SECTION 9.3

WILDFIRES

(Revised Methodology October 2004)

EMISSION INVENTORY SOURCE CATEGORY
Natural (Non-Anthropogenic) Sources / Wildfires

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

930-934-0200-0000 (90035) Wildfires - All Vegetation

METHODS AND SOURCES

This source category provides emission estimates from wildfires. A wildfire is a natural event that burns a variety of vegetation types ranging in age, size, and density. Often characterized as a large-scale event, wildfires are caused by a variety of natural and human activities including lightning strikes, arson, and escaped prescribed burn, though the most frequent documented cause of wildfire is "unknown." Unlike managed fires, such as agriculture burning and prescribed fires, wildfires are suppressed by fire fighters. Wildfires do not include prescribed burns or Wildland Fire Use (WFU). A prescribed burn is a fire ignited by a planned management action whereas a WFU is a naturally ignited lightning fire that is managed for resources benefit.

OVERVIEW OF ESTIMATION METHODOLOGY

Wildfire emissions are calculated using the Geographic Information System (GIS) based Emission Estimating System (EES) model developed for ARB by UC Berkeley's Center for the Assessment and Monitoring of Forest and Environmental Resources (CAMFER) laboratory (Clinton et al. 2003, Scarborough et al. 2001). The CAMFERS EES implements the Forest Service First Order Fire Effects Model[(1)] (FOFEM 4.0, Reinhardt et al. 1997) methodology to calculate emissions.

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(1) FOFEM is a fuel consumption and smoke production model developed by USDA – Forest Service, Rocky Mountain Research Station, Missoula Fire Laboratory. The FOFEM model determines pre-burn fuel loading, fuel mass consumed, and smoke emissions generated per fire acre burned.

Known fire perimeters from the California Department of Forestry and Fire Protection (CDF) Fire and Resource Assessment Program (FRAP) are overlaid on California vegetation (Davis et al. 1998), establishing the specific vegetation consumed in each fire. Fuel loadings are assigned to the specific vegetation that burned in each fire. The EES then calculates the tons of fuel consumed by the fire, which is influenced by moisture condition. The EES then applies the appropriate emission factor to generate smoke emissions per wildfire event (see example calculation on page 6). This methodology was used to calculate emissions for fires that burned from 1994 to 2003 and will be used for subsequent annual updates. Tables 1 and 2 attached represent 2002 wildfire activity.

EMISSION ESTIMATION METHODOLOGY

Activity Data - Wildfire Perimeters. Wildfire footprints and ignition dates are provided by the FRAP fire perimeter layer as a GIS spatial file. The FRAP wildfire history dataset is updated annually and provides the most comprehensive dataset for California, though there are some limitations to the data.

The FRAP dataset is populated with wildfire perimeters provided by land management agencies. Forest Service (FS), Bureau of Land Management (BLM), and National Park Service (NPS) report wildfires 10 acres or greater, though some areas also report fires that are smaller. Not all jurisdictions of these agencies report consistently while some areas do not report at all. CDF fires in the FRAP dataset include timber fires 10 acres and greater, brush fires 50 acres and greater, grass fires 300 acres and greater, wildland fires destroying three or more structures, and wildland fires causing $300,000 or more in damage. CDF, FS, BLM and NPS also solicit additional fire perimeter data from other federal agencies (e.g. Bureau of Indian Affairs, Department of Defense) and local agencies, for incorporation into the fire perimeters mapping project.

Several agencies may respond to an individual fire, resulting in multiple reporting of the same fire. A significant amount of work is done at FRAP to resolve duplicate fires in the dataset. Also, fire units may respond to incidents outside of their immediate jurisdiction. As a result, fires that occur in nonreporting areas, such as tribal lands or private lands, may also be included in the FRAP dataset. Fire perimeters may also over-generalize the area burned by not delineating the unburned "islands" within the final perimeter, which is common in large fires.

Wildfire data was processed in GIS as follows: wildfires that burned in 2002 were exported from the FRAP wildfire history GIS dataset. Fire polygons were then intersected with the Air Basin, District, and County polygon layer to annotate location information to each fire and to clip fires that extend out of

State. Fire acres were recalculated and a unique fire identifier was assigned to each wildfire polygon. There were about 225 wildfires that burned in 2002, totaling about 486,300 acres.

