MISCELLANEOUS PROCESS METHODOLOGY 7.10
Unpaved Road Dust, Non-Farm Roads

(*Revised and Updated, December 2012*)

EMISSION INVENTORY SOURCE CATEGORY
Miscellaneous Processes / Road Dust

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
645-638-5400-0000 (47399) Unpaved Road Travel Dust - City & County Roads
645-640-5400-0000 (47407) Unpaved Road Travel Dust - U.S. Forest and Park Roads
645-644-5400-0000 (47423) Unpaved Road Travel Dust - BLM & BIA Roads
645-648-5400-0000 (82156) Unpaved Road Travel Dust - Unspecified

METHODS AND SOURCES

This source category provides estimates of the entrained geologic particulate matter (PM) emissions that result from vehicular travel over non-agricultural (public and industrial) unpaved roads. PM emissions are estimated using an equation that incorporates unpaved road miles, a statewide default of 10 vehicle passes per day, an emission factor, and a rainfall adjustment.

Emissions are estimated separately for four jurisdictional categories: (1) city and county roads, (2) U.S. Forest Service (USFS) and National Park (Parks) roads, (3) Bureau of Land Management (BLM) and Bureau of Indian Affairs (BIA) roads, and (4) unspecified roads. Estimates of road mileage are based on data from the California Statewide Local Streets and Roads Needs Assessment (CSLSRNA), the California Department of Transportation (Caltrans), counties and air districts. Rainfall data were obtained from the Western Regional Climate Center.

The unpaved road mileage for 2008 and the associated PM_{10}, $PM_{2.5}$ and Total Suspended Particulates (TSP) emissions are summarized in Tables 1 and 2. Table 3 presents the average annual days of rainfall by county and air basin. Table 4 presents temporal profiles by county and air basin, based on average days of rain per month.

EMISSIONS ESTIMATION METHODOLOGY

Dust emissions from unpaved roads were calculated using an emission factor (EF) derived from tests conducted by the University of California, Davis (UCD), and the Desert Research Institute (DRI). This methodology assumes that dust emissions are primarily related to the mechanical disturbance of the roadway and vehicle-generated air turbulence effects. Unpaved road vehicle miles traveled (VMT) were based on county-specific road mileage estimates from the CSLSRNA report, Caltrans, counties and air districts. Each mile of unpaved road was assumed to receive ten vehicle passes per day, and emissions were assumed to be suppressed for each day with rainfall of 0.01 inch or greater.

Emission Factor (EF). The EF used for estimating PM_{10} emissions is 2.0 lbs PM_{10}/VMT. It is based on the average of 22 tests conducted by UCD and DRI in the San Joaquin Valley, using light-duty trucks on unpaved roads.[1,2] This EF is lower than the previous factor of 2.27 lbs PM_{10}/VMT, which was based on preliminary data from the same studies.[3] A step-by-step derivation of ARB's unpaved road EF is presented in the document, "Emission Estimation Methodology Section 7.10-SJV, Unpaved Road Dust (non-farm roads, San Joaquin Valley)".[4]

Road Mileage. Total unpaved city and county road mileage, by county, was obtained directly from CSLSRNA centerline mile data.[5] The CSLSRNA report did not include mileage for USFS, Parks, BLM or BIA unpaved roads and no recently updated data were available from other sources. ARB allocated mileage to USFS, Parks and BIA road categories by distributing total maintained road mileage from Caltrans' 2008 California Public Road Data report according to Caltrans 1992 statewide unpaved road category percentages (the most recent year that roads were identified by jurisdictional categories).[6,7] BLM road mileage was scaled similarly, using 1998 Caltrans road mileage (the most recently available year) and the statewide percentage for unpaved BLM roads from 1992.[7,8] For counties and air districts providing total unpaved road mileage for either 2008 or 2009, ARB scaled total mileage to Caltrans road categories per the Caltrans 1992 statewide inventory, then apportioned mileage to ARB roadway categories using Caltrans 1992 county-specific percentages. Unspecified unpaved road mileage (canals, drainage ditches, etc.) was provided directly by counties and air districts. Table A shows the unpaved road mileage sources and the scaling approach used to allocate mileage to ARB emission inventory road categories.[8] For counties split among two or more air basins, unpaved road mileage was apportioned based on the land surface areas provided in ARB's 2009 Almanac of Emissions, Appendix D.[9]

Table A. Approach used to allocate unpaved road mileage to ARB roadway groups

ARB Unpaved Road Category	Data Source	Scaling Approach
City/County	CSLSRNA	None
USFS/Parks, BIA	2008 California Public Road Data	Statewide percentage of state forests and parks, state forestry and fire protection, USFS and National Park Service and BIA unpaved roads in 1992
BLM	1998 California Public Road Data	Statewide percentage of BLM unpaved road mileage in 1992
City & County, USFS/Parks, BLM & BIA	Total unpaved mileage provided by counties and air districts	Scaled to 1992 Caltrans categories per 1992 statewide inventory, apportioned to ARB categories per Caltrans 1992 county-specific percentages
Unspecified	Counties, air districts	None

VMT. In the previous unpaved road dust methodology, ARB assumed an average of 10 daily passes based on surveys of several county traffic engineers and discussions with the U.S. Forest Service.[3] Traffic counts conducted in 2001 on unpaved California roads support the prior assumption of 10 passes per day.[10] Annual VMT can thus be computed from the road mileage in Table 1 as follows:

Annual VMT = Unpaved Road Miles x 10 passes/day x 365 days/year
= Unpaved Road Miles x 3,650 passes/year

(Note: For Imperial County, more detailed data were available to determine the number of passes per day.)

