



Sunken Lake Fire Restoration

Prescribed Fire in the Chippewa National Forest
Cutfoot Experimental Forest



Doug Kastendick, Ecologist, Northern Research Station, USFS
Kate Hagsten, Plant Program Director, Division of Resource Management, LLBO
Anita Cloud, Intern and recent graduate of Leech Lake Tribal College
Colin Eagle, Intern and 2019 graduate of Leech Lake Tribal College



Purpose and Need

- History of fire well documented pre 1900's
- Lack of frequent surface fires
- Declining fire dependent communities
- Compositional shifts in species
- Loss of ground layer plants with cultural importance

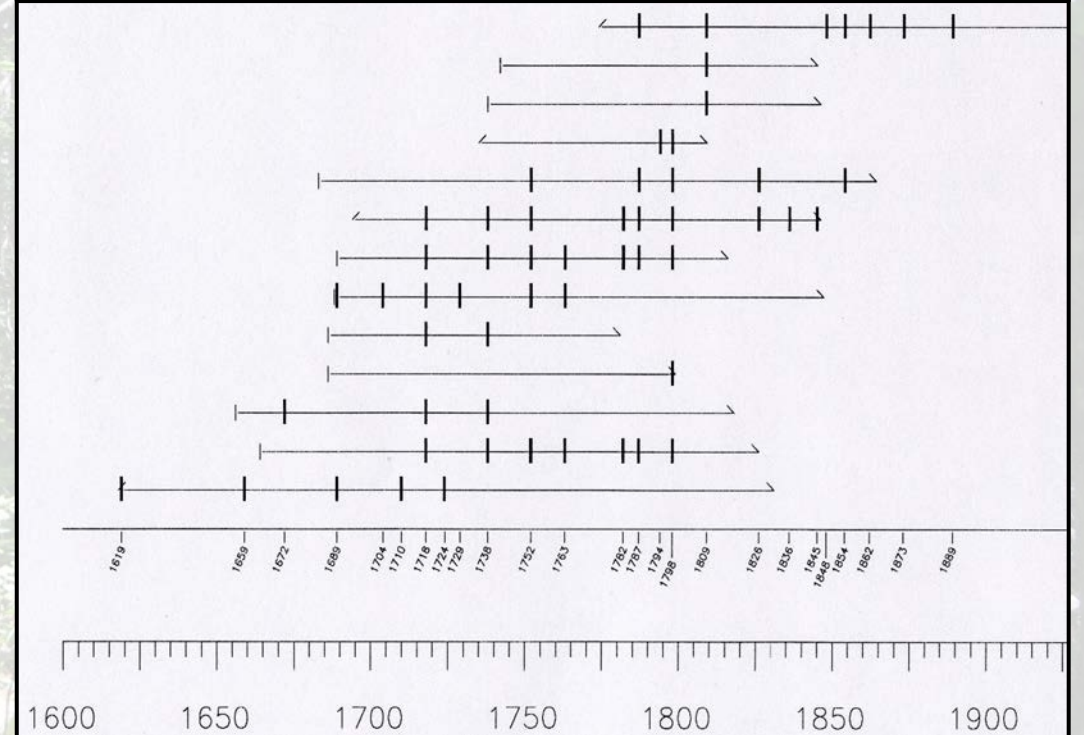
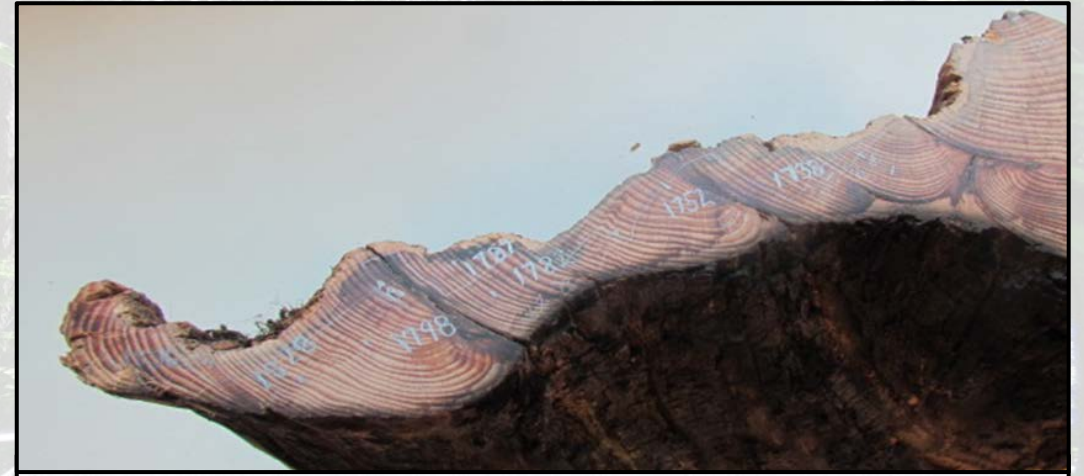


