RTI News

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RTI Study Shows Thinning of East Side Forests Will Reduce Forest Fire Risk and Create Economic Opportunities in Rural Communities

The recently released RTI Fire Plan Report, Investigation of Alternative Strategies for Design, Layout and Administration of Fuel Removal Projects, shows how computer technology can be used to analyze effective fire risk reduction strategies to help professionals, publics, and policy-makers gain a better understanding of the current conditions and future alternatives.

The Okanogan and Fremont National Forests (ONF & FNF) were selected as case study areas to evaluate a range of management treatments that could reduce forest fire risk and to provide a north to south range in climate as well as substantially different market infrastructures. Forest inventory data were assembled from the Continuous Vegetation Survey (CVS), with 502 plots for FNF and 413 plots for ONF suitable for the analysis. Simulations of alternative treatments were produced using the UW's Landscape Management System (LMS) in combination with the Forest Vegetation Simulator (FVS) as the growth model and the Fire and Fuels Extension (FFE) for fire risk analysis (both developed by the US Forest Service). LMS provides numerous habitat suitability and forest diversity measures, carbon sequestration measures, and log production algorithms for economic analysis. This array of analytical capabilities provides a consistent suite of metrics for measuring the critical influences of both fire and fire risk reduction management strategies.

Four thinning treatments were modeled: (1) removal of all trees with a diameter at breast height (DBH) less than or equal to nine inches (9 and under); (2) thin from below (smaller trees first), removing 50% of the original basal area (BA) per acre (Half BA); (3) thin from below with a residual BA target of 45 ft^2/acre favoring ponderosa pine and western larch (BA 45); and (4) removal of all trees with a DBH greater than or equal to 12 inches to simulate a high revenue alternative (12 & over). In addition, (5) a no action alternative (with no disturbances) was developed (No action) and (6) a crown fire representative of each forest (Wildfire). All simulations were treated in 2000 and the simulated growth of post-treatment inventories was modeled forward to 2030. Growth simulations were done both without understory regeneration to mimic the impact of periodic controlled burns (or other fuel removals) and with understory regeneration to simulate natural ingrowth. Twelve total alternatives were simulated and analyzed.

Pre-treatment risk assessments indicated that 77.7% of the FNF plots and 76.8% of the ONF plots were at moderate to high risk of crown fire. This risk index is based upon the estimated wind speed at 20 feet off the ground needed to initiate an active crown fire from a surface fire. Wind speed estimates less than or equal to 25 miles per hour (mph) were considered to be in a high fire risk category, while speeds of 25 to 50 mph were considered moderate risk. Estimates over 50 mph were considered low risk.

The graphs in Figure 1 display the risk reduction performance of treatment alternatives for the subset of ONF plots considered at high risk. Harvesting only 9-inch and under trees leaves 69% of the beginning high risk stands in a moderate (46%) or high risk (23%) category, whereas thinning to a target of 45 ft^2 BA/acre almost eliminates the high risk with 38% remaining in a moderate or high risk but less than 2% in high risk. Basal area, often used by foresters to describe density targets, is determined by calculating the area of the surface across the DBH of every tree and then summing the total. Thinning to a target of 45 ft^2 BA/acre typically left between 40 and 100 of the largest trees per acre standing. Removing only those trees over 12 inches provided little risk improvement; however, removing some trees in the 9-12 inch diameter range is usually required for a substantive reduction in fire risk. With overstory trees retained and the understory re-established, fire risks return within 15-20 years as evidenced by the graphs. This suggests that future fuel controls are needed. The wildfire simulation effectively reduced future fire risk but at high environmental and economic cost.

