

# RTI News

Summer 2003

Newsletter of the Rural Technology Initiative

Volume 3, No. 2



## Alternate plans: Developing templates for Eastern Washington

An important element of Washington's Forests and Fish Rules (FFR) is a provision giving landowners flexibility to create alternate management plans in cases where riparian function can be met in a more cost-effective manner. However the alternate plan process can be complicated and difficult. To simplify alternate plans, the FFR call for the development of management templates (WAC 222-12-0403). While a lot of attention has been focused on template development for Westside conditions, alternate plan templates are also needed on

the Eastside. The FFR have been shown to have significant economic impacts for some Eastside landowners (RTI Fact Sheet #20), and the Forestry Riparian Easement Program is not adequately funded to provide large-scale economic relief. Alternate plans are a necessary mechanism for helping forest landowners to maintain their economic viability while responding to Eastside management challenges such as forest health.

Forest health issues are a common situation on the Eastside where drought and overstocked conditions result in stressed forests. A serious Eastside forest health issue is the risk of mountain pine beetle (MPB) outbreaks. Healthy forests are able to repel MPB attacks. However when stressed trees do not have adequate vigor to repel a MPB attack, an outbreak occurs causing widespread mortality. Depending upon site quality, stocking density, and weather, forests can become susceptible to MPB outbreaks when they accumulate 80 to 100 ft<sup>2</sup> of basal area (BA) per acre (Cochran 1988, Larsson et al. 1983, Schmid and Mata 1992, Cochran et al. 1994).

Under the FFR, the inner portion of the riparian zone on low elevation sites cannot be harvested until BA reaches 110 ft<sup>2</sup>/acre, which is above the threshold for a MPB attack. Once a stand meets this requirement, a harvest can be done in the inner zone as long as a minimum of 60 ft<sup>2</sup> of BA/acre is retained. By itself, the retention requirement of 60 ft<sup>2</sup> of BA/acre would leave post-harvest stands below the risk threshold for MPB. However, there is also the additional retention requirement

of 50 TPA, including the 21 largest trees. If these leave trees have a quadratic mean diameter (QMD) that approaches 18" diameter at breast height (DBH) then the post-harvest BA/acre is high enough that a risk of a MPB outbreak remains. For example, Figure 1 shows the post-harvest BA distribution in the inner zone under the FFR for several Eastside riparian stands taken from RTI case studies (Oneil 2003). In this figure, BA is broken down into its components: TPA and QMD (the diameter of the tree of average BA), and it is plotted relative to the BA threshold for risk of MPB outbreak. Under the FFR, 75% of these case study inventories remain above the MPB risk threshold after harvest.

FFR provisions for alternate plans provide an opportunity to develop a management template that would meet riparian function, reduce the risk of MPB outbreak, and provide a better economic return to the landowner. One of the challenges, however, will be to assess whether or not an alternate plan meets the requirement of providing protection "at least equal in overall effectiveness" as the FFR (WAC 222-12-040). A possible approach is to look at the results of an alternate plan relative to the overall intent of the rules.

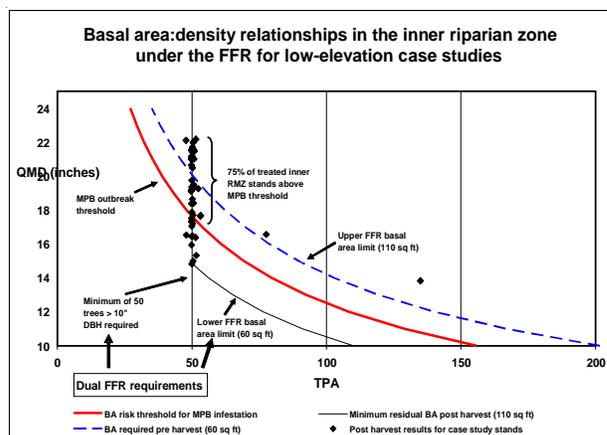


Figure 1: Basal area distribution post harvest for inner riparian zones in low elevation case study sites under the FFR.

In Eastern Washington the FFR were "designed to mimic Eastside disturbance regimes within a range that meets functional conditions and maintains general forest health" (WAC 222-30-022). An alternate plan that reduces BA below the risk threshold of MPB outbreak will help to maintain "general forest health." However, the plan must still meet "functional conditions." A possible solution is to use a measure of relative stand density, such as stand density index (SDI), to create an easy to use look-up table that links the FFR target of 50 TPA and 60 ft<sup>2</sup> of BA/acre to variable TPA and QMD targets that provide maximum riparian function,

*continued on page four*

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## RTI Director's Notes

We have been investigating the potential for alternate plans that can support viable economics as the key to sustainable forest management while providing no less protection for salmon than is provided by the new riparian management regulations. While it is unfortunate that a proper economic analysis and assessment of the impact of the rules is rather technical and expensive, the opportunity to develop templates that simplify the approval of and management under alternative plans is promising.

