IV. TRENDS IN USE IN CERTAIN PESTICIDE CATEGORIES

Reported pesticide use in California in 2002 totaled 172 million pounds, an increase of 21 million pounds from 2001. Production agriculture, the major category of use subject to reporting requirements, accounted for most of the overall increase in use. Applications for production agriculture increased by 19 million pounds.

The active ingredients with the largest uses by pounds were sulfur, petroleum oils, metam-sodium, and methyl bromide. Sulfur use increased by 6.5 million pounds (14 percent) and was again the most highly used pesticide in 2002, both in pounds applied and acres treated. By pounds, sulfur accounted for 31 percent of all reported pesticide use. Sulfur is a natural fungicide favored by both conventional and organic farmers. Petroleum oil use increased by 2.3 million pounds (15 percent), metam sodium use increased by 4.2 million pounds (37 percent), and methyl bromide use declined by approximately 21,000 pounds (0.3 percent).

Major crops that showed an overall increase in pesticide pounds applied from 2001 to 2002 included processing tomatoes (3 million pounds increase), raisin and table grapes (3 million pounds), carrots (2.2 million pounds), almonds (2.1 million pounds), potatoes (1.6 million pounds), and wine grapes (1.5 million pounds). Major crops or sites with decreased pounds applied included cotton (0.9 million pounds), bermudagrass (0.4 million pounds), public health (0.2 million pounds), and sugarbeets (0.1 million pounds).

DPR data analyses have shown that pesticide use varies from year to year depending upon pest problems, weather, acreage and types of crops planted, economics, and other factors. For most of the 14 crops investigated, pest problems were low in most areas in 2002. Prices for some crops improved in 2002 but in general economic conditions for growers were a major concern. Acreage of most of the 14 crops increased which would explain some of the increase in pesticide use.

Pesticide use is reported as the number of pounds of active ingredient and the total number of acres treated. The data for pounds include both agricultural and nonagricultural applications; the data for acres treated are primarily agricultural applications. The number of acres treated means the cumulative number of acres treated; the acres treated in each application are summed even when the same field is sprayed more than once in a year. (For example, if one acre is treated three times in a season with an individual active ingredient, it is counted as three acres treated in the tables and graphs in Sections IV and V of this report.)

Use declined in some pesticide categories and increased in other categories. Most of the increase in pounds applied was due to increases in the fumigants metam-sodium and 1,3-dichloropropene, which partly replaced use of methyl bromide. (Fumigants are applied at high rates, in part, because they treat a volume of space rather than a surface area such as the leaves and stems of plants. Thus, the pounds applied are large even thought the number of applications or number of acres treated may be relatively small.) Some of the major statistical changes from 2001 to 2002 include:

- Chemicals classified as reproductive toxins increased in pounds applied from 2001 to 2002 (up 1.8 million pounds or 9 percent) but decreased in cumulative acres treated (down 0.3 million acres or 10 percent). The increase in pounds was nearly all due to an increase in use of the fumigant metam-sodium.

- A similar pattern appeared for chemicals classified as carcinogens. Use of these chemicals increased in overall pounds applied (up 3.4 million pounds or 15 percent) but decreased in cumulative acres treated (down 0.2 million acres or 5 percent). The increase in pounds was mainly due to increase in uses of metam-sodium and 1,3-dichloropropene.

- Use of insecticide organophosphate and carbamate chemicals, which includes compounds of high regulatory concern, continued to decline, decreasing by 0.7 million pounds (8 percent) and decreasing by 0.6 million acres treated (8 percent).

- Chemicals categorized as ground water contaminants increased by about 220,000 pounds applied (11 percent). Cumulative acres treated increased by about 18,000 acres (1 percent). Most of the increase was due to diuron and simazine.

- Chemicals categorized as toxic air contaminants, another regulatory concern, increased by 3.7 million pounds applied (13 percent). Cumulative acres treated decreased by about 71,000 acres (2 percent). Most of the increase in pounds was due to increases in metam-sodium and 1,3-dichloropropene.

- Use of reduced-risk pesticides increased considerably, by 183,000 pounds applied (32 percent) and by 845,000 acres treated (29 percent).

- Biopesticide use increased by 89,000 pounds (9 percent) but decreased by 107,000 acres treated (5 percent).

Since 1994, the reported pounds of pesticides applied has fluctuated from year to year with no general increasing or decreasing trend. An increase or decrease in use from one year to the next or in the span of a few years does not necessarily indicate a general trend in use; it simply may reflect normal variations. Short periods of time (three to five years) may suggest trends, such as the increased pesticide use from 1994 to 1998 or the decreased use from 1998 to 2001. However, statistical analysis from 1994 to 2002 does not indicate a significant trend of either increase or decrease in pesticide use.

To improve data quality when calculating the total pounds of pesticides, DPR excluded values that were so large they were probably in error. The procedure to exclude probable errors involved the development of complex error-checking algorithms, a data improvement process that is ongoing.

Over-reporting errors have a much greater impact on the numerical accuracy of the database than under-reporting errors. For example, if a field is treated with 100 pounds of a pesticide active ingredient and the application is erroneously recorded as 100,000 pounds (a decimal point shift of three places to the right), an error of 99,900 pounds is introduced into the database. If the same degree of error is made in shifting the decimal point to the left, the application is recorded as 0.1 pound, and an error of 99.9 pounds is entered into the database

To provide an overview, pesticide use is summarized for eight different categories from 1993 to 2002 (Tables 3–10 and Figures 1–8). These categories classify pesticides according to certain characteristics such as reproductive toxins, carcinogens, or reduced-risk characteristics.

The statistical summaries detailed in these categories are not intended to serve as indicators of pesticide risks to the public or the environment. Rather, the data supports DPR regulatory functions to enhance public safety and environmental protection. (See “How Pesticide Data are Used” on page iv.) The different pesticide categories, described more fully, are:

1. Pesticides listed on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity."
2. Pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer."
3. Pesticides that are cholinesterase inhibitors, that is, organophosphate and carbamate chemicals.
4. Pesticides on DPR's groundwater protection list (section 6800 (a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1) and norflurazon, which DPR is recommending be listed as a restricted material.
5. Pesticides from DPR's toxic air contaminants list (California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860).
6. Oil pesticides, which may include some chemicals on the State’s Proposition 65 list of chemicals “known to cause cancer” but which also serve as alternatives to high-toxicity pesticides.
7. Active ingredients contained in pesticide products that have been given reduced-risk status by U.S. EPA.
8. Biopesticides, which include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones).

USE TRENDS OF PESTICIDES ON THE STATE'S PROPOSITION 65 LIST OF CHEMICALS THAT ARE "KNOWN TO CAUSE REPRODUCTIVE TOXICITY"

Table 3A. The reported **pounds** of pesticides used which are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1080	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
2,4-DB ACID	0	0	0	0	1,697	6,932	12,397	11,453	16,954	9,393
AMITRAZ	4,877	70,440	75,041	55,474	66,491	13,563	7,558	8,087	263	154
ARSENIC PENTOXIDE	150,200	86,445	83,814	205,089	64,372	50,899	245,238	91,406	259,386	194,650
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	1	1	<1	<1	<1
BENOMYL	536,698	141,659	190,093	148,570	114,473	227,858	133,159	118,667	76,698	28,978
BROMACIL, LITHIUM SALT	7,045	11,085	6,517	17,381	9,141	4,686	4,162	4,478	3,217	4,016
BROMOXYNIL HEPTANOATE	0	0	0	0	9	263	3,084	34,932	45,657	43,633
BROMOXYNIL OCTANOATE	112,714	127,346	119,430	148,530	115,448	120,895	120,667	116,128	78,186	72,759
CHLORSULFURON	1,110	1,228	1,485	1,638	2,218	3,052	1,445	2,589	1,201	2,190
CYANAZINE	502,224	532,691	641,454	566,802	472,169	277,313	181,085	50,468	17,250	7,178
CYCLOATE	51,715	51,077	49,138	44,634	55,460	62,784	49,096	37,411	31,781	34,347
DICLOFOP-METHYL	23,082	38,276	16,540	79,884	41,130	24,783	18,710	21,696	11,765	5,058
EPTC	698,433	766,510	660,271	704,203	579,470	393,031	448,883	323,254	276,808	253,887
ETHYLENE OXIDE	1,471	3	0	0	0	31	2	6	3	0
FENOXAPROP ETHYL	0	5,037	3,733	3,974	3,910	1,504	2,048	979	366	106
FLUAZIFOP-BUTYL	4,634	2,375	2,148	823	2,028	1,211	516	205	149	166
HYDRAMETHYLNON	142	227	807	1,741	5,456	3,183	2,267	2,495	2,378	2,741
LINURON	230,827	80,019	84,976	84,474	84,621	82,170	78,047	65,511	58,222	61,994
METAM-SODIUM	8,588,971	11,131,814	15,098,481	15,433,996	15,355,507	13,923,818	17,170,765	13,075,487	12,278,902	14,635,108
METHYL BROMIDE	14,208,365	16,806,993	17,319,465	16,106,301	16,038,048	13,739,508	15,353,832	10,880,905	6,704,435	6,538,200
METIRAM	0	0	0	0	0	<1	0	0	2	0
MYCLOBUTANIL	87,431	70,468	85,938	89,565	94,808	130,927	95,178	96,607	84,183	76,655
NABAM	0	8	1	0	0	50	2	1	8	0
NICOTINE	458	458	228	309	258	83	93	21	17	2
NITRAPYRIN	175	150	639	114	49	410	150	192	16	89
OXADIAZON	19,269	20,488	21,459	25,280	23,198	22,389	19,403	18,275	15,904	16,692
OXYDEMETON-METHYL	117,470	111,447	120,724	107,349	117,230	90,804	122,928	110,820	99,747	96,013
OXYTHIOQUINOX	6,208	4,500	7,178	6,204	2,709	1,577	2,711	411	149	117
POTASSIUM DIMETHYL DITHIO CARBAMATE	21	47	0	0	15	24,795	0	0	0	23
PROPARGITE	1,709,016	1,796,535	1,818,529	1,789,175	1,856,076	1,391,286	1,505,762	1,332,849	1,159,371	972,371

Table 3A (continued). The reported **pounds** of pesticides used which are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity."

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
RESMETHRIN	1,720	1,069	856	663	687	796	696	681	539	661
SODIUM DIMETHYL DITHIO CARBAMATE	0	337	1	0	0	8,279	355	1,315	173	0
STREPTOMYCIN SULFATE	5,130	6,218	9,630	9,510	9,628	14,960	9,427	10,822	7,536	5,990
TAU-FLUVALINATE	3,738	4,737	3,801	4,149	3,070	2,843	3,335	2,251	2,228	2,184
THIOPHANATE-METHYL	94,427	101,269	116,914	123,026	88,880	65,497	76,114	68,118	66,988	71,468
TRIADIMEFON	29,744	24,170	20,707	17,375	12,207	13,009	4,846	3,114	2,843	1,736
TRIBUTYLTIN METHACRYLATE	130	1,734	278	185	60	113	270	107	106	39
TRIFORINE	41,882	32,622	39,770	24,924	6,597	2,760	519	365	99	76
VINCLOZOLIN	37,595	33,662	48,314	60,320	46,945	54,731	52,731	35,658	32,207	22,164
WARFARIN	1	<1	<1	1	1	1	1	1	1	1
Grand Total	27,276,923	32,063,144	36,648,361	35,861,664	35,274,065	30,762,795	35,727,485	26,527,766	21,335,737	23,160,837

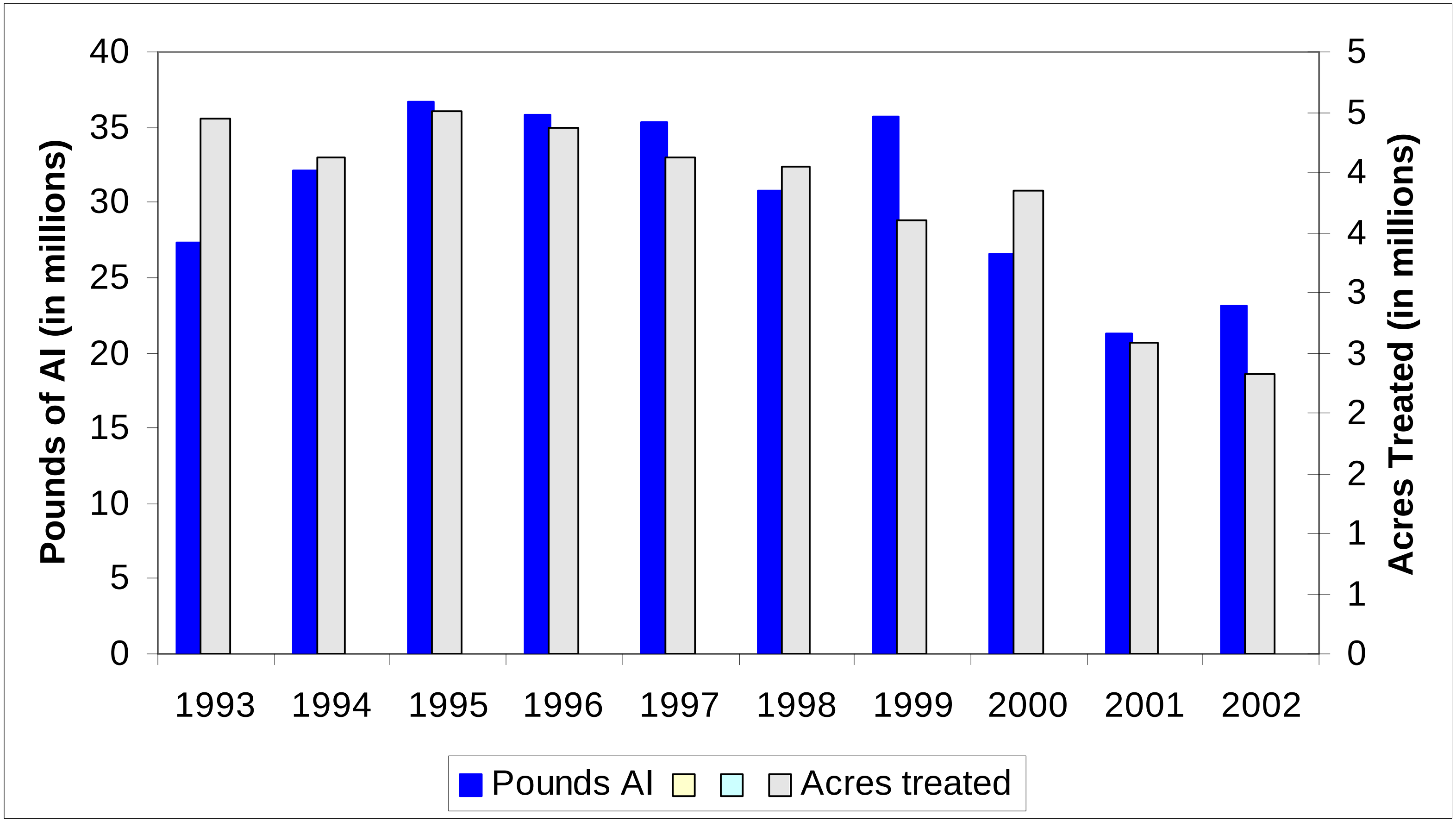
Table 3B. The reported **cumulative acres treated** with pesticides that are on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity." Use includes primarily agricultural applications. The grand total for acres treated may be less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1080	0	53	32	25	0	0	0	42	30	301
2,4-DB ACID	0	0	0	0	2,599	12,167	20,063	19,496	25,843	15,584
AMITRAZ	3,391	137,393	174,861	129,831	161,646	28,945	14,684	16,001	1,269	605
ARSENIC PENTOXIDE	0	550	0	0	0	0	0	709,893	56	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	0	1
BENOMYL	276,808	269,932	358,855	309,974	245,058	434,389	242,416	217,415	135,754	47,771
BROMACIL, LITHIUM SALT	0	0	0	0	0	40	40	30	0	0
BROMOXYNIL HEPTANOATE	0	0	0	0	36	521	9,293	132,741	160,996	158,074
BROMOXYNIL OCTANOATE	203,939	244,869	224,037	276,933	224,136	240,930	257,371	313,269	249,777	238,713
CHLORSULFURON	41,189	39,930	39,584	54,246	27,628	39,842	30,671	34,508	29,079	18,836
CYANAZINE	263,348	284,770	365,406	325,558	288,011	185,004	129,492	56,059	19,695	8,763
CYCLOATE	21,505	22,559	20,682	19,587	25,940	29,711	24,474	18,460	15,874	17,213
DICLOFOP-METHYL	27,457	47,165	19,314	89,164	46,848	28,296	21,442	24,470	14,198	6,259
EPTC	246,484	273,148	241,338	232,641	207,977	141,496	148,534	107,543	99,939	94,240
ETHYLENE OXIDE	0	0	0	0	0	194	31	41	0	0
FENOXAPROP ETHYL	0	33,712	24,153	25,540	24,439	10,480	13,824	8,847	3,820	1,327
FLUAZIFOP-BUTYL	6,414	3,824	2,225	1,513	1,537	3,898	806	137	144	98
HYDRAMETHYLNON	2	0	3	36	35	289	1,612	3,647	2,733	2,148
LINURON	110,884	97,798	105,191	104,596	109,957	111,915	110,875	86,292	81,697	86,914
METAM-SODIUM	135,687	183,209	199,025	215,497	198,072	153,885	185,869	146,268	124,447	141,357
METHYL BROMIDE	592,362	106,236	110,729	87,240	112,795	89,836	101,979	75,609	60,596	53,100
METIRAM	0	0	0	0	0	<1	0	0	7	0
MYCLOBUTANIL	857,612	691,447	839,737	812,615	864,822	1,224,118	886,007	840,974	736,518	704,231
NABAM	0	0	0	0	0	55	20	0	60	0
NICOTINE	348	375	237	167	128	57	36	14	31	1
NITRAPYRIN	434	261	1,493	147	105	851	329	276	0	169
OXADIAZON	1,094	1,811	2,400	2,212	1,833	1,975	3,407	2,656	2,637	1,838
OXYDEMETON-METHYL	234,342	225,444	253,368	220,502	243,712	186,577	252,830	225,611	199,831	193,441
OXYTHIOQUINOX	9,227	6,408	9,932	8,611	5,896	5,156	2,152	815	250	182
POTASSIUM DIMETHYL DITHIO CARBAMATE	0	6	0	0	0	0	0	0	0	2
PROPARGITE	952,150	1,030,257	1,052,050	980,825	988,441	755,915	794,851	704,434	606,257	524,421

Table 3B (continued). The reported **cumulative acres treated** with pesticides that are on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity."

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
RESMETHRIN	450	419	222	144	182	160	84,044	33	35	32
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	0	0	0	253	20	0	60	0
STREPTOMYCIN SULFATE	49,186	58,556	84,111	84,999	89,335	131,809	76,353	97,003	62,157	52,180
TAU-FLUVALINATE	24,146	26,566	18,764	21,799	18,335	14,059	17,339	10,092	10,881	9,024
THIOPHANATE-METHYL	88,502	86,641	101,462	127,636	89,387	64,028	81,360	68,313	52,994	64,324
TRIADIMEFON	165,341	132,077	118,567	99,865	59,125	79,936	25,698	11,817	9,492	6,747
TRIBUTYLTIN METHACRYLATE	0	13	<1	1	<1	1	1	1	<1	0
TRIFORINE	84,397	64,054	76,349	53,536	17,451	6,351	1,273	751	244	203
VINCLOZOLIN	48,720	49,227	63,193	82,700	67,113	68,929	63,848	43,503	38,501	27,786
WARFARIN	112	192	151	541	380	310	129	546	95	449
Grand Total	4,445,517	4,118,902	4,507,471	4,368,680	4,122,923	4,051,804	3,593,861	3,844,863	2,584,940	2,318,261

Figure 1. Use trends of pesticides that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Reported pounds of active ingredient (AI) applied includes both agricultural and nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES LISTED BY U.S. EPA AS CARCINOGENS OR BY THE STATE AS “KNOWN TO CAUSE CANCER”

Table 4A. The reported **pounds** of pesticides used that are listed by U.S. EPA as B2 carcinogens or that are on the State’s Proposition 65 list of chemicals “known to cause cancer.” Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1,3-DICHLOROPROPENE	47,694	2,122	409,821	1,956,846	2,457,170	3,011,057	3,130,745	4,446,910	4,135,583	5,359,193
ACIFLUORFEN, SODIUM SALT	6	1	6	11	29	<1	10	<1	1	3
ALACHLOR	44,957	42,854	41,119	45,733	51,259	46,267	29,789	36,468	29,431	28,666
ARSENIC ACID	13,014	27,571	37,248	53,777	59,835	52,558	48,029	11,906	12,023	4,976
ARSENIC PENTOXIDE	150,200	86,445	83,814	205,089	64,372	50,899	245,238	91,406	259,386	194,650
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	1	1	<1	<1	<1
CACODYLIC ACID	51,382	43,749	43,371	31,572	26,149	17,398	15,949	16,117	3,983	1,792
CAPTAN	484,326	608,789	735,884	919,166	800,635	1,545,397	966,180	642,756	398,851	392,205
CHLOROTHALONIL	827,443	832,746	1,126,802	1,054,317	779,696	1,183,053	755,107	680,613	521,942	601,981
CHROMIC ACID	209,555	120,822	117,092	286,521	89,931	71,109	343,543	128,836	363,205	272,300
CREOSOTE	479,417	871,469	444,461	491,044	259,086	1,752	4,873	9,879	4,700	9,018
DAMINOZIDE	7,782	6,781	6,782	7,957	11,031	10,323	9,449	9,144	11,326	10,048
DDVP	3,348	4,798	6,066	13,122	13,639	14,055	12,325	12,718	12,787	8,524
DIOCTYL PHTHALATE	10,834	11,769	11,860	10,270	8,465	4,751	3,090	2,646	2,920	3,655
DIPROPYL ISOCINCHOMERONATE	<1	2	1	3	<1	<1	0	<1	1	0
DIURON	1,075,139	1,235,444	1,055,454	1,266,123	1,228,786	1,505,299	1,188,949	1,344,023	1,105,678	1,303,015
ETHOPROP	62,143	51,270	51,104	27,955	23,842	27,949	26,196	16,119	19,046	16,531
ETHYLENE OXIDE	1,471	3	0	0	0	31	2	6	3	0
FENOXYCARB	1,928	1,492	1,673	712	65	552	71	80	86	53
FOLPET	3	3	2	<1	<1	<1	<1	<1	0	2
FORMALDEHYDE	13,322	11,864	153,519	334,548	416,457	348,320	111,714	55,300	28,612	14,035
IPRODIONE	452,656	431,580	564,818	521,372	424,625	573,105	411,801	422,524	305,545	247,365
LINDANE	9,733	5,305	4,637	4,606	5,407	6,324	4,842	4,738	2,388	1,633
MANCOZEB	446,185	465,191	659,407	568,069	528,104	989,157	631,288	611,502	430,395	396,142
MANEB	625,900	913,129	1,258,164	1,329,370	1,082,970	1,597,129	1,046,198	1,203,966	817,326	851,643
METAM-SODIUM	8,588,971	11,131,814	15,098,481	15,433,996	15,355,507	13,923,818	17,170,765	13,075,487	12,278,902	14,635,108
METIRAM	0	0	0	0	0	<1	0	0	2	0
ORTHO-PHENYLPHENOL	6,232	11,027	14,892	10,384	15,962	11,248	8,600	8,513	4,016	15,205
ORTHO-PHENYLPHENOL, SODIUM SALT	64,019	46,825	33,720	37,450	26,759	32,822	29,019	30,798	26,960	22,472
OXADIAZON	19,269	20,488	21,459	25,280	23,198	22,389	19,403	18,275	15,904	16,692
OXYTHIOQUINOX	6,208	4,500	7,178	6,204	2,709	1,577	2,711	411	149	117

Table 4A (continued). The reported **pounds** of pesticides used that are listed by U.S. EPA as B2 carcinogens or that are on the State's Proposition 65 list of chemicals "known to cause cancer."

