



LTER research in interior Alaska: *key projects that link to reforestation*

Current research projects

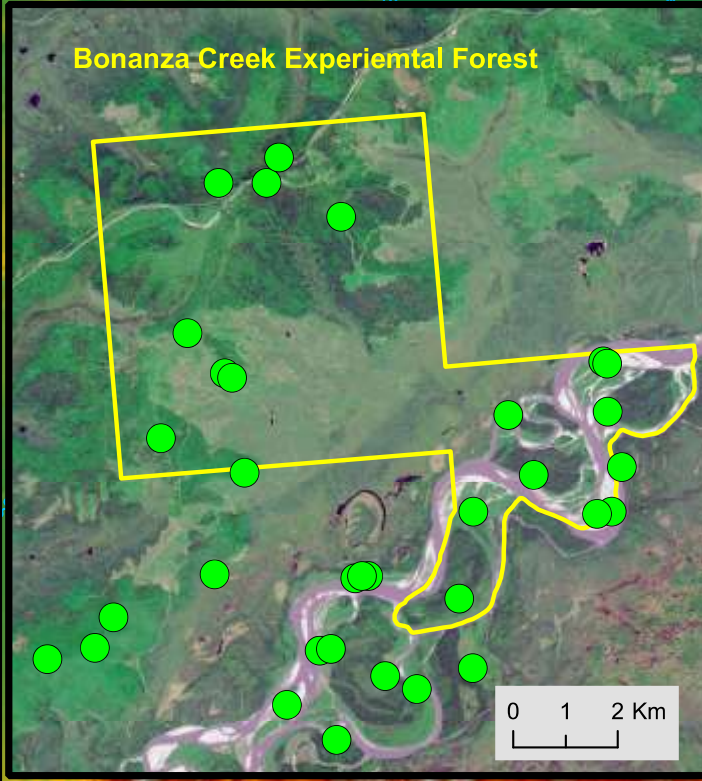
- Floodplain and upland succession (monitoring since 1960s)
- New site network (set up began in 2010)
- FIA contracting work