Rainfall Adjustment. This methodology incorporates the rainfall adjustment from the most recent version of U.S. EPA's AP-42 for unpaved roads.[11] Unpaved road dust emission estimates for each county within air basin were adjusted using the average number of days per year with rainfall equal to or greater than 0.01 inch; data are presented in Table 3.[12]

The rainfall adjustment is calculated as follows:

Rainfall Adjustment = (365-P)/365

Where P = days per year with rainfall $\geq$0.01 inch

PM_{10} Emissions. PM_{10} emissions on unpaved roads are calculated as follows:

PM_{10}(tons/year) = VMT x EF_{PM10}/(2000 lbs/ton) x Rainfall Adjustment

Where:
Annual VMT = Unpaved Road Miles x 3,650 passes/year
EF_{PM10} = 2 lbs PM_{10}/VMT

The equation can be simplified as:
PM_{10}(tons/year) = Unpaved Road Miles x 3.65 x (365-P)/365

$PM_{2.5}$ and PM Emissions. $PM_{2.5}$ and PM are calculated from PM_{10} emissions using ARB's size speciation profile #470[13]. The size profile is based on California road dust sampling conducted for the ARB in 1989 and on evaluations conducted by the Western Regional Air Partnership (WRAP).[14,15] The chemical profile is based on sampling conducted in the San Joaquin Valley for the California Regional Particulate Air Quality Study.[16] The size profile assumes that the PM_{10} fraction of total PM emissions is 0.5943, and the $PM_{2.5}$ fraction is 0.0594.[13] $PM_{2.5}$ and PM emissions can be calculated as follows:

$PM_{2.5}$ emissions (tons/year) = [PM_{10}(tons/year)/0.5943] x 0.0594

PM emissions (tons/year) = PM_{10}(tons/year)/0.5943

TEMPORAL ACTIVITY

Activity on unpaved roads is assumed to occur primarily during daylight hours and to be uniform each day of the week. It is also assumed more unpaved road travel takes place during the dry months than the rainy months. Temporal profiles are used to allocate total annual unpaved road dust emissions on a monthly basis to account for this seasonal variation in activity. Table 4 presents county- and air basin- specific temporal profiles, based on monthly days of rainfall. ARB developed these profiles for paved roads; recent research found similar seasonal distributions for dust emissions from paved and unpaved roads.[12,15,17,18] Table 4 profiles for the San Joaquin Valley Air Basin reflect re-analysis of rainfall data for the 2012 $PM_{2.5}$ SIP inventory.[19]

GROWTH FORECASTING

In the previous methodology, unpaved road growth for many counties was tied to paved road VMT growth.[3] For other counties, growth was tied to other factors (e.g., population, employment, etc.) or was set to zero. For this update, we are assuming zero growth for all non-farm unpaved roads because it is not reasonable to expect that unpaved road travel grows in proportion to growth in paved road VMT. The rationale for assuming zero growth is that construction of new unpaved roads is very limited, and unpaved roads are paved over if they become heavily traveled.

ASSUMPTIONS AND LIMITATIONS

1. This methodology assumes that all public and industrial unpaved roads in California emit the same levels of PM_{10} per VMT for all vehicles.
2. It is assumed that all unpaved roads in California receive 10 daily vehicle passes.
3. It is assumed that the emission factors derived in the San Joaquin Valley are applicable to the rest of the state.
4. It is assumed that the particle size speciation profiles derived in the San Joaquin Valley are applicable to the rest of the state.
5. It is assumed that rainfall of at least 0.01 inch on any day mitigates unpaved road dust emissions for 24 hours.
6. It is assumed that the temporal profiles developed for paved roads provide appropriate adjustments to allocate unpaved road dust emissions on a monthly basis.
7. VMT growth is assumed to be zero for unpaved non-farm roads.
8. This inventory does not include private unpaved roads. Agricultural unpaved road emissions estimates are computed in a separate methodology.[20]
9. This methodology does not account for emission reductions from control measures for unpaved roads.

CHANGES IN THE METHODOLOGY

There were several methodology changes for this update. The changes are:

- Unpaved road mileage data were updated to reflect 2008 estimates.[5,6,7,8]
- ARB used a new EF, 2 lbs PM_{10}/VMT, based on California unpaved road emissions tests.[1,2]
- ARB used the U.S. EPA's AP-42 rainfall adjustment factor for unpaved roads, [(365-P)/365], to subtract unpaved road dust on days with 0.01 inch or greater precipitation.[11,12]
- $PM_{2.5}$ emission estimates are included for the first time, based on ARB's size speciation profile #470, which was derived from testing conducted in the San Joaquin Valley and in Imperial and Mono counties.[13,14,15,16,21] ARB updated their $PM_{2.5}$ fugitive dust profiles in 2006, after a review of recent Western Regional Air Partnership (WRAP) studies and ARB's emission inventory vs. ambient air quality measurement data indicated that $PM_{2.5}$ from these sources was overestimated in California.[15,22,23] The unpaved road $PM_{2.5}/PM_{10}$ fraction was updated from 21.2% to 10% to more accurately reflect measured $PM_{2.5}$ emissions.[21]
- Historical monthly rainfall data (Table 3) were used to develop revised temporal profiles (Table 4) that reflect county- and air basin-specific reductions in emissions due to rainfall.[12,17]
- Growth assumptions were revised to zero for all non-farm unpaved roads.

The above changes reduce statewide PM_{10} unpaved road emissions by about 50% from estimates provided in the 2009 ARB Almanac for the year 2008, which is based on 1997 emission inventory estimates, grown to 2008.[24]

COMMENTS AND RECOMMENDATIONS

Estimates of unpaved road mileage and road travel activity could be improved for this category. Although expensive to develop, emission factors that incorporate greater regional and seasonal specificity would improve the accuracy of the unpaved road dust PM inventory. Additionally, emission estimates could be improved by better understanding the relationship between the amount of precipitation and reductions in PM_{10} emissions.

Unpaved Road Mileage**.** ARB has previously estimated statewide unpaved road mileage based on annual Caltrans summaries.[3] Caltrans has not compiled California public or industrial unpaved road mileage data since 1992. A 2002 UCD study, conducted under contract to ARB, investigated vehicle activity and roadway mileage for unpaved roads in California.[10] While the methodology represents an advancement in characterizing unpaved road VMT, it has several limitations and lacks full documentation for calculations of both unpaved road miles and the rainfall adjustment. Because of these uncertainties, ARB did not use the UCD study for this methodology update. Better unpaved road mileage estimates can likely be determined for subsequent revisions by using updated GIS-based road coverage maps. Emission estimates may be improved in

future surveys by including private unpaved roads, if feasible, and if these roads are determined to be significant sources of dust emissions.

Road Travel Activity Data. In the previous update to this methodology, ARB assumed a default of 10 passes per day for unpaved road travel.[3] Traffic counts conducted in the 2002 UCD study found similar values for average daily passes (mean = 11 passes per day) for land use classes similar to ARB unpaved road groups.[10] While more extensive surveys would improve estimates, current data support using 10 passes per day for unpaved road travel activity. A wider network of traffic counters on a year-round basis could provide both more conclusive regional data and incorporate better estimates of seasonality.

