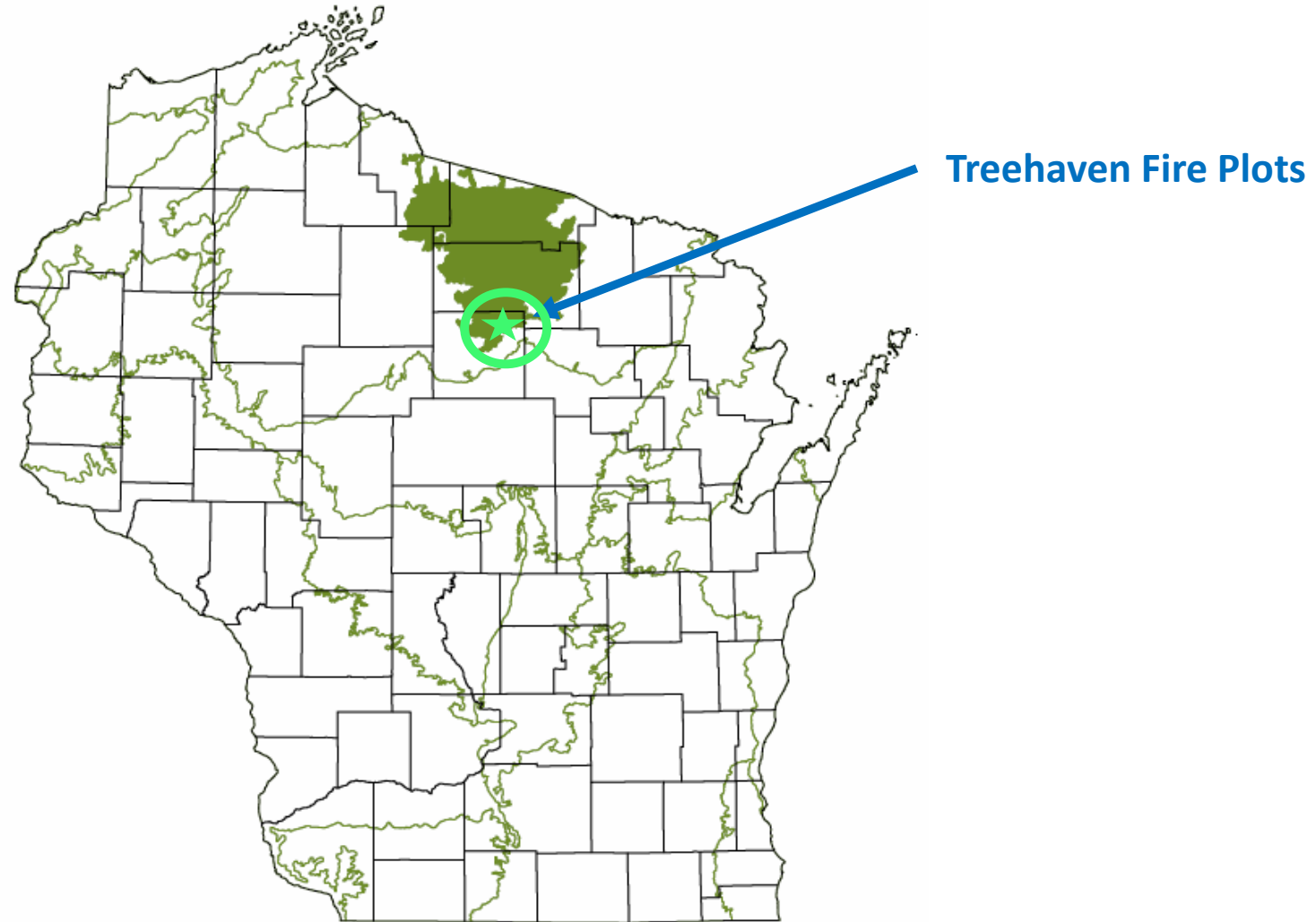
A photograph of a forest fire. In the foreground, there are several tall, thin tree trunks. The ground is covered with dry, brown pine needles and branches. In the background, a large fire is burning, with bright orange and yellow flames rising into the air. The sky is a hazy, greyish-blue color.

Treehaven Fire Plots: Effects of Variable Overstory, Fire Frequency and Season in a Northern Mixed Conifer-Hardwood System

Preliminary Results

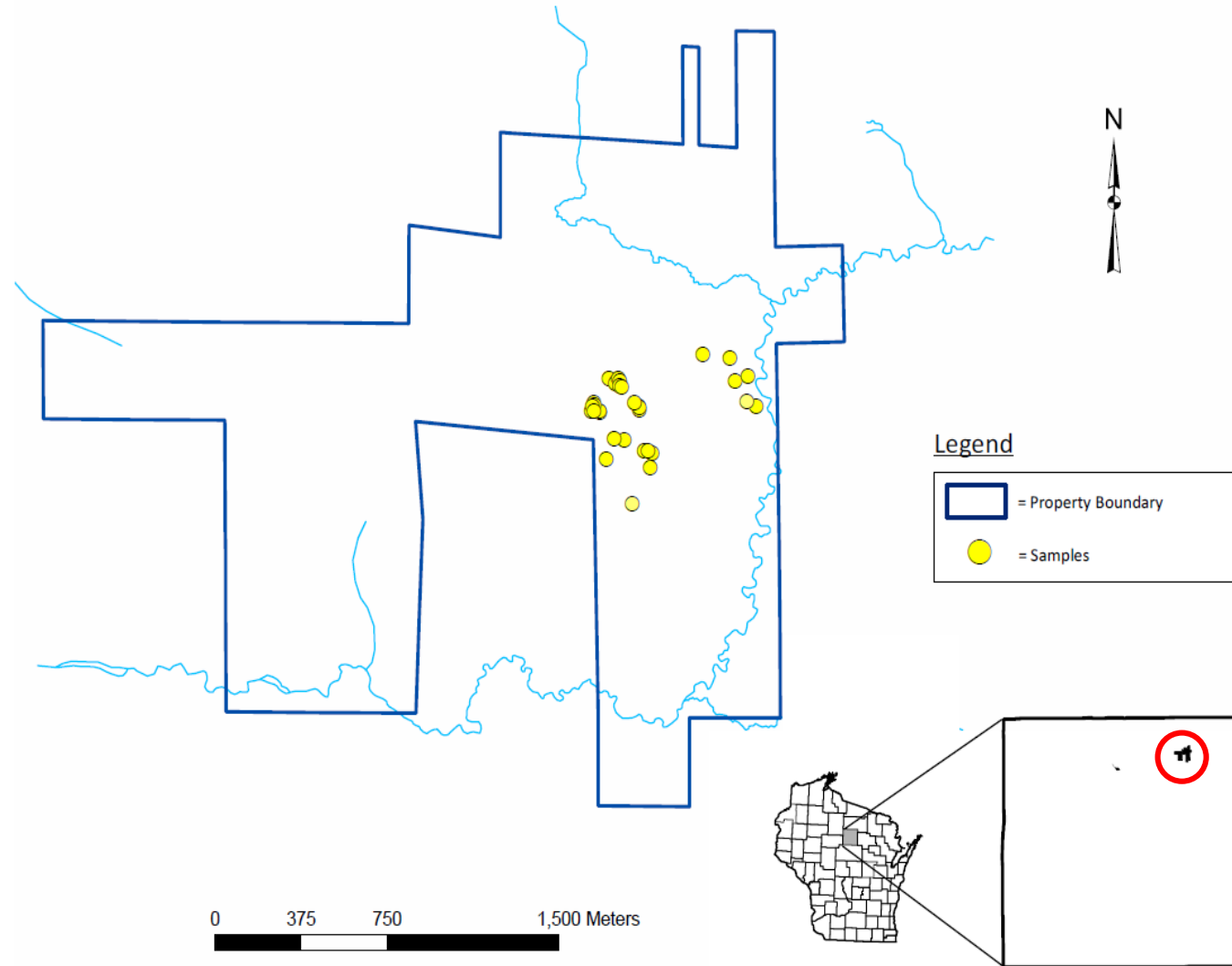
Ron Masters, Kevin Burns, Jacob Prater, Holly Petrillo,
Lucas Joers and Jon Steigerwaldt