Emission Factors and Pollutants. The CAMFER EES calculates emissions for PM10, PM2.5, CO, NOx, SO2, N20, NH3, CH4, and TNMHC for each fuel component. There are ten fuel components that represent each vegetative landcover in California: duff; litter; 0-1 inch, 1-3 inch, and 3+ inch diameter dead woody fuels; herbaceous, shrub, regeneration; and canopy fuels. There are two components that define canopy fuels: canopy branchwood, which is the ladder branches along the tree that lead to the canopy, and canopy foliage, which are the treetops. Duff is partially decomposed organic material of the forest floor that lies beneath the litter. Litter is the freshly fallen twigs, cones, needles, and leaves. Tree regeneration represents saplings and new growth. Herbaceous fuel represents grasslands and the green vegetation that comprise the forest understory. Shrubs are woody plants of relatively low height. Emission factors for these fuel components are grouped into six categories.

The CAMFER EES model uses FOFEM equations to estimate emissions. Emissions factors for PM10, PM2.5, and CO are based on a function of combustion efficiency and the ratio of flaming and smoldering phases of fire under different moisture regimes (Reinhardt et al. 1997). CAMFER further expanded the suite of emission factors by using an "emission ratio" approach (Lobert et al. 1991). The approach is based on the observation that emissions correlate with CO or CO2 depending on whether the compound is evolved primarily in the flaming or smoldering phase of fire. For a more detailed explanation of how emission factors are derived, see the references.

Table A. Emission factors in lbs/ton of fuel consumed, by fuel component, for wet, moderate, and dry burn conditions.

	PM10			PM2.5			CO			CH4		
Fuel component	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**
Litter, wood 0-1 in	9.3	9.3	9.3	7.9	7.9	7.9	52.4	52.4	52.4	2.1	2.1	2.1
Wood 1-3 in	14.0	14.0	14.0	11.9	11.9	11.9	111.4	111.4	111.4	4.5	4.5	4.5
Wood 3+ in	26.6	21.6	19.1	22.5	18.3	16.2	268.9	205.8	174.4	10.8	8.2	7.0
Herb, shrub, regen	25.1	25.1	25.1	21.3	21.3	21.3	249.2	249.2	249.2	10.0	10.0	10.0
Duff	28.2	30.4	30.4	23.9	25.8	25.8	288.6	316.1	316.1	11.5	12.6	12.6
Canopy fuels	25.1	25.1	25.1	21.3	21.3	21.3	249.2	249.2	249.2	10.0	10.0	10.0
	TNMHC			**NH3**			**NOx**			**SO2**		
Fuel component	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**	**Wet**	**Mod**	**Dry**
Litter, wood 0-1 in	3.7	3.7	3.7	0.5	0.5	0.5	8.2	8.2	8.2	2.5	2.5	2.5
Wood 1-3 in	7.8	7.8	7.8	1.1	1.1	1.1	8.0	8.0	8.0	2.5	2.5	2.5
Wood 3+ in	18.8	14.4	12.2	2.7	2.1	1.7	7.3	7.6	7.7	2.2	2.3	2.4
Herb, shrub, regen	17.4	17.4	17.4	2.5	2.5	2.5	7.4	7.4	7.4	2.3	2.3	2.3
Duff	20.2	22.1	22.1	2.9	3.2	3.2	7.2	7.1	7.1	2.2	2.2	2.2
Canopy fuels	17.4	17.4	17.4	2.5	2.5	2.5	7.4	7.4	7.4	2.3	2.3	2.3

Fuel Loading and Fuel Consumption. Each vegetation type in the California GAP layer was assigned FOFEM fuel loading values, defined by the tons of each fuel component per acre that comprise each landcover type. Fuel consumption and combustion efficiency are the two processes that determine the emissions from the fuel burned. Fuel consumption is the amount, in tons, of fuel consumed by fire. The consumption assumptions for each fuel component is as follows: litter and herbaceous fuels assumes 100% consumption; shrub and tree regeneration fuels assumes 60% consumption; wood 0-1 inch assumes 90% consumption; wood 1-3 inch assumes 65% fuel consumption; canopy fine branchwood assumes 50% consumption; and canopy foliage assumes 100% consumption. Wood 3+ inches and duff consumption depends on fuel moisture.

