Rural Technology Initiative Science and Technology to Assist Rural Forest Resource-Based Communities in Washington State, U.S.A.[1]

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Abstract

The Rural Technology Initiative (RTI) was established in January 2000 by a federal grant as a pilot project to accelerate the implementation of new technologies in rural forest resource-based communities. Increasing complexity from changing environmental regulations, such as the new Forest and Fish Agreement in Washington State, and the recognition that new research findings were well ahead of implementation, suggested the need for more rapid technology transfer. Efforts to mitigate the substantial widening gap between urban and rural incomes depend upon more successful technology transfer. University of Washington and Washington State University Extension developed RTI as a cooperative program with the support of a Rural Advisory Board. A direct congressional appropriation in 2000 and subsequent appropriations through the U.S. Department of Agriculture–Forest Service Cooperative Programs made funding possible. For additional information, please refer to the RTI Web site www.ruraltech.org.

Keywords: Forestry technology transfer.

Introduction

The state of Washington is located in the Pacific Northwestern United States and contains approximately 17 million ha of land area.

More than half of Washington is forested; ownership distribution is 55 percent government, 6 percent Native American, and 39 percent private (table 1). Approximately 100,000 family forest owners, also known as nonindustrial private landowners (NIPF) in Washington state control 1.2 million ha, or 19 percent, of the commercial forest land in the state. Recent harvest restrictions on federal forest lands intended to protect endangered species and to increase late-successional reserves have impacted rural communities. Since 1987, timber harvests have declined 95 percent on federal lands and 57 percent on state lands in Washington (Larson 2000). Nearly 9.2 million m^3 of timber was harvested off family-owned forests in 1999, accounting for 31.5 percent of the timber harvest in the state.

The disparity in personal income between rural Washington timber communities and urban areas has increased greatly over recent years and can be expected to widen further with new requirements to protect salmon habitat (Eddelson and Lippke 1999). Although urban

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Table 1—Ownership of forest land and timber harvest for Washington state

Ownership	Forest ownership	Timber harvested in 1999	
	Percent of total	*Cubic meters*	*Percent*
Forest industry	20	12 417 874	42.5
Nonindustrial private	19	9 203 835	31.5
Native American	6	2 220 607	7.6
State	11	4 499 653	15.4
Federal	44	876 555	3.0
Total	100	29 218 526	100

Sources: U.S. Department of Agriculture 2000. Conversion based on 150 board feet per cubic meter.

areas are growing with new technologies, rural areas are hampered by difficulties in adopting new technologies. The forest sector may appear to be an overly mature, low-technology sector; however, in reality the ability to manage forests for increasingly complex wood product and environmental values is extremely sensitive to technology.

The availability of basic scientific knowledge needed to manage forests is far ahead of the capacity to convert the knowledge to useable technologies, to make the technologies accessible to rural areas, and to train people to use the technologies. Thus, there is a need for a strengthened network and service system of trainers and users with a focus on access and communication. Solutions to problems created by salmon listings, for example, require intensive training in managing riparian areas and use of forestry equipment in those areas, including specialized logging machinery, remote sensing devices, use of computer inventory tools, along with landscape management plans, financial analysis, planning packages, and product marketing.

Family forest owners, or NIPFs, are facing increasing complexity from changing environmental regulations, such as the new Washington State Forest and Fish Agreement and other forest practice regulations. Tribal forestry programs need better access to science and technology to expand education and career opportunities in resource management for tribal members. Forestry consultants that provide professional services for small landowners, tribes, and other rural forest landowners are expanding their skills through increased use of analytical and mapping software technologies. Rural educators need programs that link K-12 and community colleges to emerging technologies and scientific findings resulting from university research. Interested publics and policymakers need fast access to emerging scientific findings to aid successful land use planning. These groups and others are served by the programs developed as part of the **Rural Technology Initiative** (RTI).

The Rural Technology Initiative

In January 2000, the University of Washington College of Forest Resources (UWCFR) and the Washington State University Department of Natural Resource Sciences and Extension (WSUNRS) received a $900,000 Congressional Appropriation through USDA-Forest Service Cooperative Programs to create the RTI as a pilot regional network and service system to increase technology transfer to rural forestry communities. The mission of RTI is to **Empower the existing infrastructure to use better technology in rural areas for managing forests for increased product and environmental values in support of local communities.**

The RTI Partners

Interdisciplinary teams of faculty, staff, and graduate students from both universities have been assembled to

undertake forestry technology research, development, and technology transfer. Each organization brings unique expertise and talents to the RTI partnership.