Northern Highlands Ecological Landscape, Wisconsin



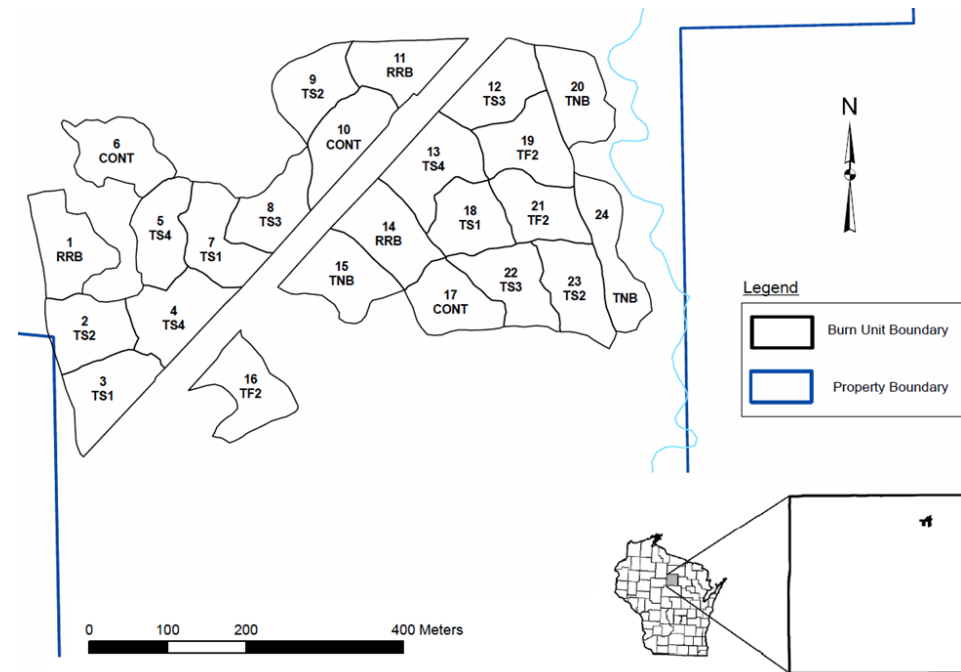
Wisconsin Department of Natural Resources (WDNR). 2014. The ecological landscapes of Wisconsin: an assessment of ecological resources and guide to planning sustainable management. Wisconsin, Dept. of Nat. Resources, Madison, WI. PUB-SS-1131

Treehaven Field Station



Study Design — Patterned after Tall Timbers Fire Ecology Plots (SFP) and Pushmataha FHRA Fire Plots

- OBJECTIVES:
- To examine effects of fire frequency & season on:
 - overstory trees
 - woody vegetation
 - herbaceous vegetation
 - small mammals-CE,
 - Insects-carabid beetles
 - soil physical and chemical properties

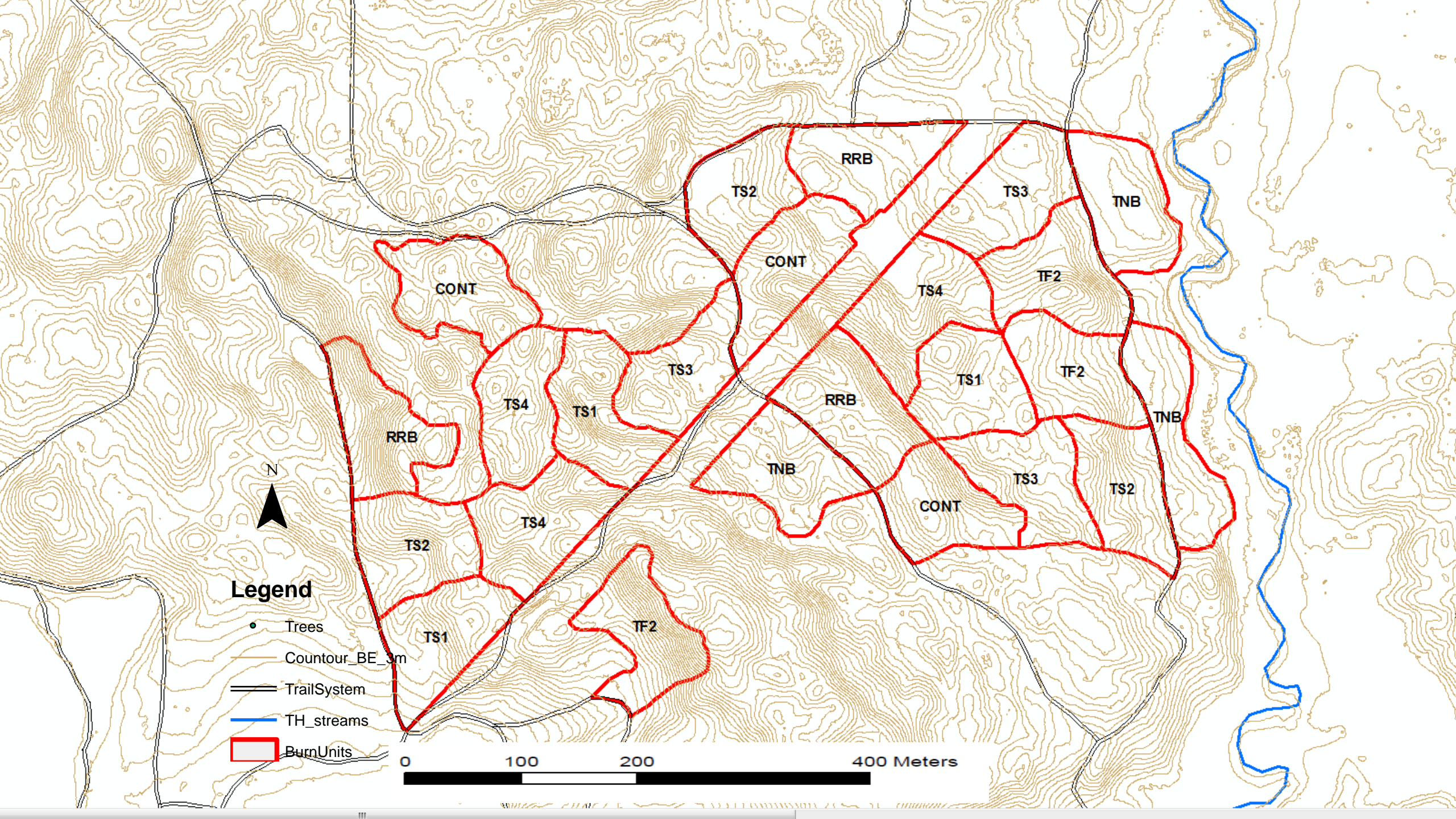


Study Design

Completely randomized design

- ∞ 24 - 0.81 ha (2 acre) units
- ∞ 8 experimental treatments
- ∞ 3 replications each
 - Pre-treatment of Balsam fir
 - Thinning from below
 - 5 burn frequencies
 - 2 seasons
- ∞ Designed to partition the effects from thinning from the effects of fire

