

The Front Range Forest Reconstruction Network: Reconstructing Forest Structure and Fire History in Montane Front Range Forests to Inform Restoration Activities

Paula J. Fornwalt¹; Peter M. Brown^{2,3}; Laurie S. Huckaby¹; Michael A. Battaglia¹; Antony S. Cheng³

¹ USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO

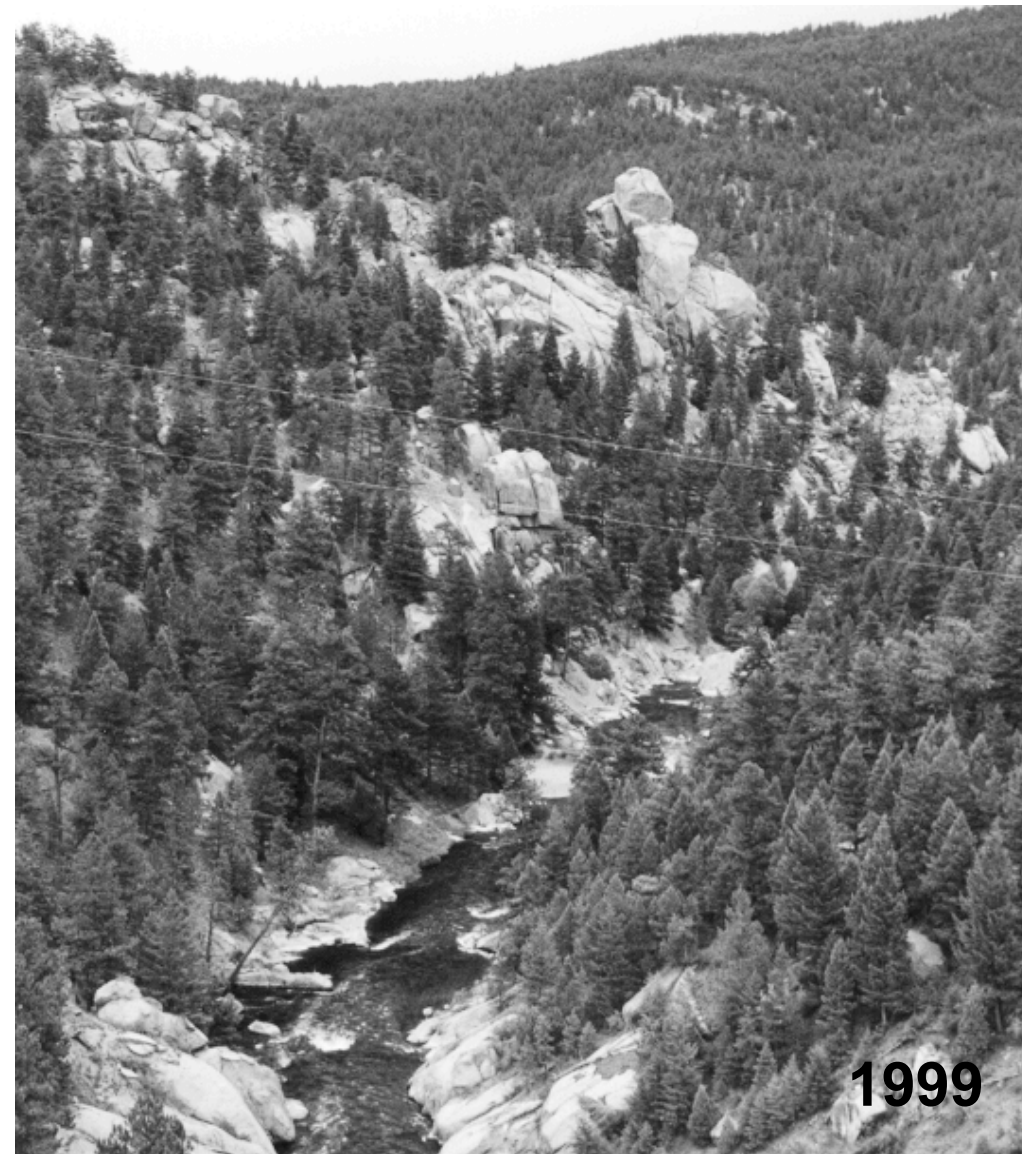
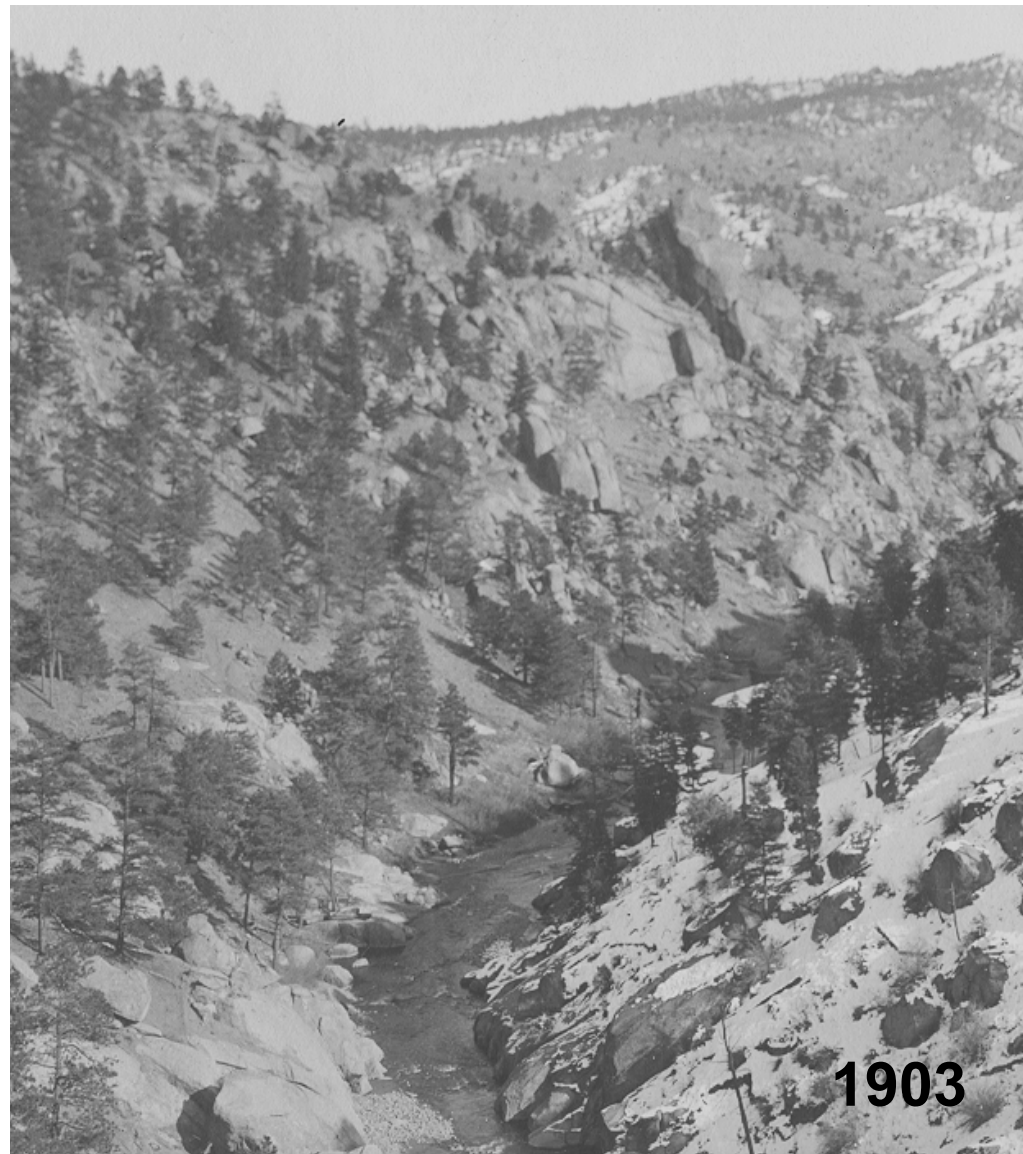
² Rocky Mountain Tree-Ring Research, Fort Collins, CO