The University of Washington (www.cfr.washington.edu). Located in Seattle in western Washington, UWCFR was founded in 1907.

Washington State University (www.nrs.wsu.edu). Washington State University Department of Natural Resource Sciences, located in Pullman, Washington, in rural eastern Washington, is unique as the state's land grant university and as such, has three distinct mandates: teaching, research, and extension.

Extension Forestry (ext.nrs.wsu.edu). The WSUNRS Program is administered by Washington State University, which is located in Pullman, Washington. Extension forestry field/county educators are located in 8 of Washington's 39 counties and have local or area-specific responsibilities, whereas state extension educators have statewide responsibilities and subject matter leadership.

Extension forestry is a relatively small component of the overall extension system, which offers educational programs in five major areas: agriculture, natural resources, community resource development, 4-H and youth development, and home economics and human nutrition. To help improve NIPF, extension programs target (1) public awareness, (2) policy education, (3) program coordination, (4) professional education, and (5) forest-land management practices.

To understand extension in the United States, two aspects are particularly important: (1) Extension is unique among public natural resource programs because it considers the objectives of the individual forest owner before all others. It works with the owner to identify management alternatives that are in his or her best interests, recognizing that the side benefits will be more productive farms and forests, and a stable raw material supply for generations. (2) Extension in the United States is administered at the state level by land grant universities. This means that most Extension professionals are members of an academic institution rather than a straight-line government agency.

U.S. Department of Agriculture, Forest Service, State and Private Cooperative Forestry (www.fs.fed.us/spf/coop). Cooperative Forestry is a federal program administered by the USDA Forest Service, which by providing federal funding to RTI and other economic action programs, helps rural communities and businesses dependent on forest-based resources to become sustainable and self-sufficient.

Cooperators. The RTI cooperates with a host of federal and state conservation programs including the Multiagency National Fire Plan Implementation Community Assistance and Economic Action Program; the USDI Bureau of Indian Affairs and Bureau of Land Management; the Intertribal Timber Council; the USDA Forest Service; Natural Resources Conservation Service; the Stewardship Incentive Program; Small Forest Landowner Office and Forest Stewardship of the Washington Department of Natural Resources; the Washington Department of Community Trade and Economic Development; the Washington Office of Public Instruction; and others to promote better technology in rural areas to manage forests for increased forest products and environmental values in support of local communities.

The RTI Rural Advisory Board

A rural advisory board, comprising representatives of community groups, tree farmers, forestry associations, tribes, forest product manufacturers, conservation districts, community colleges and others was created to guide RTI priorities. This advisory board is instrumental in project development priorities. The RTI advisory board identified four initial priorities:

- Landscape management case studies of (1) Forest and Fish Agreement impacts on NIPF owners under a range of alternative strategies, (2) dry-site thinning to reduce forest fire risk and critical habitat management alternatives, and (3) carbon credit protocols.

- Training and assistance for forest-land owners, tribal foresters, forestry consultants, rural educators, and others in response to an RTI-conducted needs assessment.
- Scientifically credible habitat models for landscape management alternatives and monitoring programs to demonstrate treatment impacts.
- Value-enhancing certified data for managed forests.

The RTI's Rural Advisory Board includes member representatives from the NIPF owners Washington Farm Forestry Association, Association of Consulting Foresters, The Yakama Nation, The Colville Confederated Tribes, The Quinault Indian Nation, The University of Washington Olympic Natural Resources Center, American Forest Resource Council, Washington Contract Loggers Association, Washington Hardwoods Commission, Columbia Pacific RC&D, Northwest Forest Products Workers, United Brotherhood of Carpenters, Washington Association of Conservation Districts, Okanogan Communities Development Corporation, USDA Forest Service Cooperative Programs, Spokane Community College, and Green River Community College.