Previous RTI newsletters have provided analysis of case studies which show substantial economic losses for some family forest owners from the Forest and Fish Rules (FFR) while also reducing the opportunity to thin overly dense stands, foregoing the opportunity to put many of these stands on a pathway to reach the desired conditions sought by the regulations. In this issue we feature two articles that provide status reports on what it takes to develop alternative plans and ultimately templates: one which is focused on the Westside and the common problem of overstocked managed stands, and one which is focused on the Eastside and the common problem of avoiding insect infestation. The results indicate that alternate plans can be developed to restore viable economics and protect habitat at least as well as the regulation. The Legislature anticipated most of the problems that we have articulated, and they have made provisions for alternative plans and templates as the solution. The process of getting them accepted and implemented in a reasonable amount of time and effort is the challenge.

The opportunity for hardwood or mixed species riparian buffers that could be more sustainable (i.e. offer better economics and more protection on agriculture lands) seemed promising to our board a year ago and we are happy to report that an RTI feasibility project has lead to a successful SARE (Sustainable Agriculture Research and Education) grant of \$242,000 awarded to WSU Professors Jim Drobrowski and Jon Johnson to develop a scale demonstration and evaluation project with the full support of a number of landowners and agricultural interests.

On the educational front, RTI and Pack Forest staff have established a demonstration of riparian buffer alternatives at the UW Pack Experimental Forest near Eatonville that has helped family forest owners, foresters, and the public to better understand the regulatory requirements and the impact of management alternatives. A comparable demonstration site for Eastern Washington has been developed by Peter Griessmann, WSU Extension, at the Sherwood Creek Demonstration Forest in Northeast Washington.

In response to a request from a number of users, we also report the release of our new "Inventory Wizard" software tool developed by Kevin Zobrist to make inventory data easily importable into the Landscape Management System (LMS). LMS is being more widely used for developing management plans as it provides so many different outputs of importance when managing for multiple objectives.

**Bruce Lippke, Director**  
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## Red Alder Seedlings Available from the WA DNR Webster Nursery

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## **An integrated process for developing alternate plan templates for overstocked stands**

RTI has been working to develop an objective, scientific process for developing alternate plan templates. There has been increasing interest in the creation of these templates to facilitate the development of alternate riparian management plans for family forest owners in Washington. The purpose of alternate plans is to “meet riparian functions while requiring less costly regulatory prescriptions” (RCW 76.113.110). Developing less costly prescriptions is important, as RTI case studies indicate that many family forest owners will have significant economic losses given the management options available under the FFR (see RTI Fact Sheets #2 and #20). While a funded Forestry Riparian Easement Program has the ability to help some of these landowners, it leaves out many others who will need less costly alternatives in order to remain economically viable.

It is important that family forests in Washington remain economically viable. Family forests are located in the lowland areas where there is a lot of critical riparian habitat. They also interface with urban and suburban areas, providing a buffer between areas of urban sprawl and the industrial forests and public lands further upslope. Coupled with the strong stewardship ethic found in family forestry, these factors put family forests in a unique position to provide for quality riparian habitat and a multitude of other public values. However, these factors also make family forests particularly sensitive to conversion pressures. Family forestland in Washington is converted at significant rates as urban areas rapidly expand. This conversion rate will be exacerbated if forest management options are no longer economically viable for these landowners.

A streamlined process for the development and approval of alternate plans is necessary to facilitate the large number of landowners who could benefit from an alternate plan. The Forest Practices Rules provide for the creation of template prescriptions to simplify the development of alternate plans for common situations (WAC 222-12-0403). A common situation in Western Washington that is a good candidate for such a template is an overstocked stand. Douglas-fir plantations are planted at high densities to maximize early growth with the expectation that the density will be reduced through subsequent thinning operations. In riparian areas, these subsequent thinnings are not always possible or economical under the options specified in the FFR. This is an economic setback for landowners, and it also leaves these areas in an unnatural and overly dense condition that inhibits stand development. An alternate plan template to address these situations would provide an opportunity for both economic relief and riparian habitat improvement.