Cost estimates for logging operations and treatment yield volumes are both site and equipment specific. As a result there is a significant range of variability in net revenue across all stands for the same treatment strategy. Although the BA 45 treatment failed to generate a net economic return as high as the 12 and over treatment, it produced the greatest risk reduction and with low cost assumptions it provided a positive net return. Table 1 shows mean net revenue from treatments on high and moderate risk forests with high and

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RTI Director's Notes

The focus of this newsletter is on the use of technology to address fire issues. We have just completed a comprehensive report on fire risk reduction strategies, which is available on our website. This report shows the impact of a wide range of fire risk reduction management strategies on levels of fire risk, habitat protection, and carbon storage, as well as log revenues. It has been known for a long time that the cost of removing small diameter material to reduce fire risk will many times be greater than the revenue available from the logs in local markets. An article by Larry Mason shows that the non-market values of fire risk reduction activities are likely to be far greater than the costs, if all of the values were properly reflected in the market. The non-market values include the reduced cost of fighting fires, facility losses, fatalities, and regeneration, as well as the value of increased water yields, habitat saved, and more.

An article by Kevin Ceder shows how the Landscape Management System can be used with inventory data to estimate the risk of a crown fire before and after various thinning strategies. Some of the impacts of alternative treatments may be surprising. Removing only the largest trees may produce the most revenue but it does not effectively reduce the fire risk. Removing only the 9-inch and under trees, as advocated by some, is not very effective at reducing the fire risk on most stands but does result in very high costs. Reducing the fire risk can also sequester a large amount of carbon while saving and restoring habitat. Strategies that produce the greatest reduction at the lowest cost while also producing a number of non-market values are identified in the report. Many of the environmental benefits are ignored by the press.

Paul Lachance and Jeff Comnick extend the technology to include the use of GIS in developing strategies for assessing fire risk. There is also an article summarizing a recently published study by WSU Professors Mathew Carroll and Keith Blatner that looks at the attitudes of NIPF and tribal landowners towards fire as both a threat to forests and a forest management tool.

While fire fighting and fire risk issues have become commonplace in the media, rarely will you find as comprehensive a look at the multiple impacts that fire and fire risk reduction strategies have on local communities.

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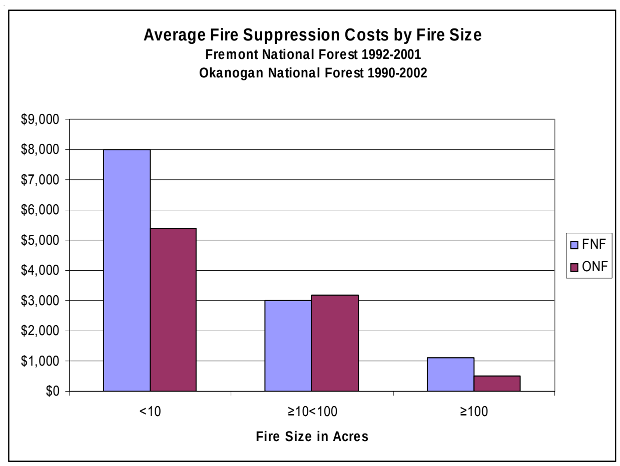
Investments in Fuel Removals to Avoid Forest Fires Result in Substantial Benefits

As a consequence of the large, intense forest fires in the inland west over recent years, considerable public attention is being directed at addressing the question of how to reduce the hazardous fuel loads from the overly dense forests that characterize the region. Removal of the many small trees that make up these fuel loads is known to be costly. While large trees can be removed for lumber and other product values as reflected in the market, the market value for the smaller logs may be less than the harvest and hauling charges, resulting in a net cost for thinning operations that are needed to lower fire risk. Concerns over costs combined with budget constraints and political debates have resulted in limited public investments in the removal of hazardous fuel loads. However, failure to remove these small logs results in the retention of ladder fuels that support the transfer of any ground fire to a crown fire with destructive impacts to the forest landscape. Unfortunately the market does not automatically reflect the costs of negative environmental consequences. A recently completed cost/benefit analysis conducted by RTI as part of a broad investigation of fire risk reduction indicates that the negative impacts of crown fires are underestimated and the benefits of government investments in fuel reductions are substantial.



