APPENDIX A

AGRICULTURAL ACTIVITY BASED TEMPORAL PROFILES

(New August 1997)

METHODS AND SOURCES

This methodology provides temporal profiles for the following stationary source emissions inventory categories: agricultural tilling (Section 7.4)[1], agricultural harvesting (Section 7.5)[2], and heavy duty farm equipment.[3]

Farm field activities produce many different pollutants. The amount of a particular pollutant emitted varies during the year along with the level of activity. Other factors, such as weather also contribute to seasonal variations in emission levels, however, this methodology only describes the development of activity-based profiles. The profiles consist of monthly data normalized to a value of 1.0 for the year.

The final outputs from this methodology are normalized monthly profiles for the following: Land preparation activities for all crops; planting activities for all crops; cultivation activities for all crops; harvesting for cotton and nuts; all activities for all crops. The land preparation profiles are used in Section 7.4 of the stationary source emissions inventory methodology as the profiles for agricultural tilling.[1] Section 7.4 only includes land preparation activities such as postharvest and preplanting earth manipulation, including: disking, plowing, chiseling, floating, land planing, subsoiling, etc.; to break up, turnover, level, shape, etc. The harvesting profiles are used in Section 7.5 of the stationary source emissions inventory methodology.[2] The all-activities profiles are used in the heavy-duty farm equipment exhaust emissions inventory.[3] The all-activities profiles include land preparation, planting, cultivation, and harvesting operations.

At present there are no sections for the calculation of agricultural planting or agricultural cultivation emissions. The planting and cultivation activity profiles discussed below are included in anticipation of future emissions testing that will allow the development of the planting and cultivation emission estimation methodologies.

Creating profiles for agricultural activities requires establishing accurate crop calendars. The planting and harvesting dates are the principal components of the crop calendar. Occurring between these dates are many additional activities that can be broadly classified as land preparation and cultivation. California Air Resources Board (ARB) staff relied mainly on survey information from San Joaquin Valley Air Basin (SJV) farmers[4] to establish the crop calendar, along with additional information from many other

sources.[5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22] Once the months in which an activity is performed for a given crop are established, the fraction of the annual value for that activity that occur in each of those months can be assigned.

The calculations in this methodology rely on crop specific activity profiles, and county specific crop acreages to establish the combined crop normalized activity profile for each county profile. The acreages of agricultural crops used are from the 1993 acreage data supplied by county Agricultural Commissioners to the California Department of Food and Agriculture (CDFA). The crop specific activity profiles established for the SJV are used, along with the crop acreages for the counties outside the SJV to establish the combined crop normalized activity profiles for the counties outside the SJV.

All of the profiles included in this methodology, with the exception of the harvesting profiles are all crop combined monthly normalized acre pass profiles. The harvesting normalized profiles are derived from the monthly normalized emission profiles for harvesting operations for cotton, almond, English walnut, and black walnut harvesting. These are the only crops for which there currently are harvesting emission estimates. Cotton is the largest nonpasture crop in the SJV, and there are large acreages of the above listed nut trees in California, for which harvesting is an exceedingly dusty operation.

To generate normalized monthly acre pass values for the land preparation, cultivation, or planting categories, the monthly activity pass values for each category, are multiplied by the respective crop acreage for each county. The acre pass numbers for each month for each crop for each county are then summed for all crops for a given county. The monthly numbers are then summed to create annual numbers for each county, and then each month is divided by the annual number to create the normalized monthly acre pass profile for each county. Currently a given crop has the same number of passes per acre throughout the SJV.

The calculation of the harvesting profile is performed in a similar manner, with a number of exceptions. Since the harvesting profiles generated in this methodology will be multiplied by the combined cotton and nut annual harvesting emissions in Section 7.5, each activity must first be weighted to the emissions per acre pass before calculating the combined cotton/nut harvesting activity profile. For the harvesting methodology, Section 7.5[2], emissions per acre pass estimates were made from emissions measurements for each cotton and nut harvesting activity.[23] This means that, unlike the land preparation methodology, for the harvesting methodology an acre pass for one harvesting activity does not produce the same emissions as the acre pass for another harvesting activity. Also unlike the land preparation emission estimates, which include silt fractions in the United States Environmental Protection Agency's (U.S. EPA's) equation AP-42[24], the harvesting emissions do not vary between locations for a given acreage of a given crop.

To calculate the harvesting profile, the measured emissions per acre pass are multiplied by

the monthly passes and then the crop acreage for each crop, in each county, before the monthly emissions are summed to the annual and then normalized. Because the normalized profile for harvesting is based on monthly emissions, not just monthly acre passes, as was the case with land preparation, the harvesting profile output from this methodology will be one normalized harvesting emissions value for each month per county.

For the farm vehicle emissions inventory[3], exhaust emissions rather than fugitive dust emissions are calculated. In addition, at present no differentiation is being made in the all activity profile calculation between acre passes for different types of equipment or different activities. Therefore, all of the activities will be summed for each county as total acre passes. For determining the profile of farm vehicle activity, the monthly passes for all of the major activity categories (land preparation, planting, cultivation, and harvesting) are summed to create the total monthly passes for all activities. These are then multiplied by the acreage of the crop in a given county to establish the monthly acre passes. The monthly acre passes are then summed for the year, and then the monthly numbers divided by the annual to produce the monthly normalized profiles.

TEMPORAL INFORMATION

The results of most ARB stationary source emission methodologies are annual emissions, along with temporal profiles. However, the results of this methodology are strictly temporal profiles. These profiles are used by a number of other methodologies. At the time of the writing of this document the agricultural tillage (Section 7.4)[1], agricultural harvesting (Section 7.5)[2], and heavy-duty farm equipment[3] emission categories used the results from this methodology. Additional adjustments have been made to the agricultural tillage and harvesting profiles produced in this methodology based on climatic influences. The climatic adjustments are not included in this methodology, nor are they reflected in any of the tables or figures in this methodology write-up. They are implemented in Section 7.4 and 7.5, respectively.

A. Agricultural Tillage Activity Based Temporal Profiles for All Crops

The agricultural tillage profiles shown in Table 1 include only land preparation activities such as disking, plowing, chiseling, subsoiling, ripping, land planing, harrowing, etc. These activities usually, though not always, occur between harvesting and planting (excluding tree and vine crops). These are the profiles used in Section 7.4[1] of the stationary source emissions inventory methodology.

Table 1: Normalized Acre Pass Temporal Profile for Land Preparation for All Crops