Photo credit M. Stambaugh

Project Goals

- Re introduce fire into fire dependent communities
 - Use Rx fire to emulate disturbance regimes
 - Base treatments on historic intervals and severities
 - Reduce hardwood component
 - Fire dependent reservoirs of biodiversity at risk
 - Increase regeneration opportunities for fire tolerant pine species
 - Promote fire dependent native ground layer plant communities
- Reduce fuels in fire dependent communities
 - Reduce fuels from estimated 18 to 6 tons per acre



Photo credit D. Kastendick

Forest Plan Objectives

- Treat areas of highest fire risk to minimize the effects of unwanted wildland fire.
- Reduce fuels and control vegetation in the understory of stands that historically had naturally occurring low intensity surface fires.
- Provide ecological conditions to sustain populations of native species and to achieve objectives for MIS and MIH's.



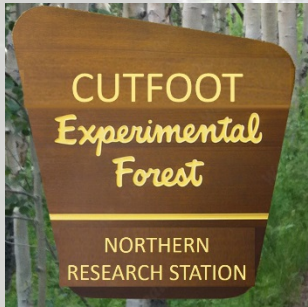
Photo credit D. Kastendick

Forest Plan Objectives

- Establish, maintain, or improve vegetation conditions using prescribed fire, mechanical treatments, and other tools.
- Restore structural diversity and ecosystem processes within stands when harvesting or burning by retaining: a diverse mix of trees, shrubs, and herbs; live and dead standing trees; earth and tree root mounds caused by uprooted trees; coarse woody debris from fallen trees; and patches of live trees.



Photo credit D. Kastendick

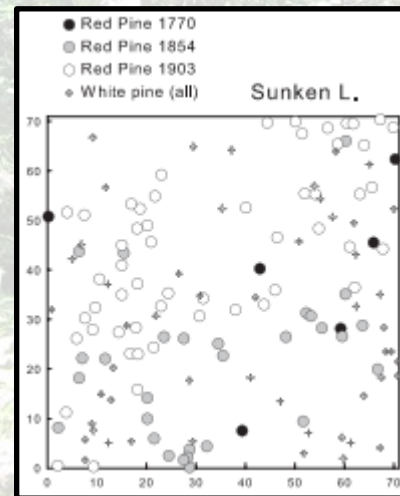


Experimental Forest Advantages

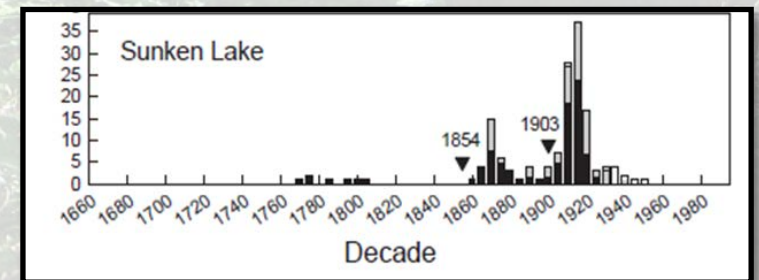
- Inventory plot data dating to 1940
- Known management history since logging era
- Contains old growth research stands
- Scale of project in size and forest types
- Comparisons to managed forest conditions
- Known historical fire frequencies



