**Prescribed Fire Encounters with Wildfires**

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Multiple spatially specific fire perimeter datasets were evaluated for both wildfire (WF) and prescribed (RX) fire types. Datasets needed to meet the criteria of being spatially specific (ie. perimeter polygons), differentiated by fire type, and encompassing at least 20 years of recent fires. Datasets were qualitatively judged by how spatially complete they appeared to other datasets and for any documented limitations.

Table 1. Wildland fire dataset descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Dataset Name** | **Years** | **Spatial Coverage** | **Fire Types Selected** | **How complete?** | **Data Limitations** |
| EQUATES | 2004-2019\* | CONUS | WF | >95%; only a handful of WF from other datasets are missing | Low fire type confidence in HMS-only; Manual entry errors for ICS |
| MTBS | 1984-2022 | Entire US | WF | Only WFs > 1000 acres | Relies on burn scars only with geospatial comparison to other datasets for fire type |
| CalFIRE | 1950-Present | California | WF | >99% for WF | May not include very small fires |
| USFS FACTS | 1980s-Present | USFS lands | RX | >99% for RX | Only includes lands managed by USFS, polygons may not represent actual completed treatment area |
| BLM | Varies | BLM lands in CA, OR, WA, CO, NM, UT | RX | >99% for RX | NV and AZ data not readily available. State data starts at different years. |
| LandFire | 1999-2022 | Entire US | RX | Difficult to tell | This is a mix of datasets, including MTBS, FACTS, and BLM/DOI, that is joined into a single geodatabase for determining distrubance in LandFire. Datasets are not consistent across years and do not completely match some of the datasets (such as the FACTS selection that I'm using) |

Each dataset was filtered so that it contained only wildfires (for wildfire types) or broadcast burns (for prescribed burn types). The datasets were spatially subset to California and Oregon and temporally subset to the years 2004-2017 for comparison purposes.

The number of records remaining in each dataset after filtering is shown in table 2.

Table 2. Number of polygons and total area for OR and CA 2004-2017

|  |  |  |  |
| --- | --- | --- | --- |
| **Dataset Name** | **Fire Type** | **Number of Polygons** | **Total Acres** |
| EQUATES | WF | 4,103 | 16,367,040 |
| MTBS | WF | 1,028 | 13,693,703 |
| CalFIRE | WF | 4,605 | 9,113,463 |
| USFS FACTS | RX | 4,993 | 982,128 |
| BLM | RX | 1,126 | 241,952 |
| LandFire | RX | 5,511 | 819,161 |

EQUATES uses a combination of MTBS, GeoMAC/NIFS, ICS, and HMS detects to determine WF activity. The event polygons were extracted from the SmartFire2 database to produce spatially specific fire data. The EQUATES WF data was subset only to those fires that were reconciled with perimeter data (MTBS and GeoMAC). All MTBS fires in CA and OR should be included in EQUATES and this was confirmed. MTBS fires labeled with an unknown type were excluded. The final perimeters in EQUATES may differ from the MTBS as GeoMAC/NIFS perimeters are given preference over the MTBS. The CalFIRE dataset contains all wildfires, including those too small to be included in MTBS and some that were reconciled into a single fire within EQUATES. This dataset is more complete that others but only available in California. It is included to help benchmark the performance of the other datasets.

The FACTS hazardous treatment polygon and BLM datasets were subset to the broadcast burn types for fires with a completion date. According to the dataset list for LandFire these datasets should be included in LandFire along with RX fire data from other states and agencies. However, the number of polygons and acres indicates that some FACTS and BLM broadcast burns are missing from the LandFire geodatabase for CA and OR in these time periods. Further geospatial analysis verified this difference with the caveat that the BLM dataset contains two large wildfire use burns in OR.

Preliminary results of the analysis for the WF datasets are shown in table 3.