Thousand-Hour Fuel Moisture. Wood 3+ inches (thousand-hour fuels) moisture is defined as the National Fire Danger Rating System Thousand-Hour (NFDR-TH) fuel moisture. NFDR-TH and moisture conditions affects fuel consumption, as well as combustion efficiency, which is defined as the portion of CO or CO2 released from fuel consumed. Combustion efficiency is directly related to the portion of consumption that happens in either the flaming or smoldering phase of fire. For example, the lower the moisture, the more efficient the combustion, and the greater the proportion of consumption in the flaming phase of fire. Likewise, the higher the moisture, a greater proportion of consumption takes place in the smoldering phase of fire, and the lower the combustion efficiency.

The CAMFER EES is especially sensitive to the fuel moisture input. NFDR-TH values represent the fuel moisture of large dead logs on the forest floor, which can vary considerably across California. In order to improve wildfire emission estimation, CAMFER created monthly averaged moisture grids, which provide a more refined distribution of thousand-hour fuel moistures Statewide. The fuel moisture grid is based on Forest Service NFDR-TH graphics averaged for the year 2000. A thorough explanation of how the gridded NFDR-TH input layer was developed is provided in the Wildland II report (Clinton et al. 2003). Archived Forest Service NFDR-TH maps can be accessed at the Wildland Fire Assessment System (WFAS) web page at: http://www.fs.fed.us/land/wfas/ (Burgan et al. 1997).

California Gap Analysis Project (GAP) Landcover Map. The GAP landcover map is used as the vegetation input (Davis et al. 1998). California's GAP coverage is comprised of over 21,000 vegetation polygons, aggregated into over 200 natural community types. The minimum mapping unit is 1 kilometer. Each GAP polygon is comprised of up to three vegetation assemblages (primary, secondary, and tertiary), with each type comprising a fraction of the total polygon area. The EES overlays the wildfire footprint with the GAP vegetation, discerning the specific landcover types and calculating the acres of each flora burned in each fire.

TEMPORAL INFORMATION

Monthly variations are calculated by using month specific wildfires and month specific thousand-hour fuel moistures. Daily and hourly activity is not calculated. For modeling purposes, gridded emissions will be provided.

ASSUMPTIONS AND LIMITATIONS

- The FRAP dataset is populated with the information submitted by land management agencies, therefore accuracy and consistency can vary by area and year. The FRAP GIS layer is updated annually and provides the most comprehensive dataset available.
- FOFEM assumes 100% of the burn area experiences fire.
- CAMFER model default settings are as follows:
  - Fuel category: Natural
  - Dead fuel adjustment factor: Typical
  - Moisture conditions: Dry
  - Fire intensity: Extreme
  - Fire will burn tree crown: Yes
  - Tree crown biomass burning: Typical
  - Herbaceous density: Typical
  - Shrub density: Typical
  - Tree regeneration density: Typical
  - NFDR-TH moisture percent: Determined for each fire based on monthly grid
- The gridded thousand-hour fuel moisture values are averaged by month based on year 2000 data.

CHANGES IN METHODOLOGY

- The EIC codes are combined into one that covers "all vegetation." Previously there were two EIC/CES codes for wildfires: Grass and Woodlands, and Timber and Brush.
- Updated methodology uses actual fire perimeter to estimate emissions.
- Emissions are vegetation specific.

EXAMPLE CALCULATION

Below is an example calculating PM10 emissions for the Plum fire that burned in El Dorado County in November 2002. The EES model overlays the Plum fire perimeter on California vegetation yielding the acres of each vegetation type burned in the fire, as depicted in the graphic below. The Plum fire footprint was 1,762 acres and burned two vegetation types: 1,012 acres were on westside ponderosa pine forest and 750 acres were on sierran mixed conifer forest. Each vegetation cover type has fuel loading characteristics assigned by fuel component, as shown in Table 1 below.

