Summary of
Pesticide Use Report Data
2011

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June 2013

For information on obtaining electronic data files, see Page iii.
This report is also available on DPR's Web site <www.cdpr.ca.gov>.
If you have questions concerning this report, call 916-445-3887.

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Preface

Since 1970, the Department of Pesticide Regulation (DPR) published annual reports of pesticides used in California. In 2011, in an effort to more efficiently and accurately capture pesticide use data, a new county-based reporting system, known as CalAgPermits, was created to streamline reporting procedures for pesticide users and upgrade data management capabilities of county departments of agriculture. As might be expected when transitioning to a new, complex data management system such as CalAgPermits, many performance anomalies had to be resolved. This delayed compilation of the 2011 pesticide use data and release of the associated data files and report. With the transition period complete, DPR expects the CalAgPermits system will operate more efficiently and pesticide use data for 2012 and future years will be released in a more timely way.

How to Access the Summary of Pesticide Use Report Data

The *Summary of Pesticide Use Report Data* indexed by chemical or commodity reports for years 1989-2011 can be found on DPR's Web site at <www.cdpr.ca.gov>. The *Summary of Pesticide Use Report Data* is available in two formats. One report is indexed by chemical and lists the amount of each pesticide used, the commodity on which it was used, the number of agricultural applications, and the acres/units treated. The second report is indexed by commodity and lists the chemicals used, the number of agricultural applications, amount of pesticides used, and the acres/units treated.

The *Annual Pesticide Use Report Data* (the complete database of reported pesticide applications for 1990-2011) are available on CD. The files are in text (comma-delimited) format.

The complete Pesticide Use Report database (Zip files by year, 1974 to current year) may be downloaded from DPR's FTP site at <ftp://pestreg.cdpr.ca.gov/pub/outgoing/pur_archives/>.

Questions regarding the *Summary of Pesticide Use Report Data* should be directed to the Department of Pesticide Regulation, Pest Management and Licensing Branch, P.O. Box 4015, Sacramento, California 95812-4015, telephone (916) 445-3887, or you may request copies of the data by contacting <mwilliams@cdpr.ca.gov>.

1 Introduction

California's pesticide use reporting program is recognized as the most comprehensive in the world. California has had pesticide use reporting of some form since at least 1950. In 1990, California became the first state to require full reporting of agricultural pesticide use to have more realistic and comprehensive pesticide data to better inform DPR's pesticide regulatory programs while protecting people and the environment. Over the years, these data have been used by many individuals and groups including government officials, scientists, growers, legislators and public interest groups. All pesticide use required to be reported must be sent to county agricultural commissioners, who in turn, report the data to DPR. DPR annually collects and processes more than 2.5 million records of pesticide applications. (A single application creates more than one record if multiple pesticide products are applied at the same time.)

California has a broad legal definition of "agricultural use" so the reporting requirements include pesticide applications in production agriculture, parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. In addition, all postharvest pesticide treatments of agricultural commodities must be reported along with all pesticide treatments in poultry and fish production as well as some livestock applications. All uses by licensed applicators and outdoor applications of pesticides with the potential to pollute ground water must be reported. The primary exceptions to the reporting requirements are home-and-garden use and most industrial and institutional uses.

California law (Food and Agricultural Code [FAC] Section 12979) requires reporting on uses of pesticides and prescribes how DPR will use the reports in setting priorities for food monitoring, enforcing pesticide use, protecting the safety of farm workers, monitoring the environment for unanticipated residues, researching pest control practices, monitoring and researching public health issues, and similar activities. These uses of the data help to achieve another mandated activity of DPR: to develop an orderly program for the continuous evaluation of currently registered pesticides (FAC Section 12824). Information gathered during continuous evaluation is used in DPR's reevaluation of currently registered pesticides. Regulations (CCR Title 3, Sections 6624 et seq.) further describe pesticide use record keeping and reporting requirements.

Continuous Evaluation of Pesticides

The PUR greatly increased the accuracy and efficiency of continuous evaluation of pesticides by providing details on each application including date, location, site (e.g., crop), time, acres or units treated, and the identity and quantity of each pesticide applied. These data allow DPR scientists and others to identify trends in pesticide use, compare use locations with other geographical information and data, and perform quantitative risk assessments of pesticides to human health to carry out their mandates.

DPR uses the PUR throughout its pesticide regulatory programs in ways that can be broadly grouped as temporal (time), geospatial (place), and quantitative (amount), and often combines elements of each.

Temporal analyses can pinpoint specific applications or span many years. Investigations into suspected worker illnesses, spray drift, fish or wildlife losses, or other enforcement inquiries frequently begin with a review of the PUR to see what applications were made in an area at a particular time. Protection of ground and surface waters, assessments of risks to human health with accurate potential acute and chronic exposure scenarios, and allocation of monitoring and enforcement resources often begin with analyses of PUR data spanning many years to evaluate pesticide use trends.

Geospatial analyses may be local or expansive in scale. Local analyses are used to help set priorities for surface and groundwater monitoring programs by determining pesticide use and runoff potential in specific watersheds or other defined areas. DPR scientists calculate pesticides' contributions of smog-forming volatile organic compounds (VOCs) in the atmosphere using reliable pesticide use data and emissions data on products. They further refine their analyses to specific air basins that are particularly vulnerable to air pollution and determine whether pesticide-related VOC emissions are below required targets or whether additional restrictions on use may be warranted to protect air quality. More expansive analyses relate areas of pesticide use to habitat of endangered species and provide a means to guide growers with use practices that better protect these species. The results of such analyses are very valuable when assessing regulatory responses or evaluating the performance of voluntary stewardship efforts.

Quantitative assessments are broadly used to model risks of pesticide use to humans and the environment. The quality and depth of the PUR often allow researchers to apply realistic assumptions when modeling pesticide exposures, for example, of residents near agricultural lands, workers in the field, handlers preparing and applying pesticides, or aquatic organisms inhabiting waterways that receive agricultural runoff. The result is well-informed and realistic risk management decisions.

After the passage of the federal Food Quality Protection Act (FQPA) in 1996, complete pesticide use data became even more important to the U.S. Environmental Protection Agency (U.S. EPA), groups representing California's various agricultural commodities, and other stakeholders. The FQPA contained a new food safety standard against which all pesticide tolerances (amounts of pesticide residue allowed by federal law to remain on a harvested crop) must be measured. DPR provides recent use data and summaries to commodity groups, University of California (UC) specialists, U.S. EPA, and other interested parties as they reassess tolerances and calculate dietary risks from pesticides.

Data on types and rates of pesticide use in various crops and at other sites help researchers understand how various pest management options are implemented and devise strategies that reduce environmental risks. Analyses of these data support and assess grant projects DPR funds to promote the development and adoption of integrated pest management practices in both agricultural and urban settings.

The PUR data are used by many state, regional and local agencies, scientists, and public interest groups to better understand pesticide use and to find better ways to protect human health and the environment while producing food and fiber and maintaining our shelters and surroundings.

Data Collection

Partial reporting of agricultural pesticide use has been in place in California since at least the1950s. In those years, county agricultural commissioners (CACs) required agricultural pest control operators to send monthly reports. County requirements varied but many included a statement for each application that showed the grower's name; treatment location and date; crop; acres or other units treated; target pest; and the kind, strength, and amount of the pesticide applied. Only statistics on aerial pesticide applications were forwarded to the state for tabulation. In 1955, state regulators asked for reports on ground application acreage but dropped requirements for detailed reporting of pesticides used and commodities treated. In 1970, DPR required farmers to report all applications of restricted use pesticides and pest control operators to report all pesticides used, whether restricted or nonrestricted. Both kinds of reports had to include the date, location, site (e.g., crop), acres or units treated, and the identity and quantity of each pesticide applied. Production agricultural applications included records for each application and the location to a square mile area (section, township, and range); all other applications were reported as a monthly summary by county. The reports were filed with the CAC, who forwarded the data to the state, where it was entered into a database and summarized in annual publications.

The Food Safety Act of 1989 (Chapter 12001, AB 2161) gave DPR statutory authority to require full reporting of pesticide use. That year, the department adopted regulations and full use reporting began in 1990.

The first years of full use reporting nearly overwhelmed the department's capacity to process data. Use reports were on paper and staff had to hand-enter data representing more than a million records each year. DPR began almost immediately to search for ways to automate reporting from pesticide users to CACs and, in turn, from the counties to DPR. However, it was difficult to find an approach that suited the diversity of use reporting and differing budget resources among the counties. Starting in 1991, various automated programs were developed and modified by DPR and the CACs. Meanwhile, technological progress and increasing use of the Internet by businesses fed expectations for more Web-based functionality for pesticide use reporting.

CalAgPermits

In 2011, the counties worked together to implement a new standardized county system, called CalAgPermits, that operates over the Internet. It helps CACs issue restricted materials permits and provides an automated platform for validating and relaying pesticide use reports electronically to DPR. It accepts pesticide use reports electronically from individuals and subscriber-based firms and allows pesticide use reporting directly via the Web. CalAgPermits allows pesticide use data to flow back and forth electronically between DPR and CACs for quality assurance. It also offers more robust data quality assurances that prevent coding mistakes and transcription errors (e.g., drop down menus and requisite data fields that must be filled before records are accepted). CalAgPermits has enhanced the efficiency of data entry and data transfer and enhanced the accuracy and integrity of the database.

Improving Accuracy

The use report data are checked for accuracy at several steps in the process. CalAgPermits checks for several kinds of errors when users enter data. For example, if the pesticide is a restricted material CalAgPermits compares the pesticide's reported use to the grower's restricted materials permit to ensure that the pesticide is listed in the permit. When data are sent to DPR to be loaded into DPR's database, more than 50 different validity checks are made against the data. In particular, the U.S. EPA or California registration number is verified and a check is made to confirm the commodity reported is an acceptable use of the pesticide product. The database contains some products that are no longer registered since continued use of those products is often allowed while existing stocks remain with end-users. Records with suspected errors are flagged and returned electronically to the county for resolution.

In the late 1990s, DPR developed a statistical method to detect probable errors in the data fields for the acres treated and the pounds of pesticide used. This is one of the error checks done after data are sent to DPR. If a reported rate of use (pounds of pesticide per area treated) is so large it was probably an error, the rate is replaced with an estimated rate equal to the median rate of all applications of the pesticide product on the same crop or site. This is still flagged as an error and sent back to the counties for checking. Since the error could have been in the pounds reported or the area or unit treated, the value that is most unusual is replaced with an estimate. Although less than one percent of the reports are flagged as this type of error, some are so large that if included they would significantly affect total pounds applied of the pesticide. (For example, in 2007 an application of the insecticide imidacloprid was inaccurately reported as 108,000 pounds on one acre of cabbage. The median rate of imidacloprid use in 2007 was 0.05 pounds an acre. These types of errors, while rare, can occur.)

Improving Access to the Data

The annual reports present only a summary of the use reporting data base (typically a 450-megabyte file for each year's data). In the late 1990s, DPR took steps to improve public access to the data and present it in a more meaningful context. Summaries of the statewide data indexed by chemical and by commodity, previously available on paper and compact disk, were posted on DPR's Web site. Summaries of use in each of the state's 58 counties, previously available only on request, were also posted online. The entire database starting with the 1974 data is also available on DPR's web site.

In 2003, DPR launched the Web-based California Pesticide Information Portal (CalPIP) database to increase public access to the nation's most extensive source of pesticide use information. CalPIP provides pesticide use statistics, including date, site or crop treated, pounds used, acres treated, pesticide product name, chemical name (active ingredient), application pattern (ground, air or other), county, ZIP code, and location to a one-square-mile area.

DPR also began examining trends in pesticide use, starting with the 1996 data, analyzing critical crops, pest problems and trends in pounds used, number of applications, and acres treated. Each year, the pesticide use report summary charts use of pesticides over several years in specific categories:

- Reproductive toxins.
- Carcinogens.
- Insecticide organophosphate and carbamate chemicals.
- Chemicals classified by DPR as ground water contaminants.
- Chemicals listed by DPR as toxic air contaminants.
- Fumigants.
- Oil pesticides derived from petroleum distillation. (Some may be on the state's Proposition 65 list of chemicals "known to cause cancer," but most serve as alternatives to high-toxicity pesticides).
- Biopesticides (including microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest, such as pheromones.).

DPR scientists review changes in pesticide use for about a dozen crops selected based on pesticide use or treated acreage. To compile this information, staff reviews publications and conducts phone interviews with pest control advisers, growers, researchers, commodity association representatives, and UC Cooperative Extension farm advisers and specialists. Based on their knowledge of pesticides, California agriculture, and pests and pest management practices, DPR scientists propose explanations for year-to-year changes in pesticide use.

Pesticide use trend analyses can help agencies understand where efforts to promote reduced-risk pest management strategies are succeeding or failing. Information on long-term trends also helps researchers better identify emerging challenges and direct research attention to finding solutions.

2 Comments and Clarifications of Data

The following comments and points should be taken into consideration when analyzing data contained in this report.

Terminology

- *Number of agricultural applications* - Number of applications of pesticide products made to production agriculture. More detailed information is given below under "Number of Applications."
- *Pounds applied* - Number of pounds of an active ingredient.
- *Unit type* - The amount listed in this column is one of the following:

  A = Acreage
  C = Cubic feet (of commodity treated)
  K = Thousand cubic feet (of commodity treated)
  P = Pounds (of commodity treated)
  S = Square feet
  T = Tons (of commodity treated)
  U = Miscellaneous units (e.g., number of tractors, trees, tree holes, bins, etc.)

Agricultural and Non-Agricultural Pesticide Use

Many pesticide licensing, sales, and use requirements are tied to California's definition of agricultural use, and pesticide labels differentiate between agricultural, industrial, or institutional uses. The law (Food and Agricultural Code Section 11408) identifies agricultural use as all use except that specifically identified as non-agricultural use, which is specified as:

- *Home* - Use in or in the immediate environment of a household.
- *Industrial* - Use in or on property necessary to operate factories, processing plants, packinghouses or similar buildings, or use for or in a manufacturing, mining or chemical process. In California, industrial use does not include use on rights-of-way. Postharvest commodity fumigations at buildings or on trucks, vans, or railcars are normally industrial use.
- *Institutional* - Use in or on property necessary to operate buildings such as hospitals, office buildings,libraries, auditoriums or schools. When a licensed structural pest control operator treats these buildings, it is structural use. Landscaping of walkways, parking lots and other

areas bordering these buildings is institutional. Landscaping of larger, more independent areas is not considered institutional.

- *Structural* - Use by licensed structural pest control operators within the scope of their licenses.
- *Vector control* - Use by certain vector control (mosquito abatement) districts.
- *Veterinarian* - Use according to a written prescription of a licensed veterinarian.

Agricultural use of pesticides includes:

- *Production agricultural use* - Any use to produce a plant or animal agricultural product (food, feed, fiber, ornamental or forest) that will be distributed in the channels of trade. (While production agricultural use includes various agricultural products, some requirements—most notably in the worker safety and use reporting—apply only to plant product production.)
- *Nonproduction agricultural use* - Any use to areas such as watersheds, rights-of-way, and landscaped areas(such as golf courses, parks, recreation areas, and cemeteries) not covered by the definitions of home and institutional. There are some pesticide products labeled for dual-use, that is, they have both agricultural and non-agricultural uses.

The reporting requirements apply to a range of uses partly due to the California legal definition of agricultural use. With implementation of full use reporting in 1990, the following pesticide uses are required to be reported to the CAC who, in turn, reports the data to DPR:

- Production of any agricultural commodity except livestock.
- Treatment of postharvest agricultural commodities.
- Landscape maintenance in parks, golf courses, cemeteries, and similar sites defined in the FAC as agricultural use.
- Roadside and railroad rights-of-way.
- Poultry and fish production.
- Application of a restricted material.
- Application of a pesticide listed in regulation as having the potential to pollute ground water when used outdoors in industrial and institutional settings.
- Application by licensed pest control operators, which include agricultural and structural applicators and maintenance gardeners.

The primary exceptions to the use reporting requirements are consumer home-and-garden use and most industrial and institutional uses.

Operator and site identification numbers. An operator identification number (OIN), sometimes called a "grower ID," is issued by CACs to property operators. The number is needed to report pesticide use and to buy agricultural- or restricted-use pesticides. Pest control professionals do not have to get operator ID numbers. A site identification code must be assigned for each location or field where pesticides will be used for production of an agricultural commodity. This alphanumeric code is also recorded on any restricted material permit the grower gets for the location.

What must be reported. The PUR contains two kinds of records: production agricultural records and all others. For the PUR, production agricultural records represent applications made while producing agricultural commodities. Production agricultural pesticide use reports must be sent monthly by growers or seven days after the application by pest control businesses to the CAC. They include:

- Date and time of application.
- Geographic location including the section, township, range, and base line/meridian.
- Operator identification number.
- Operator name and address (although this information is not submitted to DPR).
- Site identification number.
- Commodity, crop, or site treated.
- Acres or units planted and treated.
- Whether the application was by air, ground, or other means.
- For field fumigations in ozone nonattainment areas, details on fumigation method (for example, shallow shank injection with a tarp). This is to allow the department to estimate pesticide VOC emissions.
- Amount of product applied with its name and U.S. EPA registration number or, if the product was an adjuvant, its California registration number. (The U.S. EPA does not require registration of adjuvants.)

Reports of all other kinds of applications pesticide use, which are mostly nonagricultural, are monthly summaries that include pesticide product name, the product registration number, amount used, number of applications, the kind of site treated (for example, roadside, structure), the month of application, and county.

Commodity Codes

DPR's pesticide product label database is used to cross-check data entries to determine if the product reported is registered for use on the reported commodity. The DPR label database uses a crop coding system based on crop names used by the U.S. EPA to prepare official label language. However, this system caused some problems until DPR modified it in the early 1990s to account for U.S. EPA's grouping of certain crops under generic names. Problems occurred when the label language in the database called a crop by one name, and the use report used another. For example, a grower may have reported a pesticide use on "almonds," but the actual label on the pesticide product coded into the database stated the pesticide was to be used on "nuts." A cross reference table was created associating each crop with a more general crop name that could be used on a label. This cross reference table also associated the crop name used in the PUR with all the different names for a crop in the label database. For example, the PUR uses one name for "cotton", but the label database has several names for cotton, such as "cotton (fiber crop)", "cotton (forage - fodder)", "cotton (all or unspec)", and "cotton, general". This system greatly reduces the number of rejections.

Plants and commodities grown in greenhouse and nursery operations represented a challenge in use reporting because of their diversity. Six commodity groupings were suggested by industry in 1990 and incorporate terminology that are generally known and accepted. The six use reporting categories are: greenhouse-grown cut flowers or greens; outdoor-grown cut flowers or greens; greenhouse-grown plants in containers; outdoor-grown plants in container/field-grown plants; greenhouse-grown transplants/propagative material; and outdoor-grown transplants/propagative material.

Tomatoes and grapes were also separated into two categories because of public and processor interest in differentiating pesticide use. Tomatoes are assigned two codes to differentiate between fresh market and processing categories. One code was assigned to table grapes, which includes grapes grown for fresh market, raisins, canning, or juicing. A second code was assigned to wine grapes.

Unregistered Use

The report contains entries that reflect the use of a pesticide on a commodity for which the pesticide is not currently registered. This sometimes occurs because the original use report was in error, that is, either the pesticide or the commodity was inaccurately reported. DPR's computer program checks that the commodity is listed on the label, but nonetheless such errors appear in the PUR, possibly because of errors in the label database. Also, the validation program does not check whether the pesticide product was registered at the time of application. For example, parathion (ethyl parathion) is shown reported on crops after most uses were suspended in 1992. (These records are researched and corrected as time and resources allow.) DPR continues to implement methods that identify and reduce these types of reporting errors in future reports. Other instances may occur because by law, growers are sometimes allowed to use stock they have on hand of a pesticide product that has been withdrawn from the market by the manufacturer or suspended or canceled by regulatory authorities. Other reporting "errors" may occur when a pesticide is applied directly to a site to control a particular pest, but is not applied directly to the crop in the field. A grower may use an herbicide to treat weeds on the edge of a field, a fumigant on bare soil prior to planting, or a rodenticide to treat rodent burrows. For example, reporting the use of the herbicide glyphosate on tomatoes-when it was actually applied to bare soil prior to planting the tomatoes-could be perceived to be an error. Although technically incorrect, recording the data as if the application were made directly to the commodity provides valuable crop usage information for DPR's regulatory program.

Adjuvants

Data on spray adjuvants (including emulsifiers, wetting agents, foam suppressants, and other efficacy enhancers), not reported prior to full use reporting, are now included. Examples of these types of chemicals include the "alkyls" and some petroleum distillates. (Adjuvants are exempt from federal registration requirements, but must be registered as pesticides in California.)

