



Aerial View of the 1999 Wind-disturbance

SUB-BOREAL BEETLES in WIND-DISTURBED and PRESCRIBED-BURNED FORESTS

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Buprestis nutalli (Family Buprestidae)

INTRODUCTION

Wildfires have historically influenced forest processes in northern Minnesota, and fire suppression may have altered forest dynamics.

The July 4th 1999 catastrophic windstorm in the Superior National Forest provides an opportunity for re-introduction of fire in these ecosystems (1). It is presently unknown how insects will respond to prescribed fire and salvage-harvesting post-wind-disturbance.

Bark (Scolytidae), wood-boring (Cerambycidae, Buprestidae) and root-attacking (Curculionidae, Scolytidae) beetles are expected to invade wind-disturbed forests (2, 3). Litter-dwelling (epigeaic) beetles (Carabidae, Staphylinidae) are sensitive to soil disturbances that may alter their species diversity, abundance and composition patterns (4).

RESEARCH OBJECTIVES

1. To quantify the effects of severe wind disturbance and silvicultural treatments on the abundance, diversity and assemblage patterns of bark, wood-boring and root-attacking beetle species.
2. To determine the effects of severe wind disturbance and silvicultural treatments on the abundance, diversity and assemblage patterns of litter-dwelling beetle species.

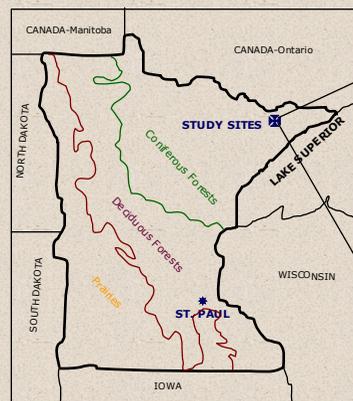


Figure 1a - Map of Minnesota showing Study Sites.

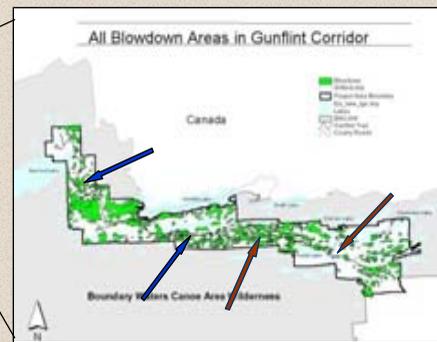


Figure 1b- Spatial Extent of Plots. Blue and Red Arrows Represent Jack Pine & Aspen/Birch Sites Respectively.

METHODS

We have sampled beetles during the summers of 2000 and 2001 along the Gunflint Corridor in the Superior National Forest in northeastern Minnesota (Fig. 1 a, b). Sampling will continue in 2002 and perhaps in 2003, pending availability of funding.

Thirty-two plots with four replicates each of the undisturbed, wind-disturbed, prescribed-burned, and salvage-harvested conditions were established within jack pine and aspen-birch sites (Fig. 2).

Epigeaic beetles were sampled with unbaited pitfall traps (5) in jack pine and aspen/birch stands, and bark, wood-boring, and root-attacking beetles were sampled with semiochemical-baited funnel (6) and pitfall traps in jack pine stands.



Figure 2 - Silvicultural Treatments (Four Replicates each) for Jack Pine Stands. Prescribed-burned Sites were Sampled in 2001 as Dependent upon the Forest Service Burning Plans.

BARK BEETLES (SCOLYTIDAE)

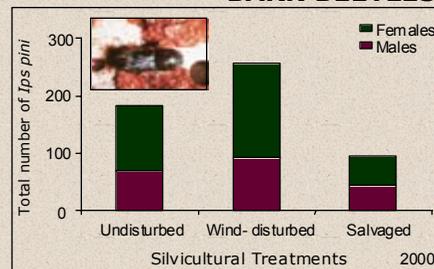


Figure 3 - Number of *I. pini* Caught in Funnel Traps Baited with *I. pini* Baits.

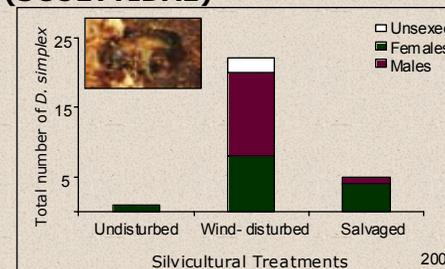


Figure 4 - Number of *D. simplex* Caught in Funnel Traps Baited with Spruce Beetle Baits.