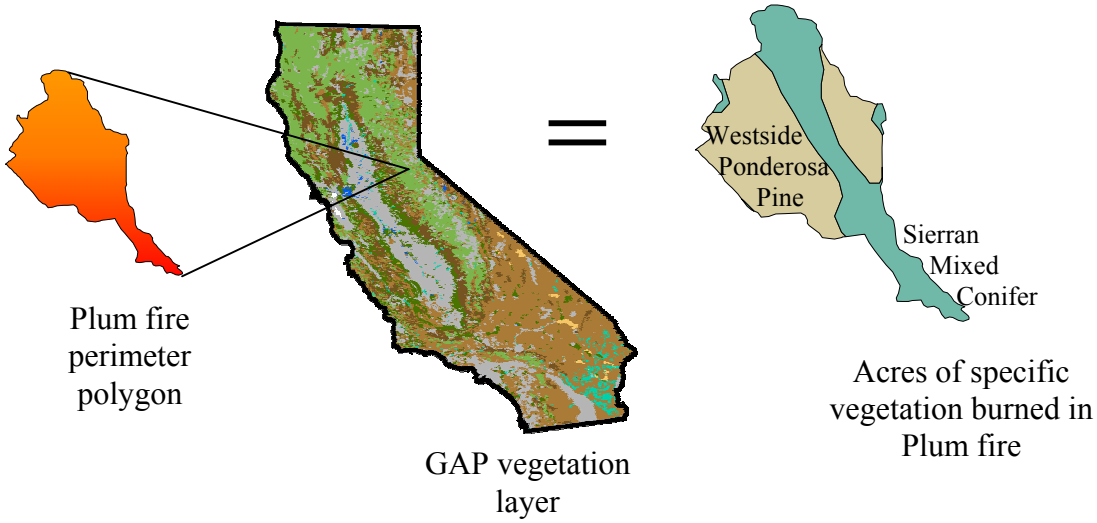

Table 1. Acres burned and fuel loading by fuel component for each vegetation type burned in the Plum fire.

Fuel Component	Westside Ponderosa Pine	Sierran Mixed Conifer
Acres	**1,012**	**750**
	Fuel Loading (tons/acre)	
Litter	1.40	1.50
Wood 0-1 inch	0.70	1.00
Wood 1-3 inch	0.80	1.50
Wood 3+ inches	5.00	20.00
Herbs	0.20	0.20
Shrubs	0.25	0.25
Regen	0.15	0.15
Duff	5.00	40.00
Canopy foliage	6.00	6.00
Canopy branchwood	0.70	3.00

Table 2 below shows the steps to calculate PM10 emissions for the Plum fire: 1) The number of acres for each vegetation type burned and the fuel loading (shown in Table 1) are multiplied; 2) Fuel loading for each vegetation type are summed; 3) The percent fuel consumption for wood 3+ inch and duff are calculated and/or default consumption assumptions are applied to calculate fuel consumption; 4) Emission factors are applied to calculate pounds of PM10 emitted; and 5) Pounds are converted to tons.

Table 2. Total fuel loading for the Plum fire, percent consumption, total fuel consumption, PM10 emission factors, and PM10 emissions by fuel component for the Plum fire.

Steps	1		2	3		4		5
Fuel Component	Westside Ponderosa Pine	Sierran Mixed Conifer	Plum Fire Total Fuel Loading (tons)	Fuel Consumption (percent)	Fuel Consumed (tons)	PM10 Emission Factors (lbs/ton)	PM10 Emissions (lbs)	PM10 Emissions (tons)
	Acres * Fuel Loading							
Litter	1,416.8	1,125.0	2,541.8	100%	2,541.8	9.3	23,638.7	11.8
Wood 0-1 inch	708.4	750.0	1,458.4	90%	1,312.6	9.3	12,206.8	6.1
Wood 1-3 inch	809.6	1,125.0	1,934.6	65%	1,257.5	14.0	17,604.9	8.8
Wood 3+ inches	5,060.0	15,000.0	20,060.0	82%(1)	16,451.6	19.1(3)	314,225.0	157.1
Herbs	202.4	150.0	352.4	100%	352.4	25.1	8,845.2	4.4
Shrubs	253.0	187.5	440.5	60%	264.3	25.1	6,633.9	3.3
Regen	151.8	112.5	264.3	60%	158.6	25.1	3,980.4	2.0
Duff	5,060.0	30,000.0	35,060.0	34%(2)	12,088.7	30.4(3)	367,496.1	183.7
Canopy foliage	6,072.0	4,500.0	10,572.0	100%	10,572.0	25.1	265,357.2	132.7
Canopy branchwood	708.4	2,250.0	2,958.4	50%	1,479.2	25.1	37,127.9	18.6
							Total	528.6