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
PARA-DICHLOROBENZENE	37	3	2	4	3	219	86	4	11	1
PENTACHLOROPHENOL	91,123	40	3	3	8	33	92	466	14	17
POTASSIUM DICHROMATE	106	596	380	41	50	103	319	554	1	<1
PROPARGITE	1,709,016	1,796,535	1,818,529	1,789,175	1,856,076	1,391,286	1,505,762	1,332,849	1,159,371	972,371
PROPOXUR	2,674	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449
PROPYLENE OXIDE	34,832	41,815	131,639	224,495	198,559	198,595	172,556	118,381	99,773	99,674
PROPYZAMIDE	112,330	114,033	116,069	108,958	101,308	106,454	104,596	103,776	108,984	107,531
SODIUM DICHROMATE	0	0	0	180,478	182,185	122,647	32,699	122	329	633
THIODICARB	<1	0	13,693	122,995	156,101	114,947	60,524	36,844	9,360	5,194
VINCLOZOLIN	37,595	33,662	48,314	60,320	46,945	54,731	52,731	35,658	32,207	22,164
Grand Total	15,690,851	18,979,205	24,120,761	27,129,307	26,298,681	27,038,961	28,146,987	24,511,936	22,201,812	25,615,057

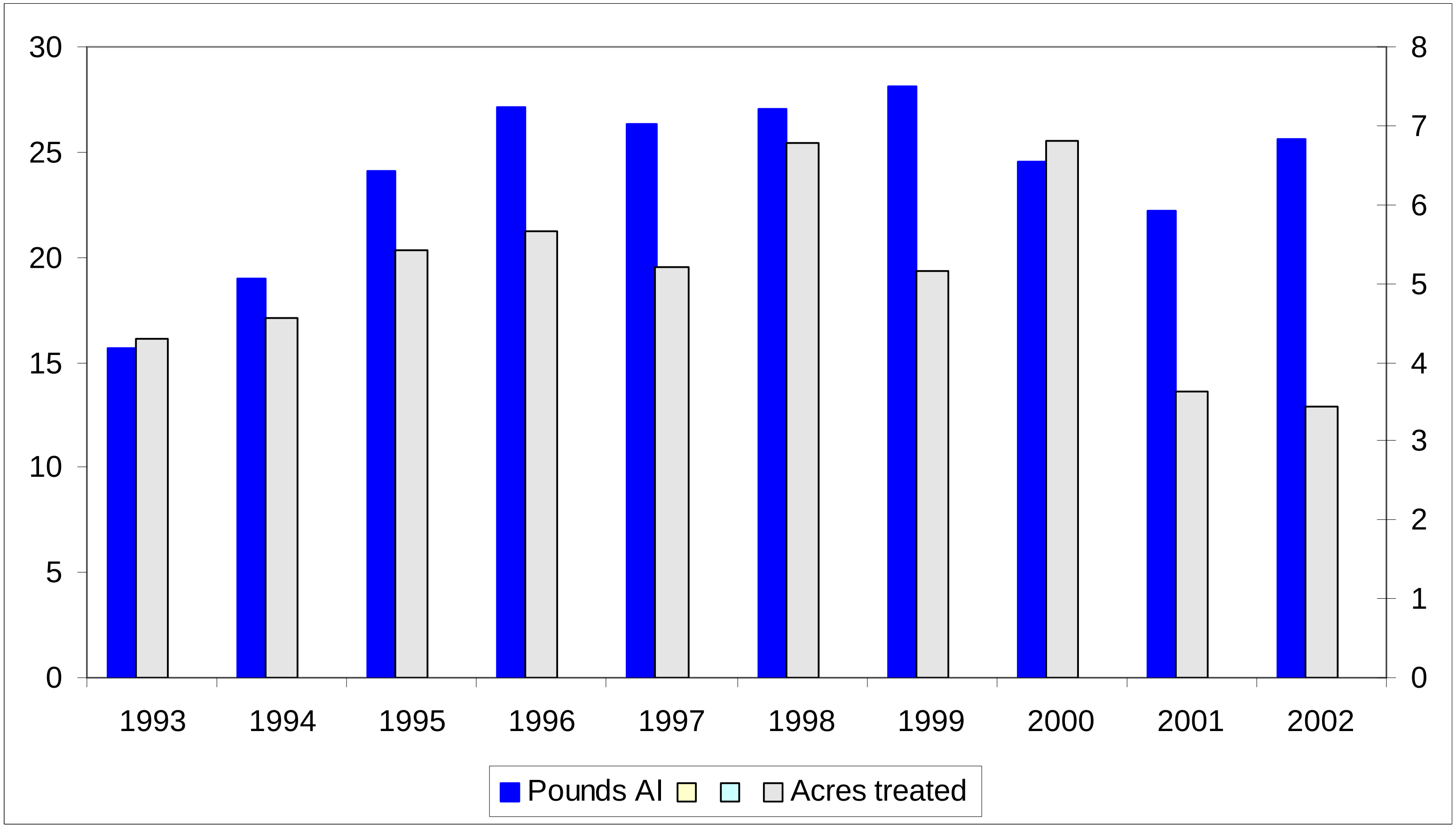
Table 4B. The reported **cumulative acres treated** with pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer." Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1,3-DICHLOROPROPENE	823	33	4,174	17,152	22,072	26,885	29,411	33,019	30,727	42,064
ACIFLUORFEN, SODIUM SALT	7	2	7	<1	0	0	0	0	0	11
ALACHLOR	17,622	16,067	15,351	18,175	19,059	16,429	11,005	13,290	11,440	14,467
ARSENIC ACID	0	0	0	0	0	0	0	0	0	0
ARSENIC PENTOXIDE	0	550	0	0	0	0	0	709,893	56	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	0	1
CACODYLIC ACID	325,934	304,036	314,908	251,396	192,732	126,911	111,570	117,642	31,283	12,648
CAPTAN	211,942	243,651	294,222	379,499	346,351	601,897	404,224	309,211	213,257	213,438
CHLOROTHALONIL	532,305	515,239	671,656	672,750	491,652	795,961	455,813	427,956	311,800	347,725
CHROMIC ACID	0	550	0	0	0	0	0	709,893	56	0
CREOSOTE	0	0	0	0	0	126	11	45	1	0
DAMINOZIDE	3,078	2,691	2,650	2,652	3,491	4,510	3,107	3,405	6,134	5,319
DDVP	683	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327
DIOCTYL PHTHALATE	125,376	149,254	145,383	127,384	96,048	61,093	49,587	40,070	43,804	42,948
DIPROPYL ISOCINCHOMERONATE	2	50	10	0	0	0	0	5	0	0
DIURON	413,461	454,082	506,876	685,055	819,525	864,776	849,304	864,026	786,383	796,903
ETHOPROP	7,056	5,767	5,450	3,136	3,213	3,777	3,610	3,477	3,542	4,152
ETHYLENE OXIDE	0	0	0	0	0	194	31	41	0	0
FENOXYCARB	1	5	11	5	<1	210	3,687	3,384	3,237	1,242
FOLPET	3	<1	0	1	2	0	0	0	0	0
FORMALDEHYDE	132	15	137	234	12	126	123	47	53	33
IPRODIONE	719,961	655,013	884,278	802,750	664,575	1,346,865	932,655	2,195,482	499,602	364,770
LINDANE	26,888	22,898	19,309	25,283	36,536	32,523	20,867	14,628	13,832	8,010
MANCOZEB	262,528	273,689	405,133	351,153	283,858	683,391	386,627	362,693	227,655	197,055
MANEB	372,082	510,429	650,232	729,576	622,124	938,924	628,976	610,474	533,808	554,787
METAM-SODIUM	135,687	183,209	199,025	215,497	198,072	153,885	185,869	146,268	124,447	141,357
METIRAM	0	0	0	0	0	<1	0	0	7	0
ORTHO-PHENYLPHENOL	6	4	8	67	75	645	583	321	59	82
ORTHO-PHENYLPHENOL, SODIUM SALT	52	88	47	652	0	20	6,234	18,599	60	40
OXADIAZON	1,094	1,811	2,400	2,212	1,833	1,975	3,407	2,656	2,637	1,838
OXYTHIOQUINOX	9,227	6,408	9,932	8,611	5,896	5,156	2,152	815	250	182

Table 4B (continued). The reported **cumulative acres treated** with pesticides listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer".

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
PARA-DICHLOROBENZENE	<1	0	0	0	0	10	0	0	0	0
PENTACHLOROPHENOL	0	2	<1	15	4	190	0	59	38	0
POTASSIUM DICHROMATE	0	0	0	0	0	40	71	40	0	20
PROPARGITE	952,150	1,030,257	1,052,050	980,825	988,441	755,915	794,851	704,434	606,257	524,421
PROPOXUR	<1	14	5	9	73	45	39	26	4	23
PROPYLENE OXIDE	0	0	0	0	<1	0	573	0	0	<1
PROPYZAMIDE	155,857	157,185	154,889	150,131	140,098	144,011	141,665	136,545	144,730	140,680
SODIUM DICHROMATE	0	0	0	0	0	0	0	0	0	0
THIODICARB	0	0	22,762	176,600	222,844	155,309	83,762	50,565	13,364	8,256
VINCLOZOLIN	48,720	49,227	63,193	82,700	67,113	68,929	63,848	43,503	38,501	27,786
Grand Total	4,304,029	4,564,067	5,409,462	5,662,877	5,195,881	6,772,138	5,162,360	6,802,016	3,638,327	3,447,193

Figure 2. Use trends of pesticides that are listed by U.S. EPA as B2 carcinogens or that are on the State's Proposition 65 list of chemicals "known to cause cancer." Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF CHOLINESTERASE-INHIBITING PESTICIDES

Table 5A. The reported **pounds** of cholinesterase-inhibiting pesticides used. These pesticides are the currently registered organophosphate and carbamate active ingredients. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
3-IODO-2-PROPYNYL BUTYL CARBAMATE	<1	0	0	<1	0	1	<1	<1	<1	0
ACEPHATE	331,522	372,021	458,234	355,876	343,908	384,755	307,291	283,381	240,200	216,853
ALDICARB	237,404	226,113	354,678	546,418	530,701	534,960	280,978	329,539	297,907	244,786
AZINPHOS METHYL	475,340	419,131	406,727	406,159	336,365	193,069	216,624	185,055	163,641	153,200
BENDIOCARB	9,740	4,431	1,526	1,674	259	125	108	593	62	32
BENSULIDE	55,639	64,796	69,271	94,592	129,978	192,405	243,089	217,491	189,194	194,687
BUTYLATE	121,979	108,686	67,179	87,612	84,268	69,805	71,071	31,732	27,640	18,929
CARBARYL	773,675	821,208	836,692	810,251	755,147	427,739	388,280	365,328	287,070	256,022
CARBOFURAN	289,807	278,579	243,339	220,642	183,606	161,689	139,098	132,452	95,927	81,486
CHLORPROPHAM	5,449	3,000	3,236	3,015	2,057	2,321	3,102	3,544	3,504	1,380
CHLORPYRIFOS	2,247,021	2,899,846	3,430,253	2,725,391	3,212,721	2,451,198	2,259,634	2,094,222	1,674,083	1,418,634
COUMAPHOS	0	0	0	0	0	0	15	152	97	62
CYCLOATE	51,715	51,077	49,138	44,634	55,460	62,784	49,096	37,411	31,781	34,347
DDVP	3,348	4,798	6,066	13,122	13,639	14,055	12,325	12,718	12,787	8,524
DEMETON	2,865	1,239	775	411	0	3	5	2	3	42
DESMEDIPHAM	8,961	8,588	8,465	6,092	6,188	4,737	6,014	6,707	3,750	3,398
DIAZINON	1,412,960	1,358,474	1,217,639	1,094,562	955,718	899,873	981,449	1,054,315	998,223	689,262
DICROTOPHOS	66	1	113	3	0	11	122	0	2	27
DIMETHOATE	586,557	672,202	584,070	420,057	516,085	398,524	485,879	397,541	284,511	309,449
DISULFOTON	151,090	134,682	96,666	142,451	128,335	105,343	95,919	76,164	51,610	54,567
EPTC	698,433	766,510	660,271	704,203	579,470	393,031	448,883	323,254	276,808	253,887
ETHEPHON	860,908	851,028	983,875	951,657	883,837	764,039	734,782	735,390	620,153	538,449
ETHION	16,521	4,054	79	2	3	906	64	0	5	13
ETHOPROP	62,143	51,270	51,104	27,955	23,842	27,949	26,196	16,119	19,046	16,531
FENAMIPHOS	232,510	178,844	187,442	189,645	156,500	125,485	107,745	104,505	74,867	70,939
FENTHION	146	186	413	141	176	29	22	33	61	79
FONOFOS	55,991	73,280	74,936	67,969	50,555	25,349	24,216	4,370	580	465
FORMETANATE HYDROCHLORIDE	182,310	152,765	104,099	106,203	98,022	77,751	65,030	43,948	45,629	35,844
MALATHION	708,781	750,415	806,168	676,921	775,880	646,984	682,413	493,107	539,914	618,138
METHAMIDOPHOS	331,167	241,010	500,173	260,338	312,212	244,399	116,284	76,923	46,741	30,645
METHIDATHION	451,890	367,852	321,709	328,836	309,347	178,455	177,105	98,129	93,521	67,455
METHIOCARB	3,686	4,126	2,673	2,120	4,788	5,385	3,316	2,412	2,257	1,852

Table 5A (continued). The reported **pounds** of cholinesterase inhibiting pesticides used.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
METHOMYL	524,752	700,306	799,267	672,382	824,526	667,863	551,549	551,375	378,456	294,160
METHYL PARATHION	154,862	129,324	140,831	130,642	153,789	158,413	157,598	75,169	59,742	53,644
MOLINATE	1,519,326	1,500,477	1,380,453	1,364,906	1,171,486	1,006,103	911,829	1,025,834	733,630	877,572
NALED	180,666	457,839	703,092	351,531	616,606	260,413	298,939	255,761	261,881	196,698
OXAMYL	71,486	73,463	66,188	82,372	119,514	161,710	129,112	138,048	77,292	80,315
OXYDEMETON-METHYL	117,470	111,447	120,724	107,349	117,230	90,804	122,928	110,820	99,747	96,013
PARATHION	4,665	6,104	13,642	14,050	5,199	5,762	4,041	3,581	2,589	3,205
PEBULATE	191,531	235,690	244,226	202,634	184,090	185,696	225,107	160,018	45,619	71,721
PHENMEDIPHAM	9,066	8,863	8,771	6,612	6,621	5,836	6,735	7,483	3,942	4,351
PHORATE	129,267	137,936	117,260	132,269	114,766	122,606	93,505	87,974	70,645	76,482
PHOSALONE	180	99	52	27	33	11	0	4	0	0
PHOSMET	204,175	189,827	266,605	395,247	569,587	645,430	639,025	583,128	483,889	404,934
POTASSIUM DIMETHYL DITHIO CARBAMATE	21	47	0	0	15	24,795	0	0	0	23
PROFENOFOS	51,239	264,411	245,440	184,833	150,705	40,679	49,575	43,879	22,011	24,452
PROPAMOCARB HYDROCHLORIDE	0	0	0	16,341	10,229	57,121	6,384	4,959	2,288	828
PROPETAMPHOS	23,804	38,307	77,985	23,249	17,338	9,970	6,074	4,500	3,991	2,463
PROPOXUR	2,674	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	922,025	891,478	865,199	758,608	625,101	438,638	346,216	396,982	257,282	190,149
SODIUM DIMETHYL DITHIO CARBAMATE	0	337	1	0	0	8,279	355	1,315	173	0
SULFOTEP	1,141	1,000	509	317	355	213	246	215	267	77
SULPROFOS	236	876	171	0	119	84	0	0	<1	0
TETRACHLORVINPHOS	8,321	10,053	7,134	7,171	6,054	5,946	3,975	4,850	4,711	3,285
THIOBENCARB	253,131	406,585	560,457	620,397	895,645	725,223	732,505	1,007,249	644,760	839,962
THIODICARB	<1	0	13,693	122,995	156,101	114,947	60,524	36,844	9,360	5,194
TRICHLORFON	5,607	4,275	4,552	3,327	3,843	2,476	2,779	3,992	3,004	1,545
Grand Total	14,745,269	16,041,622	17,166,557	15,487,551	16,199,776	13,133,779	12,276,894	11,632,658	9,247,467	8,547,501

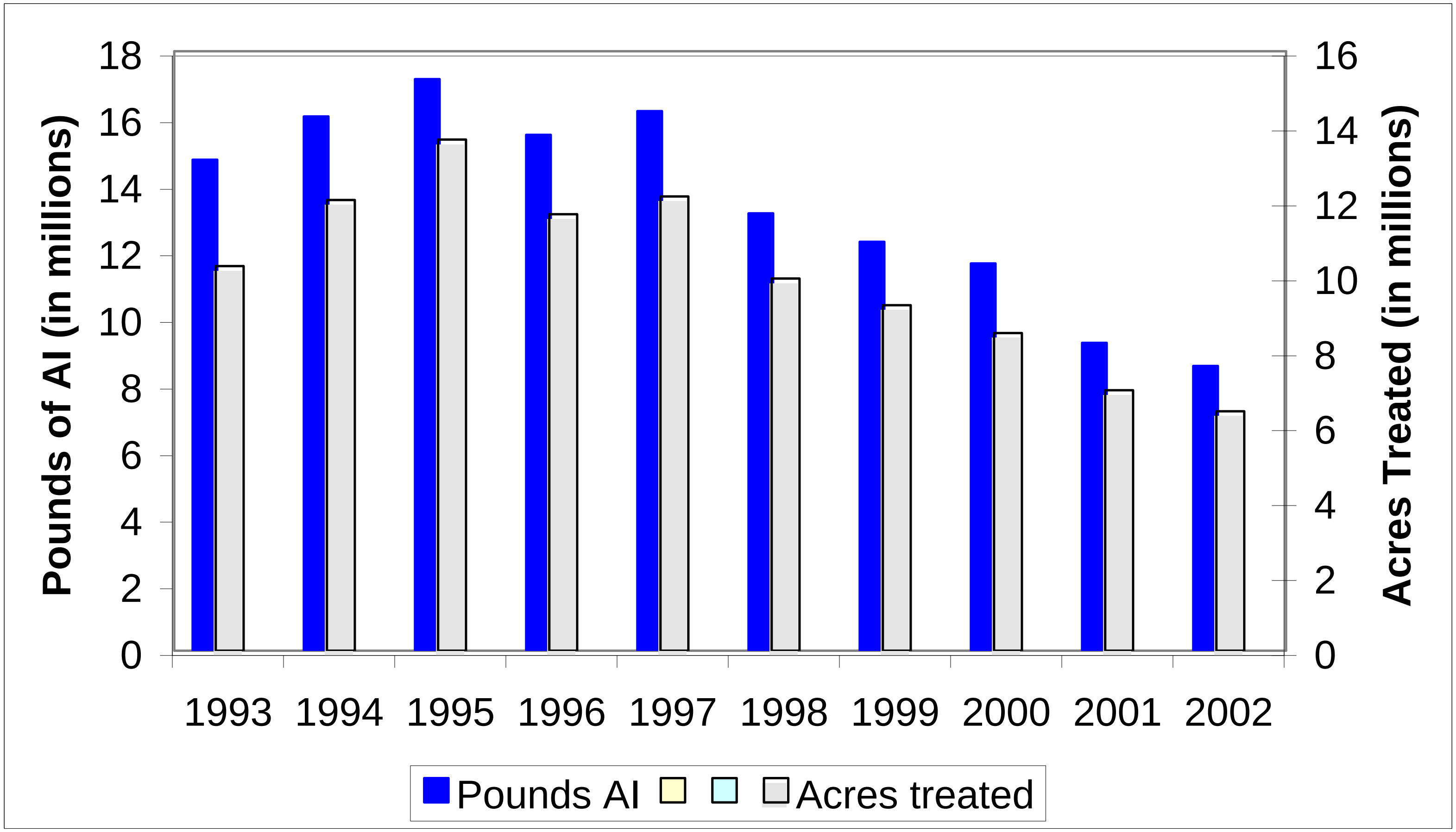
Table 5B. The reported **cumulative acres treated** with cholinesterase-inhibiting pesticides. These pesticides are the currently registered organophosphate and carbamate active ingredients. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
3-IODO-2-PROPYNYL BUTYL CARBAMATE	0	0	0	0	0	150	0	0	40	0
ACEPHATE	327,089	401,901	488,165	405,760	371,861	402,676	369,704	295,070	265,473	232,908
ALDICARB	253,719	256,314	355,284	490,309	441,380	397,506	266,615	314,106	282,143	225,820
AZINPHOS METHYL	324,531	293,375	274,286	277,721	233,370	134,327	140,197	118,805	117,467	94,035
BENDIOCARB	1,661	1,574	281	188	19	28	11	<1	2	0
BENSULIDE	15,215	17,445	22,467	31,877	45,598	61,780	80,704	72,716	62,789	60,883
BUTYLATE	24,953	23,105	14,859	17,689	17,572	14,259	14,959	6,957	6,270	4,598
CARBARYL	283,902	290,022	304,492	311,304	292,232	197,156	216,857	196,091	147,136	106,590
CARBOFURAN	396,690	460,303	449,260	363,635	321,924	303,820	272,107	258,411	246,082	182,567
CHLORPROPHAM	482	20	0	4	26	106	151	127	112	80
CHLORPYRIFOS	1,161,454	1,908,829	2,820,478	1,867,585	2,221,824	1,668,834	1,419,643	1,441,071	1,353,860	1,235,180
COUMAPHOS	0	0	0	0	0	0	0	1,339	809	733
CYCLOATE	21,505	22,559	20,682	19,587	25,940	29,711	24,474	18,460	15,874	17,213
DDVP	683	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327
DEMETON	5,363	2,489	1,583	1,002	0	18	66	0	56	0
DESMEDIPHAM	58,486	62,154	71,577	51,181	61,154	56,272	71,977	60,248	34,733	32,344
DIAZINON	826,176	876,498	750,773	680,110	529,289	477,230	545,922	478,382	437,011	489,149
DICROTOPHOS	0	0	76	9	0	16	11	0	0	0
DIMETHOATE	1,003,111	1,203,741	1,191,841	953,510	1,096,301	871,204	1,077,028	873,989	638,614	681,318
DISULFOTON	127,094	113,655	86,889	146,521	124,222	100,805	86,292	68,965	45,206	48,723
EPTC	246,484	273,148	241,338	232,641	207,977	141,496	148,534	107,543	99,939	94,240
ETHEPHON	727,183	704,232	806,219	776,159	700,784	653,686	720,584	696,769	631,076	550,255
ETHION	6,493	2,093	91	5	2	621	53	0	5	0
ETHOPROP	7,056	5,767	5,450	3,136	3,213	3,777	3,610	3,477	3,542	4,152
FENAMIPHOS	142,069	113,946	112,091	111,533	96,741	72,071	66,082	60,325	36,981	38,397
FENTHION	0	0	0	0	0	0	0	0	0	0
FONOFOS	49,690	58,575	58,872	55,126	36,111	16,884	14,131	2,308	497	234
FORMETANATE HYDROCHLORIDE	170,031	140,943	100,790	103,510	95,412	77,953	63,036	42,880	45,215	36,131
MALATHION	355,841	398,897	422,850	360,556	409,363	382,281	402,875	323,346	289,919	314,361
METHAMIDOPHOS	283,904	198,907	418,469	313,431	263,667	290,044	158,043	101,406	63,035	37,012
METHIDATHION	315,249	254,904	231,840	245,683	200,505	129,206	115,166	71,946	64,778	48,554
METHIOCARB	4,833	3,329	2,113	1,494	2,900	3,518	2,369	2,699	1,864	1,997

Table 5B (continued). The reported **cumulative acres treated** with cholinesterase-inhibiting pesticides.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
METHOMYL	930,455	1,211,786	1,422,633	1,142,867	1,375,517	1,117,102	880,070	892,502	626,867	509,104
METHYL PARATHION	171,285	137,539	129,795	125,669	125,632	128,375	119,237	43,768	39,449	37,448
MOLINATE	388,764	383,538	348,370	357,155	317,546	267,015	245,981	276,314	190,246	222,044
NALED	166,768	472,431	701,269	338,537	605,922	250,843	279,719	244,508	233,860	154,963
OXAMYL	105,354	114,501	105,245	122,084	176,677	225,178	177,023	178,975	100,201	98,313
OXYDEMETON-METHYL	234,342	225,444	253,368	220,502	243,712	186,577	252,830	225,611	199,831	193,441
PARATHION	2,459	3,404	6,661	5,089	2,067	2,590	1,974	4,025	2,977	7,026
PEBULATE	65,701	76,342	86,442	74,586	69,322	64,447	74,638	51,153	15,121	21,491
PHENMEDIPHAM	58,343	62,677	72,060	52,123	62,236	58,649	73,905	61,975	35,205	34,452
PHORATE	125,024	133,029	110,752	123,472	106,039	109,707	81,681	71,327	63,149	58,391
PHOSALONE	108	47	56	18	64	5	0	10	0	0
PHOSMET	150,404	136,489	172,448	214,378	236,563	312,472	253,199	219,662	189,244	158,970
POTASSIUM DIMETHYL DITHIO CARBAMATE	0	6	0	0	0	0	0	0	0	2
PROFENOFOS	62,047	336,785	296,677	211,730	162,140	44,638	46,241	46,615	23,585	25,997
PROPAMOCARB HYDROCHLORIDE	0	0	0	23,793	14,653	81,043	6,851	17,696	2,625	1,041
PROPETAMPHOS	0	0	0	0	0	0	0	0	0	0
PROPOXUR	<1	14	5	9	73	45	39	26	4	23
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	651,541	615,845	604,385	531,027	437,470	305,255	245,371	282,832	187,120	129,570
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	0	0	0	253	20	0	60	0
SULFOTEP	1,185	860	537	332	251	239	224	164	314	57
SULPROFOS	1,273	886	299	0	83	80	0	0	0	0
TETRACHLORVINPHOS	553	780	519	674	356	3,109	1,543	575	232	125
THIOBENCARB	65,611	91,881	126,732	159,077	227,539	187,282	186,339	252,501	169,031	222,606
THIODICARB	0	0	22,762	176,600	222,844	155,309	83,762	50,565	13,364	8,256
TRICHLORFON	2,422	818	1,037	204	149	1,071	97	70	51	19
Grand Total	10,265,545	12,030,218	13,644,217	11,650,532	12,126,885	9,932,936	9,220,574	8,478,549	6,951,857	6,392,624