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALAMEDA	0.0598	0.0001	0.0368	0.0004	0.0107	0.0107	0.0334	0.0412	0.1616	0.3642	0.1406	0.1406
AMADOR	0.0992	0.0005	0.0534	0.0007	0.0200	0.0200	0.0200	0.0773	0.1905	0.4024	0.0583	0.0575
BUTTE	0.0193	0.0124	0.2288	0.1998	0.2000	0.2000	0.0064	0.0021	0.0270	0.0513	0.0301	0.0226
CALAVERAS	0.0085	0.0006	0.0050	0.0002	0.0017	0.0017	0.0017	0.0065	0.3199	0.6382	0.0095	0.0065
COLUSA	0.0305	0.0345	0.2073	0.1902	0.1752	0.1639	0.0097	0.0000	0.0132	0.0532	0.0628	0.0594
CONTRA COSTA	0.1331	0.0401	0.1658	0.0267	0.0068	0.0172	0.0202	0.0101	0.0754	0.1990	0.1611	0.1445
DEL NORTE	0.0265	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2423	0.5464	0.0924	0.0924
EL DORADO	0.0242	0.0011	0.0011	0.0011	0.0070	0.0070	0.0264	0.0270	0.2881	0.5817	0.0270	0.0082
FRESNO	0.0680	0.0956	0.0966	0.0127	0.0303	0.0302	0.0441	0.0651	0.0358	0.0975	0.2156	0.2083
GLENN	0.0438	0.0229	0.2321	0.1630	0.1646	0.1630	0.0000	0.0000	0.0230	0.0451	0.0712	0.0713
HUMBOLDT	0.0037	0.0003	0.0015	0.0083	0.0070	0.0074	0.0071	0.0000	0.3079	0.6298	0.0139	0.0131
IMPERIAL	0.0645	0.0419	0.0731	0.0196	0.1059	0.1100	0.0990	0.0223	0.0252	0.1486	0.1339	0.1559
INYO	0.0155	0.0000	0.0000	0.0020	0.0020	0.0053	0.0065	0.0033	0.2706	0.5777	0.0590	0.0581
KERN	0.0337	0.0993	0.0997	0.0105	0.0140	0.0218	0.0324	0.0372	0.0309	0.0812	0.2714	0.2679
KINGS	0.0400	0.1194	0.1522	0.0007	0.0012	0.0013	0.0092	0.0034	0.0053	0.0354	0.3164	0.3154
LAKE	0.0913	0.0071	0.0071	0.0032	0.0200	0.0200	0.0232	0.0770	0.1706	0.3484	0.1423	0.0900
LASSEN	0.0594	0.0069	0.0073	0.0066	0.0066	0.0066	0.0000	0.0026	0.1057	0.3306	0.2318	0.2360
LOS ANGELES	0.0474	0.0005	0.0728	0.0031	0.0000	0.0026	0.0365	0.0299	0.1792	0.3813	0.1314	0.1154
MADERA	0.1102	0.0573	0.0978	0.0011	0.0341	0.0341	0.0579	0.1087	0.0412	0.1066	0.1786	0.1722
MARIN	0.0093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0260	0.0000	0.2660	0.5795	0.0597	0.0597
MARIPOSA	0.0194	0.0001	0.0363	0.0001	0.0004	0.0004	0.0004	0.0015	0.3062	0.6109	0.0131	0.0113
MENDOCINO	0.0967	0.0005	0.0005	0.0015	0.0282	0.0282	0.0418	0.1088	0.2203	0.4623	0.0112	0.0000
MERCED	0.0748	0.0793	0.1550	0.0305	0.0319	0.0217	0.0120	0.0115	0.0284	0.0902	0.2338	0.2308
MODOC	0.0498	0.0201	0.0043	0.0316	0.0273	0.0273	0.0440	0.0101	0.1035	0.3098	0.1779	0.1944
MONO	0.0196	0.0000	0.0057	0.0074	0.0074	0.0219	0.0290	0.0228	0.2226	0.4791	0.0979	0.0864
MONTEREY	0.0287	0.0142	0.0193	0.0114	0.0085	0.0067	0.4024	0.1173	0.0327	0.3172	0.0239	0.0177
NAPA	0.2792	0.0001	0.0001	0.0028	0.0809	0.0809	0.0809	0.3119	0.0300	0.1198	0.0068	0.0068
NEVADA	0.0126	0.0001	0.0001	0.0002	0.0037	0.0037	0.0037	0.0142	0.3198	0.6405	0.0015	0.0000
ORANGE	0.0153	0.0487	0.1498	0.1110	0.0420	0.0107	0.1740	0.0447	0.0754	0.2498	0.0717	0.0068
PLACER	0.0036	0.0003	0.1740	0.1738	0.1739	0.1739	0.0002	0.0008	0.0765	0.1574	0.0339	0.0318
PLUMAS	0.0157	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2610	0.5586	0.0824	0.0824
RIVERSIDE	0.0529	0.0422	0.0876	0.0377	0.0671	0.0711	0.0848	0.0526	0.0226	0.1093	0.1912	0.1808
SACRAMENTO	0.1522	0.0389	0.2074	0.0427	0.0537	0.0539	0.0092	0.0186	0.0254	0.0967	0.1475	0.1539
SAN BENITO	0.0305	0.0153	0.0329	0.0188	0.0287	0.0310	0.1790	0.0321	0.0902	0.3343	0.1055	0.1019
SAN BERNARDINO	0.0179	0.0003	0.0195	0.0021	0.0383	0.0390	0.0263	0.0065	0.2557	0.5443	0.0256	0.0244
SAN DIEGO	0.0316	0.0351	0.0806	0.0720	0.0440	0.0176	0.0488	0.0221	0.1510	0.2401	0.1976	0.0595
SAN FRANCISCO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.0000	0.0000	0.5000	0.0000	0.0000
SAN JOAQUIN	0.1525	0.0831	0.1908	0.0389	0.0372	0.0208	0.0265	0.0447	0.0232	0.0918	0.1465	0.1440
SAN LUIS OBISPO	0.0327	0.0007	0.0310	0.0243	0.0076	0.0087	0.1960	0.0731	0.0933	0.3061	0.1179	0.1087
SAN MATEO	0.0180	0.0265	0.1097	0.1005	0.0274	0.0006	0.1497	0.0729	0.0784	0.1696	0.1364	0.1103
SANTA BARBARA	0.0211	0.0112	0.0230	0.0352	0.0294	0.0094	0.3273	0.1406	0.0651	0.2691	0.0454	0.0234
SANTA CLARA	0.0463	0.0234	0.0908	0.0828	0.0215	0.0130	0.1213	0.0330	0.0823	0.2730	0.1128	0.0996
SANTA CRUZ	0.0097	0.0085	0.0081	0.0113	0.0015	0.0006	0.3737	0.1019	0.0615	0.3453	0.0654	0.0127
SHASTA	0.0317	0.0004	0.0238	0.0236	0.0235	0.0235	0.0000	0.0000	0.1900	0.4506	0.1178	0.1152
SIERRA	0.0067	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2714	0.5585	0.0817	0.0817
SISKIYOU	0.0381	0.0044	0.0000	0.0290	0.0290	0.0290	0.0000	0.0017	0.1304	0.3378	0.1981	0.2025
SOLANO	0.1417	0.1112	0.0970	0.0125	0.0109	0.0027	0.0146	0.0041	0.0291	0.1281	0.2109	0.2372
SONOMA	0.1593	0.0005	0.0188	0.0020	0.0668	0.0668	0.0624	0.1689	0.0788	0.1959	0.0951	0.0847
STANISLAUS	0.0992	0.0518	0.1718	0.1029	0.0890	0.0156	0.0226	0.0310	0.0400	0.1082	0.1382	0.1298
SUTTER	0.0482	0.0453	0.1917	0.1655	0.1609	0.1471	0.0030	0.0004	0.0191	0.0645	0.0814	0.0729
TEHAMA	0.0222	0.0144	0.0508	0.0172	0.0158	0.0158	0.0006	0.0000	0.2346	0.4496	0.1048	0.0741
TRINITY	0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3093	0.6243	0.0320	0.0320
TULARE	0.0863	0.0726	0.1655	0.0011	0.0135	0.0133	0.0285	0.0431	0.0291	0.0703	0.2446	0.2321
TUOLUMNE	0.0012	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.3293	0.6586	0.0067	0.0039
VENTURA	0.0244	0.0150	0.0403	0.0355	0.0211	0.0042	0.3141	0.0520	0.0569	0.3476	0.0566	0.0321
YOLO	0.1591	0.0753	0.1676	0.0393	0.0399	0.0336	0.0054	0.0018	0.0087	0.1126	0.1745	0.1821
YUBA	0.0135	0.0017	0.2192	0.1979	0.1973	0.1973	0.0004	0.0015	0.0472	0.0774	0.0333	0.0134

B. Agricultural Planting Activity Based Temporal Profiles for All Crops

The agricultural planting profiles shown in Table 2 include only planting activities. These activities usually, though not always, occur between land preparation and cultivation. These profiles may be incorporated in the future into new sections of the stationary source emissions inventory methodology. As of the writing of this document, they were not utilized in any existing methodology.

C. Agricultural Cultivation Activity Based Temporal Profiles for All Crops

The agricultural cultivation profiles shown in Table 3 include only cultivation activities. These activities usually, though not always, occur between planting and harvesting. For multiple year crops, such as trees and vines, the months when planting occurs have little bearing on future year cultivation periods. These profiles may be incorporated in the future into new sections of the stationary source emissions inventory methodology. As of the writing of this document, they were not utilized in any existing methodology.