(1) Wood 3+ inch percent consumption equations (Brown et al. 1991):

Diameter reduction = 7.917 - [0.252 (1.4 * NFDTH)] + (0.34 * PDIA)

Percent consumption = 1 - ((PDIA - Diameter Reduction) / PDIA)^2

PDIA - quadratic mean preburn diameter = 5

Plum fire NFDTH = 19.1

(2) Duff percent consumption equation (Brown et al. 1995):

Duff reduction = 114.7-(4.20 * NFDTH)

Plum fire NFDTH = 19.1

(3) Moisture conditions = "dry" (default EES setting)

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PREPARED BY

Neva Sotolongo
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Table 1
Wildfire Emissions
EIC: 930-934-0200-0000 CES: 90035
2002 Wildfires - Activity Data (acres) - Emissions (tons/year)

AB	District	CO ID	Activity Data	PM10	PM25	CO	CH4	TNMHC	NH3	NOX	SO2	Total
GBV	GREAT BASIN UNIFIED	2	31	7.15	6.07	68.84	2.75	4.82	0.69	2.40	0.74	93.46
		14	6700	204.62	173.65	2017.91	80.72	141.25	20.18	62.01	19.11	2719.44
		26	29592	1297.30	1101.21	11936.84	477.47	835.58	119.37	513.68	158.27	16439.71
LC	LAKE	17	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT	EL DORADO	9	375	235.77	200.06	2338.94	93.56	163.73	23.39	69.91	21.54	3146.90
	PLACER	31	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MD	ANTELOPE VALLEY	19	4717	627.65	532.63	6218.57	248.74	435.30	62.19	186.65	57.51	8369.24
	KERN	15	3436	1189.03	1008.89	11560.46	462.42	809.23	115.60	383.84	118.26	15647.74
	MOJAVE DESERT	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MOJAVE DESERT	36	7888	881.37	747.96	8740.40	349.62	611.83	87.40	260.43	80.24	11759.25
	SOUTH COAST	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	AMADOR	3	896	108.38	91.97	1047.37	41.90	73.32	10.47	35.86	11.05	1420.33
	CALAVERAS	5	1160	299.08	253.78	2894.52	115.78	202.62	28.95	98.39	30.31	3923.42
	EL DORADO	9	3764	927.96	787.43	8997.12	359.88	629.80	89.97	302.99	93.35	12188.51
	MARIPOSA	22	163	50.08	42.49	490.90	19.64	34.36	4.91	15.64	4.82	662.84
	NORTHERN SIERRA	29	236	63.07	53.51	614.42	24.58	43.01	6.14	20.21	6.23	831.17
	NORTHERN SIERRA	32	57	33.44	28.37	331.32	13.25	23.19	3.31	9.96	3.07	445.92
	NORTHERN SIERRA	46	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PLACER	31	46	3.05	2.59	29.03	1.16	2.03	0.29	1.07	0.33	39.55
	TUOLUMNE	55	146	21.40	18.16	205.79	8.23	14.41	2.06	7.23	2.23	279.51
NCC	MONTEREY BAY UNIFIED	27	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	63	0.45	0.38	4.47	0.18	0.31	0.04	0.13	0.04	6.02
		44	13	10.18	8.64	96.61	3.86	6.76	0.97	3.61	1.11	131.75
NC	MENDOCINO	23	1822	150.74	127.93	1415.54	56.62	99.09	14.16	55.59	17.13	1936.79
	NORTH COAST UNIFIED	8	30072	13110.43	11124.60	127617.94	5104.72	8933.26	1276.18	4216.54	1299.13	172682.80
	NORTH COAST UNIFIED	12	17	13.57	11.51	128.79	5.15	9.02	1.29	4.82	1.48	175.63
	NORTH COAST UNIFIED	53	24	1.01	0.85	9.17	0.37	0.64	0.09	0.41	0.13	12.67
	NORTHERN SONOMA	49	58	6.19	5.25	61.07	2.44	4.28	0.61	1.86	0.57	82.27
NEP	LASSEN	18	8498	607.99	515.96	5873.80	234.95	411.17	58.74	201.41	62.06	7966.06