There are many market and non-market values associated with reduction of fire risk that should be important to forest managers and to society at large. Perhaps the most obvious is the value of avoiding the escalating costs of fighting fire, which nationally have been in the billions of dollars during recent years. Similarly, there is the value of avoiding facility losses and fatalities that result from forest fires. Communities value a lower fire risk and reduced smoke. Forest fires destroy visual aesthetics and limit recreational opportunities. The United States Congress has historically placed a very high value on species protection as evidenced by laws such as the Endangered Species Act or the National Forest Management Act, yet irreplaceable habitats for threatened and endangered species may be lost when forests burn.

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Valuable timber resources are destroyed. Fires also reduce the carbon stored in the forest and the opportunity to produce long lasting pools of carbon stored in products. Fires consume biomass that otherwise could be used for energy conversion and green energy credits.

Regeneration after fires is problematic and costly, and there may be ongoing rehabilitation investments needed to avoid serious erosion and water contamination from excessive sediment. If forests are thinned, water consumed by overly dense forests could be saved for other uses such as salmon habitat, municipal reservoirs, and agricultural irrigation. There are also rural economic development benefits from the taxes and rural incomes that would result from fuel reduction activities. Since economic activity in these regions has been in decline as a consequence of lower federal timber harvests, any reduction in unemployment has higher than normal leverage on state and local finances by lowering assistance costs.

Many scientific studies have shown that forests thinned to remove fuel loads are unlikely to experience crown fires. Accounting for the value of this reduced risk exposure, however, must take into consideration both the predicted costs and the timing of future fire events. While it is impossible to predict exactly when a future fire might occur in a specific location, we do know that due to decades of fire suppression, the time since last ignition in many forests is well beyond previous fire return cycles and present fuel loads are well above historic levels. In 2001, Powell et al., in a Forest Service report entitled Forest Density Management; Recent History and Trends for the Pacific Northwest Region, estimated that 56 million acres of national forestlands were considered at high risk of catastrophic fire, primarily due to overcrowded trees. Fire ecologists agree that the question is not whether these forests will burn but when.

To create an example to illustrate how the relative costs and benefits of investments in hazardous fuels removal treatments to reduce the risk of crown fires might be considered, we will assume that that all acres of forests with a high risk, if left untreated, will burn sometime in the next 30 years while all those forests considered to be at moderate risk will burn sometime in the next 60 years. If there is an equal probability of each acre burning in any year during the assigned interval, we can assume for approximation purposes that an average time for all acres to burn is equivalent to one half of the interval. In other words, an equal probability that all acres burn sometime in 30 years means an average time to burn of 15 years and correspondingly given a 60-year interval the average burn time will be 30 years. If we further assume,as is often done for financial analysis, that an inflation-adjusted interest rate of 5 % is representative of the average anticipated cost of money throughout the risk interval then we have what we need to discount future cost estimates to present dollars. In simpler terms this means that every dollar that will be needed to fight forest fires during the 30 year period for high risk represents $0.48 of anticipated cost exposure today and for the 60 year period for moderate risk represents $0.23 today. Conversely, investments in fuels removals today are worth the savings represented by these present value estimates of costs avoided if fires do not occur.

Table 1 shows present value estimates of a number of market and non-market benefits associated with fuel removal treatments. Also displayed for comparison are the Forest Service contract preparation costs and operational costs of fuel removal treatments. The treatment benefits are based on a variety of governmental and non-governmental information sources. The treatment cost estimates are derived from figures provided by the Okanogan and Fremont National Forests and interviews with harvest contractors. Treatments are assumed to be forest thinnings within the understory that leave approximately 40-100 of the biggest trees per acre. A more rigorous explanation of this estimation methodology and source information can be found on the RTI web site in the "Market and Non-Market Values" section of the recently released RTI report entitled Investigation of Alternative Strategies for Design, Layout, and Administration of Fuel Removal Projects. Printed copies of this report are also available upon request.

Table 1: Estimates of market and non-market benefits from fuel removal compared with Forest Service treatment costs.