Treatment	Fire Frequency (yrs.)
CONT	None
RRB	4
TNB	None
TS1	1
TS2	2
TS3	3
TS4	4
TF2	2

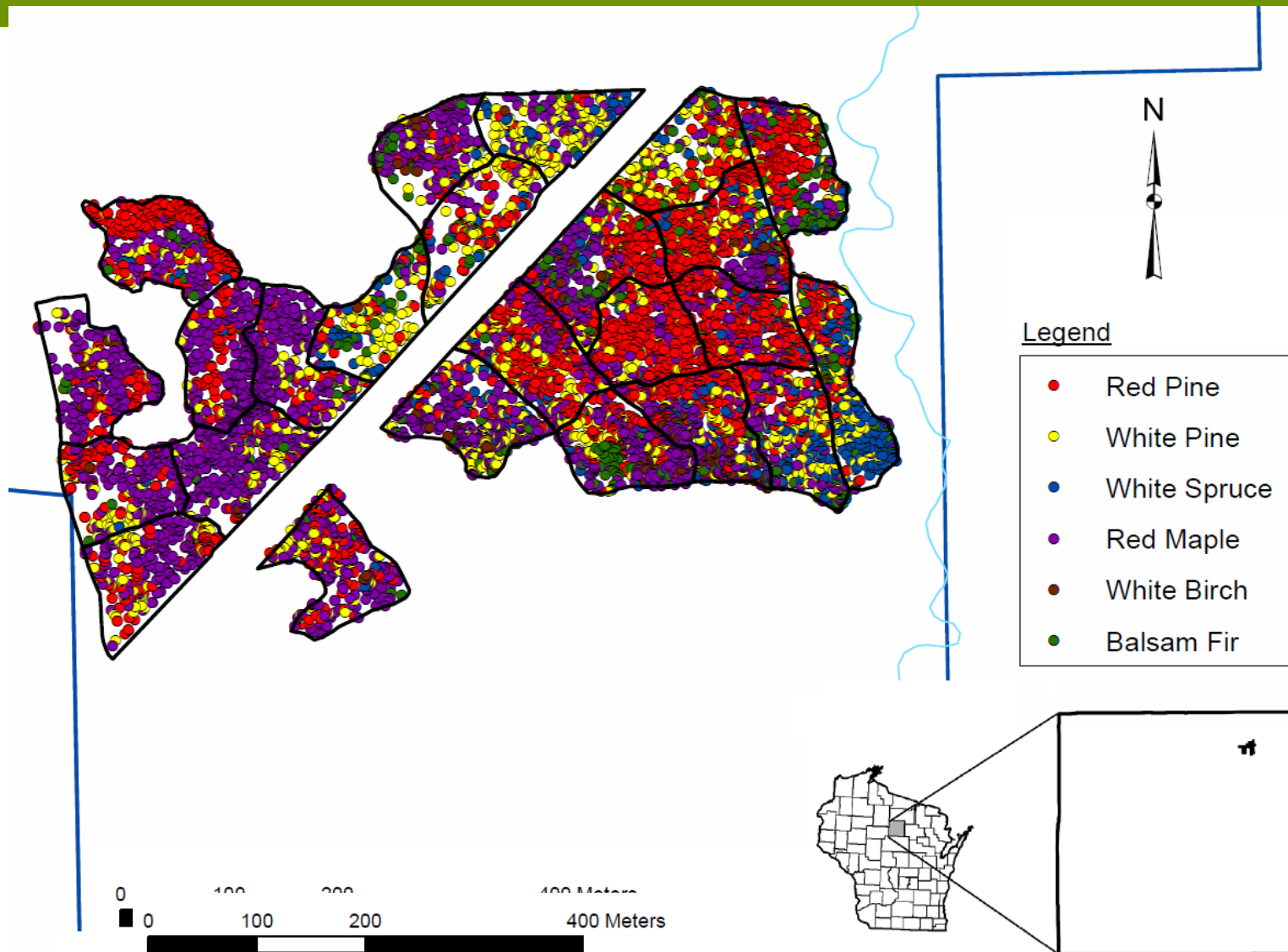


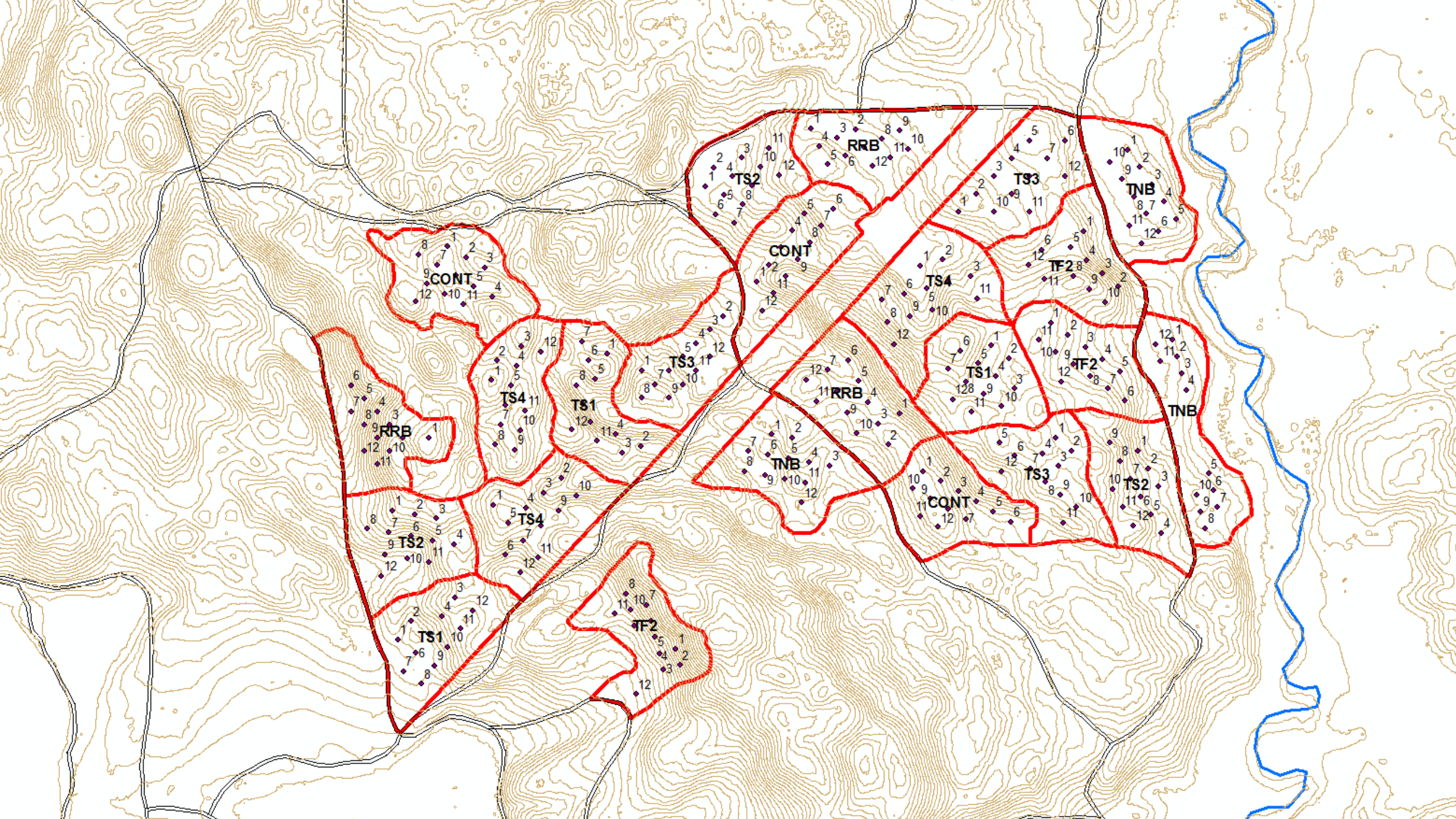
Legend

- Trees
- Countour_BE_3m
- TrailSystem
- TH_streams
- BurnUnits

0 100 200 400 Meters

Baseline Pre-treatment Study – Summer 2013





Thinning



Rx Fire Treatments

∞ Strip-head, flanking and back fires

- Spring 2014
- Fall 2014
- Spring 2015
- Spring 2016

∞ Fireline Intensity: $I = hwr$

∞ Heat Unit Area: $H_A = I/r$



Variables of Interest:

Species, Groups and Environmental Variables

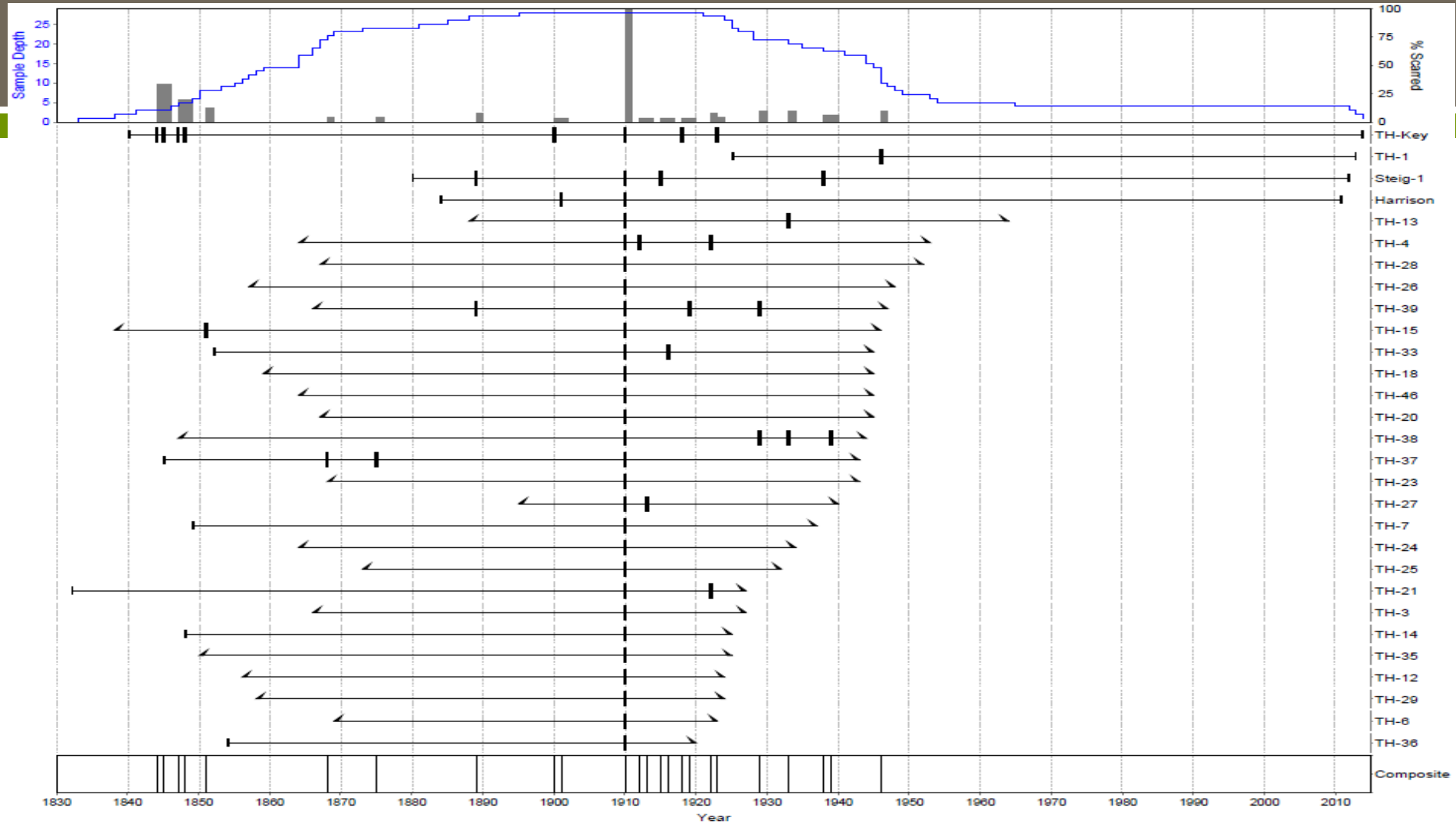
- ☞ Tree Species
- ☞ Herbaceous Species
- ☞ Woody Species
- ☞ Carabid Beetles
- ☞ Small Mammals
- ☞ Preferred Deer Browse
- ☞ Soil physical properties
- ☞ Soil chemical properties
- ☞ BA and canopy cover
- ☞ Litter cover
- ☞ Coarse woody debris
- ☞ Woody stem density
- ☞ Fire Behavior – I, HUA, RI
- ☞ Soil physical properties
- ☞ Soil chemical properties

Results





Treehaven Fire Chronology



Key

- Fire Event
- | Inner Year with Pith or Outer Year with Bark
- ◀ Inner Year Without Pith
- ▶ Outer Year Without Bark

Treehaven Fire History

	Functional Historical Period		
	Pre-European Settlement	Settlement	Suppression
Period Range	1832-1880	1881-1943	1944-2014
Number of Years	49	63	71
Number of Years with Fire	6	16	1
Number of Intervals	5.0	15.0	0
Mean Fire Interval (yr)	5.2	3.3	
Median Fire Interval (yr)	2.5	2	
Fire Interval Range (yr)	1 to 17	1 to 14	





Results Rx Fire

- ☞ Spring 2014
 - 81 to 268 kW/m
- ☞ Fall 2014
 - 8 to 260 kW/m
- ☞ Spring 2015
 - 28 to 404 kW/m
- ☞ Spring 2016
 - 150 to 650 kW/m