Photo credit D. Kastendick



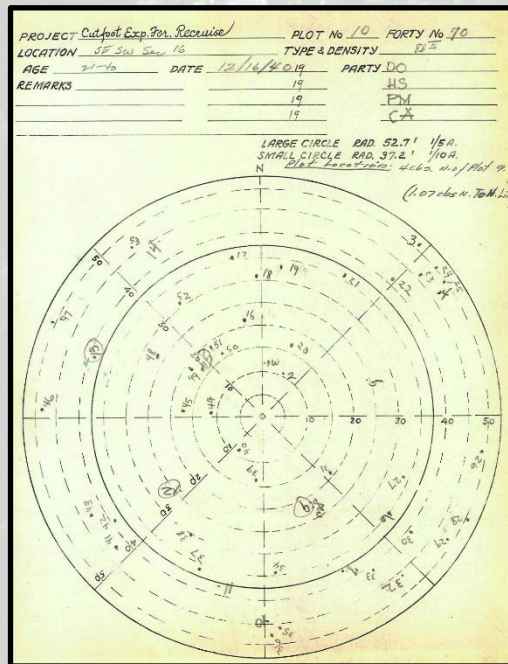
Fraver and Palik 2012



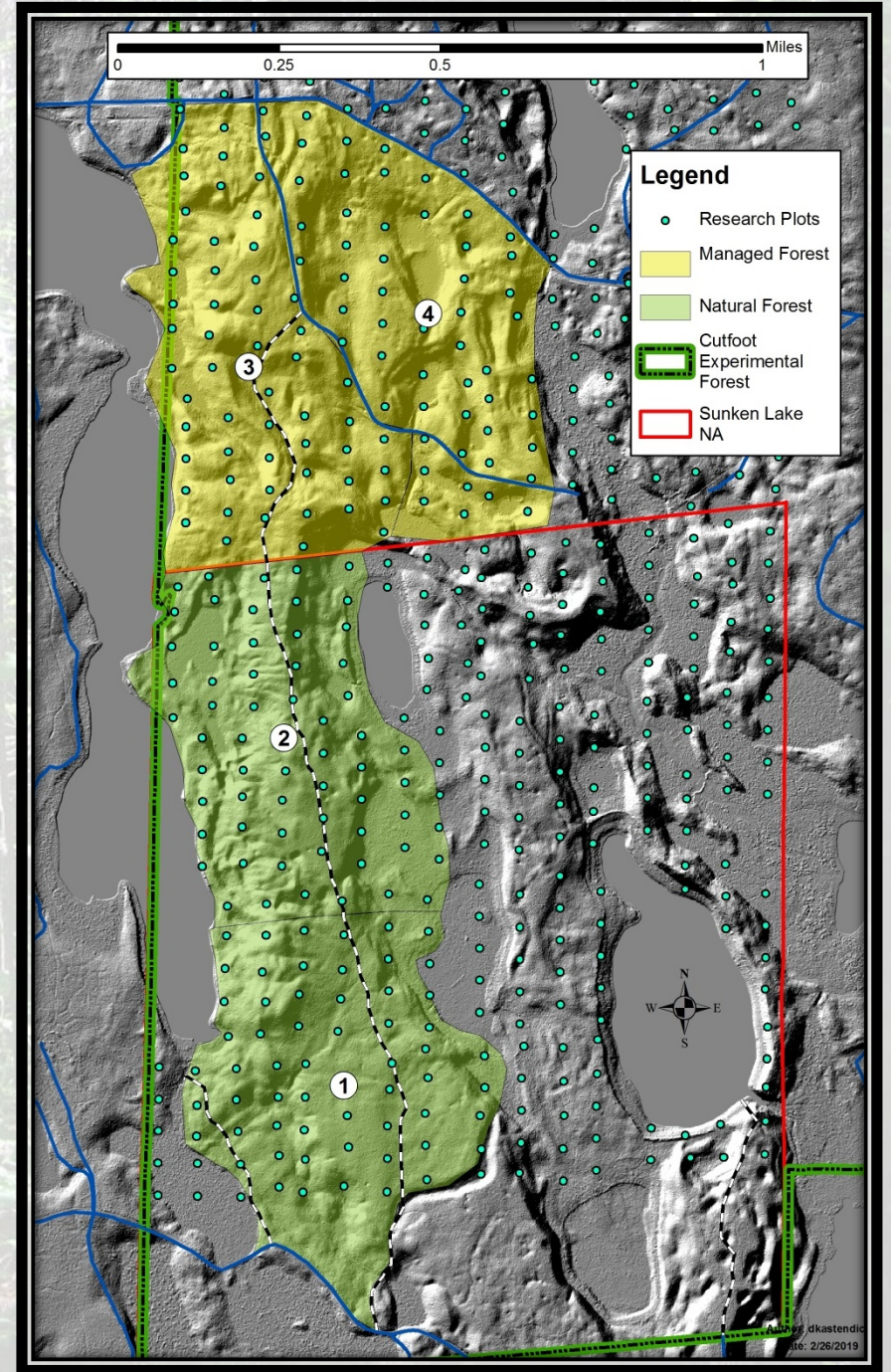
Fraver and Palik 2012

Project Design and Variables

- Managed vs Unmanaged Rx and Control areas
- Pine and Mixed-Pine covertypes
- Average of 15 plots per TRT/Covertyp



- Historic to current tree data
- Understory vegetation
- Fuels, fire severity
- Photo records
- Light environment
- Blueberries!



Effects of fire restoration in pine woodlands on the culturally important species: lowbush and velvetleaf blueberry

Additional Collaborators:

Katie Zlonis, Leech Lake DRM, MN DNR

Dr. Brian Palik, Northern Research Station

Todd Tisler, Chippewa National Forest



Photo credit D. Kastendick

Shared Management

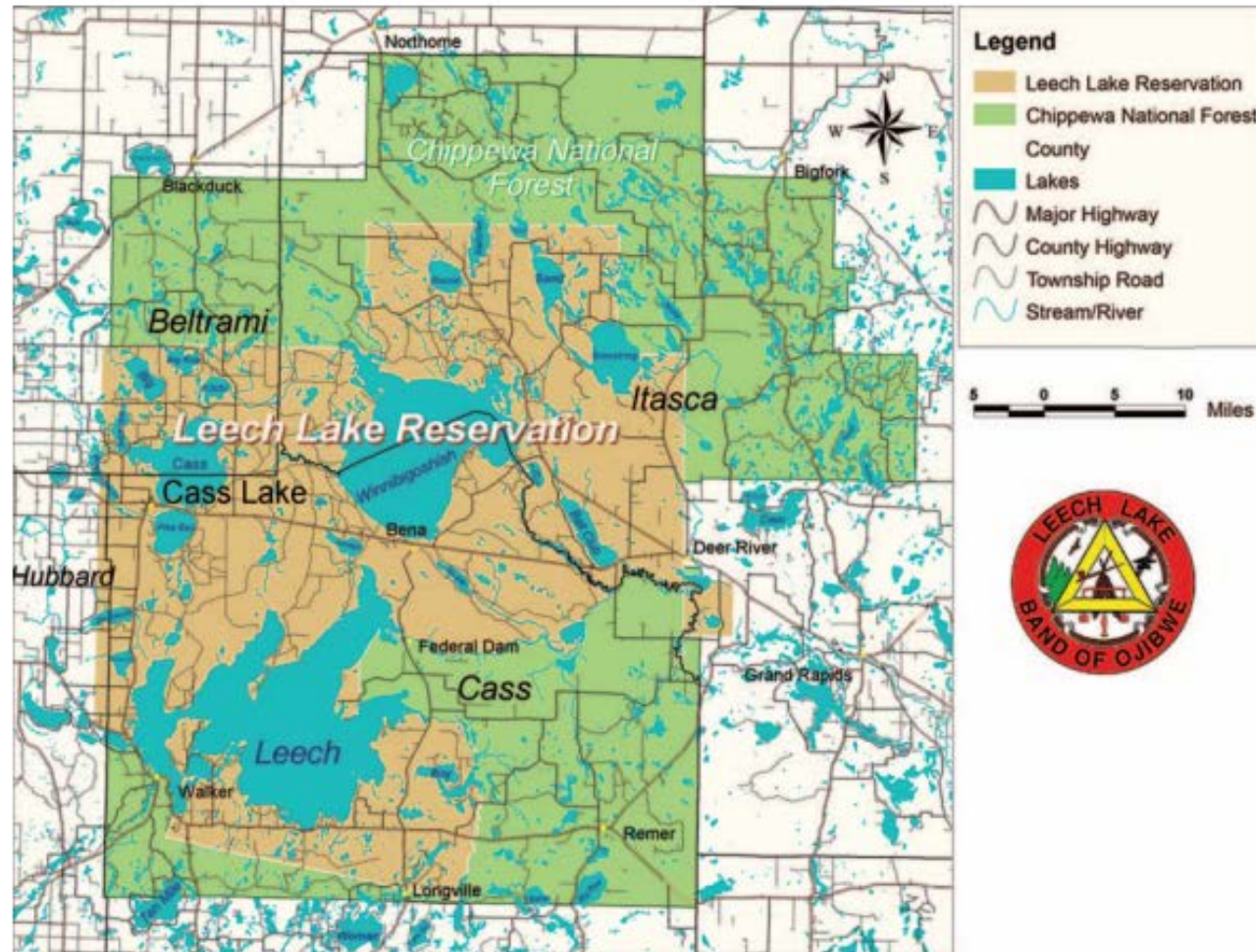


Figure 2. LLR and CNF (Wells 2007).

Wild blueberries: Miinan

- Berries are 88% water
 - Wild blueberries are smaller and more nutrient dense than cultivated berries
- Primarily spread by rhizomes
- Generally produce berries on a bi-annual cycle
- Require pruning so more energy is put into berry production
- Do not like competition

Lowbush: *Vaccinium angustifolium*

Velvetleaf: *V. myrtilloides*



Fire effects on blueberries

- Reduces competition
- Reduces insects, disease and fungal organisms that accumulate throughout the winter
- Need acidic soil of 4.0 -5.0 pH



Photo: Creative Commons

- Intensity of fire changes soil texture thus changing nutrient availability
- Plants in these communities have adaptive traits to allow them to thrive with fire