SAMPLE CALCULATIONS

The instructions and Table B, below, show the calculation of unpaved road dust emissions for Humboldt County:

1. *Road Miles.* From Table 1, obtain the miles of unpaved road for each category or the total miles for all categories.
2. *Vehicle Miles Traveled (VMT).* Compute the annual vehicle miles traveled for each road type. This is: *Road Miles x 3,650.*
3. *Rainfall Adjustment.* Compute rainfall adjustment [(365-P)/365] using data in Table 3 for P.
4. *Annual PM_{10} Emissions.* Multiply the VMT estimate (Step 2) by the emission factor (2.0 lbs PM_{10}/VMT), divide by 2000 lbs/ton and multiply by the rainfall adjustment factor (Step 3).
   Annual Emissions = VMT x Emission Factor/2000 x Rainfall Adjustment
   =VMT/1000 x Rainfall Adjustment
5. *Apply size-fraction profile to calculate $PM_{2.5}$ emissions.*
6. *Apply size-fraction profile to calculate PM emissions.*

Table B. Estimating Unpaved Road Dust Emissions in Humboldt County

Step	Calculation	Road Type			Total
		City/County	BLM/BIA	USFS/Parks	
1	Miles of Road	725.0	300.5	147.4	1,173
2	Annual VMT *(Road miles x 3,650)*	2,646,250	1,096,825	538,010	4,281,450
3	Rainfall Adjustment *[(365-P)/365, P =121]*	0.6685	0.6685	0.6685	0.6685
4	PM_{10} (tons/year) *(VMT/1000 x Rain. Adj.)*	1,769	733	360	2,862
5	$PM_{2.5}$ (tons/year) *(PM_{10}/0.5943) x 0.0594*	177	73	36	286
6	PM (tons/year) *(PM_{10}/0.5943)*	2,977	1,234	605	4,816

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Table 1. 2008 Unpaved Road Emissions for PM_{10} (1)

Air Basin	County	District	ARB Inventory: Unpaved Road Miles				PM_{10} Emissions, tons/year (1)				2008 Totals	
			City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	Miles (3)	PM_{10} (tons/year)
GBV	Alpine	GBU	82.0	45.6	0.8	–	240.3	133.6	2.3	–	128	376.2
GBV	Inyo	GBU	1,124.0	191.7	18.5	–	3,787.9	645.9	62.4	–	1,334	4,496.1
GBV	Mono	GBU	0.0	247.5	4.5	–	0.0	806.8	14.7	–	252	821.6
LC	Lake	LAK	152.0	93.2	0.0	–	451.4	276.9	0.0	–	245	728.3
LT	El Dorado	ED	6.6	47.2	0.2	–	19.6	140.3	0.7	–	54	160.6
LT	Placer	PLA	2.8	10.1	0.0	–	8.1	29.1	0.0	–	13	37.3
MC	Amador	AMA	22.0	39.3	1.5	–	66.2	118.2	4.6	–	63	189.0
MC	Calaveras	CAL	95.0	133.1	0.0	–	278.4	390.0	0.0	–	228	668.4
MC	El Dorado	ED	65.4	467.2	2.2	–	195.5	1,396.8	6.6	–	535	1,598.9
MC	Mariposa	MPA	0.0	126.8	1.5	–	0.0	375.3	4.5	–	128	379.9
MC	Nevada	NSI	148.0	151.5	0.0	–	417.4	427.3	0.0	–	300	844.7
MC	Placer	PLA	38.8	139.2	0.0	–	113.4	406.5	0.0	–	178	519.8
MC	Plumas	NSI	208.0	628.7	0.4	–	603.2	1,823.3	1.3	–	837	2,427.8
MC	Sierra	NSI	211.0	195.4	0.0	–	603.5	558.9	0.0	–	406	1,162.4
MC	Tuolumne	TUO	37.0	226.5	1.7	–	111.0	679.4	5.2	–	265	795.7
MD	Kern	KER	58.3	26.7	0.3	–	198.9	91.2	0.9	–	85	291.1
MD	Los Angeles	AV	42.0	42.5	0.0	–	143.2	144.8	0.0	–	84	287.9
MD	Riverside	MOJ	54.2	28.0	16.5	–	188.7	97.4	57.5	–	99	343.6
MD	Riverside	SC	79.7	41.1	24.3	–	277.3	143.1	84.5	–	145	504.9
MD	San Bernardino	MOJ	185.7	272.9	47.4	–	635.1	933.3	162.1	–	506 (3a)	1,730.5
NC	Del Norte	NCU	109.0	265.9	16.0	–	276.9	675.4	40.5	–	391	992.8
NC	Humboldt	NCU	725.0	300.5	147.4	–	1,769.0	733.3	359.7	–	1,173	2,861.9
NC	Mendocino	MEN	2.0	232.5	41.6	–	5.0	581.4	104.0	–	276	690.4
NC	Sonoma	NS	0.0	59.4	1.3	–	0.0	172.2	3.9	–	61	176.1
NC	Trinity	NCU	226.0	511.6	0.0	–	635.1	1,437.5	0.0	–	738	2,072.6
NCC	Monterey	MBU	8.0	63.7	0.0	–	24.8	197.5	0.0	–	72	222.3
NCC	San Benito	MBU	0.0	258.2	0.0	–	0.0	810.9	0.0	–	258	810.9
NCC	Santa Cruz	MBU	0.0	101.2	0.0	–	0.0	303.7	0.0	–	101	303.7
NEP	Lassen	LAS	513.0	253.7	2.2	–	1,569.8	776.2	6.7	–	769	2,352.7
NEP	Modoc	MOD	490.0	353.2	12.1	–	1,416.1	1,020.6	35.0	–	855	2,471.7
NEP	Siskiyou	SIS	497.0	977.9	3.8	–	1,336.9	2,630.5	10.2	–	1,479	3,977.7
SC	Los Angeles	SC	70.0	70.8	0.0	–	231.7	234.3	0.0	645.6	141	1,112
SC	Orange	SC	0.0	30.1	0.0	–	0.0	100.1	0.0	192.4	30	292
SC	Riverside	SC	88.7	45.8	27.0	–	293.7	151.6	89.5	291.0	162	826
SC	San Bernardino	SC	8.6	12.7	2.2	–	27.9	41.0	7.1	240.6	23	317
SCC	San Luis Obispo	SLO	241.0	46.3	0.0	–	778.4	149.7	0.0	–	287	928.1
SCC	Santa Barbara	SB	2.0	140.7	1.0	–	6.4	448.8	3.3	–	144	458.4
SCC	Ventura	VEN	4.0	122.1	0.0	–	13.4	407.8	0.0	–	126	421.2
SD	San Diego	SD	101.0	599.5	158.1	–	326.2	1,936.4	510.7	1544.40	859	4,317.8