	MODOC	25	628	45.47	38.59	441.44	17.66	30.90	4.41	14.77	4.55	597.80
	SISKIYOU	47	7774	3335.76	2830.26	31860.00	1274.40	2230.20	318.60	1156.54	356.33	43362.10
SV	BUTTE	4	2386	585.39	496.71	5675.86	227.03	397.31	56.76	191.13	58.89	7689.07
	COLUSA	6	110	2.47	2.10	20.35	0.81	1.42	0.20	1.31	0.40	29.09
	FEATHER RIVER	51	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	FEATHER RIVER	58	1290	73.19	62.12	687.90	27.52	48.15	6.88	26.96	8.31	941.03
	GLENN	11	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PLACER	31	878	97.09	82.39	939.75	37.59	65.78	9.40	31.95	9.84	1273.80
	SACRAMENTO METRO	34	647	7.51	6.37	72.19	2.89	5.05	0.72	2.53	0.78	98.05
	SHASTA	45	898	341.23	289.54	3322.48	132.90	232.57	33.23	109.54	33.75	4495.23
	TEHAMA	52	424	63.32	53.74	637.69	25.51	44.64	6.38	17.47	5.38	854.14
	YOLO-SOLANO	48	188	11.24	9.54	106.55	4.26	7.46	1.07	4.03	1.24	145.40
	YOLO-SOLANO	57	1514	585.02	496.39	5697.60	227.90	398.83	56.98	187.55	57.79	7708.06
SS	IMPERIAL	13	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SOUTH COAST	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD	SAN DIEGO	37	74069	7529.71	6389.99	74564.71	2982.59	5219.53	745.65	2242.21	690.84	100365.22
SF	BAY AREA	1	316	2.51	2.13	24.87	0.99	1.74	0.25	0.73	0.23	33.45
		7	200	1.42	1.21	14.14	0.57	0.99	0.14	0.42	0.13	19.02
		21	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		28	754	331.48	281.26	3242.84	129.71	227.00	32.43	104.33	32.14	4381.20
		38	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		41	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		43	3128	818.47	694.46	7837.86	313.51	548.65	78.38	280.61	86.46	10658.40
		48	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		49	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SJV	SAN JOAQUIN VALLEY UNIFIED	10	1190	38.93	33.03	374.67	14.99	26.23	3.75	13.10	4.04	508.72
		15	446	110.28	93.57	1071.58	42.86	75.01	10.72	35.69	10.99	1450.70
		16	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		20	402	235.31	199.67	2312.91	92.52	161.90	23.13	72.67	22.39	3120.50
		24	265	6.63	5.62	62.58	2.50	4.38	0.63	2.40	0.74	85.48
		39	1308	12.70	10.78	123.59	4.94	8.65	1.24	4.08	1.26	167.22
		50	580	4.59	3.89	45.56	1.82	3.19	0.46	1.35	0.41	61.27
		54	151420	87514.87	74262.37	868243.91	34729.76	60777.07	8682.44	25938.91	7991.88	1168141.20
SCC	SAN LUIS OBISPO	40	3403	136.88	116.16	1355.91	54.24	94.91	13.56	40.64	12.52	1824.81
	SANTA BARBARA	42	7374	108.91	92.43	1068.18	42.73	74.77	10.68	33.79	10.41	1441.90
	VENTURA	56	21641	2939.56	2494.56	28962.34	1158.49	2027.36	289.62	895.33	275.86	39043.14
SC	SOUTH COAST	19	88541	11849.72	10055.94	117351.00	4694.04	8214.57	1173.51	3527.84	1086.94	157953.57
		30	4667	223.16	189.38	2204.00	88.16	154.28	22.04	67.12	20.68	2968.82
		33	756	53.26	45.20	527.69	21.11	36.94	5.28	15.80	4.87	710.15
		36	9292	954.27	809.82	9459.67	378.39	662.18	94.60	282.45	87.03	12728.40
STATE TOTALS			486263	137870.246	116993.154	1361009.68	54440.3866	95270.6793	13610.0997	41757.8918	12865.7658	1833817.90

