Insect infestation and fungal disease response to wildfire and prescribed burning in red pine in the Upper Peninsula of Michigan

Rita M. Koch[1], Linda M. Haugen[2], Linda M. Nagel[1], Michael E. Ostry[2] and Andrew J. Storer[1]

[1]School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI; [2] USDA Forest Service, St. Paul, MN

Figure 1

This study is taking place in two fire sites in Luce County in the Upper Peninsula of Michigan. The first is the Muskrat Lakes Fire/Fire Surrogate Prescribed Burn Site, and the other is the Sleeper Lake Wildfire. These study areas are located about 10 miles apart (Figure 1).

MUSKRAT LAKES FIRE/FIRE SURROGATE SITE

Burn Objectives

Characterize the effects of prescribed fire and harvesting (thinning) treatments in natural red pine dominated forests on:

- Red turpentine beetle (*Dendroctonus valens)* activity
- Shoot blight pathogens
- Red pine regeneration

Site Characteristics:

Originated from a stand-replacing fire about 80 years ago. Pretreatment forest composition was 54% red pine, 16% white pine, 11% jack pine and 9% red oak. Mean DBH of red pine was 29 cm and mean height was 15 m.

Study design Illustrated in Figure 3 (Modified from the National Fire/Fire Surrogate study www.fs.fed.us/ffs)

12 treatment areas of 17 hectares were divided into 4 treatment types:

- Untreated control
- Prescribed fire only
- Mechanical treatment only
- Mechanical treatment followed by prescribed fire

Each treatment area contains a grid of 20 plot centers 50 meters apart. Stand data were taken within a 0.04 hectare area around the plot center.

Photo: Michigan DNR

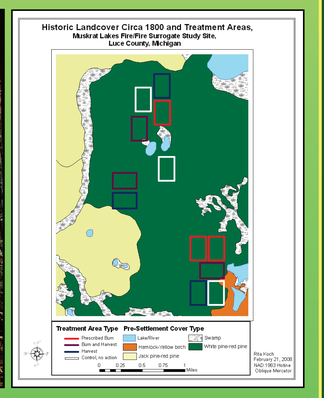
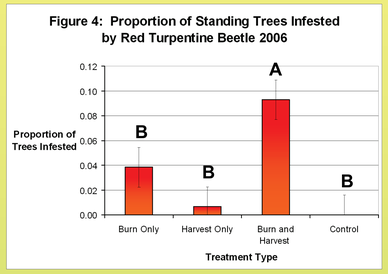


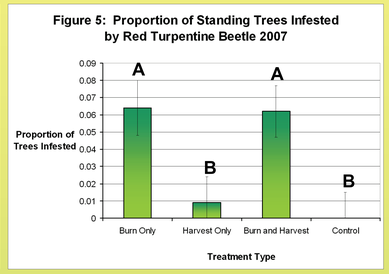
Figure 2 (left): Prescribed burn in a mechanically treated site, Muskrat Lakes
Figure 3 (right): Treatment area design and historic landcover

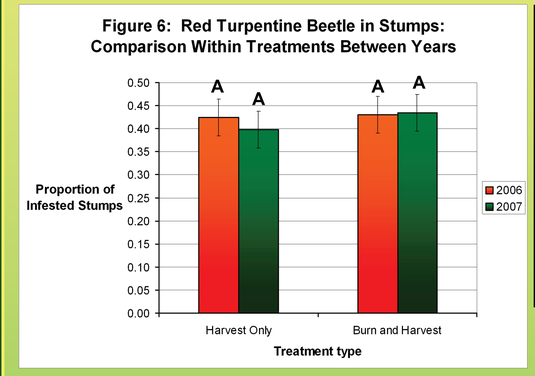
MUSKRAT LAKES RESULTS

Entomology: Response of Red Turpentine Beetle (*Dendroctonus valens*):

- Attacks by red turpentine beetle on standing trees were higher in treatments that included fire (Fig. 4 and Fig. 5)
- Attacks on stumps occur independently of fire (Fig. 6)
- No red turpentine beetle signs were observed in control treatments (Fig. 4 and Fig. 5)







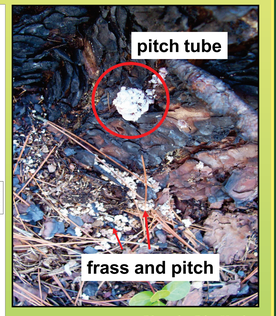


Photo by Rita Koch

Figure 7: *D. valens* pitch tube.