Current Distribution of BNZ Research Sites

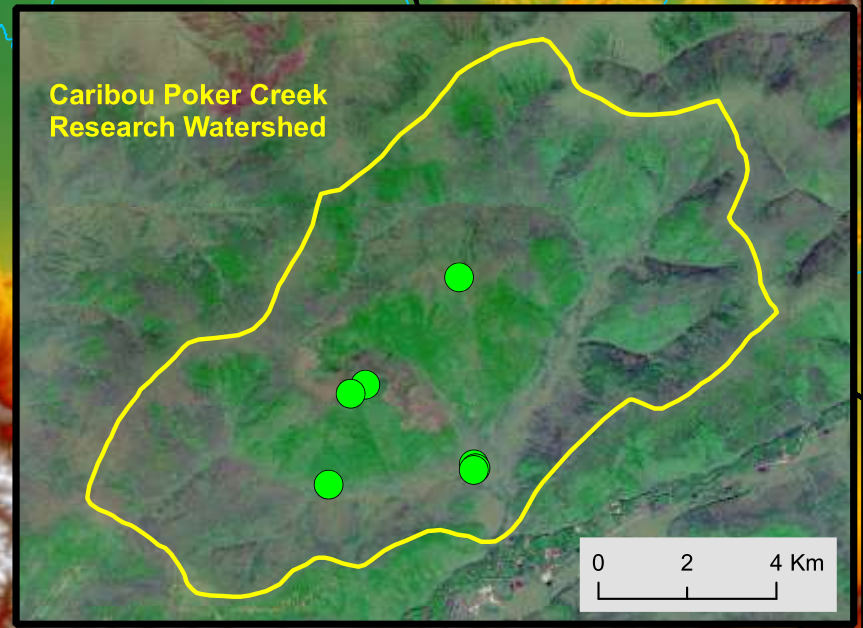


Fairbanks

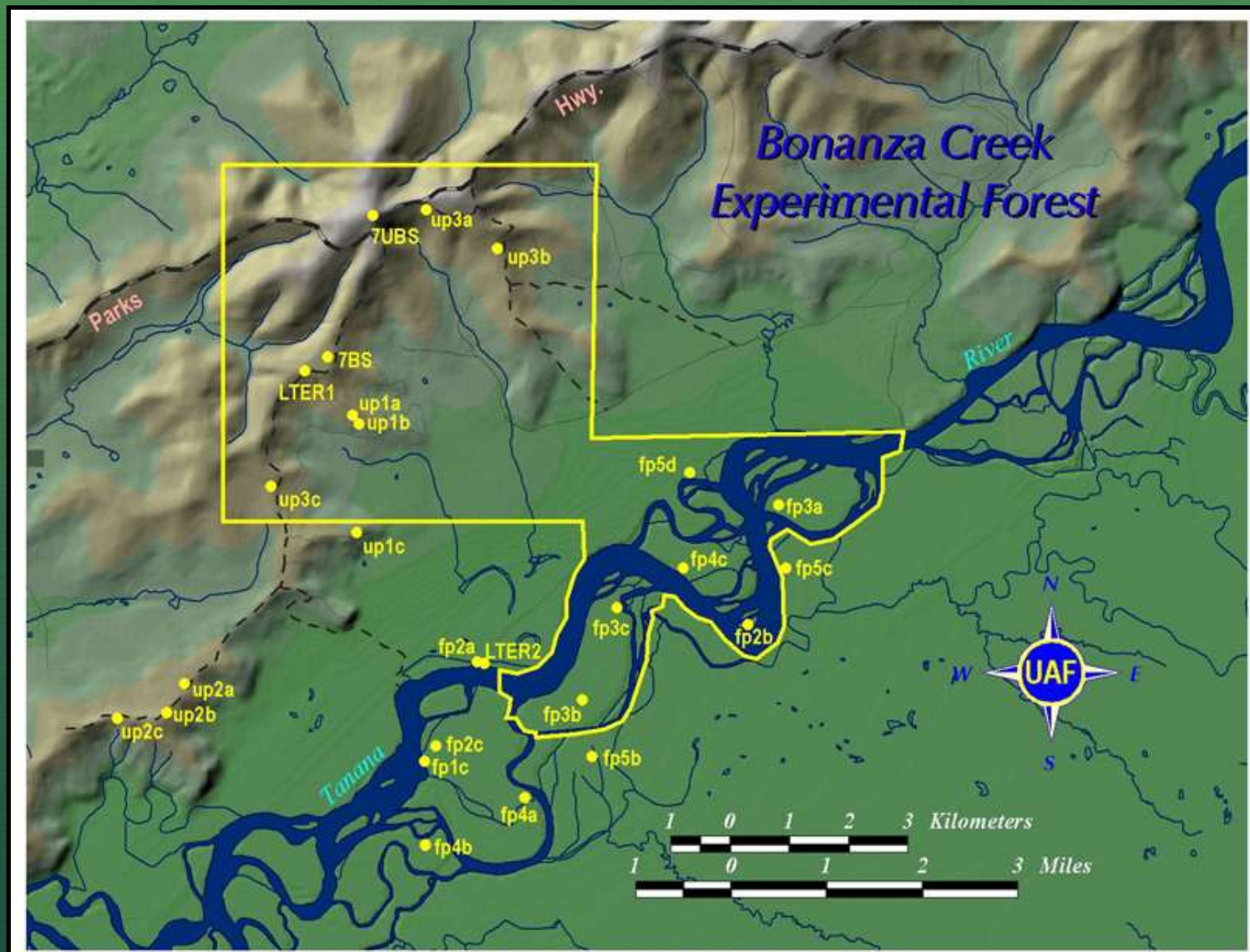
Bonanza Creek Experiemtal Forest



Caribou Poker Creek Research Watershed

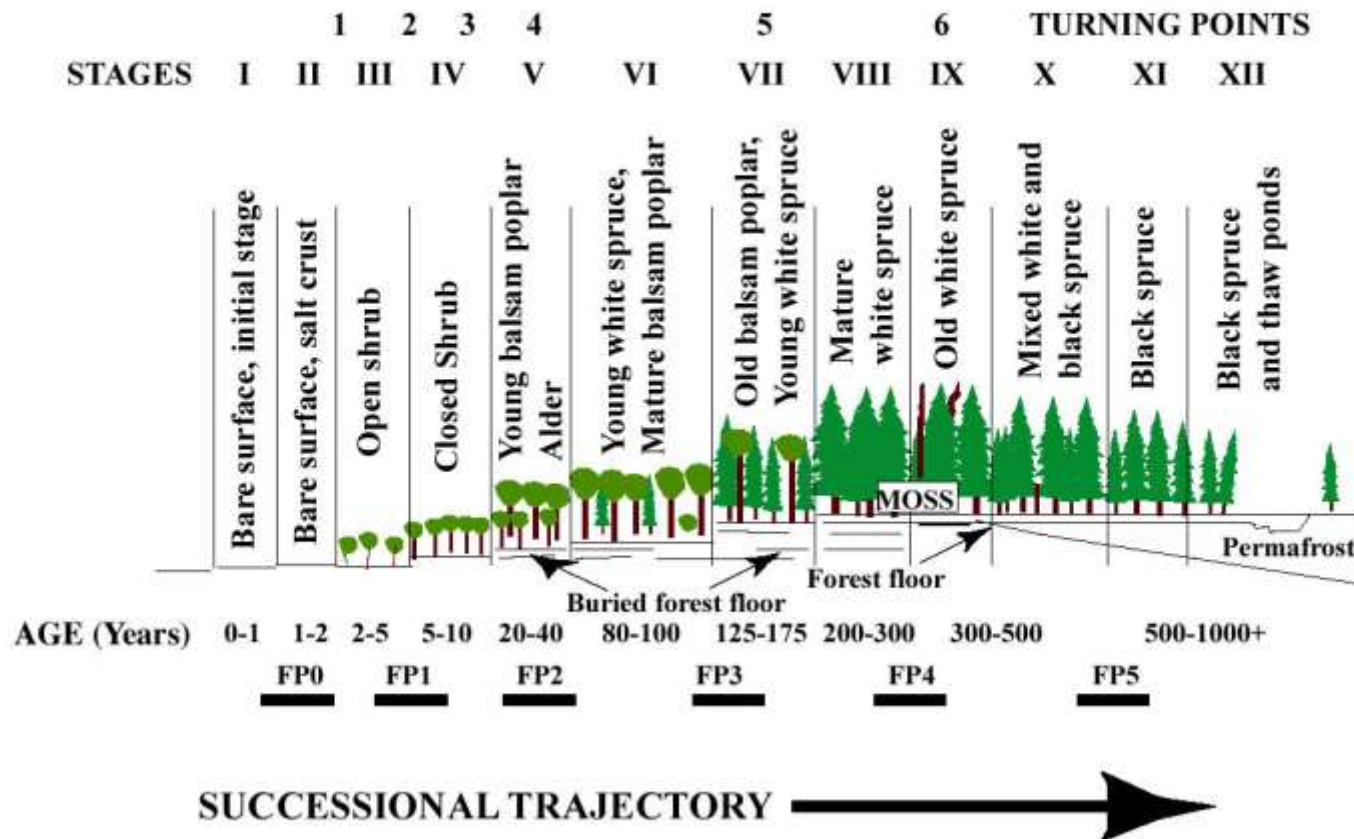


Historical datasets



Historical datasets

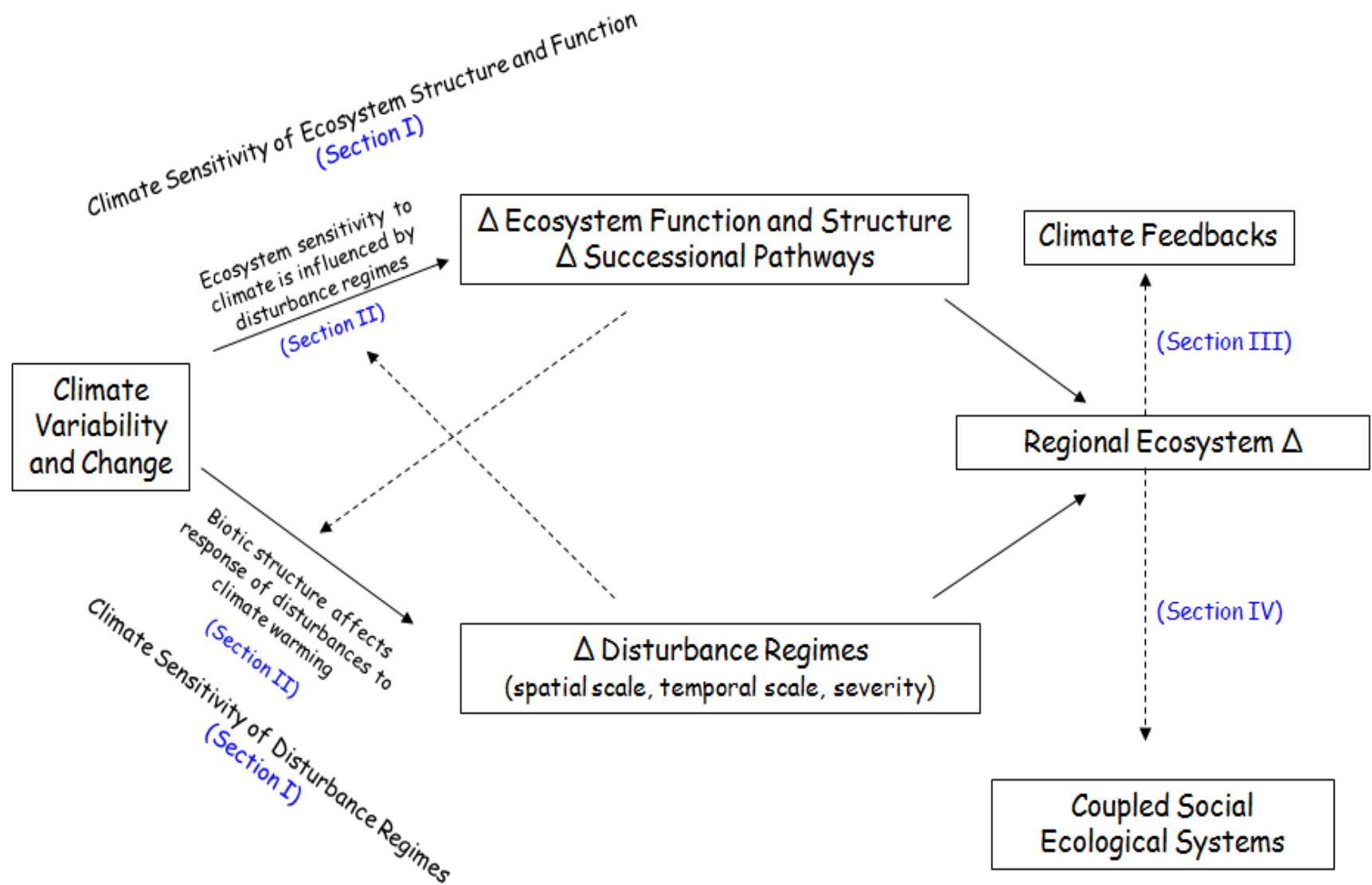
FLOODPLAIN PRIMARY SUCCESSION



Historical datasets

- Vegetation (canopy and understory)
- Tree inventory
- Soils, climate, and other important environmental variables
- These datasets gave (and continue to give) us a strong understanding of Tanana River floodplain dynamics, and well as small-scale upland fire dynamics and are called our LTER “core sites”.