Table 2: Normalized Acre Pass Temporal Profile for Planting for All Crops

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALAMEDA	0.0069	0.0006	0.0137	0.0130	0.0000	0.0000	0.0000	0.0044	0.2328	0.4566	0.0044	0.2675
AMADOR	0.0065	0.0019	0.0229	0.0211	0.0000	0.0000	0.0000	0.0000	0.2901	0.5802	0.0000	0.0774
BUTTE	0.0396	0.0428	0.1026	0.0810	0.0220	0.0113	0.0113	0.0102	0.1692	0.3253	0.0233	0.1615
CALAVERAS	0.0005	0.0007	0.0019	0.0013	0.0000	0.0000	0.0000	0.0000	0.3295	0.6589	0.0000	0.0072
COLUSA	0.1038	0.0833	0.1316	0.0659	0.0452	0.0182	0.0182	0.0084	0.0476	0.0993	0.0361	0.3423
CONTRA COSTA	0.0670	0.0446	0.1461	0.1050	0.0027	0.0106	0.0106	0.0011	0.1352	0.2833	0.0166	0.1772
DEL NORTE	0.0584	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2895	0.5789	0.0000	0.0732
EL DORADO	0.0003	0.0017	0.0017	0.0011	0.0000	0.0000	0.0000	0.0033	0.3254	0.6442	0.0033	0.0190
FRESNO	0.0749	0.0671	0.2834	0.2280	0.0202	0.0157	0.0085	0.0192	0.0559	0.0747	0.0306	0.1219
GLENN	0.0417	0.0311	0.1381	0.1330	0.0386	0.0177	0.0115	0.0000	0.0749	0.1498	0.0058	0.3577
HUMBOLDT	0.0047	0.0001	0.0006	0.0035	0.0031	0.0032	0.0003	0.0011	0.3255	0.6487	0.0011	0.0080
IMPERIAL	0.0741	0.0370	0.1081	0.1050	0.1228	0.0982	0.0209	0.0568	0.0616	0.0333	0.0425	0.2397
INYO	0.0243	0.0011	0.0000	0.0010	0.0010	0.0010	0.0010	0.0021	0.3158	0.6295	0.0000	0.0233
KERN	0.0404	0.0202	0.2081	0.2102	0.0146	0.0116	0.0090	0.0202	0.1116	0.1985	0.0140	0.1416
KINGS	0.0461	0.0155	0.3436	0.3307	0.0032	0.0016	0.0029	0.0058	0.0146	0.0444	0.0295	0.1620
LAKE	0.0542	0.0185	0.0185	0.0059	0.0000	0.0000	0.0000	0.0011	0.2578	0.5135	0.0011	0.1295
LASSEN	0.1169	0.0036	0.0040	0.0040	0.0036	0.0000	0.0000	0.0000	0.1852	0.3691	0.0014	0.3124
LOS ANGELES	0.0298	0.0090	0.0322	0.0322	0.0000	0.0013	0.0013	0.0107	0.2590	0.4911	0.0189	0.1146
MADERA	0.0321	0.0165	0.2230	0.2100	0.0029	0.0018	0.0018	0.0186	0.0997	0.1621	0.0195	0.2120
MARIN	0.0108	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0042	0.3069	0.6055	0.0042	0.0685
MARIPOSA	0.0000	0.0001	0.0099	0.0099	0.0000	0.0000	0.0000	0.0000	0.3267	0.6534	0.0000	0.0000
MENDOCINO	0.0000	0.0024	0.0024	0.0009	0.0000	0.0000	0.0000	0.0030	0.3304	0.6547	0.0030	0.0030
MERCED	0.0533	0.0333	0.2177	0.2035	0.0295	0.0166	0.0015	0.0046	0.0604	0.1140	0.0078	0.2578
MODOC	0.0723	0.0138	0.0130	0.0342	0.0321	0.0212	0.0000	0.0142	0.1588	0.2844	0.0191	0.3369
MONO	0.0703	0.0098	0.0043	0.0119	0.0075	0.0075	0.0098	0.0196	0.2708	0.5161	0.0059	0.0664
MONTEREY	0.0117	0.0100	0.0139	0.0120	0.0052	0.0022	0.1032	0.1960	0.2024	0.1538	0.1298	0.1597
NAPA	0.0195	0.0291	0.0291	0.0000	0.0000	0.0000	0.0000	0.0000	0.2982	0.5963	0.0000	0.0277
NEVADA	0.0000	0.0003	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.3331	0.6662	0.0000	0.0000
ORANGE	0.0249	0.0263	0.1029	0.0932	0.0466	0.0256	0.0419	0.1045	0.1668	0.1725	0.1013	0.0934
PLACER	0.0152	0.0015	0.0015	0.0005	0.0000	0.0000	0.0000	0.0000	0.2602	0.5204	0.0000	0.2007
PLUMAS	0.0309	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2812	0.5624	0.0000	0.1256
RIVERSIDE	0.0492	0.0085	0.1281	0.1365	0.0608	0.0646	0.0277	0.0397	0.0490	0.0451	0.0289	0.3620
SACRAMENTO	0.0822	0.0494	0.2054	0.1733	0.0269	0.0129	0.0036	0.0019	0.0365	0.1019	0.0359	0.2699
SAN BENITO	0.0158	0.0158	0.0301	0.0183	0.0138	0.0138	0.0115	0.0482	0.1987	0.3111	0.0448	0.2782
SAN BERNARDINO	0.0056	0.0002	0.0064	0.0062	0.0106	0.0108	0.0004	0.0041	0.3143	0.6205	0.0041	0.0169
SAN DIEGO	0.0327	0.0492	0.0890	0.0757	0.0353	0.0172	0.0151	0.0277	0.1220	0.2116	0.0200	0.3044
SAN FRANCISCO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.0000	0.2500	0.2500
SAN JOAQUIN	0.0900	0.0626	0.1951	0.1678	0.0568	0.0280	0.0278	0.0081	0.0229	0.0500	0.0243	0.2667
SAN LUIS OBISPO	0.0135	0.0039	0.0149	0.0143	0.0008	0.0000	0.0299	0.0529	0.1909	0.3243	0.0393	0.3154
SAN MATEO	0.0017	0.0019	0.0420	0.0515	0.0178	0.0033	0.0553	0.0496	0.1202	0.2111	0.0166	0.4290
SANTA BARBARA	0.0108	0.0072	0.0107	0.0233	0.0179	0.0036	0.1097	0.1511	0.2039	0.2586	0.0782	0.1251
SANTA CLARA	0.0294	0.0245	0.0708	0.0505	0.0094	0.0058	0.0125	0.0339	0.1708	0.2870	0.0399	0.2657
SANTA CRUZ	0.0000	0.0033	0.0064	0.0104	0.0010	0.0000	0.0772	0.2417	0.2043	0.0666	0.1902	0.1989
SHASTA	0.0616	0.0007	0.0007	0.0002	0.0000	0.0000	0.0000	0.0000	0.2814	0.5629	0.0000	0.0924
SIERRA	0.0118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2700	0.5400	0.0000	0.1783
SISKIYOU	0.0699	0.0027	0.0021	0.0219	0.0219	0.0198	0.0000	0.0000	0.1724	0.3442	0.0007	0.3443
SOLANO	0.0851	0.0829	0.1230	0.0788	0.0426	0.0088	0.0088	0.0043	0.0319	0.0694	0.0225	0.4420
SONOMA	0.0001	0.0059	0.0190	0.0145	0.0155	0.0155	0.0000	0.0074	0.1866	0.3584	0.0074	0.3697
STANISLAUS	0.0586	0.0408	0.1562	0.1656	0.0694	0.0218	0.0203	0.0082	0.0597	0.1140	0.0038	0.2816
SUTTER	0.1313	0.0996	0.1599	0.0936	0.0595	0.0283	0.0146	0.0031	0.0220	0.0754	0.0419	0.2708
TEHAMA	0.0126	0.0072	0.0148	0.0111	0.0024	0.0017	0.0017	0.0001	0.2765	0.5543	0.0025	0.1149
TRINITY	0.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3182	0.6363	0.0000	0.0430
TULARE	0.0229	0.0093	0.2638	0.2601	0.0065	0.0048	0.0070	0.0105	0.0551	0.0944	0.0095	0.2560
TUOLUMNE	0.0012	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.3324	0.6648	0.0000	0.0012
VENTURA	0.0222	0.0241	0.0523	0.0505	0.0136	0.0028	0.0388	0.1611	0.2091	0.1530	0.1393	0.1332
YOLO	0.1466	0.1063	0.2193	0.1317	0.0232	0.0050	0.0015	0.0024	0.0167	0.0657	0.0404	0.2409
YUBA	0.0206	0.0187	0.0764	0.0682	0.0000	0.0000	0.0000	0.0000	0.2557	0.5114	0.0000	0.0490

