

# ARB MISCELLANEOUS PROCESS METHODOLOGY SECTION 7.4

## Agricultural Land Preparation Operations

*(Revised and updated, April 2016)*

### **EMISSION INVENTORY SOURCE CATEGORY**

Miscellaneous Processes / Farming Operations

### **EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION**

**620-614-5400-0000 (47332)** Agricultural Land Preparation

**Method Summary.** This category estimates emissions of the airborne soil particulate emissions produced during the preparation of agricultural lands for planting and post-harvest activities. Included in this methodology are mechanical operations used to prepare the soil, such as discing, shaping, chiseling, and leveling. Emissions vary seasonally and regionally according to the crop mix and the associated land preparation activities.

ARB estimates land preparation emissions for each crop by summing the products of associated operation specific emission factors, corresponding acre-passes, and harvested crop acreage. County emissions are estimated by summing the emissions from all associated crops. Emission estimates in this update were developed for the 2016 ozone SIP inventory, Version 1.04. More information on method development is provided at the embedded links below, in the references, and in the Supporting Documentation section of the methodology's webpage at <http://www.arb.ca.gov/ei/areasrc/arbmiscprocfarmops.htm>.

**Activity Data Source.** For this update, 2012 harvested acreage from the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS), compiled from County Agricultural Commissioner reports, was used for all regions (<https://www.arb.ca.gov/ei/areasrc/fullpdf/2012acreage.pdf>) Acreage not subject to land preparation operations was excluded (pasture lands, mushrooms, greenhouse, nursery and flower crops, forest firewood), as well as acreage aggregated statewide as "Sum of Others". Harvested acreage for counties split among two or more air basins was apportioned based on land surface areas compiled by ARB (ARB, 2009), except for Kern County, which was assigned 98% to the San Joaquin Valley Air Basin (SJV AB) and 2% to the Mojave Desert Air Basin. Information about the operation type, number of operations, and time of year that land preparation operations occur is provided by 20 crop profiles ([Crop Calendars](#)), developed in consultation with growers and other agricultural experts to accurately reflect current California growing practices (CARB, April 2003).

**Emission Factor Source.** Emission factors are based on testing conducted in the SJV AB by the University of California, Davis, under contract to the USDA, subsequent supplementary data analysis, and adjustments from California agricultural experts (Flocchini, 2001; CARB, April 2003). The five operation specific emission factors (lbs PM10/acre-pass) shown in Table A were used to develop land preparation emission factors for the 21 crop profiles presented in Table B. The emission factors were then assigned to over 200 California crops based on similarities in land preparation activities ([Crop Profile Assignment and Land Preparation \(LP\) PM10 Emission Factor by CDFA Commodity](#)).

This update reflects statewide adoption of the revised rice land preparation emission factor of 6.32 lbs PM10/acre that was developed for the Sacramento Valley Air Basin (SV AB) for the 2012 PM 2.5 SIP inventory, Version 1.03 (see the December 2013 methodology update: [https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-4\\_2013.pdf](https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-4_2013.pdf)). The emission factor reflects soil conditions and seasonal activities in the SV AB, where over 97% of California rice is grown. More information on the development of the revised emission factor is available here: <https://www.arb.ca.gov/ei/areasrc/fullpdf/ricetilling.pdf>

**Emissions.** Crop specific emission factors (lbs PM10/year) were computed by summing the products of each crop's operation specific emission factors (lbs PM10/acre-pass) times the annual frequency associated with each operation (acre-passes/year). County specific emissions (tpy PM10) were calculated by summing the product of each crop specific emission factor times the associated NASS harvested acreage. Emissions were then allocated to the 69 air basin/county/air district (COABDIS) regions. PM2.5 and Total PM are calculated from PM10 using ARB speciation profile #417. Total PM and PM2.5 are derived from calculated PM10 emissions using ARB's speciation profile #417 for agricultural tilling dust. Particle size fractions are based on an average of dust measurements from 8 fields in the San Joaquin Valley and on 2006 updates to ARB PM2.5 speciation profiles [Houck, 1989; Cowherd, 2005; Gaffney, 2006].

$$\begin{aligned}\text{Total PM} &= \text{PM10}/0.4543 \\ \text{PM2.5} &= (\text{PM10}/0.4543) \times 0.0681\end{aligned}$$

Table 1 presents 2012 land preparation emissions (PM10, PM2.5 and Total PM) by COABDIS region, along with harvested acreage totals.

