EPA National Emissions Inventory (NEI) for Wildland Fires Discussion

J VUKOVICH, FIRE SECTOR LEAD
USEPA/OAQPS/ EIAG   JAN 4, 2022
OUTLINE

- NATIONAL EMISSIONS INVENTORY (NEI) FOR WILDLAND FIRES AND FIRES WORKGROUP
- ACTIVITY DATA USED IN DRAFT VERSION
- 2020 NEI DRAFT DATA AVAILABLE NOW!
- HOW YOU CAN IMPROVE THE QUALITY OF THE NEI WILDLAND FIRE EMISSIONS DATA?
NEI: Fire inventory summary

- National Emissions inventory is developed by USEPA every 3 years for anthropogenic, fires and biogenic sources
- Produce **DAY-specific** emissions for prescribed burns and wildfires
- Emissions include Criteria Air Pollutants (CAPs) and Hazard Air Pollutants (HAPs)
  - Adding Lead (Pb) emissions (led by Tesh Rao)
- Uses available national and State/Local/Tribal (SLT) **activity databases** with satellite detects from Hazard Mapping System (NOAA/NESDIS)
- Uses SMARTFIRE2 to reconcile fires with all activity databases to produce daily acres burn by fire type (WF and prescribed only)
- 2020NEI will use USFS’s Bluesky Pipeline to estimate emissions
- Emissions are provided for both flaming and smoldering phases
MISSION OF FIRES WORKGROUP

- Collaboration to generate emissions for Year 2020 from wildfires, prescribed burns and agricultural burns
- Forum for EPA to provide updates
- SLTs and other agencies have opportunity to ask questions, provide activity data, other data, and feedback
- Learning environment for all
- Contact: Vukovich.Jeffrey@epa.gov
ACTIVITY DATA AND TOOLS/METHODS USED IN 2020NEI DRAFT EMISSIONS
## Fire Activity Data used in 2020NEI Draft

<table>
<thead>
<tr>
<th>Dataset Name</th>
<th>Fire Types</th>
<th>Format</th>
<th>Agency</th>
<th>Coverage</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Mapping System (HMS)</td>
<td>WF/RX</td>
<td>CSV</td>
<td>NOAA</td>
<td>North America</td>
<td><a href="https://www.ospo.noaa.gov/Products/land/hms.html#data">https://www.ospo.noaa.gov/Products/land/hms.html#data</a></td>
</tr>
<tr>
<td>National Association of State Foresters (NASF)</td>
<td>WF</td>
<td>CSV</td>
<td>Multi</td>
<td>Participating US states</td>
<td><a href="https://famit.nwcg.gov/applications/FAMWeb">https://famit.nwcg.gov/applications/FAMWeb</a></td>
</tr>
<tr>
<td>US Fish and Wildlife Service (USFWS) fire database</td>
<td>WF/RX</td>
<td>CSV</td>
<td>USFWS</td>
<td>Entire US</td>
<td>Direct communication</td>
</tr>
<tr>
<td>Department of Interior</td>
<td>RX</td>
<td>CSV</td>
<td>DOI</td>
<td>Entire US</td>
<td>Direct communication</td>
</tr>
<tr>
<td>CARB Prescribed Fire Information Reporting System (PFIRS)</td>
<td>RX</td>
<td>CSV</td>
<td>CARB</td>
<td>California</td>
<td>Direct communication</td>
</tr>
</tbody>
</table>
SMARTFIRE2 and Agriculture burn processing for 2020 draft

HMS Detects

USDA Cropland Data Layer (CDL) + FCCS combined

Ag land detects

Non-ag and grassland detects

Crop residue burning fire methodology (USEPA)

Day-specific Ag burn Fire location, Acres Burned and Emissions

SmartFire2

Day-specific Fire lat-lon, Type and Acres Burned

ICS-209(WF)
NIFS (WF)
NASF (WF)
FACTS(WF/Rx)
DOI (Rx)
USFWS(WF/Rx)

CARB PFIRS(Rx)
ACTIVITY DATA: SATELITTE DETECTS
New satellite product suites now available in HMS

- NASA Suomi-NPP VIIRS Active Fire product suite
  - Two VIIRS active fire products are generated independently using the available 750 m and 375 m resolution data
  - VIIRS 375 m fire product provides greater response over smaller fires, as well as improved mapping of the perimeters of large fires
  - [https://viirsland.gsfc.nasa.gov/Products/NASA/FireESDR.html](https://viirsland.gsfc.nasa.gov/Products/NASA/FireESDR.html)

- GOES-R series (GOES-16 and GOES-17) Fire Detection and Characterization (FDC)
  - Advanced Baseline Imager (ABI) is capable of detecting heat signatures with improved time and space resolution, including smaller fires, compared to the previous GOES imager
  - [https://www.goes-r.gov/education/docs/fs_fire.pdf](https://www.goes-r.gov/education/docs/fs_fire.pdf)

- Result is higher resolution product and more fires (HMS detects or pixels)
- For 2017NEI about 320,000 HMS detects input into SmartFire2
- For 2020NEI about 1,000,000 HMS detects input into SmartFire2
2020 HMS detects after filtering out Agricultural (CDL) detects
Default acres per HMS detect in previous NEIs
2020 NEI Acres Per HMS Detect