Figure 3. Use trends of cholinesterase-inhibiting pesticides, which includes pesticides with organophosphate and carbamate active ingredients. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES ON DPR'S GROUND WATER PROTECTION LIST

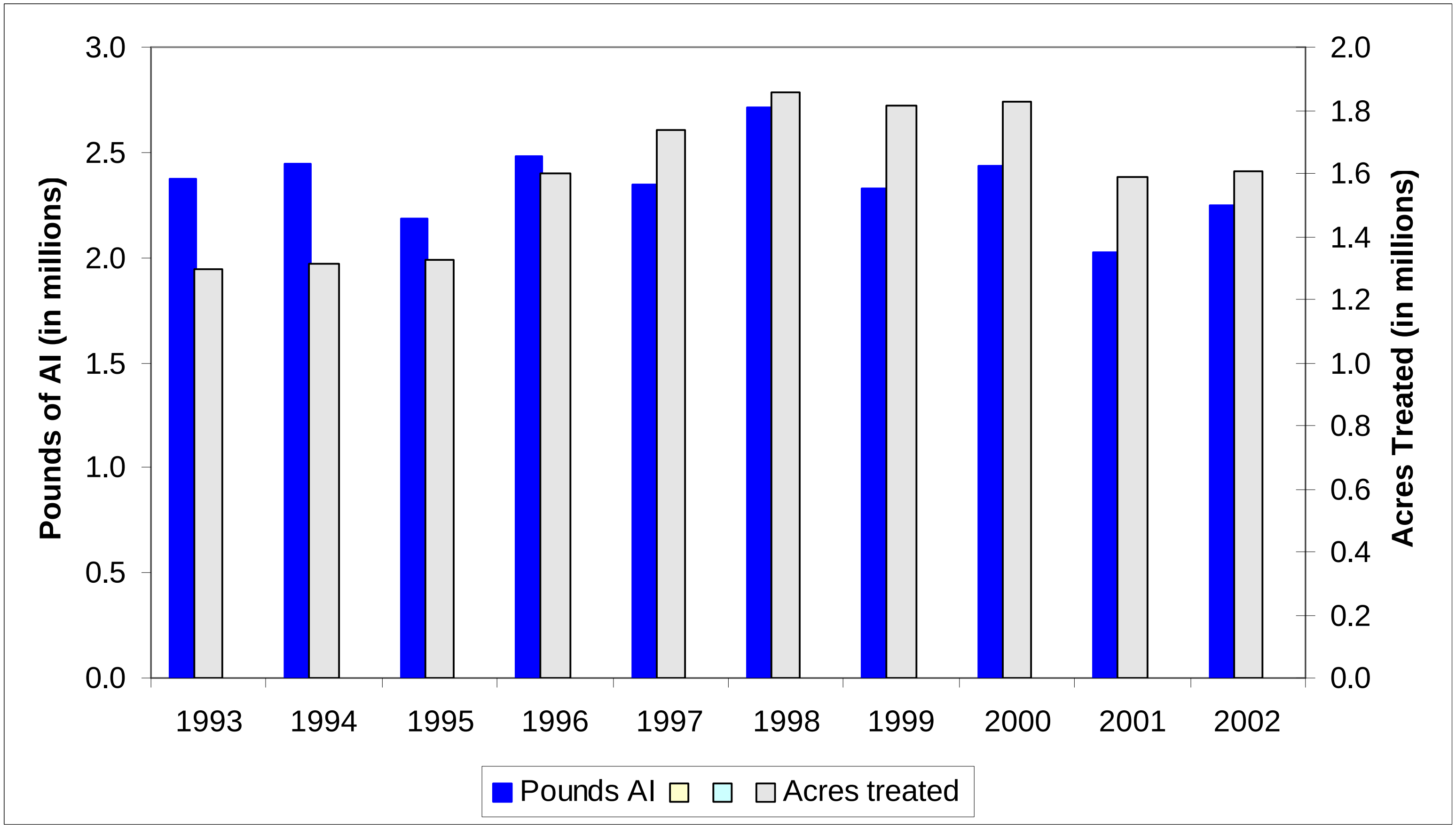
Table 6A. The reported **pounds** of pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ATRAZINE	46,101	48,256	37,618	59,212	48,482	57,003	72,175	57,403	62,872	59,292
ATRAZINE, OTHER RELATED	977	1,032	823	1,393	1,055	1,296	1,510	1,224	1,321	1,237
BENTAZON, SODIUM SALT	1,017	1,175	655	1,518	1,907	1,757	1,876	1,210	374	757
BROMACIL	117,135	104,643	95,447	98,293	82,546	84,646	75,613	67,758	56,061	55,664
BROMACIL, LITHIUM SALT	7,045	11,085	6,517	17,381	9,141	4,686	4,162	4,478	3,217	4,016
DIURON	1,075,139	1,235,444	1,055,454	1,266,123	1,228,786	1,505,299	1,188,949	1,344,023	1,105,678	1,303,015
NORFLURAZON	164,514	154,752	153,155	196,306	212,767	265,970	286,329	257,719	209,818	188,032
PROMETON	41	84	117	68	20	22	4	28	2	21
SIMAZINE	958,325	890,493	837,559	840,194	766,037	795,320	697,289	701,018	586,458	634,081
Grand Total	2,370,294	2,446,962	2,187,344	2,480,487	2,350,740	2,715,998	2,327,907	2,434,859	2,025,800	2,246,113

Table 6B. The reported **cumulative acres treated** in California with pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ATRAZINE	23,526	31,545	22,187	32,041	27,257	37,550	39,879	34,524	33,371	28,594
ATRAZINE, OTHER RELATED	23,526	31,545	22,187	32,040	27,257	37,523	39,874	34,524	33,371	28,594
BENTAZON, SODIUM SALT	1,107	1,688	801	1,460	1,987	1,904	1,968	1,502	431	1,094
BROMACIL	77,599	64,978	66,030	62,085	58,662	56,974	53,818	42,422	30,087	29,585
BROMACIL, LITHIUM SALT	0	0	0	0	0	40	40	30	0	0
DIURON	413,461	454,082	506,876	685,055	819,525	864,776	849,304	864,026	786,383	796,903
NORFLURAZON	142,202	139,333	133,444	178,963	186,971	214,058	217,070	230,751	192,004	161,702
PROMETON	11	8	23	27	8	85	18	51	0	174
SIMAZINE	614,669	589,002	573,252	606,898	612,751	646,770	611,263	619,442	513,819	561,195
Grand Total	1,296,103	1,312,181	1,324,800	1,598,568	1,734,418	1,859,680	1,813,233	1,827,272	1,589,466	1,607,840

Figure 4. Use trends of pesticides on DPR's ground water protection list. These pesticides are the currently registered active ingredients listed in section 6800(a) of the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF PESTICIDES ON DPR'S TOXIC AIR CONTAMINANTS LIST

Table 7A. The reported **pounds** of pesticides on DPR's toxic air contaminants list applied in California. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1,3-DICHLOROPROPENE	47,694	2,122	409,821	1,956,846	2,457,170	3,011,057	3,130,745	4,446,910	4,135,583	5,359,193
2,4-D	26,461	27,556	24,012	22,097	10,228	3,868	3,060	2,065	1,787	1,691
2,4-D, 2-ETHYLHEXYL ESTER	12	71	278	10	1,313	13,755	72,225	12,557	13,706	15,140
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	35,378	28,863	30,822	28,633	25,684	29,414	15,992	6,556	674	452
2,4-D, BUTOXYETHANOL ESTER	47,671	67,793	31,966	38,624	13,297	12,854	5,628	6,107	5,336	3,482
2,4-D, BUTOXYPROPYL ESTER	1,852	794	0	4	13	31	5	4	3	0
2,4-D, BUTYL ESTER	0	1	39	0	0	2,180	42	21	<1	593
2,4-D, DIETHANOLAMINE SALT	1,572	714	1,938	3,003	24,812	14,948	5,843	13,002	6,652	8,020
2,4-D, DIMETHYLAMINE SALT	350,522	399,405	454,879	469,475	430,305	422,868	356,360	426,458	399,803	423,320
2,4-D, DODECYLAMINE SALT	0	5	16	8	58	75	730	0	257	322
2,4-D, HEPTYLAMINE SALT	0	0	86	<1	0	0	46	0	0	<1
2,4-D, ISOOCTYL ESTER	2,659	1,212	13,466	7,822	60,356	46,761	17,387	6,914	15,828	12,339
2,4-D, ISOPROPYL ESTER	4,592	4,541	5,108	5,145	6,558	7,539	6,892	8,267	6,634	7,843
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	670	672	37	35	0	3	7	11	0	0
2,4-D, OCTYL ESTER	0	0	15	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	2,529	2,337	2,037	1,789	1,616	1,002	1,822	786	391	634
2,4-D, TETRADECYLAMINE SALT	0	1	4	2	13	17	170	0	60	75
2,4-D, TRIETHYLAMINE SALT	107,793	121,301	105,745	93,915	34,616	5,688	2,344	1,038	634	426
2,4-D, TRIISOPROPYLAMINE SALT	10	24	6	2	3	5	6	0	5	9
ACROLEIN	308,270	347,982	362,789	322,578	341,245	264,207	328,238	290,180	233,928	283,541
ALUMINUM PHOSPHIDE	165,874	86,740	80,710	104,601	89,301	68,173	123,742	119,560	100,059	458,473
ARSENIC ACID	13,014	27,571	37,248	53,777	59,835	52,558	48,029	11,906	12,023	4,976
ARSENIC PENTOXIDE	150,200	86,445	83,814	205,089	64,372	50,899	245,238	91,406	259,386	194,650
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	1	1	<1	<1	<1
CAPTAN	484,326	608,789	735,884	919,166	800,635	1,545,397	966,180	642,756	398,851	392,205
CAPTAN, OTHER RELATED	12,067	14,749	17,693	21,639	19,317	35,991	22,222	14,617	9,008	8,945
CARBARYL	773,675	821,208	836,692	810,251	755,147	427,739	388,280	365,328	287,070	256,022
CHLORINE	466,827	750,692	2,825,595	401,591	452,049	431,546	636,804	678,417	297,086	502,944
CHROMIC ACID	209,555	120,822	117,092	286,521	89,931	71,109	343,543	128,836	363,205	272,300

Table 7A (continued). The reported **pounds** of pesticides on DPR's toxic air contaminants list applied in California.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
DAZOMET	2,570	3,026	5,875	12,851	13,951	12,547	12,415	10,489	44,333	45,020
DDVP	3,348	4,798	6,066	13,122	13,639	14,055	12,325	12,718	12,787	8,524
ETHYLENE OXIDE	1,471	3	0	0	0	31	2	6	3	0
FORMALDEHYDE	13,322	11,864	153,519	334,548	416,457	348,320	111,714	55,300	28,612	14,035
HYDROGEN CHLORIDE	32	206	224	1,938	129	762	11,067	3,316	4,276	4,256
LINDANE	9,733	5,305	4,637	4,606	5,407	6,324	4,842	4,738	2,388	1,633
MAGNESIUM PHOSPHIDE	1,436	3,053	4,615	3,600	3,931	4,132	3,540	3,541	2,493	4,811
MANCOZEB	446,185	465,191	659,407	568,069	528,104	989,157	631,288	611,502	430,395	396,142
MANEB	625,900	913,129	1,258,164	1,329,370	1,082,970	1,597,129	1,046,198	1,203,966	817,326	851,643
META-CRESOL	5	2	2	3	6	8	11	14	1	1
METAM-SODIUM	8,588,971	11,131,814	15,098,481	15,433,996	15,355,507	13,923,818	17,170,765	13,075,487	12,278,902	14,635,108
METHANOL	1,920	100	27	0	0	0	3	<1	0	0
METHOXYCHLOR	1,412	692	1,049	484	358	566	16	26	41	144
METHOXYCHLOR, OTHER RELATED	52	90	139	62	44	11	<1	0	<1	0
METHYL BROMIDE	14,208,365	16,806,993	17,319,465	16,106,301	16,038,048	13,739,508	15,353,832	10,880,905	6,704,435	6,538,200
METHYL PARATHION	154,862	129,324	140,831	130,642	153,789	158,413	157,598	75,169	59,742	53,644
NAPHTHALENE	1	1	<1	0	1	333	<1	0	0	<1
PARA-DICHLOROBENZENE	37	3	2	4	3	219	86	4	11	1
PARATHION	4,665	6,104	13,642	14,050	5,199	5,762	4,041	3,581	2,589	3,205
PCNB	89,276	91,908	109,811	87,967	89,553	88,308	67,432	62,260	50,325	42,766
PCP, OTHER RELATED	10,596	5	<1	<1	1	2	11	54	2	2
PCP, SODIUM SALT	2,361	0	0	0	0	2	0	0	<1	0
PCP, SODIUM SALT, OTHER RELATED	329	0	0	0	0	0	0	0	0	0
PENTACHLOROPHENOL	91,123	40	3	3	8	33	92	466	14	17
PHOSPHORUS	132	29	34	58	14	12	9	22	3	1
POTASSIUM N-METHYLDITHIO CARBAMATE	0	0	0	0	2,283	9,143	0	105,364	424,123	250,251
POTASSIUM PERMANGANATE	0	0	0	0	0	243	0	0	0	0
PROPOXUR	2,674	2,667	3,296	1,341	1,760	1,604	1,735	2,141	611	449
PROPYLENE OXIDE	34,832	41,815	131,639	224,495	198,559	198,595	172,556	118,381	99,773	99,674
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	922,025	891,478	865,199	758,608	625,101	438,638	346,216	396,982	257,282	190,149
SODIUM CYANIDE	1,584	1,740	1,334	1,326	2,176	3,263	1,098	2,178	2,437	2,542
SODIUM DICHROMATE	0	0	0	180,478	182,185	122,647	32,699	122	329	633
SODIUM TETRATHIOCARBONATE	134,192	63,687	226,590	543,229	799,092	898,908	688,701	596,028	375,487	332,787
TRIFLURALIN	1,194,652	1,262,481	1,382,116	1,146,100	1,193,205	1,220,252	1,263,407	1,161,550	932,035	1,092,129
XYLENE	45,138	29,001	18,042	12,624	8,517	5,362	4,847	4,292	9,760	2,680
ZINC PHOSPHIDE	3,299	2,933	1,610	1,219	2,333	1,202	5,449	1,607	1,119	980
Grand Total	29,809,721	35,391,892	43,583,610	42,663,718	42,460,204	40,308,994	43,825,580	35,665,911	29,089,602	32,779,020

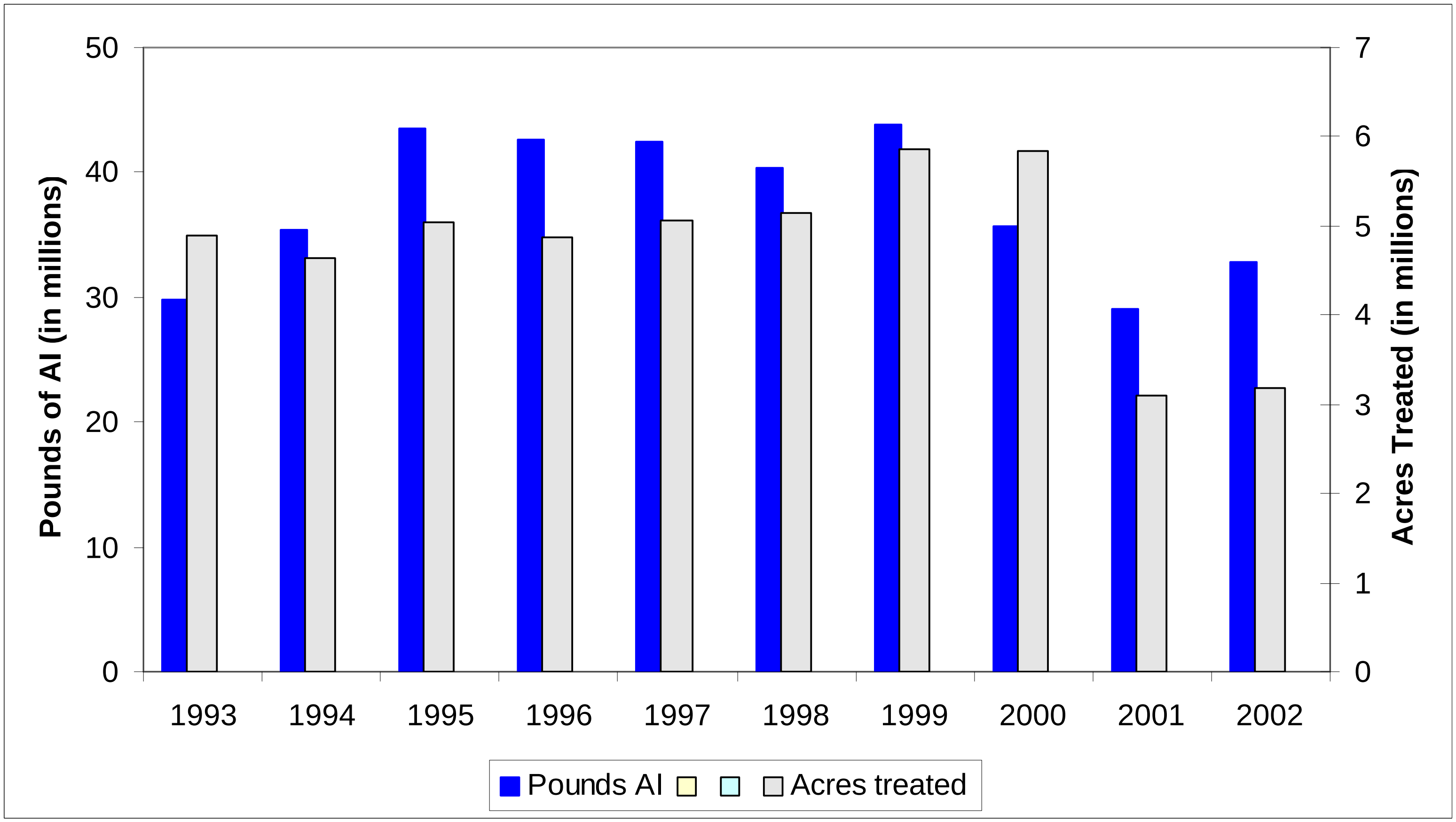
Table 7B. The reported **cumulative acres treated** in California with pesticides on DPR's toxic air contaminants list. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres treated for all active ingredients because some products contain more than one active ingredient. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1,3-DICHLOROPROPENE	823	33	4,174	17,152	22,072	26,885	29,411	33,019	30,727	42,064
2,4-D	156,292	156,542	151,261	137,211	50,654	11,649	7,791	5,054	3,952	2,295
2,4-D, 2-ETHYLHEXYL ESTER	80	65	385	160	729	6,867	7,624	7,833	6,919	9,906
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	33,103	26,110	22,298	21,855	20,055	22,106	11,815	5,711	359	264
2,4-D, BUTOXYETHANOL ESTER	35,557	46,271	29,938	35,597	13,504	13,810	7,169	7,013	5,633	2,565
2,4-D, BUTOXYPROPYL ESTER	57	98	0	2	51	93	37	5	9	0
2,4-D, BUTYL ESTER	0	0	0	0	0	307	37	24	1	101
2,4-D, DIETHANOLAMINE SALT	1,710	933	4,683	8,721	88,109	58,166	23,875	49,357	27,662	36,290
2,4-D, DIMETHYLAMINE SALT	387,812	473,950	523,192	539,961	527,043	477,890	411,683	495,320	475,245	491,048
2,4-D, DODECYLAMINE SALT	0	0	0	0	76	82	1,481	0	262	276
2,4-D, HEPTYLAMINE SALT	0	0	18	<1	0	0	29	0	0	0
2,4-D, ISOOCTYL ESTER	220	379	3,497	5,163	35,035	29,179	14,449	3,970	16,304	6,925
2,4-D, ISOPROPYL ESTER	61,201	63,198	72,753	69,016	87,412	101,038	100,795	103,934	88,817	108,908
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	1,475	449	36	26	0	2	3	0	0	0
2,4-D, OCTYL ESTER	0	0	0	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	33,902	28,812	22,655	23,846	21,479	13,974	15,542	11,278	5,200	7,468
2,4-D, TETRADECYLAMINE SALT	0	0	0	0	76	82	1,481	0	262	276
2,4-D, TRIETHYLAMINE SALT	149,511	152,453	146,262	131,662	46,545	7,381	2,638	1,311	1,257	688
2,4-D, TRIISOPROPYLAMINE SALT	0	0	0	0	0	0	0	0	0	0
ACROLEIN	243	888	3,190	2,462	1,514	292	3,981	873	1,409	2,206
ALUMINUM PHOSPHIDE	154,117	120,297	92,918	79,907	535,790	74,073	1,034,407	1,271,485	67,162	70,176
ARSENIC ACID	0	0	0	0	0	0	0	0	0	0
ARSENIC PENTOXIDE	0	550	0	0	0	0	0	709,893	56	0
ARSENIC TRIOXIDE	0	0	0	0	0	0	0	0	0	1
CAPTAN	211,942	243,651	294,222	379,499	346,351	601,897	404,224	309,211	213,257	213,438
CAPTAN, OTHER RELATED	209,999	243,584	294,192	379,498	345,955	601,798	404,004	308,559	213,246	213,388
CARBARYL	283,902	290,022	304,492	311,304	292,232	197,156	216,857	196,091	147,136	106,590
CHLORINE	4	0	290	0	1,764	1,329	46,611	37,220	95	150
CHROMIC ACID	0	550	0	0	0	0	0	709,893	56	0

Table 7B (continued). The reported **cumulative acres treated** in California with pesticides on the toxic air contaminants list.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
DAZOMET	8	59	384	861	1,099	3,589	243	222	224	136
DDVP	683	1,888	1,887	1,499	2,596	3,692	2,180	2,336	3,954	4,327
ETHYLENE OXIDE	0	0	0	0	0	194	31	41	0	0
FORMALDEHYDE	132	15	137	234	12	126	123	47	53	33
HYDROGEN CHLORIDE	0	1	0	1	0	16	0	0	27	590
LINDANE	26,888	22,898	19,309	25,283	36,536	32,523	20,867	14,628	13,832	8,010
MAGNESIUM PHOSPHIDE	37	0	23	19	26	184	616,017	46	373	7
MANCOZEB	262,528	273,689	405,133	351,153	283,858	683,391	386,627	362,693	227,655	197,055
MANEB	372,082	510,429	650,232	729,576	622,124	938,924	628,976	610,474	533,808	554,787
META-CRESOL	1,585	930	1,279	1,309	3,488	1,407	657	3,142	517	267
METAM-SODIUM	135,687	183,209	199,025	215,497	198,072	153,885	185,869	146,268	124,447	141,357
METHANOL	5	0	0	0	0	0	0	14	0	0
METHOXYCHLOR	233	220	30	19	130	194	140	197	88	24
METHOXYCHLOR, OTHER RELATED	1	70	5	9	52	5	0	0	0	0
METHYL BROMIDE	592,362	106,236	110,729	87,240	112,795	89,836	101,979	75,609	60,596	53,100
METHYL PARATHION	171,285	137,539	129,795	125,669	125,632	128,375	119,237	43,768	39,449	37,448
NAPHTHALENE	0	0	0	0	0	0	0	0	0	20
PARA-DICHLOROBENZENE	<1	0	0	0	0	10	0	0	0	0
PARATHION	2,459	3,404	6,661	5,089	2,067	2,590	1,974	4,025	2,977	7,026
PCNB	60,971	55,366	53,032	44,110	29,065	39,036	28,150	28,463	25,803	9,533
PCP, OTHER RELATED	0	2	<1	15	4	15	0	59	38	0
PCP, SODIUM SALT	0	0	0	0	0	20	0	0	0	0
PCP, SODIUM SALT, OTHER RELATED	0	0	0	0	0	0	0	0	0	0
PENTACHLOROPHENOL	0	2	<1	15	4	190	0	59	38	0
PHOSPHORUS	8,098	3,435	1,908	69	790	965	5,113	2,847	252	0
POTASSIUM N-METHYLDITHIO CARBAMATE	0	0	0	0	21	50	0	534	2,294	9,073
POTASSIUM PERMANGANATE	0	0	0	0	0	20	0	0	0	0
PROPOXUR	<1	14	5	9	73	45	39	26	4	23
PROPYLENE OXIDE	0	0	0	0	<1	0	573	0	0	<1
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	651,541	615,845	604,385	531,027	437,470	305,255	245,371	282,832	187,120	129,570
SODIUM CYANIDE	0	82,520	6,040	3,020	84,800	53,285	0	0	0	0
SODIUM DICHROMATE	0	0	0	0	0	0	0	0	0	0
SODIUM TETRATHIOCARBONATE	7,464	3,706	12,997	27,736	35,366	34,396	24,790	20,960	13,561	11,559
TRIFLURALIN	1,193,456	1,158,686	1,282,073	1,086,074	1,129,689	1,082,061	1,159,227	1,038,444	800,491	944,334
XYLENE	48,345	28,659	28,746	24,208	13,558	11,324	3,325	6,208	9,665	4,533
ZINC PHOSPHIDE	18,992	27,602	16,101	22,790	26,655	18,794	38,101	16,337	11,069	7,049
Grand Total	4,888,928	4,643,322	5,028,729	4,874,029	5,064,022	5,134,716	5,864,595	5,838,113	3,102,859	3,173,973