**Temporal Data.** Activity profiles are used to distribute annual emissions to the summer months (May - October) and winter months (November - April). The crop activity profiles shown in Table 2 are based on the crop calendars and indicate the percentage of annual land preparation operations occurring each month. The temporal activity for each COABDIS region, shown in Table 3, reflects the monthly distribution of annual land preparation emissions from all associated crops. Monthly emissions are calculated by multiplying annual emissions by the monthly fraction. Land preparation operations are assumed to occur primarily during the day, seven days a week. No adjustments are made for rainfall as the crop calendars are assumed to reflect seasonal activity patterns.

**Growth Parameter.** Growth in this category is based on projections of harvested crop acreage or farmland acreage and varies by region. For all regions of the state except the SJV AB, growth reflects linear regressions of the 2000-2009 NASS harvested crop acreage by COABDIS for regions showing a definite trend (-3% to +3% annually), and no growth when the regression analysis showed either no observable trend or an unsustainable trend. Many regions are set to zero. For the SJV AB, growth reflects linear regressions of 2000-2009 Farmland Mapping and Monitoring Program (FMMP) farmland acreage by COABDIS region, applied to NASS harvested crop acreage for base year 2007. Growth for all regions was projected to 2020.

**Changes in Method and Emission Estimates.** The significant changes for this update include:

- Activity data was updated to reflect 2012 USDA NASS harvested crop acreage, as compiled by California Agricultural Commissioners.
- The rice land preparation emission factor of 6.32 lbs/acre-pass, adopted in 2012 for the SV AB, was adopted statewide for this update.
- County specific temporal profiles were updated to reflect seasonal variations in emissions, based on the mix of crops and associated harvested acreage.

These changes produced an emissions reduction of about 12% from the previous 2008 published inventory estimates, due to a decrease in statewide harvested acreage and changes in the crop mix.

**PREPARED BY**

Janet Spencer  
April 2016

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**Table A. PM10 Emission Factors (PM10 EF) for Land Preparation Operations, by Operation Category**

<b>Operations by Category</b>	<b>PM10 EF (lbs/acre-pass)</b>
<b>Discing</b>	
Chisel	1.2
Disc	
Disc & Furrow-out	
Disc & Roll	
Finish Disc	
Harrow Disc	
Land Preparation	
Mulch Beds	
Plow	
Post Burn/Harvest Disc	
Stubble Disc	
Unspecified	
<b>Land Planing</b>	
3 Wheel Plane	1.1
Land Maintenance - Rice	
Float	12.5
Land Maintenance – Other than Rice	
Land Plane	
Laser Level	
Level	
Level (new vineyard)	
Plane	
<b>Ripping</b>	
Subsoil	4.6
Subsoil-deep chisel	
<b>Weeding</b>	
Bed Preparation	0.8
List	
List & Fertilize	
Listing	
Roll	
Seed Bed Preparation	
Shape Beds	
Shape Beds & Roll	
Shaping	
Spring Tooth	
Terrace	
<b>None</b>	
Sulfur Dusting	0

**Table B. Acre-Passes and Emission Factors by ARB Crop Profile**

Crop Profile	Land Preparation Operation	Emission Factor Category	Acre-Passes/year	Emission Factors	
				Operation (lbs/acre-pass)	Crop (lbs/acre/year)
Alfalfa	Unspecified	Discing	1.25	1.2	4
	Land Maintenance	Land Planing	0.2	12.5	
Almonds	Float	Land Planing	0.25	12.5	3.13
Citrus	Unspecified	Discing	0.06	1.2	0.07
Corn	List & Fertilize	Weeding	1	0.8	6.9
	Mulch Beds	Discing	1	1.2	
	Finish Disc	Discing	1	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
	Stubble Disc	Discing	1	1.2	
Cotton	Land Preparation	Discing	4	1.2	8.9
	Land Maintenance	Land Planing	0.2	12.5	
	Seed Bed Preparation	Weeding	2	0.8	
DryBeans	Land Maintenance	Land Planing	0.2	12.5	7.7
	Chisel	Discing	1	1.2	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
	Listing	Weeding	1	0.8	
Garbanzo	Chisel	Discing	1	1.2	7.7
	Listing	Weeding	1	0.8	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
Garlic	Land Maintenance	Land Planing	0.2	12.5	6.5
	Disc & Roll	Discing	1	1.2	
	Chisel	Discing	1	1.2	
	List	Weeding	1	0.8	
	Shape Beds	Weeding	1	0.8	
Grapes-Raisin	Terrace	Weeding	1	0.8	2.6
	Spring Tooth	Weeding	0.2	0.8	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	1	1.2	
	Level (new vineyard)	Land Planing	0.02	12.5	
Grapes-Table	Subsoil	Ripping	0.05	4.6	0.83
	Disc & Furrow-out	Discing	0.5	1.2	
Grapes-Wine	Level (new vineyard)	Land Planing	0.02	12.5	1.5
	Spring Tooth	Weeding	0.2	0.8	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	0.75	1.2	

