

TITLE: Assessing Limber Pine Stand Conditions after Mountain Pine Beetle Outbreaks

LOCATION: USFS Northern and Rocky Mountain Regions (no. CO, WY, and central MT)

DATE: October 16, 2012

DURATION: Year 3 of a 3-year project

FUNDING SOURCE: Base EM

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PROJECT OBJECTIVES: To provide land managers with information needed to develop, prioritize, and implement restoration strategies for limber pine stands impacted by mountain pine beetle (MPB). Specific objectives include:

- 1) Determine the extent and severity of mortality from MPB in the study area.
- 2) Assess white pine blister rust (WPBR) impacts on remaining limber pine trees.
- 3) Assess stocking, composition, structure, and health of remaining trees and regeneration.
- 4) Use stand data for aerial detection surveys (ADS) accuracy assessment and improving predictive models of mortality.

JUSTIFICATION:

a. Linkage to FHM Detection Monitoring: ADS have identified nearly 1.5 million acres of 5-needle pines affected by MPB from 1996-2009 in R2. These surveys provide estimates of mortality but more detailed information, such as current stand conditions, the incidence of WPBR, and regeneration success, is needed to develop and implement restoration plans. Limber pine health was assessed in these areas before MPB mortality noticeably increased (INT-EM-06-03) but a large portion of limber pine's distribution in WY (BLM lands in particular) has not been evaluated on the ground or by ADS. FIA data for these areas is incomplete and on a slow

re-measurement cycle. The need for information is urgent; MPB is quickly killing mature trees and WPBR, which is particularly damaging to young trees, continues to spread and intensify.

b. Significance in terms of geographic scale: From 1997-2008, the highest levels of MPB-caused limber pine mortality occurred in CO and WY (Gibson et al. 2008) and levels continued rising in 2008 & 2009. Researchers predict that beetle populations will remain high until hosts are depleted or weather conditions become unsuitable to the beetles. Meanwhile, white pine blister continues to spread and intensify (Burns et al. 2008, Kearns and Jacobi 2007).

c. Biological impact/political importance: Limber pines often grow in fragile ecosystems where little else can grow. The combined effects of MPB, WPBR, and climate change could greatly impact the biodiversity of these ecosystems. Intervention will be necessary to restore/maintain impacted stands. Information on stand conditions is needed to facilitate these efforts. Ancient trees, resistant trees, and national treasures are a few examples of threatened resources. Genetic conservation of high elevation white pines is a priority for FHP, NPS, and BLM. Limber pine was added to the BLM's sensitive species list in WY in 2010. This is a cooperative project between CSU, RMRS, BLM, NPS, and FHP R1 & R2.

d. Scientific basis/feasibility: This study is scientifically sound and feasible for the following reasons: 1) we will build upon previous studies and surveys to increase efficiency, 2) we have an experienced team of scientists and land managers working together, and 3). we have a proven track record of timely information exchange.

e. Priority issues addressed: This project will address priority issues: 1) tree mortality, 2) drought, and 3) filling data gaps in models. Current levels of MPB caused mortality are the highest ever documented historically. Concerns about climate change are increasing. Information on limber pine, a non-timber species, is limited. Results from this study will help fill these data gaps and ultimately facilitate our management capabilities.

DESCRIPTION:

a. Background: MPB and WPBR are causing extensive decline and mortality throughout R1& R2 leaving most limber pine stands at risk. MPB, the most immediate threat, kills mature, cone-bearing trees and limber pine is a more favorable host for MPB than lodgepole pine. The added impacts of WPBR, which continues to spread and intensify in limber pine, could be devastating in some areas since small trees are particularly susceptible. Two new alternate hosts (genera *Pedicularis* and *Castilleja*) for WPBR were verified in 2004 by RMRS. Information on stand conditions, regeneration, the extent and severity of MPB/WPBR and presence of alternate hosts are needed to make recommendations and to develop appropriate recovery plans.

b. Methods: Stands affected by MPB will be identified with ADS data, previous surveys, and local experts. Field data will be collected using established methods. Stand data collected will

include: lat/long, slope, aspect, topography, structure, understory species, and occurrence and abundance of alternate hosts. Tree data collected will include: species, DBH, health status, WPBR status, cone abundance, MPB status, and mortality cause/yr. Regeneration will be assessed in fixed area subplots.

