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ABOVE: Wildfire Date of Burning within Fire Scars across Alaska and Canada, 2001-2019

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Documentation Revision Date: 2021-01-10

Dataset Version: 1.1

Summary

This dataset provides estimates of wildfire progression represented by date of burning (DoB) within fire scars across Alaska and Canada for the period 2001-2019. Burn scar locations were obtained from two datasets: the Alaskan Interagency Coordination Center (AICC) and the Natural Resources Canada (NRC) databases. All scars within these databases were used in this study. The estimated DoB was derived using an algorithm for identifying the first fire occurrence from the Moderate Resolution Imaging Spectroradiometer (MODIS) active fire detection product (MCD14ML, Collection 6) and to subsequently determine all dates of burning within fire scars. The DoB data are provided as polygons and map the daily progression of a fire within each burn scar. As a result, within files there is one polygon for each DoB detected within an identified burn scar boundary. The MODIS active fire points (MCD14ML, Collection 6) associated with the burn scar data are also provided. Data for 2001-2015 were first published in 2017 and 2016-2019 data were added in January 2021.

This product is an improvement of the 2014 DoB algorithm (Billmire et al., 2014) and uses the MODIS active fire detections (MCD14ML) from Collection 6 to determine the date of burning within 1-km buffered fire scars found in the AICC and NRC databases. Data for 2001-2015 were first published in 2017 and 2016-2019 data were added in January 2021.

There are 38 shapefiles (.shp) with this dataset provided in compressed (.zip) format. This includes 19 files that provide the date of burning (DoB) of fire scars, and 19 files that provide filtered MODIS daily active fire locations across Canada and Alaska for the years 2001-2019. Files are also provided in *.kmz format for viewing in Google Earth.

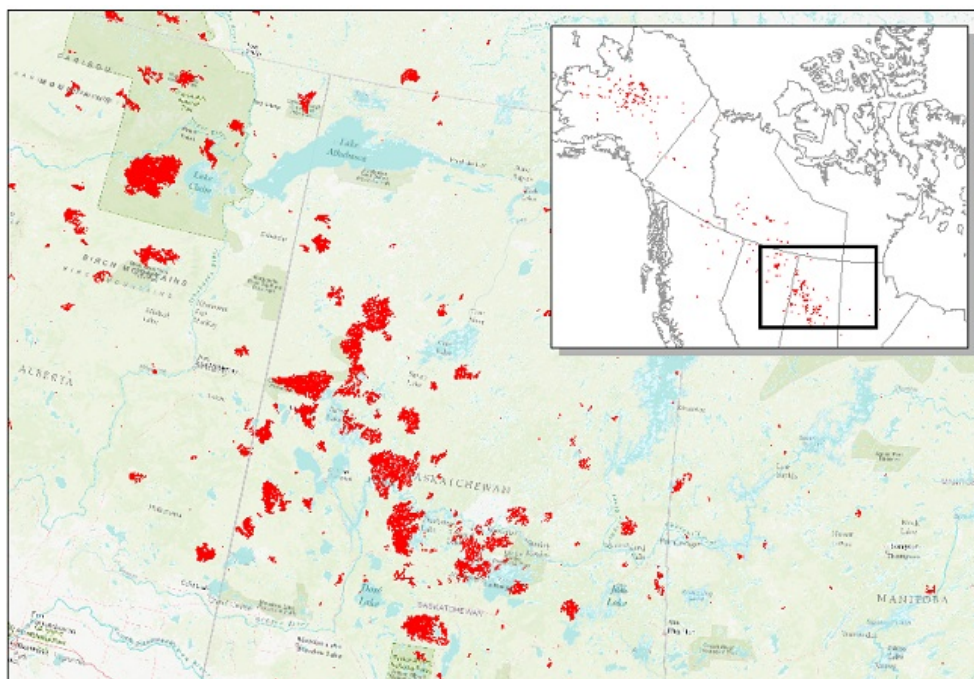


Figure 1. Date of Burning (DoB) estimated for areas within each fire scar (inset) across Alaska and Canada. Red areas show fire scar locations across central Canada (detail) in 2015.