Needs Assessments

To understand better rural forestry technology needs, one of the first RTI projects was to survey Washington forest consultants and NIPF landowners. The needs assessment is summarized below:

RTI carried out needs assessments:

- Surveyed consulting foresters' needs, including training topics, level of training, and times and locations for delivery. With a 40 percent response rate, training topics considered important or very important included the following: regulatory interpretation; riparian protection; tax and estate planning; geographic information systems (GIS) instruction; global positioning system (GPS) instruction; unstable slope and road impacts on water resources; instruction in the Landscape Management System (LMS); spreadsheets and data management; and growth and yield. A majority of respondents felt that new technology can benefit their businesses by transferring skills needed to help landowners and managers more efficiently meet regulatory requirements at lower costs.
- Analyzed and interpreted data from two NIPF landowner surveys in Washington state preparatory to the development of a habitat conservation planning approach. Training topics considered important to very important were regulatory interpretation (95 percent), riparian protection (85 percent), tax and estate planning (83 percent), GIS (75 percent), GPS (68 percent), unstable slopes (63 percent), road layout (63 percent), LMS (60 percent), spreadsheets and data management (60 percent), and growth and yield (56 percent). The majority of respondents felt that new technology can lower costs and more efficiently meet regulatory requirements.

Analysis of other questions from these surveys indicated that respondents favored 2- or 3-day short courses that were affordable, user-friendly, and could be offered during the week at different locations around the state.

The Internet

The Internet is a powerful delivery mechanism for technology transfer. It is important for RTI to assist its customers in becoming better acquainted with the ease and value of the World Wide Web. However, many rural forestry landowners and some professsionals are new to the Internet. To help promote Internet use, all training materials used in RTI short courses include verbage to assist in Internet navigation. All RTI publications, announcements, and newsletters are distributed in hardcopy but are also available for download at no charge from the RTI Web site www.ruraltech.org. The RTI Web site also offers a number of other attractive options that are increasing in popularity. An interactive conversion

calculator for forestry measurements is the most frequently used free service on the RTI Web site, but other features such as the free forestry image library or the user question and comment page are frequently visited as well. The RTI Web site is linked to the UWCFR and WSUNRS sites to provide an information suite that can be used by professional foresters, loggers, engineers, and landowners alike. Web site use has risen steadily to more than 5,500 individual nonuniversity visitors per month.

Interactive Streaming Video

Streaming video is a technology used on the World Wide Web to expedite the video viewing process and expand rural access to distance-learning technologies customized for use with low band-width. It allows the end user to start viewing a video file as soon as a connection is made to the media server. The actual process of streaming video over the Internet requires a complex system of events, but the underlying concept is simple. Instead of waiting for the entire video file to download before watching it, the user is able to watch smaller sections of the video right away while downloading the rest. This is accomplished by "streaming" the video file over the Internet in small pieces. A media player on a user's computer deciphers those streaming pieces as they are downloaded and presents them seamlessly to the viewer. The result is close to real-time viewing.

The RTI first experimented with interactive streaming video at the RTI Annual Review in January 2003. Digital video footage was taken of each presentation, synchronized with the corresponding PowerPoint® slides, and streamed from the RTI Web site. This triggered the realization that streaming video technology is a powerful tool for sharing information and ideas. It incorporates a speaker's oration with informative slides, and it makes them available to users with either a high-speed or dial-up Internet connection, as well as on CD-ROM. In little more than a year, RTI has gone from experimenting with streaming video technology to making it a major mode of outreach with skilled film crews at both Washington State University and University of Washington (fig. 1). This video technology dramatically increases the accessibility of information presented at seminars, conferences, and workshops and makes it available to a worldwide audience. Streaming video fits perfectly with RTI's goal to increase access to forestry technology and information. Washington State University Extension is using this new technology to reach and educate family forest landowners throughout the state. In 2003, RTI's interactive streaming video technology was used to expand the reach of a "Sudden Oak Death" conference. Currently there are over 180 presentations on the Washington State University Extension Forestry Web site (ext.nrs.wsu.edu) and over 200 on the main RTI Web site (www.ruraltech.org). Recently, a streaming video tutorial has been added, and workshops in the use of this technology will soon be offered to rural educators.

The RTI Projects

Listed below are some significant RTI projects. To accommodate space limitations, this is not a complete list. For additional information, please refer to the RTI Web site www.ruraltech.org.