Treatment Benefits	Value per acre: High Risk	Value per acre: Moderate Risk
Fire fighting costs avoided	$481	$231
Fatalities avoided	$8	$4
Facility losses avoided	$150	$72
Timber losses avoided	$772	$371
Regeneration and re-habilitation costs avoided	$120	$58
Community value of fire risk reduction	$63	$63
Increased water yield	$83	$83
Regional economic benefits	$386	$386
Total Benefits	$2,063	$1,286
Treatment costs		
Operational costs	($374)	($374)
Forest Service contract preparation costs	($206)	($206)
Total Costs	($580)	($580)
Positive Net Benefits from Fuel Removals	***$1,483***	***$706***

For this coarse filter cost/benefit analysis, the benefits were intentionally estimated at the low end of their potential while operations costs were estimated at the high end of their potential. It is worthy to note that many areas of the forests studied in this investigation showed positive net returns from log sales after operations costs. It is also worthy of note that no value was assigned to protection of habitat even though the Congress and the Courts have historically placed a very high

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value on protection of threatened and endangered species. Even with an assumed net cost of fuel reduction operations, however, the results of this cost/benefit analysis show that the future risk of catastrophic fire on the National Forests of the inland west is far costlier to the public than investments made today to protect against such an eventuality.

- Larry Mason, RTI -

Using GIS to Aid in Assessment of Fire Risk across a Landscape

Fire is a constant threat to forests and in turn to the objectives of forestland managers. As technology has advanced over the past several decades so have the tools available to forestland managers. Some of these tools can help managers to assess the extent that their forestlands are at risk if a fire were to occur and to decide what management actions may be appropriate in attempting to reduce risk. With a better understanding of the distribution of risk across a landscape, plans can be designed to systematically alter the risk to that landscape as a whole.

Geographic Information Systems (GIS) can be used to construct a representation of a real world landscape. Figure 1 is a representation of the present day fire risk for a watershed in the Colville National Forest. To assign individual stands to a risk class, tree-level inventory data was analyzed using the Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator developed by the US Forest Service. Among the outputs of FFE is the wind speed needed to sustain a crowning fire. If the required wind speed is less than 25 miles per hour (mph), the stand is classified as high risk (represented in Figure 1 by the darkest coloring).

Similarly, moderate stands need a wind speed between 25 and 50 mph to sustain a crowning fire (displayed in grey). The lightly shaded stands are low risk, requiring a wind speed greater than 50 mph according to FFE.

The utility of GIS does not end with its mapmaking abilities. Once stand polygons have been classified by fire risk, more complex spatial analyses can be performed. Layers can be developed for objectives such as habitat or stand structure to analyze the impact of treatments relative to multiple objectives. If fire risk is the primary concern of the forestland managers, then the spatial display of the risk classifications can be very useful in prioritizing management actions.

The significance of being able to display fire risk data in this way is that managers can plan treatments that have a large impact on the landscape while only altering select stands. This can be accomplished by identifying a group of stands that have a high fire risk classification under current conditions and are in close proximity to each other. In a group that has such characteristics, a fire in one of the stands would have a good chance of spreading to the adjacent high risk stands.

Using a GIS representation of the landscape, such groups could be identified and the interior stands could be selected for the initial treatment to effectively fracture these high risk blocks. Through this and other techniques, GIS can be used as a tool to help forestland managers reduce fire risk more effectively and efficiently across a landscape.