Figure 5. Use trends of pesticides on DPR's toxic air contaminants list. These pesticides are the currently registered active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, section 6860. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF OIL PESTICIDES

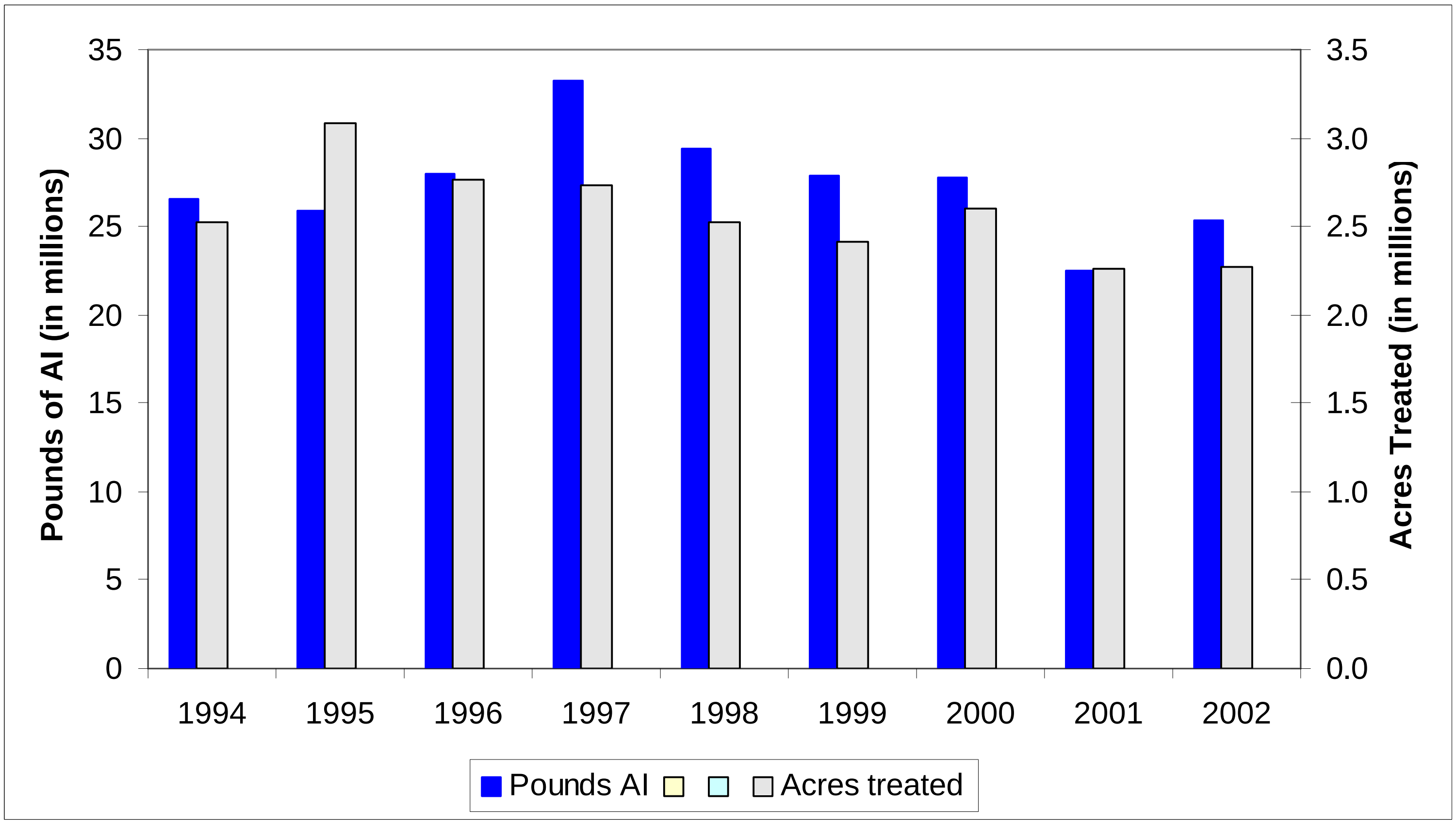
Table 8A. The reported **pounds** of oil pesticides. As a broad group, oil pesticides and other petroleum distillates are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer." However, these classifications do not distinguish among oil pesticides that may not qualify as carcinogenic due to their degree of refinement. Many such oil pesticides also serve as alternatives to high-toxicity chemicals. For this reason, oil pesticide data was classified separately in this report. Use includes both agricultural and reportable nonagricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
COAL TAR HYDROCARBONS	0	0	0	0	0	0	0	0	50	<1
ISOPARAFFINIC HYDROCARBONS	12	8	10	5	2	35	8	13	1	1,928
KEROSENE	153,940	152,431	146,042	121,014	101,404	90,156	70,675	84,562	48,317	18,402
MINERAL OIL	2,715,978	3,446,377	3,358,659	4,799,092	5,571,896	5,054,204	4,425,815	3,904,076	3,625,662	5,012,116
NAPHTHA, HEAVY AROMATIC	56	27	26	143	83	0	0	0	29	0
PETROLEUM DERIVATIVE RESIN	1,117	551	4	94	15	6	1	3	1	<1
PETROLEUM DISTILLATES	3,200,616	2,280,236	2,460,360	1,711,887	1,799,834	1,612,969	2,419,864	2,306,577	1,741,783	1,553,623
PETROLEUM DISTILLATES, ALIPHATIC	0	0	0	0	0	0	0	<1	7	49,237
PETROLEUM DISTILLATES, AROMATIC	81,300	64,527	31,575	14,630	14,376	35,085	9,925	10,400	2,648	6,202
PETROLEUM DISTILLATES, REFINED	21,157	63,657	45,970	38,423	47,909	61,305	114,550	928,006	842,893	267,386
PETROLEUM HYDROCARBONS	834,803	367,336	659,151	859,299	788,897	515,816	399,816	397,032	499,955	554,623
PETROLEUM NAPHTHENIC OILS	28	320	0	12	1	9	2	3	91	325
PETROLEUM OIL, PARAFFIN BASED	447,822	441,784	435,531	306,271	268,353	270,947	311,309	368,635	418,291	275,902
PETROLEUM OIL, UNCLASSIFIED	21,802,474	19,689,304	18,725,985	20,100,151	24,681,455	21,780,895	20,145,995	19,770,210	15,364,997	17,647,949
PETROLEUM SULFONATES	1	1	<1	4	1	<1	<1	1	<1	<1
Grand Total	29,259,304	26,506,560	25,863,313	27,951,024	33,274,225	29,421,427	27,897,960	27,769,517	22,544,724	25,387,693

Table 8B. The reported **cumulative acres treated** in California with oil pesticides. (See qualifying comments on U.S. EPA B2 carcinogen and Proposition 65 listing with Table 8A.) Uses include primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
COAL TAR HYDROCARBONS	0	0	0	0	0	0	0	0	0	0
ISOPARAFFINIC HYDROCARBONS	0	<1	0	0	0	0	0	0	0	4,490
KEROSENE	264,140	284,682	332,711	289,303	239,944	223,683	179,919	227,265	138,871	29,561
MINERAL OIL	85,112	130,371	144,012	190,382	191,728	183,162	163,301	157,463	169,008	199,089
NAPHTHA, HEAVY AROMATIC	0	0	0	0	0	0	0	0	11	0
PETROLEUM DERIVATIVE RESIN	2,089	1,321	3	191	50	13	1	0	0	0
PETROLEUM DISTILLATES	303,729	340,518	440,125	378,378	308,191	279,372	229,360	286,246	218,817	210,850
PETROLEUM DISTILLATES, ALIPHATIC	0	0	0	0	0	0	0	0	5,104	44,494
PETROLEUM DISTILLATES, AROMATIC	73,509	66,215	53,120	12,323	19,002	2,148	7,082	6,206	1,865	3,935
PETROLEUM DISTILLATES, REFINED	1,808	4,173	3,953	5,145	6,055	6,162	12,495	42,143	48,411	35,407
PETROLEUM HYDROCARBONS	525,089	429,252	723,984	759,175	713,461	640,382	579,846	598,010	608,747	634,317
PETROLEUM NAPHTHENIC OILS	12	540	0	73	0	50	37	0	5,119	13,241
PETROLEUM OIL, PARAFFIN BASED	756,085	664,314	680,084	463,948	442,920	431,821	469,815	462,577	447,135	416,525
PETROLEUM OIL, UNCLASSIFIED	630,200	602,699	702,697	663,188	811,113	753,271	775,360	816,166	628,365	703,820
PETROLEUM SULFONATES	0	0	<1	<1	<1	0	<1	10	0	0
Grand Total	2,641,586	2,523,535	3,080,530	2,761,933	2,732,379	2,520,013	2,417,118	2,596,064	2,260,377	2,275,598

Figure 6. Use trends of oil pesticides. As a broad group, oil pesticides and other petroleum distillates are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer." However, these classifications do not distinguish among oil pesticides that may not qualify as carcinogenic due to their degree of refinement. Many such oil pesticides also serve as alternatives to high-toxicity chemicals. For this reason, oil pesticide data was classified separately in this report. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF REDUCED-RISK PESTICIDES

Table 9A. The reported **pounds** of reduced-risk pesticides applied in California. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Use includes both agricultural and reportable nonagricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	0	<1	<1
ACETAMIPRID	0	0	0	0	0	0	0	0	0	6,434
ACIBENZOLAR-S-METHYL	0	0	0	0	0	0	0	0	219	1,157
AZOXYSTROBIN	0	0	0	0	23,851	70,283	95,929	115,828	85,813	95,818
BIFENAZATE	0	0	0	0	0	0	0	92	523	24,714
BISPYRIBAC-SODIUM	0	0	0	0	0	0	0	0	0	2,378
BUPROFEZIN	0	0	0	0	6,987	8,459	22,289	678	3,439	22,302
CARBO METHOXY ETHER CELLULOSE, SODIUM SALT	0	92	184	22,994	1,032	723	638	436	543	6
CARFENTRAZONE-ETHYL	0	0	0	0	0	3,076	2,736	0	492	2,128
CINNAMALDEHYDE	0	0	0	0	<1	<1	6,769	10,332	4,704	299
CORN GLUTEN MEAL	0	0	0	0	0	0	2,490	4,590	2,744	1,294
CYPRODINIL	0	0	0	0	0	48,715	56,375	98,773	81,359	99,483
FENHEXAMID	0	0	0	0	0	0	12,386	36,240	39,517	50,073
FIPRONIL	0	0	0	0	<1	1	2	662	7,849	15,017
FLUDIOXONIL	0	0	0	0	0	551	349	568	974	5,021
FORCHLORFENURON	0	0	0	0	0	0	0	0	43	35
HEXAFLUMURON	0	0	<1	<1	<1	2	8	8	12	93
IMAZAMOX, AMMONIUM SALT	0	0	0	0	0	0	0	0	0	1,490
INDOXACARB	0	0	0	0	0	0	0	3,535	29,104	27,098
IRON PHOSPHATE	0	0	0	0	0	66	187	340	617	545
MEFENOXAM	0	0	0	43	29,082	60,067	55,960	60,436	49,926	54,562
METHYL ANTHRANILATE	0	0	0	6	184	49	57	50	36	85
NOVALURON	0	0	0	0	0	0	0	0	0	2

Table 9A (continued). The reported **pounds** of reduced-risk pesticides applied in California.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
OIL OF PEPPERMINT	0	0	0	0	0	0	0	0	<1	0
OXYPURINOL	0	0	0	0	0	0	0	<1	<1	0
POTASSIUM BICARBONATE	0	0	0	0	28	65,913	93,003	130,472	121,794	179,676
PROHEXADIONE CALCIUM	0	0	0	0	0	0	0	0	47	52
PYMETROZINE	0	0	0	0	0	0	18	829	1,284	1,420
PYRIPROXYFEN	0	0	0	0	3,233	6,083	3,128	14,040	7,700	9,782
SODIUM BICARBONATE	29	0	0	0	0	0	5	22	230	2,063
SPINOSAD	0	0	0	0	10,153	29,783	44,630	55,446	51,097	53,572
TEBUFENOZIDE	0	0	7,955	3,465	5,300	9,188	8,836	62,416	65,778	65,090
THIAMETHOXAM	0	0	0	0	0	0	0	0	0	10,897
TRIFLOXYSTROBIN	0	0	0	0	0	0	0	45,938	12,347	18,321
XANTHINE	0	0	0	0	0	0	0	<1	<1	0
Grand Total	29	92	8,138	26,509	79,850	302,961	405,795	641,730	568,190	750,907

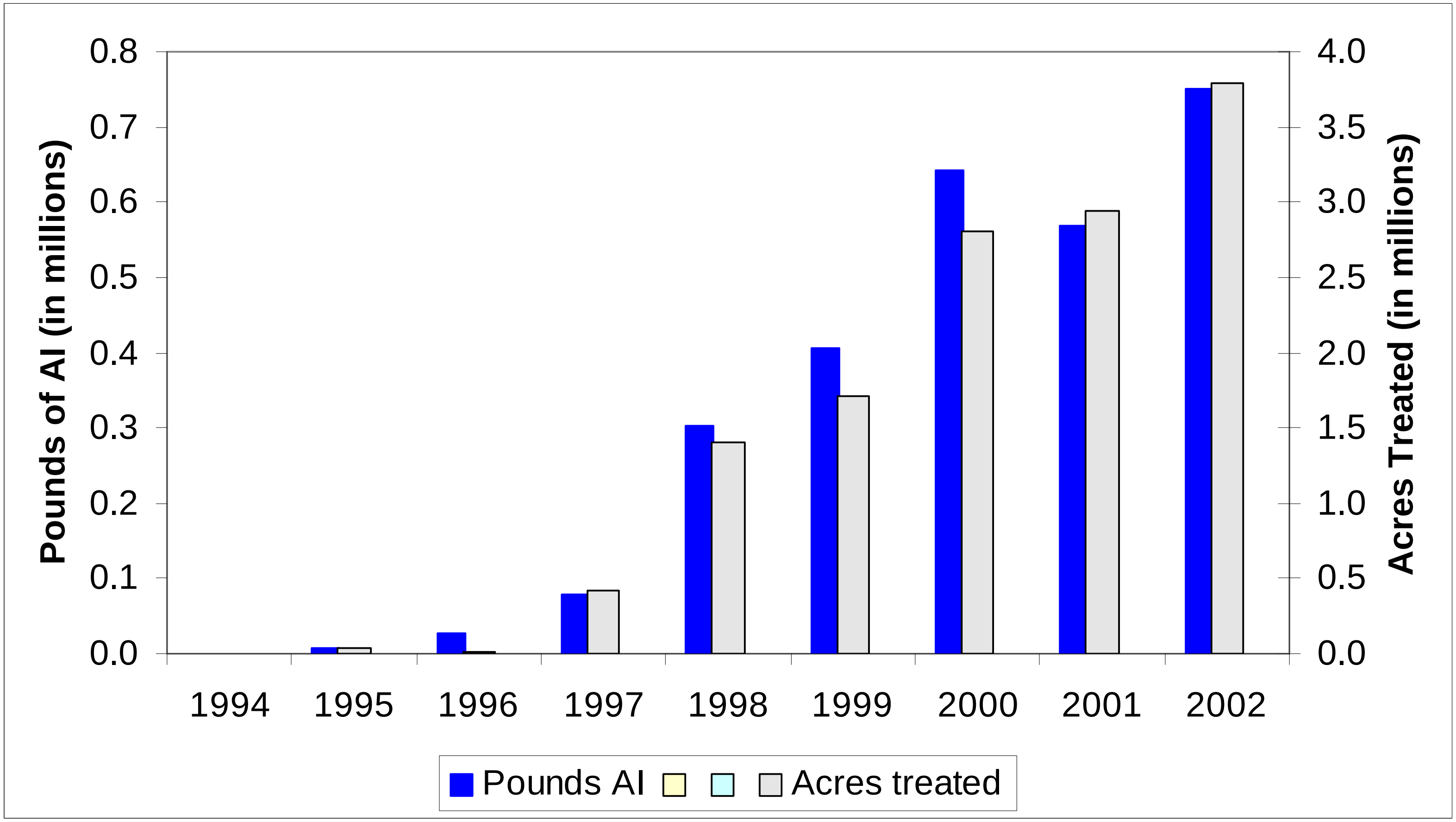
Table 9B. The reported **cumulative acres treated** of reduced-risk pesticides in California. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Use includes primarily agricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	0	3	<1
ACETAMIPRID	0	0	0	0	0	0	0	0	0	87,041
ACIBENZOLAR-S-METHYL	0	0	0	0	0	0	0	0	7,864	39,749
AZOXYSTROBIN	0	0	0	0	28,420	340,226	449,373	581,616	443,525	511,046
BIFENAZATE	0	0	0	0	0	0	0	249	2,170	58,876
BISPYRIBAC-SODIUM	0	0	0	0	0	0	0	0	0	80,499
BUPROFEZIN	0	0	0	0	18,560	8,367	15,798	1,966	10,012	32,716
CARBO METHOXY ETHER CELLULOSE, SODIUM SALT	0	61	112	235	328	83	77	197	484	5
CARFENTRAZONE-ETHYL	0	0	0	0	0	38,578	17,800	0	7,027	16,440
CINNAMALDEHYDE	0	0	0	0	<1	<1	2,407	4,136	1,533	295
CORN GLUTEN MEAL	0	0	0	0	0	0	0	0	7	3
CYPRODINIL	0	0	0	0	0	122,708	185,962	314,650	282,566	346,342
FENHEXAMID	0	0	0	0	0	0	18,325	56,914	69,779	84,525
FIPRONIL	0	0	0	0	0	0	0	0	1	1
FLUDIOXONIL	0	0	0	0	0	0	1,102	343	431	21,654
FORCHLORFENURON	0	0	0	0	0	0	0	0	786	882
HEXAFLUMURON	0	0	0	0	0	0	0	0	1	0
IMAZAMOX, AMMONIUM SALT	0	0	0	0	0	0	0	0	0	34,700
INDOXACARB	0	0	0	0	0	0	0	33,833	390,045	365,901
IRON PHOSPHATE	0	0	0	0	0	205	470	852	1,036	1,929
MEFENOXAM	0	0	0	40	153,547	360,078	335,238	405,500	272,505	283,752
METHYL ANTHRANILATE	0	0	0	0	0	0	0	0	0	81
NOVALURON	0	0	0	0	0	0	0	0	0	34

Table 9B (continued). The reported **cumulative acres treated** in California with each reduced-risk pesticide.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
OIL OF PEPPERMINT	0	0	0	0	0	0	0	0	0	0
OXYPURINOL	0	0	0	0	0	0	0	0	0	0
POTASSIUM BICARBONATE	0	0	0	0	11	33,964	52,021	60,089	52,571	73,894
PROHEXADIONE CALCIUM	0	0	0	0	0	0	0	0	156	341
PYMETROZINE	0	0	0	0	0	0	98	4,510	10,326	10,859
PYRIPROXYFEN	0	0	0	0	60,072	64,583	35,269	72,903	100,273	142,040
SODIUM BICARBONATE	0	0	0	0	0	0	8	0	0	0
SPINOSAD	0	0	0	0	128,018	383,152	540,681	679,466	692,905	731,544
TEBUFENOZIDE	0	0	32,418	14,446	28,556	53,588	52,304	387,356	399,712	348,320
THIAMETHOXAM	0	0	0	0	0	0	0	0	0	255,350
TRIFLOXYSTROBIN	0	0	0	0	0	0	0	198,192	200,594	278,530
XANTHINE	0	0	0	0	0	0	0	0	0	0
Grand Total	0	61	32,530	14,721	417,512	1,405,533	1,706,933	2,802,773	2,946,189	3,791,152

Figure 7. Use trends of reduced-risk pesticides. These active ingredients are contained in pesticide products that have been given reduced-risk status by U.S. EPA. Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



USE TRENDS OF BIOPESTICIDES

Table 10A. The reported **pounds** of biopesticides applied in California. Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Use includes both agricultural and reportable nonagricultural applications. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
(E)-4-TRIDECEN-1-YL-ACETATE	13	3	12	140	76	65	67	261	182	247
(E)-5-DECENOL	0	0	12	72	738	176	246	5	2	2
(E)-5-DECENYL ACETATE	0	0	58	346	3,512	845	1,184	26	10	12
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	0	<1	0	0	<1	0	<1	0	0
(S)-KINOPRENE	0	11	18	137	121	1,264	357	245	310	326
(Z)-11-HEXADECENAL	0	0	0	0	0	0	0	0	0	35
(Z)-4-TRIDECEN-1-YL-ACETATE	4	<1	<1	4	2	2	2	9	6	8
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	16	3	30	2	1	46	229	3	13	2
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	1	3	2	2	1	46	242	3	<1	3
1-DECANOL	4	1	1	1	<1	<1	<1	<1	<1	0
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	0	<1	<1
1-NAPHTHALENEACETAMIDE	86	72	54	99	115	283	333	217	213	88
ACETIC ACID	1	5	5	6	4	1	20	2	1	9
AGROBACTERIUM RADIOBACTER	2	4	7	14	28	20	7	2	1	4
AGROBACTERIUM RADIOBACTER, STRAIN K1026	0	0	0	0	0	0	0	<1	<1	1
ALLYL ISOTHIOCYANATE	0	0	0	0	<1	0	0	<1	<1	<1
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	0	0	0	0	0	8	1	<1	1	1
AMPELOMYCES QUISQUALIS	0	0	<1	3	9	40	4	4	2	<1
AZADIRACHTIN	22	71	558	816	842	655	16,768	1,235	1,533	1,461
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	0	0	0	0	1,298	4,886	2,274	2,746	7,939	4,667
BACILLUS SUBTILIS GB03	0	0	0	0	<1	<1	<1	<1	1	4
BACILLUS THURINGIENSIS (BERLINER)	1,071	476	1,562	536	184	751	115	112	335	44
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	711	1,936	5,115	6,533	7,406	4,283	3,017	4,419	3,933	3,972
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	802	4,936	8,050	10,182	14,211	10,856	10,427	9,067	5,536	5,845
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	9,236	4,619	6,827	4,060	4,424	13,012	5,038	8,730	25,080	9,778
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	0	0	0	0	0	0	0	1,562	1,511	4,962
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	32,880	39,676	39,682	26,020	29,958	20,545	14,155	13,162	30,165	2,660
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	0	2,714	3,625	3,056	1,448	4,632	1,360	1,765	738	1,034
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	8,294	7,042	7,466	3,468	2,752	1,633	213	139	58	19

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	7,865	6,416	8,646	8,691	11,684	9,627	8,755	9,930	12,075	13,318
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	44	10	1	3	26	8	34	18	8	1
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 123	0	0	0	0	0	6	1	33	79	164
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	0	0	0	257	15,634	12,526	12,863	16,731	8,749	681
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	0	0	0	0	0	0	<1	<1	0
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	0	0	0	0	0	0	0	6,482	14,742	435
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	0	0	0	0	0	0	3	158	494	1,295
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	0	0	0	0	0	0	0	0	25	9,485
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	0	0	0	0	0	0	0	0	0	47
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	0	0	0	<1	57	20,789	21,691	21,086	19,542	24,388
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	0	0	0	3,664	29,895	12,635	8,059	7,146	2,211	258
BEAUVERIA BASSIANA STRAIN GHA	0	0	0	1	573	1,251	924	913	678	1,031
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	414	726	216	55	0	0	0
CANOLA OIL	0	0	0	0	0	0	0	1	5	<1
CAPSICUM OLEORESIN	224	220	19	46	2	17	104	3	73	4
CASTOR OIL	<1	4	<1	1	40	174	24	557	297	504
CINNAMALDEHYDE	0	0	0	0	<1	<1	6,769	10,332	4,704	299
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0	0	0	3,212	14,009	55,574	95,020	110,511	83,441	72,927
CODLING MOTH GRANULOSIS VIRUS	0	0	321	0	0	0	0	0	0	0
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	0	0	0	0	0	0	0	0	0	103
CYTOKININ	0	0	<1	0	0	<1	0	<1	<1	0
DIHYDRO-5-HEPTYL-2(3H)-FURANONE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DIHYDRO-5-PENTYL-2(3H)-FURANONE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
E,E-8,10-DODECADIEN-1-OL	137	249	1,075	259	476	255	21,096	6,297	6,423	5,126
E-11-TETRADECEN-1-YL ACETATE	0	0	0	0	3	5	571	397	65	121
E-8-DODECENYL ACETATE	7	27	40	29	47	57	66	93	76	59
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	7,959	14,341	14,535	31,053	44,383	35,395	28,618	17,908	6,747	3,174
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	2	0	7	13	0	34	1	6	1	6
ESSENTIAL OILS	2	1	<1	0	<1	11	<1	<1	<1	1
ETHYLENE	53	0	0	0	0	1	5,073	6	6	3
EUGENOL	0	0	<1	0	0	3	0	<1	0	0

