

**SUGGESTED DATA INPUT
AND DATA FLOWS FOR THE
WRAP EDMS FIRE
MODULE**

Technical Memorandum

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SUGGESTED DATA INPUT AND DATA FLOWS FOR THE WRAP EDMS FIRE MODULE

Suggestions are provided below that build upon the “Fire Emissions Calculation Methodologies – White Paper” previously prepared by Pechan. These suggestions are meant to provide a broad overview of how fire-related information can be provided to the EDMS Fire Module, and how that data would flow through the module. Details, such as input file formats, will be developed once consensus has been reached on the overall structure and features of the Fire Module.

Pechan also expanded and refined the list of fires-related data elements, including those being gathered by each state and for Federal agencies for each of the three fire types: wildfires, prescribed burns, and agricultural burns (in the Fire Module “wildland fire use activity” will be broken out separately from wildfires and prescribed burns by specifying this activity in the “fire type” field). These elements are shown in Tables 1 through 3 below. The information in these tables provides an indication of the types of fire data managed by each state/Federal agency as well as the wide array of input data that is used by the three fuel consumption/emissions models (FOFEM, CONSUME, and FEPS). Information on the emission outputs of each of these models is also included at the bottom of Tables 1 and 2 (none of the models currently handle agricultural burns). Note that Pechan did not receive information for all burn types from all States. Also, some states track other fires-related information in addition to that listed in Tables 1 and 2. Pechan selected data elements that were common between the States/Federal Agencies and the models used to estimate fire emissions.

As shown in Tables 1 through 3, most states manage data for prescribed burns; however most of these states only gather information such as the date, location, and size of the burn (fire consumption/emission models, usually CONSUME, are used to define fuel types, loading, moisture, etc.). Very few states gather information on wildfires. For agricultural burns, information that is gathered generally consists of total acres burned by crop type (typically at the county-level). In some cases, temporal information is also available for agricultural burns (daily, assuming the burn occurred on the permit date).

Figure 1 provides a schematic of the suggested flow of fire emissions and activity data through the EDMS Fire Module. The figure shows the Fire Module contained within the large dashed box. At the left-hand side of the figure, data flow into the Fire Module is envisioned to be of two general types: emissions data and activity data (fuel consumption and other fire event information). Emissions data flow is from users that have already calculated emissions and want to populate EDMS with these data. Two separate emissions data flows are shown: National Emissions Inventory Input Format or NIF3.0 data (for users that have emissions data in this format); and non-NIF3.0 data. For users with NIF3.0 formatted data [such as that prepared for the State’s Consolidated Emissions Reporting Rule (CERR)], data do not flow through the Fire Module, since no changes are being made.

Once submitted into the system, a State/Tribal QA/QC check is performed prior to final acceptance into EDMS. This QA/QC check consists of reviewing the data prior to NIF conversion to assure that data have been entered correctly and that the Fire Module has estimated monthly (from annual inputs) correctly. After this initial QA/QC step, the State/Tribal contact also has the opportunity to perform a QA/QC review of the NIF3.0 formatted data once these are created by EDMS.

For users supplying emissions data not in NIF3.0 format, the data are entered into a yet to be prescribed Fire Module format. This is shown as the second data flow from the bottom. In this data flow, two separate input formats will need to be created – one corresponding to area source data (e.g. annual county-level totals), and the other for point source emissions data (i.e. burn or episode-level data including location and date(s)). For the area source emissions data, entry into the module is followed by a temporalization step (e.g. annual to monthly; this shouldn't be needed for point source emissions data, since temporal data should be included with the point source data). This is followed by a State/Tribal QA/QC check. Outside of the Fire Module, the emissions data are converted into NIF3.0 format, QA/QC'd by the State/Tribal contact, and loaded into EDMS.

For the activity data flows (top 2 data flows in Figure 1), both point and area source data are specified. This is because it is envisioned that data for some fires (e.g., wildfires >100 acres or other threshold) will be collected/developed at sufficient detail to support the point source format of NIF3.0, and emissions data for smaller fires will be aggregated into an area source format (e.g., county-level). Based on information collected from the States, most prescribed burns and larger wildfires would follow the point activity data flow. Most of the smaller prescribed burns, wildfires, and agricultural burns will most likely follow the area activity data flow.

The point and area activity data flow is for EDMS users who will use the Fire Module for storing their activity data and calculating emissions. Tables 1 through 3 provide details of the activity data elements used for prescribed burns (including broadcast and pile burns), wildfires, and agricultural burns. Note that many of these elements are not gathered by the user, but are specified or estimated within a fuel consumption model. The basic information needed by the user includes event information (location, start date, duration, acres burned) and some fuels information (e.g., pile or broadcast burn, pile information for pile burns, canopy consumption, and fuel loading if not estimated by the model).