<table>
<thead>
<tr>
<th>Acres/pixel</th>
<th>Fuelbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Closed Conifer Forest</td>
</tr>
<tr>
<td>15</td>
<td>Open Conifer Forests</td>
</tr>
<tr>
<td>18</td>
<td>Aspen</td>
</tr>
<tr>
<td>22</td>
<td>Boreal</td>
</tr>
<tr>
<td>27</td>
<td>Juniper</td>
</tr>
<tr>
<td>33</td>
<td>Pacific broadleaved Forest</td>
</tr>
<tr>
<td>39</td>
<td>Eastern Deciduous Forest</td>
</tr>
<tr>
<td>39</td>
<td>Other</td>
</tr>
<tr>
<td>41</td>
<td>Shrubland</td>
</tr>
<tr>
<td>57</td>
<td>Riparian</td>
</tr>
<tr>
<td>59</td>
<td>Savanna</td>
</tr>
<tr>
<td>62</td>
<td>Grassland</td>
</tr>
</tbody>
</table>
States that submitted data in 2017NEI

2017 NEI S/L/T Data Sources
- Supplemental Activity from FETS with National Defaults
- Supplemental State Activity with National Defaults
- Complete Activity Replacement
- Submitted Emissions to EIS
- Questionnaire Returned, National Defaults Used
- National Default Data Only
USFS has significantly updated the Bluesky Framework and named the new system “Bluesky Pipeline”

It is open source at https://github.com/pnwairfire/bluesky

More details of benefits of moving from Bluesky Framework to Bluesky Pipeline available in short webinar here:

  - https://usepa.sharepoint.com/sites/NEI/SitePages/Trainings.aspx
  - Look under Events-Fires section
  - If not able to view, please contact Vukovich.Jeffrey@epa.gov

EPA has compared Framework vs Pipeline for year 2017

EPA has applied BSP for various other years and projects
Comparison vs. earlier year inventories
Acres burned density maps
PM2.5 emissions density maps
What information is part of the 2020NEI draft emissions release?

- Wildfire and Prescribed Burns
  - Fire locations files
    - Tribal fires assigned by shapefiles and assign tribal FIPS code
  - State-SCC pollutant totals and acres
  - National-SCC totals and acres
  - County-month summary
  - FCCS (fuel-bed) cross-reference table
  - Including CAPs and HAPs
- Ag fires
  - Comma delimited file
  - Including CAPs and HAPs
- Technical memo
- Posted https://gaftp.epa.gov/Air/nei/2020/doc/supporting_data/events/
HOW CAN YOU IMPROVE THE QUALITY OF THE NEI WILDFIRE INVENTORY?
REQUEST FOR YEAR 2020 FIRE ACTIVITY

- Request sent out on Fall 2021
  - Included documentation, data template and completeness questionnaire
  - Attached to this meeting’s invite
- Activity data must be sent via email to NEI_Help@epa.gov with keyword “2020NEI_fires” in subject line
- Deadline for submitted activity is REAL soon but have some flexibility
- Final version of 2020NEI for fires likely released late summer 2022
<table>
<thead>
<tr>
<th>Name</th>
<th>Units</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>Decimal degrees</td>
<td>Best estimate of latitude of fire</td>
<td>This could be the centroid or starting point of the fire. If location is an estimate (such as county centroid or TRS), please note that in metadata.</td>
</tr>
<tr>
<td>Longitude</td>
<td>Decimal degrees</td>
<td>Best estimate of longitude of fire</td>
<td>Same as latitude</td>
</tr>
<tr>
<td>area</td>
<td>Acres</td>
<td>Final size of the fire</td>
<td>This is preferably the “blackened acres” rather than the total perimeter.</td>
</tr>
<tr>
<td>start_date</td>
<td>Date as YYYYMMDD</td>
<td>First detection date of fire</td>
<td></td>
</tr>
<tr>
<td>end_date</td>
<td>Date as YYYYMMDD</td>
<td>Last date fire was active</td>
<td>OPTIONAL but desired</td>
</tr>
<tr>
<td>type</td>
<td>WF, RX, or AG</td>
<td>Primary fire type</td>
<td>Types are wildfire (WF), prescribed burn (RX), or cropland agricultural (AG). Rangeland burns are considered RX.</td>
</tr>
<tr>
<td>centroid used</td>
<td>Yes or No</td>
<td>If county centroid is used for latitude-longitude of fire, please indicated by putting “Yes” in this column</td>
<td>OPTIONAL: Default is No, so if left blank or column not included in submission then answer assumed to be &quot;No&quot;.</td>
</tr>
<tr>
<td>fccs</td>
<td>FCCS Fuelbed number</td>
<td>Fuels as described by a standard FCCS fuelbed</td>
<td>OPTIONAL: See <a href="https://landfire.gov/CSV/LF_Remap/LF16_FCCS_200.csv">https://landfire.gov/CSV/LF_Remap/LF16_FCCS_200.csv</a> for a list of valid fuelbed numbers. Use fuel bed numbers through type 1281.</td>
</tr>
<tr>
<td>duff_depth</td>
<td>Inches</td>
<td>Depth of below-ground fuels consumed</td>
<td>OPTIONAL – Below-ground fuels, such as duff or peat, represent large uncertainty in emission estimates. Especially for larger fires, an estimate of the consumption depth of belowground fuels is helpful.</td>
</tr>
</tbody>
</table>
THANKS FOR YOUR TIME!!