Training and Technology Transfer

The RTI responded quickly and established a series of affordable short courses (6 to 8 sessions per year) in the use of forestry and mapping software technologies. All course offerings are certified for continuing forestry education credits from the Society of American Foresters and are presented by faculty and staff from UWCFR and WSUNRS.

Empowering Family Forest Landowners—Coached Planning and its Relationship to RTI

The Forest Stewardship "Coached Planning" shortcourse is an educational opportunity for family forest landowners (fig. 2). This informational, hands-on, practical

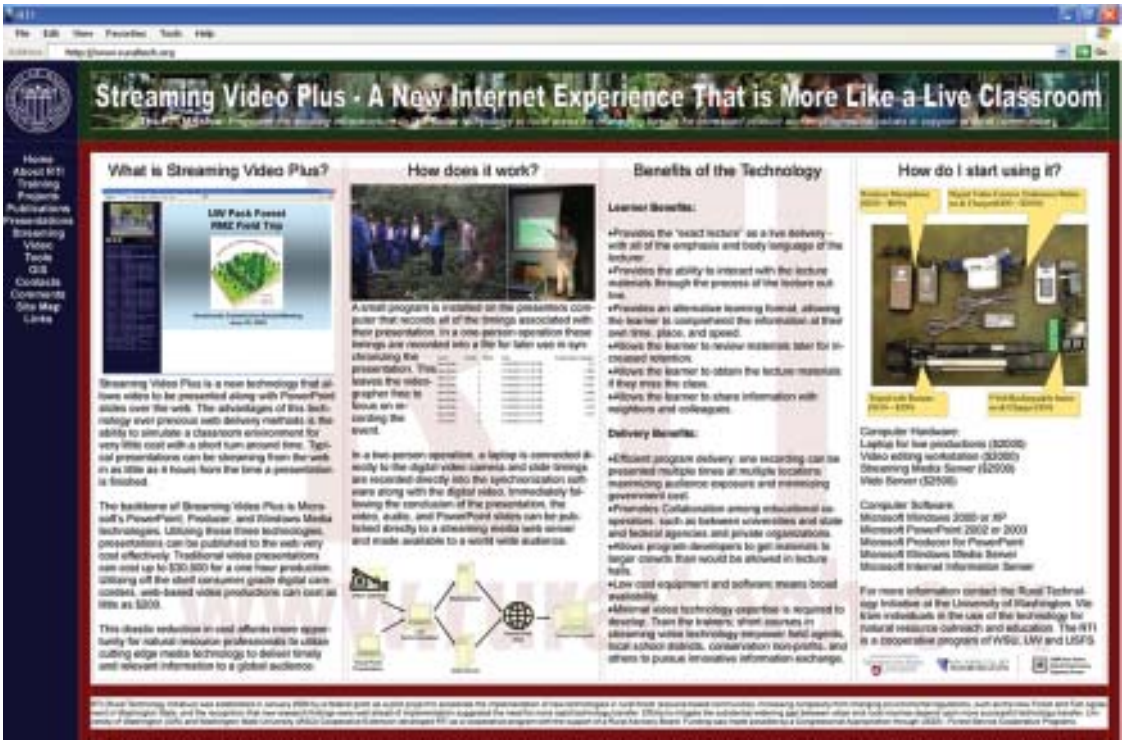

Figure 1—Web page view from the RTI Web site.

Figure 2—Coached planning participants

approach enables landowners to learn useful information about their land and its resources. Participants author their own forest stewardship plan with guidance and "coaching" by natural resource professionals, some of whom come from the RTI staff. Coached planning is important because it empowers landowners to make decisions about their land in a wise economic and ecological manner—decisions are based on their own ownership objectives, and thus the plan has a high probability of implementation. The Cooperative Extension Program in collaboration with Washington Department of Natural Resources Forest Stewardship Program, started coaching landowners in 1995, but since 2000, RTI technologies have been incrementally introduced into the curriculum with good response. The most popular software is the LMS, a powerful forestry program developed at the University of Washington with Forest Service funding support. The RTI adapted this software for use by small landowners through the development of user-friendly features such as the Inventory Wizard. Inventory Wizard allows users to easily enter field inventory data into LMS for inventory analysis, simulations of treatment alternatives, estimates of future growth and yield, and other outputs of interest including visualization of forest conditions. The LMS software is provided at no charge to all coached planning participants.