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
FARNESOL	34	28	39	53	38	30	36	37	15	10
GARLIC	812	2,135	2,555	5,114	8,993	10,205	7,147	899	1,490	627
GERMAN COCKROACH PHEROMONE	0	0	0	0	0	0	0	0	0	<1
GIBBERELLINS	19,786	30,344	21,494	21,567	23,657	23,484	20,522	21,361	19,941	25,359
GIBBERELLINS, POTASSIUM SALT	9	3	9	<1	1	1	15	<1	1	<1
GLIOCLADIUM VIRENS GL-21 (SPORES)	0	0	15	144	156	104	86	60	345	110
GLUTAMIC ACID	0	0	0	0	0	0	0	0	23	3,100
HYDROGEN PEROXIDE	0	0	0	0	0	1	15	82	1,754	2,699
HYDROPRENE	955	681	5,476	1,131	9,305	1,486	1,609	1,700	1,377	1,656
IBA	4	5	9	16	14	39	9	12	18	16
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	0	87	151	<1	134	859	499	0	1	0
LAURYL ALCOHOL	77	140	588	91	233	131	7,287	494	308	249
LINALOOL	153	114	403	391	358	631	229	196	173	274
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	0	1	1	<1	3	37	15	18	15	22
METHOPRENE	3,435	3,027	8,822	3,213	29,905	1,800	10,285	14,303	2,476	5,121
METHYL ANTHRANILATE	0	0	0	6	184	49	57	50	36	85
METHYL SALICYLATE	0	<1	0	0	0	0	0	0	<1	0
MUSCALURE	3	4	4	3	4	2	5	9	3	1
MYRISTYL ALCOHOL	16	29	119	19	48	26	1,502	101	63	51
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	0	0	0	0	1,097	8,496	18,824	20,867	45,917	35,583
NAA	110	99	41	18	21	238	14	24	10	6
NEROLIDOL	27	23	32	43	31	24	29	30	12	8
NITROGEN, LIQUIFIED	534,260	577,181	540,335	423,124	430,214	1,003,749	424,897	391,469	478,466	561,505
NONANOIC ACID	0	0	4,333	11,863	14,713	11,729	13,303	12,517	14,897	11,559
NONANOIC ACID, OTHER RELATED	0	0	228	624	774	617	700	659	784	608
NOSEMA LOCUSTAE SPORES	<1	0	0	0	<1	<1	<1	<1	<1	<1
OIL OF ANISE	0	<1	0	0	0	0	0	0	<1	<1
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	0	0
OIL OF CITRONELLA	4	1	1	0	13	5	11	1	33	0
OIL OF LEMONGRASS	1	1	<1	0	0	0	0	0	0	0
OIL OF MUSTARD	<1	<1	<1	0	0	0	0	0	0	0

Table 10A (continued). The reported **pounds** of biopesticides applied in California.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
OXYPURINOL	0	0	0	0	0	0	0	<1	<1	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	0	5	0
PERFUME	0	0	0	0	0	<1	<1	<1	<1	<1
POTASSIUM BICARBONATE	0	0	0	0	28	65,913	93,003	130,472	121,794	179,676
PROPYLENE GLYCOL	75,153	45,021	54,250	61,718	60,612	67,644	54,377	63,685	58,325	60,329
PSEUDOMONAS FLUORESCENS, STRAIN A506	0	<1	206	3,051	3,648	3,662	2,173	103	1,102	1,361
PSEUDOMONAS SYRINGAE STRAIN ESC-11	0	0	0	0	0	34	0	0	0	<1
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	0	15	<1	<1	0	0	0	0
PUTRESCENT WHOLE EGG SOLIDS	111	234	19	7	15	19	136	112	133	168
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0	0	0	0	0	0	0	882	7,113	18,734
S-METHOPRENE	95	67	77	127	1,806	2,652	409	371	365	863
SODIUM BICARBONATE	29	0	0	0	0	0	5	22	230	2,063
SODIUM LAURYL SULFATE	38	86	21	9	6	14	8	2	9	<1
SOYBEAN OIL	7,709	42,462	99,120	26,159	27,769	17,157	61,500	41,901	27,743	31,655
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	0	<1	21	1	2	5	2	5	2	1
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	0	0	0	65	39	60	121	124	116	55
XANTHINE	0	0	0	0	0	0	0	<1	<1	0
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	0	<1
Z-11-TETRADECEN-1-YL ACETATE	0	0	0	0	<1	1	88	61	9	18
Z-8-DODECENOL	1	4	6	5	7	10	12	16	13	11
Z-8-DODECENYL ACETATE	128	474	699	478	783	890	1,010	1,451	1,183	908
Z-9-TETRADECEN-1-OL	0	0	0	0	0	0	0	0	0	<1
Grand Total	712,391	785,090	836,805	662,198	799,298	1,434,438	985,728	956,419	1,024,319	1,113,104

Table 10B. The reported **cumulative acres treated** of biopesticides applied in California . Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Use includes primarily agricultural applications. The grand total for acres treated is less than the sum of acres for all active ingredients because some products contain more than one active ingredient. Zero values in early years likely indicate the pesticide was not yet registered for use. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
(E)-4-TRIDECEN-1-YL-ACETATE	783	70	706	5,414	3,574	2,886	3,132	12,571	9,159	11,739
(E)-5-DECENOL	0	0	717	1,434	2,187	1,414	1,034	784	1,316	1,206
(E)-5-DECENYL ACETATE	0	0	717	1,434	2,187	1,414	1,034	784	1,316	1,206
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	0	0	0	0	1	0	0	0	0
(S)-KINOPRENE	0	55	44	341	179	2,603	888	597	846	869
(Z)-11-HEXADECENAL	0	0	0	0	0	0	0	0	0	1,053
(Z)-4-TRIDECEN-1-YL-ACETATE	783	70	706	5,414	3,574	2,886	3,132	12,571	9,159	11,739
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	2,785	588	5,535	2,295	279	82	148	171	128	87
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	1,350	588	2,120	2,295	279	82	148	171	128	87
1-DECANOL	0	0	0	0	0	0	0	0	0	0
1-METHYLCYCLOPROPENE	0	0	0	0	0	0	0	0	3	<1
1-NAPHTHALENEACETAMIDE	651	695	812	1,764	1,820	5,211	5,418	4,135	3,690	1,705
ACETIC ACID	224	1,844	1,301	2,456	620	331	623	216	267	461
AGROBACTERIUM RADIOBACTER	3,233	2,517	2,110	6,048	1,284	5,954	1,517	1,072	513	500
AGROBACTERIUM RADIOBACTER, STRAIN K1026	0	0	0	0	0	0	0	4	325	355
ALLYL ISOTHIOCYANATE	0	0	0	0	2	0	0	0	1	0
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	0	0	0	0	0	75	142	1	6	10
AMPELOMYCES QUISQUALIS	0	0	366	4,566	18,628	15,022	8,338	7,111	2,187	540
AZADIRACHTIN	1,547	5,610	51,039	76,154	69,921	64,065	102,988	71,124	73,555	92,133
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	0	0	0	0	104	84	39	0	0	0
BACILLUS SUBTILIS GB03	0	0	0	0	0	0	0	0	0	0
BACILLUS THURINGIENSIS (BERLINER)	18,225	18,412	12,305	8,368	6,286	4,437	5,561	3,345	16,810	2,738
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	13,907	42,136	108,216	136,455	145,279	82,001	59,954	74,095	71,049	73,888
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	7,669	45,238	67,544	84,387	109,389	85,996	85,535	65,864	41,200	45,129
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	3,614	1,754	730	3,355	4,287	5,235	3,221	2,427	1,956	4,907
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	0	0	0	0	0	0	0	9,474	11,755	43,337

Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	387,675	399,874	573,710	435,426	486,238	342,462	249,650	245,111	141,826	56,866
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	0	16,665	27,972	22,742	11,590	22,097	9,280	11,887	5,818	8,214
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	72,344	55,543	62,387	32,462	19,702	11,013	1,684	843	439	134
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	134,695	104,452	133,820	138,846	175,378	161,670	152,696	143,542	168,109	180,617
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	8	3	0	4	100	6	20	18	7	2
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 12	0	0	0	0	0	87	7	687	1,390	6,279
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	0	0	0	1,373	86,810	81,416	83,072	118,550	55,514	5,061
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	0	0	0	0	0	0	2	0	0
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	0	0	0	0	0	0	0	30,602	76,906	2,571
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	0	0	0	0	0	0	32	1,561	4,658	10,656
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	0	0	0	0	0	0	0	0	0	5
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	0	0	0	0	0	0	0	0	0	1,310
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	0	0	0	24	2,718	202,524	217,001	199,263	176,450	138,223
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	0	0	0	6,374	43,649	23,143	14,721	14,660	4,593	546
BEAUVERIA BASSIANA STRAIN GHA	0	0	0	3	1,453	2,991	25,510	3,392	2,844	3,673
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	0	0	0	0	0	0	0
CANOLA OIL	0	0	0	0	0	0	0	2	2	2
CAPSICUM OLEORESIN	673	1,055	1,048	581	443	2,720	1,797	261	254	149
CASTOR OIL	0	0	0	0	<1	0	<1	1	0	0
CINNAMALDEHYDE	0	0	0	0	<1	<1	2,407	4,136	1,533	295
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0	0	0	7,516	13,509	22,029	45,168	49,036	36,013	34,133
CODLING MOTH GRANULOSIS VIRUS	0	0	448	0	0	0	0	0	0	0
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	0	0	0	0	0	0	0	0	0	935
CYTOKININ	0	0	0	0	0	82	0	3	0	0
DIHYDRO-5-HEPTYL-2(3H)-FURANONE	0	0	0	0	20	0	0	0	0	0
DIHYDRO-5-PENTYL-2(3H)-FURANONE	0	0	0	0	20	0	0	0	0	0
E,E-8,10-DODECADIEN-1-OL	2,719	3,001	3,879	3,811	3,696	4,296	4,514	10,407	10,381	11,841
E-11-TETRADECEN-1-YL ACETATE	0	0	0	0	13	2,171	54,460	38,834	14,011	16,870
E-8-DODECENYL ACETATE	3,112	4,539	3,863	6,045	9,932	11,789	23,548	22,709	33,220	33,602

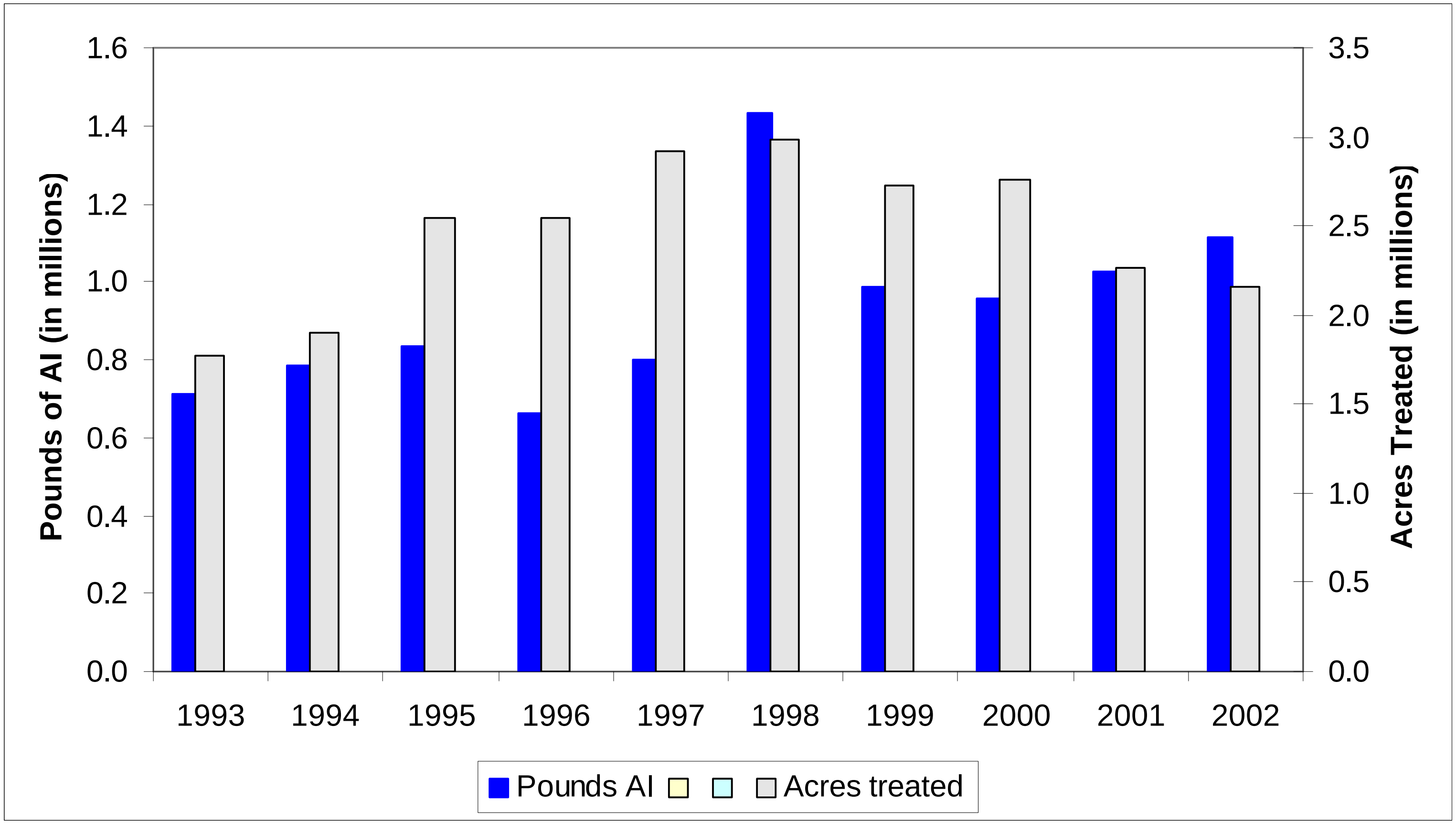
Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	17,743	33,833	35,500	69,181	96,671	82,894	59,593	32,273	15,188	7,525
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	0	0	4	1	0	19	7	6	4	<1
ESSENTIAL OILS	0	10	0	0	0	0	0	6	268	9
ETHYLENE	1	0	0	0	0	0	2	0	0	0
EUGENOL	0	0	0	0	0	1	0	0	0	0
FARNESOL	16,994	15,117	17,721	22,072	16,837	12,543	43,182	25,536	8,495	6,584
GARLIC	1,133	4,758	3,974	6,579	24,303	12,367	7,312	4,725	2,371	2,756
GERMAN COCKROACH PHEROMONE	0	0	0	0	0	0	0	0	0	0
GIBBERELLINS	399,496	414,606	439,868	415,763	455,107	486,900	438,994	462,779	387,245	423,330
GIBBERELLINS, POTASSIUM SALT	839	479	903	101	184	70	1,429	8	188	22
GLIOCLADIUM VIRENS GL-21 (SPORES)	0	0	1	21	14	29	12	8	768	6
GLUTAMIC ACID	0	0	0	0	0	0	0	0	320	43,652
HYDROGEN PEROXIDE	0	0	0	0	0	0	5	21	485	633
HYDROPRENE	<1	0	0	0	0	1	1	<1	1	0
IBA	265	185	139	96	410	1,319	1,236	266	124	244
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	0	0	0	<1	0	0	0	0	0	0
LAURYL ALCOHOL	2,719	2,807	3,027	1,798	2,858	2,882	2,666	8,038	6,429	4,635
LINALOOL	0	0	0	0	0	0	0	0	0	0
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	0	0	0	0	0	0	0	0	0	0
METHOPRENE	27	35	86	65	11	23	58	38	50	0
METHYL ANTHRANILATE	0	0	0	0	0	0	0	0	0	81
METHYL SALICYLATE	0	0	0	0	0	0	0	0	0	0
MUSCALURE	513	361	794	1,439	699	979	292	435	144	121
MYRISTYL ALCOHOL	2,719	2,807	3,027	1,798	2,858	2,882	2,666	8,038	6,429	4,635
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	0	0	0	0	104	1,514	3,347	3,173	4,391	3,926
NAA	208	28	33	33	364	542	788	172	101	72
NEROLIDOL	16,994	15,117	17,721	22,072	16,837	12,543	43,182	25,536	8,495	6,584
NITROGEN, LIQUIFIED	0	0	0	0	0	0	0	0	0	0
NONANOIC ACID	0	0	674	518	294	645	573	496	495	443

Table 10B (continued). The reported **cumulative acres treated** in California with each biopesticide.

Active Ingredient	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
NONANOIC ACID, OTHER RELATED	0	0	674	518	294	645	573	496	495	443
NOSEMA LOCUSTAE SPORES	13	0	0	0	0	7	14	2	9	0
OIL OF ANISE	0	0	0	0	0	0	0	0	0	0
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	0	0
OIL OF CITRONELLA	0	0	0	0	6	80	24	1	0	0
OIL OF LEMONGRASS	0	0	0	0	0	0	0	0	0	0
OIL OF MUSTARD	0	0	0	0	0	0	0	0	0	0
OXYPURINOL	0	0	0	0	0	0	0	0	0	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	0	13	0
PERFUME	0	0	0	0	0	0	0	70	0	0
POTASSIUM BICARBONATE	0	0	0	0	11	33,964	52,021	60,089	52,571	73,894
PROPYLENE GLYCOL	676,079	661,878	900,693	1,008,553	1,052,321	1,147,272	923,876	997,706	779,865	726,172
PSEUDOMONAS FLUORESCENS, STRAIN A506	0	8	990	16,951	26,617	29,656	15,760	1,443	11,668	13,126
PSEUDOMONAS SYRINGAE STRAIN ESC-11	0	0	0	0	0	17	0	0	0	0
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	0	0	0	0	0	0	0	0
PUTRESCENT WHOLE EGG SOLIDS	0	1,047	68	0	0	0	0	0	0	0
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0	0	0	0	0	0	0	2,151	15,031	40,573
S-METHOPRENE	0	0	0	0	0	505	<1	567	951	166
SODIUM BICARBONATE	0	0	0	0	0	0	8	0	0	0
SODIUM LAURYL SULFATE	3	0	<1	0	0	48	0	16	0	29
SOYBEAN OIL	8,030	64,098	86,196	16,830	22,455	10,427	13,530	12,837	11,253	18,627
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	0	<1	13	20	115	34	27	83	50	17
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	0	0	0	<1	69	369	456	885	1,048	293
XANTHINE	0	0	0	0	0	0	0	0	0	0
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	0	13
Z-11-TETRADECEN-1-YL ACETATE	0	0	0	0	13	2,171	54,460	38,834	14,011	16,870
Z-8-DODECENOL	3,112	4,539	3,863	6,045	9,932	11,789	23,548	22,709	33,220	33,602
Z-8-DODECENYL ACETATE	3,112	4,539	3,863	6,045	9,932	11,789	23,548	22,709	33,220	33,602
Z-9-TETRADECEN-1-OL	0	0	0	0	0	0	0	0	0	13
Grand Total	1,774,822	1,900,374	2,546,075	2,546,349	2,915,319	2,987,578	2,725,837	2,754,116	2,261,712	2,154,884

Figure 8. Use trends of biopesticides. Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Reported pounds of active ingredient (AI) applied includes both agricultural and reportable nonagricultural applications. The reported cumulative acres treated includes primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.



V. TRENDS IN PESTICIDE USE IN CERTAIN COMMODITIES

This summary describes possible reasons for changes in pesticide use from 2001 to 2002 for the following commodities: (1) cotton, (2) wine grapes, (3) table and raisin grapes, (4) almonds, (5) alfalfa, (6) rice, (7) processing tomatoes, (8) head lettuce, (9) oranges, (10) peaches and nectarines, (11) walnuts, (12) leaf lettuce, (13) strawberries, and (14) carrots. These commodities were chosen because they had the greatest pesticide use by acres treated or were of particular interest to DPR.

Information used to develop this section was drawn from several publications and phone interviews with pest control advisers, growers, University of California Cooperative Extension farm advisers and specialists, researchers, and commodity association representatives. The information collected was analyzed by DPR staff, using their extensive knowledge of pesticides, California agriculture, and pest management practices to draw conclusions about possible reasons for changes in pesticide use. Thus these explanations are based on anecdotal information, not rigorous statistical analyses.

Reported pesticide use in California in 2002 totaled 172 million pounds, an increase of 21 million pounds from 2001 (14 percent). The active ingredients with the largest uses by pounds were sulfur, petroleum oils, metam-sodium, and methyl bromide. Sulfur use increased by 6.5 million pounds (14 percent) and was the most highly used pesticide in 2002, both in pounds applied and acres treated. By pounds, sulfur accounted for 31 percent of all reported pesticide use. Sulfur is a natural fungicide favored by both conventional and organic farmers. Petroleum oil use increased by 2.3 million pounds (15 percent), metam sodium use increased by 4.2 million pounds (37 percent), and methyl bromide use declined by approximately 21,000 pounds (0.3 percent).

DPR data analyses have shown that pesticide use varies from year to year depending upon pest problems, weather, acreage and types of crops planted, economics, and other factors. For the majority of the 14 crops investigated, pest problems were low in most areas in 2002. Prices for some crops improved in 2002 but, in general, economic conditions for growers were a major concern. Acreage of most of the 14 crops increased, which would explain some of the increase in pesticide use.

Sulfur was used mostly on grapes and use increased because of greater grape acreage and lower grape prices. Sulfur is also less costly than other fungicides.

Most of the increase in pounds of active ingredients occurred with the fumigants. The use of the fumigants metam sodium and 1,3-dichloropropene (1,3-D) increased partly as replacements for methyl bromide, use of which decreased. More than half of the methyl bromide was used on strawberries; use decreased probably because of the expanded restrictions that DPR placed on field applications in the last few years and because a federally mandated phaseout has significantly increased the cost of methyl bromide.

Different pesticides are used at very different rates. In California, most pesticides are applied at rates of around 1 to 2 pounds per acre. However, fumigants are usually applied at rates of hundreds of pounds per acre. Thus, comparing use by pounds will emphasize fumigants. Comparing use among different pesticides using acres treated gives a different picture.

By acres treated, the pesticides with the greatest use in 2002, after sulfur, were glyphosate, oxyfluorfen, and paraquat dichloride, all herbicides. Herbicides aaccounted for most of the increase in acres treated from 2001 to 2002. Most of the increase in glyphosate and oxyfluorfen was in almonds and wine grapes. Use of glyphosate increased because of a trend toward more use of postemergence herbicides and because it is less costly than other herbicides. Oxyfluorfen is often applied with glyphosate.

Use is given by pounds of active ingredient applied and by acres treated. Acres treated means the cumulative number of acres treated; the acres treated in each application are summed even when the same field is sprayed more than once in a year. (For example, if one acre is treated three times in a season with an individual active ingredient, it is counted as three acres treated).

Cotton

Cotton is grown for fiber, oil, and animal feed. Even though cotton acreage has decreased significantly in recent years, it is still one of the most widely grown crops in California. Most cotton is grown in the southern San Joaquin Valley, but a small percentage is grown in the Imperial and Sacramento valleys.