- Synthesis CJFR volume on these datasets: CJFR 2010 43(1)

Current LTER research focus



New Site Network

- Trying to expand our knowledge and understanding of post-fire dynamics on both a spatial and temporal scale.
- Using sites that were established by LTER scientists for other projects (including LTER core sites) whenever possible.
- Focusing on sites that are currently black spruce or were black spruce prior to burning.

Picea mariana (black spruce) communities



Black spruce exhibits large phenotypic plasticity

Exists in a large range of environmental conditions

Black spruce is fire-adapted

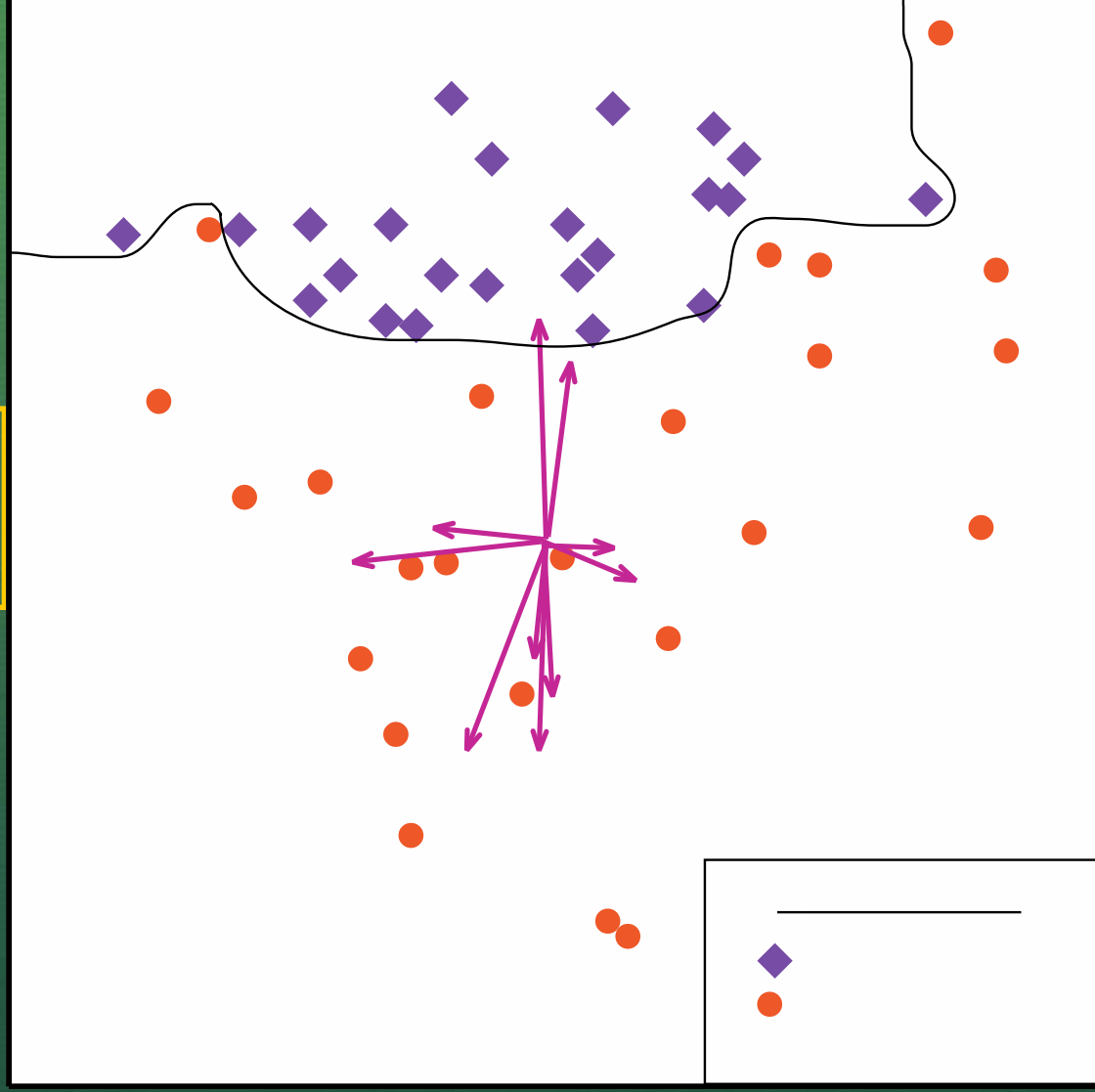
Predominant tree type in interior Alaska

