

# Lake States Fire Science Consortium

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## 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”

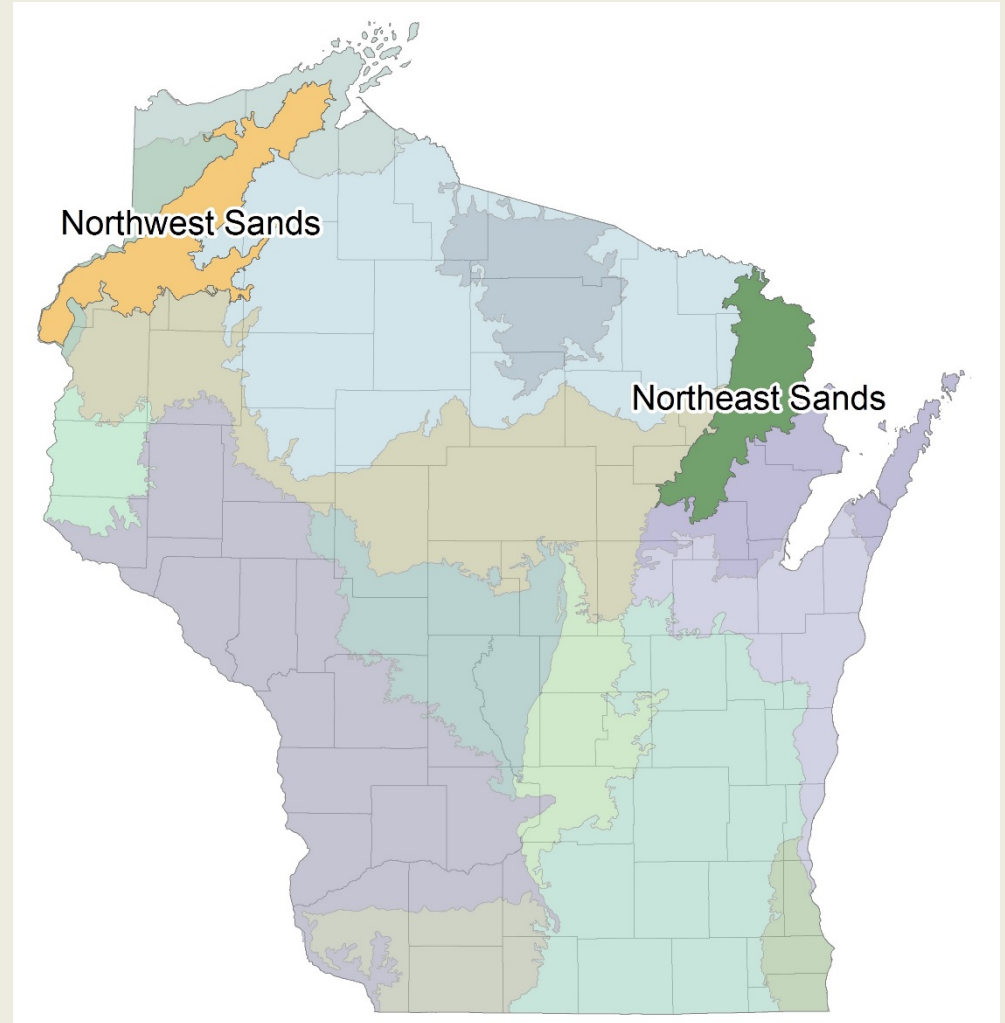
## **Approach:**

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.



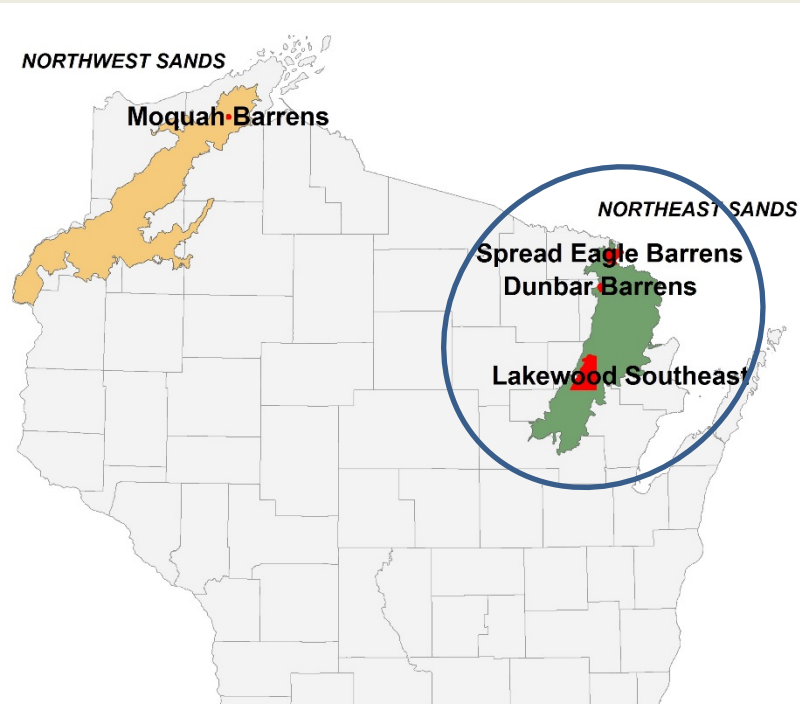
Northwest Sands –  
Moquah Barrens, Bayfield Co.

