Lake States Fire Science Consortium

A JFSP KNOWLEDGE EXCHANGE CONSORTIUM

2016-2017 Webinar Series
November 17, 2016

Restoration of fire-dependent pine barren ecosystems in northern Wisconsin – Bridging the gap between research and management practices.

Brian Sturtevant, Christel Kern, and Deahn Donner
USDA Forest Service, Northern Research Station

Audio will start at top of the hour.
This webinar is listen only – to ask questions please use the chat box in lower right of screen.

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Restoration of fire-dependent pine barren ecosystems in northern Wisconsin – Bridging the gap between research and management practices.

Brian Sturtevant, Christel Kern, and Deahn Donner

USDA FS Northern Research Station

Internships

Goal (Intern 1, Sara Kelso):
Provide exposure to fire science, management and forest restoration in addition to seed banks, field and greenhouse techniques, and plant germination and identification of pine barren ecosystems.

Goal (Intern 2, Michael Dunn):
Provide hands-on experience in fire science, management, and barrens restoration with an emphasis on plant identification within "Reference Communities"

Approach:
As part of a larger team of technicians, the intern will also get exposure to standard forestry practices and FIREMON protocol

Northwest Sands and Northeast Sands Ecological Landscapes

- Both are extensive glacial outwash ecosystems

- Primarily excessively drained, sandy and sandy loam soils

- Average growing season length is 121 days (NE Sands) and 122 (NW Sands)
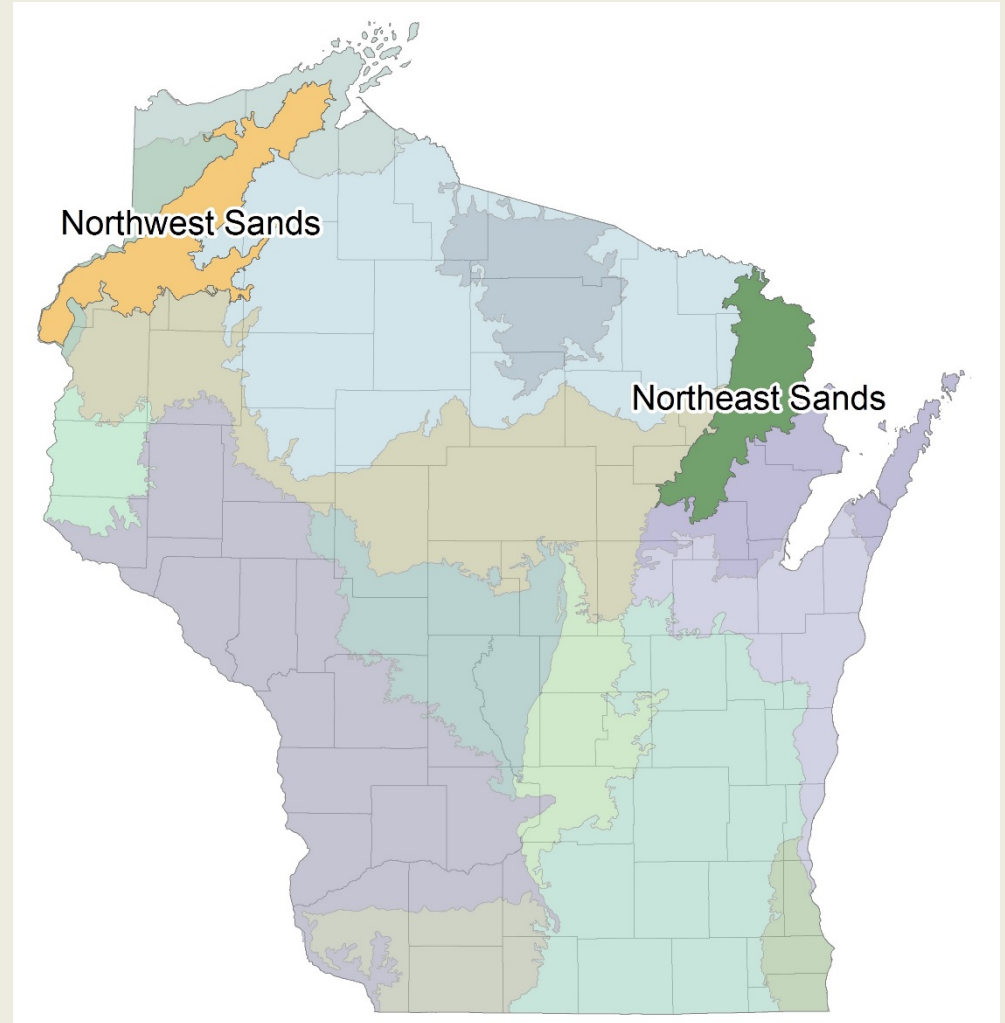
Source: Wisconsin Department of Natural Resources. 2015. *Ecological landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management*. Wisconsin Department of Natural Resources, PUB-SS-1131 2015, Madison.