Range distribution and glacial history of *Picea mariana*



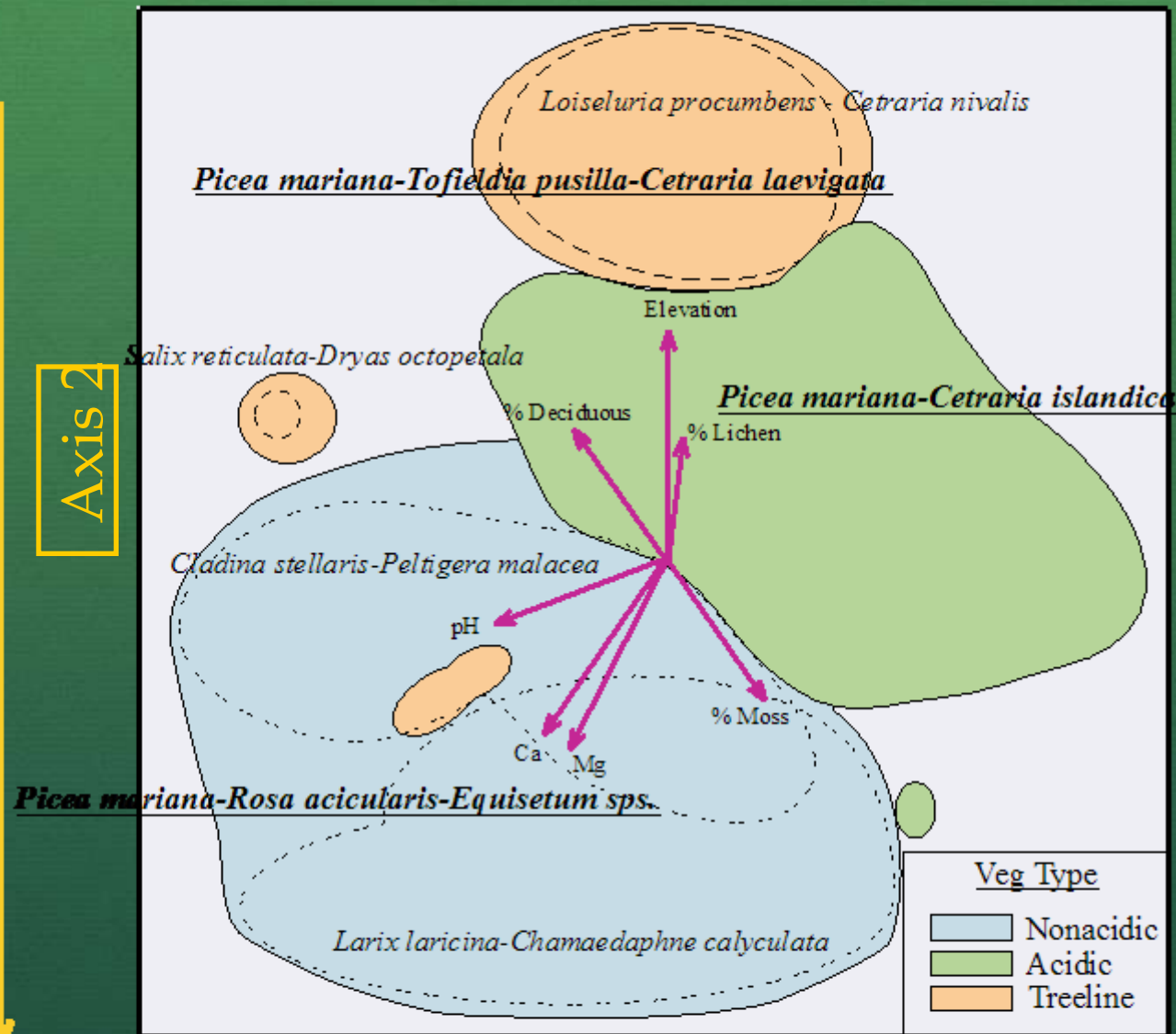
Topography gradient

Axis 2



Interior Alaska grouped by community

Elevational gradient
Site drainage gradient



Axis 1

Complex pH Gradient

Objectives

- Select sites that can be monitored long-term (taking into account land ownership, accessibility, previous studies done, etc. etc)
- Understand how representative each of our sites is within:
 - The fire scar
 - The ecoregion
 - The landscape of interior Alaska