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



## **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

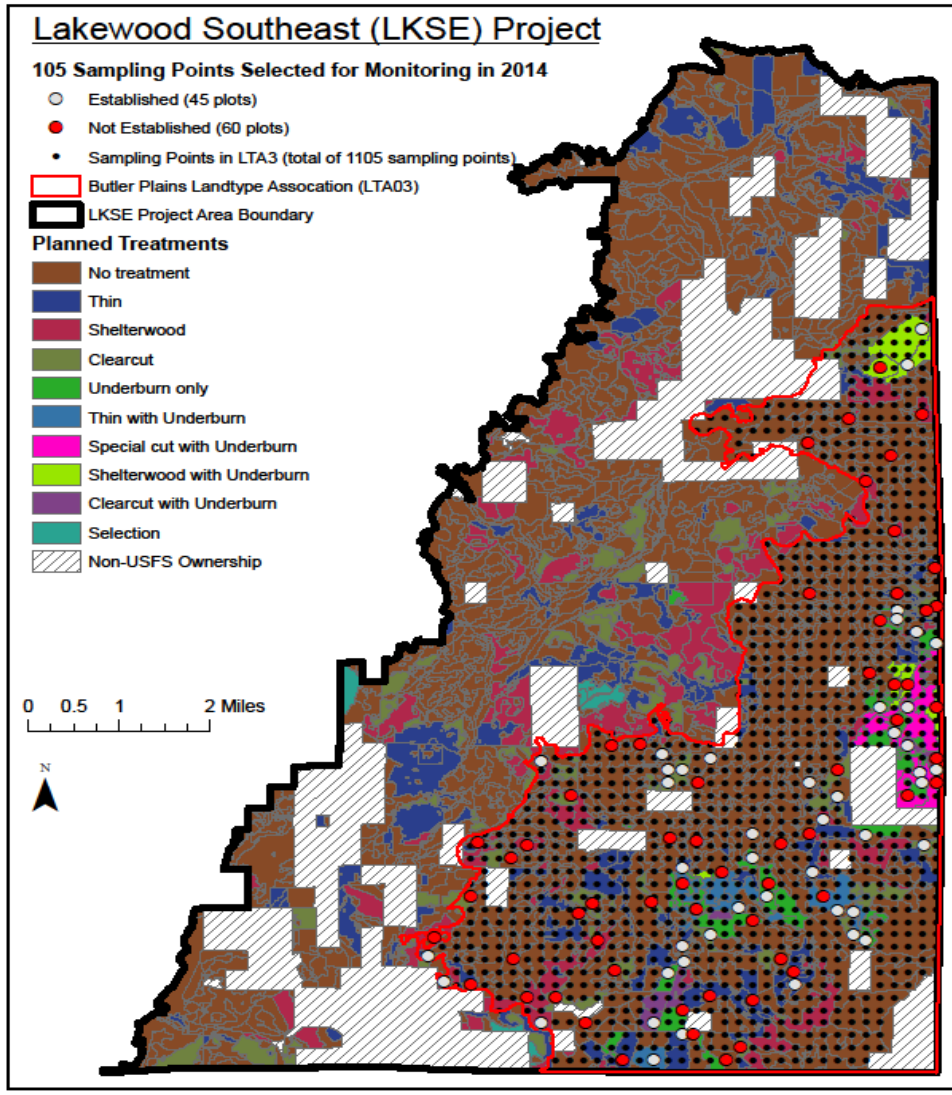
Present – Heavily  
stocked



*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



## Variables measured:

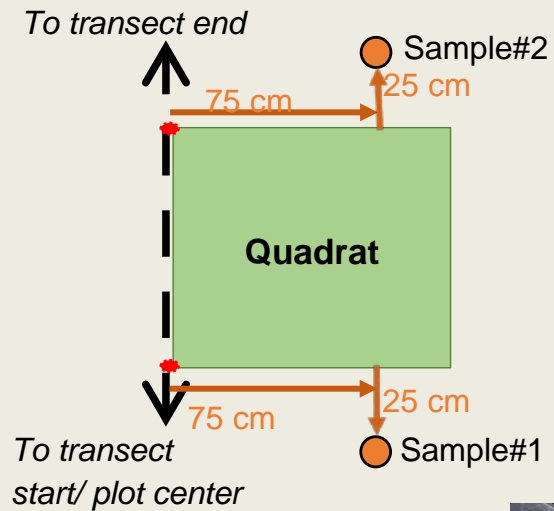
- Mature tree
- Herbaceous vegetation
- Regeneration
- Shrub
- Fuel load
- Butterflies
- Seed Bank (**New in 2016**)