28 kW/m

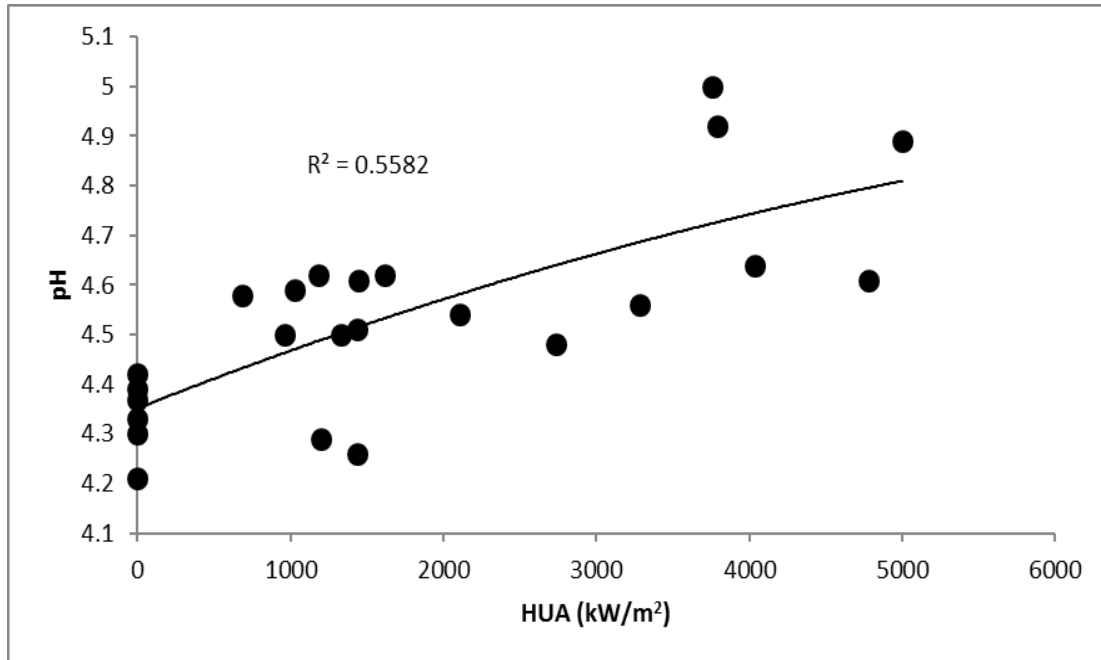
Ave Flame length = 0.2 m



400 kW/m

Ave Flame length = 0.9 m

Results: pH and OM



Results: Soil respiration

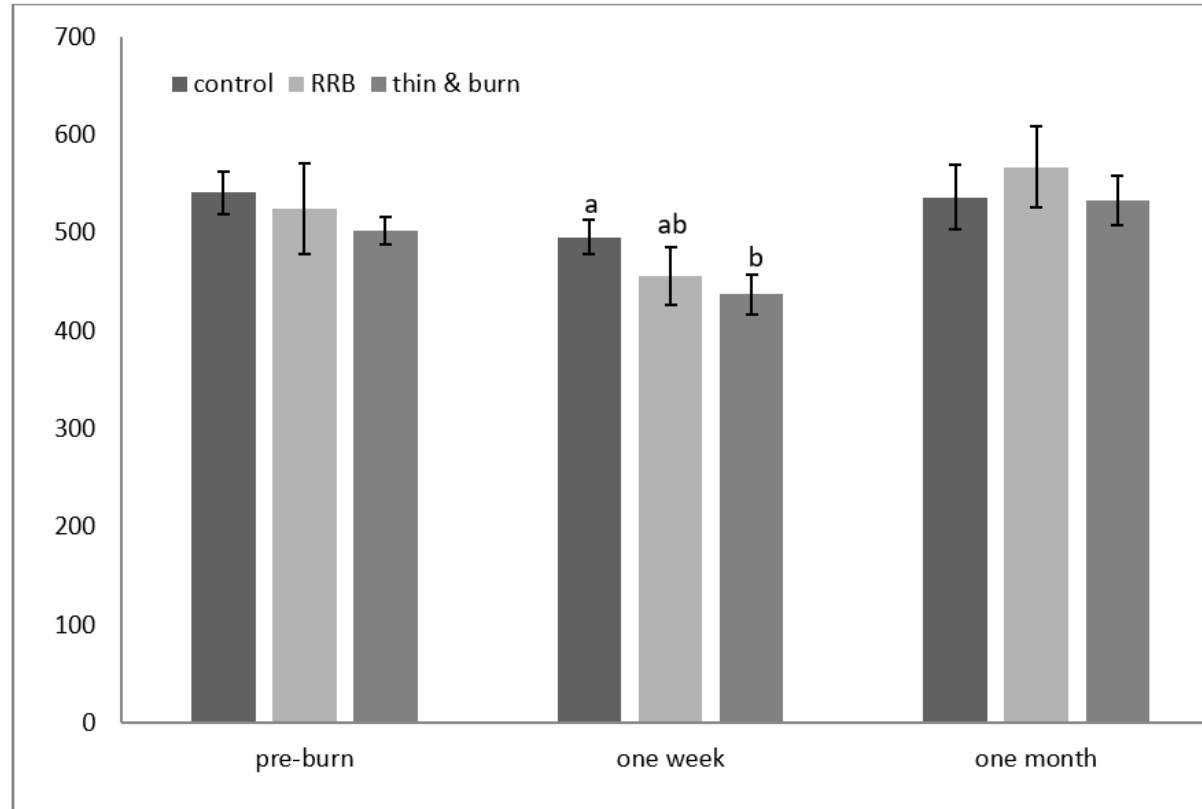


Fig. 5. Mean values of soil respiration, represented as CO₂ flux after a five-minute period. Means separation was based on rank-transformed data using Tukey's HSD test on the ranks. Those means with the same letters were not different between years ($P > 0.05$).

Understory herbaceous plants

133 Species -> 149 species

45 families

58,269 stems later...