Acres Treated

The summary information in this annual report cannot be used to determine the total number of acres of a crop. However, it can be used to determine the cumulative acres treated. The problem is that the same field can be treated more than once in a year with the same active ingredient. A similar problem occurs when the product used contains more than one active ingredient. (In any pesticide product, the active ingredient is the component that kills, or otherwise controls, target pests. A pesticide product is made up of one or more active ingredients, and possibly one or more inert ingredients.) For example, if a 20-acre field is treated with a product that contains three different pesticide active ingredients, a use report is filed by the farmer correctly recording the application of a single pesticide product to 20 acres. However, in the summary tables, the three different active ingredients will each have recorded 20 acres treated. Adding these values results in a total of 60 acres as being treated instead of the 20 acres actually treated.

Number of Applications

The values for number of applications include only production agricultural applications. Applicators are required to submit one of two basic types of use reports, a production agricultural report or a monthly summary report. The production agricultural report must include information for each application. The monthly summary report, for all uses other than production agriculture, includes only monthly totals for all applications of pesticide product, site or commodity, and applicator. The total number of applications in the monthly summary reports is not consistently given so they are no longer included in the totals. In the annual PUR reports before 1997, each monthly summary record was counted as one application. In the annual summary report by commodity, the total number of applications given for each commodity may not equal the sum of all applications of each active ingredient on that commodity. As explained above, some pesticide products contain more than one active ingredient. If the number of applications were summed for each active ingredient in such a product, the total number of applications would be more than one, even though only one application of the product was made.

3 Data Summary

This report is a summary of 2011 data submitted to DPR as of April 5, 2013. Total pounds may change slightly due to ongoing error correction. The revised numbers, when available, will more accurately reflect the total pounds applied.

Pesticide Use in California

In 2011, there were 192 million pounds of pesticide active ingredients reported used in California. Annual use has varied from year to year since full use reporting was implemented in 1990. For example, reported pesticide use was 195 million pounds in 2005, 160 million pounds in 2009, and 192 million pounds in 2011.

Such variances are and will continue to be a normal occurrence. These fluctuations can be attributed to a variety of factors, including changes in planted acreage, crop plantings, pest pressures, and weather conditions. For example, extremely heavy rains result in excessive weeds, thus more pesticides may be used; drought conditions may result in fewer planted acres, thus less pesticide may be used.

In addition, it should be noted that the pounds of pesticides used and the number of applications are not necessarily accurate indicators of the extent of pesticide use or, conversely, the extent of use of reduced-risk pest management methods. For example, farmers may make a number of small-scale “spot” applications targeted at problem areas rather than one treatment of a large area. They may replace a more toxic pesticide used at one pound per acre with a less hazardous compound that must be applied at several pounds per acre. Either of these scenarios could increase the number of applications or amount of pounds used, respectively, without indicating an increased reliance on pesticides.

As in previous years, the greatest pesticide use occurred in California’s San Joaquin Valley (Table 1). The four counties in this region with the highest use were Fresno, Kern, Tulare, and Madera.

Table 2 breaks down the pounds of pesticide use by general use categories: production agriculture, post-harvest commodity fumigation, structural pest control, landscape maintenance, and all others.

Table 1: *Total pounds of pesticide active ingredients reported in each county and rank during 2010 and 2011.*

	2010 Pesticide Use		2011 Pesticide Use	
County	Pounds Applied	Rank	Pounds Applied	Rank
Alameda	295,196	37	352,704	37
Alpine	633	58	621	58
Amador	66,814	45	95,375	44
Butte	1,952,875	22	2,094,523	21
Calaveras	38,081	47	78,438	46
Colusa	2,064,928	21	2,523,811	18
Contra Costa	455,774	34	406,979	36
Del Norte	288,120	38	293,246	38
El Dorado	136,868	43	130,524	42
Fresno	30,250,572	1	36,784,255	1
Glenn	2,153,394	19	2,324,538	19
Humboldt	31,097	49	27,881	50
Imperial	4,900,805	11	5,221,939	11
Inyo	1,285	57	7,801	54
Kern	25,713,116	2	28,131,525	2
Kings	6,768,103	9	7,193,006	8
Lake	419,246	35	699,049	32
Lassen	211,331	42	80,131	45
Los Angeles	2,139,452	20	1,658,199	22
Madera	9,130,306	5	11,639,271	4
Marin	64,478	46	64,525	48
Mariposa	5,875	54	5,808	55
Mendocino	1,146,231	28	747,762	31
Merced	7,730,240	7	7,022,329	9
Modoc	78,327	44	116,150	43
Mono	5,544	55	9,745	53
Monterey	8,727,883	6	8,578,249	6
Napa	1,329,099	25	1,390,747	24
Nevada	10,252	53	27,658	51
Orange	1,311,387	26	925,744	28
Placer	235,341	41	264,202	40
Plumas	12,785	52	2,897	56
Riverside	2,361,412	18	2,116,570	20
Sacramento	3,622,127	13	3,578,339	13
San Benito	700,037	33	547,772	34
San Bernardino	398,011	36	506,566	35
San Diego	1,370,676	24	1,357,633	25

Table 1: (continued) *Total pounds of pesticide active ingredients reported in each county and rank during 2010 and 2011.*

County	2010 Pesticide Use Pounds Applied	2010 Pesticide Use Rank	2011 Pesticide Use Pounds Applied	2011 Pesticide Use Rank
San Francisco	18,480	50	40,667	49
San Joaquin	9,425,876	4	10,861,698	5
San Luis Obispo	3,033,397	14	3,242,901	15
San Mateo	276,462	39	282,815	39
Santa Barbara	4,393,097	12	5,202,246	12
Santa Clara	1,132,356	29	890,845	29
Santa Cruz	1,030,787	31	1,652,522	23
Shasta	249,149	40	232,246	41
Sierra	1,413	56	717	57
Siskiyou	1,759,745	23	1,248,464	26
Solano	1,068,342	30	548,477	33
Sonoma	2,649,940	17	2,637,951	17
Stanislaus	5,961,405	10	6,664,842	10
Sutter	2,802,269	16	3,134,112	16
Tehama	794,219	32	882,954	30
Trinity	13,298	51	25,156	52
Tulare	13,143,767	3	15,289,748	3
Tuolumne	31,968	48	70,918	47
Ventura	7,006,004	8	7,527,248	7
Yolo	2,828,757	15	3,324,649	14
Yuba	1,250,171	27	1,201,622	27
Total	174,998,605		191,969,313	

Table 2: *Pounds of pesticide active ingredients, 1998 – 2011, by general use categories.*

Year	Production Agriculture	Post Harvest Fumigation	Structural Pest Control	Landscape Maintenance	All Others	Total Pounds
1998	207,927,327	1,760,324	5,930,341	1,397,157	6,861,142	223,876,291
1999	189,265,944	2,059,858	5,673,525	1,398,550	7,892,724	206,290,601
2000	175,720,588	2,167,778	5,187,054	1,404,713	6,842,213	191,322,346
2001	142,936,823	1,462,160	4,922,462	1,284,605	6,304,885	156,910,936
2002	159,183,466	1,852,668	5,469,445	1,442,756	6,816,830	174,765,165
2003	160,997,923	1,785,747	5,177,451	1,962,979	7,512,050	177,436,150
2004	165,871,930	1,874,210	5,119,987	1,603,433	6,981,525	181,451,084
2005	178,316,646	2,260,932	5,625,037	1,763,906	8,498,876	196,465,397
2006	168,594,714	2,216,042	5,273,685	2,273,020	10,320,213	188,677,674
2007	157,547,081	2,279,532	3,967,354	1,658,768	7,318,057	172,770,791
2008	149,363,763	2,540,189	3,224,583	1,581,544	7,143,067	163,853,146
2009	146,391,872	1,479,629	2,939,893	1,340,289	5,999,377	158,151,060
2010	159,778,078	2,160,782	3,734,038	1,727,525	7,598,180	174,998,605
2011	176,924,973	1,442,570	3,202,012	1,929,956	8,469,802	191,969,313

Pesticide Sales in California

Reported pesticide applications are only a portion of the pesticides sold each year. Typically, about two-thirds of the pesticide active ingredients sold in a given year are not subject to use reporting. Examples of non-reported active ingredients are chlorine (used primarily for municipal water treatment) and home-use pesticide products.

There were 619 million pounds of pesticide active ingredients sold in 2011, 629 million pounds sold in 2010, 594 million pounds sold in 2009, 713 million pounds sold in 2008, and 678 million pounds sold in 2007. Prior-years data are posted on DPR's Web site at <www.cdpr.ca.gov>, click "A - Z Index," "Sales of pesticides."

4 Trends in Use in Certain Pesticide Categories

Reported pesticide use in California in 2011 totaled 192 million pounds, an increase of just over 17 million pounds from 2010. Production agriculture, the major category of use subject to reporting requirements, accounted for nearly all of the increase. Applications increased by 17 million pounds for production agriculture, 202,000 pounds for landscape maintenance, and 872,000 pounds for other reported non-agricultural uses, which includes rights of way, vector control, research, and fumigation of nonfood and nonfeed materials such as lumber and furniture. In contrast, there was a 718,000-pound decrease in post-harvest treatments and a 532,000-pound decrease in structural pest control.

The active ingredients (AI) with the largest uses by pounds in 2011 were sulfur, petroleum and mineral oils, 1,3-dichloropropene (1,3-D), metam-sodium, and glyphosate. Sulfur was the most highly used non-adjuvant pesticide in 2011, both in amount applied and area treated. By amount, sulfur accounted for 27 percent of all reported pesticide use. Sulfur is a natural fungicide favored by both conventional and organic farmers.

Most of the increase in reported pesticide use were from sulfur, which increased by 4.5 million pounds (10 percent increase). Other pesticides with large increases in amount applied include petroleum and mineral oils (4.2 million-pound increase, 15 percent), 1,3-D (2.1 million-pound increase, 24 percent), glyphosate (2.0 million-pound increase, 23 percent), chloropicrin (0.91 million-pound increase, 14 percent), calcium hydroxide (0.86 million-pound increased, 19 percent), and potassium N-methyldithiocarbamate, also called metam-potassium, (0.86 million-pound increase, 18 percent).

In contrast, some pesticides had decreased use. The largest decrease was use of kaolin, which decreased 1.4 million pounds (45 percent). Other pesticides with decreases in amount applied were methyl bromide (790,000-pound decrease, 17 percent), sulfuryl fluoride (391,000-pound decrease, 14 percent), maneb (316,000-pound increase, 85 percent), and metam-sodium (310,000-pound decrease, 2.8 percent).

Major crops or sites that showed an overall increase in pesticide amount applied from 2010 to 2011 include almond (5.5-million pound increase, 27 percent), wine grape (3.1-million pound increase, 12 percent), table and raisin grape (2.4 million pound increase, 17 percent), cotton (2.0-million pound increase, 65 percent), and orange (1.3-million pound increase, 14 percent) (Table 3). Major crops or sites with decreased amount applied include carrot (1.5-million pound decrease, 18 percent), sweet potato (905,000-pound decrease, 63 percent), pomegranate (897,000-pound decrease, 59 percent), public health (562,000-pound decrease, 40 percent), and structural pest control (532,000-pound decrease, 14 percent). Public health refers to the management and control of pests having medical and public health importance.

DPR data analyses have shown that pesticide use varies from year to year depending upon pest

Table 3: *The change in pounds of AI applied and planted or harvested acreage and the percent change from 2010 to 2011 for the crops or sites with the greatest increase and decrease in pounds applied. Acreage values come from NASS reports.*

	Change in Use 2010–2011		Percent Change 2010–2011	
Crop Treated	Pounds	Acres	Pounds	Acres
Almond	5,540,407	10,000	27	1
Wine Grapes	3,089,452	8,000	12	1
Table and Raisin Grapes	2,393,339	-2,000	17	-1
Cotton	1,982,208	150,000	65	49
Orange	1,260,817	-3,000	14	-2
Structural Pest Control	-532,026		-14	
Public Health	-562,178		-40	
Pomegranate	-897,395	-3,386	-59	-11
Sweet Potato	-904,576	500	-63	3
Carrot	-1,491,001	3,000	-18	5

problems, weather, acreage and types of crops planted, economics, and other factors. Use of most pesticide categories increased from 2010 to 2011, except for decreases in area treated by pesticides identified as air contaminants and pounds of pesticides known to cause reproductive toxicity.

Pesticide use is reported as the number of pounds of AI and the total number of area treated. The data for pounds include both agricultural and nonagricultural applications; the data for area 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 AI, it is counted as three acres treated in the tables and graphs in Sections IV and V of this report.)

To provide an overview, pesticide use is summarized for eight different pesticide categories from 2002 to 2011 (Tables 4 – 19) and from 1995 to 2011 (Figures 1 – 8). These categories classify pesticides according to certain characteristics such as reproductive toxins, carcinogens, or reduced-risk characteristics. Some of the major changes from 2010 to 2011 include:

- Chemicals classified as reproductive toxins decreased in pounds applied from 2010 to 2011 (1.3-million pound decrease, 7 percent) while increasing in area treated (339,000-acres treated increase, 11 percent). The decrease in pounds was mainly due to less use of the fumigants methyl bromide and metam-sodium. In addition, there were also decreases in the fumigant sodium tetrathiocarbonate, the insecticides oxydemeton-methyl and carbaryl, and the fungicide thiophanate-methyl . The increase in area was mostly from uses of the miticide/insecticide abamectin (also called avermectin). Pesticides in this category are ones listed on the State's Proposition 65 list of chemicals "known to cause reproductive toxicity."

- Use of chemicals classified as carcinogens increased from 2010 to 2011 (3.1-million pound increase, 10 percent; 360,000 acre increase, 9.4 percent). The increase in pounds was mainly due to higher use of the fumigants 1,3-dichloropropene and potassium n-methyldithiocarbamate (metam-potassium), and, to a lesser degree, increases in the fungicides mancozeb and chlorothalonil and the herbicide oryzalin. The increase in area treated was mostly from increases in acreage treated with the fungicide mancozeb and the herbicide diuron. The pesticides in this category are ones listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals "known to cause cancer".

- Use of cholinesterase-inhibiting pesticides (organophosphate [OP] and carbamate pesticides), which include compounds of high regulatory concern, slightly increased from the previous year (20,000 pound increase, 0.44 percent; 60,000 acre increase, 1.5 percent). Pesticides in this category had continued to decline for nearly every year since 1995. However, pounds and acreage both increased in 2010, and this higher use level continues in 2011. The AI with the greatest increase in pounds was the plant growth regulator ethephon, used mostly in cotton. The AIs with the greatest increases in area treated were ethephon and the insecticides dimethoate and chlorpyrifos. Note that ethephon is not a classical organophosphate and has only mild cholinergic potential.

- Use of chemicals categorized as ground water contaminants increased in both pounds and area treated (133,000 pound increase, 12 percent; 189,000 acre increase, 21 percent). The increase in pounds was largely from higher use of the herbicides diuron, simazine, and bromacil. The increase in area treated was mostly from the increase in area treated with diuron.

- Chemicals categorized as toxic air contaminants increased in pounds while decreasing in area treated (1.1-million pound increase, 3 percent; 188,000 acre decrease, 7 percent). By pounds, most toxic air contaminants are fumigants which are used at high rates. The increase in pounds was mainly from increased uses of the fumigants 1,3-D and potassium n-methyldithiocarbamate (metam-potassium). The increase in area treated was mainly from the fungicide mancozeb.

- Use of fumigant chemicals applied increased in both pounds and area treated (2.6-million pound increase, 6.7 percent; 59,000 acre increase, 18 percent). Pounds of 1,3-D, chloropicrin, and potassium n-methyldithiocarbamate (metam-potassium) had the largest increases, while methyl bromide, sulfuryl fluoride, and metam sodium decreased. The increase in area treated was mostly from increases in area treated with aluminum phosphide, chloropicrin, and methyl bromide.

- Use of oil pesticides increased in both pounds and area treated (4.2-million pound increase, 15 percent; 409,000 acre increase, 11 percent). Oils include many different chemicals, but the category used here includes only ones derived from petroleum distillation. Some of these oils may be on the State's Proposition 65 list of chemicals "known to cause cancer" but most serve as alternatives to highly toxic pesticides. Oils are also used by organic growers.

- Pounds of biopesticides increased in both pounds and area treated (180,000-pound increase, 13 percent; 319,000 acre increase, 12 percent). The most used biopesticide AIs by pounds were vegetable oil, potassium bicarbonate and *Bacillus thuringiensis* (combining all subspecies); these AIs also had the greatest increase in pounds. The increase in area was mostly due to more area treated with vegetable oil and propylene glycol. In general, biopesticides are derived from or synthetically mimic natural materials such as animals, plants, bacteria and minerals and fall into three major classes: microbial, plant-incorporated protectant, or naturally occurring substances that control pests by non-toxic mechanisms.

Since 1990, the reported pounds of pesticides applied have fluctuated from year to year. 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 variations related to various factors (e.g. climate or economic changes). Short periods of time (three to five years) may suggest trends, such as the increased pesticide use from 2001 to 2005 or the decreased use from 2005 to 2009. However, regression analyses on use from 1998 to 2011 do not indicate a significant trend of either increase or decrease in total 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 AI 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.

The summaries detailed in the following use 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 "Continuous Evaluation of Pesticides" on page 1.)

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

Table 4: *The reported pounds of pesticides used that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1080	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-DB ACID	9,393	6,408	5,486	11,722	9,733	9,185	11,416	13,523	4,570	55
ABAMECTIN	7,544	7,883	8,514	9,817	10,941	12,362	12,846	16,624	19,344	26,658
ABAMECTIN, OTHER RELATED	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
AMITRAZ	154	115	0	0	12	0	0	7	0	0
ARSENIC PENTOXIDE	233,506	165,709	12,705	180,505	474,517	7,805	7,433	400	16,144	8,034
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BENOMYL	29,053	7,105	2,217	948	898	590	100	56	31	28
BROMACIL, LITHIUM SALT	4,016	3,025	1,801	1,059	2,529	1,172	1,851	896	1,835	1,486
BROMOXYNIL OCTANOATE	73,338	77,668	50,232	34,481	37,406	41,406	65,375	50,300	43,594	47,859
CARBARYL	256,112	205,139	240,068	190,633	156,997	142,010	126,742	135,301	113,160	74,756
CHLORSULFURON	2,190	8,684	9,967	3,242	3,488	3,675	3,886	5,048	3,386	4,371
CYANAZINE	7,178	37	8	7	0	0	0	0	0	1
CYCLOATE	34,427	30,827	43,249	40,092	41,488	31,868	21,242	25,284	27,292	31,037
DICLOFOP-METHYL	5,058	9,309	5,988	1,413	174	157	0	15	0	7
DINOCAP	2	<1	2	2	2	2	2	2	0	<1
DINOSEB	577	113	63	131	213	81	166	816	26	75
EPTC	253,887	141,756	182,532	181,825	108,228	152,707	129,470	128,993	118,509	126,441
ETHYLENE GLYCOL MONOMETHYL ETHER	3,134	1,782	2,729	2,546	4,186	2,653	1,986	2,257	5,187	4,324
ETHYLENE OXIDE	0	0	0	0	0	2	3	7	0	0
FENOXAPROP-ETHYL	106	53	64	161	196	153	219	11	<1	8
FLUAZIFOP-BUTYL	166	31	34	41	26	5	3	21	11	8
FLUAZIFOP-P-BUTYL	10,074	8,770	10,298	11,638	11,104	10,192	11,287	7,903	9,542	9,074
HYDRAMETHYLNON	2,741	2,029	1,896	1,381	1,231	887	825	393	609	1,095
LINURON	63,164	60,117	69,289	72,093	59,164	58,592	60,247	51,265	48,424	54,426
METAM-SODIUM	16,078,916	14,823,439	14,698,228	12,991,279	11,422,382	9,929,803	9,497,379	9,027,455	11,153,177	10,843,326
METHYL BROMIDE	7,095,223	7,391,458	7,120,860	6,509,322	6,542,161	6,448,643	5,693,325	5,615,653	4,786,082	3,995,441
METIRAM	0	1	5	0	<1	0	0	0	0	15
MOLINATE	881,605	539,871	367,155	171,362	141,421	75,241	19,653	12,516	24	<1
MYCLOBUTANIL	82,512	93,161	74,963	84,102	74,365	68,403	61,550	59,056	65,598	65,284
NABAM	0	0	10,693	30,440	23,414	9,073	9,635	8,963	10,518	13,358
NICOTINE	2	2	4	2	<1	<1	<1	<1	<1	7
NITRAPYRIN	89	117	12	171	0	9	0	84	211	0
OXADIAZON	16,693	12,566	13,129	13,825	11,714	12,517	9,402	8,738	12,382	7,772
OXYDEMETON-METHYL	104,500	94,007	105,318	122,433	119,891	122,723	111,612	68,576	71,290	26,017