Since 1995, 80 eight-week coached planning sessions have been offered serving more than 1,400 family forest landowners. Over 700 stewardship plans have been prepared. We have received dozens of testimonial letters from satisfied landowners. We have implemented the use of the interactive streaming video as a teaching aid and have begun use of the Inventory Wizard and LMS to help develop management alternatives templates.

The Landscape Management System

The LMS brings together a user-friendly software package of growth-and-yield models, forest visualization capabilities, habitat indices, economic analysis, and more (fig. 3). Trainees learn how to model changes in

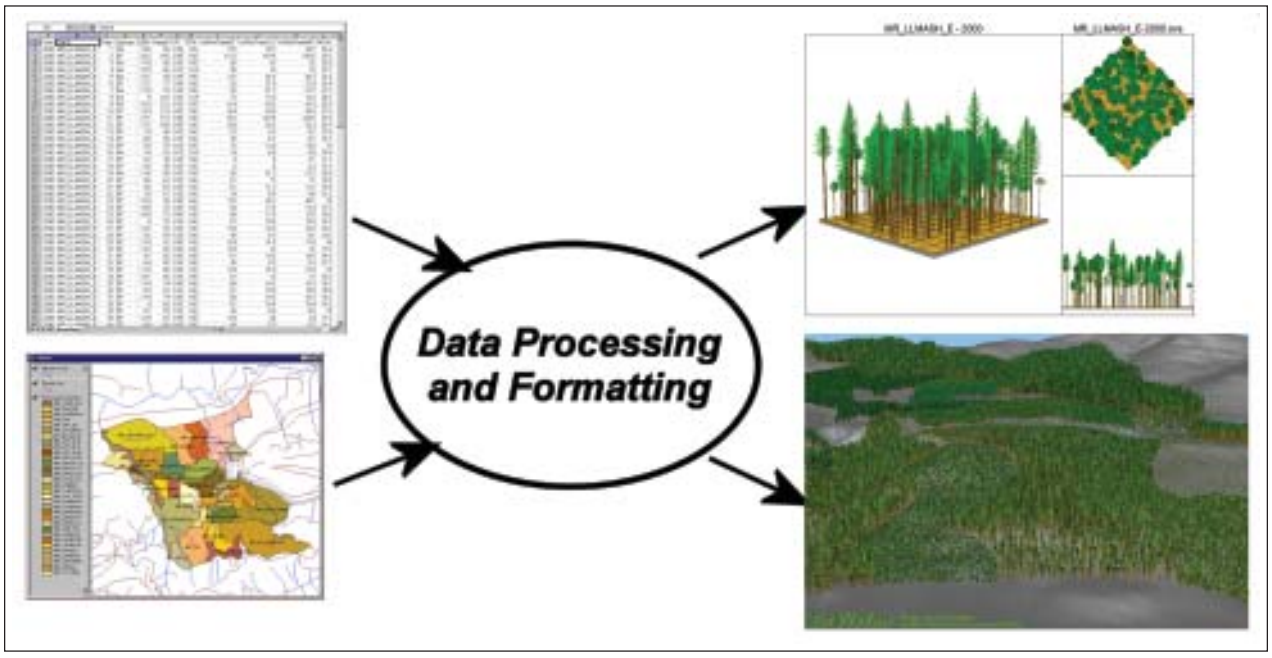

Figure 3—LMS brings together a user-friendly software package of growth and yield models, forest visualization capabilities, habitat indices, economic analysis, and more.

forest inventories over time and across large geographical areas. The LMS is distributed at no charge (lms.cfr.washington.edu/) through a partnership between the UWCFR and the Yale School of Forestry and the Environment. In the past year, the following updates are noted:

- Released LMS version 3. The new version is designed to increase user friendliness, such as the inclusion of the Inventory Wizard, Econometrics, Site Index Calculator, and Log Sort Wizard.
- Conducted numerous LMS training sessions for consultants, educators, small forest landowners, tribal foresters, and others.
- Developed a user-friendly LMS tutorial with software made available at no charge on CD or download from lms.cfr.washington.edu/.
- Developed templates for management alternatives that are being integrated with Washington State University/Department of Natural Resources coached planning classes to assist NIPF owners in developing forest stewardship plans.
- Introduced LMS 3 to family forest landowners and forest consultants with the expectation that they will help us integrate this software tool in management planning.