Proposed Study Design

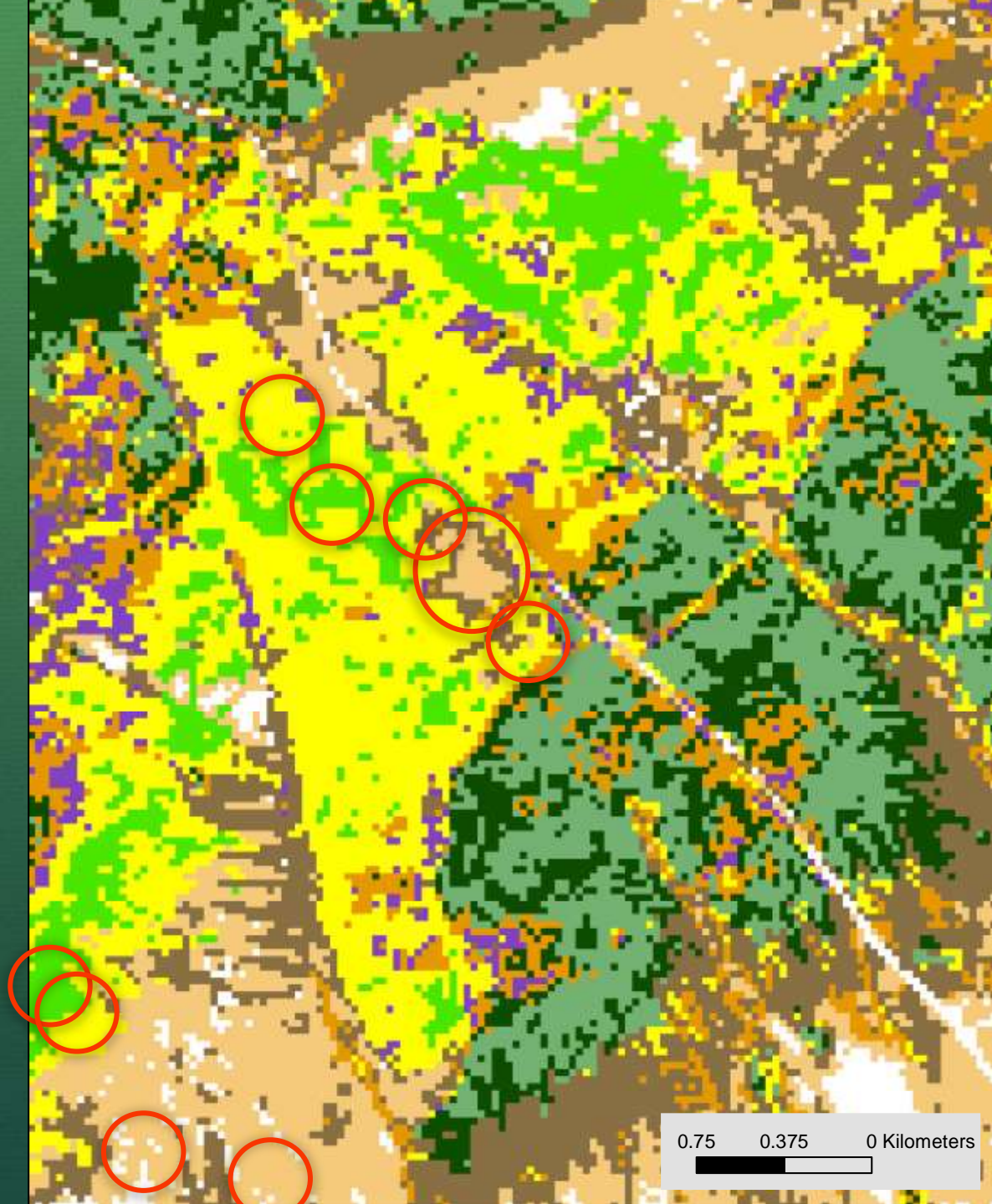
Ecoregion	Area (km ²)	Permafrost thickness	Permafrost stability	Parent material (bedrock)	Fire regime	Dominant vegetation
The Ray Mtns	51,243	Thin to moderate across most of the region	Generally stable	Metaphorphic Ruby terrane	Occasional	Black spruce woodlands
Yukon-Tanana Uplands	102,496	Thin to moderate, depending on topography	Thin, ice-rich, and warm in valley bottoms and toeslopes.	Metasedimentary Yukon-Tanana terrane	Very frequent	Black spruce forests, black spruce woodlands, and black spruce bogs
Tanana-Kuskokwim Lowlands	51,730	Thin	Temperatures are near melting point	Alluvial, Fluvial, and glaciofluvial	Ocassional, depending on site moisture	Boreal black spruce forests, black spruce bogs

We proposed:

- 1) Selecting sites within different age-classes in all ecoregions
- 2) That covered a gradient of site drainage (to account for permafrost, soil texture, and permafrost)