**Table B. Acre-Passes and Emission Factors by ARB Crop Profile**

Crop Profile	Land Preparation Operation	Emission Factor Category	Acre-Passes/year	Emission Factors	
				Operation (lbs/acre-pass)	Crop (lbs/acre/year)
Lettuce(1)	Land Maintenance	Land Planing	0.2	12.5	12.75
	Disc & Roll	Discing	2/2	1.2	
	Chisel	Discing	2/2	1.2	
	List	Weeding	2/2	0.8	
	Plane	Land Planing	1/2	12.5	
	Shape Beds & Roll	Weeding	2/2	0.8	
Melon	Plow	Discing	1	1.2	5.7
	Shape Beds	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Disc	Discing	1	1.2	
No Land Prep.	Unspecified	Discing	0	1.2	0
Onions	List	Weeding	1	0.8	6.5
	Shape Beds	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Chisel	Discing	1	1.2	
	Disc & Roll	Discing	1	1.2	
Rice	Chisel	Discing	1	1.2	6.32
	Land Maintenance - Rice	Land Planing	0.2	1.1	
	Post Burn/Harvest Disc	Discing	0.5	1.2	
	Roll	Weeding	1	0.8	
	3 Wheel Plane	Land Planing	1	1.1	
	Harrow Disc	Discing	1	1.2	
	Stubble Disc	Discing	1	1.2	
Safflower	List	Weeding	1	0.8	4.5
	Land Maintenance	Land Planing	0.2	12.5	
	Stubble Disc	Discing	1	1.2	
Sugar Beets	Disc	Discing	1	1.2	22.8
	Land Plane	Land Planing	1	12.5	
	Subsoil-deep chisel	Ripping	1	4.6	
	Stubble Disc	Discing	1	1.2	
	List	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
Tomatoes	Bed Preparation	Weeding	2	0.8	10.1
	Land Preparation	Discing	5	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
Vegetables	Land Maintenance	Land Planing	0.2	12.5	8.5
	Unspecified	Discing	5	1.2	
Wheat	Stubble Disc	Discing	1	1.2	3.7
	Land Maintenance	Land Planing	0.2	12.5	

1 Lettuce is double-cropped (2 crops per year). Acre-passes are divided by 2, except for land maintenance, because double cropping is reflected in NASS harvested acreage totals in the emission calculations.