Geographic Information System and Global Positioning System Activities

The GIS is a specialized computer system made for the creation, storage, analysis, and display of spatially referenced information. The popular ESRI program ArcGIS is the software used in this training. The GIS helps forest landowners to plan harvest activities and road maintenance projects. The RTI has developed several GIS extensions that are downloadable from the Web site: "Pegger" for virtual road pioneering (fig. 4), "CulSed" for culvert location to reduce sediment at less cost, and "LMS Analyst," which creates stand attributes for mean slope, elevation, and aspect. The GPS is a utility used for a variety of purposes in forest and natural resource management. Features such as roads, streams, wetlands, stand boundaries, sampling plots, and bird nests can be mapped easily and with high accuracy and precision when GPS coordinates are transferred into GIS.

Roads Impacts

- Developed case studies that identify the cost of required changes to roads and culverts and consider road density planning for tree farms to identify preferred alternatives to comply with forest practice requirements.
- Estimated total landowner costs for culvert replacements that led to legislation more favorable to sustainable production.
- Produced an extension bulletin, Roads on Small Acreage Forests, which describes basic road principles for NIPF landowners.

Riparian Management

Strategies to maximize habitat opportunities for anadromous fish are required by both federal and state law but are often costly and may cause small forest landowners to seek financial relief by developing their lands for nonforestry use. To understand better the breadth of economic impacts to Washington's family forest landowners, RTI conducted case studies of actual landowner circumstances. These case studies have proven to be useful to landowners wishing to provide the Washington state legislature with credible estimates of real costs of regulatory compliance. Case studies also point out opportunities for the development of customized approaches that provide better habitat at reduced cost. Further study into riparian functionality will help landowners with the development of alternative plans. The RTI has assembled interdisciplinary teams of faculty and staff experts from UWCFR and WSUNRS to investigate canopy/sun relationships, course woody debris recruitment, and organic particulate delivery within forested riparian zones towards the development of user-friendly management templates to aid landowners in planning riparian harvest activities (fig. 5).

Figure 4—GIS extension are downloadable from website such as "Pegger" for virtual road pioneering.

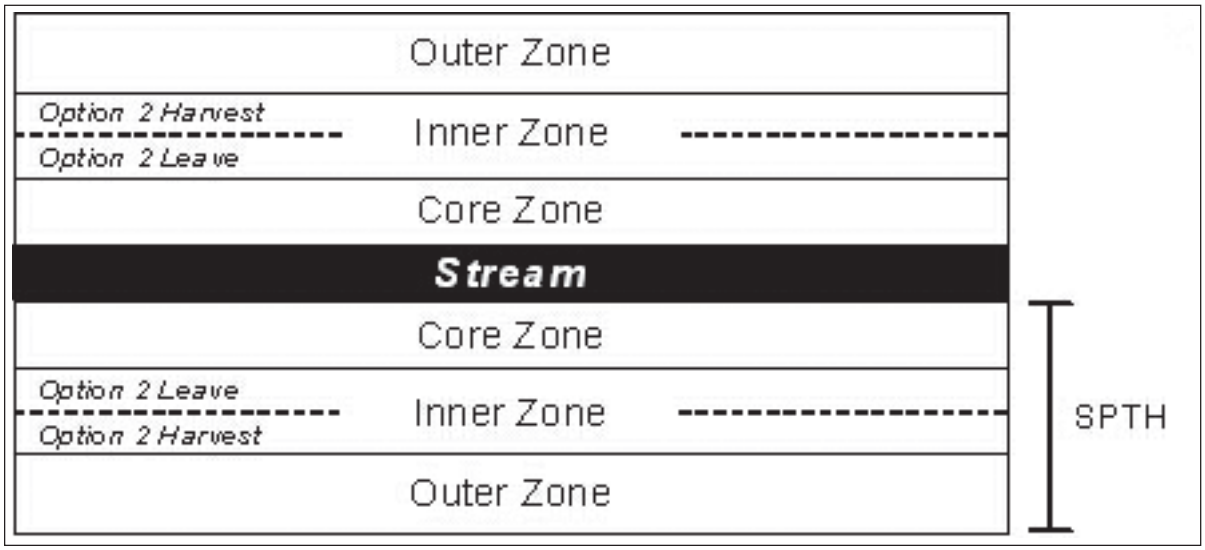

Figure 5—To understand the impact of new riparian regulations, in the state of Washington, the RTI analyzed impacts of management alternatives, such as the three-tiered zones approach offered here. SPTH = Site potential tree height.