Table 2
Wildfire Emissions
EIC: 930-934-0200-0000 CES: 90035
2002 Wildfires - Activity Data (acres) - Monthly emissions as percent of total emissions

AB	District	CO ID	Activity Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GBV	GREAT BASIN UNIFIED	2	31	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		14	6700	0.00	0.00	6.04	0.00	0.00	0.00	93.96	0.00	0.00	0.00	0.00	0.00
		26	29592	0.00	0.00	0.00	0.00	0.00	88.86	8.53	0.00	2.61	0.00	0.00	0.00
LC	LAKE	17	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LT	EL DORADO	9	375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.42	0.00	0.00	8.58	0.00
	PLACER	31	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MD	ANTELOPE VALLEY	19	4717	0.00	0.00	1.07	0.00	0.94	0.00	0.00	1.97	96.02	0.00	0.00	0.00
	KERN	15	3436	0.00	0.00	0.00	0.00	0.00	99.91	0.09	0.00	0.00	0.00	0.00	0.00
	MOJAVE DESERT	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MOJAVE DESERT	36	7888	0.00	0.00	0.00	0.00	0.05	97.78	0.00	2.17	0.00	0.00	0.00	0.00
	SOUTH COAST	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	AMADOR	3	896	0.00	0.00	0.00	0.00	0.00	39.42	21.72	1.21	0.00	0.00	37.65	0.00
	CALAVERAS	5	1160	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.19	20.85	0.00	78.14	0.00
	EL DORADO	9	3764	0.00	0.00	0.00	0.23	0.00	0.00	6.93	11.78	0.70	0.00	80.36	0.00
	MARIPOSA	22	163	0.00	0.00	0.00	0.00	0.00	0.00	24.96	0.00	0.00	75.04	0.00	0.00
	NORTHERN SIERRA	29	236	0.00	0.00	0.00	0.00	0.00	0.00	13.37	0.00	86.63	0.00	0.00	0.00
	NORTHERN SIERRA	32	57	0.00	0.00	0.00	0.00	0.00	21.11	78.89	0.00	0.00	0.00	0.00	0.00
	NORTHERN SIERRA	46	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PLACER	31	46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	TUOLUMNE	55	146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.58	3.60	26.86	50.96	0.00
NCC	MONTEREY BAY UNIFIED	27	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	63	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
		44	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
NC	MENDOCINO	23	1822	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.81	23.89	0.00	66.30	0.00
	NORTH COAST UNIFIED	8	30072	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
	NORTH COAST UNIFIED	12	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	NORTH COAST UNIFIED	53	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	NORTHERN SONOMA	49	58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
NEP	LASSEN	18	8498	0.00	0.00	0.00	0.00	0.00	0.00	34.72	0.00	65.28	0.00	0.00	0.00
	MODOC	25	628	0.00	0.00	0.00	21.52	0.00	0.00	78.48	0.00	0.00	0.00	0.00	0.00
	SISKIYOU	47	7774	0.00	0.00	0.00	0.00	0.00	5.59	93.47	0.00	0.93	0.00	0.00	0.00
SV	BUTTE	4	2386	0.00	0.00	0.00	0.00	0.00	93.90	0.00	0.00	0.00	0.00	6.10	0.00
	COLUSA	6	110	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	FEATHER RIVER	51	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	FEATHER RIVER	58	1290	0.00	0.00	0.00	0.00	0.00	99.45	0.00	0.00	0.00	0.55	0.00	0.00
	GLENN	11	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PLACER	31	878	0.00	0.00	0.00	0.00	0.00	21.41	0.00	0.00	78.59	0.00	0.00	0.00
	SACRAMENTO METRO	34	647	0.00	0.00	0.00	0.00	0.00	61.96	7.81	0.00	11.93	18.29	0.00	0.00
	SHASTA	45	898	0.00	0.00	0.00	0.00	0.00	16.10	0.00	0.00	76.46	0.00	7.44	0.00
	TEHAMA	52	424	0.00	0.00	0.00	0.00	0.00	0.00	0.26	12.49	0.00	87.25	0.00	0.00
	YOLO-SOLANO	48	188	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	YOLO-SOLANO	57	1514	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
SS	IMPERIAL	13	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SOUTH COAST	33	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD	SAN DIEGO	37	74069	0.00	1.62	0.00	0.33	0.40	2.53	93.49	1.63	0.00	0.00	0.00	0.00
SF	BAY AREA	1	316	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		7	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
		21	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		28	754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
		38	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		41	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		43	3128	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	99.87	0.00	0.00	0.00
		48	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		49	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SJV	SAN JOAQUIN VALLEY UNIFIED	10	1190	0.00	0.00	0.00	0.00	19.87	22.40	52.51	0.00	1.72	1.81	1.69	0.00
		15	446	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		16	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		20	402	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
		24	265	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
		39	1308	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		50	580	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		54	151420	0.00	0.00	0.00	0.00	0.01	0.01	99.98	0.00	0.00	0.00	0.00	0.00
SCC	SAN LUIS OBISPO	40	3403	0.00	0.00	0.00	0.00	0.00	11.26	88.74	0.00	0.00	0.00	0.00	0.00
	SANTA BARBARA	42	7374	0.00	0.00	0.00	0.00	0.00	98.02	1.98	0.00	0.00	0.00	0.00	0.00
	VENTURA	56	21641	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
SC	SOUTH COAST	19	88541	0.00	0.00	0.06	0.01	4.18	18.50	0.37	0.02	76.75	0.10	0.00	0.00
		30	4667	3.93	74.95	0.00	0.45	12.87	1.17	0.00	0.00	0.00	0.00	6.62	0.00
		33	756	0.00	14.50	0.00	6.48	0.00	79.01	0.00	0.00	0.00	0.00	0.00	0.00
		36	9292	0.00	0.00	0.00	0.47	30.95	62.62	0.00	5.42	0.00	0.54	0.00	0.00

