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Research Brief for Resource Managers

California's 1-million-acre goal: tracking our progress

Accurate monitoring of forest activity is an essential component of sustainable forest management, but effective monitoring is an ongoing challenge in forests globally. For example, challenges arise when forest operations are diverse and tracked by many landowners, or when different metrics based on different data sources are used resulting in an "apples to oranges" comparison. Standardized, comparable datasets are needed to track progress towards management goals.

As in other temperate forests, California forests are threatened by climate-exacerbated disturbances that transcend administrative boundaries. Forest conversion and the loss of forests as natural climate solutions may result. In recognition of these possible outcomes, the USDA Forest Service (USFS) and State of California committed to treating 500,000 acres annually for a total of 1,000,000 acres per year by 2025. However, a key question remains: how close is the State to meeting the 1-million-acre goal?

In this study, we integrated archival federal (FACTS) and state (CAL FIRE) forest activity databases dating from 1984 to 2019, analyzed current and historic management trends, and evaluated the archival record's spatial accuracy against remotely sensed data. In order to best understand pace and scale towards landscape

Management Implications

- California's progress toward the 1-million-acres of annually treated land is currently at 30%
- The rate of prescribed burning has increased but occurs less frequently on forests, where fuel reduction is greatly needed, and treatment longevity is greatest
- Regional initiatives interested in landscape level impact should focus on net spatial extent of treatments rather than gross total acres of overlapping or sequential treatments
- Our "refined" hybrid remote-archival statewide dataset provides a critical check on the accuracy of reported activities
- Tracking forest restoration treatments across ownerships, jurisdictions, or agencies should be a key part of regional level monitoring and adaptive management

restoration goals, we found that net spatial extent of treatments is a far more pertinent metric than gross annual total acres of overlapping or sequential treatments and consequently we used completed footprint acres as the primary analysis metric.

A key finding is that completed footprint acres have decreased since a peak in 2008. And at most, 325,000 footprint acres were completed annually, ~30% of the million-acre goal (Fig. 1).
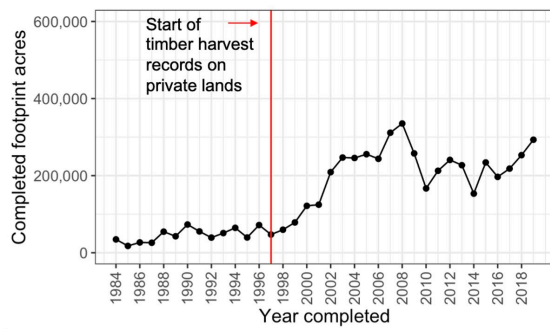
Figure 1. Completed footprint acres in are shown at year completed (note that CAL FIRE's prescribed fire dataset starts in 1984).

We also found that the intensity of silviculture treatments varied over time and between public and private lands. In general, more high and medium intensity harvest occurred on private lands than on federal forest lands (Fig. 2). High and medium intensity treatments include clear cuts, commercial thins, and removal cuts. The disparity between public and private lands may be due to differences in forest policy and regulatory frameworks. Or it may be due to differences in economic realities. For example, national forests have federal funds to implement low intensity fuel management treatments whereas private forest land managers may be constrained. This underscores the importance of recent efforts from the state of California to provide both technical and financial assistance for fuel reduction and forest restoration to private forest landowners who manage approximately 39% of California forest lands.
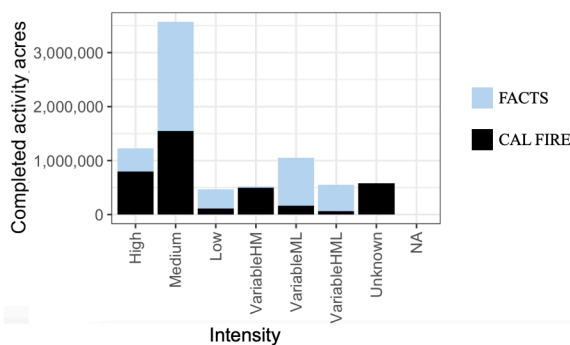

Figure 2. The intensity variation in completed activity acres is depicted across FACTS datasets (blue) and CAL FIRE datasets (black) between 1984 and 2019.