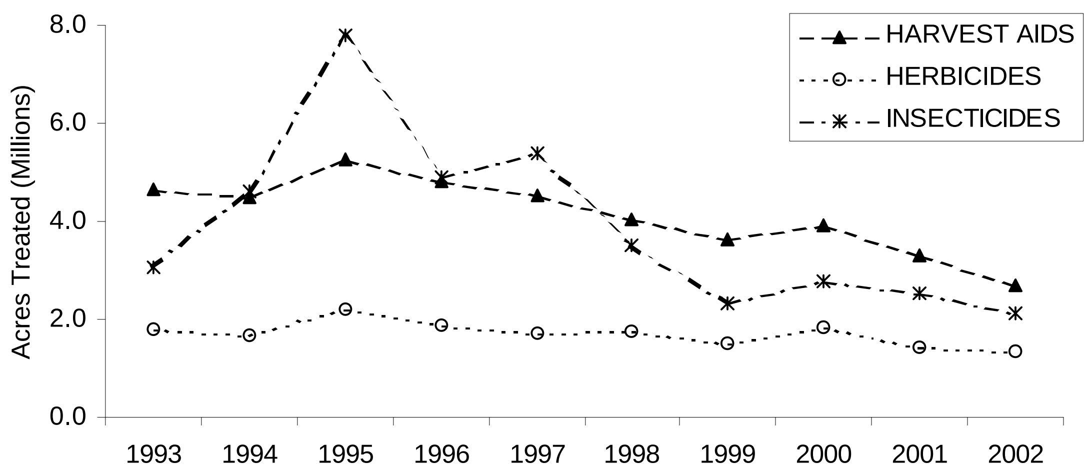
Table 11A. Total reported pounds of all active ingredients (AIs), acres treated, acres planted, and prices for cotton each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	9,614,948	8,624,822	9,358,314	8,126,324	7,008,999
Acres Treated	13,455,192	10,673,253	12,168,045	10,022,629	8,661,444
Acres Planted	850,000	850,000	920,000	870,000	690,000
Upland Cotton Price $/lb	0.678	0.562	0.520	0.416	0.538

Table 11B. Percent difference from previous year for reported pounds of all AIs, acres treated, acres planted, and prices for cotton from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	-29	-10	9	-13	-14
Acres Treated	-22	-21	14	-18	-14
Acres Planted	-20	0	8	-5	-21
Upland Cotton Price $/lbs	-7	-17	-7	-20	29

Figure 9. Acres treated in cotton by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in cotton in 2002 were avermectin, chlorpyrifos, aldicarb, thiamethoxam, and dicofol; the major herbicides were glyphosate, trifluralin, pendimethalin, oxyfluorfen, and pyrithiobac-sodium; and the major harvest aids were paraquat dichloride, ethephon, mepiquat dichloride, sodium chlorate, and diuron. The use of most pesticides declined. Some of the major exceptions were increases in avermectin, thiamethoxam, endosulfan, pyriproxyfen, buprofezin, trifluralin, pyrithiobac-sodium, clethodim, and endothall.

In 2002, weather conditions for cotton production were excellent, and pest levels were unusually low. Lygus bug, which is one of the major cotton pests, had very low populations in most areas. Spider mites caused little problems in most areas. Lepidopteran pests were also very low. The main concerns were silverleaf whiteflies and aphids near the end of the cotton-growing season. These pests are of particular concern because they produce sugary excretions, which drop on the cotton lint creating “sticky cotton.” The California cotton industry was concerned because sticky cotton was a major problem in 2001, and other countries threatened to discount California cotton unless they could be assured that the cotton would be clean. Therefore, in 2002, growers were aggressive in controlling whiteflies and aphids.

The other major factor in understanding trends in pesticide use is that cotton acreage has declined in the last few years, reaching the lowest acreage since 1946. Growers are planting less because of low cotton prices, high electricity costs, and uncertainty of the water supply. Many cotton growers replanted their acreage with permanent crops, so they could not quickly switch back to cotton even though cotton prices were higher in 2002.

Most of the insecticides which had a higher use in 2002, such as thiamethoxam, endosulfan, pyriproxyfen, and buprofezin were used for whitefly or aphid control near the end of the season. Thiamethoxam was a new reduced-risk pesticide, first used in cotton in 2002. Pyriproxyfen and buprofezin are insect growth regulators specific to whiteflies. Avermectin use was slightly higher in 2002 than 2001. It is used to control mites, and its use increased probably not so much because of greater mite problems but as a replacement for older miticides, which are becoming less effective.

Herbicide use decreased but less than the decrease in acres planted, implying an increase in use per acre planted. The primary increase was in trifluralin, which is used as a preplant treatment of cotton fields. Growers used more trifluralin in 2002 because of their experience with Roundup-Ready cotton, which is resistant to the herbicide glyphosate. One of the reasons some growers planted Roundup-Ready cotton was to reduce their use of preplant herbicides and increase their use of glyphosate during the growing season. However, they found that some weeds could not be controlled by glyphosate so they returned to the older practice of using preplant trifluralin. The use of the herbicide pyrithiobac-sodium increased probably because growers found it to be effective for some weeds.

Use of harvest aids was down because weather conditions in 2002 made cotton easier to defoliate. Also, growers are switching from high rate defoliants, such as S,S,S-tributyl phosphorotrithioate and sodium cacodylate to chemicals such as diuron and thidiazuron, which are used at lower rates.

Wine grapes

There are four major wine grape production regions in California: 1) North Coast (Lake, Mendocino, Napa, and Sonoma counties) with about 10 percent of the statewide wine grape production; 2) Central Coast (Alameda, Monterey, San Luis Obispo, Santa Barbara, San Benito, Santa Cruz, and Santa Clara counties) with about 8 percent of the wine grape production; 3) Northern San Joaquin Valley (San Joaquin, Calaveras, Amador, Sacramento, Merced, Stanislaus and Yolo Counties) with about 20 percent of the wine grape production; and 4) Southern San Joaquin Valley (Fresno, Kings, Tulare, Kern, and Madera counties) with about 60 percent of the wine grape production. Each region has distinct climatic and geologic characteristics that lead to different cultural and pest management practices.

Table 12A. Total wine grape acres planted, reported pounds of all AIs, acres treated, and prices for wine grapes each year from 1998 to 2002.

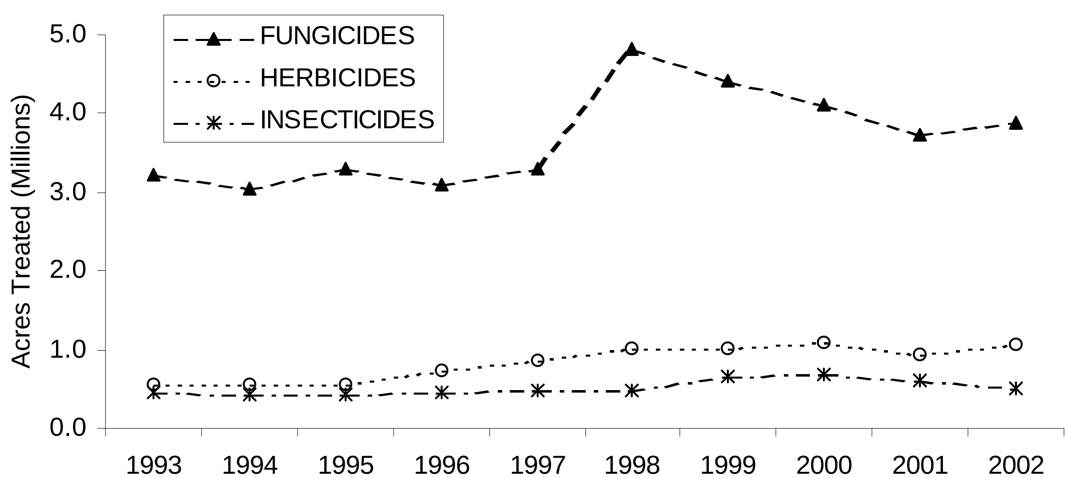
	1998	1999	2000	2001	2002
Lbs AI	34,399,678	30,701,171	27,626,490	22,787,101	24,110,084

Acres Treated	7,490,026	7,286,660	7,073,507	6,523,868	6,747,188
Acres Planted	507,000	554,000	568,000	570,000	556,000
Price $/ton	581.00	585.00	567.00	597.00	535.00

Table 12B. Percent difference from previous year for wine grape acres planted, reported pounds of all AIs, acres treated, and prices for wine grapes from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	27	-11	-10	-18	6
Acres Treated	35	-3	-3	-8	3
Acres Planted	12	9	3	0	-2
Price $/ton	-3	1	-3	5	-10

Figure 10. Acres treated in wine grapes by all active ingredients in the major types of pesticides from 1993 to 2002.



The major fungicides by acres treated in wine grapes in 2002 were sulfur, copper hydroxide, myclobutanil, trifloxystrobin, and tebuconazole. The major insecticides and miticides were imidacloprid, tebufenozide, propargite, avermectin, and pyridaben. The major herbicides were glyphosate, oxyfluorfen, paraquat dichloride, simazine, and diuron. Pesticides with large percentage increases in acres treated include lime-sulfur, diuron, tebuconazole, trifloxystrobin, myclobutanil, oxyfluorfen, and glyphosate. Those with large decreases in use include mancozeb, propargite, azoxystrobin, avermectin, fenarimol, imidacloprid, and copper hydroxide.

In 2002, the major factors influencing pesticide use changes include pest pressure (which varied by region); low grape prices (hence the need for growers to reduce costs); competition from newer products; and continued increasing emphasis on sustainable farming. Buyer restrictions and reduced pest pressure contributed to the decreased use of certain fungicides and insecticide/miticides.

Most fungicide use was for control of powdery mildew. Rainfall was moderate in 2002, and disease mildew pressure was not especially high in the valley regions, although the Central Coast region reported high disease pressure. Fungicide use by acres treated in 2002 increased by 4 percent. A small change in mildew pressure can easily result in a change in fungicide use. Low grape prices resulted in decreased use of the more costly treatment alternatives and the increased use of the less expensive alternatives (e.g., sulfur, myclobutanil, and lime-sulfur). The use of lime-sulfur as a dormant treatment contributed to its large increase. Benomyl use significantly decreased because of it is not available and growers are using only inventory on hand.

Insecticide and miticide use decreased by 14 percent due mainly to reduced pest pressure from worms and mites. Economic considerations (e.g., fewer growers treated for grape leafhopper and bluegreen sharpshooter) and market competition from newer products contributed to the declining use of several of the top insecticides and miticides (such as imidacloprid, avermectin, pyridaben, and cryolite). Growers' increasing emphasis on sustainable farming practices was another major factor accounting for declining uses. Buyer restrictions also contributed to use reductions in certain products such as cryolite and propargite. Some of the largest decreases were imidacloprid (for leafhoppers, sharpshooters, and mealybugs); propargite, avermectin, and pyridaben (for spider mites); cryolite (for omnivorous leafroller); methomyl (for leafhoppers, spider mites, and omnivorous leafroller); and Bt (for omnivorous leafroller and other Lepidoptera).

A major contributor to the 12 percent increase in herbicide use was the increased use of less costly herbicides and the increased use of postemergence herbicides, particularly glyphosate, in place of preemergence herbicides. Glyphosate usually requires several applications in contrast to one application for preemergence herbicides. The continued limited availability of oryzalin (due to a manufacturing plant explosion in 2000) was one reason for the increased use of oxyfluorfen for weed control; another reason was the increased use of glyphosate + oxyfluorfen, including the use of a new product that combines these AIs.

Although norflurazon is registered to control nutsedge in grapes, it is not very cost-effective where large populations occur. Therefore, many growers have moved to other less expensive herbicides like glyphosate. A less expensive generic oryzalin product was released into California for the 2002 season, and growers took advantage of the cost savings over the original product. Since its tank-mix partner is typically oxyfluorfen, this may help explain the significant increase in use of both herbicides. The increase in simazine and diuron may be explained by use of these herbicides in inexpensive tank-mix combinations that can control a wide spectrum of weeds that the other pre- and post-emergence herbicides miss.

Table grapes and raisins

Production of table grapes is largely centered in the Southern San Joaquin Valley region (85%), although a significant portion of production (14 percent) comes from the Coachella Valley region. The Southern San Joaquin Valley region includes Fresno, Madera, Tulare, Kern, and Kings counties; the Coachella Valley region includes the Coachella regions of Riverside, Imperial, and San Bernardino counties. The remaining regions account for less than 1 percent of the state's production. Almost all (99 percent) production of raisin grapes is in the Southern San Joaquin Valley region, and 1 percent in the Northern San Joaquin Valley region (San Joaquin, Calaveras, Amador, Sacramento, Merced, and Stanislaus counties.

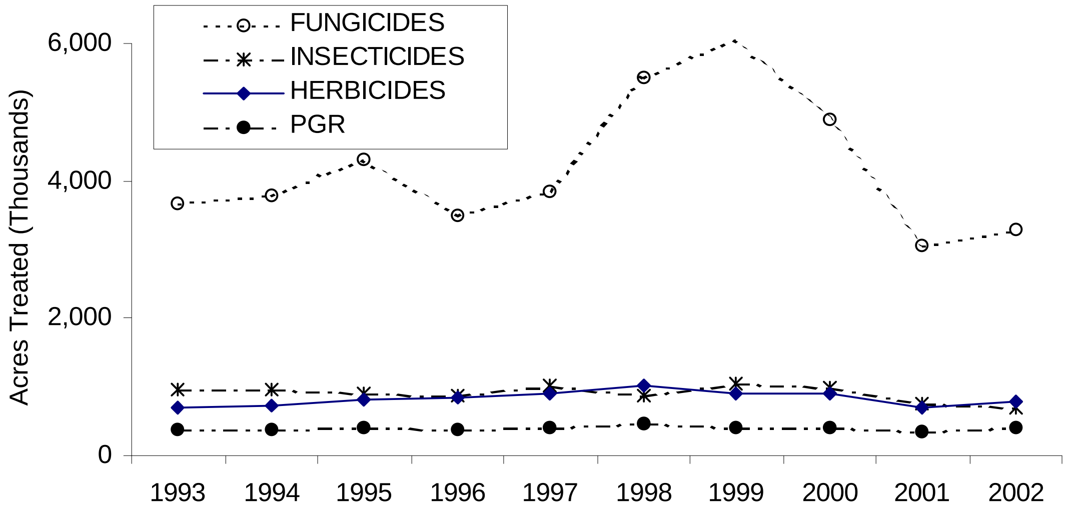
Table 13A. Total table grape and raisin acres planted, reported pounds of all AIs, acres treated, and prices for grapes each year from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	35,056,442	29,495,289	26,794,701	19,651,756	22,151,432
Acres Treated	9,042,232	9,537,373	8,196,293	5,685,704	5,978,578
Acres Planted	379,000	386,000	387,000	340,000	351,000
Price $/ton Raisin	291.00	321.00	166.00	182.00	155.00
Price $/ton Table	499.00	552.00	565.00	610.00	618.00

Table 13B. Percent difference from previous year for table grape and raisin acres planted, reported pounds of all AIs, acres treated, and prices for grapes from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	30	-16	-9	-27	13
Acres Treated	25	5	-14	-31	5
Acres Planted	3	2	0	-12	3
Price $/ton Raisin	11	10	-48	10	-15
Price $/ton Table	11	11	2	8	1

Figure 11. Acres treated in table grapes and raisin by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides and miticides by acres treated in table and raisin grapes in 2002 were cryolite, imidacloprid, tebufenozide, propargite, and chlorpyrifos; the major herbicides were glyphosate, paraquat, simazine, oxyfluorfen, and diuron; and the major fungicides were sulfur, myclobutanil, copper hydroxide, tebuconazole, and trifloxystrobin. Pesticides with large increases in use include tebufenozide, trifloxystrobin, cyprodinil, oxyfluorfen, paraquat, and sulfur. Those with large decreases in use include benomyl, imidacloprid, propargite, myclobutanil, and cryolite.

Most of the highest use fungicides were used for powdery mildew control. Total pounds of fungicide increased, however not all major uses increased. Reasons contributing to increased use were the use of lower-cost alternatives (e.g., sulfur, myclobutanil, and lime-sulfur) and preference for newer materials such as tebuconazole and trifloxystrobin. Weather in 2002 was not particularly wet, and disease pressure was not a major reason for increases in use. Reasons for the decreased use of certain fungicides include efforts by growers to reduce costs due to lower crop prices, lower pest pressure, and competition from other products. The large decrease in use of benomyl is due to its unavailability.

Overall, use of insecticides and miticides decreased. Cryolite use decreased in part due to competition from other pesticide alternatives for control of lepidopteran pests and because of restrictions from buyers. Cryolite is used to control omnivorous leafroller and other Lepidopteran pests. Imidacloprid use decreased by 24 percent, mainly because of decreased pest pressure. Imidacloprid is used primarily for control of leafhoppers, mealybugs, and sharpshooters. Propargite decreased mainly due to competition from newer miticides, its long re-entry interval, restrictions from buyers, and cost. Propargite is used for control of spider mites. Methomyl use decreased due to cost and regulatory status (a highly toxic Category 1 pesticide). Acres treated with the nematicide fenamiphos increased, mainly due to greater pest pressure and because of the higher cost and use restrictions of pre-plant methyl bromide. Young vineyards were hit hard by nematodes, especially those planted without fumigation. Nematode problems were more apparent in vineyards with deficit irrigation.

Herbicide use increased overall, although no very large increases in individual herbicides occurred. The poor economic environment had a major impact on the way weed control options were selected. The very poor demand in raisin grapes has probably overshadowed any effect table grape production may have played on herbicide selection. For the most part, many growers who used other, more expensive options in the past have opted for cheaper alternatives, even if it meant not achieving complete weed control. Among the most affordable herbicides (and highest uses) in table and raisin grapes are glyphosate, paraquat, and simazine. The weed pests marestail and hairy fleabane are fast becoming a significant problem in vineyards in the San Joaquin Valley. Additional sprays of glyphosate and paraquat are often needed to control these weeds. Simazine is probably the most effective; therefore, simazine is used more often to handle these specific weeds, even in areas that have not previously been treated for them. Oxyfluorfen is now almost always added to glyphosate to help control these weeds, which may help explain the oxyfluorfen increase.

Almonds

California is the only state that commercially produces almonds. Over the last several years California has produced, on average, 67 percent of the world's almonds; ranging as high as 75 percent in 1996. The California almond industry has 6,000 growers with production in three distinct regions (Northern Sacramento Valley, Central San Joaquin Valley and Southern San Joaquin Valley).

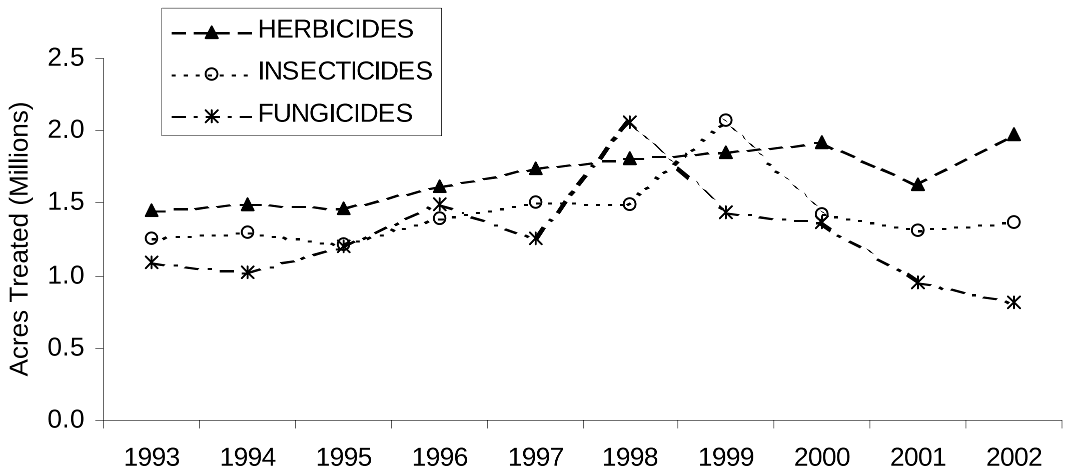
Table 14A. Total almond acres planted, reported pounds of all AIs, acres treated, and prices for almonds each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	16,136,996	14,873,546	11,652,867	10,156,663	11,932,203
Acres Treated	6,809,423	7,524,850	7,281,604	5,089,774	5,519,719
Acres Planted	573,000	585,000	595,000	595,000	600,000
Price $/ton	1.41	0.86	0.97	0.91	1.10

Table 14B. Percent difference from previous year for almond acres planted, reported pounds of all AIs, acres treated, and prices for almonds from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	10	-8	-22	-13	17
Acres Treated	9	11	-3	-30	8
Acres Planted	13	2	2	0	1
Price $/ton	-10	-39	13	-6	21

Figure 12. Acres treated in almond by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in almonds in 2002 were petroleum oil, avermectin, propargite, permethrin, and esfenvalerate; the major fungicides were cyprodinil, iprodione, copper hydroxide, azoxystrobin, and ziram; and the major herbicides were glyphosate, oxyfluorfen, paraquat dichloride, simazine, and 2,4-D. The use of most pesticides increased in 2002. The largest increases between 2001 and 2002, of all pesticides in pounds AI, were “petroleum oil, unclassified,” mineral oil, 1,3-D, glyphosate, and methyl bromide.

In 2002, pest levels were low in the northern growing region. Wet weather in November-December 2001 in the north helped reduce over-wintering navel orangeworm (NOW) populations by reducing the number of mummies in the trees. This resulted in less 2002 NOW problems and treatments. Weather in the central and southern regions was not exceptionally wet. Generally growers checked for mummies; and, if numbers were high, they used a winter sanitation program to help reduce the over-wintering population.

Other factors play a role in understanding trends in pesticide use. Bearing almond acreage continues to increase resulting in the likelihood of increased applications. Production was also up in 2002, along with the price for almonds. In a good year, growers generally are more inclined to treat with pesticides to protect the crop, thereby increasing the number of applications.

Most of the increase in insecticide use in 2002 was to control San Jose scale, NOW, and mites. Dormant oils showed a significant increase in 2002, establishing a trend of oil treatment alone to control San Jose scale, other scales, and mite eggs. Use of highly toxic organophosphates such as azinphos methyl and methidathion to control peach twig borer continues to decrease. Diazinon use was up slightly in 2002, but still on a decline overall. Monitoring, using egg traps, is the primary means for determining whether to treat for NOW at hull split. A lot of growers reportedly are not comfortable using the traps so they still treat by the calendar, using the traps to determine the optimum time to treat. The use of the reduced-risk pesticide tebufenozide to control NOW increased in 2002.

Herbicide use increased both in pounds applied and acres treated. Oxyfluorfen had the greatest increase by acres treated. However, there was also an increase in contact herbicides such as glyphosate and paraquat dichloride indicating a possible shift away from pre-emergent herbicides. Also, the use of 1,3-D is up significantly continuing a trend away from the use of methyl bromide to control soil pests.

Alfalfa

Alfalfa hay is produced for animal feed. Most counties produce some alfalfa, but the leading producers are Imperial, Kern, Tulare, Merced, and Fresno counties. Alfalfa acres have increased in the state. Production of hay, of which nearly 85 percent is alfalfa hay, surpassed cotton production as the state's highest-valued field crop in 2001. The dairy industry is the biggest market for alfalfa hay production.

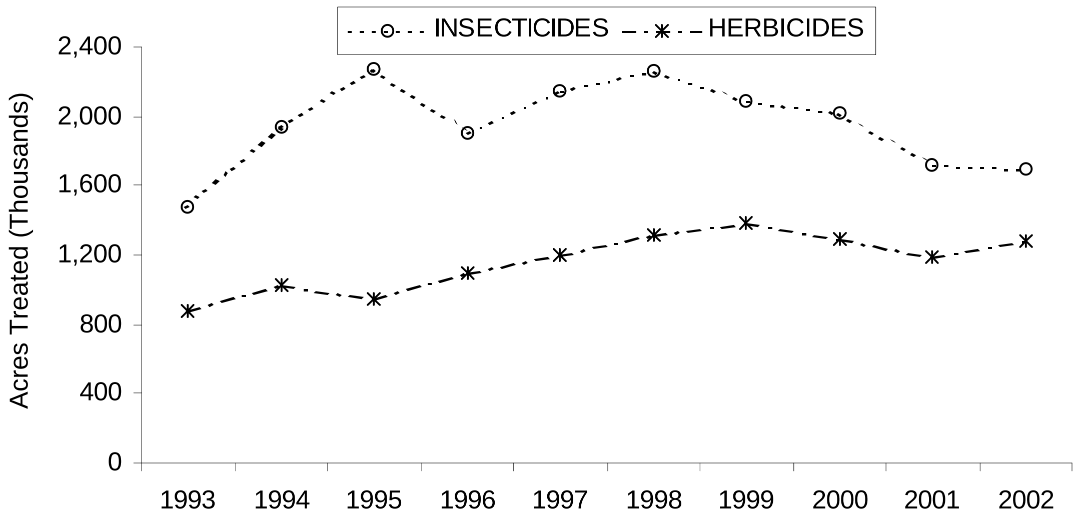
Table 15A. Total alfalfa acres harvested, reported pounds of all AIs, acres treated, and prices for alfalfa each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	3,849,639	3,750,546	3,317,950	2,914,750	3,002,814
Acres Treated	5,745,160	5,537,122	5,360,334	4,578,040	4,620,108
Acres Harvested	1,050,000	1,050,000	1,020,000	1,010,000	1,140,000
Price $/ ton	103	90	87	119	99

Table 15B. Percent difference from previous year for alfalfa acres harvested, reported pounds of all AIs, acres treated, and prices for alfalfa from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	8	-3	-12	-12	3
Acres Treated	7	-4	-3	-15	1
Acres Harvested	11	0	-3	-1	13
Price $/ton	-13	-13	-3	38	-18

Figure 13. Acres treated in alfalfa by all active ingredients in the major types of pesticides from 1993 to 2002.