- Analyzed impacts of management alternatives.
- Prepared economic impact case studies on small-sized forested parcels, analyzed the economic impact of a base case and four management alternatives allowed under the Forest and Fish Agreement. Total forest value losses ranged from 27 percent to 36 percent under the "best case" scenario, and from 45 percent to 83 percent under the "worst case" scenario indicating a broad disparity in landowner impacts.
- Developed an assessment procedure to evaluate alternative plans for effectiveness in achievement of desired future environmental conditions and economics sufficient for sustainable forest management.

Wildlife Management

Response of wildlife to forest management is another important consideration in the development of forest management plans. The RTI staff work to assist tribes, consultants, and landowners in the use of habitat suitability indices (HSI) to understand quantification of expected wildlife response to alternative harvest activities. Additionally RTI partially supports a wildlife habitat specialist at Washington State University that has primary responsibilities for small forest lands and habitats. Wildlife habitat management is a fully integrated topic in the coached planning curriculum as well.

Habitat Conservation Planning

The RTI has assembled an interdisciplinary team of faculty and staff that are working with small forest landowners (Family Forest Foundation, familyforestfoundation.org) as well as federal and state agency personnel in Lewis County, Washington, to develop a programmatic multispecies Habitat Conservation Plan (HCP). The HCPs are described under the Endangered Species Act as contractual agreements between landowners and the federal government where landowners volunteer protection, restoration, and enhancement of targeted habitat qualities in exchange for long-term management certainty. To date, HCPs have been too complicated and expensive to be accessible to small forest landowners. The creation of a programmatic HCP will bring together multiple landowners as one negotiating entity in a simplified regulatory process that will be the first of its kind in the Nation and will serve as a model for achieving sustainable forestry in other counties and states. Emerging forestry technologies, RTI scientific expertise, and a subsequent better understanding of adaptive management concepts have made this possible.

To develop credible data on the impacts of forest management on habitat and stream conditions, RTI:

- Developed models directly linking habitat-suitability measures to the evolution of forest stands under management.
- Convened a panel of forest scientists to plan the development of better models and to identify gaps in needed coverage. The panel circulated a draft plan identifying upland habitat, riparian zone habitat, and instream functionality and modeling needs.
- Used the Satsop Management Plan (Grays Harbor County) as a pilot test and case study for developing upland habitat models based on the Fish and Wildlife Habitat Evaluation Procedure. Using LMS, a range of management alternatives and resulting HSIs can be evaluated for their impacts over time.
- Evaluated instream functionality indicators identified by the National Council for Air and Stream Improvement, Inc. (streambank stability, sediment reduction, chemical removal, shade and temperature, large woody debris, particulate matter) in order to develop similar forest-dependent instream functionality measures linked to LMS.
- Developed management plans and assessment methods for a multi- and small-owner HCPs.

Carbon Sequestration

Global warming is thought by many to be occurring because of increases in atmospheric carbon associated with combustion of fossil fuels. An embryonic marketplace for the sale of "carbon credits" from forests dedicated to carbon storage is developing. Adjustments to forest management such as increased fertilization or longer rotations can increase carbon storage potential. For landowners to benefit from carbon credit sales opportunities, assessing forest carbon fluctuations will be needed. The RTI has collaborated with the Consortium for Research in Recyclable Industrial Materials (CORRIM) to development carbon assessment software to be used with forest inventory systems such as LMS. A sample assessment of carbon storage in forest biomass has been prepared for King County, Washington. Life Cycle Analysis (LCA) is used to demonstrate the importance of carbon reduction contributions by forest management. The LCA is a cradle-to-grave evaluation of the environmental implications of forest initiation, growth, harvest, product streams, product substitutions, decay, and other considerations. The CORRIM conducted years of research that has now been connected, with the help of RTI resources, to the LMS software so that LCA considerations will add new information quality to selection of best management practices.