## Update:

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

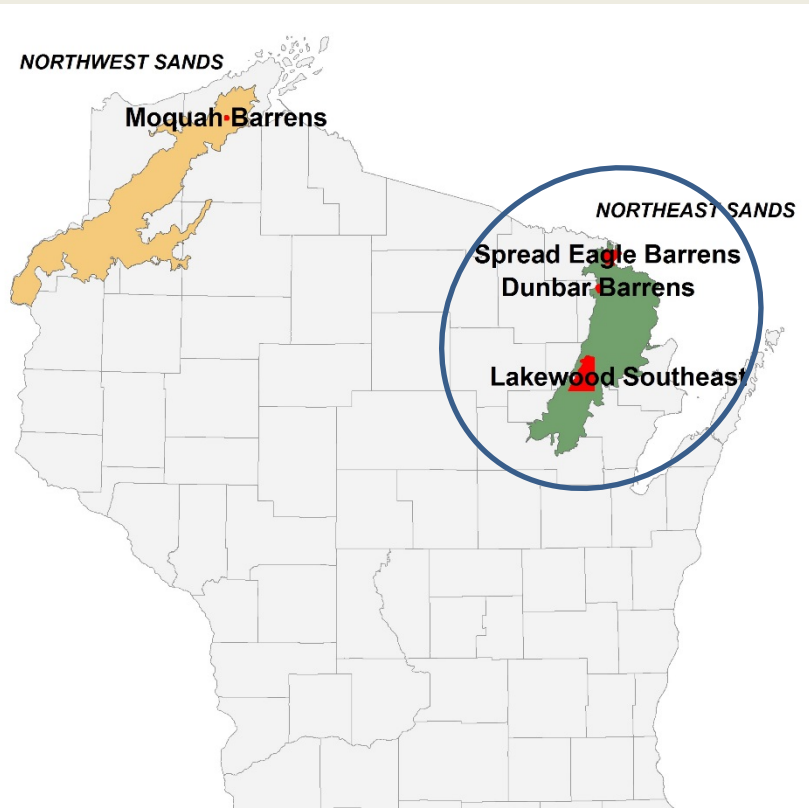


# Seedbank sampling





# Reference Communities



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



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



Butterfly sampling – Open Pan





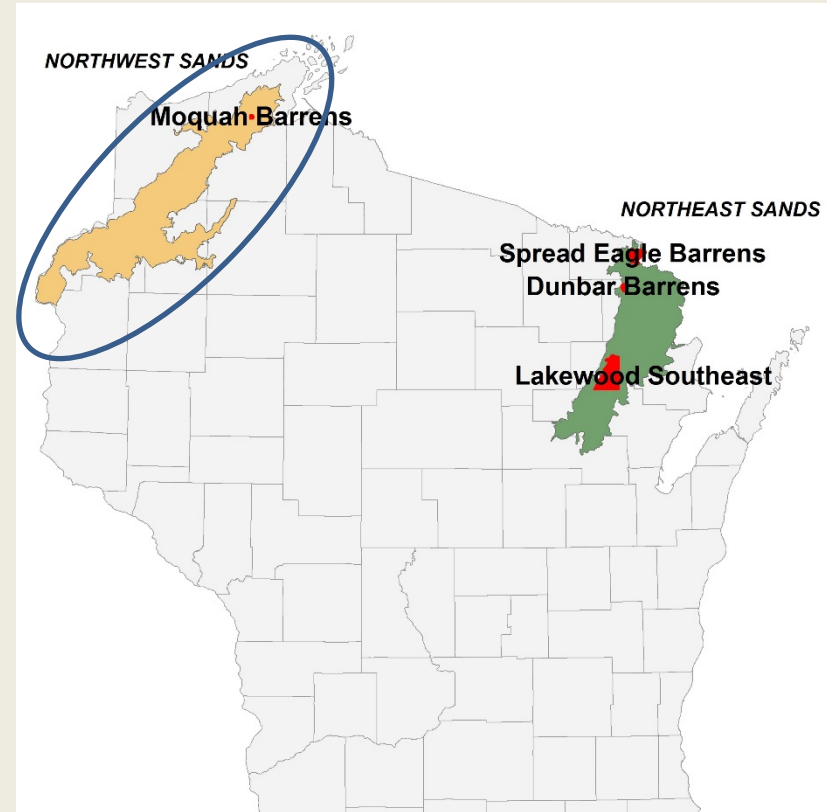
## 2. Manipulating soil heating patterns to optimize barrens restoration (JFSP)