Citation

Loboda, T.V., J.V. Hall, and A. Baer. 2017. ABOVE: Wildfire Date of Burning within Fire Scars across Alaska and Canada, 2001-2019. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1559>

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1. Dataset Overview

This dataset provides estimates of wildfire progression represented by date of burning (DoB) within fire scars across Alaska and Canada for the period 2001-2019. Burn scar locations were obtained from two datasets: the Alaskan Interagency Coordination Center (AICC) and the Natural Resources Canada (NRC) databases. All scars within these databases were used in this study. The estimated DoB was derived using an algorithm for identifying the first fire occurrence from the Moderate Resolution Imaging Spectroradiometer (MODIS) active fire detection product (MCD14ML, Collection 6) and to subsequently determine all dates of burning within fire scars. The DoB data are provided as polygons and map the daily progression of a fire within each burn scar. As a result, within files there is one polygon for each DoB detected within an identified burn scar boundary. The MODIS active fire points (MCD14ML, Collection 6) associated with the burn scar data are also provided. Data for 2001-2015 were first published in 2017 and 2016-2019 data were added in January 2021.

Burn scar locations were originally downloaded from:
 Alaskan Interagency Coordination Center (AICC; <https://fire.ak.blm.gov/>)
 Natural Resources Canada (NRC; <https://www.nrcan.gc.ca/>)

This product is an improvement of the 2014 DoB algorithm (Billmire et al., 2014) and uses the MODIS active fire detections (MCD14ML) from Collection 6 to determine the date of burning within 1-km buffered fire scars found in the AICC and NRC databases. Data for 2001-2015 were first published in 2017 and 2016-2019 data were added in January 2021.

Project: Arctic-Boreal Vulnerability Experiment

The Arctic-Boreal Vulnerability Experiment (ABOVE) is a NASA Terrestrial Ecology Program field campaign being conducted in Alaska and western Canada, for 8 to 10 years, starting in 2015. Research for ABOVE links field-based, process-level studies with geospatial data products derived from airborne and satellite sensors, providing a foundation for improving the analysis, and modeling capabilities needed to understand and predict ecosystem responses to, and societal implications of, climate change in the Arctic and Boreal regions.

Acknowledgements:

This study was funded by NASA's Arctic-Boreal Vulnerability Experiment (Grant number: NNX13AK44G).

2. Data Characteristics

Spatial Coverage: Alaska and Canada

ABOVE Reference Locations:

Domain: Core ABOVE

State/territory: Alaska and Canada

Spatial Resolution: Burn scar and DoB data are represented by vector polygons. MODIS active fires are vector point data.

Temporal Coverage: 2001-01-01 to 2019-12-31

Temporal Resolution: Daily

Study Area (All latitude and longitude given in decimal degrees)

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Alaska and Canada	-178.841	-53.82671	70.15916	41.74560

Data file information

There are 38 shapefiles (.shp) with this dataset provided in compressed (.zip) format. This includes 19 vector polygon files that provide the date of burning (DoB) for the fire scars, and 19 vector point files that provide the filtered MODIS daily active fire locations across Canada and Alaska for the years 2001-2019.

These 38 shapefiles are also provided as companion files in *.kmz format for viewing in Google Earth.

User Note: Data for years 2016-2019 were added in November 2020 (Version 1.1). Date of burning and active fire locations were determined using the same process as for earlier data. No changes to previously released data.

Table 1. File names and descriptions.

File Name	Description
ABOVE_DoB_YYYY.zip	Date of burning of fires for the years 2001-2019 (YYYY) as a shapefile and associated files combined in a compressed format.
ABOVE_DoB_MODIS_Active_Fires_YYYY.zip	Daily active fire locations in Canada and Alaska for the years 2001-2019 (YYYY) as a shapefile and associated files combined in a compressed format.