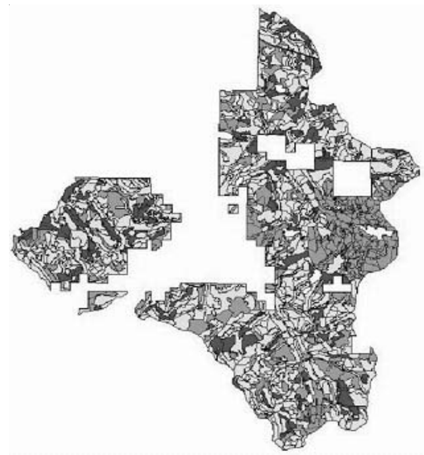

Figure 1: Present fire risk for a watershed in the Colville National Forest

- Paul LaChance & Jeff Comnick, RTI -

Fire Modeling Developments Provide User-Friendly Risk Analysis

Modeling and analysis of forest fire risks associated with present conditions and future management alternatives can now be done easily in the Landscape Management System (LMS) with the release of the LMS-FFE Add-On. The components of this add-on include the Fire Scoping Report, all variants of the Fire and Fuels Extension (FFE) for the Forest Vegetation Simulator (FVS), the LMS-FFE Configuration Tool, and LMS tables linked to FFE-FVS outputs.

FFE is a fire effects model developed by the US Forest Service for use with the FVS growth model. Variants of FFE-FVS are available for the majority of the fire-adapted ecosystems of the western US including the Eastern Cascades, Inland Empire, Rocky Mountains, Sierras, and Siskiyous. All FFE-FVS variants are installed by the LMS-FFE Add-On, which is available for free download from the LMS web site.

The Fire Scoping Report included with the add-on provides fire risk analysis on a multiple-stand or landscape level. This series of tables and graphs summarizes fire risk relative to various forest attributes such as elevation, stand density (TPA), quadratic mean diameter (QMD), basal area (BA), dominant species, Reineke's stand density index (SDI), and

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"Fire Modeling" continued from previous page

canopy layers. Fire risk is classified based on crowning index, which is the potential wind speed at 20-feet above the ground needed to initialize and carry a crown fire in a stand. High risk stands have a crowning index value of 25 miles per hour (mph) or less. Moderate stands have a crowning index of 25 – 50 mph. Low risk stands have a crowning index value of 50 mph or more. Graphical summarization of stand attributes based on risk class in the Fire Scoping Report are useful to see how trends of risk are influenced by dominant species, canopy structure, stand density, and elevation (Figure 1).

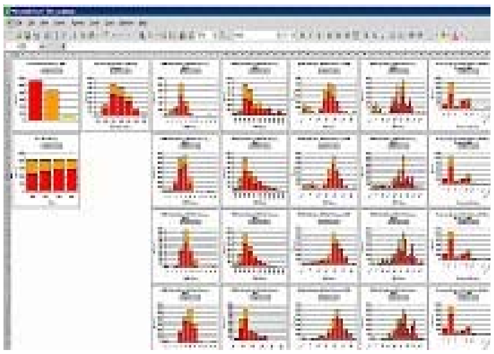

Figure 1: LMS FVS-FFE graphical out puts provide ready access to stand attributes of interest.

Configuring LMS to run FFE-FVS is done with the LMS-FFE Configuration Tool (Figure 2). With this tool, features of the LMS-FFE Add-On such as potential fire reports, fire simulations, and simulated fire visualization images can all be set-up in a user-friendly dialogue box. When any of these features are enabled, default values from the selected variant of FFE-FVS are automatically entered. However, any of these values can be altered by the user to tailor behavior of FFE-FVS to better fit local conditions.

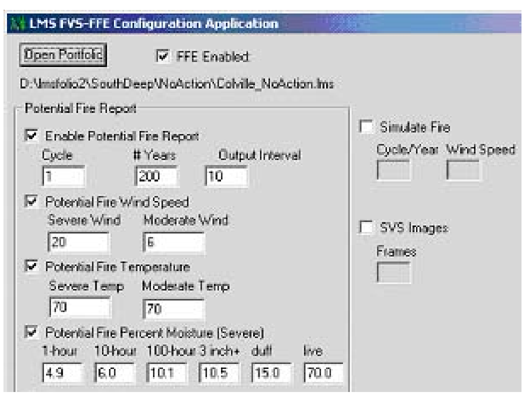

Figure 2: LMS FVS-FFE dialogue box. User can define modeling parameters or use model defaults.

Additional links are added to LMS by the LMS-FFE Add-On that provide access to three FFE output tables: Potential Fire Report, Consumption and Physical Effects Report, and All Fuels Report. These tables allow users to answer questions regarding fire behavior, fuel loading, smoke emissions, mortality, and biomass consumption and associated carbon release from either a simulated fire or a potential fire.