1 PM_{10} emissions (tons/year) = [(VMT x Emission Factor)/2000] x Rainfall Adjustment
Where: VMT = (road miles x 10 passes/day x 365 days/year), Emission Factor = 2 lb PM_{10}/VMT,
Rainfall Adjustment = (365-P)/365, and
P = average days/year/county with $\geq$ 0.01 inch precipitation; precipitation data are in Table 3

2 Unspecified unpaved road data provided by county or districts for canals, drainage ditches, etc.

3 County or air district provided unpaved road mileage for either 2008 (a) or 2009 (b). ARB scaled mileage to Caltrans road categories per Caltrans 1992 statewide inventory, then apportioned mileage to ARB roadway categories using Caltrans 1992 county-specific percentages.

4 All Imperial County unpaved road mileage and emissions are from the August 2009 PM_{10} SIP for Imperial County for 2005. Emissions are based on district-specific vehicle passes per day. Unspecified unpaved road emissions are from canal roads.

Table 1. 2008 Unpaved Road Emissions for PM_{10} (1)

Air Basin	County	District	ARB Inventory: Unpaved Road Miles				PM_{10} Emissions, tons/year (1)				2008 Totals (2)	
			City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	City/ County	USFS/ Parks	BLM/ BIA	Unspec. (3)	Miles (3)	PM_{10} (tons/year)
SF	Alameda	BA	0.0	3.4	0.0	–	0.0	10.3	0.0	–	3	10.3
SF	Contra Costa	BA	0.0	63.6	0.0	–	0.0	193.9	0.0	–	64	193.9
SF	Marin	BA	0.0	85.4	0.0	–	0.0	255.3	0.0	–	85	255.3
SF	Napa	BA	0.0	17.2	0.0	–	0.0	51.0	0.0	–	17	51.0
SF	San Francisco	BA	0.0	26.0	0.0	–	0.0	77.4	0.0	–	26	77.4
SF	San Mateo	BA	0.0	29.0	0.0	–	0.0	88.6	0.0	–	29	88.6
SF	Santa Clara	BA	0.0	127.7	0.0	–	0.0	384.5	0.0	–	128	384.5
SF	Solano	BA	0.0	47.0	0.0	–	0.0	146.2	0.0	–	47 (3b)	146.2
SF	Sonoma	BA	0.0	27.9	0.6	–	0.0	82.7	1.9	–	29	84.6
SJV	Fresno	SJU	81.0	375.9	7.4	–	259.2	1,203.0	23.8	356.2	464	1,842.2
SJV	Kern	SJU	126.7	58.1	0.6	–	415.5	190.4	2.0	239.7	185	847.6
SJV	Kings	SJU	70.0	0.0	1.8	–	228.9	0.0	6.0	56.1	72	291.0
SJV	Madera	SJU	66.0	246.1	2.8	–	211.9	789.9	8.9	80.1	315	1,090.7
SJV	Merced	SJU	163.0	43.5	0.0	–	511.8	136.5	0.0	118.6	206	766.9
SJV	San Joaquin	SJU	19.0	40.5	0.0	–	58.9	125.5	0.0	54.0	59	238.4
SJV	Stanislaus	SJU	42.0	22.1	0.0	–	131.5	69.1	0.0	48.9	64	249.4
SJV	Tulare	SJU	110.0	345.4	22.8	–	357.5	1,122.7	74.1	150.0	478	1,704.3
SS	Imperial (4)	IMP	1,361.5	26.0	114.0	6,148.0	9,328.0	94.5	414.3	11,220.0	7,650	21,056.8
SS	Riverside	SC	93.4	48.2	28.4	–	324.9	167.7	99.0	–	170	591.6
SV	Butte	BUT	274.0	142.7	5.8	–	827.5	430.9	17.6	–	422	1,275.9
SV	Colusa	COL	236.0	30.0	9.0	–	729.2	92.8	27.7	–	275	849.7
SV	Glenn	GLE	145.0	51.0	0.8	–	437.9	154.0	2.4	–	197	594.3
SV	Placer	PLA	18.3	65.8	0.0	–	54.9	196.6	0.0	–	84	251.5
SV	Sacramento	SAC	26.0	6.6	0.0	–	80.1	20.4	0.0	–	33	100.5
SV	Shasta	SHA	231.0	425.2	2.0	–	653.7	1,203.3	5.8	–	658	1,862.8
SV	Solano	YS	24.6	36.1	6.3	–	75.5	110.9	19.3	–	67 (3b)	205.7
SV	Sutter	FR	163.0	0.0	0.0	–	472.7	0.0	0.0	–	163	472.7
SV	Tehama	THE	274.0	189.1	0.0	–	805.6	555.8	0.0	–	463	1,361.4
SV	Yolo	YS	82.1	37.9	0.0	–	252.1	116.3	0.0	–	120 (3b)	368.4
SV	Yuba	FR	102.0	47.1	0.0	–	308.0	142.2	0.0	–	149	450.2
TOTALS			**9,407**	**10,265**	**735**	**6,148**	**33,575**	**30,640**	**2,280**	**15,237**	**26,554**	**81,733**

1 PM_{10} emissions (tons/year) = [(VMT x Emission Factor)/2000] x Rainfall Adjustment
Where: VMT = (road miles x 10 passes/day x 365 days/year), Emission Factor = 2 lb PM_{10}/VMT,
Rainfall Adjustment = (365-P)/365, and
P = average days/year/county with $\geq$ 0.01 inch precipitation; precipitation data are in Table 3

2 Unspecified unpaved road data provided by county or districts for canals, drainage ditches, etc.

3 County or air district provided unpaved road mileage for either 2008 (a) or 2009 (b). ARB scaled mileage to Caltrans road categories per Caltrans 1992 statewide inventory, then apportioned mileage to ARB roadway categories using Caltrans 1992 county-specific percentages.

