

Data dictionary for CARB vegetation wildfire emissions and consumption data

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I. Overview

CARB annually estimates emissions and consumption data from vegetation on all wildfires present in the CAL FIRE FRAP perimeter dataset (<https://www.fire.ca.gov/what-we-do/fire-resource-assessment-program/fire-perimeters>). Using Visible Infrared Imaging Radiometer Suite (VIIRS) satellite data, CARB estimates daily wildfire activity with the FEDS algorithm (Chen *et al.* 2022) and by extension, is able to estimate daily emissions and consumption data for fires detected by the VIIRS active fire product (Schroeder *et al.* 2014). If multi-day fire activity is not detected by VIIRS, CARB defaults to using the final fire footprint from CAL FIRE, estimating the total bulk emissions and consumption of the duration of the fire.

Estimates derived from the FEDS perimeters are additionally post-processed to ensure that acres burned, emissions, and consumption, y , are of similar magnitude to those estimated from CAL FIRE perimeters. To do so, we multiply y by a scalar φ :

$$y = \varphi \cdot y_{FEDS} \quad (1)$$

$$\varphi = \frac{area_{CAL\ FIRE}}{area_{FEDS}} \quad (2)$$

such that φ adjusts for differences between the final fire size of FEDS and the CAL FIRE footprint (eq. 2).

There are two public datasets for download, containing data for fires beginning in 2015:

1. "Full Dataset": A spatial dataset including emissions and consumption for each analyzed wildfire. The dataset indicates which fire perimeter—daily or final perimeters—is used to derive emissions and consumption, along with attributes of the fire, consumption, flaming emissions, smoldering emissions, and the geometry of the fire perimeter up until that day or date range. The data is available via ArcGIS or on the homepage in the explore data view as geojson.
2. "Full Dataset by CoAbDis": A tabular dataset (csv) including emissions and consumption for each analyzed wildfire, containing the same data from the spatial

dataset, split for each county-air basin-district (CoAbDis) boundary. This dataset does not contain a geometry column.

For additional information on the methodology, please refer to the inventory landing page here: [California Vegetation Wildfire Emissions Inventory](#).

II. Row Descriptions

1. Full Dataset

Each row in the dataset represents a specific wildfire. If daily perimeters are available for a fire, multiple rows will appear for the same fire—one for each day of the fire—and the column *source* will be “feds”. If daily perimeters are not available, only one row will represent the fire, and the *source* will be “frap”. Each fire is identified with a unique alpha-numeric code in the column *region*. Detailed information on the fire dates, consumption, flaming emissions, and smoldering emissions are provided. The geometry column represents either the daily footprint if the source is “feds” or the final fire footprint if source is “frap”.

2. Full Dataset by CoAbDis

Similar to the Full Dataset, each row in this dataset represents a specific wildfire. If daily emissions and consumption data are available, multiple rows per fire will be present. However, this dataset also splits each fire by CoAbDis. This means that multiple rows may be present for each fire, even if it is just reporting on total bulk emissions. When a fire burns across CoAbDis boundaries, the acres burned, emissions, and consumption data are proportionally split according to the area burned within each CoAbDis. The acres burned, consumption and emissions data have been allocated and reported accordingly.

III. Column Descriptions

All columns present in both the Full Dataset (spatial) and Full Dataset by CoAbDis (tabular) are defined the same. Columns exclusive to either dataset will be indicated. The Explore Data page on CARB’s website shows alias names, which are specified as well.

1. **source:** (alias: Source) The dataset of the fire perimeter data, including either “feds” or “frap”. If “feds”, the FEDS algorithm was used to interpolate daily fire perimeters and daily emissions and consumption values are provided. If “frap”, the final fire perimeter from CAL FIRE FRAP was used to estimate total bulk emissions and consumption values.
2. **year_:** (alias: Year) The year in which the fire began.

3. **region:** (alias: Fire ID) An alpha-numeric code used to uniquely identify the fire within that year. The code concatenates the fire name and incident number from the CAL FIRE perimeter dataset.
4. **supp_wfu:** (alias: Suppression/WFU) Indicator of whether a fire is classified as "Suppression (Wildfire)" or "Resource Benefit (WFU)" with codes "suppression" and "wfu", respectively. Classifications correspond to the column "OBJECTIVE" from the CAL FIRE perimeter dataset.
5. **date_:** (alias: Date of activity (feds)/start date (frap)) If source is "frap", the alarm date of the fire. If source is "feds", the date of the daily perimeter as of 11:59 pm.
6. **end_date:** (alias: End date) If source is "frap", the end date of the fire incident corresponds to the containment date from the CAL FIRE perimeter dataset. If source is "feds", end date is detected when VIIRS AFP are no longer associated with that fire, which is often sooner than the declared containment date.
7. **acres:** (alias: Acres) If source is "frap", the total acres burned by the wildfire. If source is "feds", the adjusted burned acres for that day. Note that since these acres have been adjusted to match the size of the final fire footprint from CAL FIRE (see eq. 2), they will not match the new growth calculated from the geometry.
8. **CH4F:** (alias: CH4 (flaming)) Methane (CH4) emissions from the flaming phase in tons.
9. **CH4S:** (alias: CH4 (smoldering)) Methane (CH4) emissions from the smoldering phase in tons.
10. **CO2F:** (alias: CO2 (flaming)) Carbon dioxide (CO2) emissions from the flaming phase in tons.
11. **CO2S:** (alias: CO2 (smoldering)) Carbon dioxide (CO2) emissions from the smoldering phase in tons.
12. **COF:** (alias: CO (flaming)) Carbon monoxide (CO) emissions from the flaming phase in tons.
13. **COS:** (alias: CO (smoldering)) Carbon monoxide (CO) emissions from the smoldering phase in tons.
14. **N2OF:** (alias: N2O (flaming)) Nitrous oxide (N2O) emissions from the flaming phase in tons.
15. **N2OS:** (alias: N2O (smoldering)) Nitrous oxide (N2O) emissions from the smoldering phase in tons.