Grasses

Rough Leaved Rice Grass

Oryzopsis asperifolia

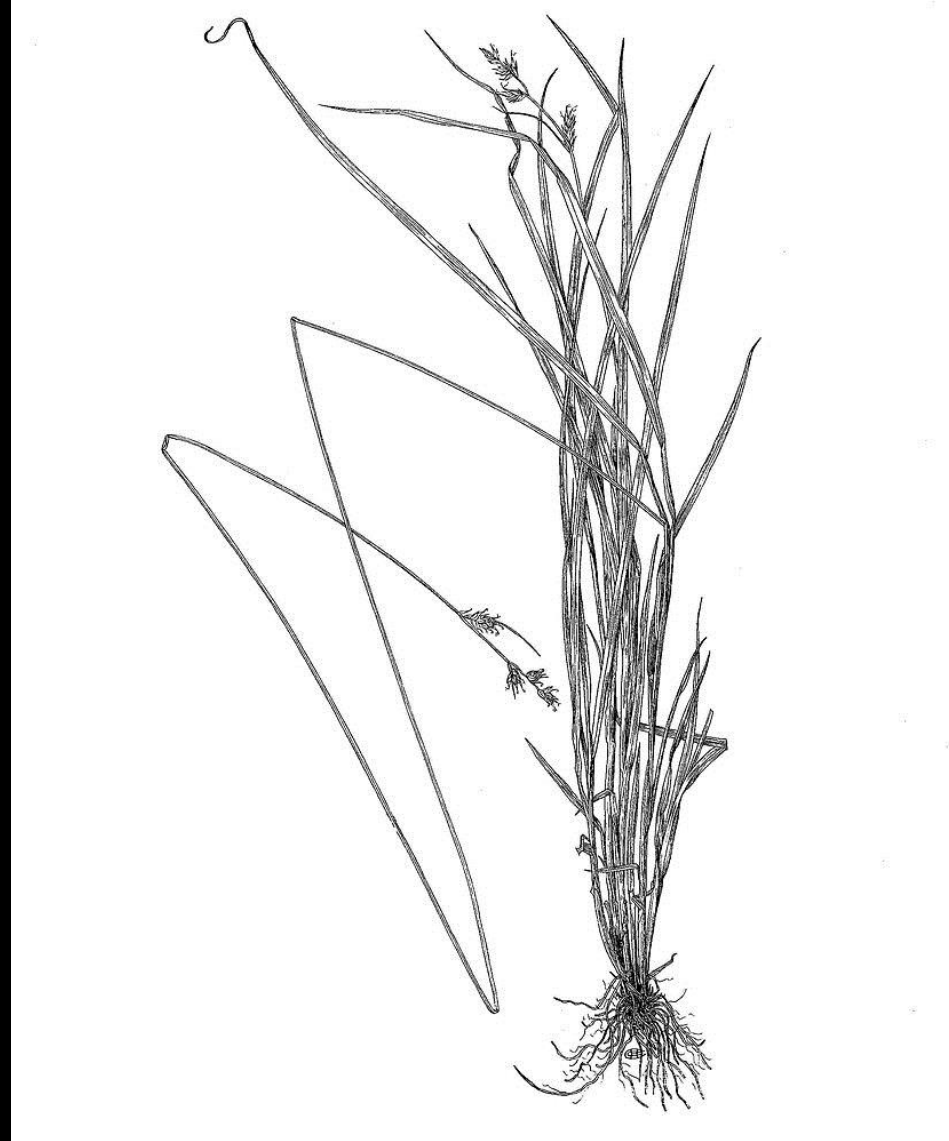


Sedges

Pennsylvania Sedge
Carex pennsylvanica



Dewey's Sedge
Carex deweyana



Forbs

Bunchberry
Cornus canadensis



Goldthread
Coptis trifolia

Canada
Mayflower
*Maianthemum
canadense*



Ferns

Bracken Fern
Pteridium aquilinum



Shrubs

Beaked Hazelnut
Corylus cornuta



Common Blackberry