It is currently envisioned that a fuel consumption model would be called up from outside of the Fire Module or the user would directly input fuel consumption and other necessary data for each event in the yet to be prescribed input format. Advantages of calling up a fuel consumption model include the ability to continually access the most up to date version of the model(s) and to eliminate the need to modify the EDMS code to reflect future improvements in fuel consumption modeling. After conducting the fuel consumption modeling, the user would input the data in the prescribed input format. Direction needed from the FEJF includes which models to support:

- CONSUME is the most popular fuel consumption model used by the WRAP states (as shown in the attached spreadsheets); however
- FEPS currently contains the highest level of input data detail, since it is designed to calculate hourly consumption, plume characteristics, and emissions. The FEJF will need to determine if it is important to allow for this level of refinement in the data stream. Advantages to using FEPS include the calculation of flaming/short-term smoldering/long-term smoldering emissions and plume rise;
- FOFEM is also shown as an option in Figure 1; however, it appears to be much less commonly used in the WRAP states.

The dashed boxes within the Fire Module specify data tables that will be needed to support the development of the area and point source emissions files. The following data tables are envisioned: fuel loading/consumption (e.g. for each land use at the county-level); emission factors; plume rise; hourly fuel consumption; and monthly activity profiles. These tables could be constructed as dynamic tables that allow a State/Tribal user to revise the default information, as new or locality-specific information become available.

As mentioned above, event-specific data are accepted into the “Point Activity” table of the Fire Module. For each event, the first step is for that the user either enters the fuel consumption data, event data, and other information from a previous analysis or calls up a fuel consumption model from outside of the Fire Module to supply fuel consumption estimates. If we do not envision that the user will input the data by hand from the fuel consumption model, there will be a need for a conversion tool (not shown in Figure 1) to convert the consumption model output into the Fire Module input format. Alternatively, fuel consumption algorithms could be coded into the Fire Module; however, this would negate the benefits mentioned above.

In the second step, from the fuel consumption estimates, the Fire Module will estimate the daily or hourly emissions for each event. Pechan recommends using an internal emission factor table for this purpose, due to the inconsistencies in the emission factors available in the fuel consumption models and because it will allow for easy updating of emission factors, as new data become available (e.g. from EPA or other sources). In the third step for point sources, the following are performed: daily emission estimates are converted to hourly estimates using default hourly profiles; plume heights are incorporated from either FEPS or a default table (e.g., based on previous WRAP fires inventory work); and the boundary layer versus lofted emissions are calculated.

Pechan will also need input from the FEJF on last item above on developing the boundary layer versus lofted emissions within the Fire Module. Alternatively, this could be performed outside of the module. However, it appears that we are moving toward having multiple release points (e.g. release heights) specified within the NIF3.0 point source structure (based on work conducted by the Midwest RPO; no information from EPA yet on this issue). [NOTE: Release height refers to the layer of the atmosphere into which a certain fraction of the emissions are released. This is different from “mixing layer”, which is the lowest (“boundary”) layer of the atmosphere from the earth’s surface within which emissions are assumed to be evenly distributed.] Because of this, Pechan recommends keeping the calculation of boundary layer versus lofted emissions within the Fire Module.

The final step for both point and area activity data flows is a QA/QC step by the State/Tribal contact, so that a review of the activity/emissions data can be performed prior to NIF3.0 conversion by EDMS. This QA/QC step involves checks to assure that the fire data were entered correctly, the Fire Module correctly estimated monthly activity for area sources, the event-level and hourly emissions for point sources have been correctly allocated in time and space; and that the emission estimates are reasonable based on the inputs. The State/Tribal contact will also have the opportunity to review the NIF3.0-formatted data created by EDMS.

For area sources, (e.g., small prescribed burns and wildfires, most agricultural burns), the data submitted by the states will likely be limited to acres burned by county and land use (land cover, crop type). In certain cases, states may also have information on fuel loading and/or consumption and the timing of burns (e.g., month). As with point sources, the first step is to

estimate fuel consumption (e.g., monthly, at the county-level). Two options are available, using one of the external fuel consumption models or values from a default fuel loading/consumption table. Of these two options, a default lookup table seems to be the best option. Currently, none of the fuel consumption models handle agricultural burning, but this may change. If monthly consumption data are not available from the state agency, a default set of monthly temporal profiles will be used (e.g. based on previous WRAP work).