Fire Dependent Pine Barren Ecosystems

Open temperate grassland systems have been greatly reduced and are considered globally threatened

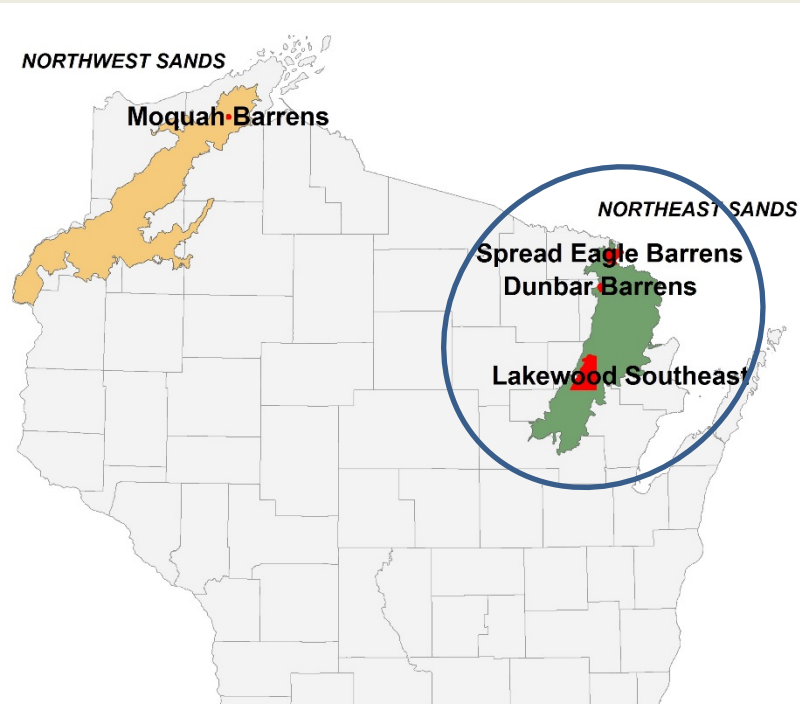Northeast Sands –
Spread Eagle Barrens, Florence Co.

Northwest Sands –
Moquah Barrens, Bayfield Co.

Major opportunity exists for restoring northern dry forest, pine barrens, and bracken grassland communities

1. Restoring Northern Dry Forests and Barren Communities

<1800 Presettlement

1890s – Big Pine

1930s – CCC forest restoration

Present – Heavily stocked

NORTHWEST SANDS

Moquah Barrens

NORTHEAST SANDS

Spread Eagle Barrens
Dunbar Barrens

Lakewood Southeast

Northern Research Station
Brian Sturtevant
Christel Kern
Deahn Donner

Lakewood-Laona Ranger District
John Lampereur, Scott Anderson, Jay Saunders, Scott Linn, Tym Sauter, Mark Gilley, Jeff Seefeldt

Photo credits: USDA Forest Service
Source: LKSE Forest Vegetation Resource Report (p 10-17; Appendix A, Fig.8, pg. 3 and Fig.16, pg. 6)

1. Restoring Northern Dry Forests and Barren Communities

Lakewood Southeast (LKSE) Project

105 Sampling Points Selected for Monitoring in 2014

○ Established (45 plots)
● Not Established (60 plots)
· Sampling Points in LTA3 (total of 1105 sampling points)
▭ Butler Plains Landtype Association (LTA03)
▭ LKSE Project Area Boundary

Planned Treatments
- No treatment
- Thin
- Shelterwood
- Clearcut
- Underburn only
- Thin with Underburn
- Special cut with Underburn
- Shelterwood with Underburn
- Clearcut with Underburn
- Selection
- Non-USFS Ownership

0   0.5   1   2 Miles

N

Variables measured:

- Mature tree
- Herbaceous vegetation
- Regeneration
- Shrub
- Fuel load
- Butterflies
- **Seed Bank (New in 2016)**

Update:
- All 105 sampling points established with pretreatment data collected.
- Harvest treatments have started, but burn treatments will begin in 2017