Attributes in the Date of Burning Shapefiles

Table 2. Attributes in the data files ABOVE_DoB_YYYY.zip

Attribute Name	Description
UID_Fire	Unique identifier assigned for each fire event that occurred in the study area during the specific year. The same UID_Fire can be repeated during subsequent years
Year	Year of mapping

Map_date	Date of Burning. Format = YYYY-MM-DD; Null value = 0000-00-00
JD	Day of year. Valid values = 1 – 365 (or 366 for leap year); Null value = 0
FD_Agency	Fire Database reference: AK = Alaskan Interagency Coordination Center (AICC) Database CA = Natural Resources Canada (NRC) Database
REF_ID	Fire Reference ID from the original Fire Database: For the AICC Database, the value provided is the database value for "FIREID" and for the NRC Database, the value provided is the database value for "CFS_REF_ID" .
date_src	Used to define the data source of the mapping date: FPM = Date obtained from the Fire Progression Model. 1AF = The burn only contained 1 MODIS active fire point and therefore the mapped date for the entire scar was given the date from the active fire point. FD = There were no MODIS active fire points, therefore the date was obtained from either the "REP_DATE" if the scar was from the NRC database or "DiscDate" if the scar was from the AICC database. NA = For these scars there were neither MODIS active fires nor any date information within the Fire Database. These scars will have a "JD" of 0 in the final output. Refer to Table 3.

Table 3. Number of Fire Database (FD) scars that were allocated either "FPM", "1AF", "FD", or "NA"

Year	Total FD scars	FPM	1AF	FD	NA
2001	751	105	31	119	496
2002	859	325	63	125	346
2003	1120	434	61	178	447
2004	920	567	39	308	6
2005	945	445	42	455	3
2006	1472	434	86	947	5
2007	1225	363	67	774	21
2008	1277	299	75	896	7
2009	1261	396	87	770	8
2010	1771	503	107	1154	7
2011	904	320	58	520	6
2012	1400	498	83	810	9
2013	1528	532	97	887	12
2014	1140	399	63	676	2
2015	2092	858	113	1088	33
2016	1177	325	71	774	7
2017	1718	617	94	1004	3
2018	1955	663	117	1170	5
2019	1188	356	84	748	356

Attributes in the Active Fire Shapefiles

Table 4. Attributes in the data files **ABoVE_DoB_MODIS_Active_Fires_YYYY.zip**

User Note: Columns 1-11 are attributes from the original MCD14ML product. Attributes 12-16 were added for this Active Fire Product. Attribute 13, dn*, is available only for years 2016-2019.

Column	Attribute Name	Units	Description
1	YYYYMMDD		UTC year (YYYY), month (MM), and day (DD)
2	HHMM		UTC hour (HH) and minute (MM)
3	sat		Satellite: Terra (T) or Aqua (A)
4	lat	decimal degrees	Latitude at center of fire pixel
5	lon	decimal degrees	Longitude at center of fire pixel
6	T21	degrees K	Band 21 brightness temperature of fire pixel
7	T31	degrees K	Band 31 brightness temperature of fire pixel

8	sample		Sample number (range 0-1353)
9	FRP	MW	Fire radiative power (FRP)
10	conf	%	Detection confidence (range 0-100)
11	type		Inferred hot spot type: 0 = presumed vegetation fire 1 = active volcano 2 = other static land source 3 = offshore
12	dn*	Day/Night Algorithm Flag	D = daytime N = nighttime
13	UID_Fire		Unique identifier assigned for each fire event that occurred in the study area during the specific year. The same UID_Fire can be repeated during subsequent years
14	Status		Indicates the level of filtering applied to the Active Fire point: primary = MODIS Active Fire points used within the IDW interpolation. residual = MODIS Active Fire points encountered within the same location after the first date/time of fire detection representing residual burning. removed = temporally and spatially anomalous MODIS Active Fire points within the identified fire events within the mapped scars.
15	FD_Agency		Fire Database reference: AK = Alaskan Interagency Coordination Center (AICC). .Database CA = Natural Resources Canada (NRC).
16	REF_ID		Fire Reference ID from the original Fire Database: For the AICC Database, the value provided is the database value for "FIREID" and for the NRC Database, the value provided is the database value for "CFS_REF_ID"