Table 4: (continued) *The reported pounds of pesticides used that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity."*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
OXYTHIOQUINOX	117	34	27	8	90	166	170	45	6	<1
POTASSIUM DIMETHYL DITHIO CARBAMATE	22	28	293	0	0	0	0	<1	0	0
PROPARGITE	980,442	1,055,629	1,014,200	1,010,039	580,630	537,439	389,492	380,651	295,162	296,274
RESMETHRIN	661	1,561	245	958	676	452	269	211	206	122
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	10,693	30,440	23,414	9,073	9,800	8,963	11,053	13,358
SODIUM TETRATHIOCARBONATE	352,342	212,308	259,542	330,886	171,204	391,303	354,294	249,580	233,949	168,761
STREPTOMYCIN SULFATE	6,063	8,838	4,740	7,862	7,598	5,809	4,394	3,233	4,040	4,644
TAU-FLUVALINATE	2,223	1,675	1,603	1,166	1,104	1,028	1,068	1,179	869	822
THIOPHANATE-METHYL	72,872	126,489	120,249	159,957	114,191	99,497	74,903	89,882	115,025	86,719
TRIADIMEFON	1,736	1,774	2,111	1,918	1,116	873	1,503	1,056	2,153	1,918
TRIBUTYLTIN METHACRYLATE	39	0	0	0	0	0	0	0	0	0
TRIFORINE	78	88	295	137	452	64	69	4	42	22
VINCLOZOLIN	22,171	19,481	14,863	3,574	402	390	512	476	217	328
WARFARIN	1	3	3	1	9	1	<1	<1	1	2
TOTAL	26,694,126	25,119,086	24,466,373	22,213,619	20,158,768	18,188,015	16,694,128	15,975,446	17,173,670	15,913,933

Table 5: *The reported cumulative acres treated with pesticides that are on the State's Proposition 65 list of chemicals that are "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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1080	301	50	<1	41	22	170	<1	67	176	127
2,4-DB ACID	15,584	10,384	10,162	18,597	16,303	15,080	19,457	21,629	6,980	121
ABAMECTIN	847,679	885,944	1,001,281	1,076,948	1,131,758	1,257,542	1,225,216	1,274,898	1,552,270	1,977,726
ABAMECTIN, OTHER RELATED	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
AMITRAZ	605	379	0	0	<1	0	0	74	0	0
ARSENIC PENTOXIDE	<1	<1	48	<1	<1	<1	<1	<1	<1	<1
ARSENIC TRIOXIDE	0	<1	<1	1	<1	<1	<1	<1	<1	<1
BENOMYL	47,879	13,340	3,983	2,789	1,674	568	221	162	0	26
BROMACIL, LITHIUM SALT	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BROMOXYNIL OCTANOATE	239,110	218,281	162,572	120,175	134,283	136,831	186,026	146,301	125,836	141,014
CARBARYL	106,616	97,811	103,261	99,086	87,789	97,016	96,136	107,458	80,082	68,249
CHLORSULFURON	18,836	26,280	25,745	21,903	26,345	12,653	32,912	31,267	20,345	18,877
CYANAZINE	8,763	25	5	8	0	0	0	0	0	4
CYCLOATE	17,228	16,713	20,699	19,319	19,886	15,601	10,581	12,058	13,799	14,895
DICLOFOP-METHYL	6,259	11,257	7,391	729	186	224	0	30	0	20
DINOCAP	3	<1	47	7	9	8	7	7	0	1
DINOSEB	167	59	98	310	72	16	453	304	111	427
EPTC	94,240	56,639	64,194	64,263	38,871	51,706	45,560	49,708	44,289	47,922
ETHYLENE GLYCOL MONOMETHYL ETHER	36,299	24,249	25,075	16,655	25,655	26,412	14,857	14,573	35,802	37,642
ETHYLENE OXIDE	0	0	0	0	0	<1	2	60	0	0
FENOXAPROP-ETHYL	1,326	839	1,681	3,247	3,418	2,552	3,444	142	<1	61
FLUAZIFOP-BUTYL	98	<1	<1	3	<1	<1	6	2	80	<1
FLUAZIFOP-P-BUTYL	40,967	28,325	31,739	35,348	34,591	31,920	31,045	25,517	27,724	27,252
HYDRAMETHYLNON	2,148	2,057	1,314	1,990	657	931	1,138	1,280	4,689	1,554
LINURON	86,942	85,412	95,565	101,987	81,535	81,041	81,244	68,604	68,058	76,833
METAM-SODIUM	141,415	142,406	128,427	97,562	102,451	78,030	71,815	74,132	71,407	70,753
METHYL BROMIDE	53,140	55,254	57,385	45,700	50,677	45,675	35,685	39,587	32,078	44,009
METIRAM	0	<1	2	0	1	0	0	0	0	<1
MOLINATE	222,044	134,120	89,593	40,535	33,045	17,476	4,529	2,942	6	<1
MYCLOBUTANIL	704,827	742,139	656,020	699,773	644,490	599,368	545,175	512,906	588,681	567,536
NABAM	0	0	<1	<1	<1	2	1	3	12	<1
NICOTINE	1	<1	2	3	<1	<1	<1	<1	<1	<1
NITRAPYRIN	169	258	42	143	0	35	0	88	111	0
OXADIAZON	1,838	1,904	3,120	2,209	2,144	2,991	2,747	1,451	1,712	924
OXYDEMETON-METHYL	193,453	189,015	206,751	173,480	164,094	161,835	140,760	82,368	86,131	27,447
OXYTHIOQUINOX	182	71	137	14	10	9	5	4	4	1
POTASSIUM DIMETHYL DITHIO CARBAMATE	2	6	<1	0	0	0	0	<1	0	0

Table 5: (continued) *The reported cumulative acres treated with pesticides that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity."*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
PROPARGITE	524,439	558,056	543,728	519,412	287,261	261,953	186,581	174,063	137,033	142,298
RESMETHRIN	32	66	209	1	1	18	3	11	<1	6
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	<1	<1	<1	2	1	3	12	<1
SODIUM TETRATHIOCARBONATE	11,558	6,832	8,497	7,977	6,170	11,485	10,725	7,180	7,301	4,826
STREPTOMYCIN SULFATE	52,180	63,445	37,461	52,061	57,295	38,468	27,011	24,453	28,966	39,156
TAU-FLUVALINATE	9,046	7,939	7,313	5,879	5,438	4,777	5,708	5,015	4,583	4,994
THIOPHANATE-METHYL	64,340	121,339	112,501	135,296	108,408	100,011	71,867	92,429	122,563	84,923
TRIADIMEFON	6,747	7,625	6,752	8,585	2,949	1,806	2,043	1,007	1,172	2,421
TRIBUTYLTIN METHACRYLATE	<1	0	0	0	0	0	0	0	0	0
TRIFORINE	203	196	61	181	102	373	11	10	22	3
VINCLOZOLIN	27,795	21,692	18,207	3,899	440	258	212	85	86	100
WARFARIN	449	632	1,504	430	473	3,165	1,118	365	290	1,290
TOTAL	3,584,913	3,531,040	3,432,572	3,376,545	3,068,503	3,058,004	2,854,299	2,772,241	3,062,400	3,403,437

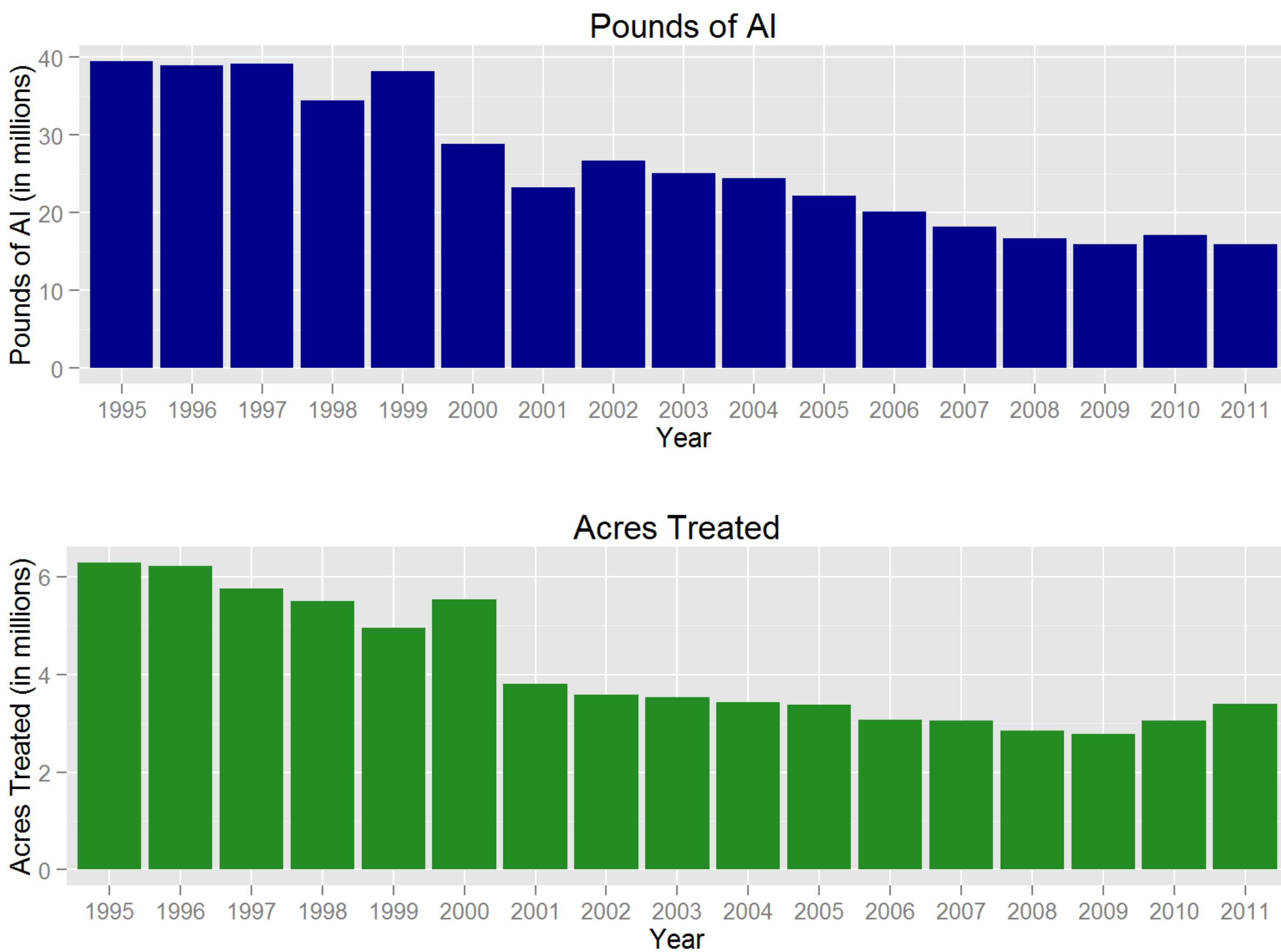

Figure 1: *Use trends of pesticides that are on the State's Proposition 65 list of chemicals that are "known to cause reproductive toxicity." Reported pounds of active ingredient (AI) applied include both agricultural and non-agricultural applications. The reported cumulative acres treated include primarily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

USE TRENDS OF PESTICIDES LISTED BY U.S. EPA AS B2 CARCINOGENS OR ON THE STATE'S PROPOSITION 65 LIST OF CHEMICALS THAT ARE "KNOWN TO CAUSE CANCER."

Table 6: *The reported pounds of pesticides used that are listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals that are "known to cause cancer." Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1,3-DICHLOROPROPENE	5,432,163	7,003,873	8,945,145	9,355,308	8,735,190	9,595,625	9,706,640	6,399,515	8,777,092	10,907,012
ACIFLUORFEN, SODIUM SALT	3	<1	18	<1	0	0	0	0	<1	0
ALACHLOR	28,666	25,015	27,229	21,052	13,740	3,911	4,343	6,362	9,936	9,294
ARSENIC ACID	4,976	318	223	68	3	0	0	0	0	17
ARSENIC PENTOXIDE	233,506	165,709	12,705	180,505	474,517	7,805	7,433	400	16,144	8,034
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CACODYLIC ACID	1,795	207	115	131	20	41	43	<1	3	<1
CAPTAN	397,475	503,579	374,026	472,107	510,105	456,132	362,476	329,623	450,099	375,738
CARBARYL	256,112	205,139	240,068	190,633	156,997	142,010	126,742	135,301	113,160	74,756
CHLOROTHALONIL	632,603	713,570	572,543	765,159	824,949	736,173	566,773	715,152	956,659	1,142,800
CHROMIC ACID	326,645	232,064	17,754	252,176	662,927	10,904	10,384	559	22,555	11,224
CREOSOTE	9,018	3,385	1,048	<1	0	3	<1	<1	0	0
DAMINOZIDE	10,224	10,167	9,635	8,882	7,812	7,192	7,094	6,570	9,361	8,343
DDVP	9,132	3,446	3,807	4,914	6,577	6,376	6,859	4,164	4,169	4,923
DIOCTYL PHTHALATE	716	521	397	708	1,016	610	340	186	453	248
DIPROPYL ISOCINCHOMERONATE	0	1	<1	<1	52	2	<1	<1	1	47
DIURON	1,304,929	1,347,903	1,399,006	957,462	1,054,075	860,510	734,757	622,598	588,570	671,580
ETHOPROP	16,572	28,419	23,130	18,924	24,485	24,241	26,897	20,793	5,495	7,475
ETHYLENE OXIDE	0	0	0	0	0	2	3	7	0	0
FENOXYCARB	53	32	34	30	8	4	8	5	3	3
FOLPET	2	<1	0	<1	<1	0	<1	0	<1	0
FORMALDEHYDE	14,035	18,690	111,151	48,968	73,392	47,733	24,306	3,972	5,511	4,615
IMAZALIL	15,366	23,749	21,291	30,480	21,624	14,421	23,415	13,255	26,181	25,753
IPRODIONE	251,602	292,268	268,239	291,299	304,219	255,123	252,212	248,877	349,021	353,137
LINDANE	1,633	908	776	40	379	2	21	8	18	1
MANCOZEB	401,790	539,027	379,790	643,194	662,040	408,652	330,238	281,639	754,865	1,044,711
MANEB	857,667	1,033,039	963,204	1,135,698	1,181,738	1,061,028	861,006	656,536	370,207	53,868
METAM-SODIUM	16,078,916	14,823,439	14,698,228	12,991,279	11,422,382	9,929,803	9,497,379	9,027,455	11,153,177	10,843,326
METHYL IODIDE	0	0	0	0	0	0	0	0	0	1,157
METIRAM	0	1	5	0	<1	0	0	0	0	15
NITRAPYRIN	89	117	12	171	0	9	0	84	211	0
ORTHO-PHENYLPHENOL	15,619	5,141	21,775	9,482	2,083	5,128	4,389	2,133	2,271	2,130
ORTHO-PHENYLPHENOL, SODIUM SALT	25,249	21,000	5,898	4,979	6,948	2,266	3,211	2,294	2,129	5,192
ORYZALIN	179,900	432,713	576,104	704,971	1,008,320	664,266	604,932	529,498	602,136	767,779
OXADIAZON	16,693	12,566	13,129	13,825	11,714	12,517	9,402	8,738	12,382	7,772

Table 6: (continued) *The reported pounds of pesticides used that are listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals that are "known to cause cancer."*

AI	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
OXYTHIOQUINOX	117	34	27	8	90	166	170	45	6	<1
PARA-DICHLOROBENZENE	1	25	10	139	0	15	1	17	0	<1
PENTACHLOROPHENOL	17	3	2	3	27	22	4	0	3	18
POLYACRYLAMIDE POLYMER	18,780	5,902	5,407	5,683	6,383	5,093	4,606	4,168	5,198	6,470
POTASSIUM DICHROMATE	<1	11	71	40	0	0	0	0	0	0
POTASSIUM N-METHYLDITHIOCARBAMATE	1,267,737	1,911,698	894,186	1,994,072	3,202,884	3,785,436	5,524,647	4,102,412	4,832,615	5,694,466
PROPARGITE	980,442	1,055,629	1,014,200	1,010,039	580,630	537,439	389,492	380,651	295,162	296,274
PROPOXUR	450	306	223	220	212	191	188	202	298	808
PROPYLENE OXIDE	99,674	99,396	158,027	147,489	133,028	110,068	105,600	111,609	300,008	421,562
PROPYZAMIDE	108,116	105,221	119,191	116,967	121,711	114,882	104,077	73,811	51,345	63,085
SODIUM DICHROMATE	633	217	0	0	0	0	0	0	0	0
TERRAZOLE	6	575	1,100	750	946	872	1,534	1,140	1,500	642
THIODICARB	5,195	8,392	2,249	1,872	894	686	410	511	152	472
VINCLOZOLIN	22,171	19,481	14,863	3,574	402	390	512	476	217	328
TOTAL	29,026,486	30,652,897	30,896,042	31,383,304	31,214,515	28,807,754	29,302,541	23,690,767	29,718,313	32,815,076

Table 7: *The reported cumulative acres treated with pesticides that are listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals that are "known to cause cancer." 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1,3-DICHLOROPROPENE	42,172	48,944	56,618	51,486	49,885	53,937	57,922	38,374	54,049	59,049
ACIFLUORFEN, SODIUM SALT	11	<1	2	<1	0	0	0	0	<1	0
ALACHLOR	14,467	10,004	9,888	7,935	5,192	1,500	1,635	2,261	3,276	3,385
ARSENIC ACID	<1	<1	<1	<1	<1	0	0	0	0	<1
ARSENIC PENTOXIDE	<1	<1	48	<1	<1	<1	<1	<1	<1	<1
ARSENIC TRIOXIDE	0	<1	<1	1	<1	<1	<1	<1	<1	<1
CACODYLIC ACID	12,648	757	100	82	121	<1	<1	<1	<1	<1
CAPTAN	215,412	271,140	211,028	252,040	262,936	215,864	198,262	173,133	245,464	209,487
CARBARYL	106,616	97,811	103,261	99,086	87,789	97,016	96,136	107,458	80,082	68,249
CHLOROTHALONIL	347,736	361,203	331,710	418,600	438,373	389,497	292,385	377,954	490,054	586,822
CHROMIC ACID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CREOSOTE	<1	<1	<1	<1	0	1	1	2	0	0
DAMINOZIDE	5,417	3,103	2,667	2,376	2,220	2,291	2,471	2,111	4,357	2,404
DDVP	4,327	2,576	1,637	7,445	1,526	2,733	2,231	2,685	1,880	5,178
DIOCTYL PHTHALATE	6,649	3,880	6,249	13,858	13,231	13,258	3,582	4,928	7,921	4,741
DIPROPYL ISOCINCHOMERONATE	0	<1	<1	1	18	<1	<1	<1	19	<1
DIURON	796,904	843,897	971,628	894,073	886,032	702,939	514,554	405,583	517,886	690,853
ETHOPROP	4,152	6,078	4,917	4,296	4,815	4,283	4,159	4,293	1,318	1,892
ETHYLENE OXIDE	0	0	0	0	0	<1	2	60	0	0
FENOXYCARB	1,242	812	1,011	1,398	828	210	489	353	100	106
FOLPET	<1	<1	0	<1	<1	0	<1	0	<1	0
FORMALDEHYDE	33	18	23	2	265	57	67	5	1	6
IMAZALIL	<1	293	476	<1	<1	<1	668	<1	26	2
IPRODIONE	364,809	445,511	409,250	450,354	468,465	412,699	436,226	434,326	577,524	637,942
LINDANE	8,010	8,828	9,437	557	9	0	37	10	31	1
MANCOZEB	197,196	276,093	194,219	370,266	348,360	212,349	169,422	145,616	431,959	634,228
MANEB	554,904	660,011	601,360	730,254	675,941	655,235	558,506	471,321	290,254	40,461
METAM-SODIUM	141,415	142,406	128,427	97,562	102,451	78,030	71,815	74,132	71,407	70,753
METHYL IODIDE	0	0	0	0	0	0	0	0	0	278
METIRAM	0	<1	2	0	1	0	0	0	0	<1
NITRAPYRIN	169	258	42	143	0	35	0	88	111	0
ORTHO-PHENYLPHENOL	82	726	272	429	65	149	22	49	58	117
ORTHO-PHENYLPHENOL, SODIUM SALT	40	9	<1	<1	<1	<1	<1	<1	<1	<1
ORYZALIN	71,985	208,230	298,712	359,076	400,237	313,343	272,273	236,523	217,144	294,432
OXADIAZON	1,838	1,904	3,120	2,209	2,144	2,991	2,747	1,451	1,712	924
OXYTHIOQUINOX	182	71	137	14	10	9	5	4	4	1
PARA-DICHLOROBENZENE	<1	<1	<1	<1	0	<1	0	<1	<1	<1