The NIF3.0 format for area sources does not incorporate daily information. Daily and hourly emissions (e.g. for use in air quality modeling) are typically developed using an emissions model (e.g. SMOKE), which has a set of weekly and diurnal profiles. Monthly and weekly profiles from SMOKE or previous FEJF-sponsored inventory work could be incorporated into the Fire Module for the purposes of calculating summer season weekday (SSWD) and winter season weekday (WSWD) emission estimates required in NIF3.0. Diurnal profiles could also be incorporated into the Fire Module, although they aren't needed to create the NIF3.0 area files. A reason to include these profiles: State/Tribal agencies could review and update these, so that the profiles (monthly, weekly, and daily) could be provided to air quality modelers (otherwise, modelers will default to the available set of profiles, which are probably uniformly distributed). Note that this capability has not been incorporated into Figure 1.

The next step for area sources is to estimate monthly, county-level emissions from the consumption data. These are estimated using the emission factors from the default table. Finally, the monthly emission estimates are converted to NIF3.0 and QA/QC'd by the State/Tribal agency (outside of the Fire Module), prior to being loaded into the EDMS. At this point, it is envisioned that any calculation of boundary layer versus lofted emissions would be handled by an emissions model outside of EDMS (e.g. SMOKE). This is because the area source format does not allow for release parameters to be specified. This is another issue that should receive further discussion with the FEJF.

More than one commenter to this Technical Memorandum wanted to know who would be responsible for entering information into the Fire Module. Essentially, this could be anyone (e.g. the actual burners, Tribal representative, State representative); however, these issues should be coordinated within each WRAP State.

Commenters also wanted to know how the Fire Module would account for emission reduction techniques (ERTs). The module was not designed with this need in mind; however a user could estimate emission reductions by entering fire data for a baseline scenario, develop the emission estimates, and save these data (either by hand, or an intermediate output table could be designed into the system). The user would then revise the input data based on the ERT (e.g. reduced fuel loading, acreage), and use the module to re-estimate the emissions. The fire information associated with the actual burn conditions would then serve as the output of the module for input into EDMS.

Table 1a. State Agency Fire Data Formats - Prescribed Burns

Item	Data Elements	CONSUME	FOFEM	FEPS	AK	AZ	CA ^a	CO	NV	NM	ND	OR	SD	UT	WA	WY	ID & MT	EDMS Elements	Comments	
Event Information	Identifier #							x		x						x		X		
	Fire Type			x	x	x	x	x	x	x	x	x		x	x	x	x	X		
	Fire Name	x		x	x			x		x	x				x	x	x	X		
	Location	x		x	x			x	x	x	x			x		x	x	X	EDMS: in addition to lat/long/datum, include fields for FIPS County and Tribal Codes.	
	Slope	x											x		x			X		
	Start Date	x		x	x	x		x	x	x	x	x		x	x	x	x	X		
	Start Hour			x		x		x						x	x	x		X	EDMS: include time zone	
	End Date			x	x	x		x			x	x		x	x	x	x	X		
	End Hour			x											x			X	EDMS: include time zone	
	Fire Shape			x														X		
	Season		x					x										X	Winter, Spring, Summer, or Fall.	
	Acres Burned	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	X	
	Hourly Fire Size			x				x											X	In FEPS, the acreage burning in each hour can be specified; the % of each fuel type in each hour can also be varied.
	Daily Fire Location																		X	Not handled by any consumption model currently; however daily episodes within an event could be modeled separately with different locations.
Daily Temporal Profile																		Default Profiles	For application to daily emission estimates.	
Fuels Data - Natural Fuels	Fuel Type	x	x	x		x	x	x	x	x	x	x				x		X	Fraction or percentage of each fuel type, e.g. shrub, grass, woody, litter.	
	Canopy Consumption	x	x	x			x	x										X	FEPS calculates canopy consumption for severe wildfires; User specifies % canopy consumption in FOFEM.	
	Rotten Log %		x				x													
	Log Loading		x				x												Weighting of smaller or larger down logs (qualitative).	
	Fuel Loading	x	x	x	x		x	x	x	x	x	x			x	x	x	Default Table	For each fuel type (tons/acre). CONSUME has fuel loadings by 1-hour, 10-hour, 1000-hour and 10000-hour and by the diameters of fuels in inches.	
	Duff Loading			x														Default Table	tons/acre	
	Fuel Reference		x	x			x											X	e.g. NFDR Fuel Model; SAF/SRM; FCC.	
	Flaming Consumption			x														X (hourly)	Flaming fuel consumption by fuel type.	
	Sh. Smoldering Consumption			x														X (hourly)	Short term (<2-hr) smoldering fuel consumption.	
	Lg. Smoldering Consumption				x													X (hourly)	Long term smoldering fuel consumption.	
1-hr Moisture			x															As part of a moisture profile.		
10-hr Moisture	x		x															As part of a moisture profile.		