Moquah Barrens



Sharp-tailed Grouse



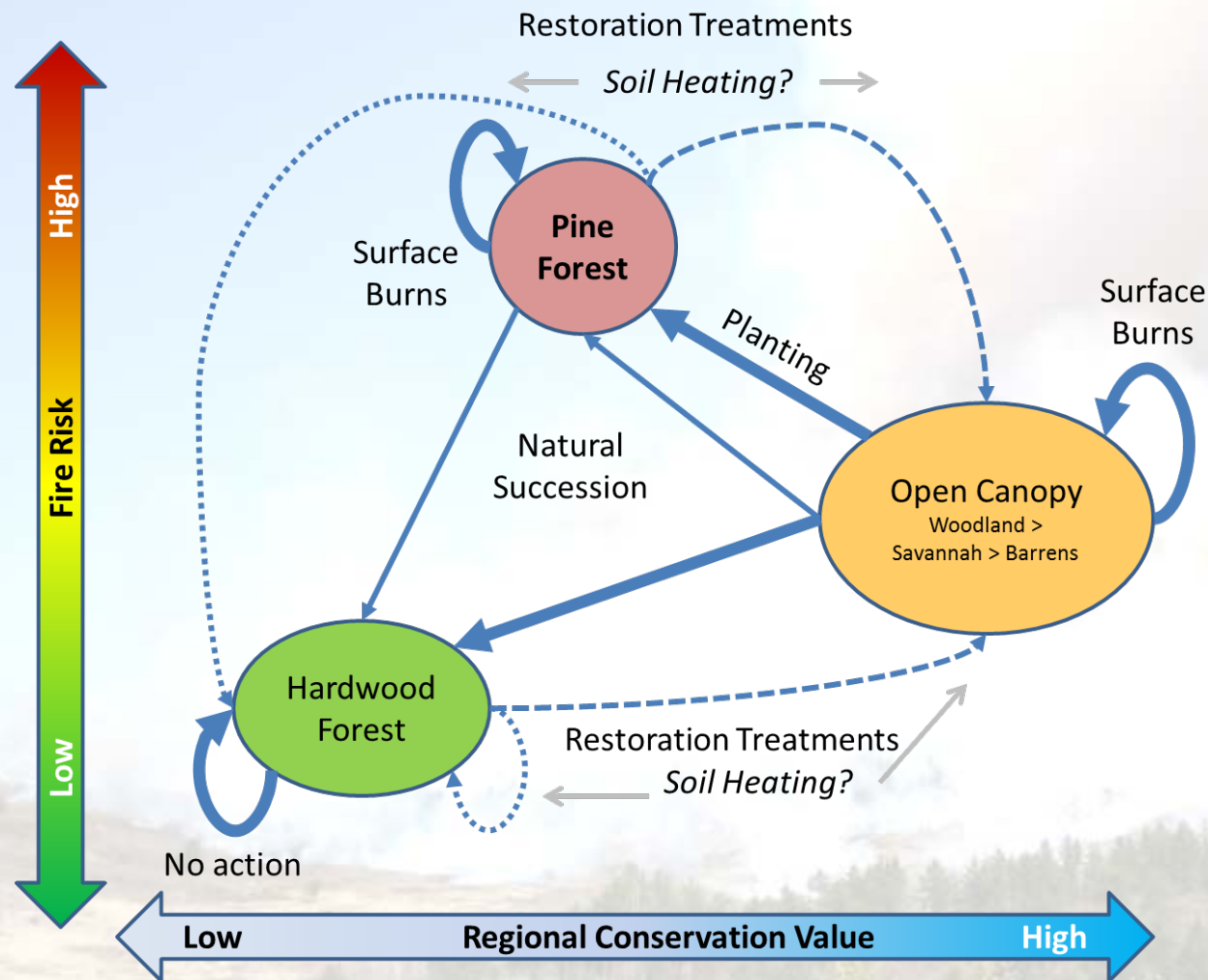
### ***Northern Research Station***

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

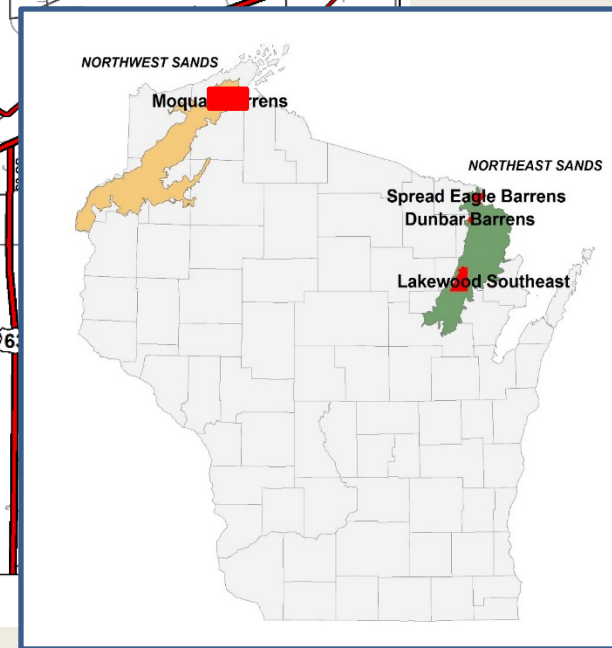
### ***2. Effect of soil heating on:***

- hardwood regeneration
- seed bank
- soil fertility
- vegetation



The map displays the Delta Lodge area, which is a collection of land parcels outlined in green. The parcels are labeled with codes such as FR 240, FR 248, FR 421, FR 691, FR 427, FR 429, FR 690, FR 435, FR 687, FR 425, FR 431, FR 50532, FR 500, FR 426, FR 431, FR 50532, FR 500, FR 245, FR 415, FR 239, FR 431B, FR 238, FR 405, FR 237, FR 419, FR 420, FR 417, FR 242, FR 241, FR 240, FR 418, FR 419, FR 420, FR 421, FR 422, FR 423, FR 424, FR 425, FR 426, FR 427, FR 428, FR 429, FR 430, FR 431, FR 432, FR 433, FR 434, FR 435, FR 436, FR 437, FR 438, FR 439, FR 440, FR 441, FR 442, FR 443, FR 444, FR 445, FR 446, FR 447, FR 448, FR 449, FR 450, FR 451, FR 452, FR 453, FR 454, FR 455, FR 456, FR 457, FR 458, FR 459, FR 460, FR 461, FR 462, FR 463, FR 464, FR 465, FR 466, FR 467, FR 468, FR 469, FR 470, FR 471, FR 472, FR 473, FR 474, FR 475, FR 476, FR 477, FR 478, FR 479, FR 480, FR 481, FR 482, FR 483, FR 484, FR 485, FR 486, FR 487, FR 488, FR 489, FR 490, FR 491, FR 492, FR 493, FR 494, FR 495, FR 496, FR 497, FR 498, FR 499, FR 500, FR 501, FR 502, FR 503, FR 504, FR 505, FR 506, FR 507, FR 508, FR 509, FR 510, FR 511, FR 512, FR 513, FR 514, FR 515, FR 516, FR 517, FR 518, FR 519, FR 520, FR 521, FR 522, FR 523, FR 524, FR 525, FR 526, FR 527, FR 528, FR 529, FR 530, FR 531, FR 532, FR 533, FR 534, FR 535, FR 536, FR 537, FR 538, FR 539, FR 540, FR 541, FR 542, FR 543, FR 544, FR 545, FR 546, FR 547, FR 548, FR 549, FR 550, FR 551, FR 552, FR 553, FR 554, FR 555, FR 556, FR 557, FR 558, FR 559, FR 560, FR 561, FR 562, FR 563, FR 564, FR 565, FR 566, FR 567, FR 568, FR 569, FR 570, FR 571, FR 572, FR 573, FR 574, FR 575, FR 576, FR 577, FR 578, FR 579, FR 580, FR 581, FR 582, FR 583, FR 584, FR 585, FR 586, FR 587, FR 588, FR 589, FR 590, FR 591, FR 592, FR 593, FR 594, FR 595, FR 596, FR 597, FR 598, FR 599, FR 600, FR 601, FR 602, FR 603, FR 604, FR 605, FR 606, FR 607, FR 608, FR 609, FR 610, FR 611, FR 612, FR 613, FR 614, FR 615, FR 616, FR 617, FR 618, FR 619, FR 620, FR 621, FR 622, FR 623, FR 624, FR 625, FR 626, FR 627, FR 628, FR 629, FR 630, FR 631, FR 632, FR 633, FR 634, FR 635, FR 636, FR 637, FR 638, FR 639, FR 640, FR 641, FR 642, FR 643, FR 644, FR 645, FR 646, FR 647, FR 648, FR 649, FR 650, FR 651, FR 652, FR 653, FR 654, FR 655, FR 656, FR 657, FR 658, FR 659, FR 660, FR 661, FR 662, FR 663, FR 664, FR 665, FR 666, FR 667, FR 668, FR 669, FR 670, FR 671, FR 672, FR 673, FR 674, FR 675, FR 676, FR 677, FR 678, FR 679, FR 680, FR 681, FR 682, FR 683, FR 684, FR 685, FR 686, FR 687, FR 688, FR 689, FR 690, FR 691, FR 692, FR 693, FR 694, FR 695, FR 696, FR 