Table 7: (continued) *The reported cumulative acres treated with pesticides that are listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals that are "known to cause cancer."*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
PENTACHLOROPHENOL	<1	<1	20	3	0	10	46	0	4	1
POLYACRYLAMIDE POLYMER	385,995	461,617	495,213	551,014	645,781	445,134	470,192	441,024	584,044	634,240
POTASSIUM DICHROMATE	20	<1	<1	10	0	0	0	0	0	0
POTASSIUM N-METHYLDITHIOCARBAMATE	9,073	12,887	10,229	19,670	27,299	42,988	56,009	38,197	41,444	44,125
PROPARGITE	524,439	558,056	543,728	519,412	287,261	261,953	186,581	174,063	137,033	142,298
PROPOXUR	23	1	7	8	2	<1	10	356	<1	3
PROPYLENE OXIDE	<1	<1	22	185	20	<1	12	<1	<1	<1
PROPYZAMIDE	140,789	132,819	147,631	148,376	153,045	148,399	133,426	102,176	69,303	60,994
SODIUM DICHROMATE	<1	<1	0	0	0	0	0	0	0	0
TERRAZOLE	47	266	253	495	884	879	1,419	711	5,107	443
THIODICARB	8,258	12,113	3,684	2,965	1,293	1,196	673	680	192	656
VINCLOZOLIN	27,795	21,692	18,207	3,899	440	258	212	85	86	100
TOTAL	3,987,463	4,585,248	4,555,834	5,009,021	4,866,938	4,059,245	3,534,196	3,240,013	3,833,848	4,194,174

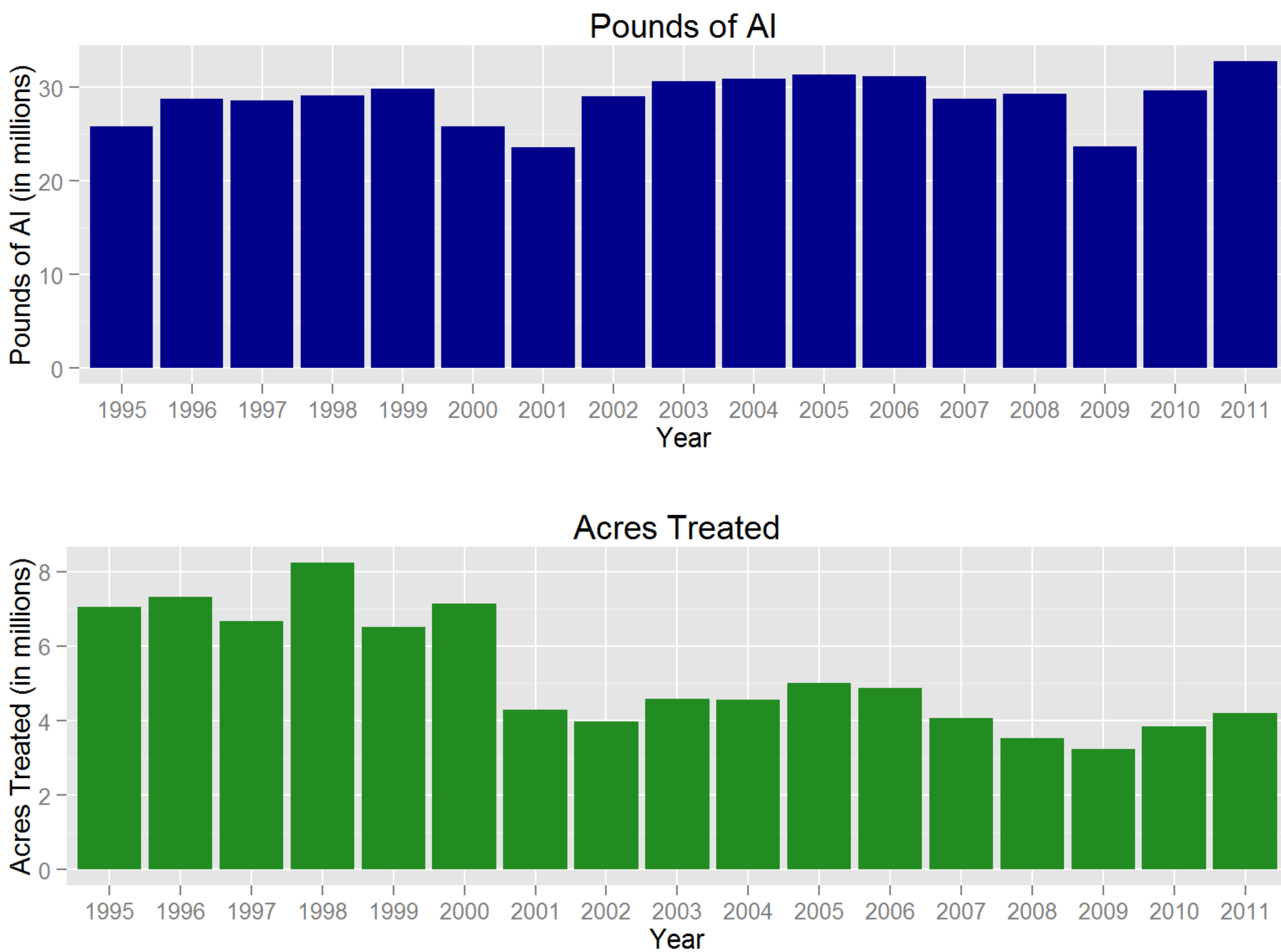

Figure 2: *Use trends of pesticides that are listed by U.S. EPA as B2 carcinogens or on the State's Proposition 65 list of chemicals that are "known to cause cancer." Reported pounds of active ingredient (AI) applied include both agricultural and non-agricultural applications. The reported cumulative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

USE TRENDS OF CHOLINESTERASE-INHIBITING PESTICIDES.

Table 8: *The reported pounds of pesticides used that are cholinesterase-inhibiting pesticides. These pesticides are organophosphate and carbamate active ingredients. Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3-IODO-2-PROPYNYL BUTYLCARBAMATE	0	0	0	0	0	0	0	<1	2,675	102
ACEPHATE	259,646	225,910	205,428	195,704	167,705	143,073	152,303	112,562	134,986	152,346
ALDICARB	244,786	262,103	231,012	231,322	176,624	115,475	75,767	31,579	64,626	23,557
AZINPHOS-METHYL	155,004	213,892	50,578	55,183	38,775	25,418	16,269	13,045	1,619	1,582
BENDIOCARB	32	23	9	6	2	8	2	<1	1	3
BENSULIDE	196,249	229,882	237,293	247,767	288,048	259,548	244,526	247,733	271,835	288,344
BUTYLATE	19,412	26,826	20,323	9,923	2,671	945	27	0	299	0
CARBARYL	256,112	205,139	240,068	190,633	156,997	142,010	126,742	135,301	113,160	74,756
CARBOFURAN	82,021	49,276	30,354	28,093	25,790	25,467	16,389	10,117	4	1
CHLORPROPHAM	1,380	6,191	2,861	2,825	3,704	1,532	4,384	4,675	6,990	3,093
CHLORPYRIFOS	1,448,244	1,554,308	1,787,240	2,031,348	1,928,989	1,442,521	1,368,568	1,246,519	1,287,993	1,296,074
COUMAPHOS	62	64	63	1	3	<1	0	0	<1	3
CYCLOATE	34,427	30,827	43,249	40,092	41,488	31,868	21,242	25,284	27,292	31,037
DDVP	9,132	3,446	3,807	4,914	6,577	6,376	6,859	4,164	4,169	4,923
DEMETON	42	<1	0	1	<1	1	0	2	0	0
DESMEDIPHAM	5,941	3,636	3,845	4,169	2,954	1,905	1,598	1,257	1,385	1,345
DIAZINON	692,475	524,610	493,748	403,996	386,244	353,098	258,544	142,061	126,804	86,595
DICROTOPHOS	27	41	0	2	6	0	0	0	0	0
DIMETHOATE	333,149	297,595	334,398	312,144	294,736	315,358	292,119	251,726	210,128	225,595
DISULFOTON	54,582	47,988	41,317	32,349	22,601	24,558	8,028	10,233	9,085	4,351
EPTC	253,887	141,756	182,532	181,825	108,228	152,707	129,470	128,993	118,509	126,441
ETHEPHON	543,218	579,518	640,139	643,450	587,954	430,522	296,421	207,788	374,279	548,802
ETHION	12	13	<1	261	13	0	2	28	72	1
ETHOPROP	16,572	28,419	23,130	18,924	24,485	24,241	26,897	20,793	5,495	7,475
FENAMIPHOS	70,939	59,421	58,691	46,336	33,511	39,677	17,482	11,493	8,978	2,964
FENTHION	79	3	36	15	2	4	4	9	4	<1
FONOFOS	465	182	30	15	0	0	1	0	<1	0
FORMETANATE HYDROCHLORIDE	40,444	28,585	30,651	30,761	33,738	34,127	44,704	32,670	30,313	20,941
MALATHION	652,762	656,885	497,263	426,416	411,505	468,614	484,322	531,966	560,010	511,313
METHAMIDOPHOS	30,645	36,987	31,332	37,865	30,570	18,867	24,224	17,934	9,625	6,037
METHIDATHION	68,389	54,678	61,206	48,857	56,691	45,666	47,203	47,319	51,190	29,543
METHIOCARB	1,859	2,276	2,800	2,460	1,798	1,767	2,068	3,093	3,506	2,689
METHOMYL	323,487	371,969	264,226	349,785	318,089	307,169	251,382	221,248	231,459	219,637
METHYL PARATHION	53,955	73,365	71,573	79,000	84,785	75,385	34,110	25,770	21,427	22,970
MEVINPHOS	40	114	1	160	18	30	4	9	24	118
MEVINPHOS, OTHER RELATED	23	76	<1	107	12	20	3	6	16	79
MEXACARBATE	0	0	0	0	0	0	0	0	0	0

Table 8: (continued) *The reported pounds of pesticides used that are cholinesterase-inhibiting pesticides. These pesticides are organophosphate and carbamate active ingredients.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MOLINATE	881,605	539,871	367,155	171,362	141,421	75,241	19,653	12,516	24	<1
MONOCROTOPHOS	0	0	0	0	0	0	0	0	0	0
NALED	201,853	185,816	152,755	225,863	196,369	132,528	172,705	162,530	174,280	198,913
O,O-DIMETHYL O-(4-NITRO-M-TOLYL) PHOSPHOROTHIOATE	0	0	0	0	<1	0	0	0	0	0
OXAMYL	80,422	93,781	113,512	153,432	123,109	45,096	100,000	48,994	118,048	136,944
OXYDEMETON-METHYL	104,500	94,007	105,318	122,433	119,891	122,723	111,612	68,576	71,290	26,017
PARATHION	3,205	611	240	855	1,542	479	33	118	285	241
PEBULATE	71,721	35,755	10,118	1,154	210	441	68	0	0	0
PHENMEDIPHAM	6,894	5,021	4,579	5,419	4,046	2,841	2,305	2,516	2,448	2,087
PHORATE	76,539	64,947	60,247	48,981	38,066	33,776	32,408	17,686	14,775	45,529
PHOSALONE	0	0	0	0	0	0	0	0	0	0
PHOSMET	405,487	341,827	658,093	547,822	628,892	424,874	341,422	132,647	115,008	95,458
POTASSIUM DIMETHYL DITHIO CARBAMATE	22	28	293	0	0	0	0	<1	0	0
PROFENOFOS	24,452	12,871	15,620	23,924	20,885	3,638	216	0	1,552	0
PROPAMOCARB HYDROCHLORIDE	828	83	5	0	364	137,589	116,725	106,078	99,482	92,165
PROPETAMPHOS	2,464	721	315	148	207	136	116	352	213	125
PROPOXUR	450	306	223	220	212	191	188	202	298	808
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	192,453	236,411	179,690	100,225	78,084	45,757	16,335	8,161	18,427	30,745
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	10,693	30,440	23,414	9,073	9,800	8,963	11,053	13,358
SULFOTEP	77	8	29	17	1	7	4	2	0	1
SULPROFOS	0	0	0	0	0	0	0	0	0	0
TEMEPHOS	0	0	356	1,102	803	1,173	684	83	99	33
TETRACHLORVINPHOS	3,285	1,262	722	788	1,203	667	1,012	1,306	1,086	839
THIOBENCARB	844,565	587,211	521,586	448,208	310,352	289,046	263,499	320,643	258,402	246,927
THIODICARB	5,195	8,392	2,249	1,872	894	686	410	511	152	472
TRIALLATE	0	0	6	0	0	0	0	0	879	2,671
TRICHLORFON	1,545	1,068	1,035	1,222	1,003	336	961	25	34	40
TOTAL	8,757,061	7,925,999	7,794,044	7,542,195	6,926,282	5,814,258	5,141,820	4,377,285	4,565,789	4,586,091

Table 9: *The reported cumulative acres treated with pesticides that are cholinesterase-inhibiting pesticides. These pesticides are organophosphate and carbamate active ingredients. 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3-IODO-2-PROPYNYL BUTYLCARBAMATE	0	0	0	0	0	0	0	0	<1	<1
ACEPHATE	232,949	223,408	211,892	198,982	172,119	148,887	147,910	115,063	144,124	149,989
ALDICARB	225,820	231,090	217,540	214,260	158,000	108,892	66,829	31,977	66,192	29,217
AZINPHOS-METHYL	94,035	117,060	38,622	37,622	25,534	16,636	9,888	7,849	1,724	1,809
BENDIOCARB	<1	8	<1	1	<1	6	<1	<1	<1	<1
BENSULIDE	60,883	66,376	70,367	70,625	82,280	76,748	75,695	73,306	78,736	84,165
BUTYLATE	4,598	5,450	3,940	1,954	610	236	6	0	60	0
CARBARYL	106,616	97,811	103,261	99,086	87,789	97,016	96,136	107,458	80,082	68,249
CARBOFURAN	182,567	91,801	50,138	55,488	43,417	39,795	24,651	7,331	15	30
CHLORPROPHAM	80	124	166	88	115	178	147	159	38	82
CHLORPYRIFOS	1,235,816	1,478,783	1,323,331	1,681,634	1,538,958	1,154,681	1,162,654	934,480	1,096,958	1,186,979
COUMAPHOS	1,073	17	49	<1	2	<1	0	0	<1	<1
CYCLOATE	17,228	16,713	20,699	19,319	19,886	15,601	10,581	12,058	13,799	14,895
DDVP	4,327	2,576	1,637	7,445	1,526	2,733	2,231	2,685	1,880	5,178
DEMETON	<1	2	0	35	<1	10	0	10	0	0
DESMEDIPHAM	32,344	35,435	37,152	35,795	30,883	24,780	16,787	16,073	19,264	19,349
DIAZINON	489,230	483,344	509,233	440,839	439,814	422,244	310,125	140,620	104,443	71,129
DICROTOPHOS	<1	64	0	<1	110	0	0	0	0	0
DIMETHOATE	681,367	621,074	701,470	672,935	613,479	608,819	576,286	499,889	436,233	530,666
DISULFOTON	48,723	39,182	34,481	25,320	18,926	20,315	4,723	7,591	6,167	1,621
EPTC	94,240	56,639	64,194	64,263	38,871	51,706	45,560	49,708	44,289	47,922
ETHEPHON	550,256	601,503	660,356	679,253	640,720	490,361	362,926	261,211	452,626	602,803
ETHION	<1	1	<1	66	32	0	6	15	184	81
ETHOPROP	4,152	6,078	4,917	4,296	4,815	4,283	4,159	4,293	1,318	1,892
FENAMIPHOS	38,397	36,293	34,142	29,314	18,918	22,618	10,730	7,537	5,873	2,127
FENTHION	<1	<1	18	<1	<1	<1	<1	<1	<1	<1
FONOFOS	234	116	20	15	0	0	<1	0	3	0
FORMETANATE HYDROCHLORIDE	36,131	29,411	33,167	31,775	35,293	35,383	45,715	32,678	30,898	22,026
MALATHION	314,683	287,467	249,319	226,729	218,196	250,823	288,852	277,523	433,352	280,396
METHAMIDOPHOS	37,012	41,506	38,874	45,835	37,585	23,022	27,532	20,408	10,681	6,464
METHIDATHION	48,554	38,516	45,281	37,751	34,786	37,301	43,010	54,227	49,662	34,918
METHIOCARB	2,000	1,757	3,064	2,501	3,072	2,649	2,439	2,131	2,335	2,048
METHOMYL	510,006	615,669	437,673	612,989	529,347	502,384	406,030	377,954	409,936	394,932
METHYL PARATHION	37,514	51,252	48,640	49,771	51,184	45,173	21,574	15,198	13,046	13,343
MEVINPHOS	160	192	3	215	8	198	34	69	11	108
MEVINPHOS, OTHER RELATED	160	192	3	215	8	198	34	69	11	108
MEXACARBATE	0	0	0	0	0	0	0	0	0	0

Table 9: (continued) *The reported cumulative acres treated with pesticides that are cholinesterase-inhibiting pesticides. These pesticides are organophosphate and carbamate active ingredients.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MOLINATE	222,044	134,120	89,593	40,535	33,045	17,476	4,529	2,942	6	<1
MONOCROTOPHOS	0	0	0	0	0	0	0	0	0	0
NALED	155,295	148,776	110,218	191,906	159,851	107,774	105,505	128,415	145,147	163,364
O,O-DIMETHYL O-(4-NITRO-M-TOLYL) PHOSPHOROTHIOATE	0	0	0	0	<1	0	0	0	0	0
OXAMYL	98,313	115,275	135,832	178,893	137,541	60,773	116,202	59,118	134,931	150,245
OXYDEMETON-METHYL	193,453	189,015	206,751	173,480	164,094	161,835	140,760	82,368	86,131	27,447
PARATHION	7,026	1,006	392	717	713	414	101	195	76	202
PEBULATE	21,491	10,680	4,319	297	35	163	151	0	0	0
PHENMEDIPHAM	34,452	38,265	38,964	38,675	33,208	26,762	18,198	18,837	21,366	20,767
PHORATE	58,390	50,290	47,488	35,938	27,676	23,557	10,933	10,236	8,719	32,510
PHOSALONE	0	0	0	0	0	0	0	0	0	0
PHOSMET	159,065	128,037	209,843	170,683	200,531	142,991	116,516	51,514	40,276	33,633
POTASSIUM DIMETHYL DITHIO CARBAMATE	2	6	<1	0	0	0	0	<1	0	0
PROFENOFOS	25,997	13,598	11,657	25,096	20,563	4,509	289	0	1,635	0
PROPAMOCARB HYDROCHLORIDE	1,041	22	10	0	187	144,949	123,699	109,027	103,734	95,729
PROPETAMPHOS	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PROPOXUR	23	1	7	8	2	<1	10	356	<1	3
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	129,570	158,604	133,535	74,538	52,330	31,408	10,850	7,182	15,785	27,233
SODIUM DIMETHYL DITHIO CARBAMATE	0	0	<1	<1	<1	2	1	3	12	<1
SULFOTEP	57	3	8	9	<1	5	2	3	0	1
SULPROFOS	0	0	0	0	0	0	0	0	0	0
TEMEPHOS	0	0	<1	<1	<1	<1	<1	<1	<1	<1
TETRACHLORVINPHOS	125	6	291	1,518	1	200	5	<1	5	5
THIOBENCARB	222,606	154,952	136,132	118,786	79,109	74,271	67,483	83,567	75,172	71,824
THIODICARB	8,258	12,113	3,684	2,965	1,293	1,196	673	680	192	656
TRIALLATE	0	0	<1	0	0	0	0	0	867	1,854
TRICHLORFON	18	8	<1	<1	<1	<1	<1	<1	<1	<1
TOTAL	6,395,707	6,396,055	6,034,805	6,362,725	5,725,402	4,976,667	4,462,290	3,597,636	4,118,499	4,178,353