³ Colorado Forest Restoration Institute, Colorado State University, Fort Collins, CO



Background

- In the Colorado Front Range, current conditions in many montane ponderosa pine – dominated forests are believed to be well outside the historical range of variability (HRV) due to a century of fire suppression, logging, and other factors.
- Many Front Range land managers are currently working to implement restoration treatments in these forests, with the goal of restoring healthier, more resilient forest ecosystems.
- HRV information can serve as a model for sustainable conditions, and thus can be useful to guide restoration prescription development and to evaluate the success of treatments at restoring resilient ecosystems.
- Detailed HRV information is largely absent for montane Front Range forests. Although HRV studies have been conducted for other ponderosa pine – dominated ecosystems, such as the southwest, climatic and topographic influences that likely governed historic disturbance regimes and forest structures differ substantially for the Front Range, and regional knowledge is needed.



(Left) A ponderosa pine forest on the Pike National Forest in 1903. This photo was taken near Deckers, CO. (Right) The same area in 1999.

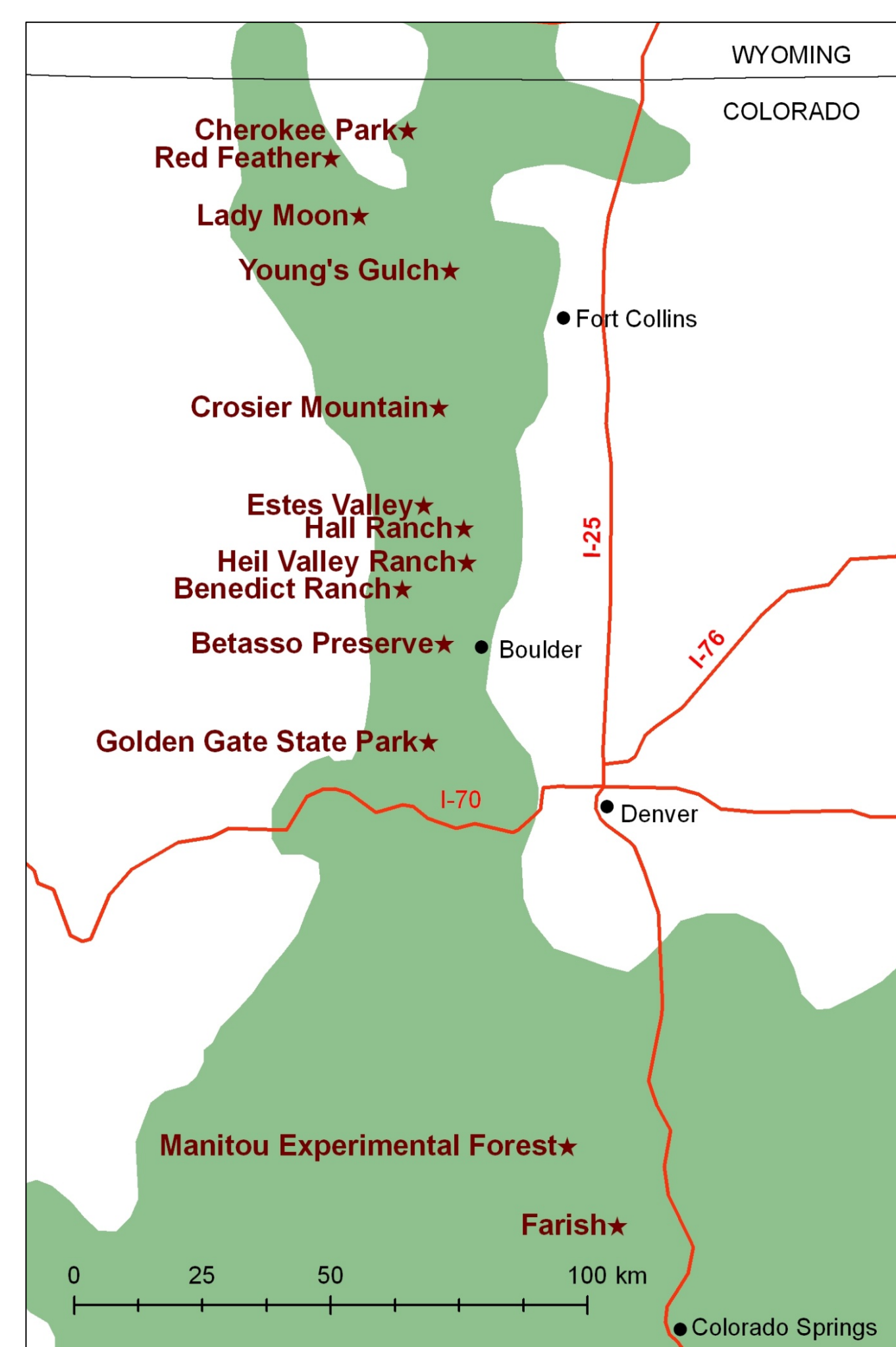
Objectives

- Reconstruct historical (ca. 1860-1880) forest structure, forest spatial patterns, and fire regimes.
- Test hypotheses about environmental conditions affecting reconstructed variables.



(Left) A mechanical forest restoration treatment being implemented in 2012 on the Pike National Forest.