The first step in developing an alternate plan template is to generate a range of creative management alternatives to

address both riparian habitat and economic needs. For overstocked stands, these alternatives should include different thinning strategies throughout the riparian zone. To demonstrate this, we created 10 example alternatives and used the Landscape Management System (LMS) to simulate them over time on a sample inventory from a 20-year-old Douglas-fir plantation on site class II that is stocked at 450-500 trees per acre (TPA). Each of the example alternatives included a 25-foot “bank stability zone,” which is most critical for shade and large woody debris (LWD) recruitment. Depending on the prescription, this zone was either thinned successively to 60 TPA, thinned successively to 25 TPA, or left untouched. Adjacent to the core zone was an additional riparian management area that extended out to 50, 80, or 113 feet. This area was either thinned successively to 25 TPA and then left alone, or it was managed on a 100-year rotation with multiple thinnings.

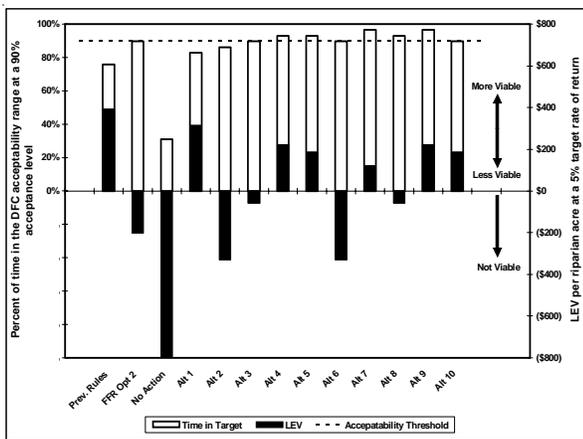
Once a series of potential management alternatives has been simulated, the adequacy of each alternative must be assessed. The rules require alternate plans to “provide protection for public resources at least equal in overall effectiveness to the protection provided in [the FFR]” (WAC 222-12-0401). One of the biggest challenges in creating viable alternatives is establishing specific criteria that can be used to objectively assess whether or not a prospective template prescription provides the necessary level of resource protection. For westside streams, the FFR have established a riparian protection and restoration paradigm known as the Desired Future Conditions (DFC). The DFC represent mature forest structure, and they are based on a sample of 80 to 300-year-old unmanaged riparian stands known as the DFC dataset. The goal of the management options specified in the FFR is to achieve basal area values at age 140 that exceed the targets established by this dataset.

Working within this paradigm, RTI has expanded on the DFC approach and created a statistically rigorous assessment procedure that can be used to evaluate potential alternate plans. This procedure addresses multiple parameters (such as stand density, mean diameter, and average height) simultaneously to better discriminate between desirable and undesirable forest structures, and it directly accounts for natural forest variability. The procedure establishes a DFC acceptability range given a desired acceptance level. Potential alternatives can be evaluated over time to see what percent of the time the resulting forest structure falls within this acceptability range.

The next step is to combine this assessment with economic analysis to assess whether or not a potential alternative is economically viable. The long-term economic potential of sustainable forest management may be the most important measure of economic viability, as it is most closely related to the motivation to maintain the land as forestland rather than converting to other uses.

This can be evaluated by calculating the land expectation value (LEV) per riparian acre for each alternative at an appropriate target rate of return.

Figure 1 compares the ten example alternatives with three reference scenarios in terms of the percentage time in the DFC acceptance range at a 90% acceptance level and LEV per riparian acre at a 5% real rate of return. The three reference scenarios include no action, FFR Option 2, and management under the previous rules. Figure 1 can be used to identify which alternatives are good candidates for an alternate plan template. Of our ten example alternatives, alternatives 3-10 fall within the DFC acceptance range at least as much as FFR Option 2. Of that subset, 4, 5, 7, 9, and 10 are judged to be economically viable for sustained management. A template prescription based on these five alternatives would meet DFC goals while maintaining economic viability.



**Figure 1: Comparison of DFC acceptability and economic performance between the previous rules, FFR Option 2, no action, and ten example alternatives. Alternatives that meet the acceptability threshold (based on FFR Option 2) while maintaining a viable LEV should be identified as potential template prescriptions.**

Alternate plan templates will be an important tool in enabling family forest owners to protect aquatic resources while keeping sustainable forestry economically viable in the long term. It is challenging to create template prescriptions that fulfill the legislative goals of meeting riparian functions while minimizing the cost to landowners. The process above provides an objective, science-based procedure to both develop and assess potential prescriptions. Our example analysis suggests that by using the process above it is indeed possible to develop prescriptions that meet challenging and often conflicting criteria. This process can be employed not only for overstocked stands, but for any common situation that could benefit from a template.