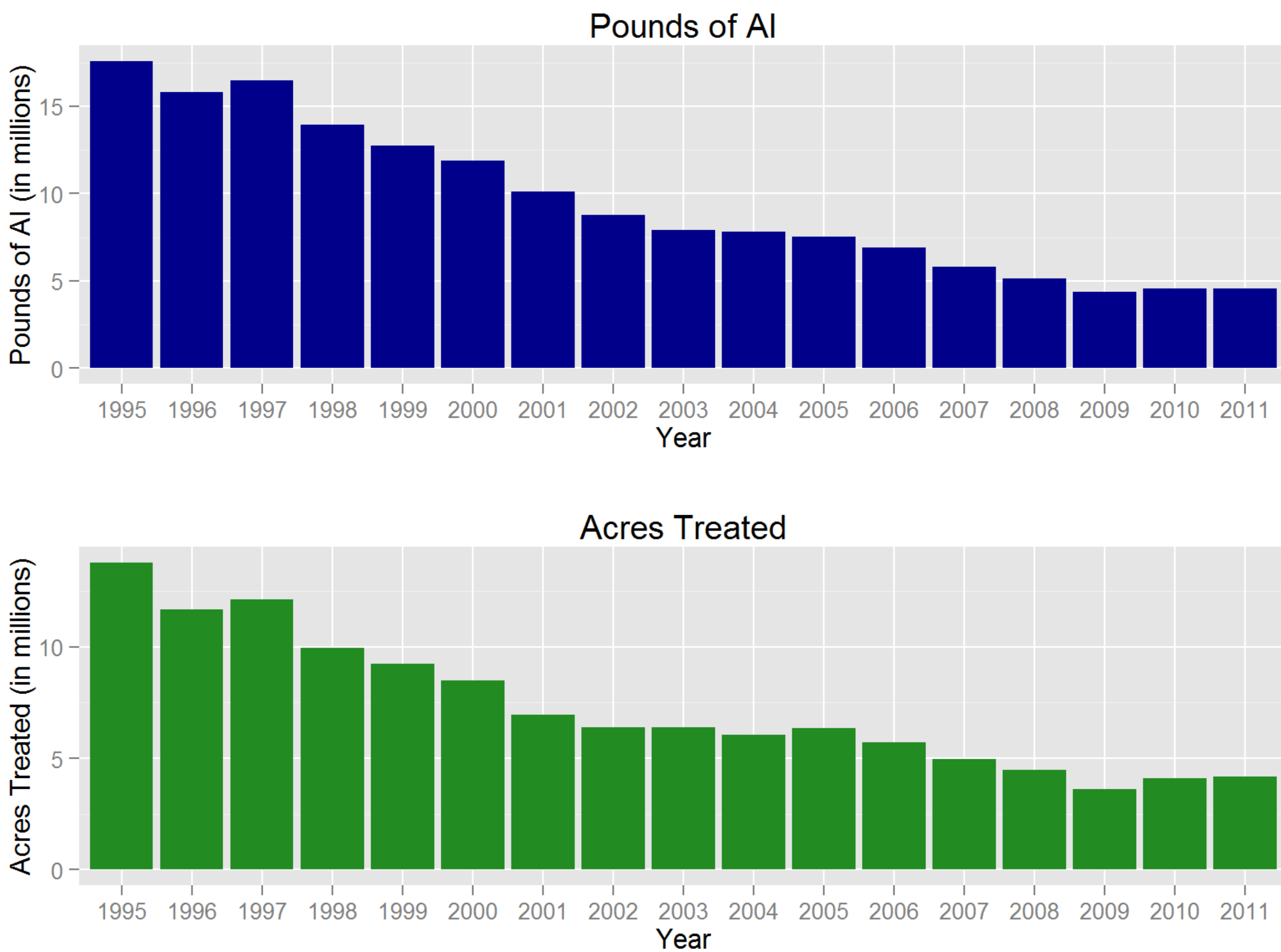

Figure 3: *Use trends of pesticides that are cholinesterase-inhibiting pesticides. These pesticides are organophosphate and carbamate active ingredients. Reported pounds of active ingredient (AI) applied include both agricultural and non-agricultural applications. The reported cumulative acres treated include primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

USE TRENDS OF PESTICIDES ON THE “A” PART OF DPR’S GROUNDWATER PROTECTION LIST.

Table 10: *The reported pounds of pesticides used that are on the “a” part of DPR’s groundwater protection list. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6800(a). Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation’s Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ATRAZINE	61,248	58,248	38,776	33,015	35,291	27,546	28,491	23,260	28,937	23,006
ATRAZINE, OTHER RELATED	1,278	1,213	812	695	732	571	600	482	607	483
BENTAZON, SODIUM SALT	1,045	1,216	1,370	2,272	2,633	4,858	8,075	9,589	7,447	5,800
BROMACIL	55,821	56,427	56,760	48,929	62,774	85,097	68,162	52,049	67,784	92,402
BROMACIL, LITHIUM SALT	4,016	3,025	1,801	1,059	2,529	1,172	1,851	896	1,835	1,486
DIURON	1,304,929	1,347,903	1,399,006	957,462	1,054,075	860,510	734,757	622,598	588,570	671,580
NORFLURAZON	188,049	146,817	140,143	94,082	107,826	78,150	58,590	44,762	43,686	30,568
PROMETON	21	2	20	3	8	3	3	1	6	3
SIMAZINE	637,031	679,720	732,677	628,561	637,691	541,296	438,952	419,423	378,360	424,718
TOTAL	2,253,436	2,294,571	2,371,364	1,766,079	1,903,558	1,599,204	1,339,482	1,173,061	1,117,233	1,250,047

Table 11: *The reported cumulative acres treated with pesticides that are on the "a" part of DPR's groundwater protection list. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6800(a). 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ATRAZINE	28,589	29,966	26,989	24,085	21,834	17,382	16,766	15,767	19,990	17,514
ATRAZINE, OTHER RELATED	28,589	29,966	26,989	24,085	21,834	17,382	16,766	15,767	19,990	17,514
BENTAZON, SODIUM SALT	1,094	987	1,279	2,218	2,217	4,215	6,631	6,424	6,258	4,846
BROMACIL	29,585	27,974	26,204	21,886	19,132	20,455	21,471	24,420	28,757	32,153
BROMACIL, LITHIUM SALT	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DIURON	796,904	843,897	971,628	894,073	886,032	702,939	514,554	405,583	517,886	690,853
NORFLURAZON	161,746	125,619	125,802	81,589	91,035	74,085	58,866	44,503	45,638	30,601
PROMETON	174	49	171	6	168	4	35	2	20	<1
SIMAZINE	561,349	546,678	588,016	463,244	480,142	411,719	320,992	339,117	289,006	324,060
TOTAL	1,552,171	1,548,690	1,716,706	1,466,859	1,483,320	1,212,529	919,200	812,543	879,625	1,068,507

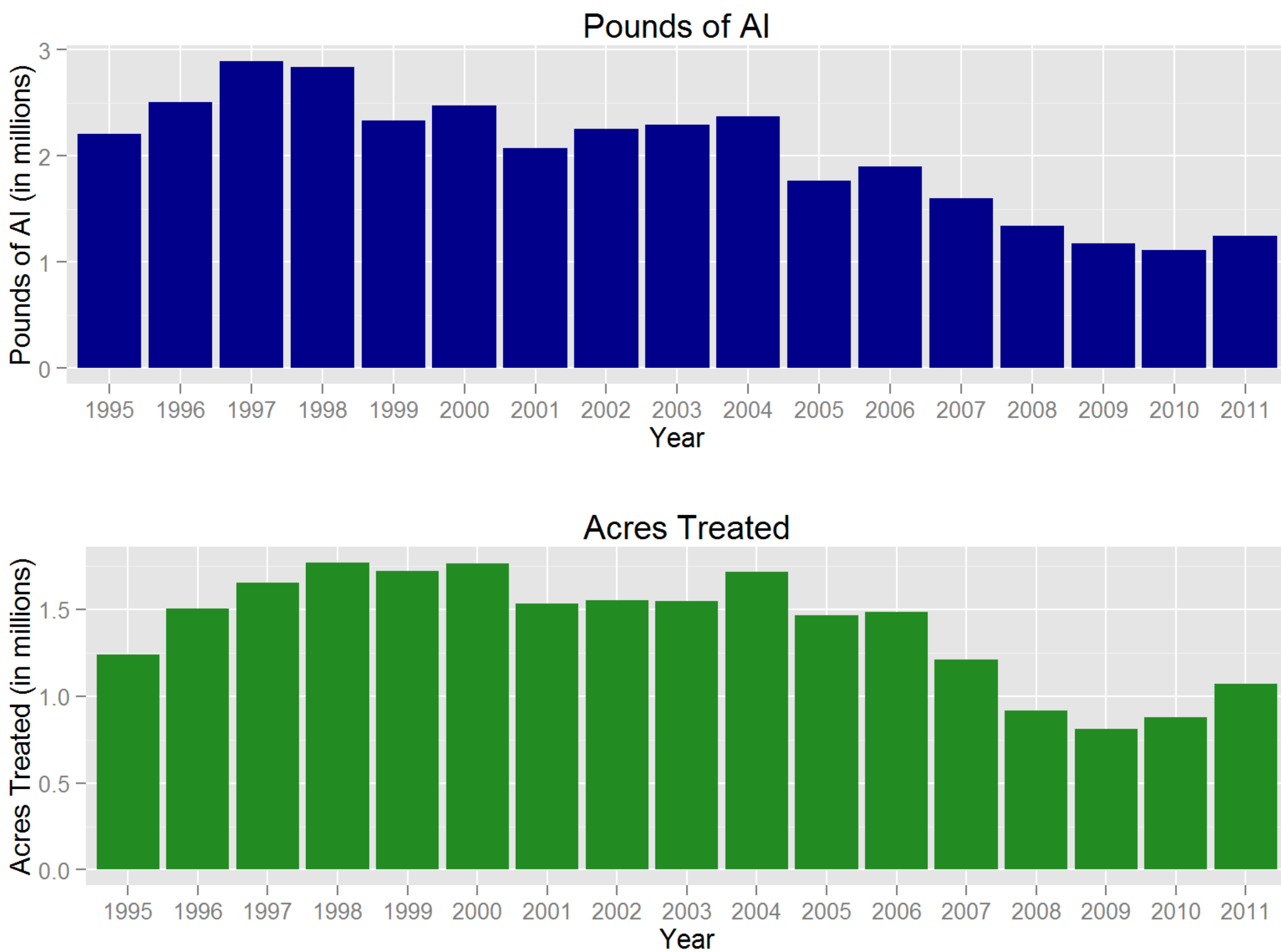

Figure 4: *Use trends of pesticides that are on the "a" part of DPR's groundwater protection list. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6800(a). Reported pounds of active ingredient (AI) applied include both agricultural and non-agricultural applications. The reported cumulative acres treated include 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 12: *The reported pounds of pesticides used that are on DPR's toxic air contaminants list applied in California. These pesticides are the 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1,3-DICHLOROPROPENE	5,432,163	7,003,873	8,945,145	9,355,308	8,735,190	9,595,625	9,706,640	6,399,515	8,777,092	10,907,012
2,4-D	1,733	1,732	1,797	1,552	1,735	2,755	11,619	10,788	12,526	5,400
2,4-D, 2-ETHYLHEXYL ESTER	22,669	19,715	21,130	26,641	21,062	15,029	20,464	15,113	74,398	25,707
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	452	1,357	624	458	16	29	25	131	516	1
2,4-D, BUTOXYETHANOL ESTER	3,556	3,812	4,782	8,190	1,720	843	1,775	2,751	1,368	1,757
2,4-D, BUTOXYPROPYL ESTER	0	0	0	0	<1	0	13	0	0	0
2,4-D, BUTYL ESTER	593	2	0	10	15	9	0	2	3	4
2,4-D, DIETHANOLAMINE SALT	8,080	8,831	5,024	3,961	2,947	4,025	5,533	4,913	6,872	3,157
2,4-D, DIMETHYLAMINE SALT	452,902	515,076	475,954	455,858	439,100	397,197	466,872	446,575	488,489	408,486
2,4-D, DODECYLAMINE SALT	322	0	0	0	0	0	0	0	0	0
2,4-D, HEPTYLAMINE SALT	<1	0	0	0	0	0	0	0	0	0
2,4-D, ISOOCTYL ESTER	12,380	12,366	10,039	10,314	10,627	11,572	9,603	4,446	4,214	5,358
2,4-D, ISOPROPYL ESTER	8,262	8,960	10,992	11,220	10,863	10,578	10,671	13,123	11,615	19,500
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	0	0	0	0	0	0	0	0	0	0
2,4-D, OCTYL ESTER	0	0	0	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	652	333	472	404	398	212	141	99	57	0
2,4-D, TETRADECYLAMINE SALT	75	0	0	0	0	0	0	0	0	0
2,4-D, TRIETHYLAMINE SALT	426	435	391	203	1,614	383	332	472	2,829	106
2,4-D, TRIISOPROPANOLAMINE SALT	565	550	742	672	1,133	985	1,140	1,930	2,092	2,747
2,4-D, TRIISOPROPYLAMINE SALT	9	6	0	0	458	636	472	1,941	1,655	1,971
ACROLEIN	283,937	272,733	211,014	257,194	246,659	201,156	215,822	161,637	121,861	96,879
ALUMINUM PHOSPHIDE	171,181	119,855	131,864	137,969	151,037	105,169	132,296	108,084	108,407	154,886
ARSENIC ACID	4,976	318	223	68	3	0	0	0	0	17
ARSENIC PENTOXIDE	233,506	165,709	12,705	180,505	474,517	7,805	7,433	400	16,144	8,034
ARSENIC TRIOXIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CAPTAN	397,475	503,579	374,026	472,107	510,105	456,132	362,476	329,623	450,099	375,738
CAPTAN, OTHER RELATED	9,060	11,423	8,348	10,619	11,773	10,474	8,311	7,498	10,128	8,479
CARBARYL	256,112	205,139	240,068	190,633	156,997	142,010	126,742	135,301	113,160	74,756
CHLORINE	502,944	619,735	516,546	613,837	730,986	857,144	1,278,580	585,673	1,011,383	762,464
CHROMIC ACID	326,645	232,064	17,754	252,176	662,927	10,904	10,384	559	22,555	11,224
DAZOMET	45,268	44,798	58,567	48,263	34,310	37,537	40,272	65,725	60,539	59,245
DDVP	9,132	3,446	3,807	4,914	6,577	6,376	6,859	4,164	4,169	4,923

Table 12: (continued) *The reported pounds of pesticides used that are on DPR's toxic air contaminants list applied in California. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6860.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ENDOSULFAN	151,178	134,080	154,351	83,302	92,757	52,403	59,917	41,840	37,146	15,679
ETHYLENE OXIDE	0	0	0	0	0	2	3	7	0	0
FORMALDEHYDE	14,035	18,690	111,151	48,968	73,392	47,733	24,306	3,972	5,511	4,615
HYDROGEN CHLORIDE	4,256	3,222	2,529	14,755	2,464	1,470	4,318	3,976	2,240	504
LINDANE	1,633	908	776	40	379	2	21	8	18	1
MAGNESIUM PHOSPHIDE	4,853	2,844	2,621	3,156	3,931	5,132	10,507	8,009	12,233	11,548
MANCOZEB	401,790	539,027	379,790	643,194	662,040	408,652	330,238	281,639	754,865	1,044,711
MANEB	857,667	1,033,039	963,204	1,135,698	1,181,738	1,061,028	861,006	656,536	370,207	53,868
META-CRESOL	1	1	2	1	<1	<1	<1	<1	<1	1
METAM-SODIUM	16,078,916	14,823,439	14,698,228	12,991,279	11,422,382	9,929,803	9,497,379	9,027,455	11,153,177	10,843,326
METHANOL	0	0	0	0	0	0	0	0	0	0
METHIDATHION	68,389	54,678	61,206	48,857	56,691	45,666	47,203	47,319	51,190	29,543
METHOXYCHLOR	144	3	1	13	130	6	0	8	270	39
METHOXYCHLOR, OTHER RELATED	0	0	<1	<1	0	0	0	0	0	0
METHYL BROMIDE	7,095,223	7,391,458	7,120,860	6,509,322	6,542,161	6,448,643	5,693,325	5,615,653	4,786,082	3,995,441
METHYL ISOTHIOCYANATE	3,512	547	1,357	1,549	1,073	388	0	0	73	476
METHYL PARATHION	53,955	73,365	71,573	79,000	84,785	75,385	34,110	25,770	21,427	22,970
METHYL PARATHION, OTHER RELATED	2,833	3,857	3,766	4,155	4,447	3,960	1,792	1,355	1,127	1,195
NAPHTHALENE	<1	23	0	<1	0	0	0	0	1	<1
PARA-DICHLOROBENZENE	1	25	10	139	0	15	1	17	0	<1
PARATHION	3,205	611	240	855	1,542	479	33	118	285	241
PCNB	43,472	39,060	34,216	38,038	32,786	30,689	29,188	24,637	37,378	11,632
PCP, OTHER RELATED	2	<1	<1	<1	3	2	1	0	<1	3
PCP, SODIUM SALT	0	0	0	0	0	<1	0	0	0	<1
PCP, SODIUM SALT, OTHER RELATED	0	0	0	0	0	<1	0	0	0	0
PENTACHLOROPHENOL	17	3	2	3	27	22	4	0	3	18
PHENOL	0	<1	9	71	<1	0	0	2	0	0
PHOSPHINE	901	1,141	1,690	2,699	3,491	5,286	48,243	29,527	11,291	118,058
PHOSPHORUS	1	1	1	<1	2	<1	<1	<1	1	0
POTASSIUM N-METHYLDITHIOCARBAMATE	1,267,737	1,911,698	894,186	1,994,072	3,202,884	3,785,436	5,524,647	4,102,412	4,832,615	5,694,466
POTASSIUM PERMANGANATE	0	0	0	0	0	0	0	109	0	0
PROPOXUR	450	306	223	220	212	191	188	202	298	808
PROPYLENE OXIDE	99,674	99,396	158,027	147,489	133,028	110,068	105,600	111,609	300,008	421,562
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	192,453	236,411	179,690	100,225	78,084	45,757	16,335	8,161	18,427	30,745
SODIUM CYANIDE	2,542	2,808	2,865	3,086	2,853	2,670	3,406	2,579	2,502	1,073
SODIUM DICHROMATE	633	217	0	0	0	0	0	0	0	0
SODIUM TETRATHIOCARBONATE	352,342	212,308	259,542	330,886	171,204	391,303	354,294	249,580	233,949	168,761

Table 12: (continued) *The reported pounds of pesticides used that are on DPR's toxic air contaminants list applied in California. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6860.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SULFURYL FLUORIDE	3,047,882	3,138,687	3,270,698	3,394,126	2,880,853	2,152,451	2,120,860	2,184,823	2,728,977	2,338,322
TRIFLURALIN	1,104,976	1,065,520	1,028,782	1,032,503	1,049,147	908,614	676,386	533,307	473,395	497,780
XYLENE	2,680	4,349	2,109	1,598	1,418	1,173	576	517	1,103	291
ZINC PHOSPHIDE	982	1,253	1,925	2,380	3,794	3,215	1,299	20,898	1,745	2,541
TOTAL	39,043,408	40,548,820	40,457,644	40,654,754	39,902,464	37,392,231	37,869,660	31,282,508	37,139,715	38,248,065