Study sites

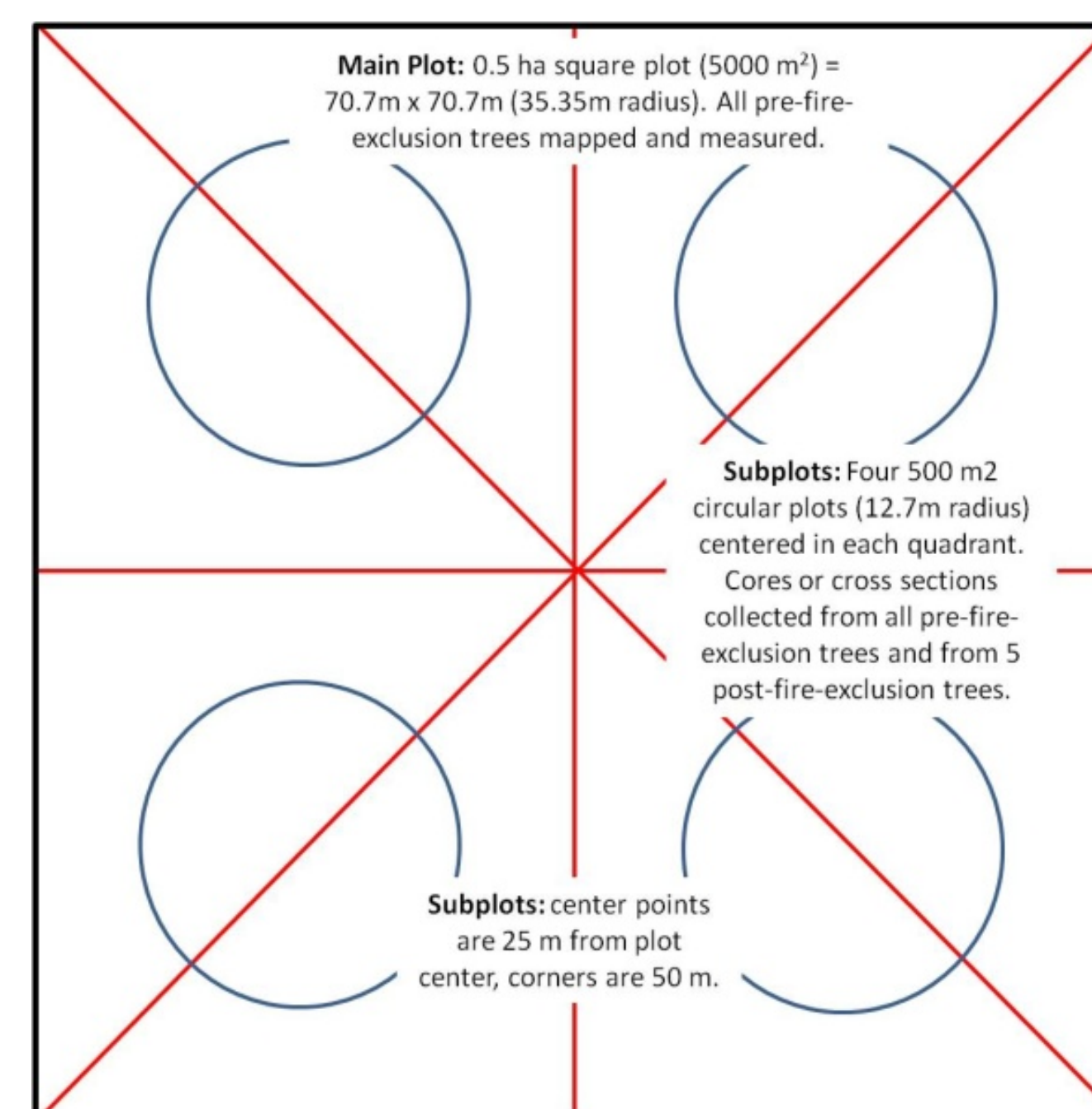


- In 2012, we established 13 study sites across the montane zone of Front Range. Sites were located to capture the region's elevational and latitudinal gradients.
- Each site contained 3 - 7 randomly located 0.5-ha plots (n=73 plots).
- Additional sites/plots will be established in 2013 - 2014.

(Left) The location of the 13 study sites. The green shaded area reflects the general distribution of ponderosa pine.

Methods

- Historical forest structure and spatial patterns:** All pre-settlement "trees" were measured and stem-mapped within each 0.5-ha plot. Pre-settlement trees were defined as (1) living trees ≥ 20 cm DBH, (2) living trees < 20 cm that exhibit old-age morphological characteristics, or (3) remnant trees (i.e., snags, logs, and stumps, excluding recently dead trees < 20 cm DBH). All pre-settlement trees were cored or cross-sectioned for age within four 500-m² subplots. Relationships between environmental factors, tree age, tree diameter, and tree morphology will be developed from the cored trees to aid in culling post-settlement trees from the larger dataset.
- Historical fire regimes:** Cross sections or cores were taken from all fire-scarred trees in the 0.5-ha plot.



