

ML 2015, Ch 76 Art 2, Sec 6a Project Abstract

For the Period Ending December 31, 2021

PROJECT TITLE: Subproject #2: Mountain pine beetle, Phase III: Protecting Minnesota
PROJECT MANAGER: Brian Aukema
AFFILIATION: University of Minnesota
MAILING ADDRESS: 1980 Folwell Avenue
CITY/STATE/ZIP: St. Paul, MN 55118
PHONE: (612) 624-1847
E-MAIL: BrianAukema@umn.edu
WEBSITE:

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LEGAL CITATION: MINNESOTA INVASIVE TERRESTRIAL PLANTS AND PESTS CENTER

ML 2015, Ch. 76, Art. 2, Sec. 6a

APPROPRIATION AMOUNT: \$445,347

AMOUNT SPENT: \$445,347

AMOUNT REMAINING: \$0

Sound bite of Project Outcomes and Results

Repeated surveys did not find mountain pine beetle in Minnesota. Scant few individuals were captured dispersing far from active infestations in western states. We found that local bark beetles and predators do not optimally recognize the insect's chemical signals, however, suggesting that such components of invasion resistance might be low.

Overall Project Outcome and Results

Surveys over the course of this project did not detect any mountain pine beetle in Minnesota. Although absence data cannot rule out inappropriate lure choices, testing of a new lure within the Black Hills of South Dakota where mountain pine beetle is endemic found that the conventional lure worked well. No improvements were noted when testing a new formulation. Long distance dispersal transects revealed that mountain pine beetles can be captured up to 30 miles away from active tree-killing outbreaks, but these singletons represented a fraction of a fraction of the population. Dispersal pressure was much lower in the last year of the project when beetles returned to endemic levels, which is the norm in western forests for decades at a time. Thus, we expect that the risk of mountain pine beetle reaching Minnesota by blowing from infestations in the Black Hills of South Dakota, which is approximately 500 miles away from the nearest mature pine forests in Minnesota, is extremely low. If mountain pine beetle was to arrive in Minnesota, it would have to establish into an environment with new flora (species of pines) and fauna (other species of bark beetles as well as their predators) to which it had never been exposed. The only species of pine common to the Black Hills and Minnesota is Scots pine; exposures to the fungus that mountain pine beetle carries revealed strong localized responses of Scots pine to the inoculation sites with defensive chemicals known as monoterpenes. Surveys of Minnesota's community of bark beetles, competitors, and predators responding to lures of mountain pine beetle in comparison to similar in the Black Hills revealed nuanced, regional variations in responses, but overall strong fidelity to cures of predators associated with local prey. Thus, we expect that predators or competitors in Minnesota would not optimally recognize the aggregation pheromone of mountain pine beetle. In one case with direct comparative tests in the Black Hills, we noted that one of the most common bark beetles that would potentially compete with mountain pine beetle in Minnesota, *Ips grandicollis*, avoids the lure of mountain pine beetle. We did note a few mountain pine beetles in traps baited with the aggregation pheromone of *Ips grandicollis* when the traps were placed far from active infestations of mountain pine beetle. This finding suggests that mountain pine beetle could respond to such pheromones as a "last-ditch" effort to find habitat during endemic periods where there are insufficient numbers to mass-attack, colonize, and kill large trees. If true, mountain pine beetle could find an endemic niche in Minnesota's pine forests. Because we still lack knowledge about how mountain pine beetles persist in endemic states, and whether colonization densities might actually be lower in other species of Minnesota's

pinus if they have lower defensive responses, continued vigilance against mountain pine beetle as a threat to Minnesota's pine forests is warranted.

Project Results Use and Dissemination

We have published one scientific paper from this work, with four more moving toward publication with peer-reviewed journal targets. We gave numerous regional, national, and even presentations as venues such as the Entomological Society of America, the IUFRO Conference on Biological Invasions in Forests, the North American Forest Insect Work Conference, North Central Forest Pest Workshop, Western Forest Insect Work Conference, Upper Midwest Invasive Species Conference, the Sustainable Forest Education Cooperative, State Forest Health Cooperators, Northern Advanced Silviculture Program, Minnesota Forest Industries, and MN Department of Natural Resources Forestry Team.