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MEETING NOTES

CONCEPTUAL MODEL FOR FIRE DATA PROJECT - CORE SCIENCE TEAM MEETING #3

DATE: March 8, 2021

TIME: 3:00-5:00pm MST

LOCATION: Microsoft Team Meeting

ATTENDEES: Matt Mavko, Tom Moore, Dave Randall, Klaus Scott, Farren Herron-Thorpe, Andrew Kirsch, Mark Fitch, Sara Strachan, Robert Kotchenruther, Rhonda Payne, Nancy French (attended first half), Lyndsey Boyle

	AGENDA ITEMS	PRESENTER	TIME ALLOTTED
1	Welcome, agenda overview	Tom Moore	5 Minutes
2	Invited expert discussion (Nancy French, MTRI)	Tom Moore (facilitator) and Nancy French	30 Minutes
3	Strawperson of WFEIS as CMFD	Matt Mavko	20 Minutes
4	Review inputs received from each CST member as homework	Matt Mavko (facilitator)	15 Minutes
5	Outline of CMFD data stream	Matt Mavko	30 Minutes
6	Next Steps and Meetings	Tom Moore and Matt Mavko	20 Minutes

	NEW ACTION ITEMS	RESPONSIBLE	DUE DATE
1	Contact Subject Matter Experts: Vince and Amber	Tom Moore	ASAP
2	Find out more information on models using FRP data	Farren Herron-Thorpe	March 29th
3	Question to consider: Do we want to build something comprehensive on the WRAP region or more piece-meal?	Core Science Team	March 29th

	UPCOMING MEETINGS	DATE AND TIME
1	Core Science Team Meeting #4	March 29, 2021, 3:00-5:00 PM MST

	FIRE DATABASES & RESOURCES DISCUSSED	LINK
1	SPECIATE	https://www.epa.gov/air-emissions-modeling/speciate
2	IRWIN	https://www.forestsandrangelands.gov/WFIT/applications/IRWIN/index.shtml
3	FFT (Fuel and Fire Tools)	https://www.fs.usda.gov/pnw/tools/fuel-and-fire-tools-fft [includes FCCS and CONSUME now]

	FCCS (Fuel Characteristics Classification System) CONSUME	
4	LF (LandFire)	https://www.landfire.gov/fccs.php
5	FINN (Fire INventory from NCAR)	https://www2.acom.ucar.edu/modeling/finn-fire-inventory-ncar
6	CALFIRE	https://www.fire.ca.gov/
7	InForm	https://in-form-nifc.hub.arcgis.com/
8	GEOMAC [no longer supported]	https://www.geomac.gov/
9	BlueSky Pipeline	https://tools.airfire.org/websky/v2/#status https://github.com/pnwairfire/bluesky
10	MODIS	https://fsapps.nwcg.gov/afm/activefiremaps.php
11	FOFEM (First Order Fire Effects Model)	https://www.firelab.org/project/fofem-fire-effects-model
12	NEI (National Emissions Inventory)	https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei
13	USFS AirFire	https://www.fs.fed.us/pnw/airfire/
14	SMARTFIREv2	https://github.com/pnwairfire/SmartFire2
15	NIFC (National Interagency Fire Center) Open Data	https://data-nifc.opendata.arcgis.com/
16	NFDRS (National Fire Danger Rating System)	https://www.fs.usda.gov/detail/cibola/landmanagement/resourcemanagement/?cid=stelprdb5368839
17	WFEIS (Wildland Fire Emissions Inventory System)	https://wfeis.mtri.org/
18	WFDSS (Wildland Fire Decision Support System)	https://wfdss.usgs.gov/wfdss/WFDSS_Home.shtml
19	North American Wildland Fuels Database	https://fuels.mtri.org
20	Pyregence consortium [wildfire forecasting]	https://pyregence.org/
21	USGS's Landsat Burned Area Essential Climate Variable (LBAECV)	https://www.sciencebase.gov/catalog/item/57867943e4b0e02680c14fec
22	Goes Fire and Smoke Tool (GOFAST):	http://www.wrapair2.org/pdf/GOFAST%20Pilot%202020.pptx

Meeting Notes

Invited Expert Discussion, Nancy French (MTRI)