For additional information regarding the LMS-FFE Add-On contact Kevin Ceder at thuja@u.washington.edu or Jim McCarter at jmac@u.washington.edu. Additional information regarding FFE-FVS can be found at the LMS web site.

- Kevin Ceder, RTI -

NIPF and Tribal Attitudes About Fire and Forest Management

A recent WSU study looks at the attitudes of non-industrial private forest (NIPF) landowners and tribal forest landowners in northeastern Washington towards fire and forest management. While much public attention and debate has focused on the role of fire as a natural process, a threat, and a management tool on public forest lands, less attention has been focused on fire in other forest land ownership categories. The primary purpose of this study was to develop a better understanding of the role played by fire both as a potential threat and a potential tool in the management strategies of non-public forest landholders in two Washington counties: Okanogan County in north central Washington and Stevens County in northeastern Washington.

The study was done by conducting interviews with a number of NIPF and tribal landowners in each county. Each landowner category was analyzed, focusing on management objectives, perception of fire as a threat, and interest in prescribed burning. Of the NIPF landowners interviewed, four generally distinct categories were identified: large-active mangers (typically owning more than 400 acres); medium-active managers (20-400 acres); farmers/ranchers; and lifestyle landowners (5-200 acres). The results for these categories are summarized in Table 1. In addition, tribal lands constitute a class of land holding consisting of two categories: tribal lands held in common and individual tribal allotments controlled by families.

Large-active landowners were those with larger land holdings (400 to 3,000 acres) who managed relatively intensely. The primary management objective in this category was timber production, with timber being an important source of income for this group. For both counties, the landowners in this group did not see fire as the biggest threat to their land, but rather forest practice regulations. In Okanogan County, fire was seen as the next biggest threat, while in Stevens County, insects and disease were seen as the next biggest threat.

The large-active landowners in Okanogan County used silvicultural practices (thinning and pruning) to reduce fire hazard as well as to improve tree growth. In contrast, Stevens County large-actives did not see fire as an immediate or highly likely threat, due in part to different moisture levels and fires histories.

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Table 1: Summary of results for four NIPF landowner categories.

	Okanogan County NIPF Landowners			
	Large-Active	**Medium-Active**	**Ranchers/ Farmers**	**Lifestyle**
Management emphasis	Timber production	Timber production	Livestock	Recreation/ Residence
Biggest perceived threat to land	Regulation	Fire	Fire	Fire
Other perceived threat(s) to land	Fire	Insects/disease	Regulations	Insects/Disease
Silvicultural treatments to reduce fire risk	Yes	Yes	No	No
Attitude towards using prescribed fire as a tool	Interested but concerned	Hesitant	Interested but concerned	Interested but concerned
	Stevens County NIPF Landowners			
	Large-Active	**Medium-Active**	**Ranchers/ Farmers**	**Lifestyle**
Management emphasis	Timber production	Timber production	Livestock	Recreation/ Residence
Biggest perceived threat to land	Regulation	Regulation	Fire	Fire
Other perceived threat(s) to land	Insects/disease	Fire	Regulations	Insects/Disease
Silvicultural treatments to reduce fire risk	No	No	No	No
Attitude towards using prescribed fire as a tool	Not interested	Hesitant	Interested but concerned	Not interested

Thus, while these landowners saw timber stand improvement treatments as also beneficial for reducing fire risk, treatments solely to reduce fire risk were considered too costly and not likely to reduce risk effectively. There was not much interest among Stevens County large-actives for using prescribed burning as a tool. There was interest in Okanogan County, but not without concerns about the potential for escaped fires and the resulting liability.