c. Products: A final report including management recommendations, field data for ADS accuracy assessment and improving the Risk Map and other predictive models, at least one full-length publication. The final dataset will be imported into the Whitebark Pine and Limber Pine Information System (WLIS) (Lockman and DeNitto). Results will be presented at the FHM Working Group and other national and regional meetings.

d. Schedule of Activities: Summer 2011: Develop protocol for all assessments and start CO & so.WY assessment; winter 2011: Organize/analyze data and present progress report at FHM meeting; summer 2012: No. WY & MT assessment and finish CO & So. WY; fall 2012: Data analyses and present progress report at FHM meeting; summer 2013 - spring 2014: Complete field assessment, data analyses, present final report at FHM/regional meetings.

e. Progress/Accomplishments:

FY11:

- CSU graduate student, Christy Cleaver, and her field crew established 175 plots in limber pine stands on 8 mountain ranges in northern CO (Arapaho-Roosevelt NF) and southern WY (Medicine Bow NF and BLM lands in the Green and Shirley Mountains).
- FHP remeasured 15 permanent plots on the Medicine Bow and Roosevelt NFs.

FY12

- Christy Cleaver and crew established 333 more plots in 17 mountain ranges in Colorado (1), Wyoming (14), and Montana (2) (Table 1).
- FHP remeasured 20 permanent plots on the Medicine Bow and Arapaho-Roosevelt National Forests and Rocky Mountain National Park.

FY13

- FHP will complete remeasuring permanent plots in northern WY and central MT.
- FHP and CSU will continue entering and analyzing data and preparing final reports.
- Modeling and manuscript writing are planned for spring term 2013.
- We expect this project to be complete by December 2013.

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding FHM
YEAR 2013^a			
Administration	Salary ^a	\$10,000	\$25,000
	Overhead		
	Travel ^b	\$9,000	\$5,000
Procurements	Other		
	Equipment	\$500	\$2,000
	Supplies	\$500	\$500
Total		\$20,000	\$32,100

^aGS-5 technician for 7 pay periods.

^bTravel for GS-5 technician for 7 pay periods, FHP 2 pay periods.

Table 1. Plot summary data from a survey of limber pine stands in Colorado, Wyoming, and Montana in 2011 and 2012.

Year	State	Mountain Range	Study Area	Ownership	n ¹
2011	Colorado	Front Range	Roosevelt	NF	25
2012	Colorado	Front Range	Boulder County	Boulder County	14
2011	Wyoming	Laramie Mtns	Pole Mountain	NF	24
2012	Wyoming	Laramie Mtns	Eastern Laramie Mtns	NF	24
2012	Wyoming	Laramie Mtns	Western Laramie Mtns	NF	24
2012	Wyoming	Laramie Mtns	Muddy Mountain	BLM	21
2011	Wyoming	Medicine Bow Mtns	Southern Medicine Bow Mtns	NF	24
2011	Wyoming	Medicine Bow Mtns	Northern Medicine Bow Mtns	NF	24
2011	Wyoming	Medicine Bow Mtns	Sierra Madre	NF	24
2011	Wyoming	Shirley Mountains	Shirley Mountains	BLM	24
2011	Wyoming	Ferris Mountains	Ferris Mountains	BLM	6
2011	Wyoming	Green Mountains	Green Mountains	BLM	24
2012	Wyoming	Beaver Rim, Crooks Mountain, Rattlesnake Mountain	Jeffrey City Area	BLM	16
2012	Wyoming	Wind River Range	Southern Wind River	NF	27
2012	Wyoming	Wind River Range	Wind River Reservation	Tribal	18
2012	Wyoming	Wind River Range	Northern Wind River	NF	28
2012	Wyoming	Absaroka Range	Southern Absaroka	NF	21
2012	Wyoming	Absaroka Range	Cody Area	BLM	16
2012	Wyoming	Absaroka Range	Northern Absaroka	NF	24
2012	Wyoming	Bighorn Basin	Bighorn Basin	BLM	11
2012	Wyoming	Bighorn Mountains	Eastern Bighorn Mountains	BLM	17
2012	Wyoming	Bighorn Mountains	Southern Bighorn Mountains	NF	20
2012	Wyoming	Bighorn Mountains	Northern Bighorn Mountains	NF	24
2012	Montana	Pryor Mountains	Pryor Mountains	NF, BLM	20
2012	Montana	Terry Badlands	Terry Badlands	BLM	8
					Total 508

¹One plot = three 6x60 meter subplots placed at random bearings with a 6x30 meter invasive species plot at the end of each subplot.