TITLE: Understanding the effects of fire management practices on forest health: implications for weeds and vegetation structure

LOCATION: Northern Rockies

DURATION: Year 1 of a 3 year project **FUNDING SOURCE:** Fire Plan

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PROJECT OBJECTIVES: The primary objective of this study is to understand how fire management tactics affect forest health by determining whether these tactics (a) increase short-term post-fire weed establishment, or (b) cause long-term differences between "natural" and "suppression-caused" post-fire patterns in vegetation structure. A second objective is to assess the opportunity to use FIA data to assist in monitoring these short and long-term effects.

JUSTIFICATION:
Fire use and suppression tactics, including hand lines, dozer lines, fire retardants, burn-outs, and the use of natural barriers, potentially cause both short- and long-term impacts to forest health. While these actions contain or control wildfire, they also create potential problems. In the short-run, these tactics may potentially increase soil disturbance, thereby promoting post-fire weed establishment. They also may initiate long-term landscape scale changes to vegetation structure that exacerbate future fire, insect or disease risk, or jeopardize wildlife habitat.

a. Linkage to FHM Survey and FIA P2 and P3 plot data

Forest health monitoring "enables the early detection and evaluation of changes in forest health conditions" (RFP, page 1). Although a number of ecological processes impacted by fire occur at a scale finer than the current FIA sampling scheme, it is possible to use FIA data to assess key vegetation attributes pre- and post-fire. We propose to work with the FIA program to determine feasibility for post-fire analysis of plots burned in 2002-2003 fires in the project area. We will tier from previous work on FIA plots, specifically the pre- and post-fire data collected on by the Atkins, Jain, Wilson, O'brien and Their team (Their et. al.) under their FHM project: Fire Effects Assessment. Where FIA plot data is unavailable, we will use the results from Their et al. suggesting correlations between pre-fire vegetation and fire severity to help reconstruct pre-fire vegetation for 2003 burns. We will also piggyback study sites with Their et al to add the dimension of fire management effects on post fire ecological conditions to the existing knowledge base.

b. Significance in terms of the geographic scale

This project will evaluate small (site) and large (landscape) scale fire effects in Idaho and Montana, both of which have significant areas of fire-adapted ecosystems and significant acreages of these systems in fuel condition classes 2 and 3. Results will be applicable in these two states and will be useful for similar areas throughout the Intermountain West.

c. Biological impact and/or political importance

Biologically, this project addresses two critical questions faced by fire managers throughout the western United States: Are the tactics we're using causing or allowing more weeds into this ecosystem? Are the tactics we're using causing long-term landscape scale changes to the vegetation of this ecosystem? Politically, this project addresses an issue of rapidly growing concern: the rising cost of fire suppression. These quickly rising costs are forcing fire managers to reconsider their strategies and tactics: Which fires to fight? Which fires to manage? And for both, what are the most cost and ecologically effective on-the-ground tactics. By using wilderness and wildland fire use tactics as reference conditions against which to evaluate suppression tactics, we will be able to contribute unique and new information to these policy discussions. We will also be generating new ecological information directly useable by fire managers.

d. Feasibility to produce immediate products

The past 3 fire seasons offer an unprecedented data source for site and landscape level analyses. Normally difficult to obtain, multiple replicates within a matrix of vegetation and fire management tactics are now readily accessible. FIA and RMRS researchers have created a significant database linking pre- and immediately post-fire vegetative conditions. BAER teams produce digital fire severity maps (including interior unburned islands) allowing immediate site and landscape analyses. The Forest Service has used satellite and forest data to produce digital vegetation layers pre-2000, and updated these layers to reflect year 2000 fires. Several landscape dynamics models are available for simulating vegetation succession. This allows us to quickly produce results: by the end of the first year of the project, we will have preliminary results on the influence of fire management tactics on short-term changes to vegetation and on weed influx, and on long-term landscape structure changes

DESCRIPTION:

a. Background: Thier et. al, used FIA plots to great advantage, re-visiting plots burned in the fires of 2000 to help build understanding of how pre-fire forest structure and composition influence fire severity. Fire severity is a key criterion by which we can gauge post-fire vegetative recovery, including the potential for establishment of noxious and non-native invasive weeds. Fire management tactics – from lines to burnout to BAER tactics – also affect post-fire vegetative recovery, by influencing seedbed characteristics as well as distance to seed sources. Thus, fire management tactics influence short and long-term susceptibility to future forest health risks. Our study builds on the work of Thier et al., generating multi-scaled knowledge of fire effects at many of the same locations.

This past fire season (2003) offers an excellent opportunity for further exploring these issues. In particular, we think there is great potential to address how specific fire suppression/management tactics influence:

- distance to seed sources through burn-out, final fire size and shape
- success of post-fire seedling establishment (native vs. noxious and non-native invasive) through seedbed preparation
- future forest health through impact on landscape structure and composition.

b. Methods: Our project area is Northern Idaho and Western Montana. Within this project area, we will use paired sites to compare the effects of fire management tactics used in wildland use

fires with tactics used in fires that were actively suppressed, seeking multiple replicates of fire severity and fire tactics. At these paired locations, we will use a combination of FIA plot data, supplemental field surveys, GIS analysis of landscape structure, and vegetation dynamic simulation models to evaluate the effects of fire management actions on potential future landscape structure and forest health.

Analysis of FIA data will target post-fire seedbed preparation, particularly on plots re-measured after the 2000 fire season. Depending upon FIA's 2004-2005 field schedule, we will also re-measure plots burned in 2003. We will work with Thier et al. to determine feasibility of re-visiting their supplemental transects to determine rates of (non-native invasive and noxious vs. native) seedling establishment. GIS analysis will focus on distance to seed sources, and change detection between pre-fire and short-term and long-term-post fire landscape structure. We will investigate the feasibility of using stand-level wind-turbulence models to improve predictions of where wind-dispersed weeds are likely to become established.

c. Products: Use of paired sites will allow us to answer questions about the implications of 'natural' fire patterns compared to 'suppression' fire patterns on short- and long-term forest health issues. GIS analyses will provide insight into the influence of burn pattern on post-fire seedling establishment and long-term landscape structure. Results will be useful for parameterizing and testing vegetation dynamics models, particularly algorithms dealing with landscape processes (fire, landscape structure, regeneration and wildlife habitat).

d. Schedule of Activities:

Winter/Spring 2004 – Pre-season data acquisition and determination of field sites.
Summer 2004 – Field studies and begin GIS processing
Fall/Winter 2004 – Field data processing, GIS analysis, assess 2005 field priorities
Spring 2005 – preliminary GIS results
Summer 2005 – Field studies
Fall/Winter 2005 – data analysis
Spring/Summer 206 – write up and presentations

e. Progress/Accomplishments:

COSTS:

	Item	**Requested FHM EM Funding**	**Other-Source Funding**	**Source**
YEAR 1				
Administration	Salary	50,000	20,000	RMRS
	Overhead	-		
	Travel	5000		
Procurements	Contracting			
	Equipment	2000		
	Supplies	2000		
TOTAL		59,000	20,000	RMRS