4 All Imperial County unpaved road mileage and emissions are from the August 2009 PM_{10} SIP for Imperial County for 2005. Emissions are based on district-specific vehicle passes per day. Unspecified unpaved road emissions are from canal roads.

Table 2. 2008 Unpaved Road Emissions for $PM_{2.5}$ and PM (1)

Air Basin	County	District	PM2.5 Emissions, tons/year (1)					PM Emissions, tons/year (1)				
			City/ County	USFS/ Parks	BLM/ BIA	Unspec (2)	Total PM2.5	City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	Total PM
GBV	Alpine	GBU	24.0	13.4	0.2	–	37.6	404.3	224.9	4.0	–	633.1
GBV	Inyo	GBU	378.6	64.6	6.2	–	449.4	6,373.7	1,086.8	104.9	–	7,565.4
GBV	Mono	GBU	0.0	80.6	1.5	–	82.1	0.0	1,357.6	24.8	–	1,382.4
LC	Lake	LAK	45.1	27.7	0.0	–	72.8	759.6	465.8	0.0	–	1,225.5
LT	El Dorado	ED	2.0	14.0	0.1	–	16.0	33.0	236.0	1.1	–	270.2
LT	Placer	PLA	0.8	2.9	0.0	–	3.7	13.7	49.0	0.0	–	62.7
MC	Amador	AMA	6.6	11.8	0.5	–	18.9	111.4	198.9	7.7	–	318.1
MC	Calaveras	CAL	27.8	39.0	0.0	–	66.8	468.4	656.2	0.0	–	1,124.6
MC	El Dorado	ED	19.5	139.6	0.7	–	159.8	329.0	2,350.3	11.2	–	2,690.5
MC	Mariposa	MPA	0.0	37.5	0.5	–	38.0	0.0	631.6	7.6	–	639.2
MC	Nevada	NSI	41.7	42.7	0.0	–	84.4	702.3	719.0	0.0	–	1,421.3
MC	Placer	PLA	11.3	40.6	0.0	–	52.0	190.8	683.9	0.0	–	874.7
MC	Plumas	NSI	60.3	182.2	0.1	–	242.7	1,015.0	3,068.1	2.1	–	4,085.2
MC	Sierra	NSI	60.3	55.9	0.0	–	116.2	1,015.4	940.4	0.0	–	1,955.8
MC	Tuolumne	TUO	11.1	67.9	0.5	–	79.5	186.8	1,143.2	8.8	–	1,338.8
MD	Kern	KER	19.9	9.1	0.1	–	29.1	334.7	153.4	1.6	–	489.8
MD	Los Angeles	AV	14.3	14.5	0.0	–	28.8	240.9	243.6	0.0	–	484.5
MD	Riverside	MOJ	18.9	9.7	5.7	–	34.3	317.6	163.9	96.7	–	578.2
MD	Riverside	SC	27.7	14.3	8.4	–	50.5	466.6	240.8	142.1	–	849.6
MD	San Bernardino	MOJ	63.5	93.3	16.2	–	173.0	1,068.6	1,570.5	272.8	–	2,911.9
NC	Del Norte	NCU	27.7	67.5	4.1	–	99.2	465.9	1,136.5	68.2	–	1,670.5
NC	Humboldt	NCU	176.8	73.3	35.9	–	286.0	2,976.6	1,233.8	605.2	–	4,815.6
NC	Mendocino	MEN	0.5	58.1	10.4	–	69.0	8.4	978.2	175.0	–	1,161.7
NC	Sonoma	NS	0.0	17.2	0.4	–	17.6	0.0	289.7	6.5	–	296.2
NC	Trinity	NCU	63.5	143.7	0.0	–	207.2	1,068.6	2,418.9	0.0	–	3,487.5
NCC	Monterey	MBU	2.5	19.7	0.0	–	22.2	41.7	332.3	0.0	–	374.0
NCC	San Benito	MBU	0.0	81.0	0.0	–	81.0	0.0	1,364.5	0.0	–	1,364.5
NCC	Santa Cruz	MBU	0.0	30.4	0.0	–	30.4	0.0	511.0	0.0	–	511.0
NEP	Lassen	LAS	156.9	77.6	0.7	–	235.2	2,641.4	1,306.1	11.3	–	3,958.8
NEP	Modoc	MOD	141.5	102.0	3.5	–	247.0	2,382.8	1,717.3	58.8	–	4,159.0
NEP	Siskiyou	SIS	133.6	262.9	1.0	–	397.6	2,249.6	4,426.3	17.2	–	6,693.0
SC	Los Angeles	SC	23.2	23.4	0.0	64.5	111	389.9	394.3	0.0	1,086.3	1,870.5
SC	Orange	SC	0.0	10.0	0.0	19.2	29	0.0	168.4	0.0	323.8	492.2
SC	Riverside	SC	29.4	15.2	8.9	29.1	83	494.2	255.1	150.5	489.6	1,389.4
SC	San Bernardino	SC	2.8	4.1	0.7	24.0	32	47.0	69.0	12.0	404.8	532.7
SCC	San Luis Obispo	SLO	77.8	15.0	0.0	–	92.8	1,309.8	251.9	0.0	–	1,561.7
SCC	Santa Barbara	SB	0.6	44.9	0.3	–	45.8	10.7	755.2	5.5	–	771.4
SCC	Ventura	VEN	1.3	40.8	0.0	–	42.1	22.5	686.3	0.0	–	708.7
SD	San Diego	SD	32.6	193.5	51.0	154.4	431.6	548.9	3,258.3	859.4	2,598.7	7,265.3

1 $PM_{2.5}$ and PM emissions (tons/year) are calculated from PM_{10} emissions using ARB's particulate matter speciation profile #470 found at: http://www.arb.ca.gov/ei/speciate/dnldopt.htm#specprof
$PM = PM_{10}/0.5943$ and $PM_{2.5} = (PM_{10}/0.5943) \times 0.0594$

2 Unspecified unpaved road data provided by county and districts for other types of unpaved roads, e.g., canals, drainage ditches, etc.