Medium-active landowners also emphasized timber production, with ownerships ranging from 20 to 400 acres. Medium-actives in Stevens County saw regulations as the biggest land threat, followed by fire. In Okanogan County, fire was seen as the biggest threat, followed by insects and disease. While medium-active landowners commonly did silvicultural treatments to reduce fire risk in Okanogan County, silviculture in Stevens County was oriented towards improving tree growth, with fire risk reduction as only a side benefit. Medium-active landowners in both counties hesitated using prescribed burning as a management tool due to concerns about the liability of escaped fires and practical considerations given their small parcel sizes.

Landowners in the ranchers and farmers group manage land primarily for livestock production. In terms of forest management, this group could be further divided into two sub-categories: active managers and non-active managers. In both counties, ranchers listed fire as the biggest threat to their land. Especially active managers also frequently mentioned regulations. Despite concerns by this group about the threat of fire, most ranchers in Stevens County had not done anything specific to address fire risk. Active managers believed that timber stand improvement treatments and the presence of grazing and irrigation had already reduced risk on their property, while the less active managers saw fire as a natural process, that one could not do much about. Active landowners in this group saw prescribed burning as a good management tool, but they had the same liability concerns as landowners in other groups.

Lifestyle landowners are those who purchased their land for recreational or residential use with parcel sizes ranging from 5 to 200 acres. Lifestyle landowners in both counties saw fire as the biggest threat to their land, with insects and disease also seen as a threat. There was no interest in the use of prescribed fire among lifestyle landowners in Stevens County. Those in Okanogan County were more familiar with prescribed burning and there was some interest in using it.

Two categories were considered for reservation landholders: trust lands held in common (tribal lands), and trust lands held by native families as allotments. The present-day objectives for tribal forest management include income production but also the long-term sustainability of a variety of forest resources. In terms of threats to forests, tribal forest managers tended to emphasize insects, disease, and overstocking, with stand-replacing fires also seen as a threat. Interestingly, allotment holders and tribal members generally talked about insects, disease, and wildfire as threats, but also emphasized the lack of periodic fire as a threat, particularly with respect to wildlife habitat and the increased risk of catastrophic fire.

Overall, the threat of wildfire does not appear to be the primary factor affecting forest management decisions for many landowners. Economic objectives are often more immediately pressing. There are a number of barriers to the use of prescribed burning as a management tool, especially on NIPF lands. The biggest of these barriers is the liability of escaped fires. Changes in liability laws would be needed to overcome this barrier. Other barriers include the expense, lack of expertise, practicality given small parcel sizes, narrow burn windows, and smoke issues. If there is a single "take-home" message from this study, it is that "one size does not fit all" either in terms of the extent to which wildfire is important in influencing management decisions or in the possibilities of using fire more extensively as a forest management tool.

- Matt Carroll, Keith Blatner, Patricia Cohn, Department of Natural Resource Sciences, WSU -

Workshop Announcement

RTI, in collaboration with CFR-CINTRAFOR, WSU Extension, and the Western Forestry & Conservation Association, is offering a one-day workshop titled:

Innovation for Survival of the NW Forest Sector: An Integrated Approach

This workshop will focus on innovations in products, management, log marketing, and policy and will be held at the WSU-Puyallup campus on **November 18, 2003**.

For additional program and registration information, contact Don Hanley, WSU Extension Forester, at dhanley@u.washington.edu or call 206-685-4960.

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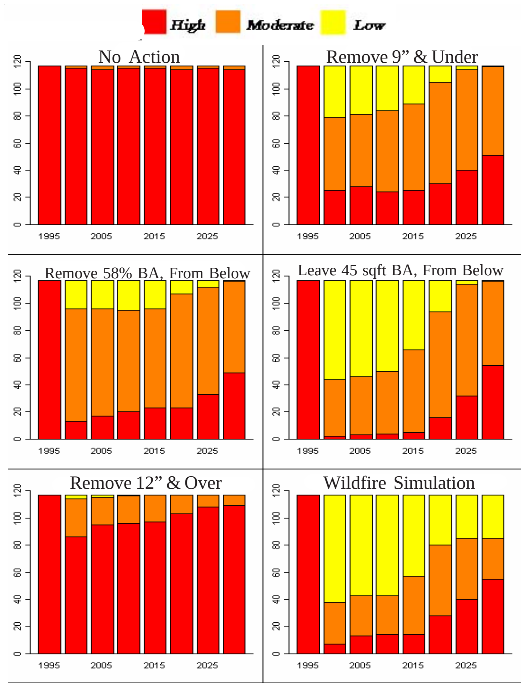