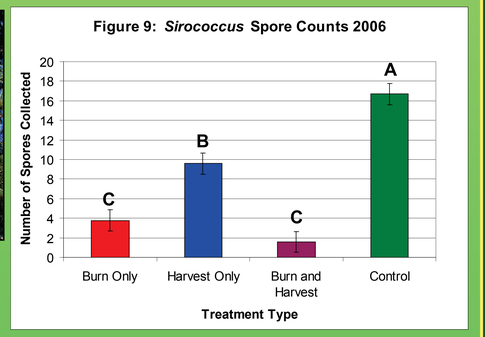
Pathology: *Sirococcus* Shoot Blight

Spore traps were placed in each of the 12 treatment areas with 4 slides at each treatment area and 48 slides over the entire site. Slides were exposed for 14 days.

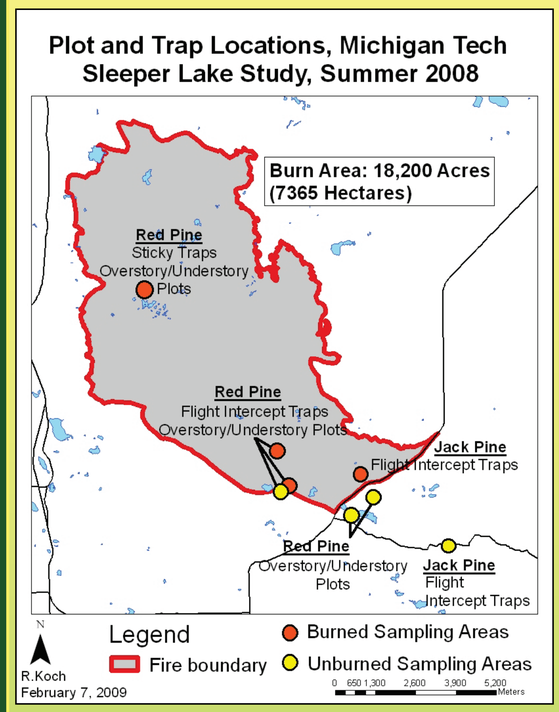
In 2006, *Sirococcus* spore counts were significantly lower in burned treatment areas than harvest only and control. *Sirococcus* spore counts were also significantly lower in harvest treatments than control (Fig. 9).

Photo by Rita Koch

Figure 8: Orange shoots symptomatic of shoot blight



SLEEPER LAKE WILDFIRE



Photos by Rita Koch

Figure 10 (left): Sleeper Lake sampling design
Figure 11 (top): Flight intercept trap baited with ethanol/alpha-pinene
Figure 12 (above): Scorched red pine in Sleeper Lake Wildfire

Current Data Collection

In the summer of 2007, lightning ignited a wildfire that burned 7,365 hectares (18,200 acres) in Luce County. This burn is 10 miles from the Muskrat Lakes site and provides an exciting opportunity to conduct similar research on a wildfire. This summer, assessment will continue on the upland pine component of the Sleeper Lake fire.

Data collection includes:

- Overstory tree data
- Understory herbaceous vegetation
- Flight intercept trapping for wood-infesting beetles and woodwasps
- Sticky trapping on high and low scorched red pine to measure landing behavior
- Fire intensity and severity
- *D. valens* and pine engraver beetle (*Ips pini*) activity

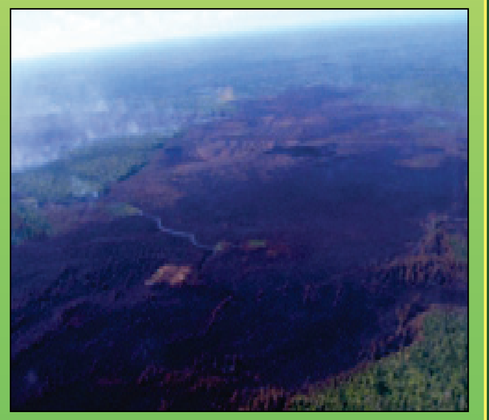


Photo: Michigan DNR

Figure 13: View of Sleeper Lake Fire from the air, August 2007

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