**Table 1**  
**2012 Agricultural Land Preparation Emissions**

Air Basin	County	Air District	2012 Harvested Acres	Annual Acre-Passes	Emissions, tons/year		
					PM10	PM2.5	Total PM
GBV	Alpine	GBU	150.00	30.00	0.19	0.03	0.41
GBV	Inyo	GBU	5,028.00	999.58	6.23	0.93	13.72
GBV	Mono	GBU	15,933.00	5,209.05	22.61	3.39	49.76
LC	Lake	LAK	15,605.00	17,563.73	18.23	2.73	40.13
LT	El Dorado	ED	325.89	201.71	0.18	0.03	0.41
LT	Placer	PLA	1,028.05	4,888.74	2.96	0.44	6.51
MC	Amador	AMA	6,271.00	5,928.66	6.64	0.99	14.61
MC	Calaveras	CAL	2,125.00	1,187.62	2.27	0.34	5.01
MC	El Dorado	ED	3,295.11	2,039.56	1.86	0.28	4.10
MC	Mariposa	MPA	104.00	105.77	0.08	0.01	0.17
MC	Nevada	NSI	312.00	317.30	0.23	0.04	0.52
MC	Placer	PLA	13,364.65	63,553.55	38.46	5.76	84.65
MC	Plumas	NSI	10,000.00	2,000.00	12.50	1.87	27.51
MC	Sierra	NSI	3,550.00	710.00	4.44	0.67	9.77
MC	Tuolumne	TUO	560.00	152.70	0.45	0.07	0.99
MD	Kern	KER	15,759.98	18,701.49	28.61	4.29	62.98
MD	Los Angeles	AV	5,110.78	1,527.85	6.48	0.97	14.26
MD	Riverside	MOJ	31,548.09	58,442.10	76.69	11.50	168.80
MD	Riverside	SC	46,394.25	85,944.27	112.78	16.91	248.24
MD	San Bernardino	MOJ	25,338.64	35,297.42	55.47	8.31	122.09
NC	Del Norte	NCU	2,600.00	520.00	3.25	0.49	7.15
NC	Humboldt	NCU	10,600.00	2,120.00	13.25	1.99	29.17
NC	Mendocino	MEN	18,925.00	18,857.90	14.05	2.11	30.92
NC	Sonoma	NS	50,931.32	48,231.65	45.02	6.75	99.11
NC	Trinity	NCU	664.00	225.94	0.77	0.12	1.70
NCC	Monterey	MBU	373,871.00	1,583,058.31	1,782.27	267.16	3,923.10
NCC	San Benito	MBU	47,657.00	136,919.29	161.62	24.23	355.77
NCC	Santa Cruz	MBU	17,226.00	47,153.21	47.07	7.06	103.62
NEP	Lassen	LAS	72,743.00	26,733.60	95.86	14.37	211.01
NEP	Modoc	MOD	86,465.00	83,303.00	177.24	26.57	390.13
NEP	Siskiyou	SIS	104,817.00	141,657.94	225.21	33.76	495.73
SC	Los Angeles	SC	5,763.22	1,722.89	7.31	1.10	16.08
SC	Orange	SC	1,035.00	3,231.06	2.88	0.43	6.33
SC	Riverside	SC	51,961.56	96,257.58	126.31	18.93	278.03
SC	San Bernardino	SC	1,617.36	2,253.03	3.54	0.53	7.79
SCC	San Luis Obispo	SLO	108,293.00	227,526.70	229.03	34.33	504.14
SCC	Santa Barbara	SB	117,363.00	407,236.60	386.14	57.88	849.96
SCC	Ventura	VEN	93,692.00	225,214.84	251.38	37.68	553.33
SD	San Diego	SD	49,072.00	33,173.86	37.12	5.56	81.71

**Table 1  
2012 Agricultural Land Preparation Emissions**

Air Basin	County	Air District	2012 Harvested Acres	Annual Acre-Passes	Emissions, tons/year		
					PM10	PM2.5	Total PM
SF	Alameda	BA	10,035.00	7,335.96	12.32	1.85	27.11
SF	Contra Costa	BA	30,709.00	96,166.08	85.68	12.84	188.59
SF	Marin	BA	4,096.00	4,191.16	6.96	1.04	15.32
SF	Napa	BA	44,036.00	44,179.86	33.33	5.00	73.37
SF	San Francisco	BA	0	0	0	0	0
SF	San Mateo	BA	3,141.00	9,412.93	8.48	1.27	18.66
SF	Santa Clara	BA	19,407.00	63,068.73	65.19	9.77	143.50
SF	Solano	BA	50,426.00	83,684.52	103.93	15.58	228.76
SF	Sonoma	BA	23,967.68	22,697.25	21.19	3.18	46.64
SJV	Fresno	SJU	1,073,350.00	2,489,549.20	2,335.78	350.14	5,141.49
SJV	Kern	SJU	772,239.04	916,372.80	1,401.89	210.14	3,085.83
SJV	Kings	SJU	557,583.00	1,723,154.00	1,579.27	236.73	3,476.27
SJV	Madera	SJU	310,420.00	338,231.50	477.18	71.53	1,050.36
SJV	Merced	SJU	562,198.00	1,210,342.54	1,428.21	214.09	3,143.77
SJV	San Joaquin	SJU	690,367.00	1,320,858.52	1,436.03	215.26	3,160.98
SJV	Stanislaus	SJU	538,956.00	898,489.94	1,141.76	171.15	2,513.23
SJV	Tulare	SJU	893,908.00	1,434,574.38	1,590.55	238.42	3,501.10
SS	Imperial	IMP	565,617.00	981,288.60	1,628.80	244.16	3,585.29
SS	Riverside	SC	55,673.10	103,133.12	135.33	20.29	297.89
SV	Butte	BUT	213,910.00	637,396.51	488.00	73.15	1,074.18
SV	Colusa	COL	294,470.00	1,168,394.43	815.63	122.26	1,795.36
SV	Glenn	GLE	242,036.00	753,782.20	591.87	88.72	1,302.81
SV	Placer	PLA	6,168.30	29,332.41	17.75	2.66	39.07
SV	Sacramento	SAC	127,756.00	282,002.12	257.06	38.53	565.84
SV	Shasta	SHA	30,060.00	39,137.47	50.50	7.57	111.15
SV	Solano	YS	82,274.00	136,537.90	169.56	25.42	373.24
SV	Sutter	FR	230,115.00	858,143.44	584.66	87.64	1,286.95
SV	Tehama	TEH	63,510.00	24,759.88	74.96	11.24	165.00
SV	Yolo	YS	412,022.00	1,291,619.40	1,138.15	170.61	2,505.28
SV	Yuba	FR	63,866.00	218,611.54	141.80	21.26	312.13
Statewide Totals			9,389,416	20,576,647	21,828	3,272	48,049