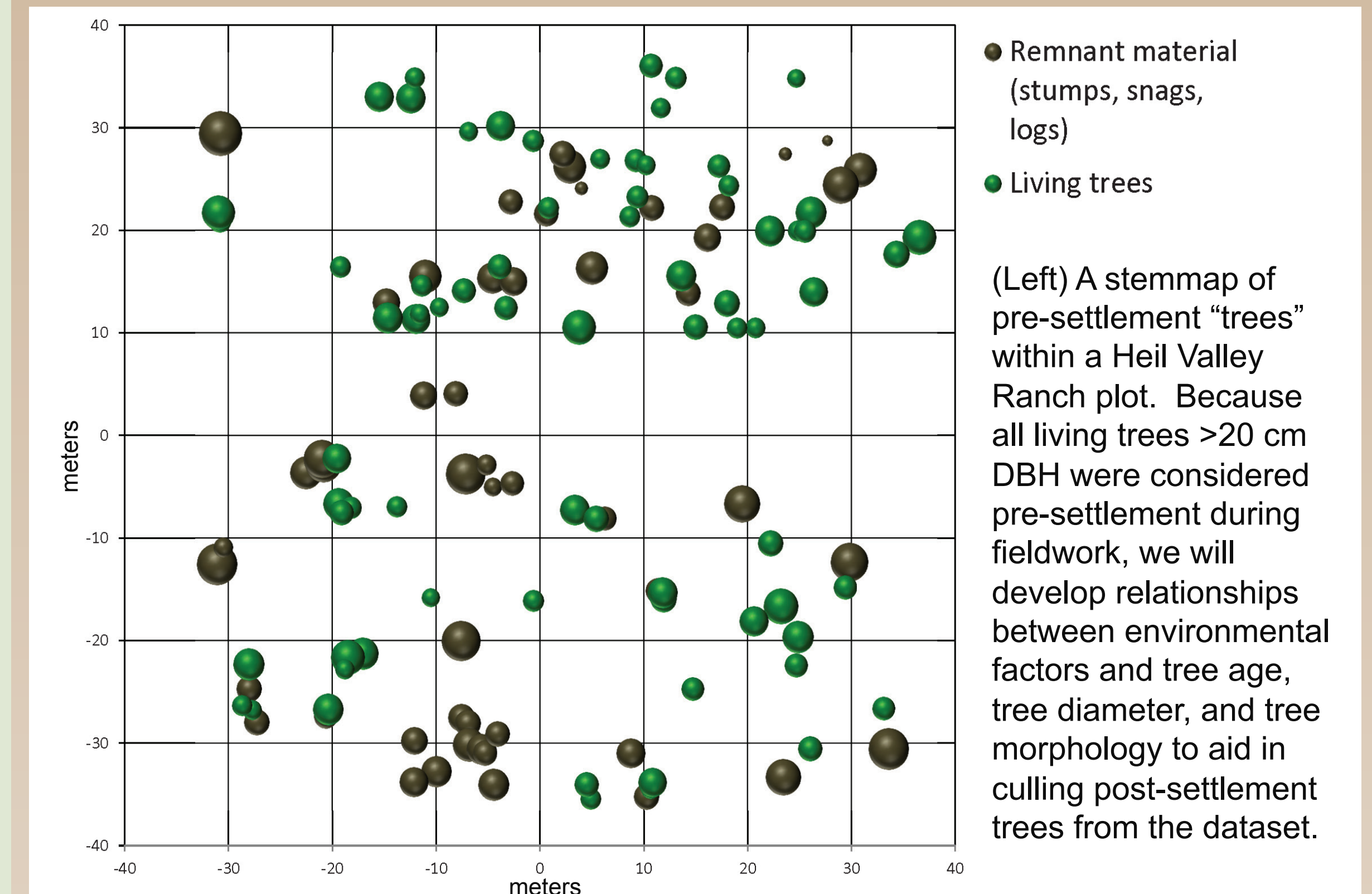
(Left) The layout of the 0.5-ha plot and the 4 500-m² subplots.

(Below) Measuring diameter on a pre-settlement ponderosa pine.