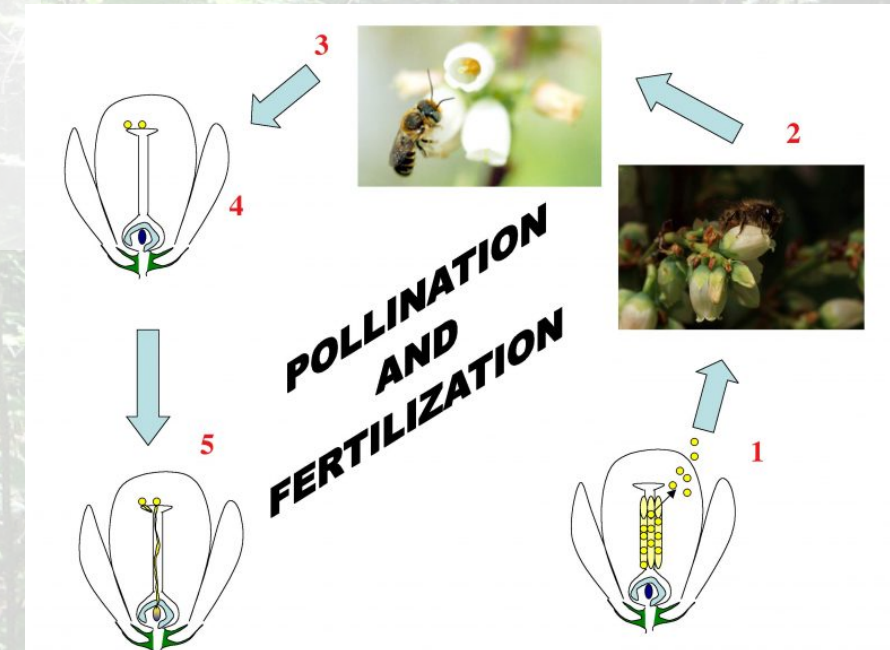
Source: Forest Encyclopedia Network

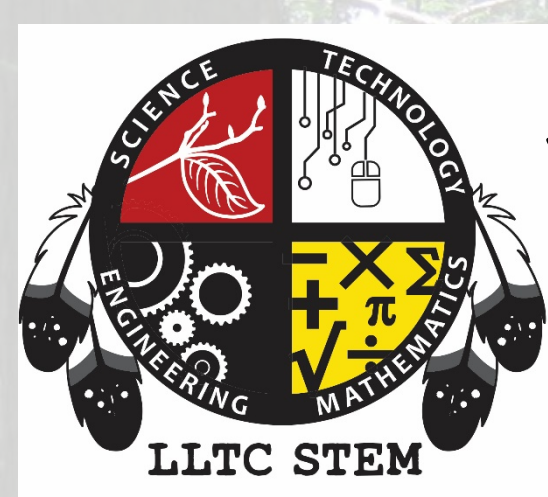
Future considerations

- Burns should happen before bees begin to look for nesting sites or after a hard frost in the fall
- Drought may be affecting flower timing
- Dependent on pollinators
- Conduct a pollinator visitor study



Pollinator on Blueberry photo by Jeremy Baker





Year 1: 2018 Pre-burn assessments



- Interns from Leech Lake Tribal College: Colin and Anita
- Collaborative approach: shared mentorship, resources, and training





