Forensic Forestry: Learning from history for a resilient future

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Forests of the future will face wildfires, insects, disease, and a changing climate promoting increasingly common wildfires. To restore the resilience of America's forests across millions of acres, collaborations such as the Ashland Forest Resiliency (AFR) partnership integrate science with social considerations to develop and apply pragmatic forest management. Ongoing research looks to forests prior to the era of fire exclusion to provide perspective on contemporary forest restoration projects.

Forensic forestry

The Nature Conservancy's and partner scientists are scouring the hills surrounding the Rogue Basin to learn what ancient forests looked like. They are measuring and mapping existing old growth and fallen giants to learn about conditions in the past, including past fires that scarred the trees. The field crew spends long days cutting slices ("cookies") from logs and stumps, and boring living trees. Patterns observable in the trees' annual growth rings will allow them to establish tree ages and the dates of historical fires, some dating back over 400 years.

Altered fire frequency

A preliminary analysis of 75 fire scars sampled in the 14,000 acre Ashland watershed has shown that historically fires were frequent – occurring every three years (range 1-14) up until the early 1900's (Figure 1). Ancient giant trees survived tens of fires over their lifetimes, but the scarcity of fire in the 1900's has dramatically changed forest composition and function.

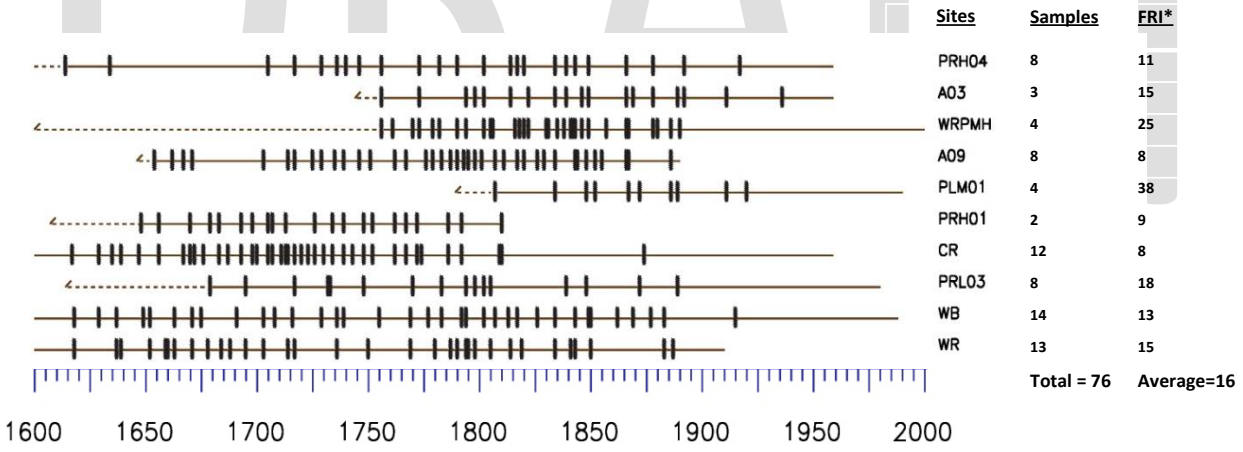

Figure 1: Fire occurrences in the Ashland watershed at 10 sites with mean fire return interval (FRI) for each site and averaged across the watershed. Horizontal bars represent particular sites within the watershed and vertical bars represent fires that scarred at least two trees at that site. Crossdating and analysis conducted by Carl Skinner of the Pacific Southwest Research Station.

Altered forest composition and structure

A profusion of white fir and Douglas-fir have grown in since the settlement era—a striking change with consequences for forest communities and fire behavior. Maps of trees reconstructed back to 1865 were patchy in distribution and composed of large diameter ponderosa pine, sugar pine, Douglas-fir (Figure 2) and at lower elevations, black oak and pacific madrone.