Rapid assessment of “middle-aged” stands



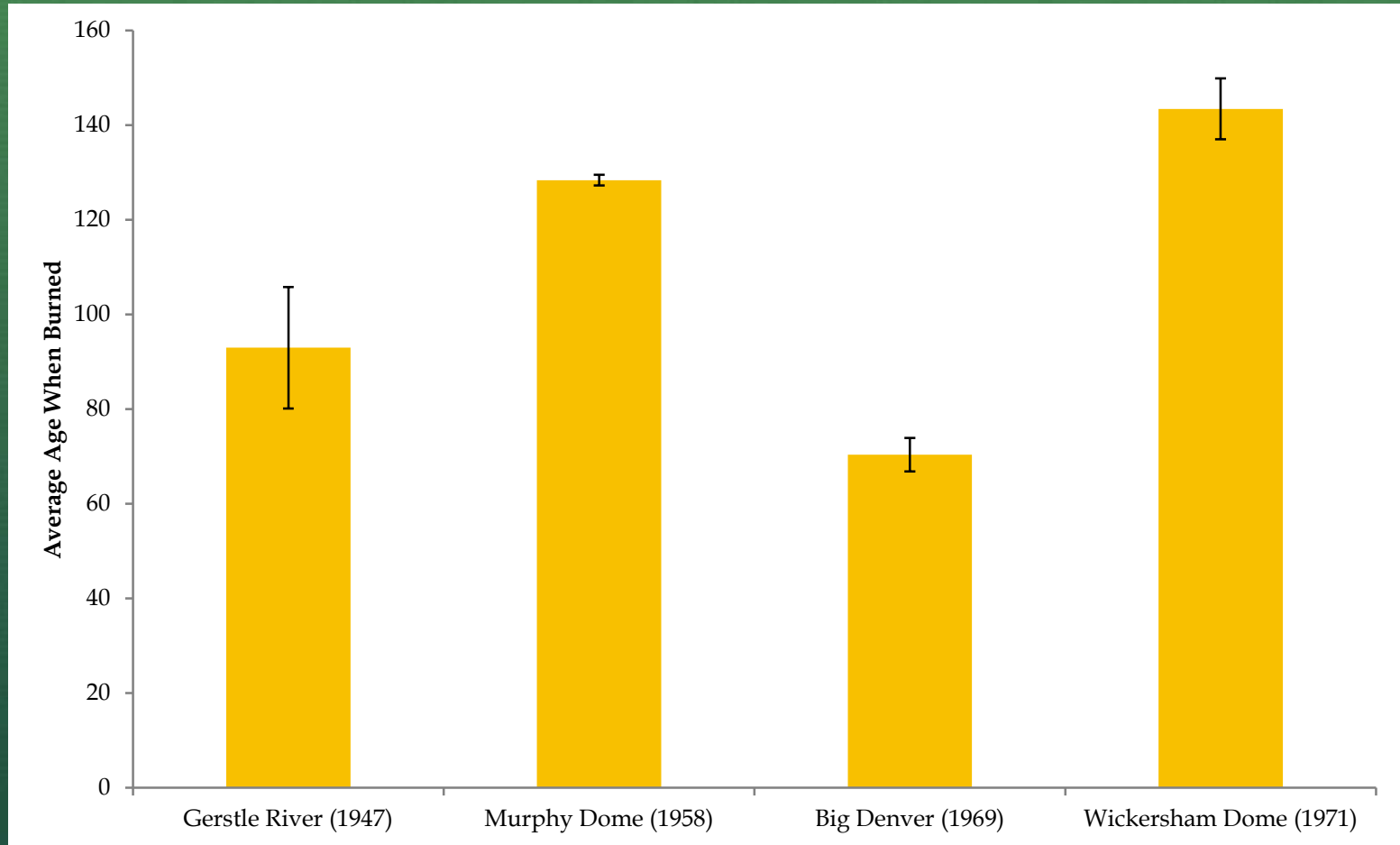


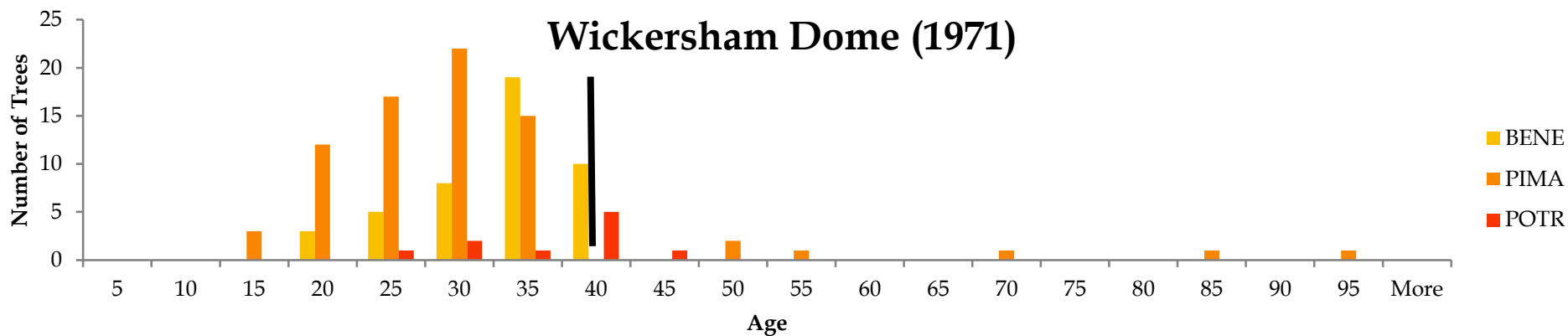
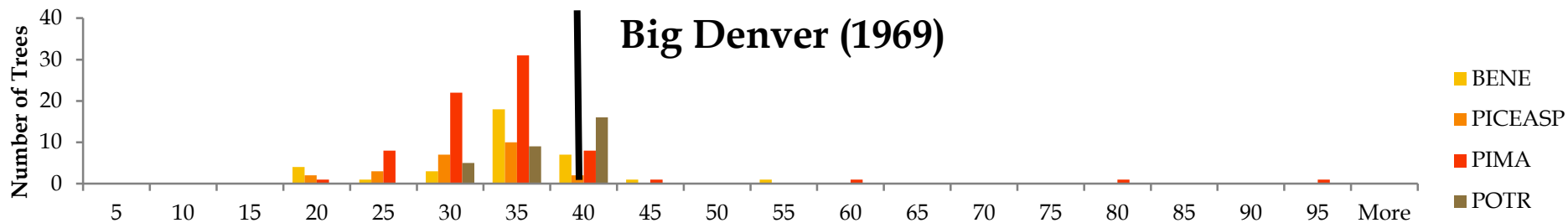
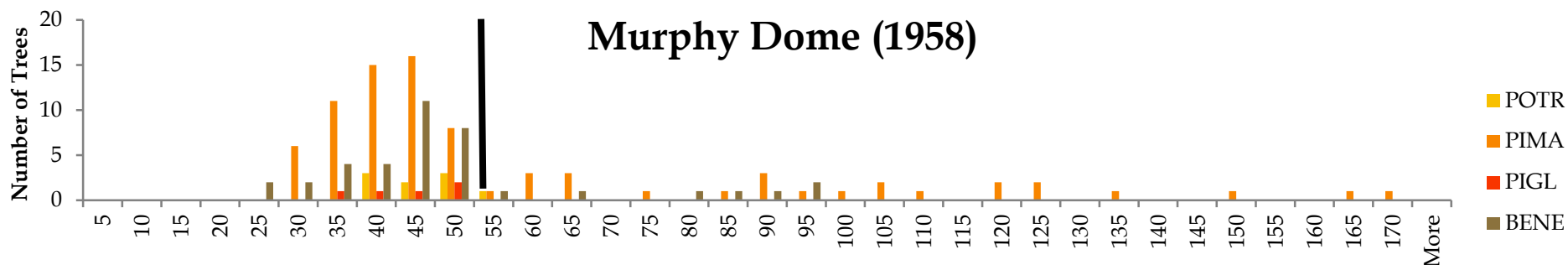
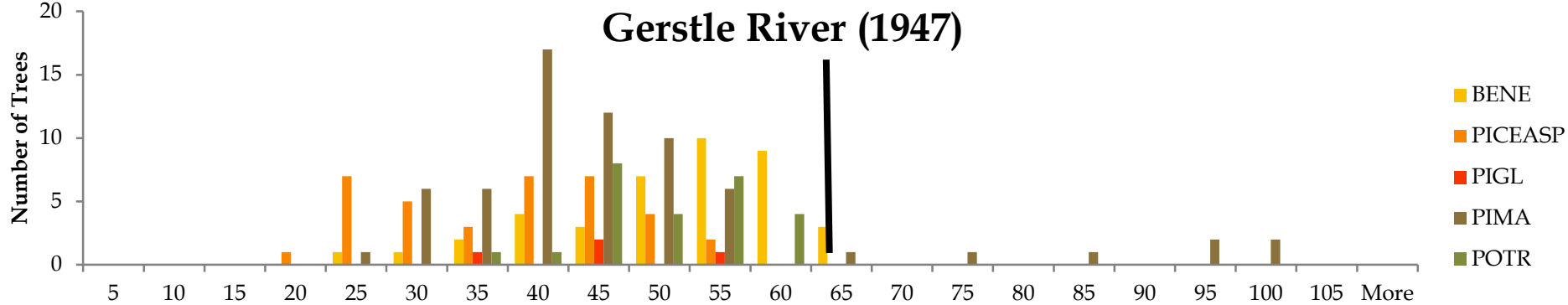
Legend