- RTI Staff -

while keeping BA lower than the MPB threshold of 80 ft<sup>2</sup>/acre. SDI creates a useful reference based upon how many 10” trees would be relatively as dense as a stand of interest (Reineke 1933, Long and Daniel 1990). The minimum post-harvest retention required in the inner zone under the FFR is 50 TPA and 60 ft<sup>2</sup> of BA/acre, which equals an SDI of 95 (i.e. it is relatively as dense as 95 10” trees).

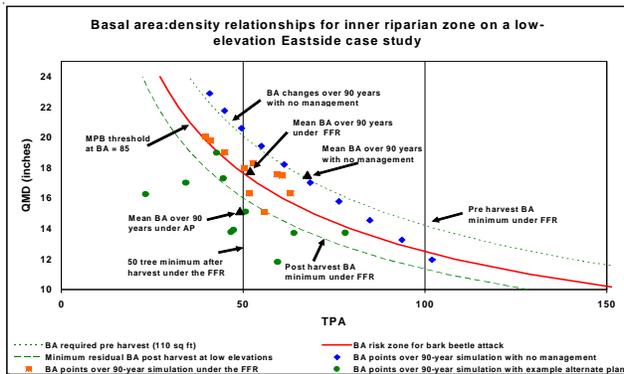
Table 1 shows incremental combinations of TPA and QMD that equal an SDI of 95, as well as the resultant BA for each combination. An alternate plan template based upon equivalent SDI would allow the number of leave trees to be selected based on their size such that the desired SDI and BA are both achieved. A template of this sort would allow landowners to create a management prescription based on easily measurable stand variables (QMD and TPA) that achieves an SDI equivalent to the rule requirements while lowering the risk of a MPB attack.

**Table 1: Combinations of TPA and QMD that achieve an SDI of 95 as compared to FFR with fixed 50 TPA.**

SDI	TPA	QMD	BA
95	95	10	52
95	82	11	54
95	71	12	56
95	62	13	58
95	55	14	59
95	50	14.9	60
95	50	15	61
95	45	16	63
95	41	17	64
95	37	18	66
95	34	19	67
95	31	20	68
95	29	21	70
95	27	22	71

Retention included 50 TPA greater than 10” in DBH, but this did not include the 21 largest trees. This flexibility in selecting leave trees allowed an SDI of 95 to be achieved with a basal area that is below the risk threshold for MPB. The alternate plan also provided a greater economic return, yielding an improved net present value for this forest of \$279/acre versus \$228/acre under the FFR.

Results presented in Figure 2 indicate that the mean BA/acre over 90 years under the FFR inner zone prescription is on the isoline where mortality from MPB outbreak can be expected. Under a no management scenario, which the FFR require in the core zone, the mean BA/acre is well above the MPB isoline, indicating high risk. In contrast, the example alternate plan maintains an average BA below the MPB risk level in all decades.



**Figure 2: Basal area relationships under the FFR and an example alternate plan for an Eastside case study.**

Alternate plan templates for Eastern Washington are necessary to address both economic and forest health concerns. Creating templates is challenging, but with the use of a relative density measure like SDI, easy to use look up tables can be constructed to guide development of alternate plans that meet riparian function, improve forest health, and provide economic relief to landowners.

- Elaine Oneil, RTI Graduate Student -



### New tool helps foresters and landowners import their forest data into LMS

An important part of RTI's mission is to put new technological tools in the hands of foresters and forest landowners to aid complex forest management decisions. One of our most effective tools is the Landscape Management System (LMS). We have received a very positive response to the numerous

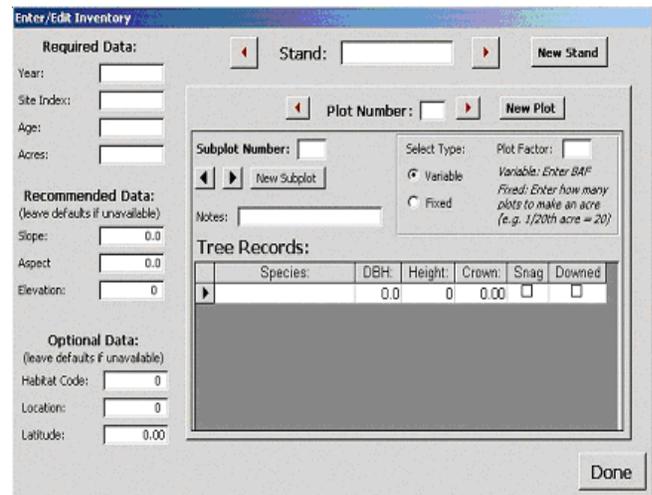


LMS trainings that have been offered throughout Washington, and the worldwide user base has continued to grow.