- The Wildland Fire Emissions Inventory System (WFEIS) began by looking at it from a carbon cycle science perspective
- The focus of WFEIS was to understand the carbon cycle, but now has other purposes
    - Started for research purposes, but would like it to be useful for operational purposes
- Started in 2000s but has been updated overtime
- Few people were doing on-the-fly geospatial analyses at the time
- Used FCCS and CONSUME previously; BlueSky came to be around the same time

- The newest update and functionality additions were done within this past year because funding from two NASA grants/opportunities
- This is a retrospective tool, it calculates emissions for fires that have already happened
- The team has thought about ways to make it more applicable for real-time fires; this is a possibility to explore in future updates
- The purpose of CONSUME was for planning for prescribed fires
- FINN has good info on active fires
- The WFEIS team does have funding to do improvements but nothing big right now
    - There are proposals out to expand it to be something more for real-time emission estimates
- Fuels are the most important part of estimating emissions (Nancy)
- When mapping the fuels based on LANDSAT mapping, based on existing vegetation type cross walked to the FCCS, they are based on 30 meter pixels
- Klaus: Scott Stephens' lab at UC Berkeley built me a workflow for refreshing an FCCS raster in the wake of prior disturbance and deploying fuels succession schema.
- Sara: I always wondered how people handled the changes due to recent burns. Using Landfire from 2014 doesn't seem sufficient.
- Nancy will update WFIES to include recent NEI data
- NEI data on WFEIS is not showing actual emissions form the report; it's using FCCS to calculate (should be similar)
- Emissions based on a point could be done either:
    - Create a circle buffer around the point to get at the total acreage
    - Assume all fuel/vegetation is the same for all acreage burned – could be good for prescribed burns
- Contact Michael Billmire for help with technical questions using WFEIS
- CONSUME is used for emissions and consumption
- Still trying to determine: How do we use this rich information on fuels?
- To utilize a daily fuel moisture
    - Spatially it's not that granular
    - Temporally it is good
        - MODIS is the only model that has daily
        - Perimeter models use the starting date for fuel moisture
- WRAP is interested in developing a long term and stable source to develop emissions inventories for WRAP states
- Perhaps, WRAP can help identify what are the best practices about selecting datasets/models, when to use one vs another, etc.
- FCCS and CONSUME is a forest product – it does not cover croplands. At one point, WFEIS incorporated croplands.

    - Croplands may not be in WFEIS currently, but Nancy will check on that
- Further information of WFEIS is available in the following article
    - French, N.H.F., D. McKenzie, T. Erickson, B. Koziol, M. Billmire, K.A. Endsley, N.K.Y. Scheinerman, L. Jenkins, M.E. Miller, R. Ottmar, and S. Prichard. "Modeling regional-scale fire emissions with the Wildland Fire Emissions Information System." Earth Interactions 18, no. 16 (2014)
- There is not currently data on fires in urban areas
- Tom to Klaus: Are you refreshing the FCCS raster for a given area for Rx fire accomplishments, say once a year?
    - Klaus: I have a year-specific FCCS-like raster for 2001 through 2019 (within the series there are the LANDFIRE vintages), for statewide. Each "year" represents conditions at the end of the year, reflecting all the disturbances (treatments, wildfires, etc.) that happened here and there over the course of the year. what I have is a bundle of R scripts that work in Arc, plus the rasters that were generated. I need to turn the crank to produce the next years.

Strawperson of WFEIS as CMFD (Matt Mavko)

- Some areas where WFEIS may be lacking:
    - Parsing out emissions by fire type
    - Looking at emissions on a daily basis
- It would be nice to better understand the uncertainty associated with any model based on fuels, e.g. 95% confidence interval (Klaus)
    - Using NAWFD probability curves
- It would be nice to provide steps to guide users through the process on the best way to utilize WFEIS (or other decided upon model); e.g. a roadmap (Sara)
- WFEIS does not use HMS detects at all
    - This explains why the NEI data is produces much higher emissions output because it includes HMS detects and nation-wide reported information
- WFEIS not including urban areas is also concerning; would need more clarity on how the model categories urban vs. non-urban because wildfires do not exclusively stay in wildland areas
- The LANDFIRE EVT types include some ag-related cover types
- WFEIS may be able to take care of the wildfire part of the "question", and WRAP can supplement with other fire types
    - It would be nice if they had an API option on their site so we could pull the data and utilize it in our own model
- Maybe our focus is on the activity dataset to get the time resolution we need (daily) and fire type