Seedbank sampling

Reference Communities

NORTHWEST SANDS

Moquah Barrens

NORTHEAST SANDS

Spread Eagle Barrens
Dunbar Barrens

Lakewood Southeast
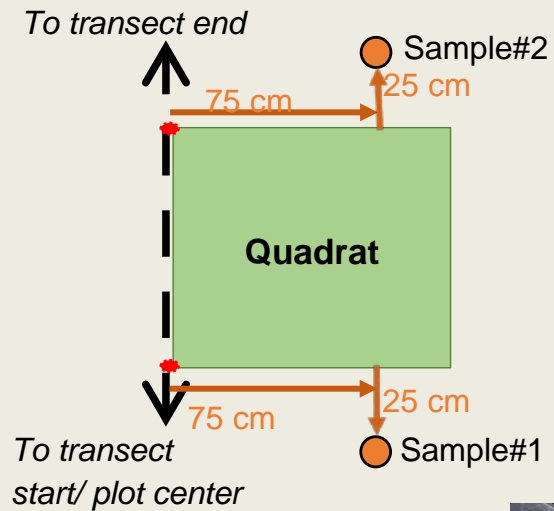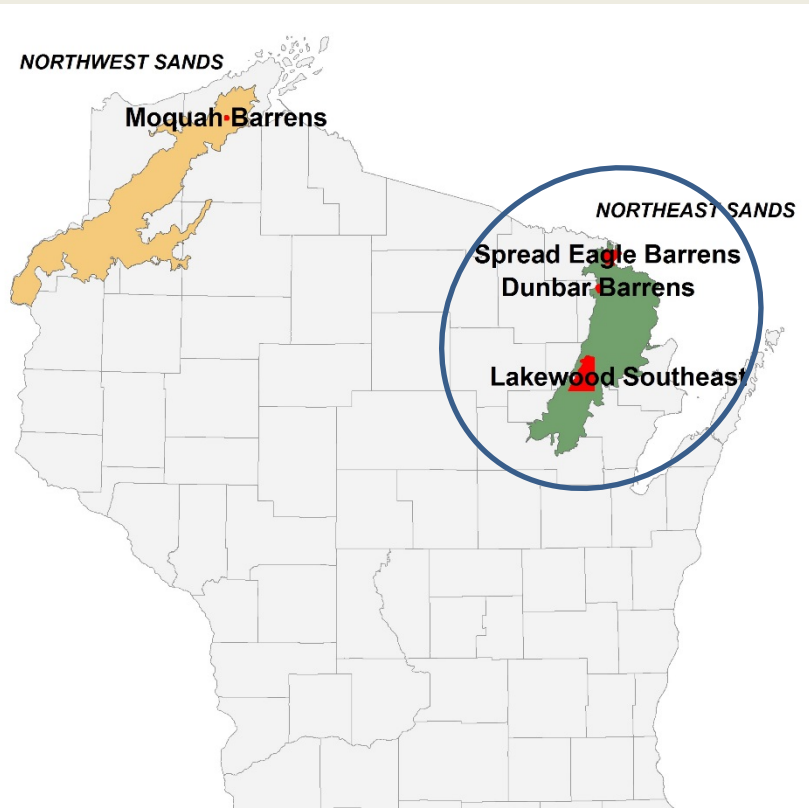
Carly Lapin, Thomas Meyer, Jason Cotter (WI DNR)

Credit: Thomas A. Meyer

Spread Eagle Barrens

Credit: E. Epstein

Dunbar Barrens

Photo credit: USDA Forest Service, LKSE Vegetation Resource Report

Existing Condition

Desired Future Condition

Lakewood Southeast

Methodology

FIREMON: Fire Effects Monitoring and Inventory System

Measuring fuels and shrub belt at Spread Eagle Barrens State Natural Area using FIREMON

Butterfly sampling – Open Pan

2. Manipulating soil heating patterns to optimize barrens restoration (JFSP)

Moquah Barrens

Sharp-tailed Grouse

NORTHWEST SANDS

Moquah Barrens

NORTHEAST SANDS

Spread Eagle Barrens
Dunbar Barrens

Lakewood Southeast
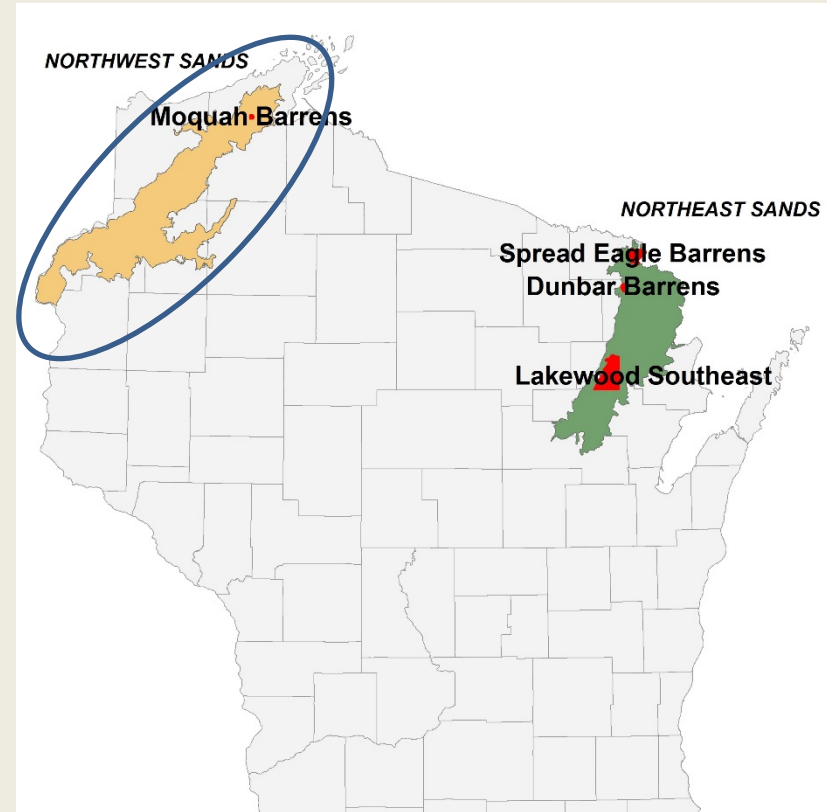
Northern Research Station
Brian Sturtevant, Christel Kern,
Randy Kolka, Matt Dickinson,
Deahn Donner
Jessica Miesel: Michigan State