Development of the LMS program continues at a rapid pace as we work to make it even more powerful and

easier to use. We have received several feedback comments regarding the difficulty that many new users have in importing their own forest data into the program. Building the necessary LMS inventory files can indeed be challenging, and in response to this feedback we have developed the LMS Inventory Wizard to greatly simplify this process and eliminate many common file errors.

The data entry window of the LMS Inventory Wizard resembles an electronic plot card. Users first enter stand level data, then individual tree records can be entered for each plot. Tree species can be selected from a drop-down list of common names, eliminating the need to know species codes. Helpful tips display in the bottom of the screen to guide users as they enter data and explain the requirements for each field. Given the plot size or basal area factor, the Inventory Wizard automatically computes expansion factors based on the total number of plots entered for a given stand. Fields for both variable and fixed plots and subplots accommodate virtually any sampling design from simple to complex.



Inventory data can be entered for just one stand or for many different stands on an ownership. Once all the inventory data have been entered, the inventory wizard automatically generates the files necessary for importing into LMS. A complete tutorial guides users through the entire process, from entering data to generating files to importing into LMS and opening the new portfolio for the first time.

Both the LMS Inventory Wizard and its tutorial are available for free download from <http://lms.cfr.washington.edu/lmsinvwizard.shtml>. It can also be found by looking under "Tools" on the RTI website. One potential limitation of the Inventory Wizard is that it requires Microsoft Access to run. If you are interested in this tool but do not have Access installed on your PC, please let us know so that we can assess the need for a stand-alone version. We also welcome any other comments or questions about this tool. Please direct all feedback to [kzobr@u.washington.edu](mailto:kzobr@u.washington.edu) or call us at (206) 543-0827.

- Kevin Zobrist, RTI Economist -

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## Riparian Buffer Demonstrations at Pack and Sherwood Creek Forests

The Forests and Fish Rules have significantly changed the way riparian zones are managed on private lands in Washington. There are several riparian harvest options under the new rules, and RTI case studies have shown that selecting the appropriate option is an important decision facing landowners. To better familiarize landowners with these options, riparian buffer demonstration sites have been established for both Western Washington and Eastern Washington.

On the westside, the University of Washington's Pack Experimental Forest has established a demonstration site that shows what the on-the-ground implementation of each westside buffer option looks like. An interpretive trail leads visitors through different harvested segments of a riparian zone that demonstrate option 1, option 2, a full-width buffer, and the previous rules. Colored stakes mark the boundary of each buffer zone (core, inner, and outer) to give visitors an idea of the relative width of each zone. This site and others at Pack Forest are open to the public.



RTI's Larry Mason leads a tour group through the riparian demonstration site at Pack Forest

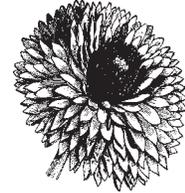
In Eastern Washington, the Sherwood Creek Demonstration Forest, a privately owned forest located near Chewelah, WA, was established as an upland management demonstration area in the year 2000. The area is a great hands-on outdoor learning environment for the public. This year a forested riparian demonstration area will be added to show varying stream harvesting and core zone "no entry" areas. Informational signs and guided tours provide landowners with valuable eastside streamside management information. This riparian area offers unique and one-of-a-kind views of a disturbed system.

To arrange a group tour at Pack Forest, please contact RTI at (206) 543-0827. For individual, self-guided tours, or for information about other demonstration sites and public hiking trails

available at Pack Forest, please call Pack Forest at 360-832-6534 (206-685-4485 from Seattle), or visit them online at [www.packforest.org](http://www.packforest.org).

Information on the Sherwood Creek Demonstration Forest can be obtained by contacting Peter Griessmann at 509-684-2588 or by email at [pgriessm@wsu.edu](mailto:pgriessm@wsu.edu).