3 Imperial County unpaved road mileage and emissions are from the August 2009 PM_{10} SIP for Imperial County for 2005.

Table 2. 2008 Unpaved Road Emissions for $PM_{2.5}$ and PM (1)

Air Basin	County	District	$PM_{2.5}$ Emissions, tons/year (1)					PM Emissions, tons/year (1)				
			City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	Total PM2.5	City/ County	USFS/ Parks	BLM/ BIA	Unspec. (2)	Total PM
SF	Alameda	BA	0	1.0	0.0	–	1.0	0.0	17.4	0.0	–	17.4
SF	Contra Costa	BA	0	19.4	0.0	–	19.4	0.0	326.3	0.0	–	326.3
SF	Marin	BA	0	25.5	0.0	–	25.5	0.0	429.7	0.0	–	429.7
SF	Napa	BA	0	5.1	0.0	–	5.1	0.0	85.8	0.0	–	85.8
SF	San Francisco	BA	0	7.7	0.0	–	7.7	0.0	130.3	0.0	–	130.3
SF	San Mateo	BA	0	8.9	0.0	–	8.9	0.0	149.1	0.0	–	149.1
SF	Santa Clara	BA	0	38.4	0.0	–	38.4	0.0	646.9	0.0	–	646.9
SF	Solano	BA	0	14.6	0.0	–	14.6	0.0	246.0	0.0	–	246.0
SF	Sonoma	BA	0	8.3	0.2	–	8.5	0.0	139.2	3.1	–	142.3
SJV	Fresno	SJU	25.9	120.2	2.4	35.6	184	436.1	2,024.2	40.0	599.4	3,099.8
SJV	Kern	SJU	41.5	19.0	0.2	24.0	85	699.1	320.4	3.3	403.4	1,426.2
SJV	Kings	SJU	22.9	0.0	0.6	5.6	29	385.2	0.0	10.0	94.4	489.6
SJV	Madera	SJU	21.2	79.0	0.9	8.0	109	356.5	1,329.2	15.0	134.7	1,835.3
SJV	Merced	SJU	51.2	13.6	0.0	11.9	77	861.2	229.7	0.0	199.5	1,290.4
SJV	San Joaquin	SJU	5.9	12.5	0.0	5.4	24	99.1	211.2	0.0	90.8	401.1
SJV	Stanislaus	SJU	13.1	6.9	0.0	4.9	25	221.2	116.2	0.0	82.2	419.6
SJV	Tulare	SJU	35.7	112.2	7.4	15.0	170	601.5	1,889.1	124.7	252.4	2,867.8
SS	Imperial	IMP	932.3	9.4	41.4	1,121.4	2,104.6	15,695.8	159.1	697.1	18,888.9	35,440.8
SS	Riverside	SC	32.5	16.8	9.9	–	59.1	546.7	282.2	166.5	–	995.4
SV	Butte	BUT	82.7	43.1	1.8	–	127.5	1,392.4	725.0	29.6	–	2,147.0
SV	Colusa	COL	72.9	9.3	2.8	–	84.9	1,227.1	156.1	46.6	–	1,429.7
SV	Glenn	GLE	43.8	15.4	0.2	–	59.4	736.8	259.1	4.1	–	1,000.0
SV	Placer	PLA	5.5	19.7	0.0	–	25.1	92.3	330.9	0.0	–	423.2
SV	Sacramento	SAC	8.0	2.0	0.0	–	10.0	134.7	34.3	0.0	–	169.1
SV	Shasta	SHA	65.3	120.3	0.6	–	186.2	1,100.0	2,024.7	9.7	–	3,134.4
SV	Solano	YS	7.5	11.1	1.9	–	20.6	127.0	186.7	32.4	–	346.1
SV	Sutter	FR	47.2	0.0	0.0	–	47.2	795.4	0.0	0.0	–	795.4
SV	Tehama	THE	80.5	55.6	0.0	–	136.1	1,355.5	935.3	0.0	–	2,290.7
SV	Yolo	YS	25.2	11.6	0.0	–	36.8	424.1	195.7	0.0	–	619.9
SV	Yuba	FR	30.8	14.2	0.0	–	45.0	518.3	239.2	0.0	–	757.5
TOTALS			**3,356**	**3,062**	**228**	**1,523**	**8,169**	**56,496**	**51,556**	**3,837**	**25,649**	**137,538**

1 $PM_{2.5}$ and PM emissions (tons/year) are calculated from PM_{10} emissions using ARB's particulate matter speciation profile #470 found at: http://www.arb.ca.gov/ei/speciate/dnldopt.htm#specprof
$PM = PM_{10}/0.5943$ and $PM_{2.5} = (PM_{10}/0.5943) \times 0.0594$

2 Unspecified unpaved road data provided by county and districts for other types of unpaved roads, e.g., canals, drainage ditches, etc.

3 Imperial County unpaved road mileage and emissions are from the August 2009 PM_{10} SIP for Imperial County for 2005.

Table 3
Annual Rainfall Days: Average Days per Year that California Counties Receive 0.01 Inch or Greater Precipitation Over Years of Record (1)

Air Basin	County	Air District	Annual Rainfall Days (1)
GBV	Alpine	GBU	72
GBV	Inyo	GBU	28
GBV	Mono	GBU	39
LC	Lake	LAK	68
LT	El Dorado	ED	68
LT	Placer	PLA	77
MC	Amador	AMA	64
MC	Calaveras	CAL	72
MC	El Dorado	ED	66
MC	Mariposa	MPA	69
MC	Nevada	NSI	83
MC	Placer	PLA	73
MC	Plumas	NSI	75
MC	Sierra	NSI	79
MC	Tuolumne	TUO	65
MD	Kern	KER	24
MD	Los Angeles	AV	24
MD	Riverside	MOJ	17
MD	Riverside	SC	17
MD	San Bernardino	MOJ	23
NC	Del Norte	NCU	111
NC	Humboldt	NCU	121
NC	Mendocino	MEN	115
NC	Sonoma	NS	75
NC	Trinity	NCU	84
NCC	Monterey	MBU	55
NCC	San Benito	MBU	51
NCC	Santa Cruz	MBU	65
NEP	Lassen	LAS	59
NEP	Modoc	MOD	76
NEP	Siskiyou	SIS	96
SC	Los Angeles	SC	34
SC	Orange	SC	33
SC	Riverside	SC	34
SC	San Bernardino	SC	41
SCC	San Luis Obispo	SLO	42
SCC	Santa Barbara	SB	46
SCC	Ventura	VEN	31
SD	San Diego	SD	42