Spatial properties of the shapefiles

EPSG: 102001

```
PROJCS["Canada_Albers_Equal_Area_Conic",
  GEOGCS["GCS_North_American_1983",
    DATUM["D_North_American_1983",
      SPHEROID["GRS_1980",6378137.0,298.257222101]],
    PRIMEM["Greenwich",0.0],
    UNIT["Degree",0.0174532925199433]],
  PROJECTION["Albers"],
  PARAMETER["False_Easting",0.0],
  PARAMETER["False_Northing",0.0],
  PARAMETER["Central_Meridian",-96.0],
  PARAMETER["Standard_Parallel_1",50.0],
  PARAMETER["Standard_Parallel_2",70.0],
  PARAMETER["Latitude_Of_Origin",40.0],
  UNIT["Meter",1.0]]
```

Table 5. Extents of the shapefiles

Filename	Northernmost latitude	Southernmost latitude	Easternmost longitude	Westernmost longitude
ABoVE_DoB_2001.shp	79.62475	28.89674	-27.5605	-178.851
ABoVE_DoB_2002.shp	79.26801	39.49561	-28.3421	-169.709
ABoVE_DoB_2003.shp	80.25712	36.63773	-26.0811	-169.876
ABoVE_DoB_2004.shp	79.51588	37.26822	-28.9261	-167.477
ABoVE_DoB_2005.shp	79.21216	35.11068	-38.6583	-170.388
ABoVE_DoB_2006.shp	76.37066	36.09079	-33.8209	-166.337
ABoVE_DoB_2007.shp	79.64559	39.51355	-28.9521	-169.671
ABoVE_DoB_2008.shp	78.41748	40.21596	-29.5072	-168.261
ABoVE_DoB_2009.shp	78.7255	39.80437	-29.0477	-168.375
ABoVE_DoB_2010.shp	79.69768	36.02449	-38.8742	-170.136
ABoVE_DoB_2011.shp	79.32386	41.5503	-31.2824	-165.643
ABoVE_DoB_2012.shp	80.45651	39.84391	-25.851	-171.771
ABoVE_DoB_2013.shp	78.14374	40.53107	-32.3789	-166.481
ABoVE_DoB_2014.shp	79.37394	40.60062	-28.788	-168.146

