THE CROSSETT EXPERIMENTAL FOREST—72 YEARS OF SCIENCE DELIVERY IN THE SILVICULTURE OF SOUTHERN PINES

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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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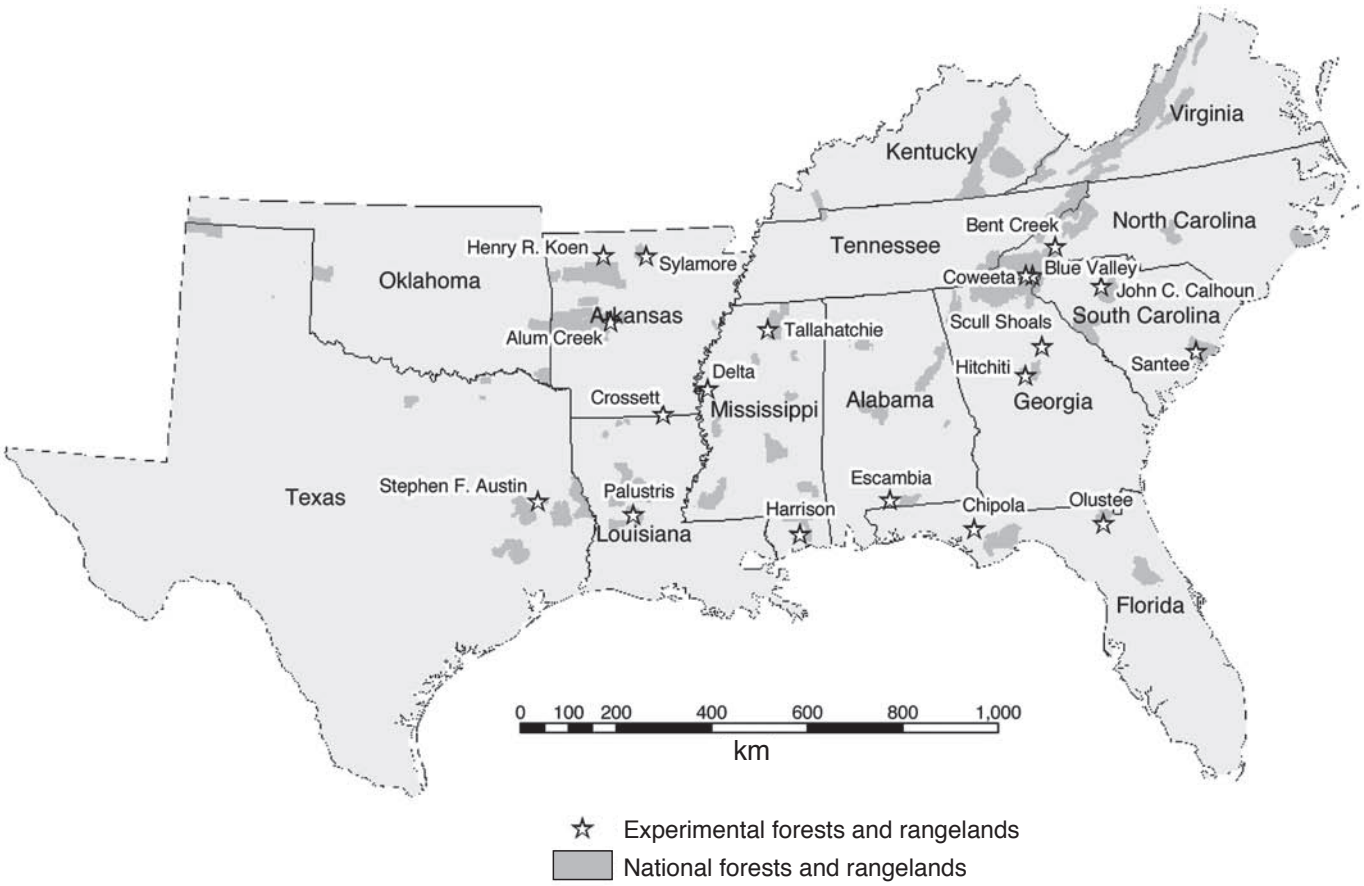

Figure 1—Experimental forests in the Southern Research Station of the U.S. Forest Service (Adams and others 2004).

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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REFERENCES

Adams, M.B.; Loughry, L.; Plagher, L., comps. 2004. Experimentalforests and ranges of the USDA Forest Service. Gen. Tech. Rep. NE-321. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 178 p.

Guldin, J.M. 2002. Continuous cover forestry in the United States—experience with southern pines. In: Continuous cover forestry: assessment, analysis, scenarios. von Gadow, K.; Nagel, J.; Saborowski, J., eds. Dordrecht, The Netherlands: Kluwer Academic Publishers: 295-307.