Table 3. Preliminary comparison of CA and OR wildfire datasets for 2004-2017

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | RX=FACTS, WF=CALFIRE | | RX=FACTS, WF=EQUATES | | RX=FACTS, WF=MTBS | |
| **State** | **# of Intersections** | **Intersection Area (acres)** | **# of Intersections** | **Intersection Area (acres)** | **# of Intersections** | **Intersection Area (acres)** |
| **CA** | 203 | 21,507 | 219 | 19,662 | 187 | 18,190 |
| **OR** | 1 | 3 | 159 | 15,862 | 116 | 11,559 |
| **Grand Total** | 204 | 21,510 | 378 | 35,524 | 303 | 29,749 |

Using the FACTS as a constant RX fire dataset I looked at the number of polygon intersections of RX with a WF on a subsequent date. EQUATES was consistent with the CalFIRE dataset. Geospatial analysis showed differences were largely related to final perimeter shape in EQUATES vs. CalFIRE. The MTBS showed fewer encounters versus EQUATES although a higher number than of encounters than expected based on the number of records in MTBS. Overall, I’m happy with the performance of EQUATES as a wildfire activity dataset in CA and OR for this time span.

Preliminary results of the analysis for RX fire datasets are shown in table 4.

Table 4. Comparison of RX fire datasets for 2004-2017 in CA and OR

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | RX=BLM, WF=EQUATES | | RX=FACTS, WF=EQUATES | | RX=LandFire, WF=EQUATES | |
| **State** | **# of Intersections** | **Intersection Area (acres)** | **# of Intersections** | **Intersection Area (acres)** | **# of Intersections** | **Intersection Area (acres)** |
| **CA** | 12 | 611 | 219 | 19,662 | 374 | 34,285 |
| **OR** | 65 | 8,741 | 159 | 15,862 | 183 | 18,433 |
| **Grand Total** | 77 | 9,352 | 378 | 35,524 | 557 | 52,718 |

A similar approach was used for analyzing the prescribed fire datasets where a constant wildfire dataset was intersected with different RX fire polygons that preceded a fire in the same location. As previously mentioned, the LandFire geodatabase is documented to include the FACTS and BLM data in the test region of CA and OR. However, the results differ between BLM+FACTS and LandFire. Further analysis is necessary to determine if this because LandFire is including more datasets or if the prescribed fire polygons differ. Currently, I have more confidence in the FACTS + BLM datasets for RX fires as they are both original data sources (as opposed to aggregated) with rich documentation and metadata.

Before further evaluation or expansion of this project a few things need to be determined:

1. Should this only include federal lands? The RX data is pointing me this way but I’d like to get some thoughts.
   * Great question! Just did a quick search and about 46% of the land in CA is federal and 53% in OR. Considering the record keeping for Rx fire is pretty weak overall I’d have to imagine it’s even worse for private land. I’m thinking we stay with federal only in light of the USFS an DOI Wildfire Crisis strategies focusing on federal land and the other Rx fire project Kirk is working on. I think this analysis will show from a federal perspective how much intersection we’ve seen historically.
   * Would it be a lot of extra work to show the total intersections on federal land and also private land? That might be a really interesting conclusion and make this assessment even more broadly applicable.
2. Should the timeseries be extended to 2023? This would give 20 years of data from 2004-2023 and add recency. EQUATES does not technically extend to 2023, although I have activity for all years up to 2023. MTBS only goes to 2022.
   * My preference would be to include as much recent data as possible. It seems like going to 2022 is possible. Is this correct?
   * I agree with Jason, I think it is fair to extend this to 2023 and just state in the manuscript all years were processed consistently with the EQUATES project
3. Should pile burns be included? This is a very different type of fuel treatment from the current broadcast burn subset but it does represent a large fraction of the prescribed fires being performed in the western US.
   * I don’t think we need to include pile burns because those are not intended to reduce wildfire risk but if we could somehow use those as a proxy for mechanical thinning and have some kind of statement about how often areas that have been managed with that approach intersect wildfire that would be really cool
   * I wouldn’t be against this considering how much of it is done in the West, but I think we’d need to present a few different types of results. Is there a way to differentiate pile burns from broadcast burns in the dataset? The pile burns would be a much smaller area from a burn scar perspective, but could actually represent a larger area of fuel treatment. Any thoughts on how to rectify the potential difference between the area treated and area burned? If we included it in the analysis maybe we present results this way:
     + Broadcast burns only
     + Broadcast burns + pile burns
     + Then present some pile burn numbers on their own?