Table 3: Normalized Acre Pass Temporal Profile for Cultivation for All Crops

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALAMEDA	0.0792	0.0059	0.0018	0.1167	0.2249	0.2198	0.2299	0.0017	0.0402	0.0393	0.0004	0.0401
AMADOR	0.1545	0.0435	0.0076	0.0907	0.1868	0.2063	0.2843	0.0086	0.0070	0.0022	0.0022	0.0063
BUTTE	0.3370	0.0457	0.0461	0.0959	0.0920	0.0789	0.0987	0.0635	0.0556	0.0204	0.0165	0.0497
CALAVERAS	0.2598	0.1036	0.0325	0.0653	0.0742	0.0768	0.2306	0.0512	0.0419	0.0133	0.0133	0.0376
COLUSA	0.1846	0.0189	0.0839	0.1009	0.2032	0.1726	0.0698	0.0524	0.0539	0.0178	0.0086	0.0334
CONTRA COSTA	0.0932	0.0611	0.0518	0.1553	0.2142	0.1170	0.0728	0.0839	0.0774	0.0182	0.0171	0.0379
DEL NORTE	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000
EL DORADO	0.1017	0.0695	0.0508	0.0905	0.1150	0.1401	0.1353	0.0899	0.0806	0.0304	0.0234	0.0730
FRESNO	0.0499	0.0174	0.0591	0.0803	0.2180	0.1983	0.2026	0.0639	0.0469	0.0293	0.0075	0.0267
GLENN	0.1970	0.0431	0.0431	0.1551	0.1592	0.0896	0.1200	0.0647	0.0542	0.0192	0.0141	0.0407
HUMBOLDT	0.2224	0.2189	0.0030	0.0066	0.0149	0.0298	0.4580	0.0232	0.0104	0.0047	0.0012	0.0069
IMPERIAL	0.0838	0.0559	0.0172	0.0754	0.1224	0.0687	0.1859	0.1134	0.1547	0.0651	0.0154	0.0421
INYO	0.2258	0.2258	0.0116	0.0125	0.0140	0.0141	0.4374	0.0126	0.0121	0.0110	0.0110	0.0120
KERN	0.0952	0.0289	0.0318	0.0440	0.2007	0.2079	0.1964	0.0507	0.0466	0.0409	0.0236	0.0335
KINGS	0.0278	0.0103	0.0160	0.0624	0.3018	0.2566	0.2594	0.0180	0.0202	0.0101	0.0031	0.0143
LAKE	0.2128	0.0518	0.0507	0.0876	0.0980	0.1125	0.1287	0.0836	0.0688	0.0222	0.0218	0.0617
LASSEN	0.2302	0.2302	0.0036	0.0245	0.0209	0.0187	0.4718	0.0000	0.0000	0.0000	0.0000	0.0000
LOS ANGELES	0.0675	0.0494	0.0704	0.1699	0.1800	0.0823	0.0722	0.0823	0.0874	0.0369	0.0188	0.0829
MADERA	0.1388	0.0243	0.0335	0.0721	0.1794	0.1914	0.1949	0.0563	0.0407	0.0254	0.0071	0.0360
MARIN	0.2500	0.1477	0.0000	0.0000	0.0000	0.0000	0.2954	0.0000	0.1023	0.1023	0.0000	0.1023
MARIPOSA	0.0653	0.0653	0.0326	0.2212	0.2268	0.0698	0.1394	0.0585	0.0479	0.0152	0.0152	0.0429
MENDOCINO	0.0582	0.0525	0.0349	0.0625	0.1335	0.2046	0.2445	0.0625	0.0569	0.0220	0.0163	0.0516
MERCED	0.1731	0.0315	0.0336	0.1075	0.2044	0.1527	0.1893	0.0508	0.0218	0.0090	0.0056	0.0206
MODOC	0.1581	0.1321	0.0072	0.0298	0.0501	0.1079	0.3683	0.0684	0.0260	0.0260	0.0000	0.0260
MONO	0.2163	0.2163	0.0187	0.0211	0.0215	0.0178	0.4044	0.0157	0.0171	0.0171	0.0171	0.0171
MONTEREY	0.0918	0.0244	0.0231	0.0131	0.0353	0.0377	0.0237	0.1322	0.3280	0.2031	0.0049	0.0828
NAPA	0.0105	0.0026	0.0002	0.0002	0.1963	0.3926	0.3977	0.0000	0.0000	0.0000	0.0000	0.0000
NEVADA	0.2221	0.2221	0.0052	0.0093	0.0194	0.0295	0.4639	0.0093	0.0076	0.0024	0.0024	0.0068
ORANGE	0.1021	0.0743	0.0918	0.0871	0.1412	0.1181	0.0356	0.0530	0.0864	0.0496	0.0555	0.1053
PLACER	0.2395	0.1845	0.0174	0.0310	0.0318	0.0340	0.3688	0.0296	0.0244	0.0085	0.0085	0.0220
PLUMAS	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000
RIVERSIDE	0.0524	0.0298	0.0269	0.0628	0.1378	0.1521	0.1359	0.1138	0.1235	0.0702	0.0397	0.0550
SACRAMENTO	0.0545	0.0483	0.0457	0.2183	0.2438	0.0966	0.1450	0.0500	0.0449	0.0123	0.0105	0.0302
SAN BENITO	0.1422	0.0198	0.0364	0.0578	0.1143	0.0961	0.0656	0.0889	0.1806	0.1046	0.0076	0.0862
SAN BERNARDINO	0.0795	0.0473	0.0375	0.0659	0.0700	0.0440	0.1688	0.1393	0.1598	0.0810	0.0393	0.0676
SAN DIEGO	0.0696	0.0615	0.0708	0.1078	0.1086	0.1070	0.1020	0.1024	0.0904	0.0429	0.0523	0.0849
SAN FRANCISCO	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.0000	0.2500
SAN JOAQUIN	0.1661	0.0433	0.0386	0.1428	0.1894	0.1422	0.1250	0.0514	0.0437	0.0211	0.0118	0.0246
SAN LUIS OBISPO	0.1059	0.0219	0.0229	0.0415	0.0781	0.0669	0.0542	0.1139	0.2568	0.1553	0.0144	0.0681
SAN MATEO	0.0920	0.0774	0.0078	0.0358	0.0908	0.0750	0.0380	0.1320	0.2546	0.1419	0.0181	0.0366
SANTA BARBARA	0.0656	0.0302	0.0302	0.0404	0.0566	0.0674	0.0415	0.1485	0.2832	0.1600	0.0124	0.0642
SANTA CLARA	0.0777	0.0293	0.0452	0.0670	0.2161	0.1976	0.0616	0.0712	0.1118	0.0555	0.0089	0.0581
SANTA CRUZ	0.1022	0.0524	0.0479	0.0659	0.1069	0.0636	0.0434	0.0949	0.1901	0.1146	0.0120	0.1063
SHASTA	0.2443	0.2000	0.0141	0.0244	0.0233	0.0233	0.3989	0.0233	0.0191	0.0061	0.0061	0.0171
SIERRA	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000
SISKIYOU	0.1753	0.1753	0.0014	0.0057	0.0262	0.0968	0.4474	0.0719	0.0000	0.0000	0.0000	0.0000
SOLANO	0.0829	0.0345	0.0857	0.1913	0.2039	0.1183	0.1485	0.0507	0.0362	0.0141	0.0071	0.0270
SONOMA	0.0487	0.0380	0.0265	0.0586	0.1473	0.2250	0.2651	0.0606	0.0584	0.0186	0.0123	0.0410
STANISLAUS	0.2255	0.0354	0.0354	0.1127	0.1389	0.1266	0.1514	0.0846	0.0426	0.0177	0.0073	0.0218
SUTTER	0.1140	0.0457	0.0637	0.1369	0.1495	0.1233	0.1299	0.0838	0.0610	0.0198	0.0186	0.0536
TEHAMA	0.2209	0.0681	0.0513	0.0951	0.0913	0.0852	0.1362	0.0818	0.0671	0.0214	0.0213	0.0602
TRINITY	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.5000	0.0000	0.0000	0.0000	0.0000	0.0000
TULARE	0.0668	0.0357	0.0393	0.0911	0.1569	0.1334	0.1599	0.0917	0.0886	0.0643	0.0263	0.0462
TUOLUMNE	0.1415	0.1415	0.0368	0.0659	0.0659	0.0659	0.2802	0.0659	0.0539	0.0172	0.0172	0.0484
VENTURA	0.0814	0.0498	0.0580	0.0890	0.0905	0.0826	0.0709	0.0944	0.1374	0.0964	0.0613	0.0883
YOLO	0.0795	0.0161	0.1028	0.2941	0.2970	0.0646	0.0790	0.0271	0.0154	0.0072	0.0037	0.0134
YUBA	0.1383	0.0614	0.0563	0.1131	0.1127	0.1003	0.1187	0.0974	0.0797	0.0254	0.0254	0.0715

