

Title: Aspen Mortality in the Rocky Mountain Region: Extent, Severity, and Causal Factors **INT-EM-08-01**

LOCATION: Federal lands in Colorado, South Dakota, and Wyoming.

DURATION: Year 2 of a 3-year project

FUNDING SOURCE: Base EM

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COOPERATORS: **Bill Jacobi**, Colorado State University; **Jose Negron**, RMRS; **Wayne Shepperd**, Retired-RMRS; **Jim Worrall**, **Dan Long**, **Brian Howell**, and **Jennifer Ross**, R2-FHM; **Blaine Cook**, Black Hills NF; **Chris Thomas**, Bighorn NF; **Randy Spiering**, Shoshone NF.

PROJECT OBJECTIVES: To assess stand conditions and causal agents involved in the aspen mortality observed in R2 using ground surveys and spatial analysis of Aerial Detection Survey (ADS) data. The specific objectives are to:

- evaluate tree, sapling, and seedling health;
- quantify frequencies of causal agents;
- generate hazard maps and descriptions of the spatial distribution (extent and severity) of aspen mortality in the region;
- analyze hazard maps in relation to R2-ADS results, and climate and other data (including drought).

JUSTIFICATION:

Linkage to FHM-DM: Increasing levels of aspen decline and mortality have been reported from ADS, FHM, forest managers, and the public over the past years throughout R2. Aspen decline is listed as one of the major concerns in the *Region 2 Insect and Disease Conditions Report* (Harris et al. 2007). The 2006 ADS of R2 indicated that approximately 170,000 acres have dead or severely damaged aspen. Preliminary results of a recent EM survey in SW Colorado suggest that rapid mortality can be associated with a lack of aspen regeneration (Worrall, INT-EM-07-01; Worrall et al. *in press*). Currently, it is unclear how widespread this phenomenon is. This project will build on the work of Worrall and others (*in press*) to obtain a region-wide perspective on the extent, severity, and causes of aspen mortality in R2.

Significance in terms of geographic scale: Concentrated patches of aspen decline and mortality have been reported from ADS and other surveys in most National Forests in R2 and nearly throughout the range of aspen in CO. A random survey of 30 aspen stands in WY found 83% of the stands have significant mortality or major damages (Harris et al. 2007). A similar phenomenon is occurring in R3 and R1/4 where EM projects are in place (Fairweather: INT-EM-03-02, Guyon: INT-F-06-01). Having a

region-wide survey in R2 will complement these studies and provide a west-wide perspective of aspen health.

Biological impact/political importance: Aspen forests are a valuable resource in R2. Rapid decline and mortality of aspen will affect diversity, wildlife habitat, watersheds, aesthetics, and possibly local economies. Aspen issues have received abundant media attention, and the public and forest managers are anxious for answers.

Feasibility: The cooperative nature of the project, extensive experience of the team, and the good working relationships among the forests and parties involved will insure successful project completion.

DESCRIPTION:

a. Background: Aspen is widely distributed in R2. Recent reports have indicated extensive mortality is occurring throughout the region and in several other western regions (Rogers 2002; Worrall, *in press*). For example, the 2005 R2-ADS found less than 25,000 impacted acres. However, by 2006 approximately 170,000 acres were impacted. Field surveys in SW Colorado reveal that severely impacted stands may not be regenerating. Unfortunately, information obtained from aerial surveys can not tell us the extent and severity of decline and mortality, the condition of regeneration, or specific causal factors. USFS districts, local landowners, and politicians are requesting information about causes, management recommendations, and what the future holds for aspen. An intensive study of aspen decline and mortality is currently being conducted in SW Colorado (Worrall: INT-EM-07-01), but information is lacking in other parts of the region. The purpose of this study is to provide a regional assessment of aspen conditions to answer the important questions being asked. Knowing the distribution, severity, and frequencies of causal agents are required before appropriate disease management recommendations can be made.

b. Methods: A series of plots will be established systematically (via a sampling grid) within aspen stands throughout the study areas using GIS, at a spacing of 2 miles or more between plots. Stands will be selected based on ownership, aspen vegetation type, and accessibility to the forest as determined by GIS data. Three circular plots will be established in each stand (1/50 acre for trees and 1/500 acre for seedlings and saplings). At each plot center, site information including coordinates, elevation, date, stand age, slope position, slope, and aspect will be recorded. Variables recorded for each tree will include tree species; tree diameter; host condition (living or dead); crown position; crown health; and associated stress/mortality agents (diseases, insects, fire, windthrow, wind breakage, lightning, and others). Results will be summarized in both tabular and spatial distribution maps (hazard maps) showing the extent and severity of aspen mortality and causal agents in the region. These maps will be analyzed in relation to R2-ADS results, and climate and other data (including drought).

c. Products:

- Posters and/or presentations at the FHM Working Group Meeting, Western International Forest Disease Work Conference, Western Forest Insect Work Conference, Great Plains Tree Pest Council, and other appropriate meetings.

- Results will be used to respond to inquiries from forest managers, land owners, politicians, and other interested parties on aspen conditions in R2.
- Results will be prepared for publication in a refereed journal.
- Publications will be distributed to all federal lands involved and to the CO, SD, and WY State Foresters, land managers and others in areas of forest stewardship, as well as others interested in the results.

d. Schedule of Activities:

- Summer 2008: Field survey in SD and WY.
- Summer 2008-Spring 2009: Data analysis including landscape GIS based research.
- Summer 2009: Complete SD and WY field survey. Begin field survey of CO.
- Fall 2009-Spring 2010: Data analysis including landscape GIS based research.
- Summer 2010: Complete CO field survey.
- Fall-Winter 2010: Final data analysis and report writing.

e. Progress/Accomplishments: Three hundred and thirty plots permanent plots were established in the Black Hills and Shoshone National forests in 2008. Damage agents that were observed on more than 2% of the trees, from most to least common, were Cytospora canker (*C. chrysosperma*), Encoelia canker (*E. pruinosa*), Phellinus stem decay (*P. tremulae*), bronze poplar borer (*Agrilus liragus*), Ceratocystis canker (*C. fimbriata*), poplar borer (*Saperda calcarata*), and Cryptosphaeria canker (*C. lignyota*). *Armillaria* spp. were found in 53% of the plots and were confirmed to be causing root disease in 14% of the plots. Ganoderma root disease (*G. applanatum*) was found in 13% of the plots. Field reconnaissance of ADS aspen decline polygons was initiated in 2008 and historic climate data, pertinent literature, and assorted GIS layers have been obtained and are being analyzed in preparation for the 2009 field season in CO.

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR 2009^a				
Administration	Salary	\$33,000 ^b	\$30,000/\$16,000	R2FHMgmt./CSU
	Overhead	\$2,500 ^c	\$1,500/\$4,600	R2FHM/CSU
	Travel	\$14,000 ^b	\$9,000	R2FHM
Procurements	Contracting	\$0	\$0	
	Equipment	\$1,500	\$3,000	R2FHM
	Supplies	\$500	\$1,000	R2FHM
Total		\$51,500	\$65,100	

^a A similar budget is expected in 2010.

^b Most of the requested funds will be used to support 2 summer temporaries at GS-5 and their travel, and a graduate student salary and travel.

^c For CSU overhead.