



FIRE HISTORY IN THE GREATER SANTA FE FIRESHED

FIRE SCARS a record of fire history

Historically, in ponderosa pine and dry mixed-conifer ecosystems in the American Southwest, surface fires primarily burned with low severity every 2-25 years on average. Ponderosa pine trees have thick bark that serves as an adaptation to help them survive fire, but occasionally enough heat can build up at the base of a tree, perhaps from a fallen log laying against the trunk, to kill the growing tissue beneath the bark. If the tree survives, it will heal over the wound and create a defined lobe of new growth. Trees heal slowly, and once an exposed wound--called a "catface"--is created, it will ooze sap and is more susceptible to burning again in subsequent fires. Each time the tree is wounded, it will try to heal itself, creating a new lobe, or "fire scar", that can be preserved for centuries in the tree rings. By studying the location of the fire scars within the tree's annual growth rings, scientists can accurately date fires to the year, and even the season. By dating hundreds of fire scars from trees over a geographical area, researchers can reconstruct a fire history, determining the frequency, extent, seasonality, severity, and fire-climate relationships of fires from centuries past.



The fire scars on this tree, which started growing in 1487, show that it survived 12 fires between 1521 and 1789.

FIRE HISTORY STUDY IN THE FIRESHED

- 1382 - Earliest fire scar
- 1890 - Last fire scar
- 127 years ago - Last recorded fire
- Every 6 years - Average fire occurrence interval in the study area
- Every 24 years - Average interval of a large fire burning over half of the study area
- 55% - Fires recorded in the study area that also burned in the Santa Fe River watershed, indicating likely extensive fire spread across the mixed-conifer forests above Santa Fe

Multiple tree-ring fire history studies exist within the Greater Santa Fe Fireshed - the area within which fires could directly affect Santa Fe, adjacent communities, and forested watersheds. The most recent study is being conducted by the US Geological Survey (USGS) in the four drainages directly north of the Santa Fe River watershed; Little Tesuque, Big Tesuque, Rio Chupadero (Pacheco Canyon) and Rio en Medio. By collecting and dating 500 tree-ring fire scars from 128 trees across the mixed conifer forests, USGS discovered that fires burned frequently for over four centuries, but that the area hasn't burned since 1890. The reconstructed fire data shows that most of the fires were low intensity, low-severity fires that left many surviving trees. There were small patches of tree-killing moderate and high-severity fire that occurred only rarely and after a period of multiple decades without fire. Climate had a strong effect, as fires typically occurred after dry winters, and the most widespread fires burned during severe drought years that followed wet years.

FIRE HISTORY IN THE GREATER SANTA FE FIRESHED

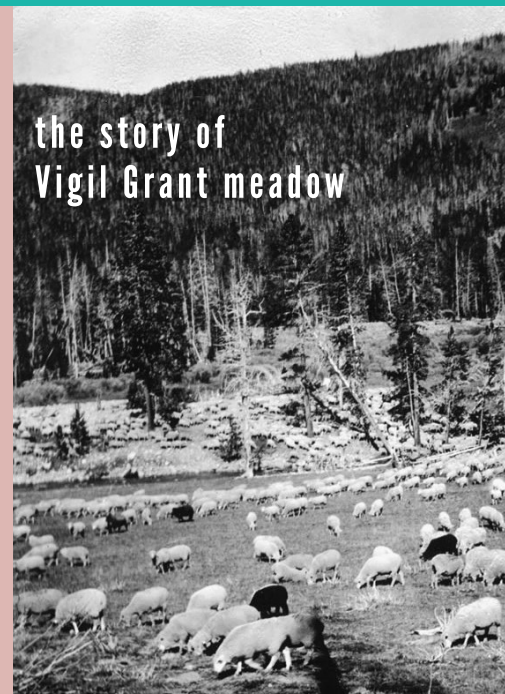
CONCLUSIONS

Similar to other dry conifer forests across the Western U.S., the mixed-conifer forests of the southern Sangre de Cristo Mountains burned frequently, primarily at low severity, for centuries up until the late 1800s when a big movement for fire suppression was ushered in. Lack of fire over the past century, especially in these productive, high-elevation forests, allowed fuels to accumulate that increases the risk of widespread, uncharacteristic, high-severity wildfires. Large high-severity wildfires just north of the Fireshed, like the Pacheco Fire in 2011, highlight the inevitable consequences of the existing conditions and the urgency to restore a forest structure that can support low-severity, beneficial fire in these important watersheds. The drought-fire association of past centuries indicates that with increasing drought severity under a warmer climate, wildfire occurrence, size, and severity are likely to increase.

POSSIBLE EARLY HUMAN-RELATED FIRE EXCLUSION

Three of the study's sites surround the Vigil Grant meadow in the Rio Chupadero drainage. Trees at these sites show to have survived up to 10 fires prior to 1780, but then underwent 80 years without fire, followed by a high-severity fire. Trees at plots outside of this area did not experience this long fire-free gap or the subsequent

high-severity fire. The Vigil Grant Meadow is at an intersection of the Rio Chupadero with Borrego Trail, which was used for moving sheep to and from Santa Fe and local communities. It is possible that sheep-grazing in the meadow and the surrounding forests beginning in the early 1800s eliminated grass that would have carried fire – effectively suppressing fires that continued to burn in the adjacent watersheds. This 80-year fire-free period allowed small trees and dead fuels to build up in the adjacent forests so that when a fire finally burned the area, it burned locally at high severity, killing most trees. This highlights the unintended effects that humans can have on fire and the connections between fire-free periods and fire severity. Vigil Grant Meadow is currently managed by Tesuque Pueblo, a partner of the Greater Santa Fe Fireshed Coalition.



This briefing paper was produced by the Forest Stewards Guild and is based off of recent work from Ellis Margolis at the U.S. Geological Survey.

For more more information and to see all the briefing papers visit us at:

www.santafefireshed.org

The Greater Santa Fe Fireshed Coalition is a partnership of agencies, private organizations, and concerned citizens who are working to build resilient ecosystems, protect watersheds, and reduce wildfire risk to the forests and communities in and around Santa Fe.



City of Santa Fe Water Division



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