    - It could potentially live on the WFEIS site as an option
- Fire type is not a mystery using GIS data (Klaus)
    - Location may be able to tell you the type of burn, so we could utilize WFEIS potentially to use this
    - We could take all of the perimeter data and the date ranges and screen out all HMS data in the existing locations so that you're left with all HMS data that is not in the GEOMAC. This would give you a wildfire data estimate and an everything else estimate. (Farren)
        - For non-wildfires, you may be able to determine type based on location
    - Perhaps use a combination of perimeter data and dates to determine fire type
- We should take advantage of the datasets that are already available at year-end
- Klaus – uses CALFIRE and PFRS
    - PFRS is a voluntary system, so sometimes it's missing data
        - Federal land managers are now required to submit to PFERS
    - CALFIRE system is pretty good

Data Warehouse Discussion (Matt Mavko – facilitator)

- Ongoing questions for the group:
    - What kinds of things would you want in a data warehouse?
    - What would you need it to do/have?
    - What about that idea excites you?
- Would love to have a system similar to CALFIRE but for other/neighboring states (Klaus)
- Longevity of the data warehouse would be key– more temporal flexibility – multiple years and keep it going (Farren)
    - People like to see trends in fire data

Outline of CMFD data stream (Matt Mavko)

- Based on the initial discussions, we have put together a diagram to organize the existing databases and models available organized by:
    - How soon the data is available (right to left)
    - Where it fits into the overall workflow (visual placement)
    - Whether it's a primary data/tool vs helper/enhancer tool is noted by shape
    - Quality of the data is noted by color
- The goal is to sift through all of the information available to us currently and thinking about how we might build a model out of it

- WFEIS only offers CONSUME as an option for consumption models
- Klaus uses FOFEM - % of crown affected by fire and fuel moisture are the only two parameters manually entered typically and then the rest are defaults
    - Allows you to change fuel loads if you want
- FOFEM has a pile calculator (fuel category = natural piles)
- BlueSky uses CONSUME and FEPS but does not allow you to adjust the assumptions or models used; it does this behind the scenes
- NEI uses FEPS, which is concerning because FEPS is outdated and uses older emission factors that have a lot of uncertainty
- Fire Geography is referring to partitioning landscapes into different varieties and classifying fires into type based on that + date range and seasonality
- MODIS product estimates area burned but an alternate example is using conversion factors to go from FRP to Tons Consumed
    - There is peer-reviewed literature that supports this approach and has conversion factors available
- This area of research is emerging and we need to build in some flexibility to incorporate new data over time
    - Using conversion factors could be a good strategy because the method would not change, but the uncertainty could be reduced
- Susan O'Neill recently wrote a paper on using polar-orbiting sat FRP for spatial and GOES FRP for constraining temporal
- Klaus: I've been trying to use page 25 here for conversion factors I like your (Matt's) method better

Closing Remarks and Next Steps

- Bring in subject matter expert on FRP, preferably someone who does not have their own model that they would want us to use/buy into
    - Vincent G. Ambrosia, NASA
      Email: vincent.g.ambrosia@nasa.gov
      Office: (650) 604-6565
    - Amber J. Soja, Ph.D.
      Associate Research Fellow
      International Association of Wildland Fire Board of Directors
    - Craig Clement
- WFEIS has promising emission info but there are opportunities to improve activity data

- Question to answer moving forward: Do we want to build something comprehensive on the WRAP region or more piece-meal?
    - WFEIS would be a good potential for collaboration if we want to go with a piece-meal approach
    - If we want to do something more streamlined and a WRAP-region specific EI, we may want to create our own data warehouse and model
- We may be able to develop a hybrid approach where WRAP puts together a regional activity dataset and then we can upload that to WFEIS
- Farren is a co-author on a paper that is comparing fire EI models for a particular fire; Four of the models use FRP as an input
    - Farren will contact the group to get more information on which model may be best for using FRP data
- Tom to contact Vince and Amber
- Next meeting – 3 weeks out
    - Will pick dates for workshops in the next meeting

Follow-up notes and Resources

- USGS's Landsat Burned Area Essential Climate Variable (LBAECV) is a resource that could be quite powerful for pinning down day burn for fuel moisture
    - Data available for 1984-2015
- USFS Region 5 remote sensing lab (Leland Tarnay) shared a presentation about a pilot project called GOES Fire and Smoke Tool (GOFAST) to estimate wildfire emissions in near real-time. It uses FRP.
    - Slides about the pilot project are available for more information.