Washburn Ranger District
Matt Bushman, Jen Rabuck,
Vance Hazelton, Dan Hinson,
Brian Heeringa, Michelle Davalos

Research Questions
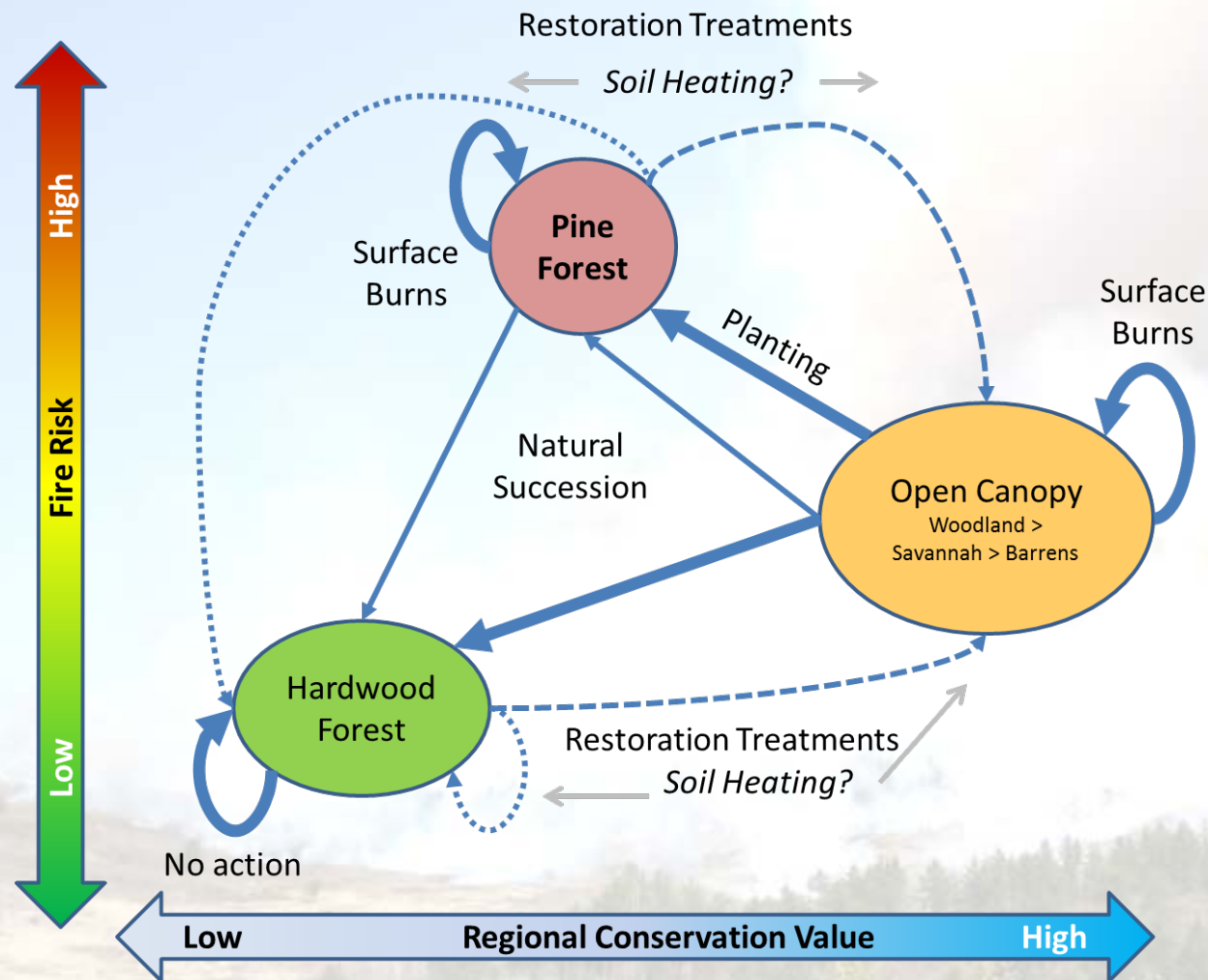
Objectives:
1. **Field Validation**
   - Campbell soil heating model
2. **Effect of soil heating on:**
   - hardwood regeneration
   - seed bank
   - soil fertility
   - vegetation

Moquah Barrens Restoration Area

Study Design
Sample Size x 2 Years

	Woodland	**Current State** **Brush**	**Grassland**
Historic State (Circa 1951)			
Pine	*4 + 4 (A)*	*4 + 4 (B) + 4 (B&R)*	*4 + 4 (A)*
Deciduous	*4*	*4 + 4 (B) + 4 (B&R)*	*4 + 4 (A)*
Grassland			*4*

Fuel treatment: A = addition, R = removal, B = Brushcut.