Historical forest structure and spatial patterns

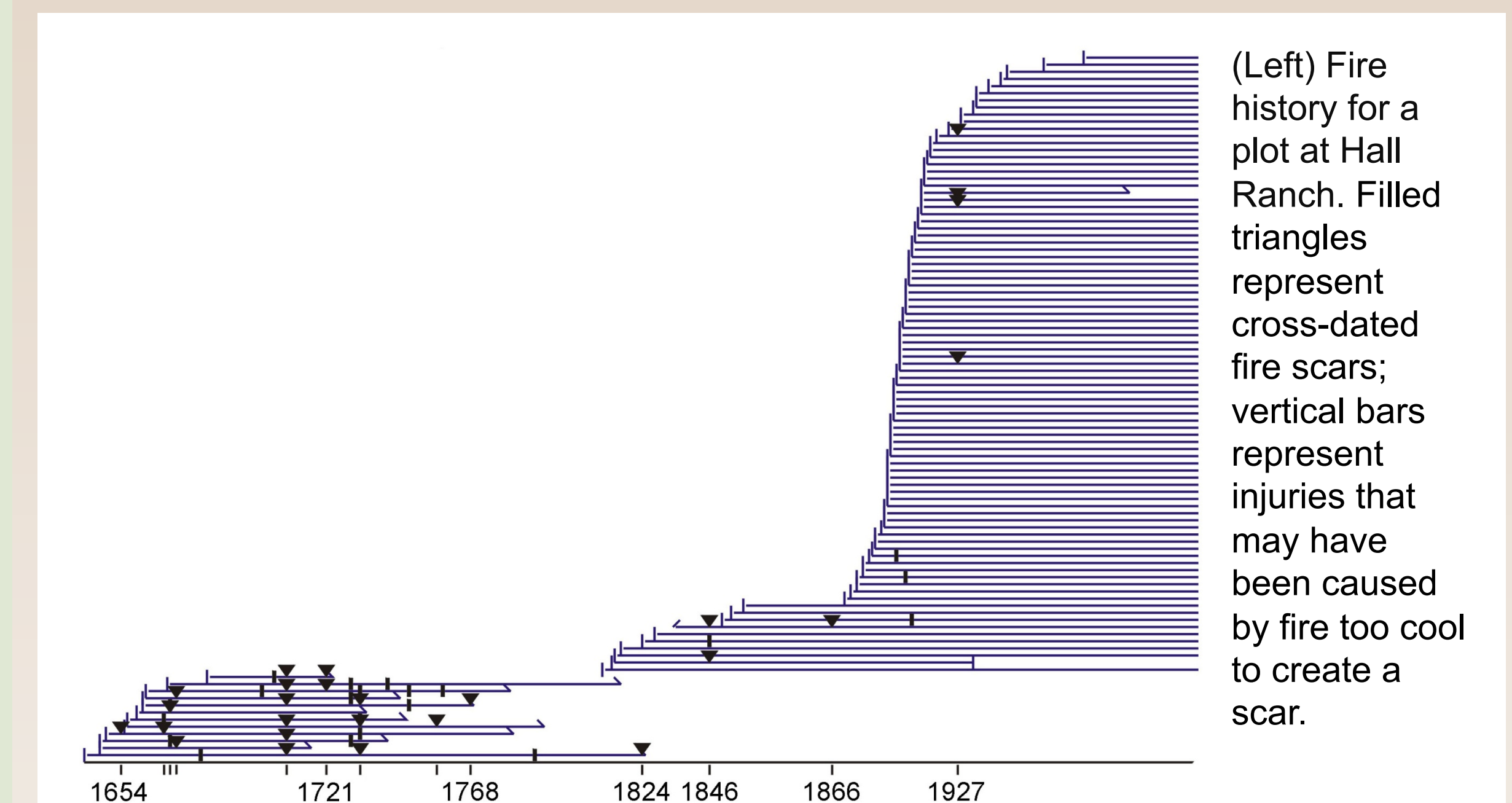
- Historical forest structure metrics – e.g., species composition, tree density, basal area, tree size and age distributions – will be developed for all plots.
- Within-stand historical forest spatial patterns – e.g., degree of tree groupiness, number of trees per group, group area, distance between groups – will also be evaluated.
- The influence of environmental conditions – e.g., aspect, elevation, latitude, fire history, climate – on historical forest structure and spatial patterning will also be examined by leveraging the full network of sites and plots.



(Left) A stemmap of pre-settlement "trees" within a Heil Valley Ranch plot. Because all living trees >20 cm DBH were considered pre-settlement during fieldwork, we will develop relationships between environmental factors and tree age, tree diameter, and tree morphology to aid in culling post-settlement trees from the dataset.

Historical fire regimes

- Historical fire regime characteristics to be reconstructed include fire frequency, behavior, and seasonality. We will also examine the extent to which environmental factors drive fire regime characteristics.



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