**Table 2**  
**Monthly Agricultural Land Preparation Activity by Crop for 2012**  
*(Sum of monthly values may not equal 100 due to rounding)*

<b>Crop Profile</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Alfalfa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
Almonds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00
Citrus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
Corn	17.39	0.00	28.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.81	26.81
Cotton	0.00	8.99	8.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.01	41.01
Dry Beans	0.00	33.77	33.77	0.00	0.00	0.00	0.00	0.00	0.00	16.23	16.23	0.00
Garbanzo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33	0.00
Garlic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	25.00	25.00	0.00
Grapes-Raisin	0.00	0.00	0.00	2.05	11.10	11.10	9.05	39.79	9.05	17.88	0.00	0.00
Grapes-Table	0.00	0.00	0.00	36.14	0.00	0.00	0.00	0.00	0.00	27.71	36.14	0.00
Grapes-Wine	0.00	0.00	0.00	3.55	15.89	15.89	12.34	12.34	12.34	27.65	0.00	0.00
Lettuce	0.00	0.00	0.00	0.00	0.00	0.00	46.73	0.00	0.00	46.73	6.54	0.00
Melon	0.00	14.04	14.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.96	35.96
No Land Prep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Onions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00	20.00	20.00	20.00
Rice	0.00	0.00	1.90	14.08	71.99	6.33	0.00	0.00	0.00	1.90	1.90	1.90
Safflower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00
Sugar Beets	7.42	7.42	7.42	7.42	7.42	7.42	9.25	9.25	9.25	9.25	9.25	9.25
Tomatoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
Vegetables	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	15.69	15.69	15.69
Wheat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table 3**  
**Monthly PM Emission Profiles for 2012 Agricultural Land Preparation Operations**  
*(% of annual emissions by month, normalized to 1.0; annual sum may not equal 100 due to rounding)*