Figure 1: Risk reduction performance of treatment alternatives for high risk stands in the ONF.

low costs. The range of net revenues for the ONF across all stands and treatments is quite large (-$1,160 to +$11,113 per acre), indicating opportunities to customize treatments to specific conditions. Stands with positive revenues could offset the losses on other stands.

Table 1: Mean net revenue per acre from treatments on high and moderate risk forests.

Treatment	High cost	Low cost
9 & under	**($345)**	**($287)**
Half BA	**($265)**	**($39)**
45 BA	**($169)**	**$291**
12 & over	**$1,025**	**$1,953**

Treatments can substantially affect stand structure and thus habitat quality. Forestry software such as LMS can be used to predict habitat changes. Fires generally have a more extreme impact on habitat than any other treatment. While the No action alternative might seem to benefit some species of wildlife, it assumes an unlikely eventuality of no fire and produces overstocked conditions at high risk. The habitat impacts of the other treatments are mixed, with some species benefiting at the expense of others. Habitat strategies associated with fire risk reduction are inherently local and need to be integrated with other objectives. Goshawks may favor high-risk forests that are neither sustainable nor characteristic of pre-settlement conditions, but their habitat can benefit from light thinnings and from avoidance of crown fires. The Lewis woodpecker can benefit from heavy thinnings if the largest trees and snags are retained. The Williamson's sapsucker needs soft snags, making it very susceptible to fires. Pileated woodpeckers favor multi-story old forests, which are currently uncommon in the ONF or FNF. Retention of large trees and snags over time would eventually improve habitat for woodpeckers. The grizzly bear avoids stem exclusion structures and would favor a mix of treatments that reduces the dominance of overly dense stands. Analysis of the alternatives provides the opportunity to identify better habitat strategies in concert with other objectives and local conditions.

Carbon is stored in forest biomass but releases undesirable emissions when fires occur. Carbon is also stored in wood products for long periods and offsets the use of products such as steel, aluminum and concrete that are energy intensive (polluting) in their manufacture. When wood biomass is converted to energy through cogeneration it displaces fossil fuels reducing carbon emissions. The 12 inch & over treatment produces the most merchantable log volumes and hence the most carbon stored in products but does not reduce the fire risk and is not sustainable. The BA 45 treatment produces the next highest level of carbon stored in products, reduces fire risk, and is sustainable. As carbon credit markets are developed, they may contribute to treatment costs, paying for otherwise unprofitable treatments. Carbon is just one of the non-market benefits that result in positive values from fire risk reduction strategies.

The Forest Service has generally been stymied in the process of completing environmental reviews and arranging contracting where costs and revenues are not directly related to positively valued timber markets. Stewardship End Result Contracts are being developed to allow negative revenue risk reduction operations that provide benefits such as contract longevity to support investments in needed infrastructure and create economic opportunities in rural communities.

This report provides case study data on treatments that reduce fire risk, including their costs, market values, non-market considerations, and contracting issues. Specific examples can be used to customize strategies for a wide range of forest, infrastructure, and market conditions. The information is also useful in training operators on how to implement fuel reduction treatments. This report demonstrates how an integrated forestry software package can assist federal agencies and other interested users in gaining greater efficiencies for planning fire risk reduction treatments to achieve multiple values with fewer conflicts and lower costs. The Landscape Management System (LMS) provides a sophisticated, user-friendly software environment from which professional and public users with little training can participate in analysis of complex data to better understand the consequences of management alternatives. The results in this report from the case study analysis of two national forests demonstrate that fire risk can be effectively reduced while creating and protecting other positive environmental, economic, and social values.

- RTI Staff -

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