ABoVE_DoB_2015.shp	80.07437	39.53679	-22.1843	-171.476
ABoVE_DoB_2016.zip	68.60278	43.69844	-56.6044	-171.411
ABoVE_DoB_2017.zip	69.95171	43.56071	-59.8641	-163.197
ABoVE_DoB_2018.zip	68.39109	43.53752	-57.249	-166.188
ABoVE_DoB_2019.zip	69.46963	45.13534	-60.5945	-165.854
ABoVE_DoB_MODIS_Active_Fires_2001.shp	74.39441	44.51606	-39.1757	-154.054
ABoVE_DoB_MODIS_Active_Fires_2002.shp	78.94646	39.82787	-28.9974	-168.529
ABoVE_DoB_MODIS_Active_Fires_2003.shp	79.16242	36.71709	-29.5627	-167.744
ABoVE_DoB_MODIS_Active_Fires_2004.shp	79.50891	40.93674	-32.0034	-167.444
ABoVE_DoB_MODIS_Active_Fires_2005.shp	79.18593	39.22152	-38.7358	-170.25
ABoVE_DoB_MODIS_Active_Fires_2006.shp	76.36248	39.09417	-34.6674	-166.325
ABoVE_DoB_MODIS_Active_Fires_2007.shp	79.16532	40.14741	-29.8921	-168.828
ABoVE_DoB_MODIS_Active_Fires_2008.shp	78.4134	40.21209	-29.5268	-168.26
ABoVE_DoB_MODIS_Active_Fires_2009.shp	78.72369	40.54558	-29.0617	-166.813
ABoVE_DoB_MODIS_Active_Fires_2010.shp	79.69872	36.02766	-36.777	-170.139
ABoVE_DoB_MODIS_Active_Fires_2011.shp	78.84153	41.56533	-32.9378	-164.732
ABoVE_DoB_MODIS_Active_Fires_2012.shp	80.44758	39.90664	-25.8889	-171.646
ABoVE_DoB_MODIS_Active_Fires_2013.shp	77.72753	41.66693	-33.2133	-165.75
ABoVE_DoB_MODIS_Active_Fires_2014.shp	79.36979	41.95637	-38.0751	-167.803
ABoVE_DoB_MODIS_Active_Fires_2015.shp	80.06294	39.73405	-27.8063	-171.25
ABoVE_DoB_MODIS_Active_Fires_2016.zip	68.2003	44.46839	-57.5433	-163.626
ABoVE_DoB_MODIS_Active_Fires_2017.zip	69.53299	43.94309	-64.6639	-163.181
ABoVE_DoB_MODIS_Active_Fires_2018.zip	68.3761	44.54529	-59.9997	-166.139
ABoVE_DoB_MODIS_Active_Fires_2019.zip	68.9331	45.38739	-63.5919	-165.859

3. Application and Derivation

These data aid in understanding fire progression across landscapes both temporally and spatially. In addition, these data could be useful in studies related to carbon storage, biomass, and climate change.

4. Quality Assessment

Caveats and Known Problems

There are fire scars mapped within the AICC and NRC databases that contain neither dates of detection nor active fire data. These mapped scars have been given a JD value of 0.

During 2001 and 2002, the MODIS instrument was turned off for substantial periods of time and therefore no active fire detections were acquired.

The annual merged shapefile contains overlapping scars. The unique identifier or reference ID can be used to extract specific scars of interest.

5. Data Acquisition, Materials, and Methods

This product is an improvement to the 2014 DoB algorithm (Billmire et al., 2014) and uses the MODIS active fire detections (MCD14ML) from Collection 6 to determine the date of burning within 1-km buffered fire scars found in the AICC and NRC databases. All scars within these databases were used in this study.