697, FR 698, FR 699, FR 700, FR 701, FR 702, FR 703, FR 704, FR 705, FR 706, FR 707, FR 708, FR 709, FR 710, FR 711, FR 712, FR 713, FR 714, FR 715, FR 716, FR 717, FR 718, FR 719, FR 720, FR 721, FR 722, FR 723, FR 724, FR 725, FR 726, FR 727, FR 728, FR 729, FR 730, FR 731, FR 732, FR 733, FR 734, FR 735, FR 736, FR 737, FR 738, FR 739, FR 740, FR 741, FR 742, FR 743, FR 744, FR 745, FR 746, FR 747, FR 748, FR 749, FR 750, FR 751, FR 752, FR 753, FR 754, FR 755, FR 756, FR 757, FR 758, FR 759, FR 760, FR 761, FR 762, FR 763, FR 764, FR 765, FR 766, FR 767, FR 768, FR 769, FR 770, FR 771, FR 772, FR 773, FR 774, FR 775, FR 776, FR 777, FR 778, FR 779, FR 780, FR 781, FR 782, FR 783, FR 784, FR 785, FR 786, FR 787, FR 788, FR 789, FR 790, FR 791, FR 792, FR 793, FR 794, FR 795, FR 796, FR 797, FR 798, FR 799, FR 800, FR 801, FR 802, FR 803, FR 804, FR 805, FR 806, FR 807, FR 808, FR 809, FR 810, FR 811, FR 812, FR 813, FR 814, FR 815, FR 816, FR 817, FR 818, FR 819, FR 820, FR 821, FR 822, FR 823, FR 824, FR 825, FR 826, FR 827, FR 828, FR 829, FR 830, FR 831, FR 832, FR 833, FR 834, FR 835, FR 836, FR 837, FR 838, FR 839, FR 840, FR 841, FR 842, FR 843, FR 844, FR 845, FR 846, FR 847, FR 848, FR 849, FR 850, FR 851, FR 852, FR 853, FR 854, FR 855, FR 856, FR 857, FR 858, FR 859, FR 860, FR 861, FR 862, FR 863, FR 864, FR 865, FR 866, FR 867, FR 868, FR 869, FR 870, FR 871, FR 872, FR 873, FR 874, FR 875, FR 876, FR 877, FR 878, FR 879, FR 880, FR 881, FR 882, FR 883, FR 884, FR 885, FR 886, FR 887, FR 888, FR 889, FR 890, FR 891, FR 892, FR 893, FR 894, FR 895, FR 896, FR 897, FR 898, FR 899, FR 900, FR 901, FR 902, FR 903, FR 904, FR 905, FR 906, FR 907, FR 908, FR 909, FR 910, FR 911, FR 912, FR 913, FR 914, FR 915, FR 916, FR 917, FR 918, FR 919, FR 920, FR 921, FR 922, FR 923, FR 924, FR 925, FR 926, FR 927, FR 928, FR 929, FR 930, FR 931, FR 932, FR 933, FR 934, FR 935, FR 936, FR 937, FR 938, FR 939, FR 940, FR 941, FR 942, FR 943, FR 944, FR 945, FR 946, FR 947, FR 948, FR 949, FR 950, FR 951, FR 952, FR 953, FR 954, FR 955, FR 956, FR 957, FR 958, FR 959, FR 960, FR 961, FR 962, FR 963, FR 964, FR 965, FR 966, FR 967, FR 968, FR 969, FR 970, FR 971, FR 972, FR 973, FR 974, FR 975, FR 976, FR 977, FR 978, FR 979, FR 980, FR 981, FR 982, FR 983, FR 984, FR 985, FR 986, FR 987, FR 988, FR 989, FR 990, FR 991, FR 992, FR 993, FR 994, FR 995, FR 996, FR 997, FR 998, FR 999, FR 1000.

The map includes a compass rose in the top left corner, a scale bar in the bottom right corner, and an inset map of Northwest Sands in the bottom right corner. The inset map shows the location of Delta Lodge within the Northwest Sands area, with a red dot indicating the lodge's location. The map also shows various roads, including US 2, CTH G, CTH F, CTH H, and CTH I. The Delta Lodge is located at the intersection of US 2 and CTH H. The map is titled "Delta Lodge" and includes the phone number "715-372-4299".