Table 1a (continued)

Item	Data Elements	CONSUME	FOFEM	FEPS	AK	AZ	CA ^a	CO	NV	NM	ND	OR	SD	UT	WA	WY	ID & MT	EDMS Elements	Comments	
	100-hr Moisture			x															As part of a moisture profile.	
	1000-hr Moisture	x		x		x													As part of a moisture profile.	
Fuels Data - Slash Fuels	Broadcast Loading			x												X		Default Table	tons/acre	
	Pile Profile	x																	CONSUME: pile group name, numbers of piles, pile shape, width and height and length to define a pile, pile quality, pile soil (%), primary and secondary species (%) in piles, pile density, volume and total consumption per group	
	Pile Loading			x						x						X		X	tons/acre: suggest EDMS accept total estimated mass (tons) for each burn. Also, provide an option to enter pile volumes with a default fuel density to estimate total mass of pile(s).	
	Duff Loading			x														Default Table	tons/acre	
	Duff Depth											x								
	Duff Fuel Moisture	x																		
	Flaming Consumption			x															X	Flaming fuel consumption by fuel type.
	Sh. Smoldering Consumption			x															X	Short term (<2-hr) smoldering fuel consumption.
	Lg. Smoldering Consumption			x															X	Long term smoldering fuel consumption.
	1-hr Moisture			x																As part of a moisture profile.
	10-hr Moisture	x		x																As part of a moisture profile.
	100-hr Moisture			x																As part of a moisture profile.
	1000-hr Moisture	x		x																As part of a moisture profile.
	Meteorological Data	Hrly. Wind Speed - Flame			x											x				Hourly wind speed at flame height.
Hrly. Wind Speed - Transport				x															Hourly wind speed at transport height.	
Hrly. Stability				x															Hourly atmospheric stability class (Pasquill)	
Min. T/Max %RH				x															Minimum temperature and maximum humidity (daily, when hourly data are not used).	
Max. T/Min %RH				x															Maximum temperature and minimum humidity (daily, when hourly data are not used).	
Snow-off Date		x					x						x			x				
Days Since Last Rain		x					x						x			x				
Harvest Date	x																			

Table 1a (continued)

Item	Data Elements	CONSUME	FOFEM	FEPS	AK	AZ	CA ^a	CO	NV	NM	ND	OR	SD	UT	WA	WY	ID & MT	EDMS Elements	Comments
	Weather Zone	x																	
Emissions (output from a model and/or as input to EDMS)	Emissions - Event	x	x															X	FOFEM: SO2, PM10, PM2.5, CH4, CO, CO2, and NOx. CONSUME: PM, PM10, PM2.5, CO, CO2, CH4, NMHC.
	Emissions - Hourly			x														X	FEPS calculates hourly emissions for PM2.5, CH4, and CO.
	Plume Rise			x														X	FEPS calculates the Briggs max value, and a theoretical min. and max. value.
	Hrly PM25 Lofted			x														X	FEPS - PM25 lofted into the plume in a given hour (lb/min). Total PM25 - Lofted PM25 = drift PM25 (boundary layer)
	Hrly Drift PM25			x														X	see above.

^a Specific information on CA's Prescribed Fires Incident Reporting System (PFIRS) was not obtained in time to incorporate into this memorandum; however the data elements listed for CA should be consistent with those used by PFIRS.

