

Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

JANUARY 2020



Morphology Is Better Than Size for Revealing a Tree's Age on Colorado's Front Range

Why Identify Old Trees?

In Colorado's Front Range, restoring fire-dependent ponderosa forests is a management priority often informed by understanding the historical structure and ecological function of these forests. Retention of old ponderosa pine trees within restored stands provides forests with a diversity of age structure, genetics, and resilience to low to moderate severity wildfires.

Ponderosa pine trees reveal their ages through several morphological characteristics that change over their potentially long lives. A tree with dark, rough bark that's paired with a pointed crown with small branches means

it's likely less than 150 years old. A tree with orange, smooth bark and a flattened crown and large branches is likely older than 150 years. But why is a tree's diameter, an obvious morphological characteristic, not as useful to determine its age? It's a common assumption that the larger the tree, the older it is.

"The problem with this approach is the correlation between tree age and tree size is generally very poor in the Front Range because we're so water limited," explains Laurie Huckaby, an ecologist with the Rocky Mountain Research Station (RMRS). "A relatively young well-watered tree can get huge whereas a tree growing on a slope where it's not getting much water could hang out there for 500 years and not be all that big or remarkable."



Ponderosa pine, a common species found on the Front Range, has distinct morphological characteristics that can be used to generally determine tree age. Field Guide to Old Ponderosa Pines in the Colorado Front Range published by RMRS is a useful tool for forest managers who don't have time or ability to take increment cores and crossdate samples (photos by (left) P. Brown, Rocky Mountain Tree Ring Research and (right) L. Huckaby, USDA Forest Service).

Validation in Using Morphology

Although the only sure means to age a tree is taking an increment core and crossdating the ring series, morphological clues can be useful for a quick age assessment by managers. In 2003, the RMRS published *Field Guide to Old Ponderosa Pines in the Colorado Front Range*, a General Technical Report (GTR-109) of which Huckaby was the lead author. This GTR provided visual examples of morphological characteristics that distinguish older and young ponderosa pine trees.

A recent study published by a research team comprised of Peter Brown, the director of Rocky Mountain Tree Ring Research, Huckaby, and other researchers with

RMRS and the Colorado Forest Restoration Institute at Colorado State University validates the use of morphology when determining whether a tree is old or young. When field crews classified trees as old or young based upon morphology, Brown reports that “96 percent of the time our crews were able to classify it as an older tree just using morphological features.”

“Using these morphological characteristics works, if one of your goals in your management implementation and planning is to retain old trees in your projects,” he adds.

Another important age classification is transitional; these are trees, usually 100 to 200 years old, with characteristics of both older and younger trees. Transitional trees are common on the Front Range because they coincide with when the area was settled in the mid-late 1800s. Because these trees will be the old growth of the near future, they are important to retain in restoration activities when old trees are unavailable.

Limitations to Using Morphological Characteristics

With the range of ponderosa pine stretching throughout the West and restoration projects underway in many areas, it would be logical to assume that all old trees have similar morphological characteristics. Huckaby cautions that applying the morphological characteristics observed on the Front Range might not work reliably elsewhere. “For instance, the trees in the Southwest tend to grow bigger because they have a more predictable growing season,” she explains. “Because the conditions are different, the morphological characteristics may occur at different ages.”

KEY FINDINGS

- Due to generally dry conditions of the central Rocky Mountain’s Front Range, morphological characteristics are a more reliable predictor of tree age than diameter at breast height (dbh).
- Older trees (> 150 years old) have morphological characteristics that include a high crown base height, large branches, a flattened crown, and orange smooth bark.
- Morphological characteristics of younger trees (< 150 years old) include a low crown base height, small branches, a pointed crown, and black, rough bark.
- Transitional trees, those with characteristics of both older and younger trees, were usually 100 to 200 years in age.

The techniques and criteria developed and outlined in *Field Guide to Old Ponderosa Pines in the Colorado Front Range* may be applied to ponderosa pine in other locations within its range, but local age data should be used to correlate with the timing of morphological changes.

Peter Brown is the Director of Rocky Mountain Tree Ring Research, a nonprofit located in Fort Collins, Colorado. His research focuses on tree-ring collection, dating, and analysis. Peter can be contacted at pmb@rmtrr.org.

Laurie Huckaby is an Ecologist with the Rocky Mountain Research Station. Her research focuses on reconstructing historical forest structure, fire history, insect outbreaks, and stand structure relative to disturbance and land use in Colorado using dendrochronology. Connect with Laurie at <https://www.fs.usda.gov/rmrs/people/lhuckaby>.

FURTHER READING

Brown, P.M.; Gannon, B.; Battaglia, M.A.; Fornwalt, P.J.; Huckaby, L.K.S.; Cheng, A.S.; Baggett, S. 2019. Identifying old trees to inform ecological restoration in montane forests of the central Rocky Mountains, USA. *Tree-Ring Research* 75: 34-48. www.fs.usda.gov/rmrs/publications/identifying-old-trees-inform-ecological-restoration-montane-forests-central-rocky.

Huckaby, L.S.; Kaufmann, M.R.; Fornwalt, P.J.; Stoker, J.M.; Dennis, C. 2003. Field guide to old ponderosa pines in the Colorado Front Range. Gen. Tech. Rep. RMRS-GTR-109. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p. www.fs.usda.gov/rmrs/publications/field-guide-old-ponderosa-pines-colorado-front-range

Huckaby, L.S.; Kaufmann, M.R.; Fornwalt, P.J.; Stoker, J.M.; Dennis, C. 2003. Identification and ecology of old ponderosa pine trees in the Colorado Front Range. Gen. Tech. Rep. RMRS-GTR-110. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 47 p. www.fs.usda.gov/rmrs/publications/identification-and-ecology-old-ponderosa-pine-trees-colorado-front-range

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