Air Basin	County	Air District	Annual Rainfall Days (1)
SF	Alameda	BA	61
SF	Contra Costa	BA	60
SF	Marin	BA	66
SF	Napa	BA	68
SF	San Francisco	BA	67
SF	San Mateo	BA	60
SF	Santa Clara	BA	64
SF	Solano	BA	54
SF	Sonoma	BA	69
SJV	Fresno	SJU	45
SJV	Kern	SJU	37
SJV	Kings	SJU	38
SJV	Madera	SJU	44
SJV	Merced	SJU	51
SJV	San Joaquin	SJU	55
SJV	Stanislaus	SJU	52
SJV	Tulare	SJU	40
SS	Imperial	IMP	11
SS	Riverside	SC	17
SV	Butte	BUT	63
SV	Colusa	COL	56
SV	Glenn	GLE	63
SV	Placer	PLA	66
SV	Sacramento	SAC	57
SV	Shasta	SHA	82
SV	Solano	YS	58
SV	Sutter	FR	75
SV	Tehama	TEH	71
SV	Yolo	YS	58
SV	Yuba	FR	63

1 Average number of days per year with rainfall of 0.01 inch or greater, by county/air basin, for years of record. Developed by ARB from Western Regional Climate Center historical records for California meteorological station-level rainfall. http://www.wrcc.dri.edu/

Table 4. Temporal Profile for Unpaved Road Dust Emissions, Based on Monthly Days of Rain (1)

Air	County	District	Monthly Rainfall Fraction (2,3)											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GBV	Alpine	GBU	0.078	0.079	0.081	0.083	0.083	0.086	0.087	0.087	0.086	0.086	0.083	0.081
GBV	Inyo	GBU	0.078	0.078	0.081	0.085	0.085	0.088	0.085	0.085	0.085	0.085	0.085	0.081
GBV	Mono	GBU	0.079	0.079	0.082	0.084	0.084	0.084	0.084	0.084	0.086	0.086	0.084	0.082
LC	Lake	ED	0.074	0.080	0.078	0.082	0.086	0.088	0.091	0.091	0.090	0.086	0.080	0.076
LT	El Dorado	LAK	0.080	0.082	0.080	0.078	0.083	0.088	0.088	0.090	0.090	0.086	0.080	0.075
LT	Placer	PLA	0.078	0.079	0.079	0.082	0.084	0.086	0.090	0.089	0.087	0.085	0.082	0.079
MC	Amador	AMA	0.075	0.077	0.078	0.081	0.085	0.089	0.091	0.089	0.089	0.087	0.081	0.077
MC	Calaveras	CAL	0.078	0.078	0.077	0.081	0.084	0.088	0.091	0.090	0.088	0.086	0.081	0.078
MC	El Dorado	ED	0.077	0.077	0.077	0.081	0.085	0.088	0.091	0.091	0.089	0.085	0.081	0.077
MC	Mariposa	MPA	0.079	0.079	0.078	0.080	0.084	0.088	0.088	0.089	0.087	0.086	0.082	0.080
MC	Nevada	NSI	0.077	0.078	0.078	0.081	0.086	0.088	0.091	0.090	0.089	0.086	0.080	0.078
MC	Placer	PLA	0.077	0.078	0.077	0.081	0.085	0.088	0.091	0.090	0.088	0.086	0.080	0.078
MC	Plumas	NSI	0.079	0.079	0.079	0.081	0.084	0.087	0.090	0.090	0.088	0.085	0.081	0.078
MC	Sierra	NSI	0.078	0.079	0.079	0.082	0.083	0.087	0.090	0.090	0.087	0.085	0.081	0.078
MC	Tuolumne	TUO	0.075	0.077	0.077	0.082	0.086	0.089	0.091	0.091	0.089	0.086	0.079	0.077
MD	Kern	KER	0.075	0.075	0.075	0.083	0.087	0.091	0.091	0.087	0.087	0.087	0.083	0.079
MD	Los Angeles	AV	0.076	0.080	0.076	0.080	0.087	0.091	0.087	0.087	0.087	0.087	0.080	0.080
MD	Riverside	MOJ	0.074	0.080	0.080	0.085	0.090	0.090	0.085	0.080	0.085	0.085	0.085	0.080
MD	Riverside	SC	0.074	0.080	0.080	0.085	0.090	0.090	0.085	0.080	0.085	0.085	0.085	0.080
MD	San Bernardino	MOJ	0.075	0.079	0.079	0.083	0.087	0.091	0.083	0.083	0.087	0.087	0.083	0.083
NC	Del Norte	NCU	0.079	0.080	0.079	0.083	0.084	0.087	0.089	0.088	0.088	0.084	0.080	0.079
NC	Humboldt	NCU	0.079	0.080	0.079	0.082	0.085	0.086	0.089	0.089	0.088	0.085	0.080	0.079
NC	Mendocino	MEN	0.078	0.080	0.080	0.083	0.085	0.088	0.089	0.088	0.087	0.085	0.080	0.078
NC	Sonoma	NS	0.076	0.078	0.078	0.081	0.086	0.090	0.091	0.090	0.088	0.086	0.079	0.078
NC	Trinity	NCU	0.078	0.079	0.079	0.082	0.085	0.088	0.090	0.089	0.088	0.084	0.080	0.078
NCC	Monterey	MBU	0.076	0.076	0.076	0.081	0.086	0.089	0.091	0.091	0.089	0.086	0.081	0.078
NCC	San Benito	MBU	0.077	0.075	0.077	0.082	0.087	0.089	0.091	0.091	0.089	0.086	0.080	0.077
NCC	Santa Cruz	MBU	0.076	0.077	0.077	0.083	0.087	0.088	0.091	0.090	0.088	0.087	0.081	0.077
NEP	Lassen	LAS	0.079	0.079	0.080	0.083	0.083	0.085	0.089	0.089	0.088	0.085	0.082	0.079
NEP	Modoc	MOD	0.080	0.080	0.080	0.081	0.083	0.085	0.089	0.089	0.087	0.085	0.081	0.080
NEP	Siskiyou	SIS	0.078	0.080	0.080	0.082	0.084	0.087	0.090	0.089	0.088	0.084	0.080	0.078
SC	Los Angeles	SC	0.075	0.075	0.075	0.083	0.088	0.091	0.091	0.091	0.088	0.086	0.080	0.078
SC	Orange	SC	0.071	0.074	0.077	0.082	0.088	0.088	0.091	0.091	0.091	0.085	0.085	0.077
SC	Riverside	SC	0.075	0.075	0.077	0.083	0.085	0.091	0.091	0.091	0.088	0.085	0.083	0.077
SC	San Bernardino	SC	0.077	0.075	0.075	0.082	0.086	0.088	0.091	0.088	0.088	0.084	0.084	0.080
SCC	San Luis Obispo	SLO	0.074	0.074	0.076	0.082	0.087	0.091	0.091	0.091	0.089	0.087	0.080	0.078
SCC	Santa Barbara	SB	0.075	0.075	0.075	0.081	0.087	0.089	0.091	0.091	0.089	0.087	0.081	0.079
SCC	Ventura	VEN	0.073	0.073	0.076	0.082	0.088	0.091	0.091	0.091	0.088	0.088	0.082	0.079
SD	San Diego	SD	0.076	0.076	0.076	0.080	0.087	0.089	0.091	0.091	0.089	0.087	0.082	0.078