Table 1b. Federal Agency Fire Data Formats – Prescribed Burns

Item	Data Elements	CONSUME	FOFEM	FEPS	FS – FASTRACS ^a	DOI – 1202 ^b	EDMS Elements	Comments
Event Information	Identifier #						x	
	Fire Type			x	x	x	x	
	Fire Name	x		x	x		x	
	Location	x		x	x		x	EDMS: in addition to lat/long, include fields for FIPS County and Tribal Codes.
	Slope	x					x	
	Start Date	x		x	x	x	x	
	Start Hour			x			x	
	End Date			x	x	x	x	
	End Hour			x			x	
	Fire Shape			x			x	
	Season			x			x	Winter, Spring, Summer, or Fall.
	Acres burned	x	x	x	x	x	x	
	Hourly Fire Size			x			x	In FEPS, the acreage burning in each hour can be specified; the % of each fuel type in each hour can also be varied.
	Daily Fire Location						x	Not handled by any consumption model currently; however daily episodes within an event could be modeled separately with different locations.
Daily Temporal Profile						Default Profiles	For application to daily emission estimates.	
Fuels Data - Natural Fuels	Fuel Type	x	x	x		x	x	Fraction or percentage of each fuel type, e.g. shrub, grass, woody, litter.
	Canopy Consumption	x	x	x			x	FEPS calculates canopy consumption for severe wildfires; User specifies % canopy consumption in FOFEM.
	Rotten Log %		x					
	Log Loading		x					Weighting of smaller or larger down logs (qualitative).
	Fuel Loading	x	x	x	x		Default Table	For each fuel type (tons/acre). CONSUME has fuel loadings by 1-hour, 10-hour, 1000-hour and 10000-hour and by the diameters of fuels in inches.
	Duff Loading			x			Default Table	tons/acre
	Fuel Reference			x	x		x	e.g. NFDR Fuel Model; SAF/SRM; FCC.
Flaming Consumption				x		x (hourly)	Flaming fuel consumption by fuel type.	

Table 1b (continued)

Item	Data Elements	CONSUME	FOFEM	FEPS	FS – FASTRACS ^a	DOI – 1202 ^b	EDMS Elements	Comments
	Sh. Smoldering Consumption			x			x (hourly)	Short term (<2-hr) smoldering fuel consumption.
	Lg. Smoldering Consumption			x			x (hourly)	Long term smoldering fuel consumption.
	1-hr Moisture			x				As part of a moisture profile.
	10-hr Moisture	x		x				As part of a moisture profile.
	100-hr Moisture			x				As part of a moisture profile.
	1000-hr Moisture	x		x		x		As part of a moisture profile.
	Broadcast Loading			x			Default Table	tons/acre
	Pile Profile	x						CONSUME: pile group name, numbers of piles, pile shape, width and height and length to define a pile, pile quality, pile soil (%), primary and secondary species (%) in piles, pile density, volume and total consumption per group
	Pile Loading			x			x	tons/acre
	Duff Loading			x			Default Table	tons/acre
	Duff Depth							
Fuels Data - Slash Fuels	Duff Fuel Moisture	x						
	Flaming Consumption			x			x	Flaming fuel consumption by fuel type.
	Sh. Smoldering Consumption			x			x	Short term (<2-hr) smoldering fuel consumption.
	Lg. Smoldering Consumption			x			x	Long term smoldering fuel consumption.
	1-hr Moisture			x				As part of a moisture profile.
	10-hr Moisture	x		x				As part of a moisture profile.
	100-hr Moisture			x				As part of a moisture profile.
	1000-hr Moisture	x		x				As part of a moisture profile.
Meteorological Data	Hrly. Wind Speed - Flame			x				Hourly wind speed at flame height.
	Hrly. Wind Speed - Transport			x				Hourly wind speed at transport height.

Table 1b (continued)

Item	Data Elements	CONSUME	FOFEM	FEPS	FS – FASTRACS ^a	DOI – 1202 ^b	EDMS Elements	Comments
	Hrly. Stability			x				Hourly atmospheric stability class (Pasquill)
	Min. T/Max %RH			x				Minimum temperature and maximum humidity (daily, when hourly data are not used).
	Max. T/Min %RH			x				Maximum temperature and minimum humidity (daily, when hourly data are not used).
	Snow-off Date	x				x		
	Days Since Last Rain	x				x		
	Harvest Date	x						
	Weather Zone	x						
	Emissions - Event	x	x				x	FOFEM: SO2, PM10, PM2.5, CH4, CO, CO2, and NOx. CONSUME: PM, PM10, PM2.5, CO, CO2, CH4, NMHC.
Emissions (output from a model and/or as input to EDMS)	Emissions - Hourly			x			x	FEPS calculates hourly emissions for PM2.5, CH4, and CO.
	Plume Rise			x			x	FEPS calculates the Briggs max value, and a theoretical min. and max. value.
	Hrly PM25 Lofted			x			x	FEPS - PM25 lofted into the plume in a given hour (lb/min). Total PM25 - Lofted PM25 = drift PM25 (boundary layer)
	Hrly Drift PM25			x			x	see above.

^a FS FASTRACS – U.S. Forest Service’s Fuel Analysis, Smoke Tracking, and Report Access Computer System.

^b Information available from Department of Interior Form 1202 obtained from Air Sciences.