Another key finding is that prescribed fires have risen over time and rapidly increased since 2016. Despite the increased rate, CAL FIRE's prescribed burning is predominantly occurring on woodlands and grasslands, not on forestlands which have longer treatment longevity (Fig. 3).
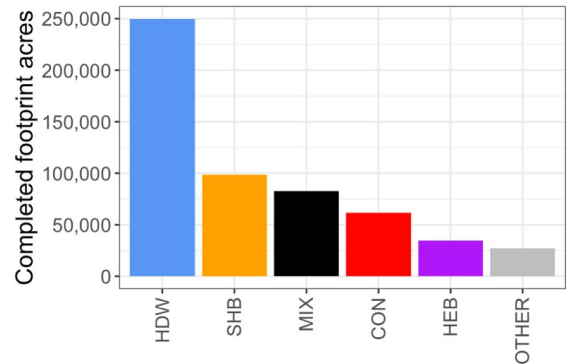

Figure 3. CAL FIRE's prescribed fire (1984 and 2019) sorted by cover type where HDW is hardwood forest (blue), SHB is shrub (orange), MIX is mixed conifer and hardwood forest (black), CON is conifer forest (red), HEB is herbaceous (purple), and OTHER is agriculture, water, urban, and barren (grey).

Annual CAL FIRE rates of prescribed fire in conifer forests are relatively low despite the well acknowledged need for fire restoration in these forested systems. These data indicate that barriers and challenges to using prescribed fire on private forest lands exist and limit widespread utilization of this tool at more effective scales.

Our last key finding is based on the satellite remote sensing data and an algorithm – called the Continuous Change Detection and Classification (CCDC) – that detected harvest disturbances. A comparison of the algorithm's detected changes to the archival record of change potentially suggests over-reporting in both federal and state archival datasets (Table 1). Our refined hybrid remote-archival management dataset provides improved information on the timing and spatial detail of past management events, as well as provides maps in areas beyond those captured in archival databases. This type of technology serves as an important tool for quality control of data that includes reporting from multiple and diverse ownerships, jurisdictions, and/or agencies. It also suggests that there may be room for collaborative data standardization across agencies.

Table 1. Total difference in acreage of original archival polygons and the acreage of CCDC-refined polygons between 1997 and 2019.

Dataset	Archival acreage (acres)	CCDC-refined acreage (acres)	Percent change (%)
FACTS hazardous fuels	3,028,007	2,420,616	-20
FACTS timber harvests	2,088,271	1,373,857	-34
CAL FIRE timber harvest plans	3,346,645	2,212,863	-34
CAL FIRE non-industrial timber mgmt plans	516,704	62,362	-88

Over the past two fire seasons (2020-2021), wildfires in California have annually burned over 3 to 4 million acres — which is magnitudes greater than annual fuel reduction and forest restoration treatment accomplishments across federal and state lands. While these fires may have restorative effects induced by low and moderate severity, increases in the proportion and patch size of high severity fire are particularly concerning to forest managers and could have adverse impacts on human communities.

Accurately tracking and monitoring fuel reduction and forest restoration treatments across multiple jurisdictions is a critical tool in understanding the rate and scale of management efforts compared to the rate and scale of adverse effects from wildfires on California's diverse ecosystems and wildlands. This analysis suggests there is a significant need to employ more wildland fuel reduction and forest restoration treatments particularly in an age where cross boundary collaboration is needed at meaningful scale. In addition, these data serve as a baseline upon which to measure success of efforts to increase pace and scale of management in an "all lands approach."

Suggestions for further reading:

California Department of Forestry and Fire Protection Resource Management (2021) CA Forest Fuels and Species Conservation (FFSC MOU). Accessible at: https://egis.fire.ca.gov/portal/apps/webappviewer/index.html?id=bdc0b304b27c4d5b86fb7cbd79fa90f4

FAO (2015) Food and Agriculture Organization. Global Forest Resources Assessment 2015: How have the world's forests changed? Rome, Italy. http://www.fao.org/forest-resources-assessment/past-assessments/fra-2015/en/

Forest Management Task Force (2021) California's Wildfire and Forest Resilience Action Plan. https://fmtf.fire.ca.gov/media/cjwfpckz/californiawildfireandforestresilienceactionplan.pdf.

US Department of Agriculture, Forest Service and State of California (2020) Agreement for Shared Stewardship of California's Forests and Rangelands.

Zhu Z, Woodcock CE (2014) Continuous change detection and classification of land cover using all available Landsat data. Remote sensing of Environment 144:152-171.