Rubus alleghaniensis

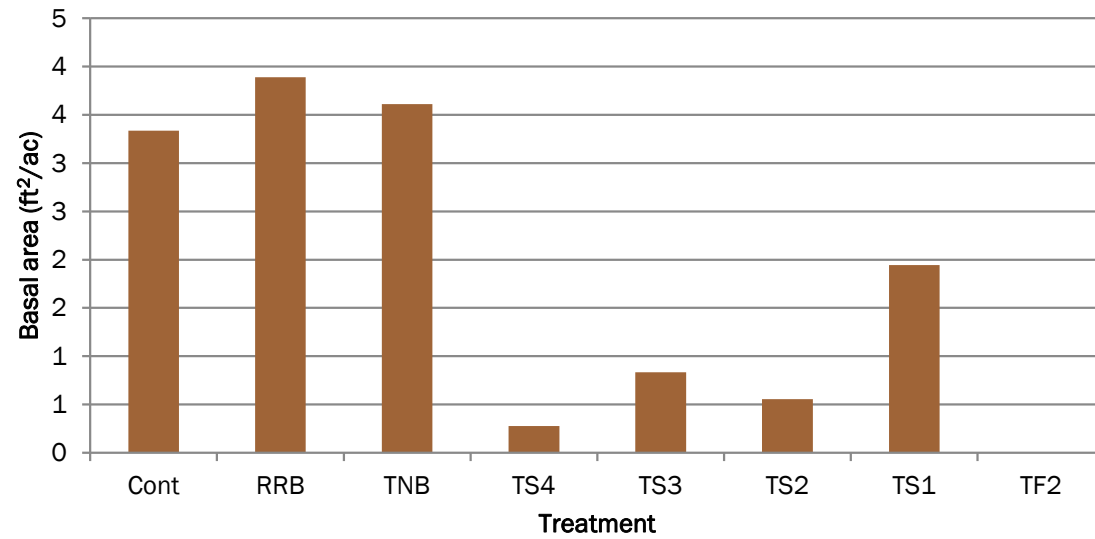


Red Raspberry
Rubus idaeus

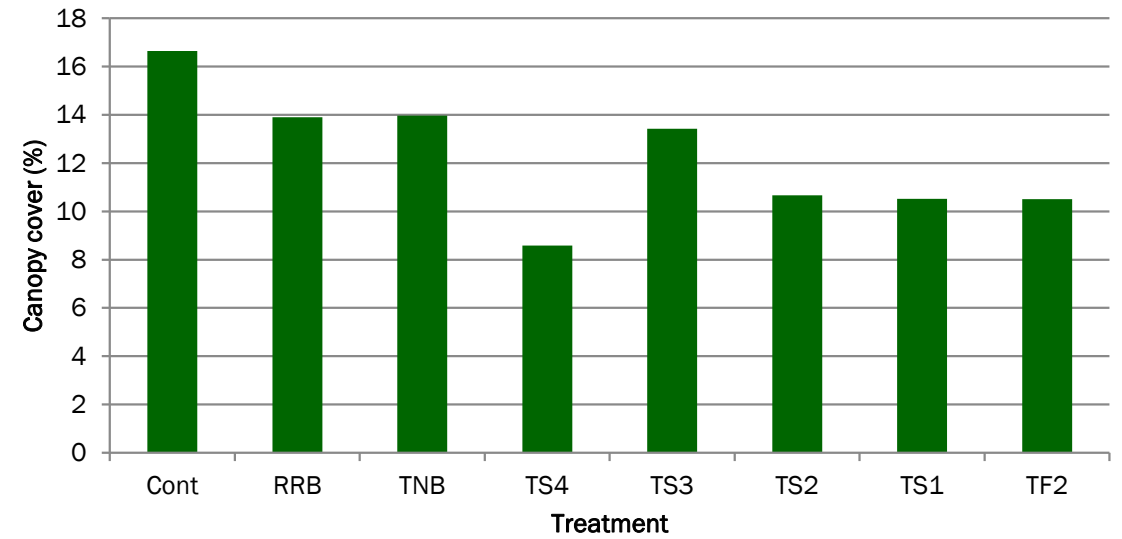




Snag Basal Area



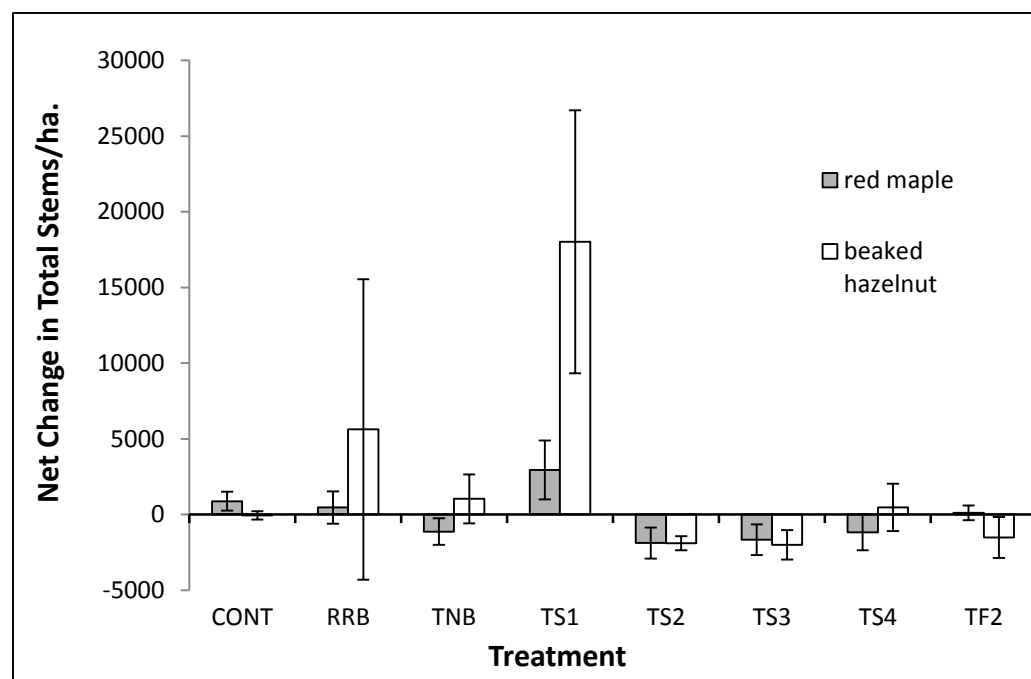
Canopy Cover



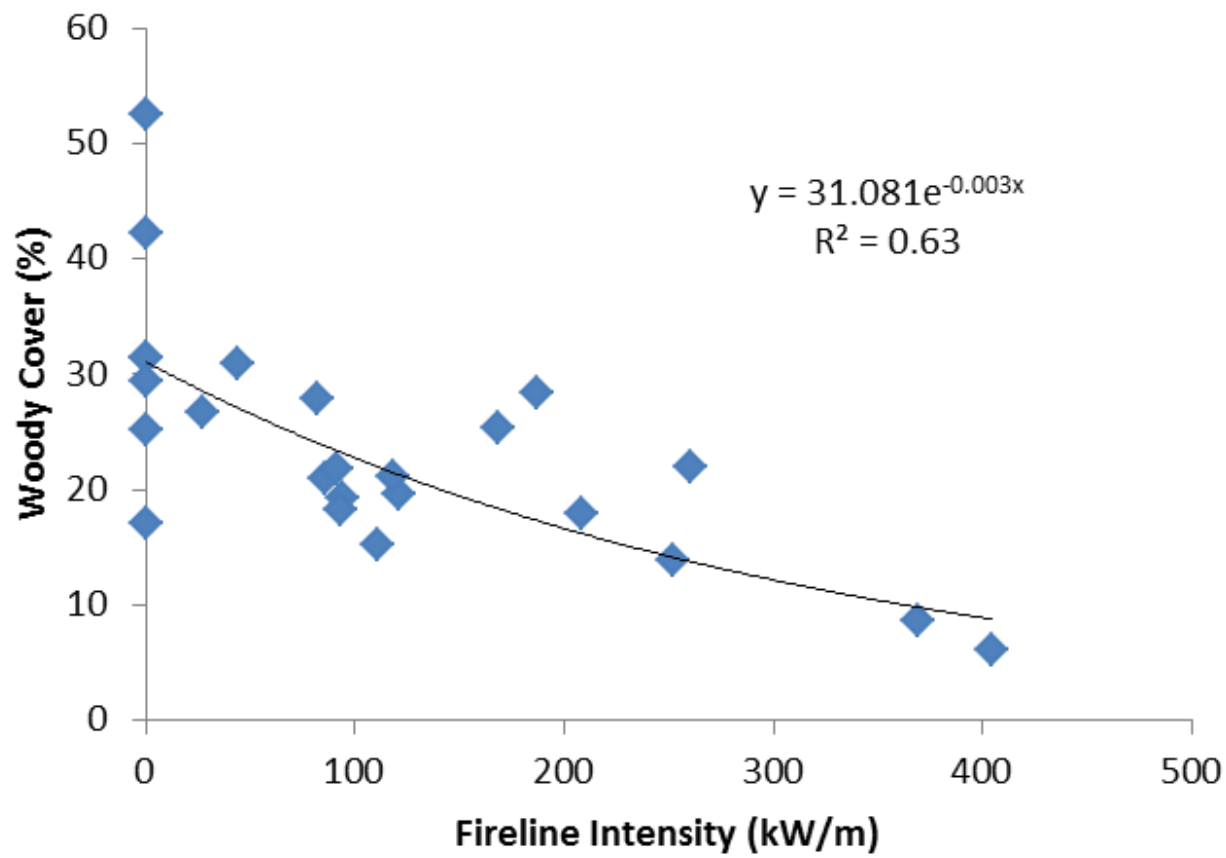
Woody Vegetation Stems/ha

∞ The largest net changes in stems/ha were observed of beaked hazelnut in:

- TS1 +18,011 ($\pm 8,689$)
- RRB +5,629 ($\pm 9,922$)