Air Basin	County	Air District	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GBV	Alpine	GBU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
GBV	Inyo	GBU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
GBV	Mono	GBU	0.82	0.82	0.82	0.82	0.82	0.82	1.03	1.85	1.85	30.39	30.38	29.56
LC	Lake	LAK	6.43	0.04	10.68	1.23	5.38	5.38	4.19	4.19	4.19	9.55	24.36	24.36
LT	El Dorado	ED	0.00	0.00	0.00	2.68	12.02	12.02	9.33	9.33	9.33	26.21	9.54	9.54
LT	Placer	PLA	1.18	0.02	3.60	11.97	61.18	5.41	0.03	0.03	0.03	2.21	7.16	7.16
MC	Amador	AMA	3.16	0.00	5.27	1.61	7.19	7.19	5.59	5.59	5.59	22.56	18.12	18.12
MC	Calaveras	CAL	0.00	0.00	0.00	1.07	4.78	4.78	3.71	3.71	3.71	13.88	32.19	32.19
MC	El Dorado	ED	0.00	0.00	0.00	2.68	12.02	12.02	9.33	9.33	9.33	26.21	9.54	9.54
MC	Mariposa	MPA	0.00	0.00	0.00	3.55	15.89	15.89	12.34	12.34	12.34	27.65	0.00	0.00
MC	Nevada	NSI	0.00	0.00	0.00	3.55	15.89	15.89	12.34	12.34	12.34	27.65	0.00	0.00
MC	Placer	PLA	1.18	0.02	3.60	11.97	61.18	5.41	0.03	0.03	0.03	2.21	7.16	7.16
MC	Plumas	NSI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
MC	Sierra	NSI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
MC	Tuolumne	TUO	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	30.82	30.82	30.82
MD	Kern	KER	1.08	2.90	2.99	1.74	1.37	1.37	1.54	2.16	2.01	9.06	37.35	36.42
MD	Los Angeles	AV	0.60	0.00	0.99	0.08	0.37	0.37	0.29	0.29	0.29	32.06	32.32	32.32
MD	Riverside	MOJ	2.85	4.48	5.31	2.62	2.42	2.42	7.95	2.87	2.87	17.26	25.02	23.93
MD	Riverside	SC	2.85	4.48	5.31	2.62	2.42	2.42	7.95	2.87	2.87	17.26	25.02	23.93
MD	San Bernardino	MOJ	1.96	0.35	3.32	0.19	0.27	0.27	21.68	0.25	0.25	31.16	21.65	18.65
NC	Del Norte	NCU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
NC	Humboldt	NCU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33
NC	Mendocino	MEN	0.57	0.57	0.57	3.76	14.85	14.85	11.66	11.66	11.66	26.52	1.67	1.67
NC	Sonoma	NS	0.47	0.26	0.61	2.60	10.77	10.77	8.42	8.42	8.42	24.31	12.47	12.47
NC	Trinity	NCU	0.00	0.00	0.00	0.39	1.76	1.76	1.37	1.37	1.37	32.70	29.64	29.64
NCC	Monterey	MBU	1.95	2.64	2.76	1.95	2.18	2.18	30.70	2.33	2.33	34.05	10.54	6.39
NCC	San Benito	MBU	1.43	1.14	1.62	1.20	1.41	1.41	25.31	1.71	1.71	35.39	15.52	12.17
NCC	Santa Cruz	MBU	1.49	5.69	5.69	2.63	1.65	1.65	20.53	1.61	1.61	24.08	18.56	14.80
NEP	Lassen	LAS	0.00	0.00	0.11	0.79	4.06	0.36	0.00	0.00	0.00	29.77	32.46	32.46
NEP	Modoc	MOD	2.80	2.91	2.91	2.80	2.80	2.80	3.29	3.82	3.82	20.33	25.89	25.84
NEP	Siskiyou	SIS	5.85	1.35	8.86	1.35	1.35	1.35	1.67	2.22	2.22	13.00	30.39	30.39
SC	Los Angeles	SC	0.60	0.00	0.99	0.08	0.37	0.37	0.29	0.29	0.29	32.06	32.32	32.32
SC	Orange	SC	0.43	12.80	12.80	0.43	0.43	0.43	1.07	0.51	0.51	2.77	33.94	33.85
SC	Riverside	SC	2.85	4.48	5.31	2.62	2.42	2.42	7.95	2.87	2.87	17.26	25.02	23.93
SC	San Bernardino	SC	1.96	0.35	3.32	0.19	0.27	0.27	21.68	0.25	0.25	31.16	21.65	18.65
SCC	San Luis Obispo	SLO	3.41	2.89	4.98	2.59	4.07	4.07	12.70	3.65	3.65	21.18	19.07	17.74
SCC	Santa Barbara	SB	3.17	5.11	5.32	3.18	3.67	3.67	18.16	3.53	3.53	25.10	14.11	11.45
SCC	Ventura	VEN	1.09	4.42	4.91	1.02	0.80	0.80	28.05	0.95	0.95	32.72	14.58	9.71
SD	San Diego	SD	2.81	3.79	5.15	2.13	2.23	2.23	9.52	2.41	2.41	24.45	22.14	20.72

**Table 3**  
**Monthly PM Emission Profiles for 2012 Agricultural Land Preparation Operations**  
 (% of annual emissions by month, normalized to 1.0; sum of monthly values may not equal 1.0 due to rounding.)

