**Title**

Recent fire severity is unprecedented compared to the previous four centuries in the Jemez Mountains, New Mexico

**Running Title**

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**Keywords:** Keywords

**Acknowledgments**: Acknowledgments. This paper was written and prepared by US Government employees on official time, and therefore it is in the public domain and not subject to copyright. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

**Target Journal**: Landscape Ecology

**Abstract**

Abstract

**Introduction**

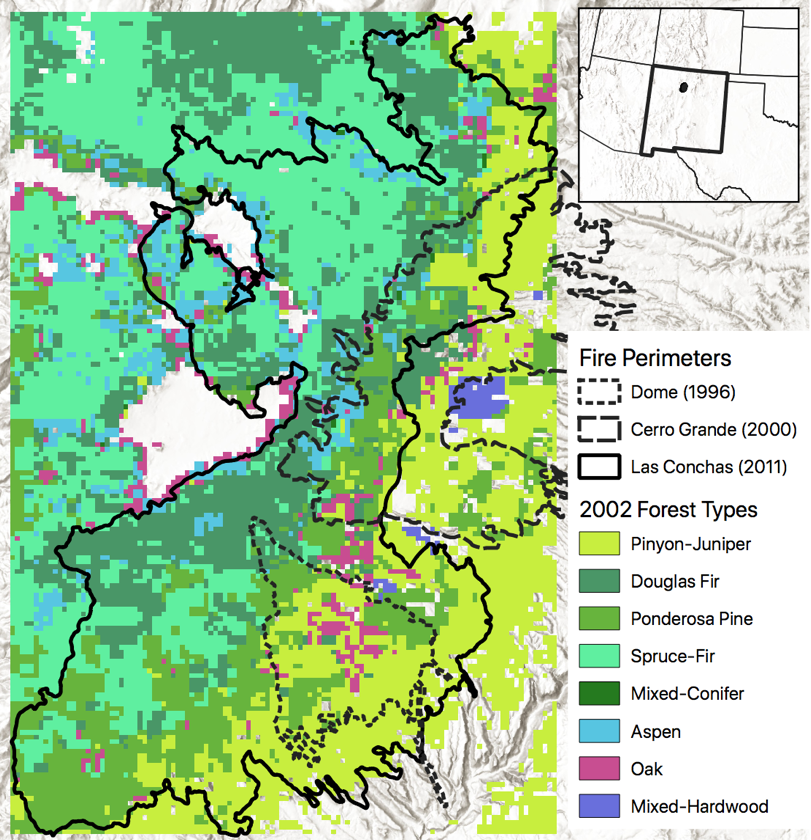
In North American forests where fire was frequent prior to the 20th century, contemporary fires are widely understood to have effects outside the range of historical variability (cite).

We hypothesized the following patterns of contemporary vs historical fire occurrence and severity

**Methods**

*Study site*

We integrated contemporary burn severity data with historical fire scar records within the eastern Jemez Mountains of northern New Mexico, USA (Figure 1). The eastern Jemez Mountains range in elevation from approximately 1600 m on their eastern boundary with the Rio Grande, to over 3000 m on the mountain peaks that comprise the rim of the Valles Caldera, created by a series of volcanic eruptions over 1 million years ago. Much of the eastern flank of the mountains is comprised of banded volcanic tuff formations deposited by these eruptions, sitting on top of basalt. Erosion of the tuff has created a series of deeply incised canyons and mesa tops, with topography generally sloping gradually except for canyon walls and fault scarps.



**Figure 1**: Map of the study area, with Las Conchas and treeless perimeter shown. Vegetation classification by USDA Forest Service (Ruefenacht et al. 2008) based on 2002 data.

Vegetation is comprised of …

The Las Conchas fire started on June ##, 2011, burning 61057 ha in total. The fire burned through different forest types, ranging from pinyon-juniper at lower elevations, to ponderosa pine and mixed-conifer (including Douglas-fir) at mid-elevations, to spruce-fir at the highest elevations (Figure 1). The Las Conchas fire burned partially or completely over the footprints of at least nine previous fires since 1977: La Mesa (1977), Dome (1996), Lummis (1997), Oso (1998), Unit 29 prescribed burn (1998), Unit 38 prescribed burn (1999), Cerro Grande (2000), San Miguel (2009) and South Fork (2010). The deforested landscape following Las Conchas therefore reflected the cumulative high-severity effects of these previous fires, even if the fire effects from Las Conchas itself did not register as high severity (see below).

We used a composite of different methods to assess three distinct scenarios of contemporary high-severity fire for comparison to the historical record. First, . Second, there were four fires since 1984 that had substantial (> 10 ha) high-severity area based on the CBI threshold described above: Dome (1253 ha high-severity within the Las Conchas footprint), Oso (605 ha), and Cerro Grande (2789 ha).

three significant previous fires in the modern historical record: the La Mesa fire of 1977, the Dome fire of 1996, and the Cerro Grande fire of 2000 (Figure 1; Table 1). For the three most recent fires we calculated area burned at high-severity (stand-replacing fire) by calculating the relative differenced normalized burn ratio (RdNBR) in Google Earth Engine following the methods of of Parks et al. (2018), with an RdNBR threshold of 643 (Parks et al. ####). We also calculated the cumulative treeless area in the Las Conchas footprint… A comparison of these fires is shown in Table 1.

Table 1: Area of fire effects in the East Jemez, 1977-2011. Stand-replacing area calculated for Dome, Cerro Grande, and Las Conchas following the methods of Parks et al. (2018), with an RdNBR threshold of 643 (Parks et al. ####). Cumulative treeless area calculated following the methods of (Walker et al. 2019). Much of the cumulative area identified as treeless (stand-replacing fire) includes areas of Las Conchas that didn’t meet the 643 RdNBR threshold.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Area burned (ha) | Area stand-replacing (ha) | Proportion stand-replacing |
| La Mesa (1977) |  |  |  |
| Dome (1996) | 6385 | 610 | 0.095 |
| Cerro Grande (2000) | 17919 | 4410 | 0.25 |
| Las Conchas (2011) | 61057 | 26122 | 0.428 |
| Cumulative treeless | 61057 | 45998 | 0.75 |

To compare contemporary fire patterns against historical fire evidence, we compiled a record of crossdated fire scars from within the footprint of the Las Conchas fire.

START HERE To simulate a range of possible historical (pree-1900) stand-replacing patch size distributions, we…

**Results**

Results

**Discussion**

Discussion

**References**:

**References**

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