# Study Design

*Sample Size x 2 Years*

|                                    | <i>Woodland</i>  | <u>Current State</u><br><i>Brush</i> | <i>Grassland</i> |
|------------------------------------|------------------|--------------------------------------|------------------|
| <u>Historic State (Circa 1951)</u> |                  |                                      |                  |
| <i>Pine</i>                        | <i>4 + 4 (A)</i> | <i>4 + 4 (B) + 4 (B&amp;R)</i>       | <i>4 + 4 (A)</i> |
| <i>Deciduous</i>                   | <i>4</i>         | <i>4 + 4 (B) + 4 (B&amp;R)</i>       | <i>4 + 4 (A)</i> |
| <i>Grassland</i>                   |                  |                                      | <i>4</i>         |

*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)***

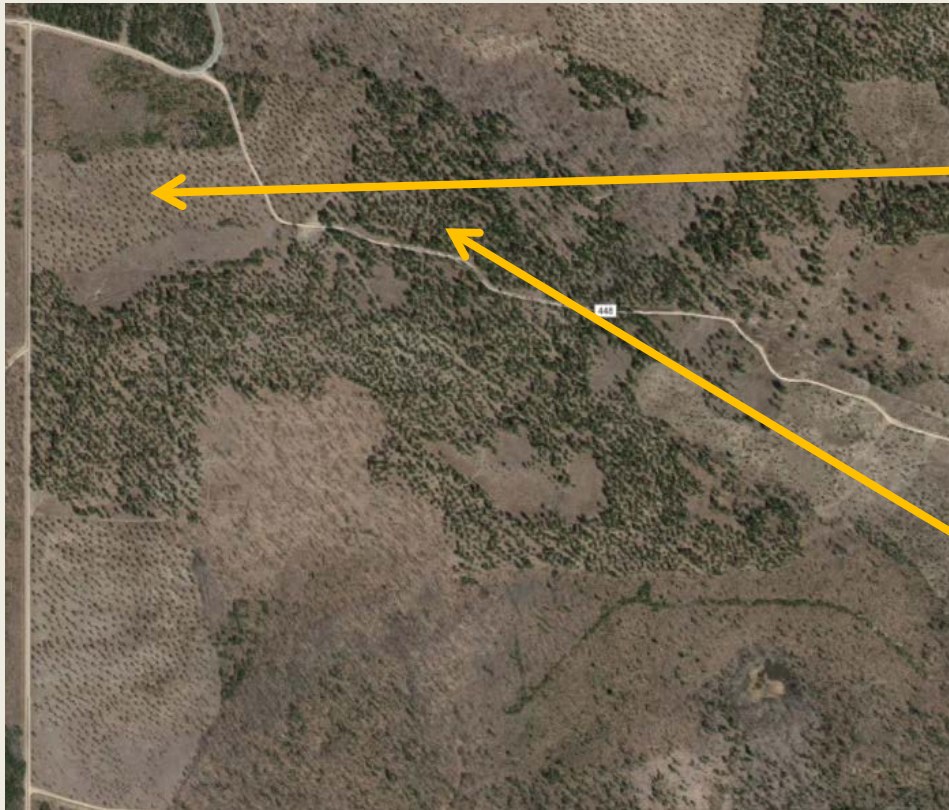
*To the extent possible – evenly distribute treatments across burn blocks*

## ***Year of Burn***

*2016 and 2017 – both in mid-late May*



# Pine Woodland (Recent Treatments)





# Brush Cut Treatment





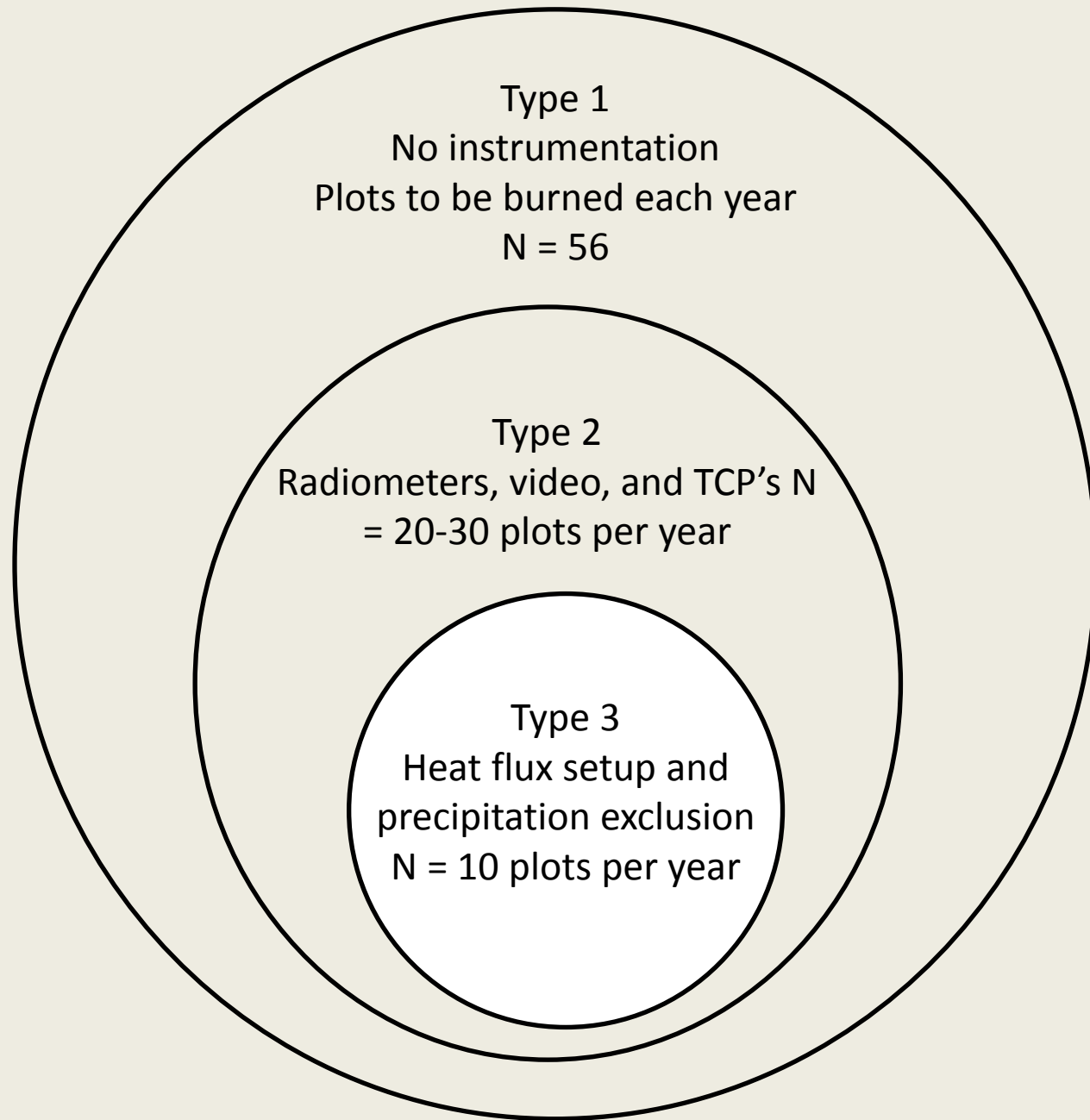
## Venn diagram of fire and soil heating instrumentation