16. **NH3F**: (alias: NH3 (flaming)) Ammonia (NH3) emissions from the flaming phase in tons.
17. **NH3S**: (alias: NH3 (smoldering)) Ammonia (NH3) emissions from the smoldering phase in tons.
18. **NO2F**: (alias: NO2 (flaming)) Nitrogen dioxide (NO2) emissions from the flaming phase in tons.
19. **NO2S**: (alias: NO2 (smoldering)) Nitrogen dioxide (NO2) emissions from the smoldering phase in tons.
20. **PM25F**: (alias: PM2.5 (flaming)) PM2.5 emissions from the flaming phase in tons.
21. **PM25S**: (alias: PM2.5 (smoldering)) PM2.5 emissions from the smoldering phase in tons.
22. **PM10F**: (alias: PM10 (flaming)) PM10 emissions from the flaming phase in tons.
23. **PM10S**: (alias: PM10 (smoldering)) PM10 emissions from the smoldering phase in tons.
24. **SO2F**: (alias: SO2 (flaming)) Sulfur dioxide (SO2) emissions from the flaming phase in tons.
25. **SO2S**: (alias: SO2 (smoldering)) Sulfur dioxide (SO2) emissions from the smoldering phase in tons.
26. **TNMHCF**: (alias: TNMHC (flaming)) Total non-methane hydrocarbons (TNMHC) emissions from the flaming phase in tons.
27. **TNMHCS**: (alias: TNMHC (smoldering)) Total non-methane hydrocarbons (TNMHC) emissions from the smoldering phase in tons.
28. **TOGF**: (alias: TOG (flaming)) Total organic gases (TOG) emissions from the flaming phase in tons.
29. **TOGS**: (alias: TOG (smoldering)) Total organic gases (TOG) emissions from the smoldering phase in tons.
30. **total_fuels_con**: (alias: Total fuels consumption) Total fuel consumption in tons.
31. **FlaCon**: (alias: Flaming consumption) Consumption (flaming phase) in tons.
32. **SmoCon**: (alias: Smoldering consumption) Consumption (smoldering phase) in tons.
33. **LitCon**: (alias: Litter consumption) Litter consumption in tons.

- 34. **DufCon**: (alias: Duff consumption) Duff consumption in tons.
- 35. **DW1Con**: (alias: 1-hr consumption) Downed woody debris consumption (1-hour) in tons.
- 36. **DW10Con**: (alias: 10-hr consumption) Downed woody debris consumption (10-hour) in tons.
- 37. **DW100Con**: (alias: 100-hr consumption) Downed woody debris consumption (100-hour) in tons.
- 38. **DW1kSndCon**: (alias: 1000-hr sound consumption) Downed woody debris consumption (1000-hour sound) in tons.
- 39. **DW1kRotCon**: (alias: 1000-hr rotten consumption) Downed woody debris consumption (1000-hour rotten) in tons.
- 40. **HerCon**: (alias: Herbaceous consumption) Herbaceous consumption in tons.
- 41. **ShrCon**: (alias: Shrub consumption) Shrub consumption in tons.
- 42. **FolCon**: (alias: Foliage consumption) Foliage consumption in tons.
- 43. **BraCon**: (alias: Branch consumption) Branch consumption in tons.
- 44. **Geometry**: Fire polygon. If source is "frap", the final fire footprint from CAL FIRE. If source is "feds", the total fire perimeter up until the date recorded in the column "date_". This column is only present in the Full Dataset.
- 45. **co_name**: County name where the fire incident occurred. This column is only present in the Full Dataset by CoAbDis.
- 46. **co**: Code (string) of county name where the fire incident occurred. This column is only present in the Full Dataset by CoAbDis.
- 47. **ab**: Code (string) of basin name where the fire incident occurred. This column is only present in the Full Dataset by CoAbDis.
- 48. **dis**: Code (string) of district name where the fire incident occurred. This column is only present in the Full Dataset by CoAbDis.
- 49. **coabdis**: Unique identifier (string) for the county, basin, and district combination. This column is only present in the Full Dataset by CoAbDis.
- 50. **COABDIS_prop**: Proportion of the fire that lies within the CoAbDis boundary, with a value 0-1. This column is only present in the Full Dataset by CoAbDis.

References

- Chen, Y., Hantson, S., Andela, N., Coffield, S.R., Graff, C.A., Morton, D.C., *et al.* (2022). California wildfire spread derived using VIIRS satellite observations and an object-based tracking system. *Sci Data*, 9, 249.
- Schroeder, W., Oliva, P., Giglio, L. & Csiszar, I.A. (2014). The New VIIRS 375 m active fire detection data product: Algorithm description and initial assessment. *Remote Sensing of Environment*, 143, 85-96.