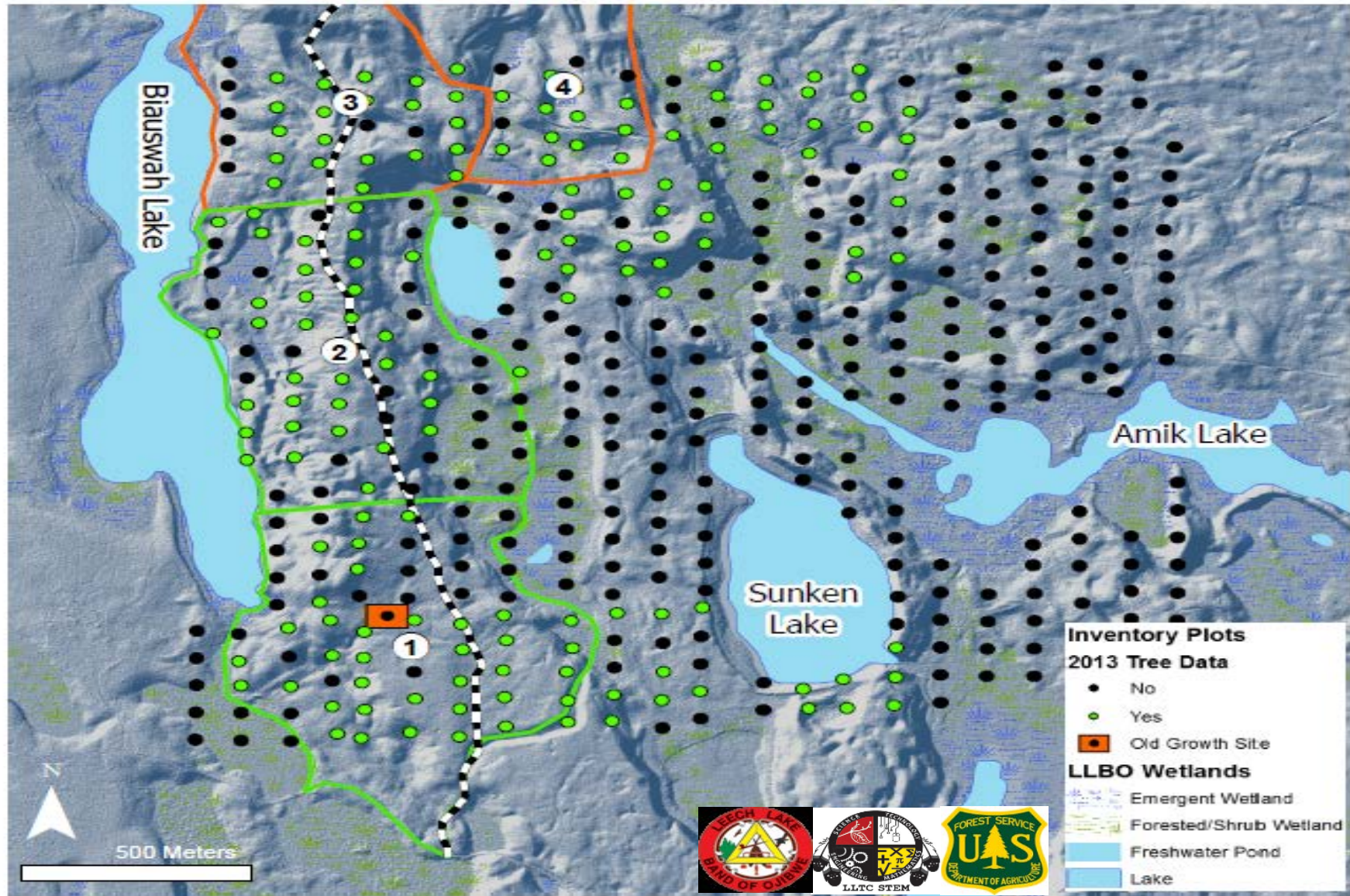
Miinan miinawaa Ishkode

Blueberries and Fire

Anita Cloud



Sunken Lake Blueberry Research Plots



Fieldwork at Sunken Lake sites



Canopy of the Sunken Lake



Hazel brush means bush-wacking!

Internship was a great experience:

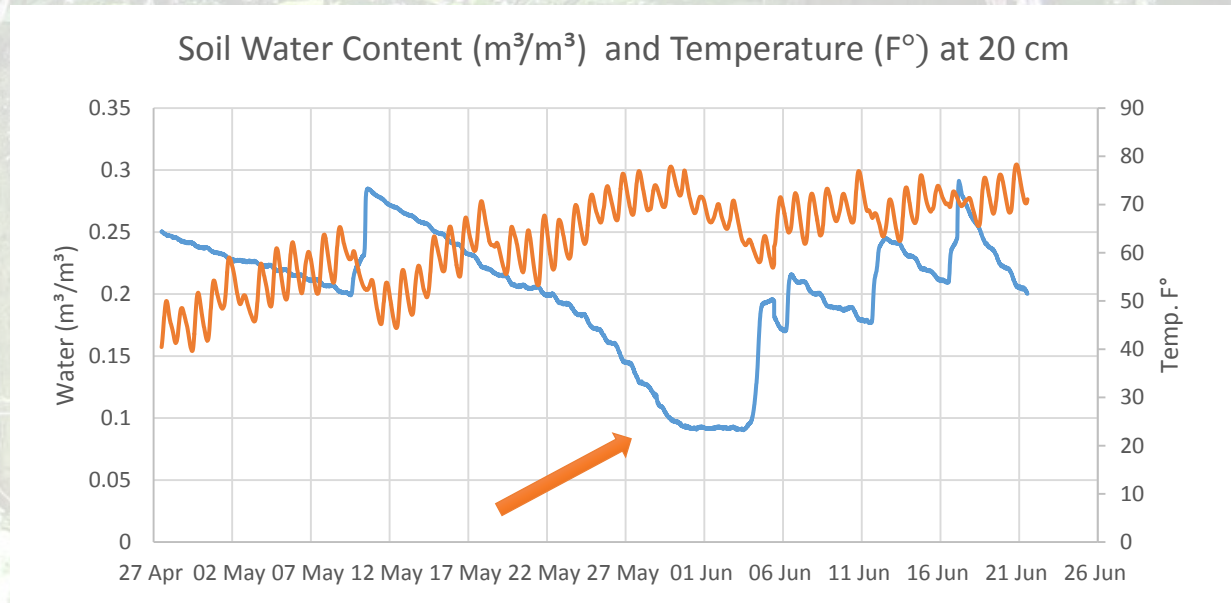
- Very focused project on important species
- Starting on a long term restoration
- Interested in long term outcomes



This is one of the few fruiting blueberry plants we found in the experiment area

Preliminary findings

- Miinan do not appear as abundant as they used to be in this area, according to those who used to pick nearby.
- Causes are not clear, but could be due to the thick hazel abundance
- We found only five fruit bearing plants in that whole area.
 - At the critical time for flowering in the last two weeks in May 2018, there were severe drought conditions with no rain for weeks and unseasonably warm temperatures.
 - It may be difficult to separate effects of the fire from a temperate spring season in the years ahead, since this wasn't a good year for berry production, but we should be able to see if there are more plants overall.