Pairing:
For fuel manipulation treatments, we have paired sites such that each manipulation plot has a paired plot with similar characteristics - typically within the same stand

Burning Block (2 per year)
To the extent possible – evenly distribute treatments across burn blocks

Year of Burn
2016 and 2017 – both in mid-late May

Pine Woodland
(Recent Treatments)

Savanna/Grassland

Pine Woodland
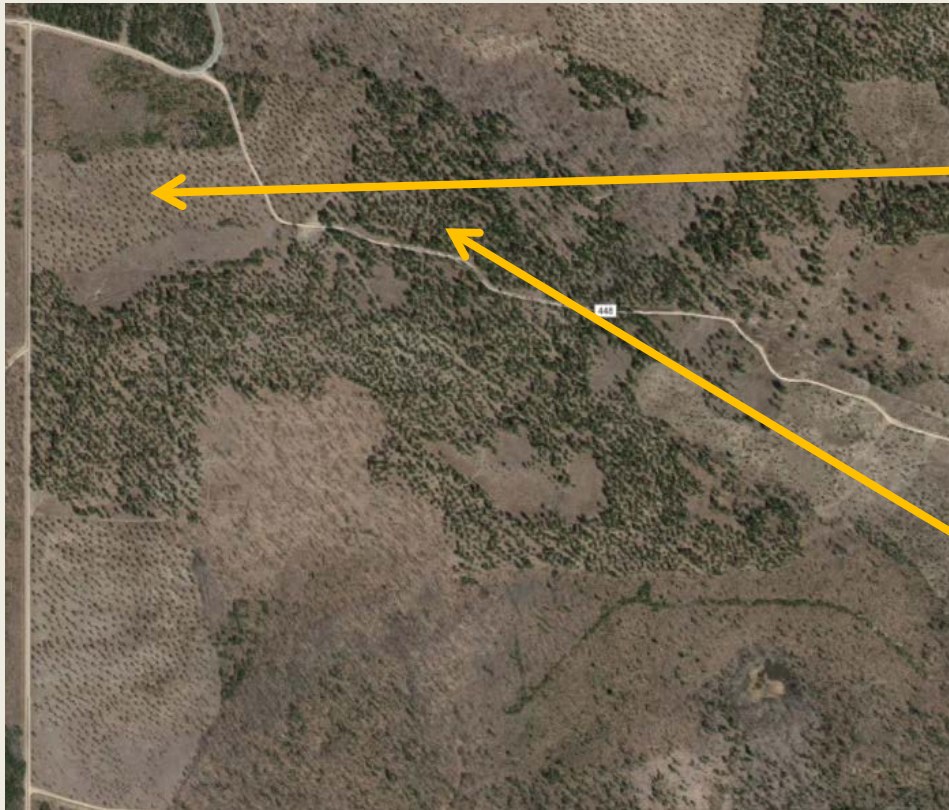
Brush Cut Treatment

Venn diagram of fire and soil heating instrumentation

Type 2 plots
- Radiometer & video camera
- T-posts, towers, & standards
- Two clusters of a thick and thin thermocouple probe (TCP)
  - One at central burn severity subplot
  - One at peripheral burn severity subplot

Type 3 plots
- All that's in Type 2
- Heat flux setup at central burn severity subplot
  - Robichaud T profiler
  - Massman heat flux plates