### Type 2 plots

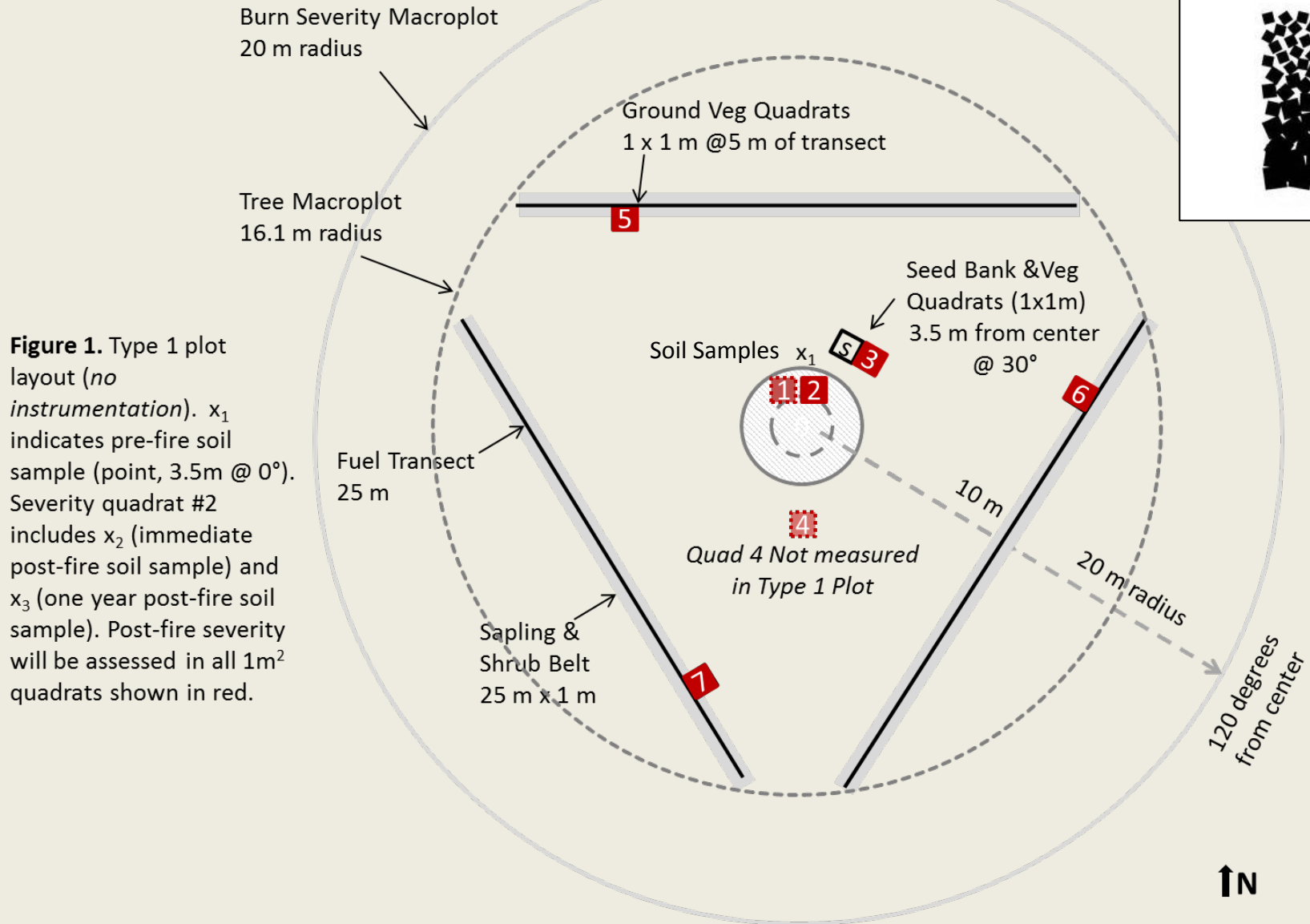
- Radiometer & video camera
- T-posts, towers, & standards
- Two clusters of a thick and thin thermocouple probe (TCP)
  - One at central burn severity subplot
  - One at peripheral burn severity subplot