County ID	
1	ALAMEDA
2	ALPINE
3	AMADOR
4	BUTTE
5	CALAVERAS
6	COLUSA
7	CONTRA COSTA
8	DEL NORTE
9	EL DORADO
10	FRESNO
11	GLENN
12	HUMBOLDT
13	IMPERIAL
14	INYO
15	KERN
16	KINGS
17	LAKE
18	LASSEN
19	LOS ANGELES
20	MADERA
21	MARIN
22	MARIPOSA
23	MENDOCINO
24	MERCED
25	MODOC
26	MONO
27	MONTEREY
28	NAPA
29	NEVADA
30	ORANGE
31	PLACER
32	PLUMAS
33	RIVERSIDE
34	SACRAMENTO
35	SAN BENITO
36	SAN BERNARDINO
37	SAN DIEGO
38	SAN FRANCISCO
39	SAN JOAQUIN
40	SAN LUIS OBISPO
41	SAN MATEO
42	SANTA BARBARA
43	SANTA CLARA
44	SANTA CRUZ
45	SHASTA
46	SIERRA
47	SISKIYOU
48	SOLANO
49	SONOMA
50	STANISLAUS
51	SUTTER
52	TEHAMA
53	TRINITY
54	TULARE
55	TUOLUMNE
56	VENTURA
57	YOLO
58	YUBA

Air Basin ID	
GBV	GREAT BASIN VALLEYS
LC	LAKE COUNTY
LT	LAKE TAHOE
MD	MOJAVE DESERT
MC	MOUNTAIN COUNTIES
NCC	NORTH CENTRAL COAST
NC	NORTH COAST
NEP	NORTHEAST PLATEAU
SV	SACRAMENTO VALLEY
SS	SALTON SEA
SD	SAN DIEGO COUNTY
SF	SAN FRANCISCO BAY AREA
SJV	SAN JOAQUIN VALLEY
SCC	SOUTH CENTRAL COAST
SC	SOUTH COAST