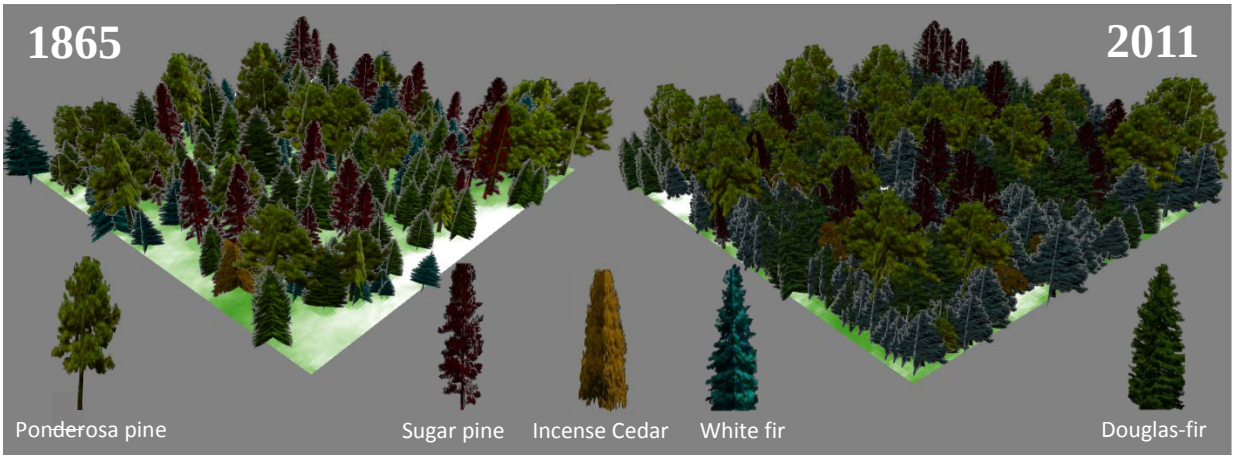

Figure 2: Comparison of historic verses contemporary forest structure on 7.4 acres of Ashland forest in a productive setting at 4,500 feet above sea level.

Historically resilient forests of the watershed contained one-third as many trees as found currently with the major increases in small white fir, Douglas-fir, and pacific madrone (Figure 3). Plots from across the entire watershed reveal only 50 trees per acre (range 16-121) in the year 1911, with the number swelling to 176 trees per acre (range 28-401) today. The cross-sectional area of trees has more than doubled from 81 ft^2/acre (range 13-225) to 194 ft^2/acre (range 63-339) in 2011.

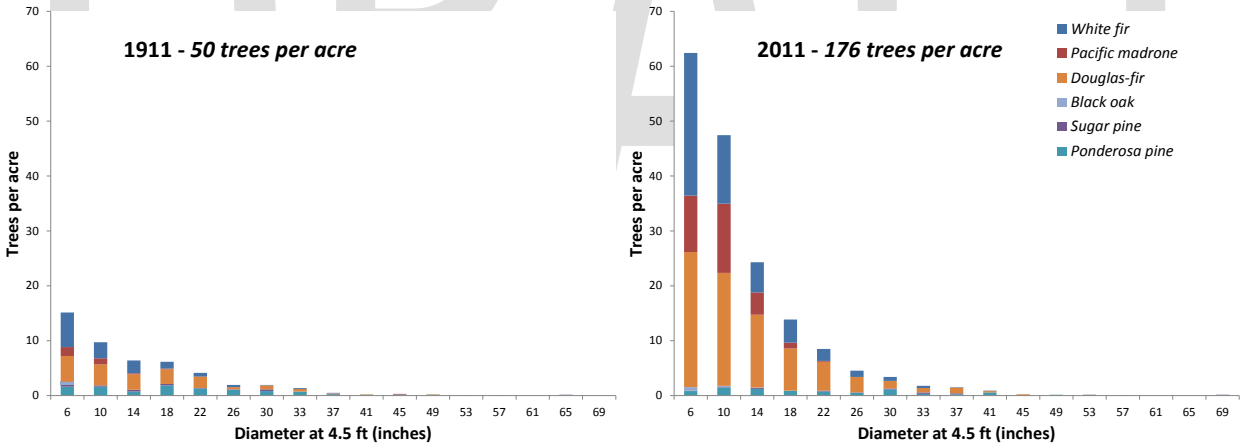

Figure 3: Size class distribution of trees >4 inches at 4.5 feet in 1911 and in 2011 by species.

Applying the past to the future

Acting with partners, The Nature Conservancy is incorporating forensic forest data, social concerns, silvicultural knowledge about how trees grow, fire behavior modeling, and critical wildlife habitat in forest restoration projects throughout the US. Ashland Forest Resiliency is one such project where the recent sights and sounds of chainsaws, logging trucks, and drip torches are promoting resilient forests of the future.

The Ashland Forest Resiliency project is in a Late Successional Reserve where both Northern Spotted Owls and Pacific Fishers abound. Tree removal can elicit a vigorous response from shrubs and regenerating conifers. Forest understories are important for diversity and wildlife habitat but can be

also be prone to more severe fire. In addition, highly erosive soils necessitate careful application of any active management. Balancing many objectives has resulted in commercial thinning prescriptions that reduce trees per acre by 50% and basal area by 29%, but applying a wide range of density targets to different implementation units (Table 1).