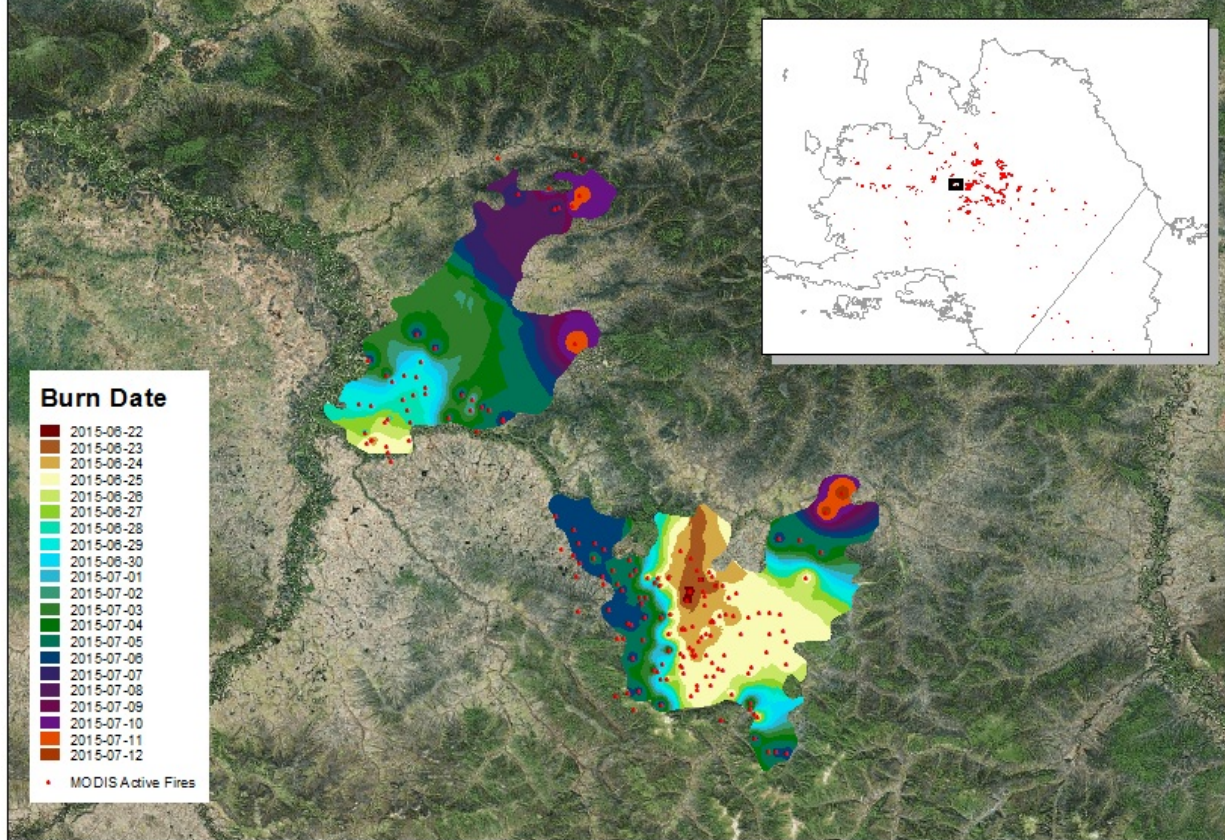


Figure 2. This figure shows a typical number of DoB polygons in two Alaskan fire scars and the associated MODIS active file points in 2015. The DoB data are provided as polygons to map the progression of a fire within each burn scar. There is one polygon for each DoB detected within an identified burn scar boundary.

Processing

A consecutive 20-day filter was applied to the active fires (filtered to only include presumed vegetation fires: type = 0; Giglio et al., 2003; 2015) on a per scar basis to remove any temporally anomalous fires. In addition, further filtering was applied to remove any anomalous fires within active fire clusters. To account for the off-nadir viewing angle geolocation inaccuracies and to remove any residual burning a 100-m radius buffer was applied to the first instance of fire detection.

Inverse distance weighting (IDW) interpolation was used to determine the fire spread through linearly weighting the active fire dates. For this product, a mapping cell size of 30-m was used in the IDW interpolation. Any scars containing only one active fire point were allocated the date from that active fire detection. Any scars that did not contain MODIS active fire detections were allocated the date of mapping based on the AICC and NRC dates. Any scars which contained neither MODIS active fire detections nor a mapping date within the FD were allocated a 0 (zero) value.

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

[ABoVE: Wildfire Date of Burning within Fire Scars across Alaska and Canada, 2001-2019](#)

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

- Billmire, M., N.H. French, T. Loboda, R.C. Owen, and M. Tyner. 2014. Santa Ana winds and predictors of wildfire progression in southern California. *International Journal of Wildland Fire*, 23(8), 1119-1129. <http://dx.doi.org/10.1071/WF13046>
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- MODIS Collection 6 NRT Hotspot / Active Fire Detections MCD14ML. Available on-line [<https://earthdata.nasa.gov/firms>]. doi: [10.5067/FIRMS/MODIS/MCD14ML](https://doi.org/10.5067/FIRMS/MODIS/MCD14ML)

8. Dataset Revisions

Version	Release Date	Revision Notes
1.1	2021-01-11	Data for years 2016-2019 were added in January 2021 (Version 1.1). Date of burning and active fire locations were determined using the same process as earlier Version 1.0 data. Previously released data (Version 1.0: 2001 - 2015) were not changed.

1.0	2018-01-30	Updated (Lobota, 2017)
1.0	2017-12-27	Published



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