D. Agricultural Harvesting Activity Based Temporal Profiles for Cotton and Nut Crops Combined

Currently, only cotton, almond, English walnut, and black walnut harvesting are included in the harvesting temporal profiles shown in Table 4. These profiles are weighted for emissions, and used in Section 7.5[2] of the stationary source emissions inventory methodology. The cotton is concentrated in the SJV along with acreages in Imperial and Riverside counties, while the nut crops are more widely dispersed. Profiles are only presented for counties that had acreages of cotton or nut crops reported by the CDFA.

E. All Activity/All Crop Based Temporal Profiles

The all-activity profiles shown in Table 5 include all four major categories of activities: Land preparation, planting, cultivation, and harvesting. As with the land preparation-based profiles to be used in Section 7.4[1], the all activity-based profiles to be used for heavy duty farm equipment[3] are not weighted for dustiness. This is because engine-related emissions, not fugitive dust emissions, are calculated for heavy duty farm equipment.

Table 4: Normalized Weighted Emissions Temporal Profile for Combined Cotton and Nut Harvesting

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALAMEDA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
AMADOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
BUTTE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
CALAVERAS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
COLUSA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
CONTRA COSTA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
EL DORADO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
FRESNO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3796	0.5000	0.1204	0.0000
GLENN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
IMPERIAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000
KERN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4407	0.5000	0.0593	0.0000
KINGS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2345	0.5000	0.2655	0.0000
LAKE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
MADERA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4799	0.5000	0.0201	0.0000
MERCED	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4828	0.5000	0.0172	0.0000
MONTEREY	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
NAPA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
PLACER	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
RIVERSIDE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000
SACRAMENTO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SAN BENITO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SAN JOAQUIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SAN LUIS OBISPO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SANTA BARBARA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SANTA CLARA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SHASTA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SOLANO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SONOMA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
STANISLAUS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
SUTTER	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
TEHAMA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
TULARE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4406	0.5000	0.0594	0.0000
YOLO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000
YUBA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000

Table 5: Normalized Acre Pass Temporal Profile for All Activities for All Crops

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALAMEDA	0.0305	0.0006	0.0184	0.0371	0.0444	0.0797	0.0893	0.0435	0.1627	0.2982	0.0632	0.1323
AMADOR	0.0630	0.0066	0.0286	0.0382	0.0538	0.0657	0.0762	0.0531	0.1936	0.3481	0.0292	0.0441
BUTTE	0.0889	0.0186	0.1275	0.1266	0.1241	0.1239	0.0332	0.0231	0.1371	0.1453	0.0226	0.0292
CALAVERAS	0.0291	0.0105	0.0061	0.0075	0.0084	0.0102	0.0256	0.0089	0.3012	0.5773	0.0057	0.0095
COLUSA	0.0498	0.0288	0.1399	0.1364	0.1396	0.1418	0.0454	0.0253	0.0813	0.1004	0.0475	0.0638
CONTRA COSTA	0.0829	0.0378	0.0957	0.0867	0.0840	0.0735	0.0642	0.0566	0.1121	0.1500	0.0694	0.0870
DEL NORTE	0.0532	0.0422	0.0000	0.0754	0.0754	0.0761	0.1606	0.0754	0.1530	0.2245	0.0380	0.0261
EL DORADO	0.0382	0.0208	0.0154	0.0266	0.0358	0.0454	0.0576	0.0438	0.2389	0.4299	0.0180	0.0296
FRESNO	0.0515	0.0546	0.0839	0.0589	0.0887	0.0896	0.0994	0.0695	0.0597	0.0950	0.1357	0.1135
GLENN	0.0543	0.0200	0.1218	0.1330	0.1283	0.1260	0.0563	0.0382	0.1050	0.1099	0.0458	0.0614
HUMBOLDT	0.0456	0.0423	0.0017	0.0242	0.0252	0.0287	0.1096	0.0237	0.2337	0.4451	0.0110	0.0091
IMPERIAL	0.0420	0.0271	0.0339	0.0858	0.1196	0.1156	0.1297	0.0918	0.1022	0.1151	0.0653	0.0718
INYO	0.0366	0.0276	0.0015	0.0609	0.0613	0.0620	0.1135	0.0613	0.1951	0.3251	0.0325	0.0224
KERN	0.0451	0.0499	0.0685	0.0539	0.0816	0.0928	0.0932	0.0511	0.0767	0.1167	0.1400	0.1306
KINGS	0.0306	0.0625	0.1118	0.0583	0.0821	0.0778	0.0832	0.0261	0.0337	0.0706	0.1896	0.1736
LAKE	0.0942	0.0209	0.0205	0.0715	0.0775	0.0855	0.1004	0.0900	0.1682	0.1864	0.0401	0.0448
LASSEN	0.0226	0.0073	0.0016	0.1083	0.1080	0.1143	0.1247	0.1070	0.1349	0.1539	0.0613	0.0560
LOS ANGELES	0.0285	0.0089	0.0366	0.0806	0.0770	0.0781	0.0860	0.0809	0.1630	0.2392	0.0568	0.0644
MADERA	0.0821	0.0291	0.0600	0.0550	0.0846	0.0937	0.1035	0.0787	0.1016	0.1299	0.0945	0.0873
MARIN	0.0126	0.0036	0.0000	0.0443	0.0443	0.0524	0.0686	0.0456	0.2318	0.4198	0.0332	0.0439
MARIPOSA	0.0130	0.0036	0.0238	0.0164	0.0125	0.0040	0.0085	0.0047	0.3027	0.5956	0.0072	0.0078
MENDOCINO	0.0585	0.0158	0.0108	0.0186	0.0502	0.0704	0.0925	0.0709	0.2022	0.3842	0.0104	0.0155
MERCED	0.0714	0.0373	0.0789	0.0830	0.0918	0.0860	0.0907	0.0489	0.0937	0.1164	0.0975	0.1044
MODOC	0.0328	0.0193	0.0043	0.0953	0.0953	0.1126	0.1386	0.0947	0.1214	0.1534	0.0598	0.0725
MONO	0.0734	0.0632	0.0073	0.0641	0.0646	0.0673	0.1796	0.0671	0.1354	0.2021	0.0434	0.0325
MONTEREY	0.0515	0.0173	0.0210	0.0145	0.0217	0.0238	0.1961	0.1305	0.1753	0.2479	0.0392	0.0612
NAPA	0.1468	0.0024	0.0015	0.0143	0.1218	0.1898	0.1916	0.1717	0.0457	0.1030	0.0067	0.0048
NEVADA	0.0621	0.0569	0.0014	0.0025	0.0065	0.0091	0.1208	0.0091	0.2438	0.4846	0.0013	0.0017
ORANGE	0.0605	0.0571	0.1070	0.0909	0.0937	0.0779	0.0938	0.0573	0.0890	0.1344	0.0721	0.0662
PLACER	0.0368	0.0260	0.0946	0.1162	0.1166	0.1264	0.0813	0.0255	0.1255	0.1869	0.0241	0.0403
PLUMAS	0.0630	0.0550	0.0000	0.0548	0.0548	0.0609	0.1710	0.0548	0.1576	0.2561	0.0347	0.0372
RIVERSIDE	0.0361	0.0226	0.0415	0.0783	0.1088	0.1270	0.1222	0.0962	0.0934	0.0973	0.0849	0.0918
SACRAMENTO	0.0832	0.0328	0.1164	0.1080	0.1017	0.0796	0.0757	0.0581	0.0762	0.0959	0.0744	0.0980
SAN BENITO	0.0516	0.0144	0.0285	0.0316	0.0507	0.0728	0.1243	0.0562	0.1465	0.2479	0.0575	0.1178
SAN BERNARDINO	0.0169	0.0050	0.0135	0.0336	0.0497	0.0489	0.0533	0.0423	0.2440	0.4470	0.0239	0.0219
SAN DIEGO	0.0577	0.0530	0.0682	0.0935	0.0941	0.0971	0.0959	0.0881	0.1056	0.0852	0.0763	0.0853
SAN FRANCISCO	0.0755	0.0000	0.0000	0.0000	0.0000	0.0000	0.2736	0.0377	0.1132	0.3491	0.0377	0.1132
SAN JOAQUIN	0.0968	0.0426	0.0871	0.0937	0.0960	0.0877	0.0850	0.0665	0.0951	0.1096	0.0673	0.0728
SAN LUIS OBISPO	0.0434	0.0067	0.0212	0.0291	0.0298	0.0568	0.1342	0.0800	0.1605	0.2473	0.0652	0.1257
SAN MATEO	0.0369	0.0355	0.0577	0.0648	0.0499	0.0724	0.1213	0.0793	0.1323	0.1551	0.0707	0.1240
SANTA BARBARA	0.0386	0.0184	0.0234	0.0376	0.0435	0.0430	0.1588	0.1396	0.1814	0.2176	0.0455	0.0526
SANTA CLARA	0.0487	0.0232	0.0631	0.0634	0.0823	0.0977	0.1026	0.0551	0.1149	0.1865	0.0568	0.1058
SANTA CRUZ	0.0578	0.0311	0.0297	0.0408	0.0585	0.0371	0.1665	0.1129	0.1425	0.1934	0.0512	0.0784
SHASTA	0.0328	0.0167	0.0060	0.0926	0.0927	0.0943	0.1205	0.0880	0.1595	0.2175	0.0457	0.0338
SIERRA	0.0721	0.0679	0.0000	0.0291	0.0291	0.0440	0.1798	0.0291	0.1632	0.2950	0.0330	0.0578
SISKIYOU	0.0297	0.0174	0.0012	0.0942	0.0958	0.1146	0.1381	0.0932	0.1270	0.1596	0.0594	0.0699
SOLANO	0.0813	0.0614	0.0706	0.0758	0.0699	0.0769	0.0917	0.0500	0.0701	0.0992	0.0967	0.1564
SONOMA	0.0849	0.0143	0.0200	0.0233	0.0820	0.1359	0.1496	0.0989	0.0871	0.1516	0.0471	0.1053
STANISLAUS	0.1010	0.0282	0.0699	0.0979	0.0964	0.0816	0.0918	0.0607	0.1230	0.1349	0.0504	0.0640
SUTTER	0.0633	0.0402	0.1154	0.1278	0.1288	0.1216	0.0609	0.0477	0.0874	0.0909	0.0510	0.0650
TEHAMA	0.0794	0.0270	0.0321	0.0522	0.0504	0.0576	0.0702	0.0472	0.2038	0.2831	0.0391	0.0578
TRINITY	0.0079	0.0058	0.0000	0.0145	0.0145	0.0229	0.0346	0.0145	0.2837	0.5518	0.0177	0.0320
TULARE	0.0550	0.0379	0.0882	0.0721	0.0833	0.0832	0.0983	0.0706	0.0885	0.1013	0.1095	0.1120
TUOLUMNE	0.0109	0.0100	0.0027	0.0118	0.0118	0.0118	0.0280	0.0130	0.3014	0.5870	0.0060	0.0056
VENTURA	0.0573	0.0359	0.0506	0.0679	0.0636	0.0546	0.1394	0.0892	0.1223	0.1769	0.0693	0.0730
YOLO	0.1012	0.0493	0.1176	0.1035	0.0904	0.0586	0.0560	0.0488	0.0707	0.1035	0.0891	0.1115
YUBA	0.0529	0.0219	0.1194	0.1354	0.1352	0.1324	0.0506	0.0474	0.1251	0.1226	0.0255	0.0317