Air Basin	County	Air District	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SF	Alameda	BA	3.29	0.17	5.36	0.80	3.02	3.02	2.38	2.38	2.38	25.83	25.68	25.68
SF	Contra Costa	BA	12.53	1.01	21.40	0.35	0.55	0.55	0.49	0.49	0.49	7.87	27.30	26.96
SF	Marin	BA	1.19	1.19	1.19	1.26	1.50	1.50	1.43	1.43	1.43	15.75	36.06	36.06
SF	Napa	BA	0.02	0.02	0.02	3.47	15.49	15.49	12.03	12.03	12.03	27.75	0.83	0.83
SF	San Francisco	BA	0	0	0	0	0	0	0	0	0	0	0	0
SF	San Mateo	BA	1.15	14.28	14.28	1.19	1.33	1.33	1.29	2.50	2.50	10.87	26.65	22.62
SF	Santa Clara	BA	1.92	2.84	5.15	0.60	0.82	0.82	18.70	1.22	1.22	32.00	19.28	15.43
SF	Solano	BA	4.94	1.03	8.81	0.31	0.45	0.45	0.41	0.41	0.41	14.09	34.52	34.15
SF	Sonoma	BA	0.47	0.26	0.61	2.60	10.77	10.77	8.42	8.42	8.42	24.31	12.47	12.47
SJV	Fresno	SJU	1.59	2.66	5.13	0.55	1.82	1.53	3.95	5.02	2.40	14.76	30.87	29.71
SJV	Kern	SJU	1.08	2.90	2.99	1.74	1.37	1.37	1.54	2.16	2.01	9.06	37.35	36.42
SJV	Kings	SJU	5.14	3.24	11.49	0.21	0.24	0.24	0.23	0.28	0.23	5.41	36.68	36.63
SJV	Madera	SJU	3.92	0.20	6.57	0.61	2.07	2.07	1.65	3.57	1.65	6.97	35.40	35.31
SJV	Merced	SJU	5.61	2.63	10.41	1.05	1.44	1.09	1.25	1.27	1.25	7.58	33.24	33.18
SJV	San Joaquin	SJU	6.94	1.24	12.36	0.70	2.14	1.27	1.04	1.12	1.12	7.41	32.49	32.17
SJV	Stanislaus	SJU	4.78	3.64	11.20	0.36	0.80	0.43	0.78	0.38	0.38	9.77	34.55	32.92
SJV	Tulare	SJU	7.71	1.42	14.17	0.43	0.22	0.22	0.19	0.30	0.19	4.19	35.82	35.13
SS	Imperial	IMP	3.44	2.84	4.36	2.53	2.53	2.53	12.94	3.39	3.39	21.57	20.94	19.55
SS	Riverside	SC	2.85	4.48	5.31	2.62	2.42	2.42	7.95	2.87	2.87	17.26	25.02	23.93
SV	Butte	BUT	1.04	0.25	3.13	9.04	46.07	4.09	0.04	0.04	0.04	1.56	17.40	17.30
SV	Colusa	COL	1.31	1.29	4.04	9.09	44.95	4.32	0.39	0.39	0.39	5.72	14.28	13.83
SV	Glenn	GLE	4.16	0.99	8.49	6.78	33.87	3.17	0.21	0.21	0.21	2.85	19.70	19.37
SV	Placer	PLA	1.18	0.02	3.60	11.97	61.18	5.41	0.03	0.03	0.03	2.21	7.16	7.16
SV	Sacramento	SAC	9.29	0.23	15.49	1.57	6.94	2.18	1.38	1.38	1.38	8.19	25.98	25.98
SV	Shasta	SHA	0.00	0.00	0.71	5.27	26.92	2.40	0.03	0.03	0.03	20.56	22.02	22.02
SV	Solano	YS	4.94	1.03	8.81	0.31	0.45	0.45	0.41	0.41	0.41	14.09	34.52	34.15
SV	Sutter	FR	2.11	0.31	4.88	9.27	46.93	4.23	0.11	0.11	0.11	4.28	13.88	13.78
SV	Tehama	TEH	1.75	0.05	2.89	0.05	0.06	0.06	0.06	0.06	0.06	5.13	44.91	44.91
SV	Yolo	YS	9.29	0.21	15.57	1.82	8.43	1.05	0.30	0.30	0.30	7.85	27.44	27.44
SV	Yuba	FR	0.00	0.00	1.59	11.80	60.32	5.30	0.00	0.00	0.00	2.42	9.28	9.28