Table 13: *The reported cumulative acres treated with pesticides that are on DPR's toxic air contaminants list applied in California. These pesticides are the 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 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1,3-DICHLOROPROPENE	42,172	48,944	56,618	51,486	49,885	53,937	57,922	38,374	54,049	59,049
2,4-D	2,304	2,562	3,377	1,466	2,824	7,405	33,344	25,244	23,856	7,565
2,4-D, 2-ETHYLHEXYL ESTER	10,260	22,426	20,642	21,360	15,303	8,362	15,047	9,020	11,797	10,164
2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	264	630	1,475	403	6	23	55	270	172	1
2,4-D, BUTOXYETHANOL ESTER	2,655	2,539	3,835	2,950	1,600	1,297	3,648	5,110	2,542	1,206
2,4-D, BUTOXYPROPYL ESTER	0	0	0	0	<1	0	<1	0	0	0
2,4-D, BUTYL ESTER	101	<1	0	8	1	10	0	6	<1	<1
2,4-D, DIETHANOLAMINE SALT	36,290	39,046	22,729	18,739	13,826	13,339	19,085	18,931	27,009	11,075
2,4-D, DIMETHYLAMINE SALT	491,242	595,235	553,369	567,143	523,912	487,361	543,863	527,098	518,915	445,524
2,4-D, DODECYLAMINE SALT	276	0	0	0	0	0	0	0	0	0
2,4-D, HEPTYLAMINE SALT	<1	0	0	0	0	0	0	0	0	0
2,4-D, ISOOCTYL ESTER	6,964	9,476	7,502	6,532	7,638	7,143	4,708	2,673	2,424	2,903
2,4-D, ISOPROPYL ESTER	108,908	116,840	117,870	144,377	146,090	137,055	135,797	132,302	137,862	145,226
2,4-D, N-OLEYL-1,3-PROPYLENEDIAMINE SALT	0	0	0	0	0	0	0	0	0	0
2,4-D, OCTYL ESTER	0	0	0	0	0	0	0	0	0	0
2,4-D, PROPYL ESTER	7,468	5,509	8,680	5,261	5,660	3,348	1,955	1,750	895	0
2,4-D, TETRADECYLAMINE SALT	276	0	0	0	0	0	0	0	0	0
2,4-D, TRIETHYLAMINE SALT	688	1,035	677	243	815	473	679	740	165	117
2,4-D, TRIISOPROPANOLAMINE SALT	<1	5	209	396	392	108	952	541	720	666
2,4-D, TRIISOPROPYLAMINE SALT	<1	<1	0	0	<1	204	<1	<1	<1	25
ACROLEIN	2,206	642	575	73	18	141	1,027	1,497	12	45
ALUMINUM PHOSPHIDE	70,367	73,869	74,762	63,289	79,951	84,963	80,989	112,063	100,859	133,018
ARSENIC ACID	<1	<1	<1	<1	<1	0	0	0	0	<1
ARSENIC PENTOXIDE	<1	<1	48	<1	<1	<1	<1	<1	<1	<1
ARSENIC TRIOXIDE	0	<1	<1	1	<1	<1	<1	<1	<1	<1
CAPTAN	215,412	271,140	211,028	252,040	262,936	215,864	198,262	173,133	245,464	209,487
CAPTAN, OTHER RELATED	215,362	270,968	209,571	251,846	262,860	215,229	198,095	173,083	245,464	209,487
CARBARYL	106,616	97,811	103,261	99,086	87,789	97,016	96,136	107,458	80,082	68,249
CHLORINE	150	650	2,137	<1	431	1,201	14,414	24,644	88,144	24,253
CHROMIC ACID	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DAZOMET	136	326	298	113	124	700	183	301	274	243
DDVP	4,327	2,576	1,637	7,445	1,526	2,733	2,231	2,685	1,880	5,178
ENDOSULFAN	162,460	156,711	180,387	97,745	111,338	56,627	64,695	48,639	47,147	19,812

Table 13: (continued) *The reported cumulative acres treated with pesticides that are on DPR's toxic air contaminants list applied in California. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6860.*

AI	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
ETHYLENE OXIDE	0	0	0	0	0	<1	2	60	0	0
FORMALDEHYDE	33	18	23	2	265	57	67	5	1	6
HYDROGEN CHLORIDE	590	273	1	17	18	4	46	49	116	<1
LINDANE	8,010	8,828	9,437	557	9	0	37	10	31	1
MAGNESIUM PHOSPHIDE	7	167	1	23	29	6	143	32	145	80
MANCOZEB	197,196	276,093	194,219	370,266	348,360	212,349	169,422	145,616	431,959	634,228
MANEB	554,904	660,011	601,360	730,254	675,941	655,235	558,506	471,321	290,254	40,461
META-CRESOL	267	244	288	164	50	54	38	108	79	144
METAM-SODIUM	141,415	142,406	128,427	97,562	102,451	78,030	71,815	74,132	71,407	70,753
METHANOL	0	0	0	0	0	0	0	0	0	0
METHIDATHION	48,554	38,516	45,281	37,751	34,786	37,301	43,010	54,227	49,662	34,918
METHOXYCHLOR	24	<1	44	26	395	43	0	75	90	58
METHOXYCHLOR, OTHER RELATED	0	0	<1	<1	0	0	0	0	0	0
METHYL BROMIDE	53,140	55,254	57,385	45,700	50,677	45,675	35,685	39,587	32,078	44,009
METHYL ISOTHIOCYANATE	<1	<1	<1	<1	<1	<1	0	0	<1	<1
METHYL PARATHION	37,514	51,252	48,640	49,771	51,184	45,173	21,574	15,198	13,046	13,343
METHYL PARATHION, OTHER RELATED	37,244	51,177	48,609	49,644	50,762	45,165	21,331	15,053	13,029	13,326
NAPHTHALENE	20	<1	0	2	0	0	0	0	3	<1
PARA-DICHLOROBENZENE	<1	<1	<1	<1	0	<1	0	<1	<1	<1
PARATHION	7,026	1,006	392	717	713	414	101	195	76	202
PCNB	9,533	7,759	3,817	3,001	1,496	1,764	1,656	1,400	4,429	879
PCP, OTHER RELATED	<1	<1	20	3	0	10	46	0	4	1
PCP, SODIUM SALT	0	0	0	0	0	<1	0	0	0	47
PCP, SODIUM SALT, OTHER RELATED	0	0	0	0	0	<1	0	0	0	0
PENTACHLOROPHENOL	<1	<1	20	3	0	10	46	0	4	1
PHENOL	0	25	310	239	<1	0	0	15	0	0
PHOSPHINE	<1	<1	349	22	23	3	1,751	50	643	665
PHOSPHORUS	<1	<1	<1	23	<1	10	<1	<1	<1	0
POTASSIUM N-METHYLDITHIOCARBAMATE	9,073	12,887	10,229	19,670	27,299	42,988	56,009	38,197	41,444	44,125
POTASSIUM PERMANGANATE	0	0	0	0	0	0	0	5	0	0
PROPOXUR	23	1	7	8	2	<1	10	356	<1	3
PROPYLENE OXIDE	<1	<1	22	185	20	<1	12	<1	<1	<1
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	129,570	158,604	133,535	74,538	52,330	31,408	10,850	7,182	15,785	27,233
SODIUM CYANIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
SODIUM DICHROMATE	<1	<1	0	0	0	0	0	0	0	0
SODIUM TETRATHIOCARBONATE	11,558	6,832	8,497	7,977	6,170	11,485	10,725	7,180	7,301	4,826
SULFURYL FLUORIDE	<1	50	2	<1	78	9	57	361	130	537

Table 13: (continued) *The reported cumulative acres treated with pesticides that are on DPR's toxic air contaminants list applied in California. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6860.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TRIFLURALIN	944,407	903,654	920,545	886,258	901,629	772,753	556,306	492,498	438,635	466,987
XYLENE	4,533	7,502	3,375	2,722	1,824	2,021	1,418	1,387	609	747
ZINC PHOSPHIDE	7,234	8,387	14,150	9,038	15,284	9,301	11,478	14,512	12,751	21,459
TOTAL	3,388,615	3,735,305	3,516,643	3,655,334	3,566,012	3,110,259	2,801,311	2,571,594	2,724,469	2,536,897

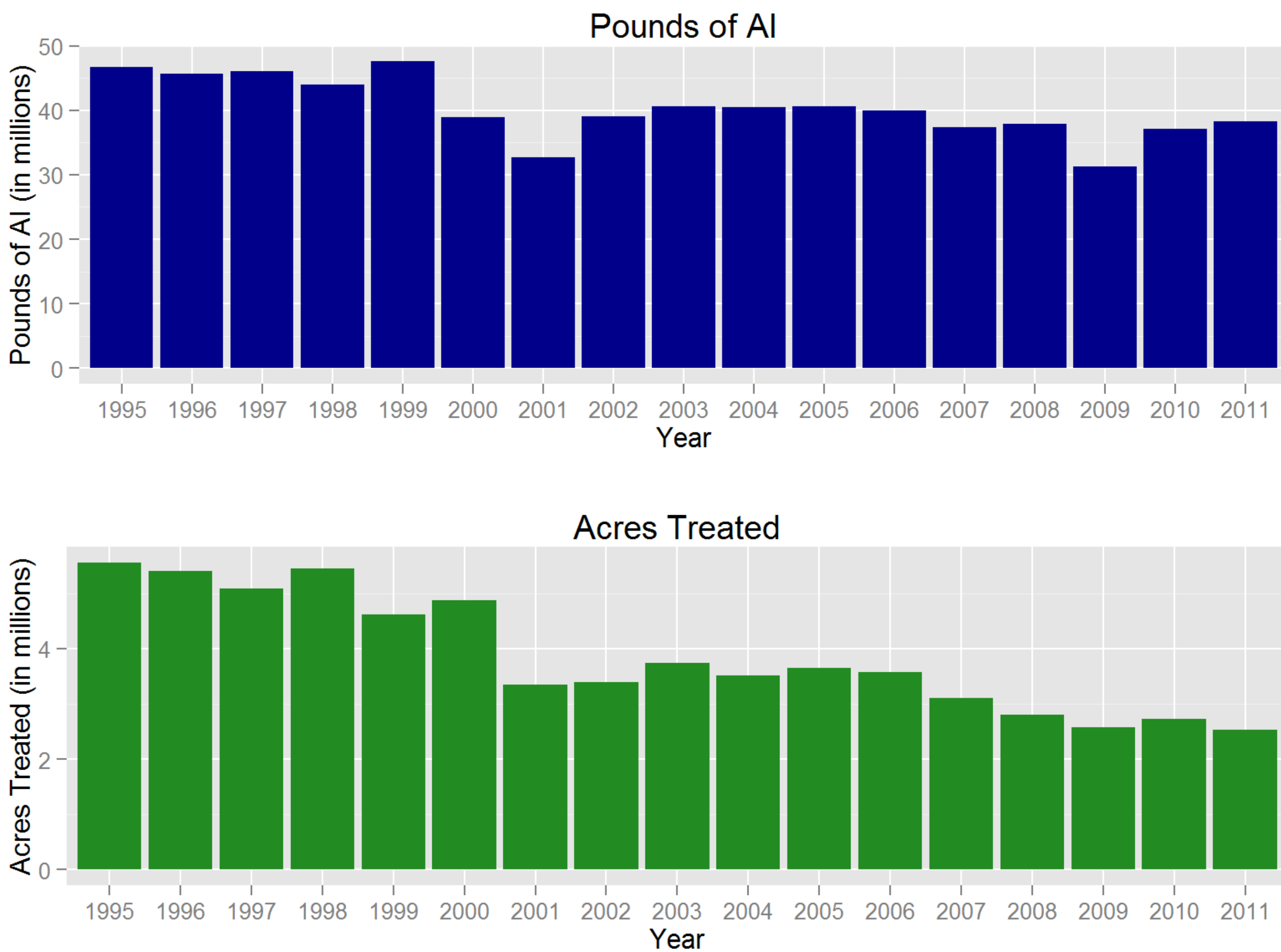

Figure 5: *Use trends of pesticides that are on DPR's toxic air contaminants list applied in California. These pesticides are the active ingredients listed in the California Code of Regulations, Title 3, Division 6, Chapter 4, Subchapter 1, Article 1, Section 6860. Reported pounds of active ingredient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

USE TRENDS OF PESTICIDES THAT ARE FUMIGANTS.

Table 14: *The reported pounds of pesticides used that are fumigants. Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1,2-DICHLOROPROPANE, 1,3-DICHLOROPROPENE AND RELATED C3 COMPOUNDS	331	393	22	0	182	10,532	0	0	0	0
1,3-DICHLOROPROPENE	5,432,163	7,003,873	8,945,145	9,355,308	8,735,190	9,595,625	9,706,640	6,399,515	8,777,092	10,907,012
ALUMINUM PHOSPHIDE	171,181	119,855	131,864	137,969	151,037	105,169	132,296	108,084	108,407	154,886
CARBON TETRACHLORIDE	5	1	<1	0	0	180	1,980	<1	0	0
CHLOROPICRIN	4,682,566	4,930,921	5,143,213	4,872,161	5,037,770	5,502,827	5,587,045	5,686,410	6,375,111	7,283,032
DAZOMET	45,268	44,798	58,567	48,263	34,310	37,537	40,272	65,725	60,539	59,245
ETHYLENE DIBROMIDE	<1	<1	3	0	0	3	127	<1	0	0
ETHYLENE DICHLORIDE	11	0	1	0	0	0	<1	0	0	0
ETHYLENE OXIDE	0	0	0	0	0	2	3	7	0	0
MAGNESIUM PHOSPHIDE	4,853	2,844	2,621	3,156	3,931	5,132	10,507	8,009	12,233	11,548
METAM-SODIUM	16,078,916	14,823,439	14,698,228	12,991,279	11,422,382	9,929,803	9,497,379	9,027,455	11,153,177	10,843,326
METHYL BROMIDE	7,095,223	7,391,458	7,120,860	6,509,322	6,542,161	6,448,643	5,693,325	5,615,653	4,786,082	3,995,441
METHYL IODIDE	0	0	0	0	0	0	0	0	0	1,157
PHOSPHINE	901	1,141	1,690	2,699	3,491	5,286	48,243	29,527	11,291	118,058
POTASSIUM N-METHYLDITHIOCARBAMATE	1,267,737	1,911,698	894,186	1,994,072	3,202,884	3,785,436	5,524,647	4,102,412	4,832,615	5,694,466
PROPYLENE OXIDE	99,674	99,396	158,027	147,489	133,028	110,068	105,600	111,609	300,008	421,562
SODIUM TETRATHIOCARBONATE	352,342	212,308	259,542	330,886	171,204	391,303	354,294	249,580	233,949	168,761
SULFURYL FLUORIDE	3,047,882	3,138,687	3,270,698	3,394,126	2,880,853	2,152,451	2,120,860	2,184,823	2,728,977	2,338,322
ZINC PHOSPHIDE	982	1,253	1,925	2,380	3,794	3,215	1,299	20,898	1,745	2,541
TOTAL	38,280,034	39,682,064	40,686,593	39,789,111	38,322,216	38,083,212	38,824,517	33,609,706	39,381,227	41,999,356

Table 15: *The reported cumulative acres treated with pesticides that are fumigants. 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.*

AI	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
1,2-DICHLOROPROPANE, 1,3-DICHLOROPROPENE AND RELATED C3 COMPOUNDS	44	45	9	0	32	108	0	0	0	0
1,3-DICHLOROPROPENE	42,172	48,944	56,618	51,486	49,885	53,937	57,922	38,374	54,049	59,049
ALUMINUM PHOSPHIDE	70,367	73,869	74,762	63,289	79,951	84,963	80,989	112,063	100,859	133,018
CARBON TETRACHLORIDE	<1	<1	<1	0	0	<1	161	<1	0	0
CHLOROPICRIN	58,907	58,460	60,932	53,797	56,129	55,678	53,964	49,639	51,877	70,374
DAZOMET	136	326	298	113	124	700	183	301	274	243
ETHYLENE DIBROMIDE	<1	<1	<1	0	0	<1	<1	<1	0	0
ETHYLENE DICHLORIDE	<1	0	<1	0	0	0	160	0	0	0
ETHYLENE OXIDE	0	0	0	0	0	<1	2	60	0	0
MAGNESIUM PHOSPHIDE	7	167	1	23	29	6	143	32	145	80
METAM-SODIUM	141,415	142,406	128,427	97,562	102,451	78,030	71,815	74,132	71,407	70,753
METHYL BROMIDE	53,140	55,254	57,385	45,700	50,677	45,675	35,685	39,587	32,078	44,009
METHYL IODIDE	0	0	0	0	0	0	0	0	0	278
PHOSPHINE	<1	<1	349	22	23	3	1,751	50	643	665
POTASSIUM N-METHYLDITHIOCARBAMATE	9,073	12,887	10,229	19,670	27,299	42,988	56,009	38,197	41,444	44,125
PROPYLENE OXIDE	<1	<1	22	185	20	<1	12	<1	<1	<1
SODIUM TETRATHIOCARBONATE	11,558	6,832	8,497	7,977	6,170	11,485	10,725	7,180	7,301	4,826
SULFURYL FLUORIDE	<1	50	2	<1	78	9	57	361	130	537
ZINC PHOSPHIDE	7,234	8,387	14,150	9,038	15,284	9,301	11,478	14,512	12,751	21,459
TOTAL	341,296	356,352	356,814	300,847	337,084	333,549	333,467	331,252	328,725	388,119

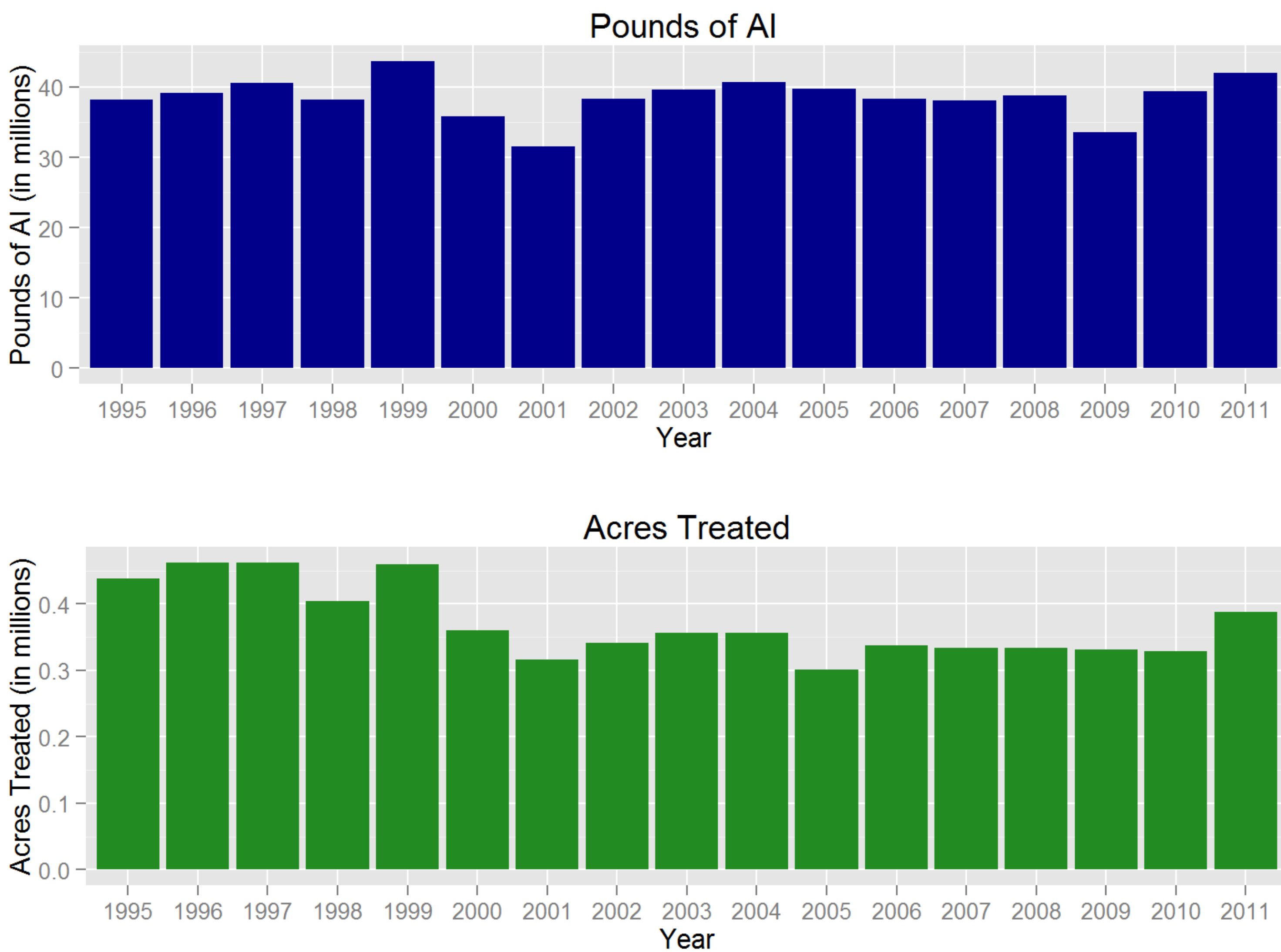

Figure 6: *Use trends of pesticides that are fumigants. Reported pounds of active ingredient (AI) applied include both agricultural and non-agricultural applications. The reported cumulative acres treated include primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

USE TRENDS OF OIL PESTICIDES.