Data from HOBO deployment at LLTC near Cass Lake

Miinan in Minnesota

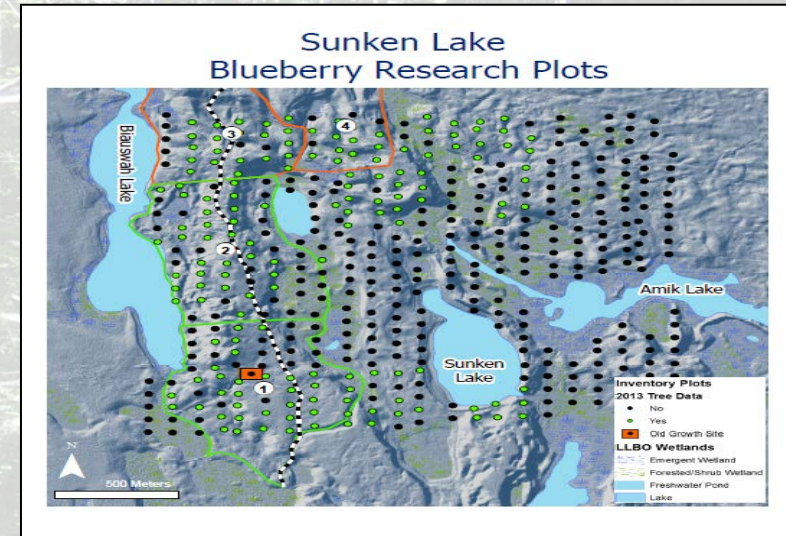
By: Colin Eagle



Project scope



Excess ground foliage from decades of fire suppression.



74 sights were visited, half of it control and the other half experimental

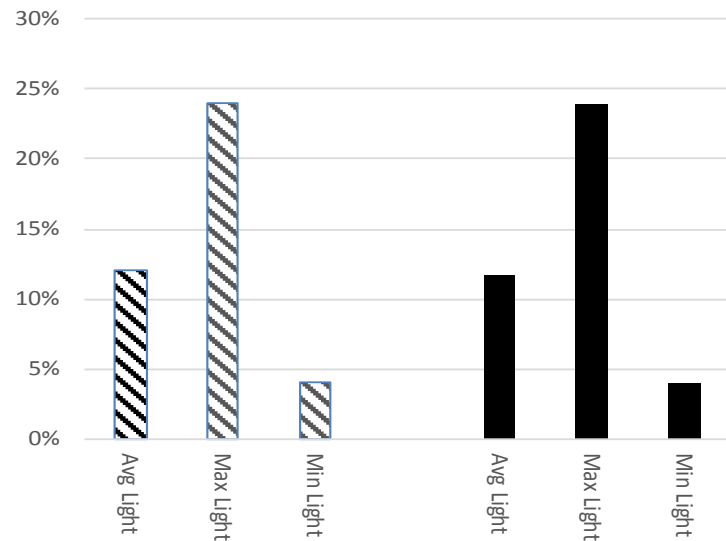
Site surveys

- Three, 32' transects were laid at each site
- A plot (1 m²) was surveyed on each transect, recording cover class of ground plants
- Canopy cover was measured with a densitometer at cardinal points
- Photographs were taken on each transect



Preliminary Results

Densiometer Derived Open Canopy Percentage



- Open canopy characteristics were not significantly different between plots with or without blueberry plants.
- However, we think that fire will allow blueberries to produce fruit under the new canopy

Future collaboration

- Hobo U30 data logger before and after prescribed burn in SPRING 2019
- 1 control and 2 experimental sites
- 5 year study



Conclusion

- My observations were that miinan were mostly absent in natural red pine forests, but present in sites that tended to have more birch, balsam fir, and poplar.
- We found most of the fruiting plants in the transitional areas between stand types.
- The study area is scheduled for a burn in Spring 2019, and I hope to return to these sites after.





Miigwech To all our collaborators!



And... LLTC Earth System Science Program will enter the collaboration in 2019 with soil, hydrology, and climate components added to the fire science, thanks to a generous grant from LSFSC!