Type 1
No instrumentation
Plots to be burned each year
N = 56

Type 2
Radiometers, video, and TCP's N = 20-30 plots per year

Type 3
Heat flux setup and precipitation exclusion
N = 10 plots per year

Type 1 plot

Burn Severity Macroplot
20 m radius

Ground Veg Quadrats
1 x 1 m @5 m of transect

Tree Macroplot
16.1 m radius

Seed Bank &Veg
Quadrats (1x1m)
3.5 m from center
@ 30°
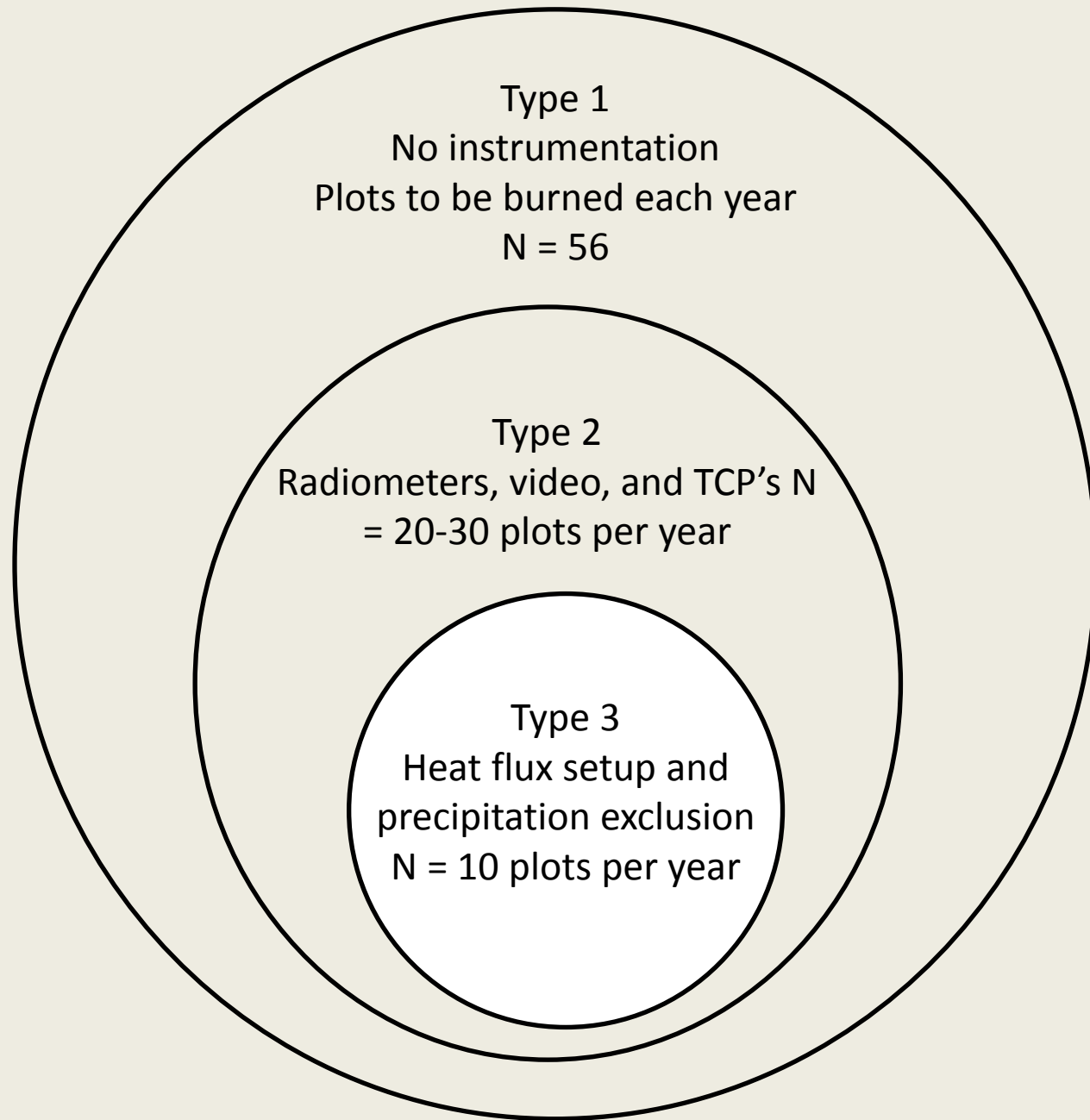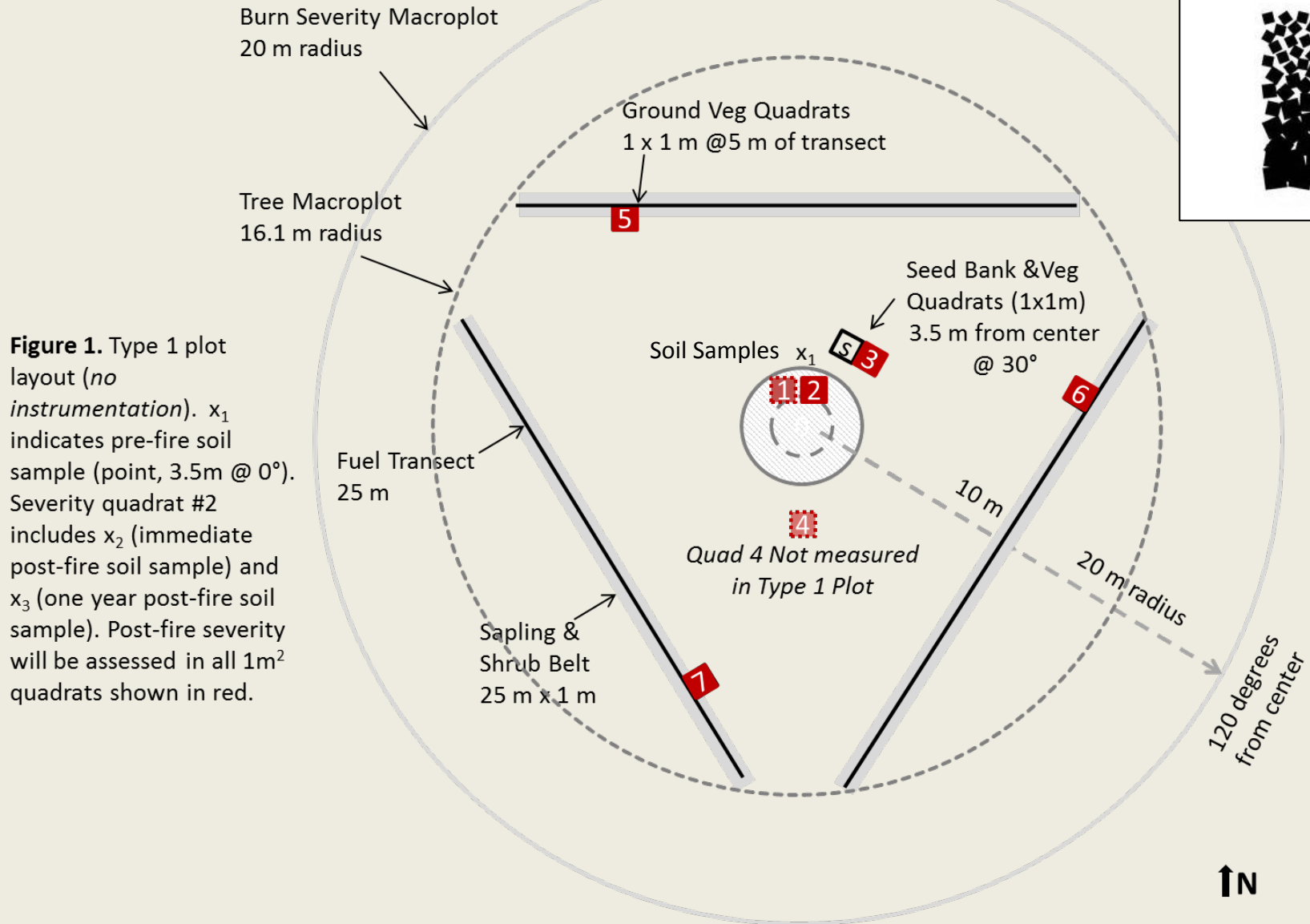
Soil Samples x_1