Woody cover



Focal Small Mammal Species



Myodes gapperi



Peromyscus leucopus



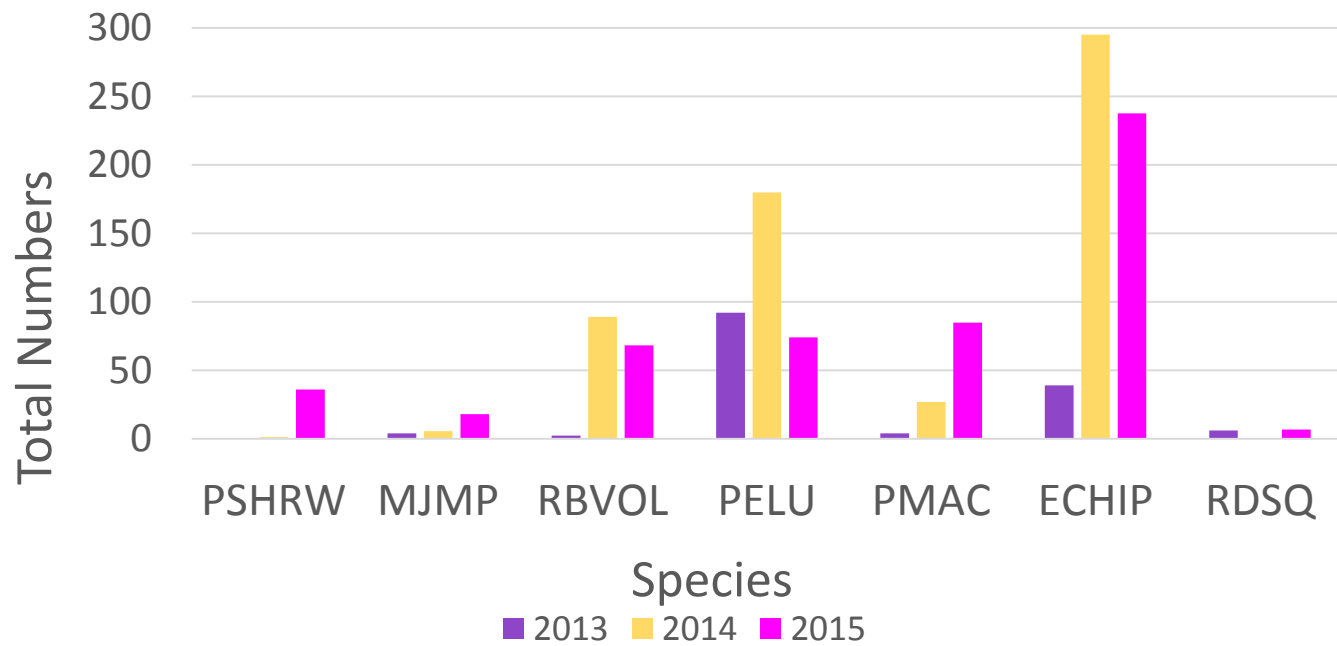
Tamiasciurus hudsonicus



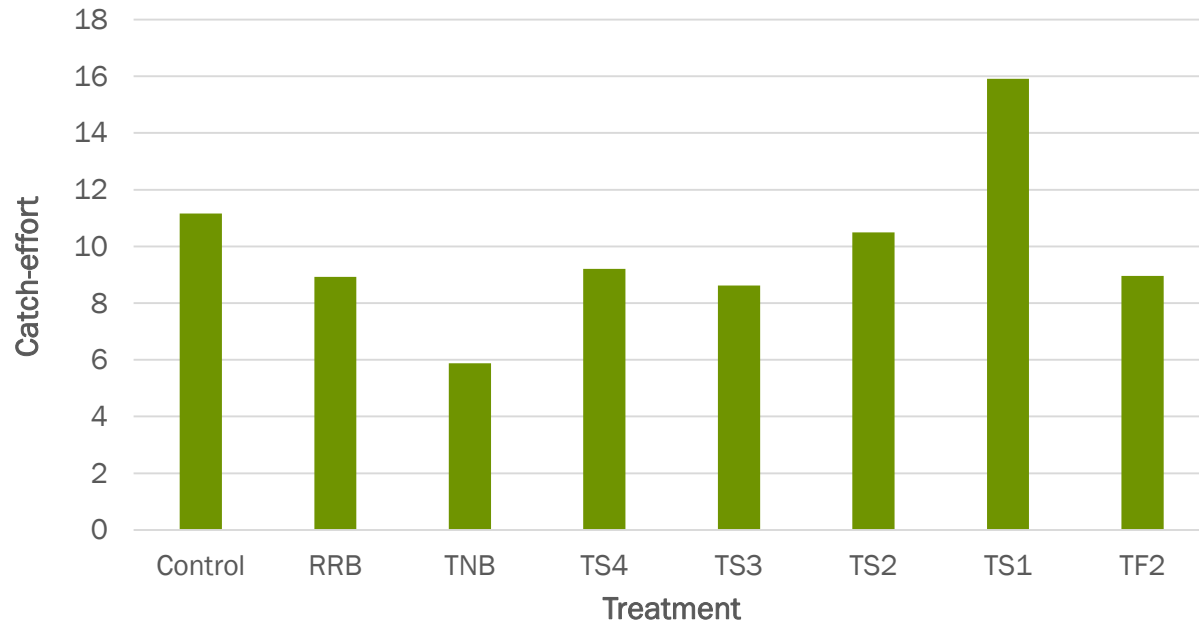
Tamias striatus



Total Captures — Small Mammals



Catch-effort — Eastern Chipmunk

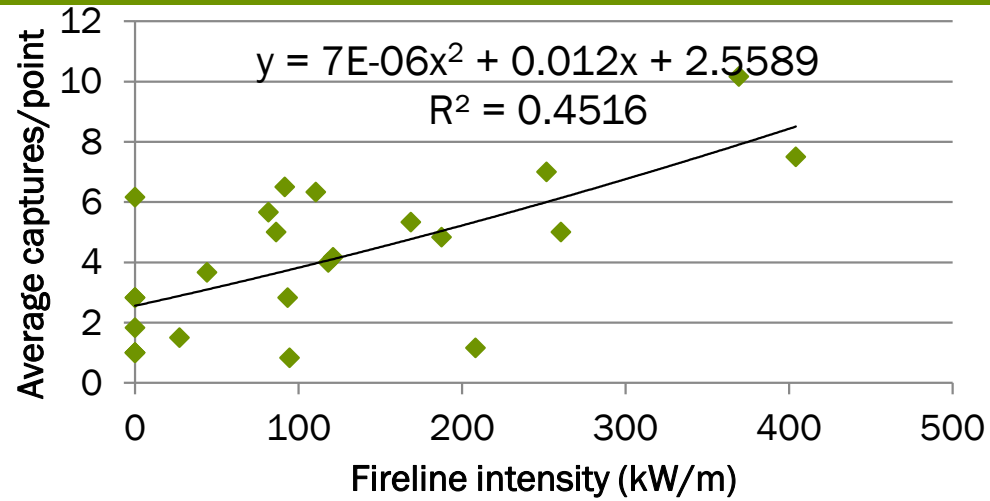


Results/ Implications

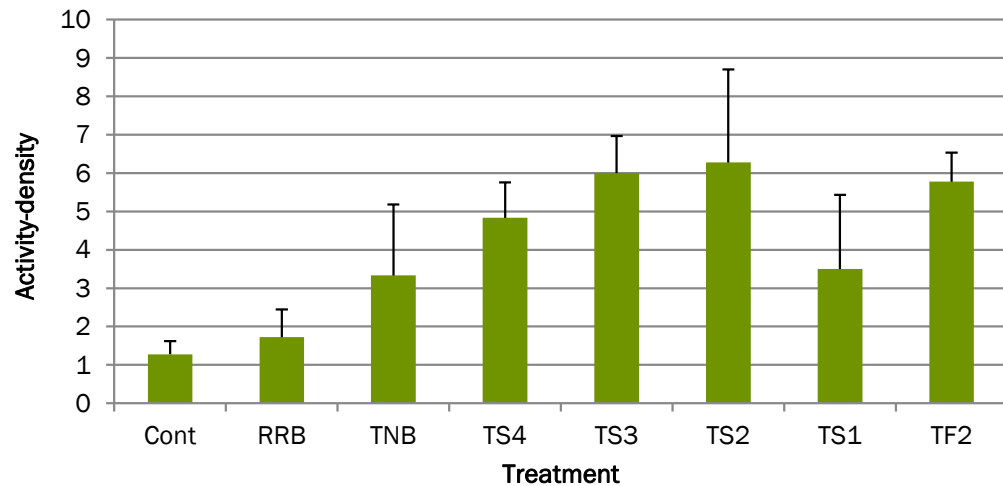
- Carabid species abundance highest in August, species richness highest in June
 - Carabid beetle mating season
- Timing of sampling



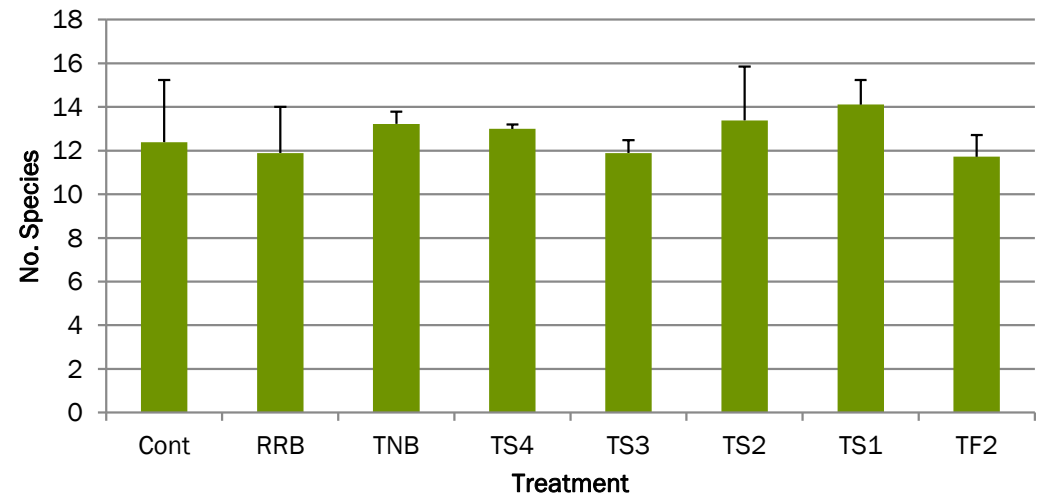
Carabid beetle response



August activity density



Beetle Richness



Acknowledgements

- ☞ USDA McIntire-Stennis program
- ☞ University of Wisconsin-Stevens Point, College of Natural Resources
- ☞ UWSP Fire Crew
- ☞ UWSP Treehaven – Summer Experience Students
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- ☞ Jesse Hodel
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- ☞ John Foshag
- ☞ Kyle Hackert
- ☞ Landin Brockman
- ☞ Lauren Steinhaugen
- ☞ Volunteers