Trifluralin, the leading herbicide used in each of the last three years, was used primarily for summer grass control, but also in response to dodder. Pounds of AI applied increased by 14 percent compared to 2001, in line with the increase in acres. Diuron use increased 41 percent, most likely to reduce costs and broaden winter weed control when combined with hexazinone, which increased 15%.

Insecticide use in pounds was reduced by 12 percent overall, despite the increase in acreage. Of the major insecticides, chlorpyrifos, methomyl, and endosulfan use decreased 20, 52, and 61 percent, respectively. Chlorpyrifos is used primarily for Egyptian alfalfa weevil, and the pyrethroids (such as lambda-cyhalothrin, cyfluthrin, and permethrin) have replaced chlorpyrifos during the winter and early spring. The decrease in methomyl is likely attributed to the rapid acceptance of indoxacarb for late season armyworm control. Indoxacarb, a new insecticide for lepidopteran pests and leafhoppers, became the tenth most popular AI in a single year, going from no use in 2001 to 7,211 pounds AI in 2002. It was the seventh most popular insecticide in terms of acres treated (96,735 acres). Malathion (16 percent), dimethoate (11 percent), and carbofuran (6 percent) use increased moderately.

Fungicide use in alfalfa was insignificant and mirrored the use in 2001.

Rice

The Sacramento Valley contains more than 95 percent of the state's rice acreage. The remainder is in north to central San Joaquin Valley. The leading rice-producing counties are Colusa, Butte, Sutter, and Glenn. Approximately 600,000 acres in the Sacramento Valley are of a soil type restricting the crops to rice or pasture. The remainder of the acreage has greater crop flexibility.

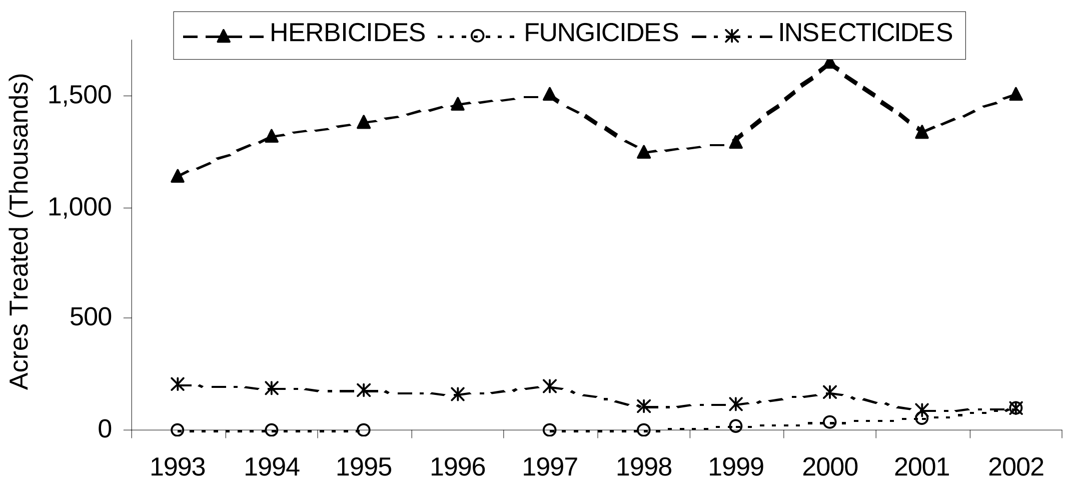
Table 16A. Total rice acres planted, reported pounds of all AIs, acres treated, and prices for rice each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	4,981,754	4,952,442	7,085,411	5,946,563	5,959,837
Acres Treated	1,568,564	1,747,663	2,312,138	1,882,397	2,195,258
Acres Planted	460,000	510,000	550,000	473,000	533,000
Price $/cwt	8.15	6.97	5.30	5.28	5.00

Table 16B. Percent difference from previous year for rice acres planted, reported pounds of all AIs, acres treated, and prices for rice from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	-10	-1	43	-16	0
Acres Treated	-20	11	32	-19	17
Acres Planted	-11	11	8	-14	13
Price $/cwt	3	-14	-24	0	-5

Figure 14. Acres treated in rice by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in rice in 2002 were lambda-cyhalothrin, diflubenzuron, limonene, and carbaryl; the major herbicides were propanil, triclopyr, thiobencarb, molinate, and bispyribac-sodium; and the major fungicides were copper sulfate (pentahydrate) and azoxystrobin. Pesticides with large increases in use include bispyribac-sodium, azoxystrobin, thiobencarb, triclopyr, lambda-cyhalothrin, and molinate. Those with large decreases in use include 2,4-D, bensulfuron-methyl, MCPA, copper sulfate (pentahydrate), and diflubenzuron.

The increase in rice acreage was a big factor in most cases where pesticide use increased. In 2002, there were no major shifts in pest pressure. Herbicides accounted for the largest portion of rice pesticides. Propanil and triclopyr usage remained stable; the moderate increases were due to the increase in rice acreage. Besides acreage, other reasons for increased herbicide use include pest resistance, increased grower confidence with use of new herbicides on the market, and the fit of older herbicides with the new herbicides (increased use of those with the best fit). Bispyribac-sodium is a new herbicide, providing excellent watergrass and rice field bulrush control and effective control of California arrowhead. Carfentrazone-ethyl use has increased due partly to the decreased use of bensulfuron-methyl and MCPA, and better development of the compound with ground applications into the water to avoid drift. MCPA and 2,4-D use continue to decline as all registrations (except one 2,4-D label) were cancelled a few years ago. Growers use only material on hand when needed for broadleaf weed control. Growers are also substituting other broadleaf herbicides for MCPA and 2,4-D such as triclopyr, propanil, and carfentrazone-ethyl. Bensulfuron has a declining market share due to widespread pest resistance. Fenoxyprop use continues to decline because of problems with uneven results and frequent rice damage. Favorable weather conditions contributed to the decrease in the algae problem and the use of copper sulfate from 2001 to 2002. The use of some herbicides such as bensulfuron-methyl continued to decline due to widespread pest resistance.

The large increase in use of the fungicide azoxystrobin was due more to an aggressive marketing campaign than a change in status of target pests. Use of the insecticides lambda-cyhalothrin and diflubenzuron replaced carbofuran for rice water weevil (RWW) control in 2000 after the rice production season. Increased grower experience and confidence with the use of these new insecticides contributed to the continued increases in use. Lambda-cyhalothrin is most popular among growers for RWW control. The diversity of labeled uses for lambda-cyhalothrin (RWW, midge, and armyworm) may also have contributed to its increased use.

Tomatoes (Processing)

Virtually all of the 296,000 acres of processing tomatoes grown in 2002 were located in the Sacramento Valley (29 percent) or San Joaquin Valley (69 percent). Fresno County had the largest acreage (106,900 acres), followed by Yolo County (41,600 acres) and San Joaquin County (32,600 acres). Most of the acreage increase from 2001 to 2002 (nearly 30,000 acres) occurred in the San Joaquin Valley region; acreage in the Sacramento Valley remained static.

Table 17A. Total processing tomato acres planted, reported pounds of all AIs, acres treated, and prices for processing tomato each year from 1998 to 2002.

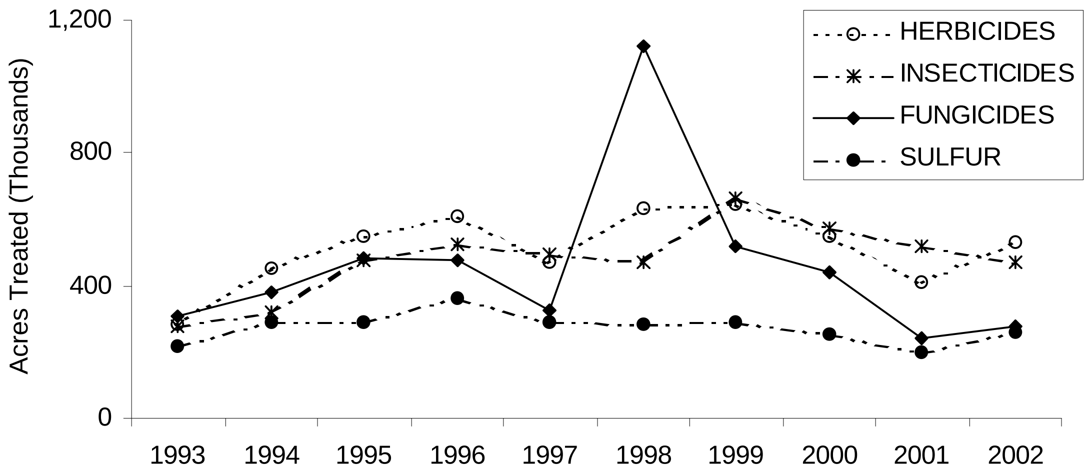
	1998	1999	2000	2001	2002
Lbs AI	11,639,555	12,811,271	10,664,650	7,834,579	10,571,757
Acres Treated	3,176,131	2,793,253	2,422,542	1,909,032	2,062,647
Acres Planted	282,000	337,000	289,000	258,000	296,000
Price $ per ton*	54.65	58.00	51.50	48.00	49.40

*Excerpted from a recent Section 18 application by the California Tomato Research Institute, Inc.

Table 17B. Percent difference from previous year for processing tomato acres planted, reported pounds of all AIs, acres treated, and prices for processing tomato from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	4	10	-17	-27	35
Acres Treated	55	-12	-13	-21	8
Acres Planted	4	20	-14	-11	15
Price $/ton		6	-11	-7	3

Figure 15. Acres treated in processing tomatoes by all active ingredients in the major types of pesticides from 1993 to 2002.



Total pounds of pesticide active ingredient used on processing tomatoes in 2002 increased by almost 3 million pounds. However, pesticide use in 2002 was nearly identical to use in 2000. The low use in 2001 was due to favorable weather for the crop. A major factor in the increased pesticide use was the increase in acres planted. There were no major pest outbreaks, and transplant acres remained similar to 2001. Growers were concerned about the costs and availability of hand labor, reflected in a general increase in herbicide use (including the use of metam-sodium as an herbicide treatment). Most preplant herbicide use increased in 2002. A shortage of pebulate, corrected in 2002, may account for the 78 percent increase in its use by pounds of AI. Trifluralin, metolochlor, and metribuzin all increased, 43, 30, and 54 percent, respectively.

Sulfur and metam-sodium made up over 90 percent of the total pounds of AIs applied to tomatoes in 2002, similar to the trend in 2001. Sulfur is used for russet mite and powdery mildew, annual pests throughout California. Growers replaced some metam-sodium use with rimsulfuron, doubling its use in 2002. In terms of acres treated, rimsulfuron, an herbicide used at low application rates, was applied on more acres than all herbicides other than trifluralin (122,427 acres). A drop in price was the reason for the shift.

Early season weather in March and April did not favor bacterial speck and other early season diseases; therefore, the use of copper hydroxide, mancozeb, and maneb decreased. A September heat wave coupled with a larger-than-expected crop resulted in the application of late season fungicides and sun-block (kaolin) in an attempt to carry the crop through to harvest. Use of kaolin, technically classified as a fungicide, increased to 67,317 lbs in 2002 from only 5,795 pounds in 2001, most applied in July. Use of chlorothalonil increased 34 percent, mostly applied in August for late-season disease control, again an attempt to carry the crop further into the fall to accommodate harvest.

Insecticide use decreased 12 percent from 2001 to 2002. Imidacloprid, an insecticide used at a low rate, increased during April and May and again slightly in July. It is used for potato aphid control. Acres treated with imidacloprid increased from 75 acres to 4,384 acres, comparing April 2001 to April 2002. Replacement of dimethoate with imidacloprid resulted in decreased use of dimethoate.

Head (Iceberg) Lettuce

Head lettuce is grown in four regions in the state: the central coastal area (Monterey, San Benito, Santa Cruz, and Santa Clara counties); the southern coastal area (Ventura and Santa Barbara counties); the San Joaquin Valley (Fresno, Kings, and Kern counties); and the southern deserts (Imperial and Riverside counties). In 2002, 55 percent of all California head lettuce was planted in the central coastal area, 16 percent in the southern coastal area, 17 percent in the San Joaquin Valley, and 12 percent in the southern deserts. California produces approximately 72 percent of the head lettuce grown in the United States annually.

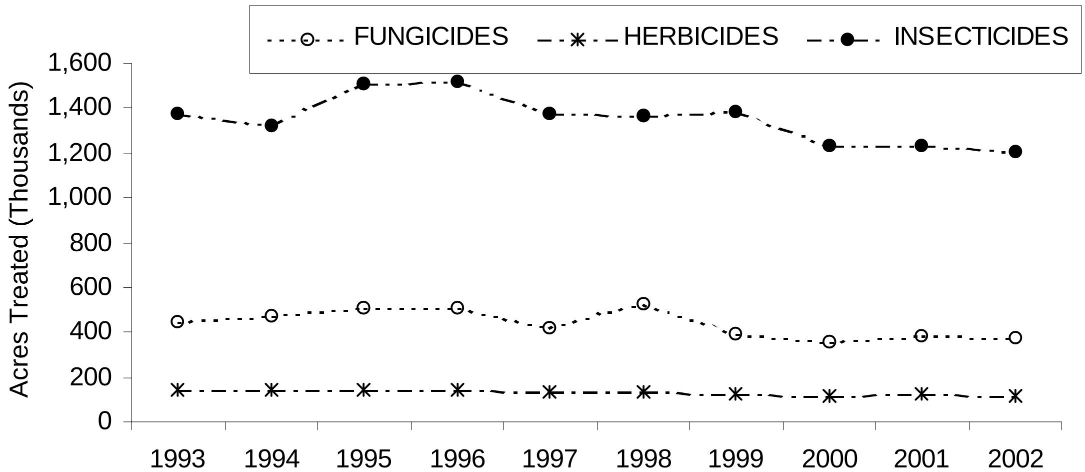
Table 18A. Total head lettuce acres harvested, reported pounds of all AIs, acres treated, and prices for head lettuce each year from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	1,940,570	1,632,400	1,770,876	1,431,263	1,440,025
Acres Treated	2,448,343	2,251,244	2,038,115	2,080,731	2,022,796
Acres Harvested	135,000	140,000	130,000	137,000	129,000
Price $/cwt	16.30	13.70	18.80	18.50	15.20

Table 18B. Percent difference from previous year for head lettuce acres harvested, reported pounds of all AIs, acres treated, and prices for head lettuce from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	11	-16	8	-19	1
Acres Treated	4	-8	-9	2	-3
Acres Harvested	-4	4	-7	5	-6
Price $/cwt	-16	-16	37	-4	-16

Figure 16. acres treated in head lettuce by all active ingredients in the major types of pesticides from 1993 to 2002.



During 2002, the top insecticides used (by acres treated) were permethrin, diazinon, spinosad, acephate, and imidacloprid. The main fungicides used were maneb, iprodione, fosetyl-al, acibenzolar-S-methyl, and vinclozolin. Three herbicides dominated ? propyzamide (pronamide), bensulide, and benefin. Four fumigants? metam-sodium, 1,3–D, chloropicrin, and methyl bromide? were used.

There was less insecticide, fungicide, and herbicide use during 2002 than in 2001, and a 6 percent reduction from 2001 to 2002 in acres of head lettuce harvested. However, fumigant use increased.

Permethrin and spinosad are used to manage larvae of beet armyworm and cabbage looper. Use of permethrin dropped in 2002, possibly due to less worm pressure throughout California, and the increased use of many reduced-risk insecticides such as spinosad and emamectin. In the central coastal area, insecticides other than permethrin such as avermectin were used to manage leafminers. Use of spinosad also increased in 2002, possibly due to concern about thrips damage. Thrips have become important pests in coastal and desert regions of California. Diazinon is mostly used as a preplant treatment to manage soil pests and occasionally thrips. Use of diazinon increased in the coastal areas due to pressure from springtails and symphylans and in the southern deserts due to thrips. Increased use of lambda-cyhalothrin in the southern deserts may have also targeted thrips.

In 2002, maneb was the dominant fungicide used in head lettuce production, primarily to control downy mildew and prevent anthracnose. There was a reduction in use of fosetyl-al, an alternative to maneb for controlling downy mildew. Iprodione, used to treat lettuce drop, was the second most widely used fungicide for head lettuce; unlike vinclozolin and dicloran, which are also used for lettuce drop management, its use in 2002 was higher than that used in 2001. Use of acibenzolar-S-methyl, first registered for lettuce in 2001, increased seven-fold in one year, elevating it to fourth place for number of acres treated. This new reduced-risk fungicide stimulates plants to resist the pathogen that causes downy mildew. Use of another new biofungicide, QST 713 strain of dried *Bacillus* *subtilis*, increased five-fold from 2001 to 2002. First registered for use on lettuce in 2000, *B. subtilis* manages bacterial leaf spot.

Use of propyzamide (pronamide), applied as a postplant–pre-emergent herbicide, decreased from 2001 to 2002, but as consistent with its use for the past ten years, was applied to many more acres than the pre-emergent bensulide, which targets small-seeded annual grasses and is not as efficacious as propyzamide in the coastal areas. Benefin is used as a pre-plant herbicide, especially in the San Joaquin Valley and the southern deserts.

Nematodes are rarely economic pests of head lettuce, so soil is primarily fumigated to control soil-borne diseases. In 2002 the number of acres treated with methyl bromide fell to half the number treated in 2001, while acres treated with1,3–D jumped nearly ten-fold. 1,3–D combined with chloropicrin reduces soil populations of *Verticillium* wilt. Although primarily used as a fumigant to control soil-borne diseases, metam-sodium can also be used to control weeds, if somewhat unreliably. In 2002, five times more acres were treated with this fumigant and preplant herbicide than in 2001.

Oranges

Eighty-six percent of California oranges are grown in the San Joaquin Valley. The rest are grown in the interior region (Riverside and San Bernardino counties) and on the south coast (mostly in Ventura and San Diego counties).

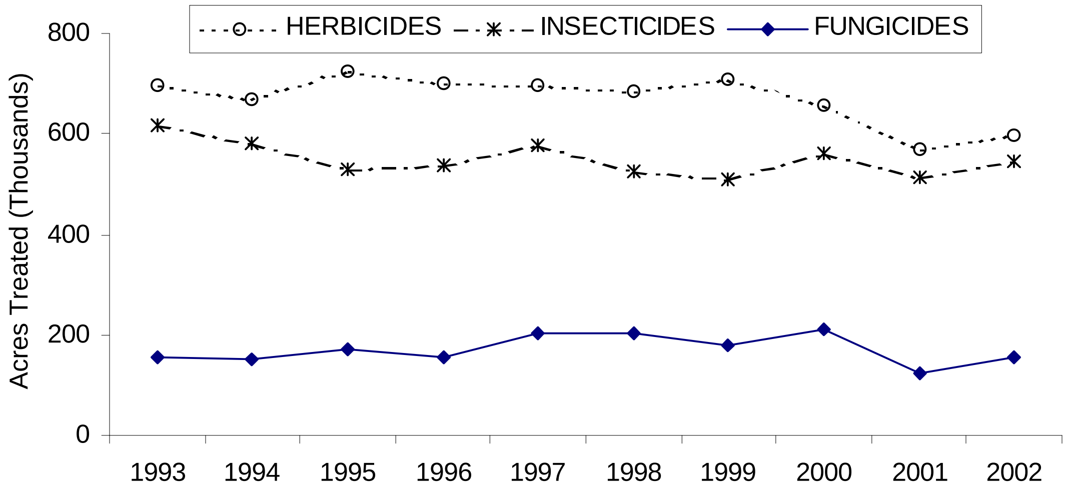
Table 19A. Total orange bearing acres, reported pounds of all AIs, acres treated, and prices for oranges each year from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	10,272,627	8,782,798	8,577,145	6,294,454	6,947,897
Acres Treated	2,031,380	2,064,197	2,202,705	1,741,951	1,929,130
Acres Bearing	200,200	201,500	195,500	194,500	191,500
Price $/box	16.70	26.70	14.70	18.00	20.00

Table 19B. Percent difference from previous year for orange bearing acres, reported pounds of all AIs, acres treated, and prices for oranges from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	-11	-15	-2	-27	10
Acres Treated	-4	2	7	-21	11
Acres Bearing	0	1	-3	-1	-2
Price $/box	-1	60	-45	22	11

Figure 17. Acres treated in oranges by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in oranges in 2002 were petroleum oil, spinosad, chlorpyrifos, cyfluthrin, and pyriproxyfen; the major fungicides were copper hydroxide and copper sulfate (basic); and the major herbicides were glyphosate, diuron, and simazine. The use of pesticides did not increase much above the 2001 level (by acres treated), and since 1993 use has declined overall. However, some specific pesticides did show increases from 2001 to 2002: copper sulfate, spinosad, copper hydroxide, cyfluthrin, simazine, diuron, and glyphosate.

The major insect pests in citrus are citrus thrips, scale, orangeworms, and katydids. A new pest in the Coachella Valley, the citrus leafminer, is under quarantine. The Mexican Fruit Fly infestation impacted fruit prices from Southern Riverside County and Northern San Diego County. Growers are required to spray for glassy-winged sharpshooters (GWSS) in most of the citrus-growing regions. According to the National Oceanic and Atmospheric Administration, the citrus-growing regions of California had a dry year with the interior region receiving only 25 percent of normal rainfall. Temperatures in the eastern part of the state were 3 percent above normal. The higher temperatures caused California red scale populations to increase.

Petroleum oil is a broad-spectrum insecticide for aphids, mites, and scales; chlorpyrifos is a broad-spectrum insecticide for insects; cyfluthrin is used for citrus thrips, katydids, and worms; spinosad is used for citrus thrips, orangeworms, and katydids; pyriproxyfen is used to control red scale; and imidacloprid is used to manage GWSS and leafminer. Pyriproxyfen, an insect growth regulator, is not working as well as it did when first introduced in 1998, suggesting that pest resistance may be developing. Growers prefer to use pyriproxyfen for red scale control because it is cheaper, more effective, and has a shorter pre-harvest interval than buprofezin, another insect growth regulator.

The increase in spinosad use was probably due to the increased number of bearing acres. In addition, citrus thrips are developing resistance to pyrethroids; therefore, growers use cyfluthrin in a tank mix with spinosad, which may also explain the increase in use for cyfluthrin. The mandated spray program for GWSS is disrupting the reduced-risk approach that is in place in the interior region. Kern County also reports that the effort to control GWSS is increasing the use of imidacloprid. Growers prefer using a systemic pesticide like imidacloprid that does not impact beneficial insects. Japan lowered the acceptable maximum residue limits for chlorpyrifos, which significantly impacted citrus by preventing use of the product, a valuable IPM tool for citrus.

The fungicides copper hydroxide and copper sulfate are used to prevent Phytophthora gummosis, Phytophthora root rot, and fruit diseases such as brown rot and Septoria spot. When acreage begins bearing fruit, growers use one or two applications of copper spray to protect the fruit. Increases in copper sulfate and copper hydroxide were probably due to the increased number of acres coming into production.

The herbicide glyphosate is used to control weeds post-emergence; diuron and simazine are used for pre-emergent weed control. Since growers use herbicides to prepare the ground prior to planting, glyphosate, simazine and diuron increases are most likely due to the increase in acres planted.

Peaches/Nectarines

California ranks first in the U.S. in the production of peaches and nectarines, producing 71 percent of the peaches in the U.S. and 99 percent of the nectarines. California produces 100 percent of the U.S. processed peaches and 49 percent of the U.S. fresh market peaches. Clingstone peaches comprise approximately 70 percent of the total peach crop in California and are exclusively utilized for processing, which includes canning (including baby food), juice, and frozen. The California fresh shipping freestone peach production represents 30 percent of the annual tonnage. Clingstone peach acreage increased slightly in 2002 over 2001, while freestone peach and nectarine acreage remained unchanged. Pest management issues for peaches and nectarines are nearly identical so these crops are discussed together.

Table 20A. Total peach/nectarine bearing acres, reported pounds of all AIs, acres treated, and prices for peaches/nectarines each year from 1998 to 2002.