Figure 1. Type 1 plot layout (*no instrumentation*). x_1 indicates pre-fire soil sample (point, 3.5m @ 0°). Severity quadrat #2 includes x_2 (immediate post-fire soil sample) and x_3 (one year post-fire soil sample). Post-fire severity will be assessed in all 1m^2 quadrats shown in red.

Fuel Transect
25 m

10 m

20 m radius

Quad 4 Not measured in Type 1 Plot

Sapling & Shrub Belt
25 m x 1 m

120 degrees from center

N

S 3

1 2

4

5

6

7

Preliminary Findings
- strong range in surface fire intensities
- soil heating was generally low – most below 60°C
- implications for season of burn

Moquah Research Natural Area *Established 1935*
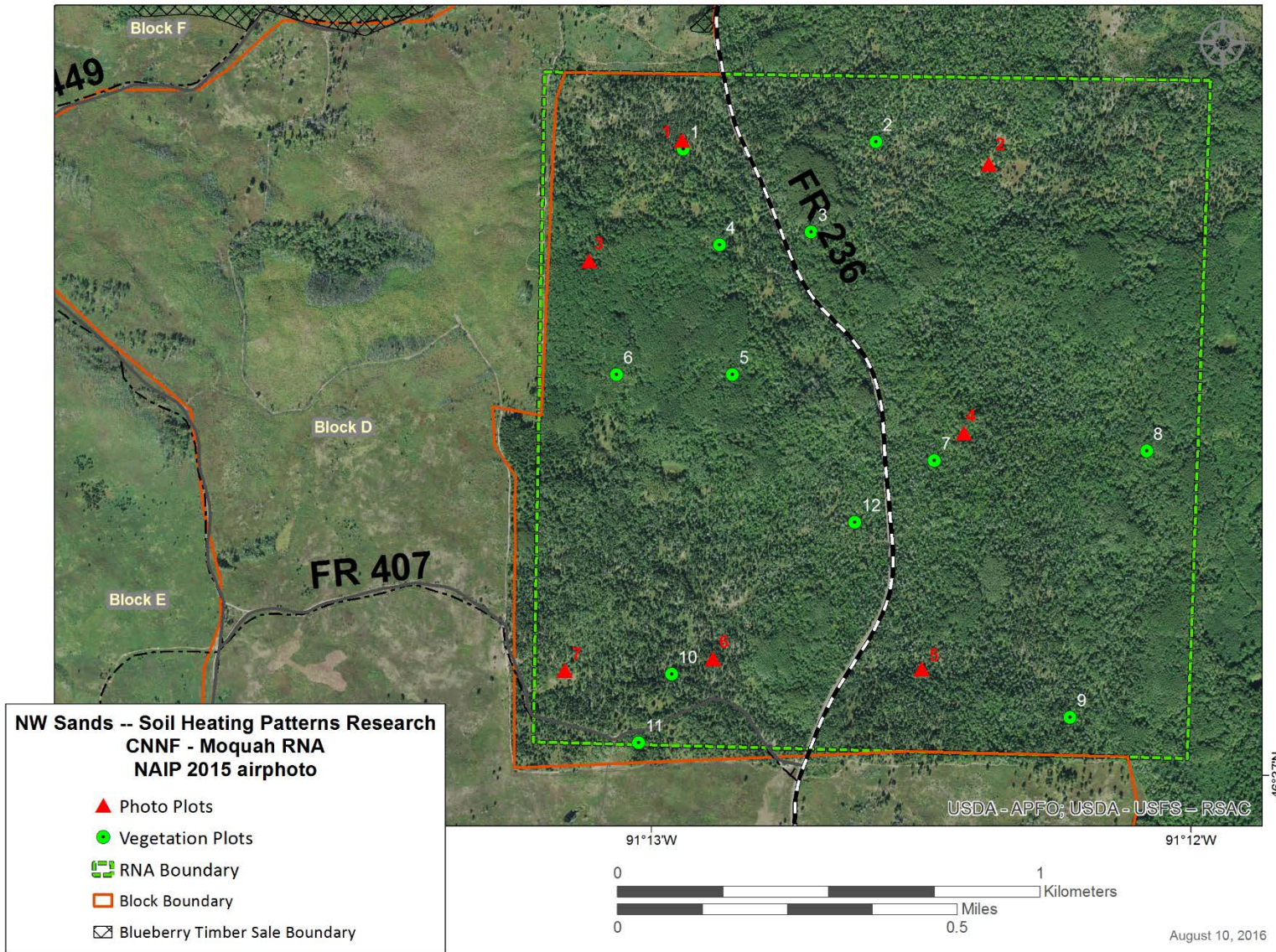
Establishment Question:
What will naturally take place under fire protection only?