Table 1: Forest density targets and the percent reduction from pretreatment for the Ashland Forest Resiliency Project averaged across 48 commercial thin units.

Trees per acre		**Basal area ft^2/ac**	
Mean (Min-Max)	% Reduction (Min-Max)	Mean (Min-Max)	% Reduction (Min-Max)
199 (67-415)	50 (6-79)	144 (87-255)	29 (10-46)

Density targets alone tell an incomplete story; the size and species of trees are also critical. Prescriptions largely call for thinning from below with some variable density and radial thinning around old growth pines. When these prescriptions were applied to a 7.4 acre reconstruction plot, the result was a mix of species with spatial patterning more similar to the reference condition. Retained old forest structures ensured a clumped distribution among trees in the resulting stand and density reduction provided openings critical for modifying fire behavior and promoting shade intolerant species (Figure 4).

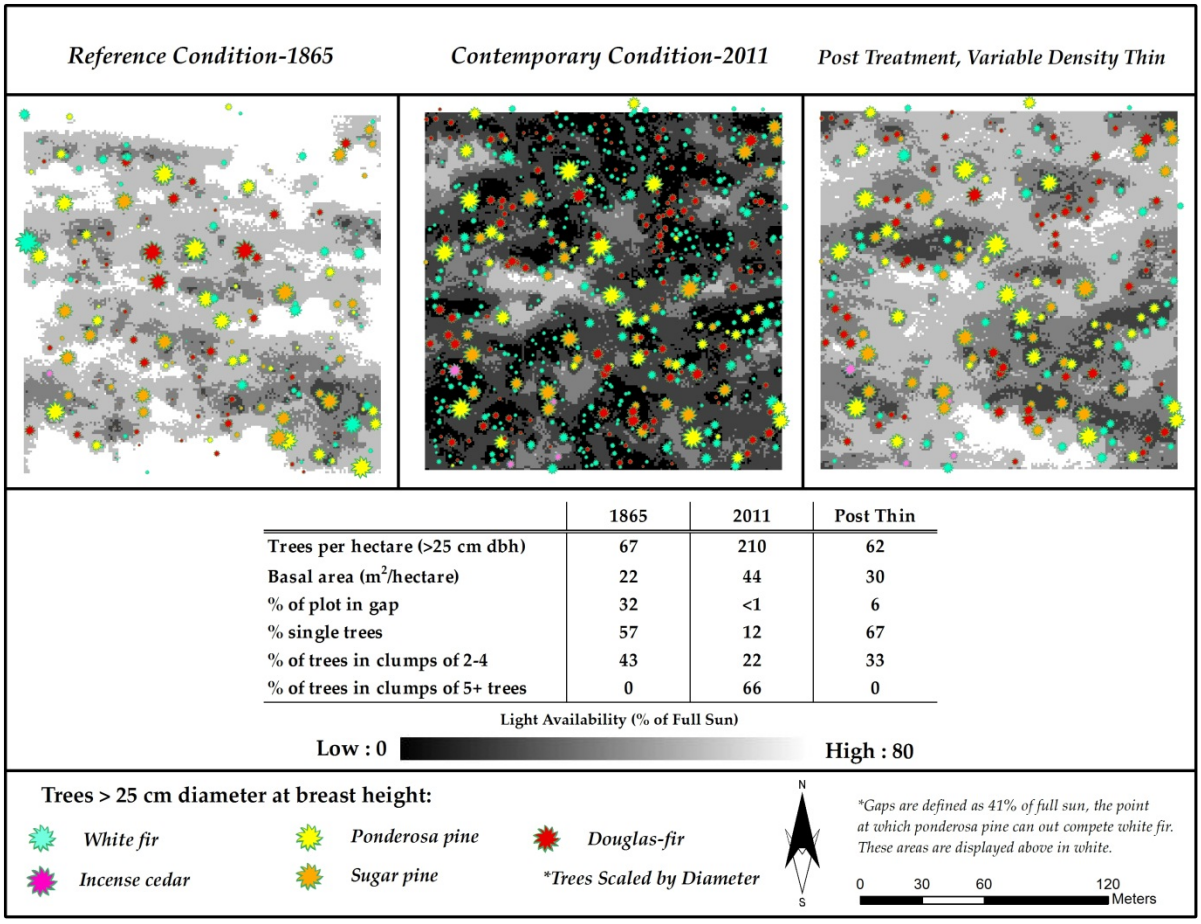

Figure 4: A representative stand of mixed conifer forest with many existing old growth trees before, and after proposed forest resiliency treatments. **Only includes trees >10 inches DBH**.

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