Table 16: *The reported pounds of pesticides used that are oils. 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 non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
COAL TAR HYDROCARBONS	<1	0	0	0	0	0	0	0	0	0
HYDROTREATED PARAFFINIC SOLVENT	212,112	286,090	334,196	244,817	254,213	300,501	247,676	248,774	224,458	239,331
ISOPARAFFINIC HYDROCARBONS	22,504	23,782	30,166	31,183	18,997	16,859	11,250	13,007	6,628	13,823
KEROSENE	21,608	17,163	14,266	8,023	11,387	12,431	22,269	148,476	95,971	34,658
MINERAL OIL	7,345,356	9,252,311	9,975,877	10,617,874	12,414,370	12,859,559	12,271,609	11,635,254	11,412,832	10,293,217
MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT REFINED LIGHT	0	0	0	0	169	139	219	124	401	11
NAPHTHA, HEAVY AROMATIC	0	2	53	0	0	0	0	0	0	0
PETROLEUM DERIVATIVE RESIN	<1	1	1	4	5	0	0	1	0	<1
PETROLEUM DISTILLATES	1,160,455	828,905	715,611	609,966	297,335	343,123	504,035	548,178	341,843	284,627
PETROLEUM DISTILLATES, ALIPHATIC	49,237	15,187	40,238	34,182	34,017	18,323	16,390	10,493	15,480	8,988
PETROLEUM DISTILLATES, AROMATIC	6,202	2,916	5,486	2,092	2,136	1,160	367	103	247	12
PETROLEUM DISTILLATES, REFINED	327,873	372,181	1,025,718	781,411	1,206,463	1,240,305	1,487,043	1,222,830	2,005,527	1,968,041
PETROLEUM HYDROCARBONS	1,564	985	642	956	1,574	1,407	184	138	177	177
PETROLEUM NAPHTHENIC OILS	325	208	27	48	158	240	248	254	884	1,062
PETROLEUM OIL, PARAFFIN BASED	362,173	374,754	443,264	414,094	563,646	511,255	506,839	1,048,107	617,316	749,117
PETROLEUM OIL, UNCLASSIFIED	15,969,591	15,538,854	15,936,714	16,232,621	18,241,640	13,419,141	13,583,475	12,246,765	12,487,440	17,829,437
PETROLEUM SULFONATES	<1	0	0	0	<1	<1	<1	0	0	<1
TOTAL	25,479,001	26,713,338	28,522,260	28,977,272	33,046,110	28,724,444	28,651,605	27,122,505	27,209,205	31,422,501

Table 17: *The reported cumulative acres treated with pesticides that are oils. 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 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
COAL TAR HYDROCARBONS	<1	0	0	0	0	0	0	0	0	0
HYDROTREATED PARAFFINIC SOLVENT	220,789	306,243	327,022	252,863	270,421	261,415	226,988	232,299	227,415	254,609
ISOPARAFFINIC HYDROCARBONS	53,847	56,120	67,795	55,920	39,757	27,903	19,228	22,913	13,709	19,129
KEROSENE	194,210	291,162	264,266	314,821	348,522	254,279	284,440	303,415	316,673	319,353
MINERAL OIL	246,604	347,909	417,559	488,458	607,575	823,491	870,533	996,931	1,181,535	1,261,922
MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT REFINED LIGHT	0	0	0	0	959	522	1,010	850	1,255	60
NAPHTHA, HEAVY AROMATIC	0	<1	<1	0	0	0	0	0	0	0
PETROLEUM DERIVATIVE RESIN	<1	<1	<1	10	<1	0	0	<1	0	<1
PETROLEUM DISTILLATES	210,498	237,198	244,673	171,158	180,495	280,747	422,253	277,893	238,831	215,812
PETROLEUM DISTILLATES, ALIPHATIC	44,494	26,131	25,904	22,723	34,136	31,441	28,159	30,905	57,764	75,134
PETROLEUM DISTILLATES, AROMATIC	3,935	1,808	519	385	658	383	107	225	445	12
PETROLEUM DISTILLATES, REFINED	35,413	39,830	79,589	117,570	200,933	231,860	288,363	258,026	273,923	254,640
PETROLEUM HYDROCARBONS	3,269	2,869	108	430	260	546	334	309	159	35
PETROLEUM NAPHTHENIC OILS	13,241	11,314	2,484	358	11,125	17,950	18,093	22,435	44,459	65,431
PETROLEUM OIL, PARAFFIN BASED	417,941	488,928	555,670	605,289	724,671	738,037	658,709	631,120	672,867	712,393
PETROLEUM OIL, UNCLASSIFIED	657,135	615,742	653,743	717,903	807,931	674,659	702,988	693,354	761,696	1,041,493
PETROLEUM SULFONATES	<1	0	0	0	<1	<1	<1	0	0	<1
TOTAL	2,081,226	2,404,946	2,632,389	2,744,767	3,213,555	3,323,231	3,500,780	3,445,259	3,745,994	4,154,537

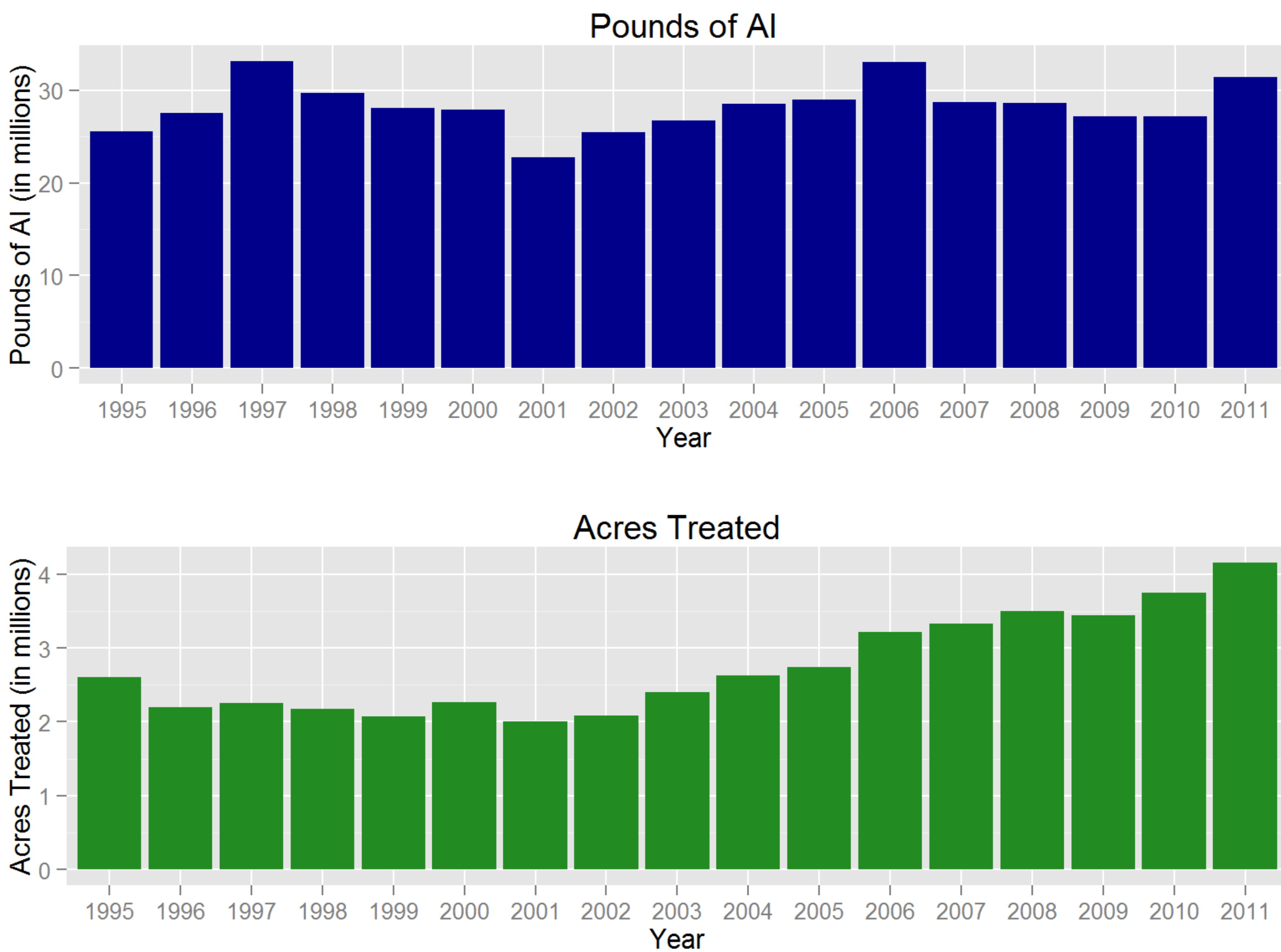

Figure 7: *Use trends of pesticides that are oils. As a broad group, oil pesticides and other petroleum distillates are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer." However, these classifications do not distinguish among oil pesticides 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 include both agricultural and non-agricultural applications. The reported cumulative acres treated include primarily agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

USE TRENDS OF BIOPESTICIDES.

Table 18: *The reported pounds of pesticides used that are 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). Use includes both agricultural and reportable non-agricultural applications. Data are from the Department of Pesticide Regulation's Pesticide Use Reports.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
(3S, 6R)-3-METHYL-6-ISOPROPENYL-9-DECEN-1-YL ACETATE	0	1	<1	<1	<1	0	0	<1	0	0
(3S, 6S)-3-METHYL-6-ISOPROPENYL-9-DECEN-1-YL ACETATE	0	<1	<1	<1	<1	0	0	<1	0	0
(E)-4-TRIDECEN-1-YL-ACETATE	247	254	131	68	103	113	176	80	94	0
(E)-5-DECENOL	7	295	5	<1	4	2	2	1	1	<1
(E)-5-DECENYL ACETATE	38	889	23	<1	17	7	8	4	5	2
(E,E)-9, 11-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	39	28	11	2	6
(E,Z)-7,9-DODECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	50	249
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	0	<1	<1	0	0	0	0	0	0
(S)-KINOPRENE	357	418	359	289	201	238	252	276	277	193
(Z)-11-HEXADECEN-1-YL ACETATE	35	10	10	5	6	2	0	681	0	1
(Z)-11-HEXADECENAL	35	10	10	5	6	2	0	0	0	0
(Z)-4-TRIDECEN-1-YL-ACETATE	8	8	4	2	3	4	6	3	3	0
(Z)-9-DODECENYL ACETATE	0	0	0	<1	<1	1	<1	<1	<1	<1
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	2	0	0	0	0	0	<1	3	2	0
(Z,Z)-11,13-HEXADECADIENAL	0	0	0	0	0	<1	<1	0	<1	569
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	3	0	0	0	0	0	0	3	3	0
1,7-DIOXASPIRO-(5,5)-UNDECANE	0	<1	0	<1	<1	<1	<1	<1	<1	<1
1-DECANOL	0	0	0	0	0	0	0	0	0	0
1-METHYLCYCLOPROPENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1-NAPHTHALENEACETAMIDE	88	119	113	55	30	49	55	32	25	20
3,13 OCTADECADIEN-1-YL ACETATE	0	0	0	0	0	0	44	0	1	12
3,7-DIMETHYL-6-OCTEN-1-OL	0	0	0	0	0	0	1	5	23	12
ACETIC ACID	<1	<1	<1	<1	0	1	21	79	1,732	70
AGROBACTERIUM RADIOBACTER	144	211	183	27	291	577	32	142	124	48
AGROBACTERIUM RADIOBACTER, STRAIN K1026	1	<1	<1	<1	6	<1	<1	1	<1	<1
ALLYL ISOTHIOCYANATE	<1	<1	<1	<1	<1	0	0	0	0	0
ALMOND, BITTER	0	0	0	0	<1	<1	<1	<1	<1	<1

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	1	0	0	24	703	963	1,073	543	1,024	1,190
AMMONIUM BICARBONATE	0	10	0	<1	2	7	2	<1	9	14
AMPELOMYCES QUISQUALIS	<1	<1	<1	<1	<1	<1	0	<1	<1	0
ANIMAL GLAND EXTRACTS	0	0	0	0	0	0	0	0	0	0
ASPERGILLUS FLAVUS STRAIN AF36	0	0	0	<1	0	0	0	0	0	<1
AZADIRACHTIN	1,796	1,369	2,933	1,350	2,408	2,235	2,246	2,500	1,880	2,004
BACILLUS PUMILUS, STRAIN QST 2808	0	<1	2	3,567	5,646	7,062	8,138	6,987	6,783	7,536
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	4,667	10,158	14,187	34,154	45,430	20,192	21,441	18,178	13,013	10,119
BACILLUS SUBTILIS GB03	4	5	7	15	14	6	1	<1	<1	<1
BACILLUS THURINGIENSIS (BERLINER)	16	11	12	16	35	27	16	4	6	26
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	3,980	5,026	4,088	11,255	9,377	20,474	20,484	27,539	20,397	11,666
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	3,890	7,548	3,015	2,336	1,752	2,877	2,373	894	814	812
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	8,238	11,327	9,254	11,869	14,310	8,267	9,433	17,202	11,401	22,423
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	23,432	27,174	16,576	16,580	16,042	22,702	12,325	12,128	7,424	4,689
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	3,425	6,181	3,987	1,932	2,272	987	460	402	150	244
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	1,481	222	107	211	281	147	369	118	66	478
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	19	39	2	5	1	0	0	0	<1	<1
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	22,596	19,685	20,547	53,895	54,236	63,866	66,612	80,565	75,036	58,225
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	1	2	1	<1	2	2	0	<1	<1	0

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 123	164	130	10	1	3	0	764	118	14	0
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	681	1,503	344	338	3,872	632	277	42	1	75
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	<1	0	0	0	<1	0	<1	0	0
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	439	1,527	930	1,919	1,384	154	442	95	0	0
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	10,540	21,956	27,075	33,336	28,905	32,529	39,464	31,043	26,250	24,282
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	1,329	562	532	315	432	563	256	243	130	88
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	9,485	29,326	23,001	41,734	59,019	40,376	52,969	53,778	71,050	52,533
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	15,494	38,034	46,762	57,987	53,351	71,755	78,527	69,545	96,988	82,899
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	10,892	7,174	4,731	3,185	6,139	2,262	2,068	3,747	3,579	2,611
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	258	54	5	3	<1	1	26	28	<1	<1
BACTERIOPHAGE ACTIVE AGAINST XANTHOMONAS CAMPESTRIS PV. VESICATORIA AND PSEUDOMONAS SYRINGAE PV. TOMATO	0	0	0	0	0	0	0	0	0	<1
BALSAM FIR OIL	0	0	0	0	0	0	0	0	<1	0
BEAUVERIA BASSIANA STRAIN GHA	1,041	715	863	824	571	711	569	378	357	574
BUFFALO GOURD ROOT POWDER	0	0	0	0	0	137	279	1	11	0
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	0	0	0	0	0	0	0

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CANOLA OIL	<1	1	4	1	4	29	25	17	131	26
CAPSICUM OLEORESIN	4	5	49	2	2	10	5	2	4	4
CASTOR OIL	504	1,281	363	79	37	4	4	21	7	<1
CHENOPODIUM AMBROSIODES NEAR AMBROSIODES	0	0	0	0	0	0	0	20,330	10,336	7,897
CHITOSAN	0	0	<1	0	0	0	0	0	0	0
CINNAMALDEHYDE	808	238	326	34	12	3	354	0	0	1
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	302,404	60,547	86,776	117,205	96,537	110,881	104,822	106,271	115,931	70,316
CODLING MOTH GRANULOSIS VIRUS	0	0	0	0	<1	<1	<1	<1	<1	<1
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	103	171	198	6	11	6	0	127	80	176
CORN GLUTEN MEAL	1,430	8	18	2	1	0	<1	0	0	0
CORN SYRUP	0	0	0	0	0	81	1,893	2,891	3,026	4,363
COYOTE URINE	0	0	0	0	0	0	0	0	<1	1
CYTOKININ	0	<1	0	0	0	0	0	0	0	<1
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	0
E,E-8,10-DODECADIEN-1-OL	8,953	1,835	1,170	2,388	2,278	2,273	2,037	4,978	1,942	1,384
E-11-TETRADECEN-1-YL ACETATE	283	132	91	79	99	2,399	744	312	100	172
E-8-DODECENYL ACETATE	184	115	135	118	229	236	265	607	898	186
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	3,178	445	114	7	6	32	18	18	0	1
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	6	0	2	1	0	0	0	0	0	0
ESSENTIAL OILS	<1	<1	1	<1	4	<1	0	<1	<1	<1
ETHYLENE	3	24	32	0	0	0	0	0	97	1,030
EUCALYPTUS OIL	0	0	0	50	<1	0	0	0	22	<1
EUGENOL	0	0	3	<1	<1	0	0	0	0	0
FARNESOL	10	9	7	10	4	2	2	3	10	5
FENUGREEK	0	0	0	0	5	31	6	17	1	5
FISH OIL	0	0	0	0	0	0	0	0	0	1,657
FORMIC ACID	0	0	0	0	1	1,509	499	280	223	241
FOX URINE	0	0	0	0	0	0	0	0	<1	<1
GAMMA AMINOBUTYRIC ACID	133,161	6,834	8,664	8,679	4,213	1,936	944	177	118	40
GARLIC	684	295	174	203	89	142	212	36	423	29

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
GERANIOL	0	0	0	0	<1	0	1	5	23	12
GERMAN COCKROACH PHEROMONE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
GIBBERELLINS	32,703	22,977	22,984	26,516	24,688	25,083	23,516	22,916	21,309	20,854
GIBBERELLINS, POTASSIUM SALT	<1	<1	1	<1	15	<1	<1	0	<1	<1
GLIOCLADIUM VIRENS GL-21 (SPORES)	110	48	30	19	1	152	945	356	945	650
GLUTAMIC ACID	133,161	6,834	8,664	8,679	4,213	1,936	944	177	118	40
HARPIN PROTEIN	5,334	228	170	127	60	32	16	14	13	11
HEPTYL BUTYRATE	0	0	0	0	0	0	0	0	<1	<1
HYDROGEN PEROXIDE	3,029	2,618	2,822	5,553	17,526	11,860	20,740	21,750	69,179	59,228
HYDROPRENE	1,656	1,043	1,309	2,910	11,970	2,282	2,383	1,664	6,381	11,250
IBA	16	13	27	11	31	20	11	6	7	9
IRON PHOSPHATE	545	860	1,256	1,645	1,484	1,634	1,901	1,435	2,351	2,856
LACTOSE	3,354	3,123	3,923	7,903	10,667	9,019	11,341	9,160	7,967	9,280
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	0	0	58	<1	0	<1	<1	0	0	0
LAURYL ALCOHOL	1,457	257	317	876	472	503	830	432	736	501
LAVANDULYL SENECIOATE	0	0	0	0	0	0	140	462	437	6,120
LIMONENE	87,130	28,287	14,392	45,890	32,845	68,949	45,536	56,495	56,406	60,535
LINALOOL	274	280	174	176	170	113	63	62	1,104	174
MARGOSA OIL	0	0	0	0	0	0	0	0	579	7,701
MENTHOL	0	58	0	93	<1	0	0	0	5	<1
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	22	<1	<1	<1	<1	<1	<1	0	<1	<1
METHOPRENE	5,117	7,875	8,874	9,900	6,941	3,357	2,620	1,568	1,492	1,664
METHYL ANTHRANILATE	85	34	534	151	449	152	118	312	343	443
METHYL EUGENOL	0	0	0	0	0	0	0	0	0	5
METHYL SALICYLATE	0	0	0	0	<1	<1	0	<1	0	0
MONTOK PEPPER	0	<1	0	0	0	0	0	0	0	0
MUSCALURE	1	11	10	14	15	22	19	20	15	15
MYRISTYL ALCOHOL	300	52	65	178	96	102	169	88	150	102
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	36,280	47,037	39,888	27,977	25,039	29,990	23,867	23,273	22,813	27,671
N6-BENZYL ADENINE	35	53	174	124	446	198	153	168	217	128
NAA	6	5	13	12	9	4	31	3	5	4
NAA, AMMONIUM SALT	1,799	1,929	1,356	1,543	1,100	1,253	1,193	1,203	976	839
NAA, ETHYL ESTER	13	15	1	3	1	2	8	3	6	23
NAA, SODIUM SALT	4	22	10	8	3	3	1	2	0	0
NEROLIDOL	8	7	6	8	3	2	2	6	24	12

