Reconstructing late-1800s landscapes of the Uncompahgre Plateau using the General Land Office Surveys

William L. Baker, Emeritus Professor
Program in Ecology/Dept. of Geography
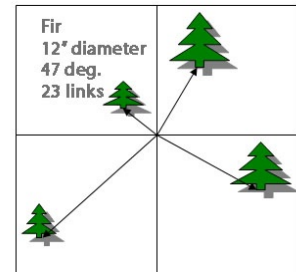University of Wyoming, Laramie

GOAL
- Use late-1800s land-surveys to provide landscape-scale data to complement stand-level rapid assessments to further inform ecological restoration on the Uncompahgre Plateau

THE GENERAL LAND OFFICE (GLO) SURVEYS
- Rectangular surveys: townships 6 miles X 6 miles with 36 sections each 1 mile X 1 mile

- Data
  - Bearing trees at marked section corners
  - Section-line descriptions of dominant trees & shrubs in order of abundance
    "Timber heavy pine and spruce. Dense undergrowth of oak"

- Can use these data to reconstruct:
  - Tree density
  - Tree basal area
  - Tree species composition
  - Tree diameter distributions
  - Understory composition (dominant shrubs) and relative abundance
  - Fires: severity, patch size, fire rotation
  - Location of ecotones (e.g., boundary from subalpine forest into grassland openings)

THE UNCOMPAHGRE GLO PROJECT - 2014 PROGRESS
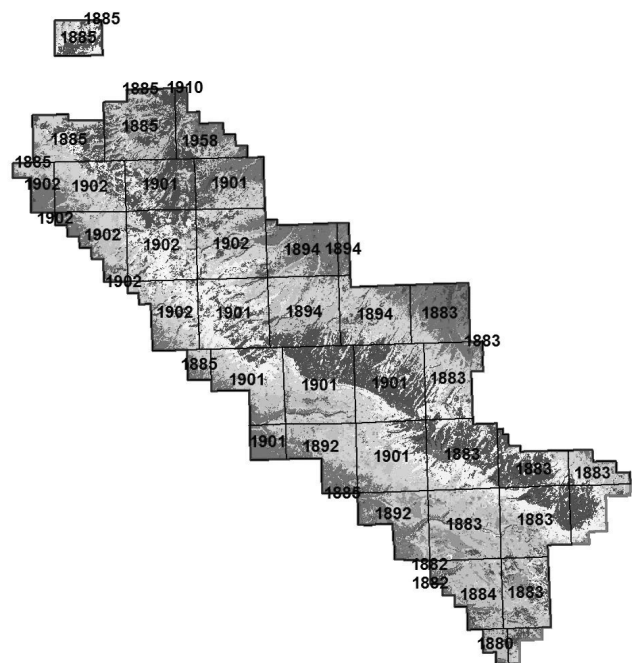- 2014 startup funding from Colorado Forest Restoration Institute–Thanks to Tony Cheng

- Collab. with Dan Binkley, Bill Romme-CSU

- Study Area
  - Plateau section-Uncompahgre NF
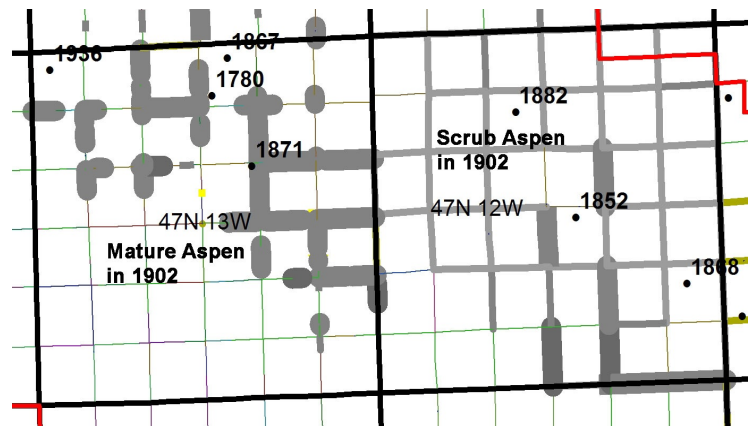 - Mostly surveyed 1883-1902

- Entered data into GIS in Fall 2014
  - About 650,000 acres and 28 townships
  - 3,507 bearing trees
  - 4,070 section-line descriptions across 2,011 miles of section lines
  - Covers
    - Pinyon-juniper woodlands
    - Ponderosa pine forests
    - Mixed conifer forests
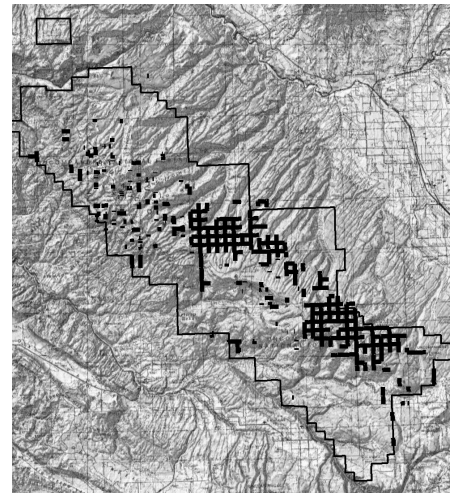   - Spruce-aspen forests

SOME INITIAL OBSERVATIONS FROM THE GLO DATA

- Aspen forests on the Plateau likely link to an 1879 fire and other 1800s fires

  - Binkley et al. 2014 found the Plateau's aspen forests were strongly shaped by late-1800s fires that initiated many stands
  - Binkley et al. stand-origin dates (solid dots) that are older match with aspen that were mature & dates after 1879 match with "scrub" aspen in 1902.

- Scrub aspen (dark lines) common both (1) in openings without trees and (2) in understories of forests over large areas on the Plateau at the time of surveys.

  - This supports a hypothesis that the 1879 fire on the Plateau or other late-1800s fires were spatially extensive and varied from low- to high-severity.
  - Scrub aspen in openings likely from high-severity fires that killed most pre-fire trees
  - Scrub aspen in understories of forests likely from moderate-severity fire that killed many pre-fire trees, but left many canopy survivors

- These initial observations suggest restoration dilemmas
  - Should we restore the unusually open conditions that occurred shortly after these late-1800s fires or the mature forests that dominated before these late-1800s fires or should both be restored?
  - Are today's forests (e.g., older aspen) the product of recovery from late-1800s fires, so that they are not necessarily in need of restoration, or are today's forests in abnormal condition because of fire suppression, logging, and other land uses or are today's forests a complex mix of both natural recovery and land-use effects?

- Many high-elevation openings in spruce-aspen areas were likely dominated by bitterbrush (*Purshia tridentata*), based on the section-line data.

PROPOSED 2015 WORK, IF FUNDING IS AVAILABLE

- Complete fieldwork (about 1 month) needed to:
  - Revisit section corners and section lines to resolve remaining uncertainties in GLO data (e.g., ambiguous tree names, such as "spruce")
  - Collect detailed data on trees (crown radius, Voronoi area) needed for reconstructions
  - Develop dating and sampling methods to resolve the role of the 1879 fire and other late-1800s fires enough to allow their effects to be mapped across the Plateau

- Complete detailed reconstructions of tree density, basal area, composition etc. across the study area using GIS.

- Archive completed datasets with Colorado State University, so available to everyone