Table 2a. State Agency Fire Data Formats - Wildfires

Item	Data Elements	CONSUME	FOFEM	FEPS	AK	AZ	CA	CO	NV	NM	ND	OR	SD	UT	WA	WY	ID & MT	EDMS Elements	Comments	
Event Information	Identifier #									x								X		
	Fire Type			x	x					x					x		x	X	EDMS – specify “wildfire” versus “wildland fire use activity”	
	Fire Name	x		x	x					x								X		
	Location	x		x	x					x					x		x	X	EDMS: in addition to lat/long, include fields for FIPS County and Tribal Codes.	
	Slope	x																X		
	Start Date	x		x	x						x					x		x	X	
	Start Hour																		X	
	End Date			x	x						x							x	X	
	End Hour																		X	
	Ignition Time																		X	
	Fire Shape			x															X	
	Season		x	x															X	Winter, Spring, Summer, or Fall.
	Acres burned	x	x	x	x						x					x			X	
Fire Size				x														X	In FEPS, the acreage burning in each hour can be specified; the % of each fuel type in each hour can also be varied.	
Daily Temporal Profile																		Default Profiles	For application to daily emission estimates.	
Fuels Data – Natural and Slash Fuels	Fuel Type	x	x	x						x							x	X	Fraction or percentage of each fuel type, e.g. shrub, grass, woody, litter.	
	Canopy Consumption	x	x	x														X	FEPS calculates canopy consumption for severe wildfires; User specifies % canopy consumption in FOFEM.	
	Rotten Log %		x																	
	Log Loading		x																	Weighting of smaller or larger down logs (qualitative).
	Fuel Loading	x	x	x						x							x	Default Table	for each fuel type (tons/acre). CONSUME has fuel loadings by 1-hour, 10-hour, 1000-hour and 10000-hour and by the diameters of fuels in inches.	
	Duff Loading			x														Default Table		
	Fuel Reference		x	x														X	e.g. NFDR Fuel Model; SAF/SRM; FCC.	
	Flaming Consumption			x														X (hourly)	Flaming fuel consumption by fuel type.	
	Sh. Smoldering Consumption			x														X (hourly)	Short term (<2-hr) smoldering fuel consumption.	
	Lg. Smoldering Consumption			x														X (hourly)	Long term smoldering fuel consumption.	
	1-hr Moisture			x																As part of a moisture profile.
	10-hr Moisture	x		x																As part of a moisture profile.
100-hr Moisture			x																As part of a moisture profile.	
1000-hr Moisture	x		x																As part of a moisture profile.	
Meteorological Data	Hrly. Wind Speed - Flame			x															Hourly wind speed at flame height.	
	Hrly. Wind Speed - Transport			x															Hourly wind speed at transport height.	

Table 2a (continued)

Item	Data Elements	CONSUME	FOFEM	FEPS	AK	AZ	CA	CO	NV	NM	ND	OR	SD	UT	WA	WY	ID & MT	EDMS Elements	Comments	
	Hrly. Stability			x															Hourly atmospheric stability class (Pasquill)	
	Min. T/Max %RH			x															Minimum temperature and maximum humidity (daily, when hourly data are not used).	
	Max. T/Min %RH			x															Maximum temperature and minimum humidity (daily, when hourly data are not used).	
	Snow-off Date	x																		
	Days Since Last Rain	x																		
	Harvest Date	x																		
	Weather Zone	x																		
Emissions (output from a model and/or as input to EDMS)	Emissions - Event	x	x															X	FOFEM: SO2, PM10, PM2.5, CH4, CO, CO2, and NOx. CONSUME: PM, PM10, PM2.5, CO, CO2, CH4, NMHC.	
	Emissions - Hourly			x														X	FEPS calculates hourly emissions for PM2.5, CH4, and CO.	
	Plume Rise			x														X	FEPS calculates the Briggs max value, and a theoretical min. and max. value.	
	Hrly PM25 Lofted			x														X	FEPS - PM25 lofted into the plume in a given hour (lb/min). Total PM25 - Lofted PM25 = drift PM25	
	Hrly Drift PM25			x														X	see above.	

