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MEETING NOTES

CONCEPTUAL MODEL FOR FIRE DATA PROJECT - CORE SCIENCE TEAM MEETING #4

DATE: March 29, 2021

TIME: 3:00-5:00pm MST

LOCATION: Microsoft Team Meeting

ATTENDEES: Matt Mavko, Tom Moore, Dave Randall, Klaus Scott, Farren Herron-Thorpe, Mark Fitch, Sara Strachan, Robert Kotchenruther, Lyndsey Boyle

	AGENDA ITEMS	PRESENTER	TIME ALLOTTED
1	Welcome, agenda overview	Tom Moore	5 Minutes
2	Re-visit current draft of Conceptual Model	Matt Mavko	30 Minutes
3	Review other possible CM inputs	Matt Mavko	15 Minutes
4	Discuss outreach process to MTRI about incorporating WFEIS v2.2020.10	Tom Moore	10 Minutes
5	Present and discuss implementation of Warehouse home for CM	Tom Moore	15 Minutes
6	CST discussion on wrapping up CM, future CST meetings, workshops	Tom Moore	15 Minutes
7	Next Steps and Meetings	Tom Moore	5 Minutes

	NEW ACTION ITEMS	RESPONSIBLE	DUE DATE
1	Create outline/agenda for three workshops	Tom Moore, Matt Mavko, Dave Randall, Mark Fitch	April 8th
2	Formalize conceptual model and workflow diagram	Matt Mavko	April 8th

	UPCOMING MEETINGS	DATE AND TIME
1	Core Science Team Meeting #5	April 8, 2021, 9:30-11:30 PM MST
2	Workshops	TBD

	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/

Meeting Notes

Re-visit current draft of Conceptual Model, Matt Mavko

- Ultimately what we want in the WRAP Fire EI is the fire activity classified by burn type
- We can utilize the WFEIS emission factors and calculations but improve on the activity dataset
- If we develop an activity database that we like, then we can upload it to the WFEIS system to calculate emissions
- Activity data can come from:
    1. NIFS + HMS for daily WF activity
    2. Point Reports activity from state smoke management programs and forest services
    3. HMS + fire geography for other activity

- The first two are traditional datasets that have acres burned; these are already compatible with WFEIS. The third uses FRP for consumption
- There are quality issues with the Rx and Ag burns, especially with smaller burns
    - The detectors often have a minimum threshold size
    - Coming up with total acres burned is difficult
- Proposed methodology for small burns:
    - Assign each fire to a Consumption Profile based on the length of burn (1-day, 2-day, etc.) using HMS detects (source: BlueSky Playground)
    - Match the FRP value to the hour on the consumption profile; use the relative % hourly consumption to determine the estimated FRP value for every hour on the curve
    - Convert FRP to Tons Consumed
    - Integrate across all hours to calculate the total tons consumed
- Have performed this methodology on 5 fires so far as a case study
    - Would like to proceed with more case-studies using different datasets
- Propose rounding /assigning bins or ranges to the Tons Derived numbers to reflect the uncertainty; be more transparent about the confidence level (Farren)

Proposed methodology for wildfires:

- A trap that many have been caught in is trying to use satellite detects to calculate acres burned instead of just using it to record that a fire occurred
- How do the satellite detects help us?
    - How burning is progressing over time
    - Where burning is occurring over time
    - Daily activity data for burns
- Example of how to use satellite detects to improve daily activity data with a fire that has a known acreage and duration
    1. Divide total acres by days
    2. Apportion based on associated detects
    3. Adjust to fill in days with 0 detections
    4. Reapportion acres based on adjusted detects
- Key considerations:
    - Assessing true time gaps for weather and duration
    - Day vs Night detects
    - Multiple detects at one location in a day
    - Try for custom diurnal profiles
    - Incorporate fire weather grid (fire danger) for assessing gaps
- Based on Amber's feedback, we will likely use GOES dataset which has 2km, 5-min accuracy

