Building a fire history
White Lake State Park Fieldtrip June 12, 2026
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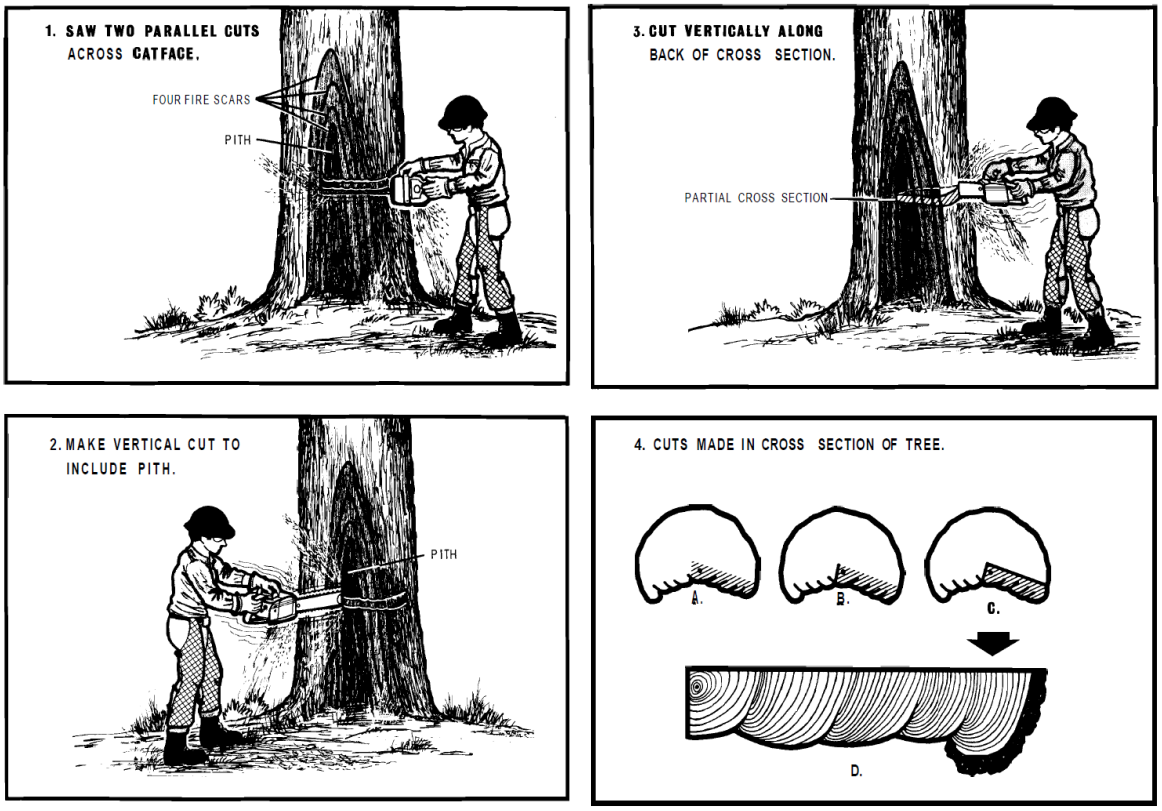
Fire history reconstruction uses tree ring fire scars to determine when fires occurred in the past. The process involves (1) collecting samples from scarred trees, (2) preparing and crossdating the samples to assign exact calendar years to tree rings, and (3) identifying and compiling fire scars into a site-wide fire history.

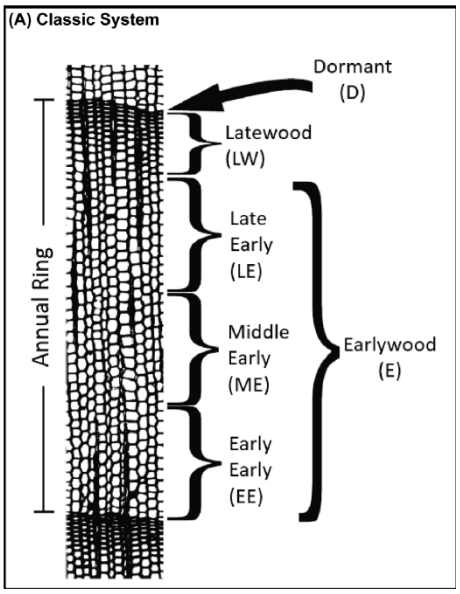
Sampling multiple fire scars on a single tree *requires* a cross section to be removed. Removing a section off the top of a stump is easy, but from a standing tree or log, other techniques are required. This set of images shows the basic premise (from Arno and Sneck 1977)



Will sampling hurt the tree? No: Fire-scarred trees have already survived substantial injury and often continue growing for decades after the original wound formed. A long-term observational study last published in 2017 showed that 21 years following sampling there was no significant difference in mortality rates of sampled versus unsampled trees (Heyerdahl and McKay 2017). The greatest threat to sampled and fire-scarred trees is fire, especially after the long absence of fire on many landscapes. A carefully cut sample should remove less than 10% additional basal area, leaving plenty of holding wood to keep the tree upright. However, extreme caution should be practiced when sampling and afterward in the case that the tree does become weakened in any way.