Table 2b. Federal Agency Fire Data Formats - Wildfires

Item	Data Elements	CONSUME	FOFEM	FEPS	DOI - Fire Mgmt. Data ^a	FS - ICS 209	FS - SIT Reports	EDMS Elements	Comments
Event Information	Identifier #				x	x	x	X	
	Fire Type			x	x		x	X	EDMS – specify “wildfire” versus “wildland fire use activity”
	Fire Name	x		x	x	x	x	X	
	Location	x		x	x	x	x	X	latitude and longitude; some sources include other location information (e.g. TRS, UTM). EDMS: in addition to lat/long, include fields for FIPS County and Tribal Codes.
	Slope	x			x			X	
	Start Date	x		x	x	x	x	X	
	Start Hour				x			X	
	End Date			x	x	x	x	X	"control date" from DOI 1202 or ICS 209 could be used as the end date.
	End Hour				x			X	"control time" could be used as the end time.
	Ignition Time							X	
	Fire Shape			x				X	
	Season			x				X	Winter, Spring, Summer, or Fall.
	Acres burned	x	x	x	x	x	x	X	
	Fire Size (hrly)			x				X	In FEPS, the acreage burning in each hour can be specified; the % of each fuel type in each hour can also be varied.
	Fire Location (hrly)			x				X	
	Daily Temporal Profile						Default Profiles	For application to daily emission estimates.	
Fuels Data - Natural Fuels	Fuel Type	x	x	x	x			X	Fraction or percentage of each fuel type, e.g. shrub, grass, woody, litter.
	Canopy Consumption	x	x	x				X	FEPS calculates canopy consumption for severe wildfires; User specifies % canopy consumption in FOFEM.
	Rotten Log %		x						Weighting of smaller or larger down logs (qualitative).
	Log Loading		x						
	Fuel Loading	x	x	x	x			Default Table	for each fuel type (tons/acre). DOI 1202 also lists consumption % for each fuel type.
	Duff Loading			x				Default Table	
	Fuel Reference			x	x			X	e.g. NFDR Fuel Model; SAF/SRM; FCC.
	Flaming Consumption			x			X (Hourly)	Flaming fuel consumption by fuel type.	

Table 2b (continued)

	Sh. Smoldering Consumption		x		X (Hourly)	Short term (<2-hr) smoldering fuel consumption.
	Lg. Smoldering Consumption		x		X (Hourly)	Long term smoldering fuel consumption.
	1-hr Moisture		x			As part of a moisture profile.
	10-hr Moisture	x	x			As part of a moisture profile.
	100-hr Moisture		x			As part of a moisture profile.
	1000-hr Moisture	x	x			As part of a moisture profile.
	Broadcast Loading		x		X	tons/acre CONSUME: pile group name, numbers of piles, pile shape, width and height and length to define a pile, pile quality, pile soil (%), primary and secondary species (%) in piles, pile density, volume and total consumption per group
	Pile Profile	x				
	Pile Loading		x		X	
	Duff Loading		x		X (Hourly)	tons/acre
	Duff Depth				X (Hourly)	
Fuels Data - Slash Fuels	Duff Fuel Moisture	x			X (Hourly)	
	Flaming Consumption		x			Flaming fuel consumption by fuel type.
	Sh. Smoldering Consumption		x			Short term (<2-hr) smoldering fuel consumption.
	Lg. Smoldering Consumption		x			Long term smoldering fuel consumption.
	1-hr Moisture		x			As part of a moisture profile.
	10-hr Moisture	x	x			As part of a moisture profile.
	100-hr Moisture		x			As part of a moisture profile.
	1000-hr Moisture	x	x			As part of a moisture profile.
Meteorological Data	Hrly. Wind Speed - Flame		x			Hourly wind speed at flame height.
	Hrly. Wind Speed - Transport		x			Hourly wind speed at transport height.
	Hrly. Stability		x			Hourly atmospheric stability class (Pasquill)
	Min. T/Max %RH		x	x		Minimum temperature and maximum humidity (daily, when hourly data are not used).
	Max. T/Min %RH		x	x		Maximum temperature and minimum humidity (daily, when hourly data are not used).

Table 2b (continued)

	Snow-off Date	x				
	Days Since Last Rain	x				
	Harvest Date	x				
	Weather Zone	x				
	Emissions - Event	x	x		X	FOFEM: SO2, PM10, PM2.5, CH4, CO, CO2, and NOx. CONSUME: PM, PM10, PM2.5, CO, CO2, CH4, NMHC.
Emissions (output from a model and/or as input to EDMS)	Emissions - Hourly			x	X	FEPS calculates hourly emissions for PM2.5, CH4, and CO.
	Plume Rise			x	X	FEPS calculates the Briggs max value, and a theoretical min. and max. value.
	Hrly PM25 Lofted			x	X	FEPS - PM25 lofted into the plume in a given hour (lb/min). Total PM25 - Lofted PM25 = drift PM25
	Hrly Drift PM25			x	X	see above.

^a DOI data submitted to Air Sciences on the Wildland Fire Management Data compact disc.