- We can develop extended decision trees to decide in each of these instances what we are going to do; what the best methodology is for any given situation or potential gaps in datasets
    - E.g. if fire lays down because of weather or cloud cover, etc.
- In a recent paper that Klaus sent around (GOFAST project), the 5-min GOES data allows you to get high resolution data; use the FRP values to get relative magnitude
- For fires that are over 12,000 acres – we can get diurnal profiles for fires
    - Previously we were only able to get total acres burned but only had one type of diurnal burn pattern
    - They found from the GOES data that that is not how fires typically behave; each fire day has a unique diurnal pattern
- How to handle situations where fire detects are not available for multi-day fires?
    - Create a growth curve based only on the duration of fire using a logistic function
- We can create a detailed ruleset/decision tree to easily see how to combine different datasets and when to use them depending on the circumstance
- Fire Geography: Create a layer in GIS with default information on fire types by season
    - Adjust locally as necessary and as information is available
    - Create a temporal and spatial dataset that we can apply to datasets that don't have a lot of data on fire types (e.g. satellite data)
- If we use FRP data, we do not need to know total acres burned because we can go directly to tons consumed of fuel
- One question to consider: How much burning is going on that is not being reported?
- In one case, the FRP is for temporal, the other (rule set 4) is for fuel consumption. At CARB we think there is a lot of burning we do not know about. (Klaus)
- Consider: How to reconcile reported data and satellite data? The satellite data has issues with spatial mapping; sometimes the satellite detects are picking up a reported burn but may be off spatially so it may register as the same fire and could lead to double counting
- The model / ruleset could be developed using a series of python scripts
- HMS has VIIRS data, GOES20, and MODIS
- Our focus is to use the VIIRS data and GOES
- GOES is getting most of the burns now because of the temporal resolution; can capture ~70% of fires (according to NASA)
    - The grid never changes because it is geostationary. This is helpful for tracking a fire's burn pattern over time
- HMS may be over-processed, and we may miss some of the detail available in the raw datasets from VIIRS and GOES

Workshop Content and Audience, Tom Moore (facilitator)

- The intent of the first workshop is to spread the word about the conceptual model that we have decided on; less emphasis on the audience giving feedback on what they want the conceptual model to be like
- The PFIRS system would have records for when the CARB meteorologists designated what days were ok for burning in which air basins, which could delineate time frames to search for candidate fire detects. (Klaus)
- IDEQ's meteorologist does that too, forecasting good/marginal/no burn days for specifically delineated areas. For both Rx and CRB, but for different polygons and different (but sometimes overlapping) times of year. Could be leveraged for a fire geography. (Sara) [this is also done by MT/ID Airshed Group and Oregon]
- GOES could be Level 0 because it gives a good capture rate
    - Individual/state level modification to QA to get to Level 1 or 2 data
- Modeling would not be recommended for Level 0 data, only Level 1 and above
- Are there other types of users to consider? E.g. natural resource folks, conservation folks?
    - There may be other users, but the focus will be on federal, state, local, and tribal level agencies because they will be direct stakeholders
- If we cannot explain the concept well and simply, it will not be useful or effective
- We may want to split the workshops into two categories: data users and applications
    - There may be some crossover between data users and the application folks
- Potential audience to invite:
    - TRACK FIRE [???]
    - Inventory folks
    - CAPCOA (Klaus)
    - People that track fire data
- Question to ask audience: What level of effort would it be for folks to submit the activity tracking data they already have?
- First workshop could be higher level and the goals/motivation of the WRAP fire inventory. The second workshop could be more detailed. (Sara)
- We could have a 30-min intro meeting on what we are working on, high-level applications, and then put out the schedule for the two upcoming workshops: technical details and applications (user experience and applications) (Dave)
- Exceptional events: we may not be able to satisfy all exceptional event needs if we are focusing on WRAP states only (Farren)
    - We can extend perimeter to include Canada and Mexico so that we capture neighboring areas of the WRAP states (e.g. Washington and California); keep the east/west boundaries but extend the north/south boundaries

- Data warehouse concept: How do we roll the data warehouse and conceptual model into one product? Are they two distinct objects or related? How do these relate to the workshops? (Mark)
- Consider: Who are the people we want buy-in from? What workshop(s) would it make sense to target these folks? Financial support and/or non-monetary support

Next Steps and Action Items

- Action Item 1: Outline of the three workshops (management group)
- Next meeting: Morning of the 8th –9:30-11:30am MST
- Action Item 2: Matt – regenerating and formalizing the workflow diagram