Preparing fire-scarred samples for analysis requires substantial labor and patience. The samples must be dried, then sanded to a fine polish. This usually starts by removing the chainsaw kerf edge with coarse sandpaper (25-36 grit), a hand planer, or a bandsaw before progressing through steadily finer sandpapers. Common grit sequences are 120, 220, 320, 400. Since fire-scarred trees produce abundant resin, the pieces must be kept cool and a sandpaper “eraser” is necessary to clean between samples.

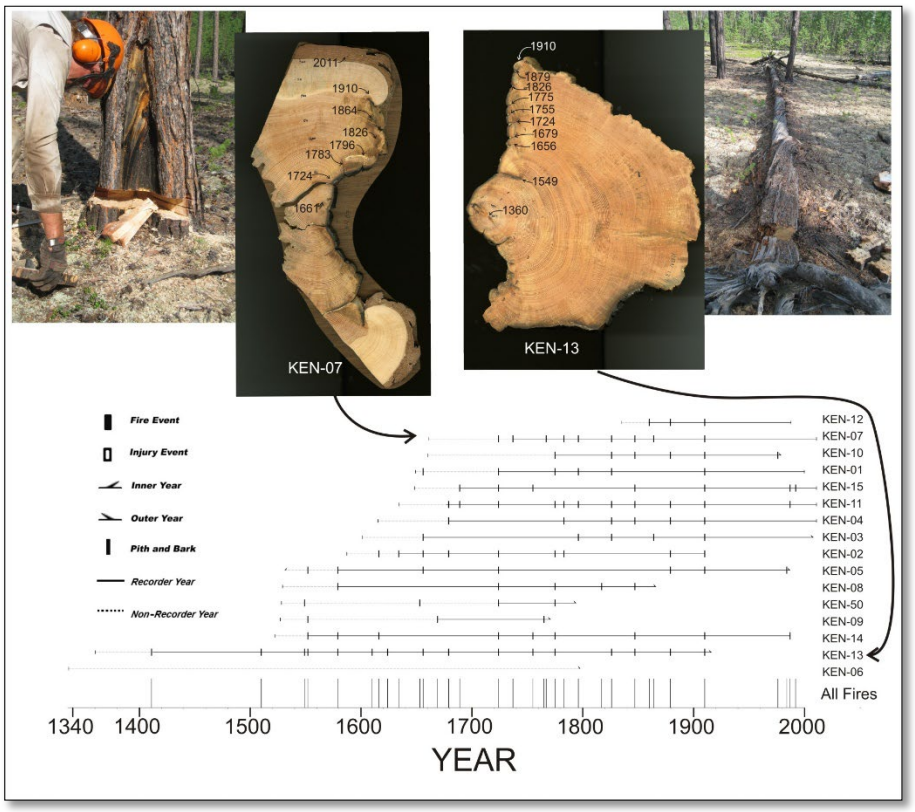
Fragile or broken samples need to be carefully and painstakingly glued together, using basic wood glue, clamps and weights. Many in the field will mount pieces on 4-ply, roughly ½" thick plywood.



Crossdating is the process of matching patterns of wide and narrow rings among trees to assign an exact calendar year to every ring. Without crossdating, fire scars can only be assigned an approximate age. There are many reference books (e.g., Speer 2010) that describe the process and practice of crossdating, and there is no substitute for practice and patience. Successful crossdating can feel almost magical.

Determining the fire scar dates requires a well-sanded surface. The scars are assigned to the year of the ring growth in which they are found. The position of a scar within an annual ring can often indicate the season in which the fire occurred. As seen here (from Caprio and Swetnam 1995), there are 6 seasonal designations: three in the earlywood portion of the ring (early, middle, and late), latewood, and dormant. Dormant-season fires pose the greatest challenge of assigning the correct year because they could be formed in the fall or spring. Local phenology, fire seasons, or intra-ring positions of other scars in the same year are used to help define the default year to assign the fire.

Assembling the fire history for a site provides the time series for each tree, from inside ring to outside, along with each of the fire scars observed on the trees. Researchers distinguish between a tree's 'recording' and 'non-recording' periods. Before the first scar forms, a fire may pass the tree without leaving evidence. Once a scar exposes wood, subsequent fires are much more likely to leave additional scars, creating a more reliable fire record..



The resulting fire chart displays each sampled tree as a timeline, with fire scars marked at their dated positions. By comparing many trees, we can identify how often fires occurred, how widespread they were, and whether fire activity changed through time.