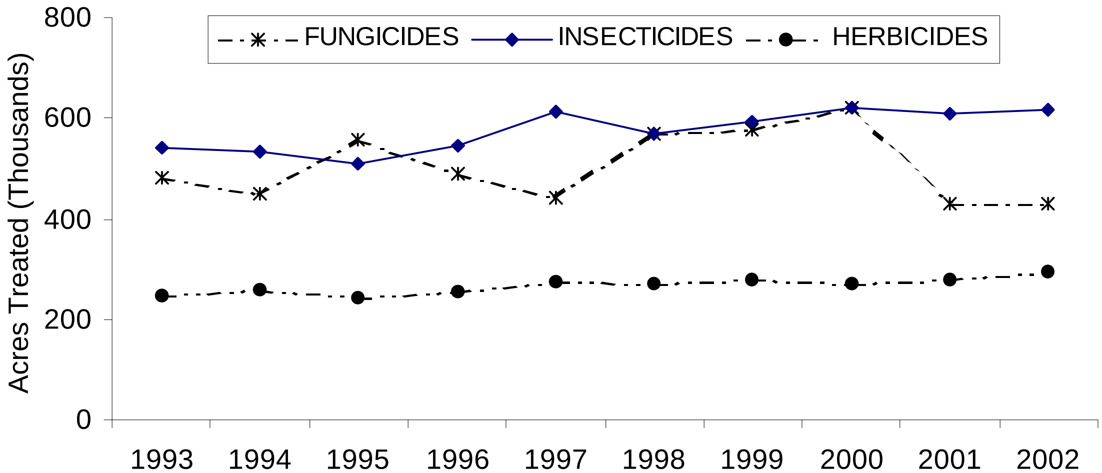
	1998	1999	2000	2001	2002
Lbs AI	6,777,980	5,962,023	6,758,695	5,973,969	6,472,544
Acres Treated	1,722,577	1,725,140	2,701,043	1,615,343	1,619,480
Bearing Acres	102,900	103,300	102,700	104,300	106,500
Price $/ton peach	258.00	266.00	278.00	294.00	290.00
Price $/ton nectarine	471.00	411.00	398.00	464.00	383.00

Table 20B. Percent difference from previous year for peach/nectarine bearing acres, reported pounds of all AIs, acres treated, and prices for peaches/nectarines from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	0	-12	13	-12	8

Acres Treated	-75	0	57	-40	0
Bearing Acres	1	0	-1	2	2
Price $/ton peach	2	3	5	6	-1
Price $/ton nectarine	26	-13	-3	17	-17

Figure 18. Acres treated in peaches and nectarines by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in peaches/nectarines in 2002 were esfenvalerate, petroleum oil unclassified, phosmet, mineral oil, and the pheromones E-8-dodecenyl acetate, Z-8-dodecenyl acetate, and Z-8-dodecenol; the major fungicides were sulfur, copper hydroxide, iprodione, propiconazole, and ziram; and the major herbicides were glyphosate, oxyfluorfen, paraquat dichloride, simazine, and norflurazon. The use of many pesticides increased in 2002. The largest increases (pounds AI) were mineral (horticultural) oil, 1,3-D, sulfur, copper sulfate (basic), copper oxide, and petroleum oil unclassified. Small increases were reported for chlorpyrifos, carbaryl, and methomyl. Overall, use of diazinon continues to decline. In addition, use of propargite was also down in 2002 along with large decreases in copper hydroxide, ziram, and copper sulfate (pentahydrate).

Oriental fruit moth (OFM) was a particular problem in 2002. The season started with a larger over-wintering population of OFM that required supplemental treatments in addition to a mating disruption program. Windy periods during May and June in the Sacramento Valley may have negatively affected pheromone-mating disruption programs. Controlling San Jose scale (SJS) continues to be a primary concern for freestone growers in the San Joaquin Valley. Mites were not particularly a problem; some growers had them, others did not. Katydids continue to be a secondary pest of concern in the south. As growers continue to move away from broad-spectrum pesticides, the incidence of fruit damage by katydids is more prevalent.

Most of the increase in insecticide use in 2002 was to control SJS and OFM. Used in-season, mineral (horticultural) oil was effective in controlling scale crawlers and mites. Increases in the use of phosmet, carbaryl, and methomyl on freestone varieties, was probably due to late season treatments for OFM. Many freestone growers used pheromone mating-disruption for OFM early in the season. Some growers reportedly were not pleased with the results and did not do a mid-season second hanging of pheromone dispensers (due to the labor cost to hang). Many clingstone growers reportedly used sprayable pheromones in their conventional spray (i.e., pyrethroids to control peach twig borer [PTB]). While this practice may have increased pesticide use, it also appeared that the treatments might have been more efficacious. Overall, PTB treatments using Bt and spinosad were up in 2002. As in 2001, growers continue the trend of using 1,3-D instead of methyl bromide to kill soil pests during replanting operations.

Walnuts

California produces 99% of the walnuts grown in the United States and accounts for 38 percent of the world's production. California exports more than 40 percent of its walnut crop. Thirty-five percent of the crop is marketed in shell. Bearing walnut acreage in California increased from 196,000 in 2001 to approximately 200,000 in 2002. Yield per acre in 2002 was 1.41 tons compared to 1.56 tons in 2001. As a result, estimated total production was also down in 2002, compared to 2001.

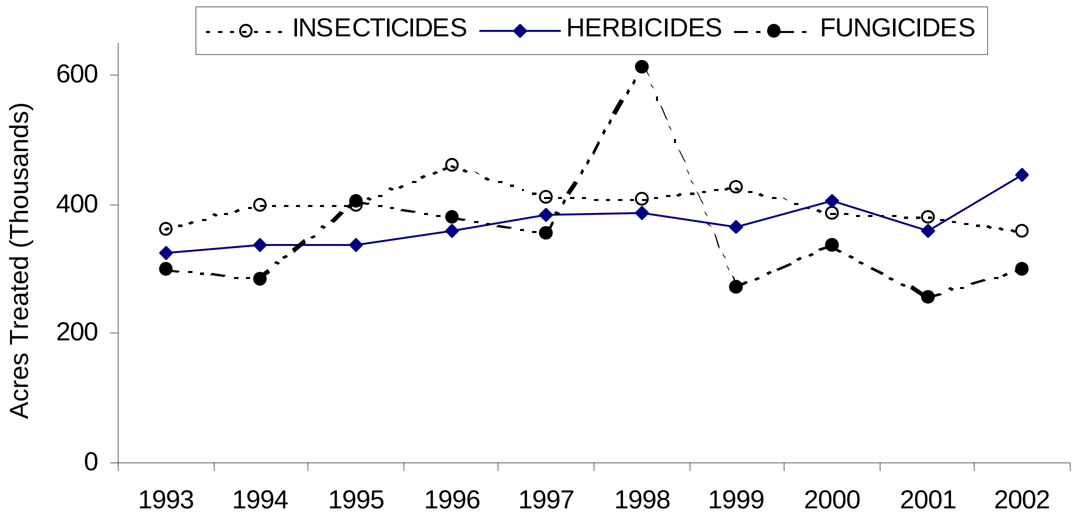
Table 21A. Total walnut bearing acres, reported pounds of all AIs, acres treated, and prices for walnuts each year from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	3,966,057	2,655,000	2,760,383	2,235,045	2,421,157
Acres Treated	1,775,418	1,387,628	1,443,526	1,277,485	1,428,963
Bearing Acres	193,000	191,000	193,000	196,000	200,000
Price $/ton	1,050.00	886.00	1,240.00	1,120.00	1,080.00

Table 21B. Percent difference from previous year for walnut bearing acres, reported pounds of all AIs, acres treated, and prices for walnuts from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	31	-33	4	-19	21
Acres Treated	21	-22	4	-12	12
Bearing Acres	1	0	-1	1	2
Price $/ton	-27	-16	40	-10	-4

Figure 19. Acres treated in walnuts by all active ingredients in the major types of pesticides from 1993 to 2002.



The major insecticides by acres treated in walnuts in 2002 were chlorpyrifos, propargite, methyl parathion, esfenvalerate, and tebufenozide; the major fungicides were copper hydroxide, maneb, copper oxide, and copper ammonium complex; and the major herbicides were glyphosate, oxyfluorfen, simazine, paraquat dichloride, and diuron. The use of most pesticides increased in 2002. The largest increases (pounds AI) were in copper hydroxide, maneb, 1,3-D, methyl bromide, and glyphosate.

Part of the increased use of pesticides in 2002 was due to an increase in bearing acreage statewide. Most of the increase in insecticide use was to control codling moth (CM). Overall, insecticide use in 2002 declined. Populations of CM were low to moderate in the first half of the season. In some areas, late flights were detected, indicating a need to treat. This extended the season by requiring additional treatments. Chlorpyrifos was the primary pesticide used for CM control along with esfenvalerate. Chlorpyrifos use was about the same in 2002 as 2001, and esfenvalerate use decreased; by far the largest increase was hydrolyzed corn product. In addition, the reduced-risk pesticide tebufenozide also showed a sharp increase in 2002. Walnut husk fly was a problem later in the season and required treatment with malathion. Walnut aphid was a secondary pest in some orchards, which resulted in the need for additional treatments of chlorpyrifos and naled.

Other factors played a role in the increased use of pesticides in walnuts. Using a computer index, conditions for development of walnut blight were observed later in the season than normal. This resulted in additional fungicide treatments in May, which accounts for the increase in fungicides applied. The use of glyphosate as a contact herbicide increased in 2002. One explanation may be a practice that involves treating with glyphosate between the tree rows to knock down resident vegetation. This is done to facilitate harvest particularly if a late harvest is anticipated. Use of 1,3-D was up significantly in 2002, since it is used as a replacement for methyl bromide to control soil pests prior to replanting and when planting new orchards. However, methyl bromide use also increased from 2001 to 2002.

Leaf Lettuce

Leaf lettuce is grown in four regions in the state: the central coastal area (Monterey, San Benito, Santa Cruz, and Santa Clara counties); the southern coastal area (Ventura and Santa Barbara counties; the San Joaquin Valley (Fresno, Kings, and Kern counties); and the southern deserts (Imperial and Riverside counties). In 2002, 68 percent of all California leaf lettuce was planted in the central coastal areas, 13 percent in the southern coastal areas, 6 percent in the San Joaquin Valley, and 13 percent in the southern deserts. California produces approximately 81 percent of the leaf lettuce grown in the United States. Romaine dominates the leaf lettuce market in California with approximately 63 percent of production followed by green leaf, 23 percent; red leaf, 10 percent; and butterhead, 4 percent.

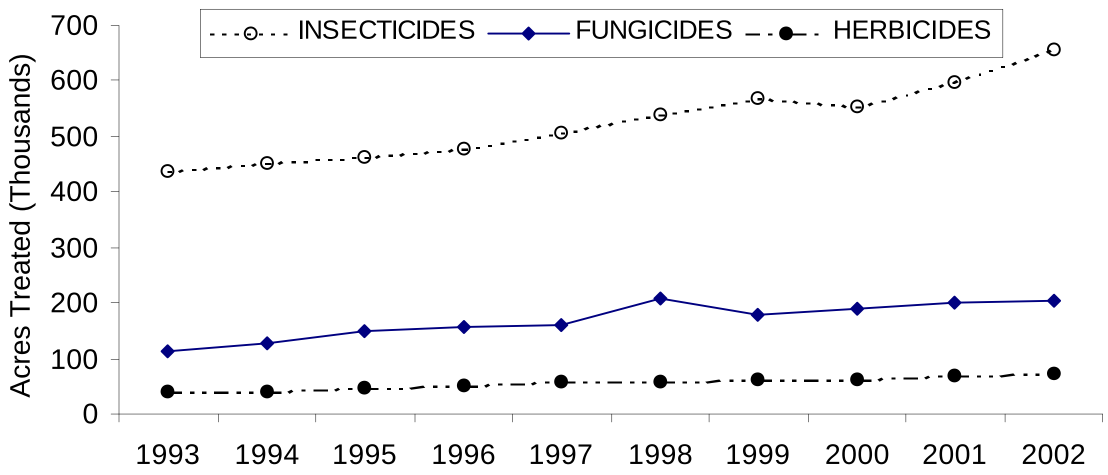
Table 22A. Total leaf lettuce acres harvested, reported pounds of all AIs, acres treated, and prices for leaf lettuce each year from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	998,082	740,467	887,629	788,129	845,826
Acres Treated	934,496	946,333	954,436	1,021,570	1,104,324
Harvested acres	38,000	43,000	45,000	49,000	49,000
Price $/cwt, romaine	21.60	18.00	20.10	17.50	19.90
Price $/cwt, other	30.50	23.80	29.60	24.90	28.10

Table 22B. Percent difference from previous year for leaf lettuce acres harvested, reported pounds of all AIs, acres treated, and prices for leaf lettuce from 1998 to 2002.

	1998	**1999**	**2000**	**2001**	**2002**
Lbs AI	14	-26	20	-11	7
Acres Treated	12	1	1	7	8
Harvested acres	-10	13	5	9	0
Price $/cwt, romaine	13	-17	12	-13	14
Price $/cwt, other	8	-22	24	-16	13

Figure 20. Acres treated in leaf lettuce by all active ingredients in the major types of pesticides from 1993 to 2002.



During 2002, the top insecticides used (by acres treated) were imidacloprid, permethrin, diazinon, spinosad, and lambda-cyhalothrin. The main fungicides used were maneb, fosetyl-al, iprodione, acibenzolar-S-methyl, and dicloran. Propyzamide was the main herbicide applied, followed by bensulide and benefin. Metam-sodium was used almost to the exclusion of the two other fumigants, 1,3–D and chloropicrin. No methyl bromide was applied during 2002.

There was more fungicide and herbicide used during 2002 than in 2001, and no change in acres of leaf lettuce harvested.

Imidacloprid, generally applied to control aphids in coastal areas and whiteflies in the southern deserts, was used on more acres than any other insecticide. In the coastal areas a large portion of the romaine crop is processed as salad mix, and aphids are unacceptable to salad packers. In the southern deserts, one application of imidacloprid at planting will usually control whitefly, and will carry over for aphid control in the winter and spring. Permethrin is used to manage leafminers, thrips, and larvae of beet armyworm and cabbage looper. Use of permethrin increased in 2002 in all areas except for the central coast, where the use of many reduced-risk insecticides such as spinosad and indoxacarb are gaining favor. Diazinon is used mostly as a preplant treatment to manage soil pests and occasionally thrips. Use of diazinon increased in the coastal regions due to pressure from springtails and symphylans and in the desert regions due to thrips. Thrips have become important pests in the coastal areas and southern deserts of California. Use of spinosad, which is used to manage lepidopterous larvae (worms) and thrips, increased in 2002 in all lettuce-growing regions except the southern deserts, where there was less worm pressure than in 2001. Increased use of lambda-cyhalothrin in the southern deserts may have also targeted thrips.

In 2002, maneb was the dominant fungicide used in leaf lettuce production, primarily to control downy mildew and prevent anthracnose. There was a reduction in use of fosetyl-al, an alternative to maneb for controlling downy mildew. Iprodione, used to treat lettuce drop, was the third most widely used fungicide for leaf lettuce. Dicloran, also used for lettuce drop, decreased in use throughout the state to fifth place. Dicloran was not used at all in the southern deserts, but was popular in the southern coastal area, especially Ventura County. Use of acibenzolar-S-methyl, first registered for lettuce in 2001, increased four-fold in one year, elevating it to fourth place for number of acres treated. This new reduced-risk fungicide stimulates plants to resist the pathogen that causes downy mildew. Use of another new biofungicide, QST 713 strain of dried *Bacillus subtilis*, more than doubled from 2001 to 2002. First registered for use on lettuce in 2000, *B. subtilis* manages bacterial leaf spot.

Use of propyzamide (pronamide), applied as a postplant–pre-emergent herbicide, increased from 2001 to 2002 but, consistent with its use for the past ten years, was applied to many more acres than bensulide, another pre-emergent, which is not as efficacious as propyzamide in the coastal areas. Use of bensulide increased slightly from 2001 to 2002, primarily due to its widespread use in the southern deserts where almost as much was applied as propyzamide. (The statewide ratio of propyzamide to bensulide was four to one.) Benefin is used as a pre-plant herbicide, especially in the San Joaquin Valley and desert areas. Its use decreased overall, except in the central coastal area, where it was used to treat more acres in 2002 than in 2001.

During 2002, fumigants were used on few acres. Nematodes are rarely economic pests of leaf lettuce, so soil is primarily fumigated to control soil-borne diseases. From 2001 to 2002, the number of acres treated with metam-sodium doubled. Although primarily used as a soil fumigant to control soil-borne diseases, metam-sodium can also be used as a preplant herbicide, although results are somewhat unpredictable. No methyl bromide was applied in 2002, probably due to the phaseout of this fumigant in 2005. 1,3–D combined with chloropicrin reduces soil populations of *Verticillium* wilt. Use of 1,3-D increased only in the southern deserts.

Strawberries

Strawberries are grown for mostly fresh market. Depending on market prices, some are processed. California strawberry production occurs primarily along the central and southern coast, with a small but significant production occurring in the central valley.

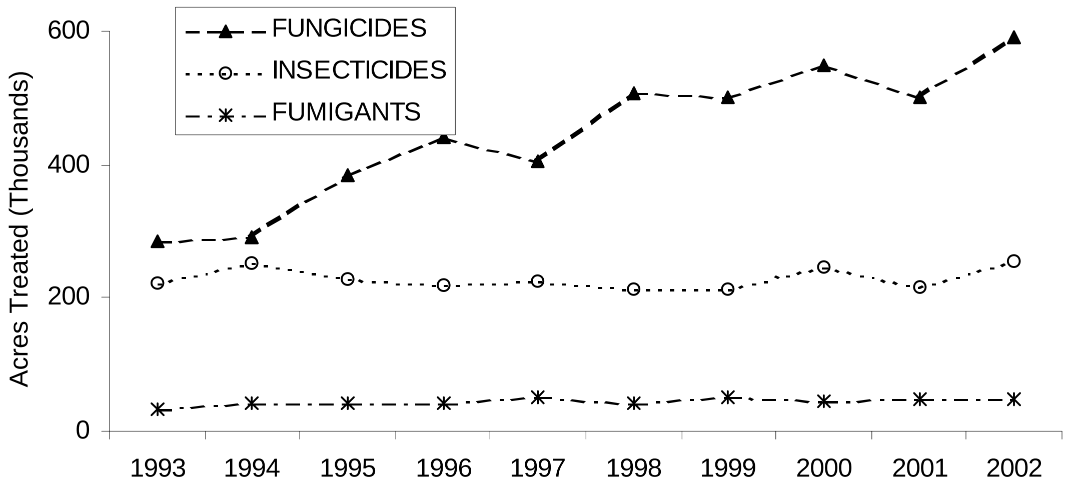
Table 23A. Total strawberry acres harvested, reported pounds of all AIs, acres treated, and prices for strawberries each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	7,272,986	8,847,645	7,743,217	7,893,553	8,206,324
Acres Treated	866,077	905,381	1,027,519	874,829	991,931
Acres Harvested	24,200	25,800	27,600	26,400	28,500
Price $/cwt	68.70	71.30	61.40	70.60	67.40

Table 23B. Percent difference from previous year for strawberry acres harvested, reported pounds of all AIs, acres treated, and prices for strawberries from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	6	22	-12	2	4
Acres Treated	8	5	13	-15	13
Acres Harvested	7	7	7	-4	8
Price $/cwt	12	4	-14	15	-5

Figure 21. Acres treated in strawberries by all active ingredients in the major types of pesticides from 1993 to 2002.



Strawberry production relies on several fumigants (e.g., methyl bromide, chloropicrin, 1,3-dichloropropene, and metam-sodium) that are generally used at high rates. Fumigants are applied at high rates, in part, because they treat a volume of space rather than a surface area such as the leaves and stems of plants. Thus, the pounds applied are large even though the number of applications or number of acres treated may be relatively small. Fumigants accounted for about 89 percent of all pesticide active ingredients by pounds applied in strawberries. Methyl bromide use decreased 2 percent (from 3,777,550 pounds in 2001 to 3,706,589 pounds in 2002). This decrease in methyl bromide use is likely due to expanded restrictions that DPR placed on field applications in the last few years and the federally mandated phaseout which has significantly increased the price of methyl bromide. Growers are replacing methyl bromide with 1,3-D, and metam-sodium. Use of metam-sodium and 1,3-D more than doubled by both acres treated and pounds applied. Chloropicrin use in pounds decreased by 3 percent from 2001 to 2002. The use of a methyl bromide formulation that contained less chloropicrin likely explains this decrease.

Total acres treated and pounds applied increased from 2001 to 2002 for the major fungicides captan, sulfur, myclobutanil, and fenhexamid, likely due to favorable weather for disease development, a longer growing season, and increased acreage in 2002. Iprodione, benomyl, and thiram use decreased significantly from 2001 to 2002. The use of iprodione and benomyl are being phased out for strawberry production. Thiram was likely replaced by fenhexamid and the newly registered azoxystrobin whose uses increased by 6,879 and 4,459 pounds, respectively.

Carrots

California ranks among the top in the U.S. in the production of carrots. Carrots are grown for fresh market and processing. California has four main production regions for carrots: the San Joaquin Valley (Kern County), with significant production in Cuyama Valley (San Luis Obispo County); the low desert (Imperial Valley and Riverside counties); the high desert (Los Angeles County); and the central coast (Monterey County).

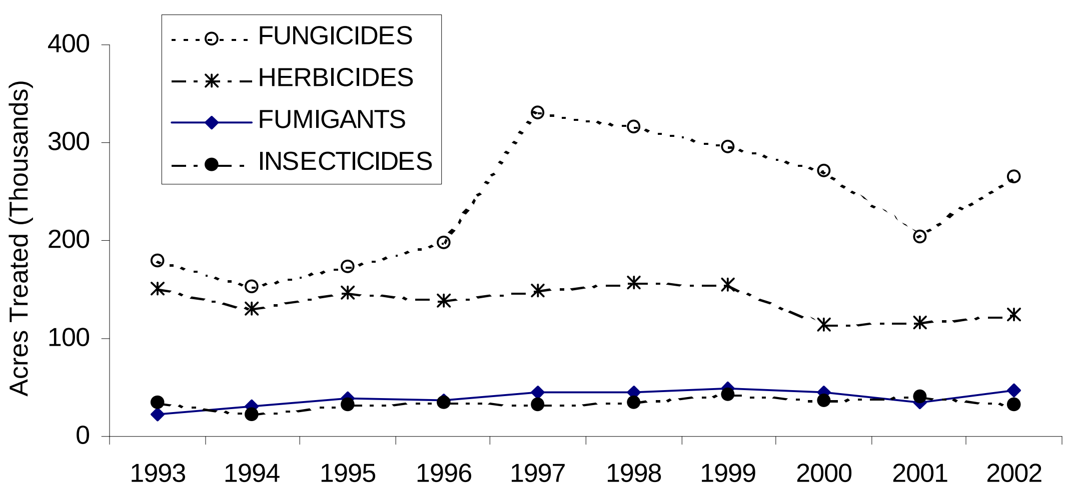
Table 24A. Total carrot acres harvested, reported pounds of all AIs, acres treated, and prices for carrots each year from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	7,733,720	8,653,162	7,582,591	6,448,782	7,775,193
Acres Treated	507,494	503,617	417,985	363,774	436,119
Acres Harvested	91,000	87,900	85,400	84,300	79,100
Price $/cwt	11.40	17.20	13.30	18.10	20.30

Table 24B. Percent difference from previous year for carrot acres harvested, reported pounds of all AIs, acres treated, and prices for carrots from 1998 to 2002.

	1998	1999	2000	2001	2002
Lbs AI	-2	12	-12	-15	21
Acres Treated	-11	-1	-17	-13	20
Acres Harvested	6	-3	-3	-1	-6
Price $/cwt	-12	51	-23	36	12

Figure 22. Acres treated in carrots by all active ingredients in the major types of pesticides from 1993 to 2002.



Most of the pesticides used, as measured by acres treated, were fungicides. Use of all pesticide types, except for insecticides, increased. The major foliar applied fungicides by acres treated in carrots in 2002 were mefenoxam, iprodione, sulfur, and chlorothalonil. The use of these fungicides increased by at least 20 percent. This increase was most likely due to weather favorable for development of powdery mildew and Alternaria leaf blight, the most damaging foliar disease of carrots. Metalaxyl use, the mostly widely used fungicide from 1994 to 1996, has been phased out; its use decreased to nearly zero in 2002. To control cavity spot, the most troublesome root disease in carrots, growers use mefenoxam, which has replaced metalaxyl. Therefore, mefenoxam use in pounds increased by 13 percent in 2002.

Carrot production relies on several fumigants (1,3-D, chloropicrin, and metam sodium) that generally are used at high rates to control soil borne pests and weeds. Methyl bromide is no longer used on carrot acreage. In 2002, fumigants accounted for about 85 percent of the total pounds of pesticide AIs applied to carrots. Acres treated and pounds of 1,3-D used increased by more than 140 percent in 2002. Chloropicrin use also increased (31 percent more acres were treated than in 2001); however, chloropicrin is not used by itself in carrot production. It is contained in a formulation of 1,3-D; therefore, the increase in chloropicrin use is likely due to the increased use of 1,3-D. The use of metam sodium also increased.

Herbicide use increased while acres planted decreased, implying an increase in use per acre planted. The primary increase was in linuron, used to control annual broadleaf weeds and yellow nutsedge. Trifluralin use also increased. It is used to control annual grasses and some small-seeded broadleaf weeds.

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UC Cooperative Extension Area IPM Advisors

UC Cooperative Extension Farm Advisors

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UC Researchers

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