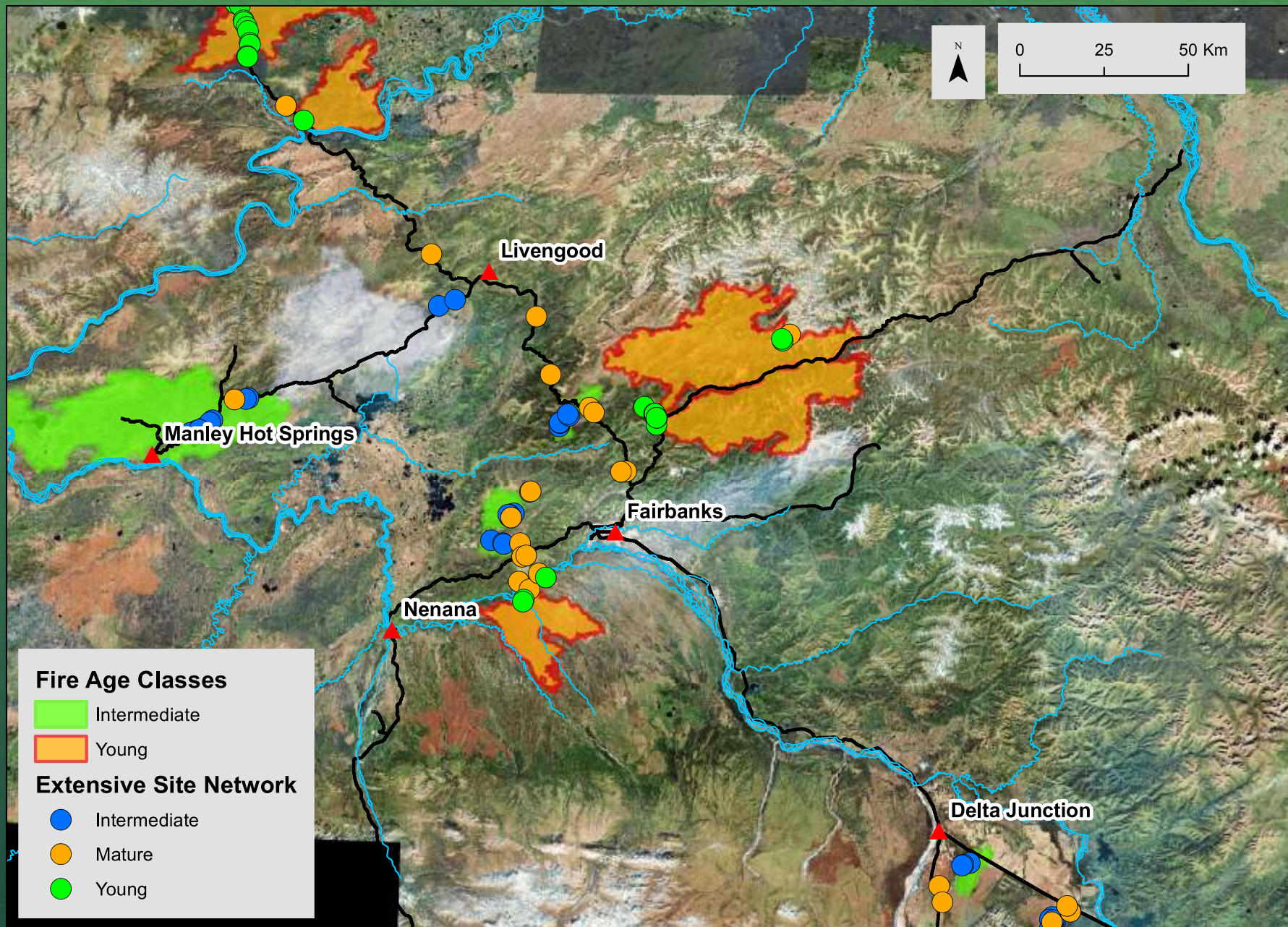
- closed canopy BS
- moderate canopy conifer
- mixed canopy high spruce
- open canopy BS with shrubs
- mixed high decid
- Alder/Willow
- open shrub with BS
- nonveg
- pure decid

0.75 0.375 0 Kilometers

Mean Age when burned







NSN Matrix of Sites

- Young sites were distributed by their fire severity (high, moderate, and low) and site moisture (xeric, subxeric, subxeric/mesic, mesic, mesic/subhygric, subhygric)
- Intermediate sites were by landscape position (uplands, lowlands), canopy type (hardwood, mixed and black spruce), and soil type (rocky/sandy, loamy/peaty)
- Mature sites were distributed by site moisture and water flux (no flux, ombitrophic, minerotrophic)