ASSUMPTIONS

The assumptions associated with this methodology are mostly related to the emissions potential of various agricultural activities, the effect of varying local conditions on emissions, or the establishment of the crop calendar. Some of the most basic are:

1. That activities like disking, chiseling, floating, and land planing are representative of the dustiness of all land preparation activities that cause significant soil disturbance.

2. That variations in soil and other local conditions do not substantially affect the amount of harvesting emissions.

3. The crop calendar dates for crops were what was considered typical for the SJV, and the SJV basin calendar was extended throughout the state. In the future, region and county-specific crop calendars will improve the estimate.

4. Crop calendar data were often extended from the data of similar crops.

5. That the CDFA harvested acreage estimates adequately reflect the acreage that undergoes the various agricultural activities.

Refer to the Method Description section above, and the references listed in that section, for further details on the above assumptions and other assumptions associated with the 1993 methodology revision.

SUMMARY OF CHANGES IN METHODOLOGY FROM 1990 TO 1993 FOR LAND PREPARATION AND 1990 TO 1993 FOR ALL ACTIVITY PROFILES

This is a summary of the changes in the activity profile generation methodology that occurred between 1990 and 1993 for agricultural tillage, and between 1990 and 1993 for all activities. Since the agricultural activity profiles for harvesting, planting and cultivation are new for 1993, no comparisons will be made for these categories.

The 1990 land preparation and 1990 all activity profiles were statewide activity estimates based on the data from the Midwest Research Institute study[8], and the county Agricultural Commissioner reports, respectively. Included in the 1993 land preparation and all activity inventory analyses are data from the SJV farmers and other sources cited earlier.

The methodologies for calculating the temporal profiles for 1993 have been dramatically changed from the previous methodologies. The 1990 profiles were created by generalizing from the Midwest Research Institute report and county agricultural activity reports to create statewide profiles. By comparison, the 1993 profiles now weight each activity category for

each crop for each county using the crop acreage in the county. In this manner crop and county specific profiles are generated.

DIFFERENCES BETWEEN THE 1990 AND 1993 LAND PREPARATION PROFILES AND THE 1990 AND 1993 ALL ACTIVITY PROFILES

A. AGRICULTURAL TILLAGE (LAND PREPARATION) PROFILE DIFFERENCES

The 1990 agricultural tillage temporal profile is shown in Table 6. This temporal profile was used for all of the counties in the 1990 emission inventory.

Table 6

1990 Statewide Agricultural Tillage Temporal Profile

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.068	0.085	0.153	0.169	0.153	0.119	0.034	0.034	0.034	0.051	0.051	0.051

The 1993 land preparation temporal profiles, shown in Table 1, are unique to each county. This is because the individual crop acreages are county specific. However, the crop calendar information used statewide for the 1990 profiles is from the SJV. Nonetheless, the level of detail, and, therefore, the accuracy of the 1993 inventory is much improved over that in the 1990 inventory.

The source apportionment analyses currently available support minimal geological source emissions during the winter, and higher emissions during the spring, summer, and fall.[25,26,27,28] This is contradicted somewhat by the overall pattern represented by the 1993 plots in Figures 1 and 2. However, these profiles are strictly activity based. They don't take into account climate. Seasonal effects are separately accounted for in Sections 7.4 and 7.5. If the climates were factored in, the November through March sections of the profiles would be lower. Current apportionment analyses also do not allow differentiation between different geological sources. Therefore, the contributions of specific sources, such as agricultural tillage and windblown agricultural emissions can't be estimated. In the future, the capabilities may exist to differentiate these sources, and create emission apportionment profiles specific to agricultural tilling and agricultural windblown dust. This may prove to be a difficult task. However, if it can be accomplished, the profiles represented by Figures 1 and 2 may be adjusted.