- Kevin Zobrist, RTI Economist  
Peter Griessman, WSU  
Extension Forester -



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## Newly Released RTI Report Shows Thinning Can Reduce Forest Fire Risk and Create Economic Opportunities for Depressed Rural Communities

"Investigation of Alternative Strategies for Design, Layout and Administration of Fuel Removal Projects" details the results of a two-year study undertaken by RTI, to examine how the use of emerging forestry software technologies combined with existing knowledge provides new opportunities to more effectively reduce fire risk through removal of hazardous fuel loads. An electronic version of this report is available at [www.ruraltech.org](http://www.ruraltech.org). Printed copies are available upon request.

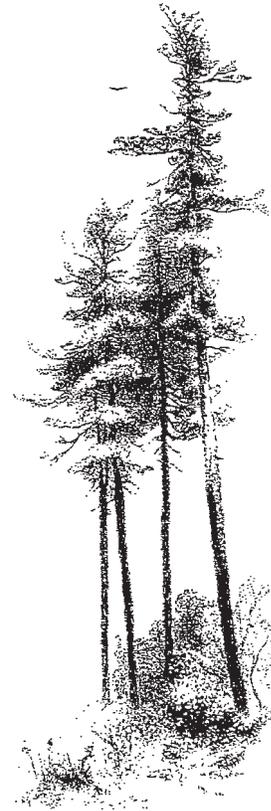
### Report Highlights:

- Approximately 2/3 of forested acreage in the Fremont and Okanogan National Forests is at moderate to high risk of crowning forest fire.
- These forests average more than 1000 trees per acre and the majority of the trees are in small diameter classes that contribute to historically unprecedented ladder fuel loads.
- Computer generated thinning simulations show that harvests of smaller trees with retention of larger trees can substantively reduce risk of catastrophic wildfire while protecting habitats, reducing releases of harmful carbon to the atmosphere, creating economic development opportunities for rural communities, and reducing fire fighting costs, fatalities, and lost facilities.
- The non-market values produced by fire risk reduction activities are substantially greater than the costs of fuel reduction.
- Modeling technologies, if delivered in user-friendly formats, can provide powerful tools to develop scientifically credible and politically acceptable fuel reduction projects for the public forestlands of the intermountain west.

## RTI to Co-sponsor International Symposium in 2004

Human Dimensions of Family and Farm Forestry International Symposium will be held March 29 - April 1, 2004 at Washington State University, in collaboration with IUFRO (International Union of Forest Research Organizations) Research Group 3.08.00: Small Scale Forestry. The objective of this symposium is to bring together scientists and practitioners from all corners of the world to discuss research problems, results, and practical applications related to human dimensions of family, farm, small-scale, nonindustrial private, and community forestry. The symposium will have oral and poster presentations. RTI is a co-sponsor.

For more information, please visit the website at: [www.familyforestrysymposium.wsu.edu](http://www.familyforestrysymposium.wsu.edu) or send an email to: [familyforestry@wsu.edu](mailto:familyforestry@wsu.edu)



## Upcoming Events

### SEPTEMBER

Watershed Restoration: Rehabilitations and Recovery of Disturbed Watersheds 9/22 - 9/26 2003      Wenatchee, WA		
<b>Forest Stewardship Coached Planning Shortcourses:</b>		
<i>Forestry Agent:</i>		
Peter Griessmann:	9/9 - 10/14	Spokane, WA
	Tuesday evenings	
	9/10 - 10/15	Usk, WA
	Wednesday evenings	
	9/11 - 10/16	Colville, WA
	Thursday evenings	
Mike Nystrom	9/16 - 11/4	Puyallup, WA
	Tuesday evenings	
Steve Sax	9/17 - 11/19	Maple Valley, WA

### OCTOBER

Fall Forestry Educational Seminar ( <i>Forestry education for natural resource professionals who work with private forest landowners</i> ) 10/25 2003      Pack Forest Eatonville, WA		
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### NOVEMBER

GIS Training Workshop 11/3 - 11/5 2003      Colville, WA	
Forestry education for logging professionals ( <i>Current concepts of forest ecology, silviculture, and forest management</i> ) 11/20 2003      TBA	

### DECEMBER

Landscape Management System Training Course 12/10 - 12/12 2003      Spokane, WA	
Forest Health Update 12/6 2003      Colville, WA	

For information on the Landscape Management System training course, visit the RTI website at <http://www.ruraltech.org/training> or call (206) 543-0827.

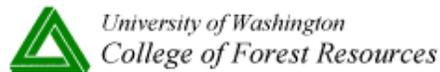
For all other events, visit the website: <http://ext.nrs.wsu.edu/newsevents/index.htm> or call the Washington State University Cooperative Extension office at 509-335-2963.

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