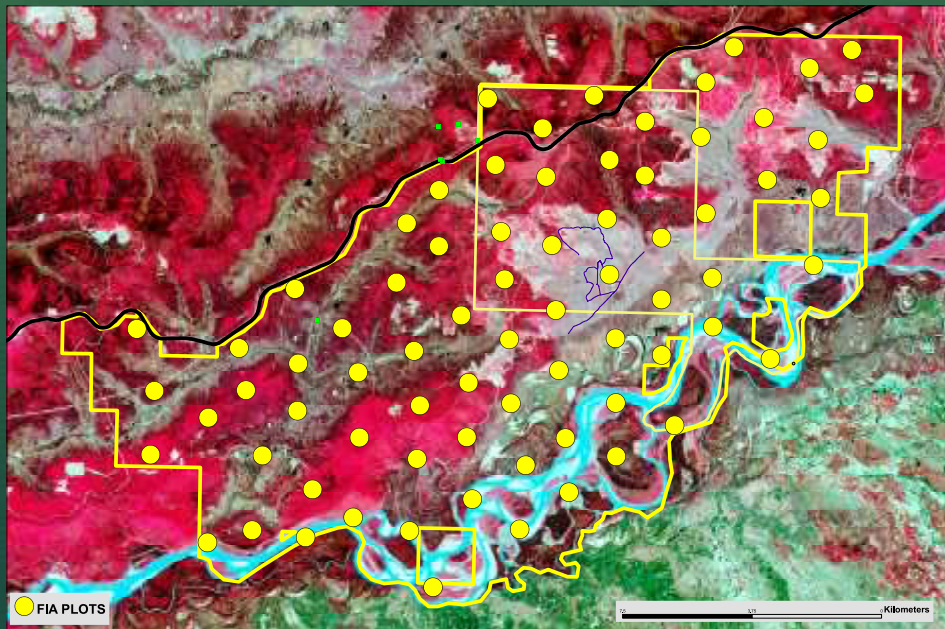
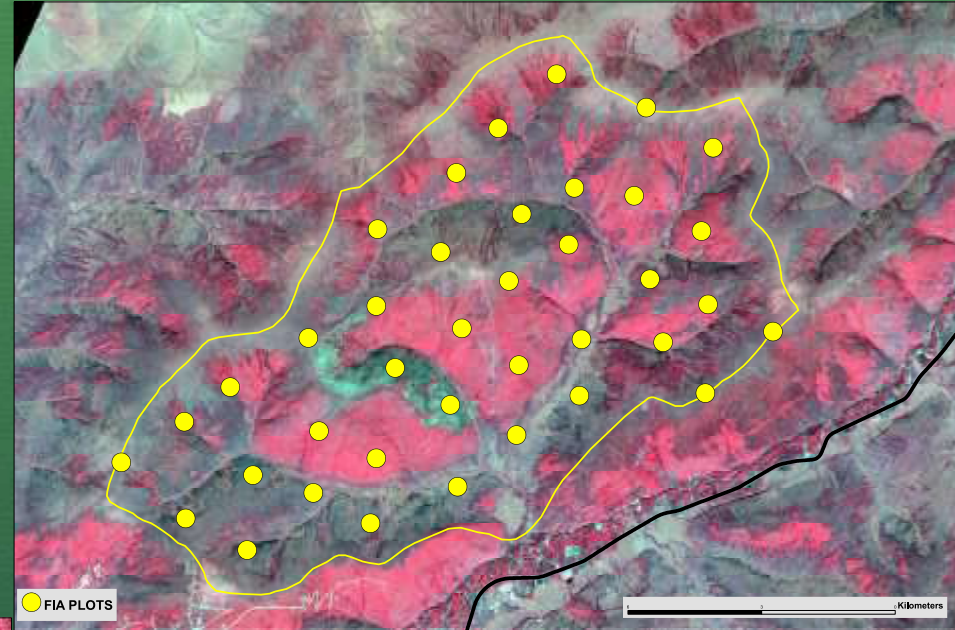
NSN datasets

- 30 young sites (< 30 years), 33 intermediate sites (> 40 < 80 years), and 33 mature sites (> 80 years)
- Tree inventory
- Climate stations in each ecoregion (soil temp, soil moisture, precip, and thaw depth)
- Soil descriptions
- Vegetation (composition, shrub density, litterfall, seed traps, dendrometers)
- Herbivory (vertebrate, insects)

FIA contracting work (2011-2014)

- Experimental Forest
- Tanana Valley State Forest

FIA of BCEF and CPCRW



FIA of Tanana Valley State Forest

2014 Interior Alaska Forest Inventory Pilot Project

Interior Alaska Forest Inventory Pilot Project 2014

What is it?

A large data collection effort targeting the Tanana River Valley, including:

- Remotely sensed data
- Establishing an On-the-Ground plot network

Why here?

The Alaska boreal biome (~ 1/5th of forests in the US) is an essential part of the energy, carbon and water cycling in the global ecosystem. Over the past 35 years, Alaskan boreal forests have experienced significant warming, resulting in:

- impacts on spruce growth
- shifts in vegetation
- wildfire frequency and intensity
- melting permafrost
- changes in greenhouse gas emissions
- changes in wildlife habitat
- changes in water levels

Who?

- The U.S. Forest Service
- Forest Inventory and Analysis (FIA) program
- University of Alaska - Fairbanks
- NASA
- State of Alaska Division of Forestry
- Tanana Valley State Forest
- U.S. Fish and Wildlife Service
- Tetlin National Wildlife Refuge

FIA plots established in interior Alaska along with NASA remotely sensed data can be used to measure and monitor this relationship. The Pilot Project efforts are aimed at refining forest inventory and monitoring protocols that can be used efficiently to measure the vast interior Alaska boreal forest biome.

What's next?

Because of the vastness and inaccessibility of the boreal forest in Alaska, cooperation among land owners/managers, development of efficient measurement protocols and logistical support innovations will be crucial to understanding boreal forest dynamics in interior Alaska.



<http://goo.gl/WTQ6lp>



<http://goo.gl/10YhYr>



Vicinity Map

Legend

- Tanana Valley State Forest plots completed in 2014
- Tetlin National Wildlife Refuge plots completed in 2014



Conclusions

- LTER researchers have been studying reforestation after flooding and fire since the 1960s
- There are many projects at both local and regional scales that are looking at regeneration, tree inventory, vegetation composition, and linking these patterns to environmental and climate variables.
- Visit the LTER website: lter.uaf.edu for more information on datasets, interactive maps of research locations, and publications.