The farmers and other agricultural experts in the middle and southern SJV referenced earlier indicated that most of the land preparation activities for many important crops, such as cotton, occur during the fall. The shifting between 1990 and 1993 of activity from the Spring to the Fall, in Fresno County (Figure 1) reflects this information. The large Fall peak in Figure 1 also

Figure 1: Fresno County

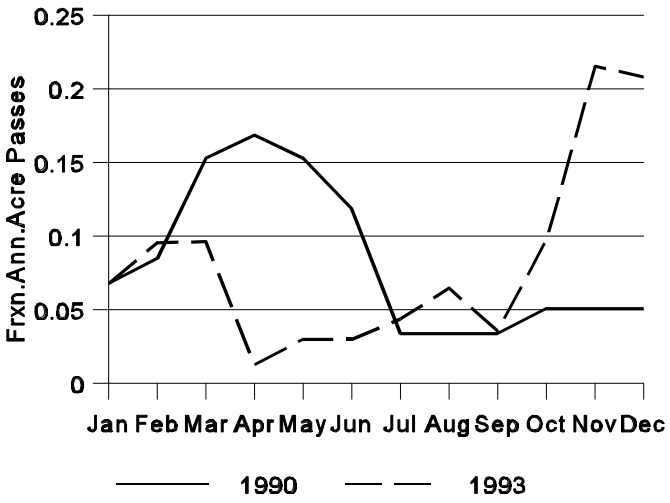
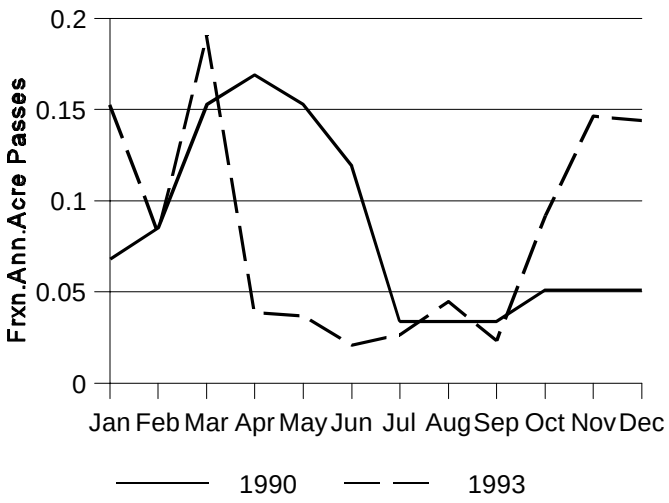


Figure 2: San Joaquin County



corresponds with the PM10 exceedances produced by geological dust sources under stagnant meteorological conditions.[29,30] The available evidence supports the 1993 profiles over the statewide 1990 profile for the SJV.

Comparison of 1990 and 1993 for Land Preparation

ALL ACTIVITY PROFILE DIFFERENCES

The 1990 all activity profile used for both diesel and gasoline heavy-duty farm equipment was based on activity reports from Agricultural Commissioners, and was not tied to crop acreages. The 1990 all activity profile was a statewide estimate. The 1993 all activity profiles are based on acre passes for each type of activity for each crop for each county. The 1990 and the current 1993 all activity profiles will be compared in this section. The 1990 statewide all activity temporal profile is shown in Table 7.

Table 7

1990 Statewide All Activity Temporal Profile

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.071	0.071	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.080	0.071

The 1993 all activity temporal profiles, shown in Table 5, were unique to each county in California. This was because the individual crop acreages were county specific. However,

Figure 3: Fresno County

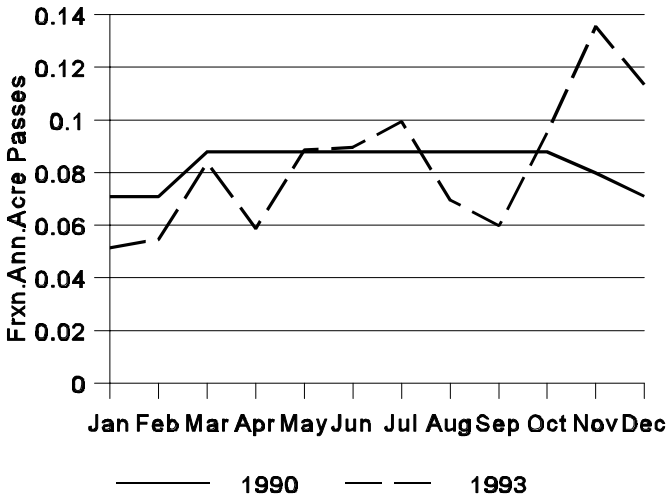
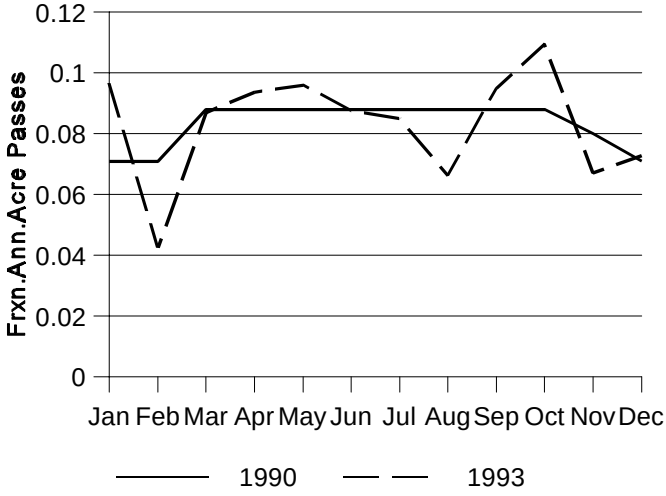


Figure 4: San Joaquin County



the crop calendar information used statewide for the 1993 profiles was from the SJV Air Basin. Nonetheless, the level of detail, and the accuracy of the 1993 profile is much improved over that in the 1990 inventory.

Figures 3 and 4 compare the 1990 all activity profile to the 1993 all activity profiles for two of the SJV Air Basin counties. The large amount of land preparation activity that was shifted to the fall in 1993 also shows up in the all activity profiles for these counties.

Comparison of 1990 and 1993 for All Activities

RECOMMENDATIONS

1. Continue to improve the geographic detail of crop acreages, agricultural practices and activity calendars. This will improve county emission estimates, as well as enhancing the ability to link this information to geographic information systems (GIS).

    a. Continue collecting information on crop activity calendars, from the agricultural community. Contact farmers in regions outside of the SJV.

    b. Incorporate basin specific crop activity data using the 1993 methods into the inventories for the remainder of the counties in California (those counties outside the SJV).

    c. Eventually develop crop activity calendars on a county rather than an air basin level.

2. Use the agricultural tillage dust specific source apportionment research results, as they become available, to verify the normalized monthly profiles.

3. For the all activity/all crop profiles used for the heavy-duty farm equipment category[3], scaling factors based on brake horsepower could be developed.

4. Develop climate influenced profiles for the land preparation and the harvesting profiles. This might be accomplished by using aspects of the wind erosion equation[31], as well as information on typical soil moisture present during activities. Currently there are climatic adjustments made on a seasonal basis in sections 7.4[1] and 7.5.[2] However, the methodology suggested here would dramatically increase the level of detail in the analysis.

SAMPLE CALCULATIONS

As was discussed earlier, this methodology does not produce annual emissions, but, instead, it produces the monthly profiles for land preparation, planting, and cultivation for all crops; for harvesting for cotton and nuts; for all activities for all crops.

The sample calculations, below, start with the all crop land preparation/planting/cultivation monthly profile factor calculations. The subsequent cotton and nut harvesting calculations, and the all crop/all activity calculations are performed in the same manner as the land preparation/planting/cultivation calculations. The only differences are in the multiplication of harvesting acre passes by the measured emissions for each activity, to weight the passes

per acre between the different harvesting activities for the different crops prior to normalization.

The SJV is the largest agricultural region in California; cotton is the largest nonpasture crop in the SJV. Therefore, cotton growing in Fresno County will be used in this methodology as an example for single crop/county calculations. In order to produce the final profiles for the land preparation/planting/cultivation and all activity calculations, the calculations must include all crops in the county.