Table 3. Fire Data Formats - Agricultural Burns

Item	Data Elements	AK	AZ	CA	CO	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	EDMS Elements	Comments
Event Information	Location			x					x					x		X	State and County (some states may have more resolved data, but they are aggregated to the county-level).
	Month															X	Consumption by month.
	Season															X	Consumption by Season
	Acres burned			x					x					X		X	
	Start Date								x					X		X	e.g. permit date
	End Date													X		X	
Fuels Data	Crop Type			x					x					x		X	
	Fuel Loading								x					x		X	e.g. for each crop type (tons/acre).
	Fuel Consumption													x		X	Fraction of loading consumed by the fire.
NOTE: there are no Federal agency formats for agricultural burns.																	

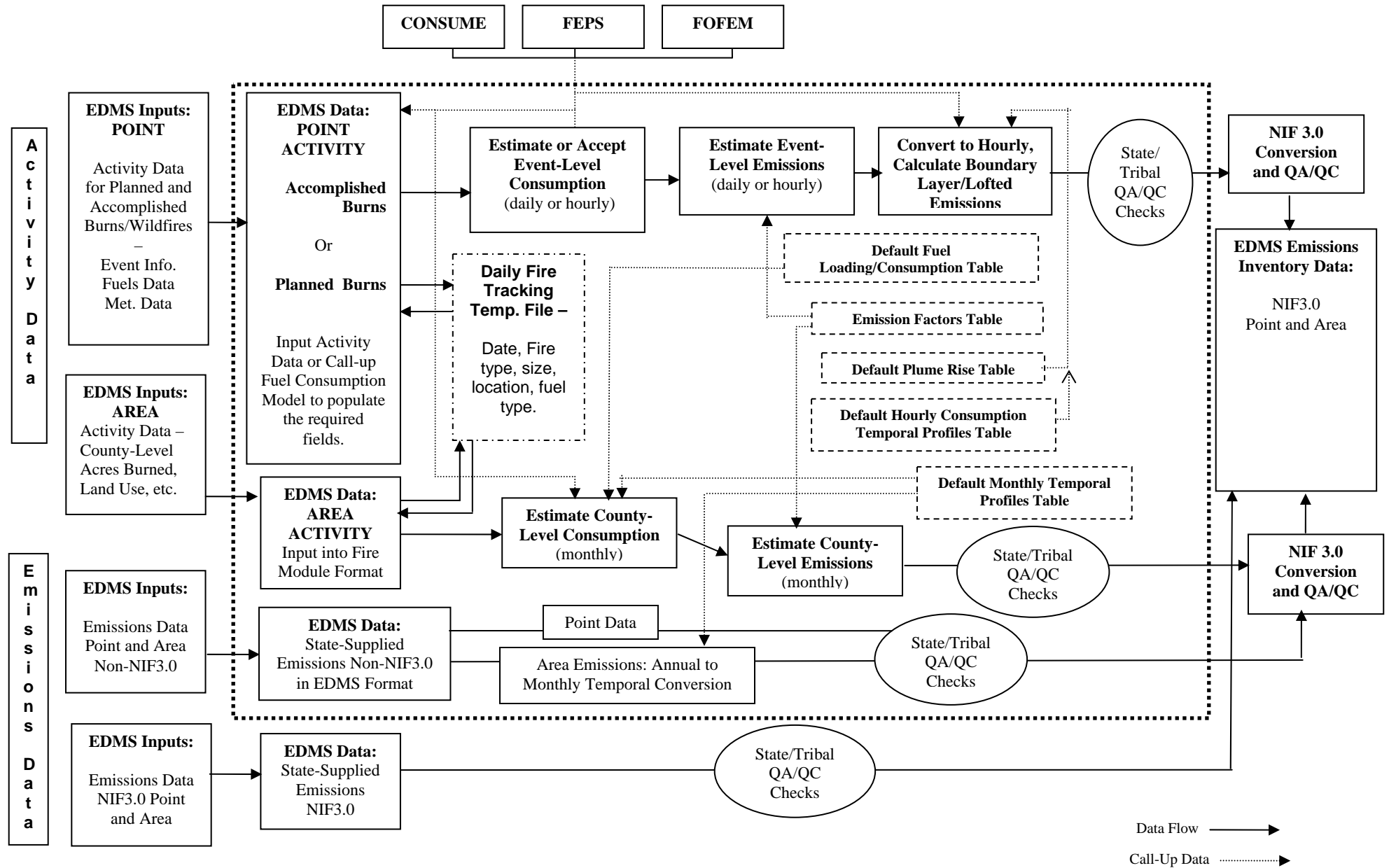


Figure 1. EDMS Fire Module