1 Western Regional Climate Center data (http://www.wrcc.dri.edu/), average days per month with rainfall of 0.01 inch or greater, based on California meteorological station level rainfall data for years of record.

2 Non-San Joaquin Air Basin regions:
Normalized Rainfall per Month = 1- [Rain days per month/Annual rain days]
Monthly Rainfall Fraction = [Normalized Rainfall per Month]/[Total Normalized Rainfall]

3 San Joaquin Air Basin: Normalized Rainfall per Month = (365/12- Rain days per month)/365
Monthly Rainfall Fraction = Normalized Rainfall per Month/∑(Monthly Normalized Rainfall)

Table 4. Temporal Profile for Unpaved Road Dust Emissions, Based on Monthly Days of Rain (1)

Air Basin	County	District	Monthly Rainfall Fraction (2,3)											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SF	Alameda	BA	0.076	0.077	0.077	0.082	0.088	0.089	0.091	0.089	0.089	0.085	0.079	0.077
SF	Contra Costa	BA	0.076	0.077	0.077	0.082	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.076
SF	Marin	BA	0.074	0.077	0.077	0.083	0.087	0.090	0.091	0.091	0.090	0.085	0.080	0.076
SF	Napa	BA	0.077	0.075	0.077	0.081	0.087	0.089	0.091	0.091	0.089	0.087	0.079	0.076
SF	San Francisco	BA	0.076	0.076	0.077	0.083	0.087	0.090	0.091	0.090	0.088	0.085	0.080	0.077
SF	San Mateo	BA	0.076	0.077	0.077	0.082	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.076
SF	Santa Clara	BA	0.078	0.074	0.077	0.080	0.087	0.090	0.091	0.091	0.090	0.087	0.080	0.077
SF	Solano	BA	0.072	0.077	0.077	0.082	0.088	0.089	0.091	0.091	0.089	0.088	0.079	0.076
SF	Sonoma	BA	0.075	0.078	0.078	0.083	0.087	0.089	0.091	0.091	0.089	0.085	0.079	0.076
SJV	Fresno	SJU	0.070	0.070	0.073	0.083	0.089	0.092	0.095	0.095	0.092	0.089	0.079	0.073
SJV	Kern	SJU	0.074	0.074	0.074	0.080	0.086	0.092	0.092	0.092	0.089	0.086	0.083	0.077
SJV	Kings	SJU	0.074	0.074	0.074	0.080	0.086	0.092	0.092	0.092	0.092	0.086	0.080	0.074
SJV	Madera	SJU	0.070	0.073	0.073	0.082	0.089	0.092	0.095	0.095	0.092	0.089	0.079	0.073
SJV	Merced	SJU	0.065	0.071	0.071	0.081	0.090	0.097	0.097	0.097	0.093	0.090	0.078	0.071
SJV	San Joaquin	SJU	0.069	0.069	0.072	0.081	0.091	0.094	0.097	0.097	0.094	0.088	0.075	0.072
SJV	Stanislaus	SJU	0.065	0.069	0.072	0.081	0.091	0.094	0.097	0.097	0.094	0.088	0.078	0.072
SJV	Tulare	SJU	0.072	0.072	0.075	0.081	0.087	0.093	0.093	0.093	0.090	0.087	0.081	0.075
SS	Imperial	IMP	0.075	0.075	0.075	0.092	0.092	0.092	0.083	0.083	0.083	0.083	0.083	0.083
SS	Riverside	SC	0.074	0.074	0.079	0.085	0.090	0.090	0.090	0.085	0.085	0.085	0.085	0.079
SV	Butte	BUT	0.075	0.076	0.078	0.082	0.085	0.088	0.091	0.091	0.089	0.085	0.081	0.078
SV	Colusa	COL	0.075	0.076	0.078	0.083	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.076
SV	Glenn	GLE	0.075	0.078	0.079	0.082	0.085	0.088	0.091	0.090	0.090	0.085	0.079	0.077
SV	Placer	PLA	0.076	0.077	0.077	0.081	0.086	0.088	0.091	0.091	0.088	0.086	0.080	0.077
SV	Sacramento	SAC	0.075	0.077	0.077	0.083	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.077
SV	Shasta	SHA	0.076	0.079	0.078	0.081	0.083	0.088	0.091	0.090	0.090	0.086	0.081	0.078
SV	Solano	YS	0.074	0.077	0.077	0.083	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.075
SV	Sutter	FR	0.076	0.079	0.077	0.081	0.085	0.088	0.091	0.090	0.088	0.086	0.080	0.079
SV	Tehama	THE	0.077	0.078	0.078	0.082	0.086	0.088	0.091	0.090	0.088	0.086	0.079	0.077
SV	Yolo	YS	0.075	0.077	0.078	0.083	0.086	0.089	0.091	0.091	0.089	0.086	0.080	0.075
SV	Yuba	FR	0.075	0.078	0.078	0.082	0.087	0.089	0.091	0.089	0.089	0.085	0.079	0.076

1 Western Regional Climate Center data (http://www.wrcc.dri.edu/), average days per month with rainfall of 0.01 inch or greater, based on California meteorological station level rainfall data for years of record.

2 Non-San Joaquin Air Basin regions:
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3 San Joaquin Air Basin: Normalized Rainfall per Month = (365/12- Rain days per month)/365
Monthly Rainfall Fraction = Normalized Rainfall per Month/∑(Monthly Normalized Rainfall)