A. Land Preparation, Planting and Cultivation Calculations: All Crops

The output from this methodology will be one land preparation normalized acre pass value for each month for each county. The profile calculations for planting and cultivation are performed in the same manner as the land preparation profile calculations. Therefore, example calculations for planting and cultivation will not be explicitly covered in this section.

Table 8 includes all acre pass activities for cotton, of which land preparation is a subset. The "Pass Per Year" column indicates the number of times during a year that an activity is performed on a given field. The "Frxn Field Per Year" column is the fraction of the field that experiences the activity per year. The two columns listed above are then multiplied together to create the fourth column, called "Annual Complete Field Passes." This column is then multiplied individually by each month's fraction of annual activity (temporal profile). This product is then summed for all activities in the land preparation category. This results in the monthly complete field pass temporal profile shown in the "Land Preparation" row.

Table 8: All Activity Complete Field Pass Temporal Profile for Cotton

Activity	Pass Per Year	Frxn Field Per Year	Annual Complete Field Passes	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total Passes			**11.7**	**0**	**1**	**1.5**	**0.5**	**1**	**1**	**1**	**0**	**0**	**0.5**	**2.88**	**2.38**
Land Preparation			**6.75**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2.38**	**2.38**
Deep Rip	1	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Plow	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Primary Disc	2	1	2	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Make Beds	2	1	2	0	0.5	0.5	0	0	0	0	0	0	0	0	0
Land Plane	1	0.25	0.25	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Shred	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Planting			**1**	**0**	**0**	**0.5**	**0.5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Plant	1	1	1	0	0	0.5	0.5	0	0	0	0	0	0	0	0

Cultivation			**3**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
Cultivate	3	1	3	0	0	0	0	0.33	0.33	0.33	0	0	0	0	0
Harvesting			**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.5**	**0.5**	**0**
Harvest	1	1	1	0	0	0	0	0	0	0	0	0	0.5	0.5	0

These monthly complete field pass numbers (Table 9) are then multiplied by the CDFA acreage for cotton in the county. This produces the monthly acre pass numbers for cotton for Fresno County, as shown in Table 10:

Upland Cotton Lint Acreage in Fresno County = 338,000 acres

Table 9: Complete Field Pass Profile for Cotton Land Preparation in Fresno County

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	1	0	0	0	0	0	0	0	2.375	2.375

Table 10: Acre Pass Profile for Cotton Land Preparation in Fresno County

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	338000	338000	0	0	0	0	0	0	0	802750	802750

Adding up the acre passes for the year yields: 2,281,500 acre passes.

Dividing the monthly acre passes by the annual number yields the normalized monthly profile for cotton land preparation in Fresno County:

Table 11: Normalized Monthly Acre Pass Profile for Cotton Land Preparation in Fresno County

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.148	0.148	0	0	0	0	0	0	0	0.352	0.352

This example was for a single crop: cotton. The actual method first sums the monthly acre passes for all crops for each county, and then normalizes the summed crop values.

Currently a given crop has the same crop calendar and number of complete field passes per month throughout the SJV. The subregion in the SJV where the crop was most prevalent was used to establish the crop calendar and the number of complete field passes per month. The activity data for the SJV was extended to the rest of the state, by substituting the other county crop acreages. This is a rough approximation method, and needs to be improved, by inputting the local crop calendars for the different regions of the state.

B. Harvesting Calculations: Cotton and Nuts Only

The calculation method for harvesting is essentially the same as for land preparation. The major difference is that the emissions per acre pass value is used to establish the relative dustiness of the harvesting activities. The final profiles for harvesting are then the normalized monthly emissions profiles, rather than the normalized monthly acre pass profiles, as are the cases for the land preparation/planting/cultivation and all activity profiles. For harvesting of cotton and nuts, the emissions per acre pass were based on research from the University of California at Davis (U.C. Davis)[23]. The fourth column in Table 12, labeled as "Emiss Per Acre Pass," shows the emissions per acre pass for cotton. The second and third columns are multiplied by this column to create the "Annual Emiss Per Acre," in the fifth column, before multiplying by the monthly fraction of annual activity to create the weighted profile of emissions per acre.

This process is repeated for nut harvesting using the data in Table 13. Thereafter, the calculation is identical to the land preparation calculation listed above, except that only cotton and nut harvesting are combined to form the harvesting profile. These crops are the only crops that are currently included in the harvesting inventory. The nut crops in the harvesting inventory include almonds, English walnuts, and black walnuts.

Table 12: Cotton Harvesting Emissions Profile in Pounds Per Acre

Activity	Pass Per Year	Frxn Field Per Year	Emiss Per Acre Pass	Annual Emiss Per Acre	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Profile				**1.1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.56**	**0.56**	**0**
Harvest	1	1	1.1	1.1	0	0	0	0	0	0	0	0	0	0.5	0.5	0

Table 13: Nut Harvesting Emissions Profile in Pounds Per Acre

Activity	Pass Per Year	Frxn Field Per Year	Emiss Per Acre Pass	Annual Emiss Per Acre	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Profile				**34.2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17.1**	**17.1**	**0**	**0**
Shake	1	1	0.13	0.13	0	0	0	0	0	0	0	0	0.5	0.5	0	0
Sweep	1	1	1.76	1.76	0	0	0	0	0	0	0	0	0.5	0.5	0	0
1st Pickup	1	1	12.38	12.83	0	0	0	0	0	0	0	0	0.5	0.5	0	0
2nd Pickup	1	1	19.48	19.48	0	0	0	0	0	0	0	0	0.5	0.5	0	0

C. All Activity Calculations: All Crops

Table 8 demonstrates the complete field passes calculation for the cotton all activity profile. The same method was used for the all activity/all crop calculation (farm equipment exhaust profile), as for the land preparation calculation, above. However, in addition to the land preparation category, the passes per acre for all of the other major activity categories (planting, cultivation and harvesting) were also summed to create the "total passes." The rest of the method is the same as the land preparation method, above. As with the land preparation method, the total monthly passes were multiplied by the acres of the crop in the county to create the total acre passes for the month. The monthly values were then summed for the year, and then the monthly numbers divided by the annual to produce the monthly normalized acre pass profiles. In the future, for the heavy-duty farm equipment emissions category[3], the activities may be weighted using estimates of brake horsepower hours.

DEFINITION OF TERMS

acre pass = The number of passes (complete or fractional) multiplied by the number of acres of crop grown.

activity = Any operation conducted by the farmer on an agricultural field. The activities included in this methodology for 1993 have been limited to those that require large equipment and/or have the potential to generate significant dust emissions.

agricultural tillage = Usually refers to activities that cause significant soil disturbance. However, the term is sometimes used to refer to other activities as well. For the purposes of this inventory methodology, agricultural tillage only refers to land preparation activities.

crop calendar = Temporal (monthly) distribution of agricultural activities (e.g., land preparation, planting, cultivation, and harvesting dates). Since crops are grown year round in much of California, the calendars used for calculating the temporal activity profiles must be crop specific.

cultivation = Usually refers to postplanting/preharvest activities that control weeds, add soil amendments, or work the soil around the plants. However, for multiple year crops, such as trees and vines, the months when planting occurs have little bearing on future year cultivation periods.

harvesting = There are many different types of harvesting. Destructive harvesting, such as performed for root crops, removes the entire plant from the soil. Nondestructive

harvesting is performed on tree crops, such as almonds, where only the fruit is removed. There can be many harvesting operations for a single crop, and the dustiness of the operations varies widely.

land preparation = Usually postharvest and preplanting earth manipulation, including disking, plowing, chiseling, subsoiling, etc.; to breakup, turnover, level, shape, etc.

pass = Refers to a single activity performed on an agricultural field. In this methodology a complete pass indicates that the activity was performed on the entire field. In other words, if only a fraction of the field undergoes the operation during a given calendar year, that field is assigned a fractional annual pass value.

planting = Planting operations vary widely for different crops. Tree crops are planted infrequently, while annual crops are planted at least once per year. The amount of soil disturbance for the actual planting operation also varies widely by crop.

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