We remeasured plots established by Dunn and Stearns (1980)

Current Question
To what extent can the RNA serve for "reference" conditions?

Legend:
- ▲ Photo Plots
- ● Vegetation Plots
- RNA Boundary
- Block Boundary
- Blueberry Timber Sale Boundary

NW Sands -- Soil Heating Patterns Research
CNNF - Moquah RNA
NAIP 2015 airphoto

Ribic, Christine A.; Rugg, David J.; Donner, Deahn M.; Beck, Albert J.; Byers, BJ., Jr. 2016. The Moquah Barrens Research Natural Area: Loss of a pine barrens ecosystem. Gen. Tech. Rep. NRS-161. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 25 p.

Important Aspects of Internship

- Heightened plant ID skills and introduction to new field techniques

- Opportunity to practice and sharpen field skills

- Experience with FIREMON protocol

- Opportunity to be able to work with a variety of people on several different projects

- Enhanced communication skills

"This experience allowed me to not only practice utilizing my field skills, but enabled me to strengthen them by sharing my knowledge with others that I worked with who came from different backgrounds and different experience levels."
– Sara Kelso

"My favorite part of the internship was collecting data on woodland vegetation in the Research Natural Area…. Knowing what commonly occurred in the barrens allowed us to see the difference in species composition between the two sites.
– Michael Dunn

Why was this experience valuable?

"*This experience will be one that I look back on and draw from in the years to come as I prepare myself for a career in natural resources research.*" – Sara Kelso

Sara Kelso working in the greenhouse

Why was this experience valuable?

Michael Dunn (far right) with field Crew at Moquah site

"*I learned that a surprisingly complex protocol for data collection can become second nature within a week...I had never done fuel measurements or collected duff, litter, and mineral soil....I also never used USDA plant codes, and now I think of them every time I see certain species.*" – Michael Dunn

Land Management Partners

Northwest Sands (Moquah) – Matt Bushman, Jen Rabuck, Vance Hazelton, Dan Hinson, Brian Heeringa, Michelle Davalos (Washburn Ranger District)
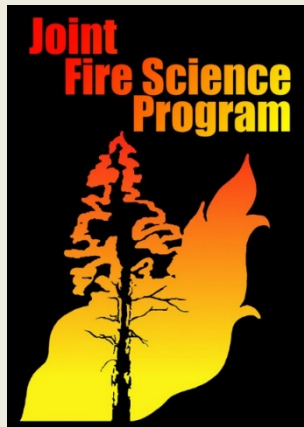
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Northeast Sands (Dunbar Barrens and Spread Eagle Barrens) – Carly Lapin, Thomas Meyer, Jason Cotter (WI DNR)

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Thank you!

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Field Support: To numerous to list!!

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2016-2017 Webinar Series
December 15, 2016

Reconstructing Historical Fire Regimes and Forest Structure in Wisconsin's Red Pine Dominated Forests

Jed Meunier

Wisconsin Department of Natural Resources

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