Forest Fire Risk Reduction

Large areas of forest land in the inland West are overstocked with small-diameter suppressed trees. These forests have unprecedented fuel loads and are at a high risk of catastrophic forest fire. Rural communities, most at risk from forest fires, are often economically depressed. However, removal of many small-diameter trees is known to be costly. Opportunities to reduce costs and increase fuel reduction activities are linked to such questions as: (1) How might harvest units be designed to reduce or eliminate operational cost deficits? (2) How might evolving markets and increasing public interest in cogeneration, carbon sequestration, and fire safety investments influence values? (3) What are the marginal costs of alternative residual density targets? (4) What are the impacts on desired future environmental conditions that result from harvest alternatives? (5) How might answers to the above questions help administrators and field personnel to better customize project design to fit local forest and community needs? The RTI, working with National Fire Plan partners, developed a parametric sensitivity analysis to address the above questions for a range of market and stand conditions that can be customized to local circumstances. Although more work is needed, this preliminary analysis is providing the basis for development of thinning/fuel reduction instructional materials and training modules that better estimate marginal tradeoffs associated with treatment alternatives. Working with the USDI Bureau of Indian Affairs, RTI has begun a training program for fire risk analysis and fuels reduction planning on tribal forests.

Increased numbers of intense crown fires are symptomatic of a changed management paradigm, e.g., fire suppression and insufficient attention to stand structure. RTI:

- Evaluated the impact of alternative fuel reduction treatments on fire risk.
- Developed tools linked to LMS that support development of fire risk reduction strategies.
- Demonstrated that the benefits of fuel treatments that reduce fire risk, when nonmarket benefits (saving habitat, firefighting and relocation costs, fatalities, facilities losses, carbon, and water) are included, are much greater than the public cost of treatment.
- Demonstrated that archival evidence of pre-European east-side forests can serve as a measure of crowning potential for east-side forests. Developed metrics will be used to provide guidance to land managers in designing future landscapes to sustain biodiversity goals and reduce fire hazard.

Special Forest Products Quality Control

Markets in special forest products (SFPs) or NTFPs can be better served if the quality, efficacy, and safety of medicinal botanicals and herbal nutrient supplements can be assured. High-quality and consistent SFPs have customarily brought a higher market value. Clearly, the harvesters need advanced technologies for quality control and standardization for routine practice. However, owing to the traditionally high cost of such technologies, and overall low income among the rural SFP community, these technologies are unaffordable. The main objectives for the project were to (1) improve and guarantee both sustainability and profitability of the herbal medicine and dietary supplement industry by implementing an affordable, easily available, standardized tannin analysis technology; (2) develop a database on tannin content for several of the most profitable medicinal herbs, such as St. John's Wort and Echinacea; and (3) provide front-line technological support for Pacific Northwest SFP industries through scientific recommendations aimed at the improvement of standardized growing, harvesting, and processing methods. The RTI support for initial work was leveraged to secure supplemental funding to convert laboratory bench-top tannin assay procedures into a Tanalyzer Technology—a hand-held digital device providing multiple sample screening for tannin directly in the field.

Conclusions

Since its beginning in January 2000, RTI has trained over 500 consultants, extension agents, tribal foresters, rural schoolteachers, and family forest owners in the use of forestry software products. Mentioned above are some, but not all, of the projects undertaken by RTI. An interdisciplinary team comprising biologists, engineers, programmers, silviculturists, GIS specialists, mensurationists, and economists has been assembled from faculty, staff, and graduate students at the RTI centers created by this unique partnership of Washington's premier resource science universities. More than 30 faculty members from University and Washington State University have contributed to the rapid development of RTI programs. Scholarships and research assistantships have been provided to worthy students creating double benefit. Research findings have been used by the state legislature to understand the complexities of rural forestry challenges and to support subsequent beneficial policy adjustments. The RTI personnel have become frequent presenters at association meetings, community get-togethers, and symposia throughout the Pacific Northwest.

English Equivalents

1 hectare (ha) = 2.47 acres
1 cubic meter (m^3) = 35.3 cubic feet (ft^3)

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