GROUND BEETLES (CARABIDAE)

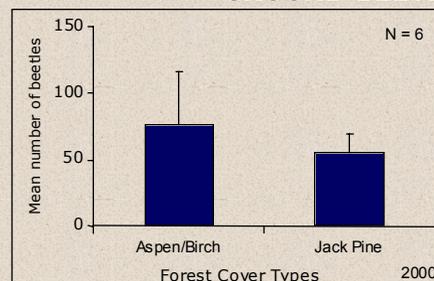


Figure 5 - Mean Number of Carabids Caught in Two Forest Cover Types.

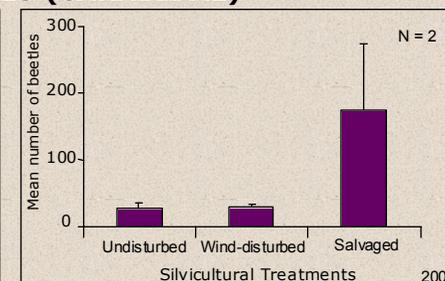


Figure 6 - Mean Number of Carabids Caught in Treated Aspen/Birch Stands.

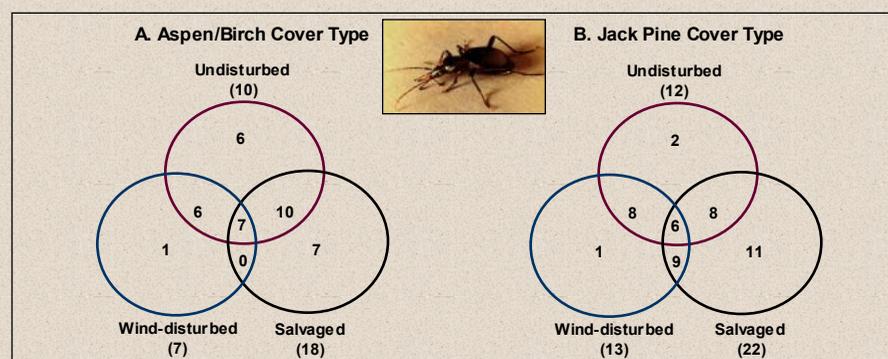


Figure 7 - Venn Diagram for Species Diversity of Ground Beetles Caught using Pitfall Traps. Numbers in Parentheses Refer to the Total Number of Species Caught.

PRELIMINARY RESULTS

Summer 2000: Results from two replicates of jack pine stands indicate that bark beetles such as *Ips pini* and *Dendroctonus simplex* show increased flight activity in wind-disturbed stands (Figs. 3, 4). This suggests that management activities would be crucial to curb bark beetle outbreaks.

We caught a total of 775 ground beetles represented by 35 species. Salvaged aspen/birch sites had more ground beetles than any of the other conditions in either cover-type (Figs. 5, 6).

Salvaged sites had more unique ground beetle species than wind-disturbed and undisturbed sites (Fig. 7) indicating different successional trajectories in salvaged sites.

Summer 2001: We observed wood-boring beetles attacking standing live jack pine trees in one wind-disturbed and one undisturbed stand suggesting that these beetles may cause tree mortality.

Data collected from funnel, and baited and unbaited pitfall traps are currently being processed and analyzed.

FORESTRY IMPLICATIONS

We are assessing the role of large-scale wind disturbance and prescribed burning on forest beetles to optimize forest health and regeneration models. This project is the first and largest systematic study on forest beetles of northern Minnesota, and will provide information about forest elements critical to maintaining sub-boreal biota.

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LITERATURE CITED

1. USDA. 2000. Gunflint Corridor Fuel Reduction: Final Environmental Impact Statement, Superior National Forest.
2. Gardiner L. M. 1957. *Can. Ent.* 5: 387-398.
3. Wermelinger *et al.* 1999. *Mit. Der Sch. Ent. Ges.* 72: 209-220.
4. Spence *et al.* 1997. *Forests and Insects.* Chapman and Hall.
5. Spence, J.R. and Niemelä, J.K. 1994. *Can. Ent.* 126:881-894.
6. Lindgren, B.S. 1983. *Can. Ent.* 115: 299-302.

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