increased ability to manage natural resources in the context of urbanization and changing land use, while reducing risks and maximizing ecological goods and services.

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BUILDING PROGRAMS THROUGH PARTNERSHIPS

Alan Long and Chris Demers¹

In the last 15 years, educational programs for forest landowners in Florida have benefited greatly from a diversity of partnerships. The Cooperative Extension Service, Florida Division of Forestry and Fish and Wildlife Conservation Commission, Florida Forestry Association, forestry consultants, Florida Farm Bureau, and industry have all played key roles in determining program needs, providing speakers and educational materials, hosting field tours, workshops, and web pages, and providing financial support in various ways. The result has been a wide variety of themes and venues across the state. Two important keys to these partnerships have been a willingness to work together in whatever functional role is needed at a certain time, and a steady exchange of ideas among partners on program ideas, planning, and conduct. Our case study will elaborate on how these keys have been developed and provide a set of examples to illustrate different types of partnerships.

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SURVEY STUDIES HOW TO REACH PRIMARY HARDWOOD PRODUCERS WITH NEW INFORMATION

Philip A. Araman, Robert L. Smith, and Matthew F. Winn¹

It is important for the timber industry to obtain new knowledge in order to stay competitive, increase productivity, or to produce new products from a sometime changing resource. We sought to understand how new knowledge—innovative techniques, improved technology, and marketing information—reach our primary forest industries in the United States. We surveyed hardwood lumber producers. We will present the results of our survey. Scientists want to make a difference and to do that we need to complete the cycle with effective technology transfer.

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COMPUTERIZED TRAINING FOR THE HARDWOOD SAWMILL INDUSTRY: THE EDGING AND TRIMMER TRAINER (VERSION 3.0)

Philip A. Araman, A. Jefferson Palmer, Matthew F. Winn, and D. Earl Kline¹

In the hardwood sawmill industry, decisions made at the various processing stages directly affect the value of the end product. In order to realize maximum product value, it is essential that employees be properly trained. The edging and trimming stage of lumber processing is one area where lack of proper training can result in poor manufacturing decisions and ultimately reduced product value. To supplement on-site training, we have created a computer program to assist edger and trimmer operators in making good manufacturing decisions. The Edging and Trimming Trainer Program is designed to help hardwood lumber edger and trimmer operators and sawmill managers better understand how lumber grade, surface measure, and price interact to affect lumber value and processing decisions.

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FROM A PROMISING STRATEGY TO A PRACTICAL MANAGEMENT SYSTEM

Boris Zeide¹

To realize the potential of the minimax strategy and turn it into a practical management system, it is proposed to combine forestry with agriculture and use several silvicultural techniques, including cluster planting and pruning. To compensate for establishment mortality and be able to select better trees, they are planted in clusters. The clusters tested on the study established in 1997-1998 by our School in Hope, Arkansas, consist of four loblolly pine (*Pinus taeda* L.) seedlings planted at the corners of a square with sides of 1 foot. All but one tree per cluster are thinned by age 5. Instead of struggling with the competing vegetation, we put to agricultural use the portion of land unutilized by pines until they close their crowns. Thus, the minimum number-maximum yield strategy leads naturally to diversified land use: agroforestry. Traditionally, foresters improved wood quality by keeping high stand density. Unfortunately, such density kills many trees and slows the growth of the rest. Pruning is a better way to improve stem form and wood quality than choking trees with density. Pruning improves wood quality physically by cutting off branches, and physiologically by removing of the apical meristem of branches (which stimulates the production of juvenile wood) and forcing trees to grow taller, which moves the crown apical meristems further from the lower bole. The described system not only increases financial returns but also maximizes them. On good sites (site index >60, base age 25 years) the system doubles sustainable returns as compared with regular forestry or agriculture practiced separately.

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THE MINIMUM NUMBER-MAXIMUM YIELD STRATEGY FOR TREE GROWTH

Boris Zeide¹

To maximize stand volume, foresters keep stand density in a medium range by periodic thinning to a certain residual basal area. It is possible to show without any experiments that higher final (and most valuable) harvest and returns can be expected when we let density to increase with age. The reason is that stand volume increases with density and average tree size. Low density at the beginning means high growth rate and larger size. High density at the rotation time means large harvested volume. Because this volume would be composed of bigger trees, it should be greater than the volume from stands where density was stationary. The reasoning that the optimal density trajectory increases with age might send us to search for some equation relating basal area or stand density index and age. Actually, no sophisticated functions and parameters are needed. The best description of optimal trajectory is simple: keep the number of trees per unit area constant. The number should be the minimum that assures the density sufficient to maximize financial returns by harvest time. At the beginning, this number assures low density and fast growth. Due to this growth, stand density increases with age. Such a rule can be called the minimum number-maximum yield (minimax) strategy. Albeit unknown in forestry, it is not new: for millennia, farmers have grown only the plants (sometimes, after the initial thinning of seedlings) they intend to harvest. However promising it sounds, minimax has several disadvantages such as inability to select better trees, forfeiting intermediate harvest, competition from undesirable vegetation, and poor wood quality of final harvest.

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Ashton, Sarah F.; Hubbard, William G.; Rauscher, H. Michael, eds. 2009. A southern region conference on technology transfer and extension. Gen. Tech. Rep. SRS-116. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 237 p.

Forest landowners and managers have different education and technology transfer needs and preferences. To be effective it is important to use a multi-faceted science delivery/technology transfer program to reach them. Multi-faceted science delivery programs can provide similar content over a wide range of mechanisms including printed publications, face-to-face workshops and training sessions, satellite-based and pod casting-based distributed learning courses, and a wide range of Internet-based products. Several opportunities exist to share theories, products, activities, successes and failures across the science delivery, Extension and education communities. These proceedings from the Southern Region Conference on Technology Transfer and Extension in Natural Resources contain 4 keynote papers, 18 papers on various technical and procedural aspects of science delivery, and 9 papers describing various technology transfer efforts. As a collection, these papers describe the state of activities and thinking in Southern United States natural resource science delivery and technology transfer.

Keywords: Extension, forestry, technology, transfer.



The Forest Service, United States Department of Agriculture (USDA), is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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