### 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 plot



**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<sup>2</sup> quadrats shown in red.



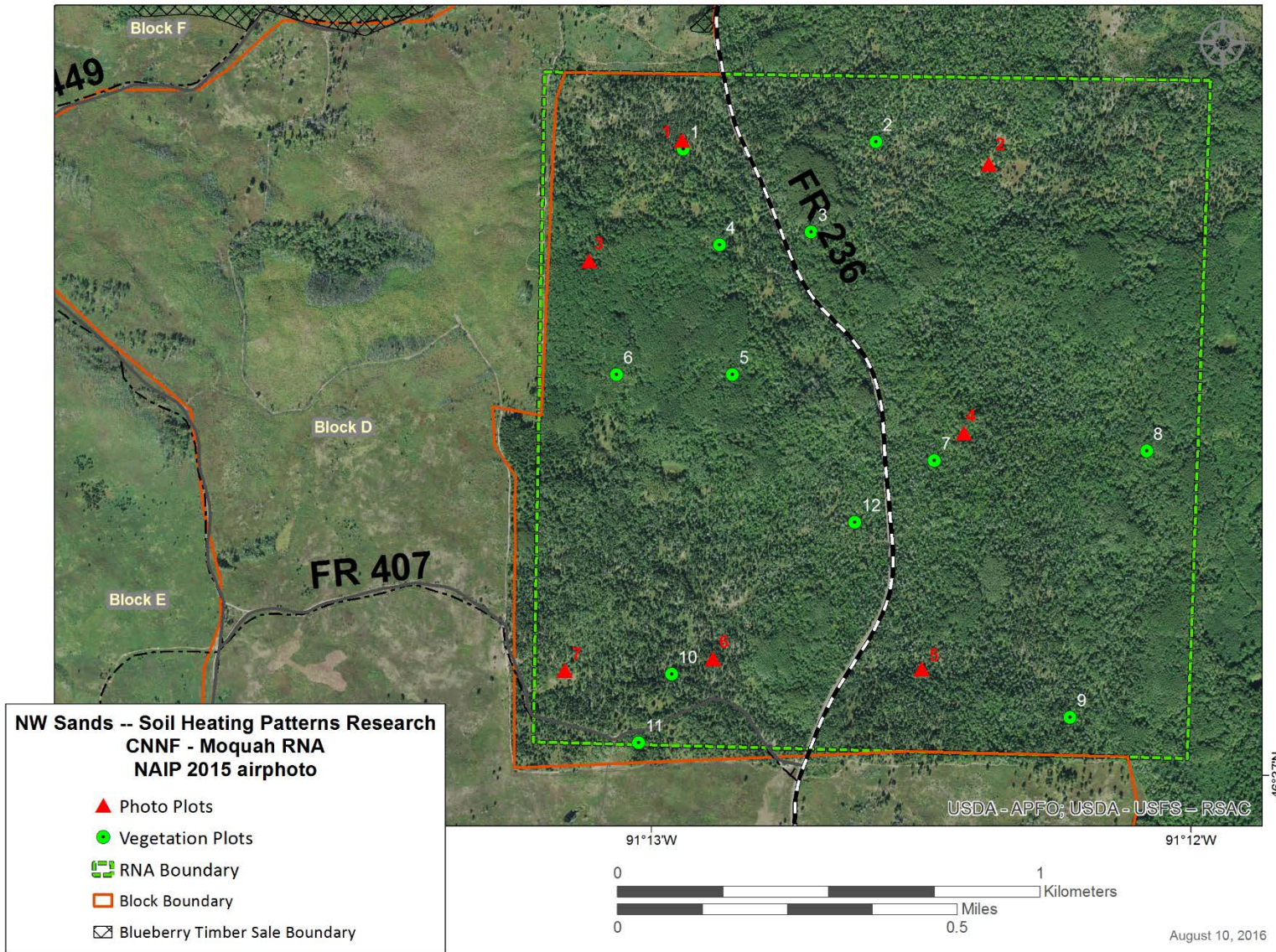
## Preliminary Findings

- 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?*

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?

*“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*



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



### **Land Management Partners**

**Northwest Sands (Moquah)** – Matt Bushman, Jen Rabuck, Vance Hazelton, Dan Hinson, Brian Heeringa, Michelle Davalos (Washburn Ranger District)

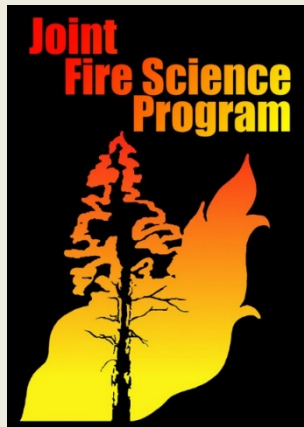
**Northeast Sands (Lakewood Southeast Project)** - John Lampereur, Scott Anderson, Jay Saunders, Scott Linn, Tym Sauter, Mark Gilley, Jeff Seefeldt (Lakewood- Laona Ranger District)

**Northeast Sands (Dunbar Barrens and Spread Eagle Barrens)** – Carly Lapin, Thomas Meyer, Jason Cotter (WI DNR)



# Lake States Fire Science Consortium

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Thank  
you!



## Co-PIs:

Jessica Miesel, Randy Kolka, Matt Dickinson, Deahn Donner

Professional Support: Heather Jensen & Sue Lietz

Financial support:

Joint Fire Sciences Program, Northern Research Station  
of the USFS, Lake States Fire Science Consortium

Field Support: To numerous to list!!



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# Lake States Fire Science Consortium

A JFSP KNOWLEDGE EXCHANGE CONSORTIUM



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



@LSFireScience



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