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NITROGEN, LIQUIFIED	561,505	321,182	79,369	82,298	57,121	15,741	11,945	2,181	135	216
NONANOIC ACID	11,561	7,886	7,224	8,845	11,203	10,949	11,093	9,063	17,322	17,935
NONANOIC ACID, OTHER RELATED	608	415	380	466	590	576	584	477	912	944
NOSEMA LOCUSTAE SPORES	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
OIL OF ANISE	<1	<1	<1	<1	<1	<1	<1	0	0	<1
OIL OF BERGAMOT	0	0	0	0	<1	0	0	0	0	0
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	<1	0
OIL OF CITRONELLA	0	10	0	<1	<1	<1	3	0	5	395
OIL OF CITRUS	0	0	0	<1	0	0	0	0	0	0
OIL OF GERANIUM	0	0	0	0	0	0	0	0	<1	0
OIL OF JOJOBA	1,387	1,417	3,031	3,540	9,572	7,240	12,070	3,418	4,176	1,202
OIL OF LEMON EUCALYPTUS	0	0	0	0	0	0	0	0	0	<1
OIL OF LEMONGRASS	0	2	0	<1	<1	0	0	0	0	0
OIL OF MUSTARD	0	0	0	0	0	0	0	0	0	0
OIL OF PEPPERMINT	0	<1	<1	<1	0	<1	<1	0	<1	0
OXYPURINOL	0	0	0	<1	0	<1	0	0	0	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	0	0	0
PAECILOMYCES LILACINUS STRAIN 251	0	0	0	0	0	0	0	0	252	515
PANTOEA AGGLOMERANS STRAIN E325, NRRL B-21856	0	0	0	0	0	0	0	33	4	1
PERFUME	0	0	<1	0	0	0	0	0	0	0
POLYHEDRAL OCCLUSION BODIES (OB'S) OF THE NUCLEAR POLYHEDROSIS VIRUS OF HELICOVERPA ZEA (CORN EARWORM)	0	1	1	0	0	0	<1	1	1	51
POTASSIUM BICARBONATE	180,596	285,473	160,569	390,806	163,083	114,163	109,171	180,858	275,645	356,373
PROPYLENE GLYCOL	63,046	52,376	46,580	48,956	42,641	28,505	24,132	25,792	54,215	48,600
PSEUDOMONAS FLUORESCENS, STRAIN A506	1,361	1,972	872	896	1,004	614	390	328	217	274
PSEUDOMONAS SYRINGAE STRAIN ESC-11	<1	0	20	<1	<1	0	0	0	0	0
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	0	0	<1	0	0	0	<1	0
PUTRESCENT WHOLE EGG SOLIDS	184	186	110	60	69	20	1	143	3	1
PYTHIUM OLIGANDRUM DV74	0	0	0	0	0	0	0	0	0	<1
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	19,063	17,351	16,737	14,040	17,139	17,337	16,703	16,175	21,307	23,690
QUILLAJA	0	0	0	0	83	276	1,183	410	682	1,059

Table 18: (continued) *The reported pounds of pesticides used that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
REYNOUTRIA SACHALINENSIS	0	0	0	0	0	0	0	179	8,996	14,721
S-ABSCISIC ACID	0	0	0	0	0	0	7	66	864	1,861
S-METHOPRENE	867	762	530	1,138	1,391	1,726	3,520	3,284	3,921	3,558
SAWDUST	1	1	1	<1	2	<1	1	<1	1	0
SESAME OIL	0	0	0	0	35	883	529	851	1,309	1,334
SILVER NITRATE	0	0	0	0	0	0	0	0	<1	<1
SODIUM BICARBONATE	2,063	0	126	0	0	0	67	27	3	515
SODIUM LAURYL SULFATE	<1	<1	3	15	274	400	340	146	96	445
SOYBEAN OIL	33,192	33,006	50,301	46,199	70,398	14,747	12,005	28,359	23,805	23,956
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	1	1	<1	<1	1	<1	<1	<1	<1	<1
STREPTOMYCES LYDICUS WYEC 108	0	0	0	0	<1	<1	<1	1	2	1
SUCROSE OCTANOATE	0	0	0	0	2	0	1,685	4,003	1,128	230
THYME	0	0	0	0	171	485	593	775	1,311	662
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	56	43	37	16	24	38	20	11	504	129
TRICHODERMA ICC 012 ASPERELLUM	0	0	0	0	0	0	0	0	0	13
TRICHODERMA ICC 080 GAMSII	0	0	0	0	0	0	0	0	0	13
VANILLIN	0	0	0	0	1	5	1	3	<1	1
VEGETABLE OIL	110,641	140,805	248,684	208,860	256,605	154,128	270,375	196,078	323,250	514,929
XANTHINE	0	0	0	<1	0	<1	0	0	0	0
XANTHOMONAS CAMPESTRIS PV. POANNUA	0	0	0	0	<1	0	0	0	0	0
YEAST	1,741	1,787	1,085	1,106	1,159	1,030	999	926	470	1,165
YUCCA SCHIDIGERA	0	0	0	0	0	0	5	145	471	1,603
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	<1	0	0	0	0	1	0	6,149	1	7
Z-11-TETRADECEN-1-YL ACETATE	45	19	14	12	14	228	9	9	9	4
Z-8-DODECENOL	33	20	24	21	41	41	47	106	157	32
Z-8-DODECENYL ACETATE	2,791	1,767	2,081	1,818	3,454	3,646	4,050	9,261	13,964	2,869
Z-9-TETRADECEN-1-OL	<1	0	0	0	0	0	0	0	0	0
TOTAL	1,879,732	1,254,042	1,002,777	1,355,579	1,184,708	948,993	1,051,147	1,094,325	1,420,814	1,600,636

Table 19: *The reported cumulative acres treated with pesticides that are 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). 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.*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
(3S, 6R)-3-METHYL-6-ISOPROPENYL-9-DECEN-1-YL ACETATE	0	15	86	1,604	1,484	0	0	3	0	0
(3S, 6S)-3-METHYL-6-ISOPROPENYL-9-DECEN-1-YL ACETATE	0	15	86	1,604	1,484	0	0	3	0	0
(E)-4-TRIDECEN-1-YL-ACETATE	11,739	10,902	5,555	3,226	4,870	5,193	7,672	3,942	3,905	0
(E)-5-DECENOL	1,206	1,360	809	70	385	737	262	118	249	166
(E)-5-DECENYL ACETATE	1,206	1,360	809	70	385	737	262	118	249	166
(E,E)-9, 11-TETRADECADIEN-1-YL ACETATE	0	0	0	0	0	22	956	3	474	759
(E,Z)-7,9-DODECADIEN-1-YL ACETATE	0	0	0	0	0	0	0	0	5,168	18,092
(R,Z)-5-(1-DECENYL) DIHYDRO-2-(3H)-FURANONE	0	0	15	<1	0	0	0	0	0	0
(S)-KINOPRENE	872	755	1,864	494	440	453	575	510	490	346
(Z)-11-HEXADECEN-1-YL ACETATE	1,053	476	365	164	183	116	0	1,622	0	49
(Z)-11-HEXADECENAL	1,053	476	365	164	423	72	0	0	0	0
(Z)-4-TRIDECEN-1-YL-ACETATE	11,739	10,902	5,555	3,226	4,870	5,193	7,672	3,942	3,905	0
(Z)-9-DODECENYL ACETATE	0	0	0	570	96	5,342	1,304	123	74	1,814
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE	87	0	0	0	0	0	1	93	1	0
(Z,Z)-11,13-HEXADECADIENAL	0	0	0	0	0	200	109	0	763	11,336
(Z,Z)-7,11-HEXADECADIEN-1-YL ACETATE	87	0	0	0	0	0	0	93	1	0
1,7-DIOXASPIRO-(5,5)-UNDECANE	0	313	0	49	4	55	<1	6	<1	<1
1-DECANOL	0	0	0	0	0	0	0	0	0	0
1-METHYLCYCLOPROPENE	<1	9	4	8	2	6	13	61	3	1
1-NAPHTHALENEACETAMIDE	1,705	2,354	2,201	1,100	666	927	870	607	408	315
3,13 OCTADECADIEN-1-YL ACETATE	0	0	0	0	0	0	85	0	50	131
3,7-DIMETHYL-6-OCTEN-1-OL	0	0	0	0	0	0	67	349	1,531	788
ACETIC ACID	1,146	734	290	60	0	10	2	226	110	162
AGROBACTERIUM RADIOBACTER	500	365	493	306	698	555	217	215	362	325
AGROBACTERIUM RADIOBACTER, STRAIN K1026	355	716	524	292	335	366	1,935	5,086	81	19
ALLYL ISOTHIOCYANATE	<1	36	<1	20	<1	0	0	0	0	0
ALMOND, BITTER	0	0	0	0	328	2,068	87	471	74	412

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE	10	0	0	229	6,453	9,238	10,253	5,611	10,179	11,120
AMMONIUM BICARBONATE	0	313	0	49	4	55	<1	6	<1	<1
AMPELOMYCES QUISQUALIS	540	332	696	247	10	14	0	22	2	0
ANIMAL GLAND EXTRACTS	0	0	0	0	0	0	0	0	0	0
ASPERGILLUS FLAVUS STRAIN AF36	0	0	0	258	0	0	0	0	0	260
AZADIRACHTIN	92,145	79,581	64,488	55,657	68,244	91,385	86,813	82,652	71,628	69,991
BACILLUS PUMILUS, STRAIN QST 2808	0	1	4	34,748	64,333	79,795	91,795	75,509	72,518	83,999
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	<1	<1	<1	<1	<1	<1	<1	<1	9	<1
BACILLUS SUBTILIS GB03	<1	<1	379	23	3	2	5	2	<1	6
BACILLUS THURINGIENSIS (BERLINER)	535	2	441	100	2,939	1,129	41	82	127	875
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	73,992	90,283	63,504	62,244	39,077	53,040	40,440	48,842	40,395	18,657
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	31,487	54,037	24,160	19,190	15,784	24,379	20,510	7,888	6,847	7,745
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	824	2,114	1,048	3,480	543	833	4,719	501	1,873	337
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI STRAIN SA-12	43,337	54,540	28,485	34,533	29,505	35,513	21,008	19,700	10,721	8,222
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	56,879	65,654	69,454	31,406	42,279	16,522	8,671	7,807	2,269	3,063
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG 2348	10,416	1,931	737	1,625	2,913	1,271	2,147	1,302	688	3,428
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN EG2371	134	338	18	54	7	0	0	0	<1	<1
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	180,621	158,448	123,796	156,026	125,390	119,055	100,581	101,522	111,686	84,068
BACILLUS THURINGIENSIS (BERLINER), SUBSP. SAN DIEGO	2	3	1	<1	<1	<1	0	<1	<1	0

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI STRAIN BMP 123	6,279	3,013	268	20	93	0	1,898	310	73	0
BACILLUS THURINGIENSIS SUBSPECIES KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7841 LEPIDOPTERAN ACTIVE TOXIN	5,061	8,479	1,766	1,160	6,684	1,225	451	62	3	200
BACILLUS THURINGIENSIS VAR. KURSTAKI STRAIN M-200	0	1	0	0	0	<1	0	<1	0	0
BACILLUS THURINGIENSIS VAR. KURSTAKI, GENETICALLY ENGINEERED STRAIN EG7826	2,571	8,493	6,456	8,724	3,021	479	1,298	250	0	0
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	13,835	34,164	38,718	47,071	41,546	43,209	49,890	41,724	37,209	35,251
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)	10,897	4,989	3,465	3,025	4,235	4,766	2,343	2,136	1,057	640
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	5	1	3	313	4,809	25	2,497	270	758	824
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	33,146	75,373	94,559	109,681	100,697	133,297	134,290	120,661	162,444	152,226
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	110,540	62,367	44,536	29,129	23,346	20,045	15,173	20,295	18,369	16,389
BACILLUS THURINGIENSIS, VAR. KURSTAKI DELTA ENDOTOXINS CRY 1A(C) AND CRY 1C (GENETICALLY ENGINEERED) ENCAPSULATED IN PSEUDOMONAS FLUORESCENS (KILLED)	546	111	7	<1	<1	<1	25	52	2	<1
BACTERIOPHAGE ACTIVE AGAINST XANTHOMONAS CAMPESTRIS PV. VESICATORIA AND PSEUDOMONAS SYRINGAE PV. TOMATO	0	0	0	0	0	0	0	0	0	11
BALSAM FIR OIL	0	0	0	0	0	0	0	0	<1	0
BEAUVERIA BASSIANA STRAIN GHA	3,702	2,887	4,019	3,531	2,743	2,481	2,091	2,188	1,686	2,573
BUFFALO GOURD ROOT POWDER	0	0	0	0	0	1,694	3,227	8	138	0
CANDIDA OLEOPHILA ISOLATE I-182	0	0	0	0	0	0	0	0	0	0

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CANOLA OIL	2	2	<1	2	5	33	1,388	1,541	4,786	3,872
CAPSICUM OLEORESIN	149	318	379	71	247	277	528	325	388	238
CASTOR OIL	<1	<1	<1	<1	2	<1	4	12	<1	<1
CHENOPODIUM AMBROSIODES NEAR AMBROSIODES	0	0	0	0	0	0	0	6,355	9,265	6,868
CHITOSAN	0	0	<1	0	0	0	0	0	0	0
CINNAMALDEHYDE	295	105	137	18	10	2	556	0	0	<1
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	34,157	38,357	51,009	69,051	73,386	71,278	64,156	47,422	42,281	40,678
CODLING MOTH GRANULOSIS VIRUS	0	0	0	0	1,479	2,141	1,487	1,139	984	3,468
CONIOTHYRIUM MINITANS STRAIN CON/M/91-08	935	1,301	1,781	26	62	120	0	1,204	395	1,107
CORN GLUTEN MEAL	3	<1	<1	<1	<1	0	3	0	0	0
CORN SYRUP	0	0	0	0	0	1,132	7,991	14,316	12,877	27,610
COYOTE URINE	0	0	0	0	0	0	0	0	<1	12
CYTOKININ	0	<1	0	0	0	0	0	0	0	199
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	0
E,E-8,10-DODECADIEN-1-OL	11,841	21,255	17,383	21,896	20,728	27,784	21,585	15,300	15,283	17,872
E-11-TETRADECEN-1-YL ACETATE	16,870	10,335	8,836	7,351	6,637	6,189	5,996	5,592	5,405	1,701
E-8-DODECENYL ACETATE	33,602	39,198	41,752	33,419	37,412	49,086	54,242	46,757	49,591	45,650
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS	7,529	1,160	143	33	9	35	91	37	0	<1
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. SAN DIEGO IN KILLED PSEUDOMONAS FLUORESCENS	<1	0	1	0	0	0	0	0	0	0
ESSENTIAL OILS	<1	<1	1	<1	<1	1	0	<1	4	<1
ETHYLENE	<1	<1	7	0	0	0	0	0	4	70
EUCALYPTUS OIL	0	0	0	150	<1	0	0	0	2	<1
EUGENOL	0	0	15	<1	<1	0	0	0	0	0
FARNESOL	6,584	5,451	4,294	4,369	1,246	652	422	503	1,597	827
FENUGREEK	0	0	0	0	328	2,068	87	471	74	412
FISH OIL	0	0	0	0	0	0	0	0	0	<1
FORMIC ACID	0	0	0	0	<1	1	51	10	60	1
FOX URINE	0	0	0	0	0	0	0	0	<1	12
GAMMA AMINOBUTYRIC ACID	43,682	87,153	117,477	114,189	58,586	24,697	12,905	1,786	835	542
GARLIC	2,756	828	259	513	363	346	288	374	1,123	1,369

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
GERANIOL	0	0	0	0	<1	0	67	349	1,531	788
GERMAN COCKROACH PHEROMONE	<1	<1	<1	6	<1	<1	<1	<1	<1	<1
GIBBERELLINS	423,337	431,001	414,093	462,231	458,764	455,130	490,530	513,398	491,238	509,170
GIBBERELLINS, POTASSIUM SALT	22	59	170	65	348	32	8	0	34	150
GLIOCLADIUM VIRENS GL-21 (SPORES)	6	<1	<1	18	<1	5	1,090	716	1,401	1,077
GLUTAMIC ACID	43,682	87,153	117,477	114,189	58,586	24,697	12,905	1,786	835	542
HARPIN PROTEIN	39,669	19,651	17,949	12,232	6,089	3,721	1,998	1,562	1,631	1,582
HEPTYL BUTYRATE	0	0	0	0	0	0	0	0	<1	<1
HYDROGEN PEROXIDE	636	802	1,057	985	9,952	7,744	9,361	14,521	23,208	39,175
HYDROPRENE	<1	<1	<1	<1	7	2	200	82	<1	<1
IBA	244	252	1,566	79	27,670	44,093	3,862	150	227	1,154
IRON PHOSPHATE	1,929	1,253	2,148	3,910	4,197	7,145	6,569	4,561	6,345	5,472
LACTOSE	45,903	36,654	45,293	79,734	95,549	80,366	99,526	77,363	80,273	91,887
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)	0	0	24	2	0	<1	<1	0	0	0
LAURYL ALCOHOL	4,635	4,791	6,009	6,719	5,488	9,358	7,782	4,705	5,495	6,443
LAVANDULYL SENECIOATE	0	0	0	0	0	0	4,316	2,375	7,025	11,754
LIMONENE	39,562	48,939	49,320	62,359	75,333	79,012	64,151	55,465	29,621	15,289
LINALOOL	<1	<1	<1	<1	<1	<1	7	1	<1	<1
MARGOSA OIL	0	0	0	0	0	0	0	0	40	4,110
MENTHOL	0	<1	0	150	<1	0	0	0	2	<1
METARHIZIUM ANISOPLIAE, VAR. ANISOPLIAE, STRAIN ESF1	<1	<1	<1	<1	<1	<1	<1	0	<1	<1
METHOPRENE	<1	359	1	<1	157	51	42	211	4	896
METHYL ANTHRANILATE	80	56	1,458	448	1,557	298	219	550	380	2,043
METHYL EUGENOL	0	0	0	0	0	0	0	0	0	<1
METHYL SALICYLATE	0	0	0	0	<1	1	0	<1	0	0
MONTOK PEPPER	0	<1	0	0	0	0	0	0	0	0
MUSCALURE	121	2,283	307	2,715	476	1,179	<1	739	300	70
MYRISTYL ALCOHOL	4,635	4,791	6,009	6,719	5,488	9,358	7,782	4,705	5,495	6,443
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255	3,926	4,390	8,348	4,680	4,478	5,097	5,257	5,331	4,840	5,027
N6-BENZYL ADENINE	967	1,510	4,544	1,552	7,711	2,628	1,775	2,072	3,352	1,687
NAA	72	75	1,096	49	26,799	43,507	3,331	47	38	220
NAA, AMMONIUM SALT	14,313	15,620	12,889	12,569	11,174	11,709	10,445	9,024	9,140	9,075
NAA, ETHYL ESTER	78	58	<1	<1	<1	<1	73	1	23	396
NAA, SODIUM SALT	470	1,856	642	858	452	340	37	257	0	0
NEROLIDOL	6,584	5,451	4,294	4,369	1,246	652	422	503	1,597	826

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NITROGEN, LIQUIFIED	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
NONANOIC ACID	443	476	1,075	675	883	1,275	498	703	412	828
NONANOIC ACID, OTHER RELATED	443	476	1,075	675	877	1,275	498	701	412	828
NOSEMA LOCUSTAE SPORES	<1	35	37	1	<1	254	30	132	12	12
OIL OF ANISE	<1	<1	<1	<1	<1	<1	<1	0	0	<1
OIL OF BERGAMOT	0	0	0	0	<1	0	0	0	0	0
OIL OF CEDARWOOD	0	0	0	0	0	0	0	0	15	0
OIL OF CITRONELLA	0	<1	0	<1	<1	<1	2	0	34	48
OIL OF CITRUS	0	0	0	<1	0	0	0	0	0	0
OIL OF GERANIUM	0	0	0	0	0	0	0	0	15	0
OIL OF JOJOBA	556	379	1,259	4,705	9,029	7,846	11,566	7,203	8,255	1,760
OIL OF LEMON EUCALYPTUS	0	0	0	0	0	0	0	0	0	<1
OIL OF LEMONGRASS	0	36	0	20	<1	0	0	0	0	0
OIL OF MUSTARD	0	0	0	0	0	0	0	0	0	0
OIL OF PEPPERMINT	0	<1	<1	<1	0	<1	<1	0	15	0
OXYPURINOL	0	0	0	<1	0	1	0	0	0	0
PAECILOMYCES FUMOSOROSEUS APOPKA STRAIN 97	0	0	0	0	0	0	0	0	0	0
PAECILOMYCES LILACINUS STRAIN 251	0	0	0	0	0	0	0	0	1,115	2,330
PANTOEA AGGLOMERANS STRAIN E325, NRRL B-21856	0	0	0	0	0	0	0	698	55	25
PERFUME	0	0	<1	0	0	0	0	0	0	0
POLYHEDRAL OCCLUSION BODIES (OB'S) OF THE NUCLEAR POLYHEDROSIS VIRUS OF HELICOVERPA ZEA (CORN EARWORM)	0	293	742	0	0	0	98	254	302	14,752
POTASSIUM BICARBONATE	74,151	106,988	64,994	143,968	61,465	47,299	41,899	69,155	101,281	118,070
PROPYLENE GLYCOL	746,000	763,898	778,321	754,665	738,448	520,537	420,161	381,957	591,117	661,081
PSEUDOMONAS FLUORESCENS, STRAIN A506	13,126	16,945	6,559	7,176	11,929	4,801	1,943	2,463	1,472	1,281
PSEUDOMONAS SYRINGAE STRAIN ESC-11	<1	0	<1	<1	<1	0	0	0	0	0
PSEUDOMONAS SYRINGAE, STRAIN ESC-10	0	0	0	0	<1	0	0	0	3	0
PUTRESCENT WHOLE EGG SOLIDS	<1	<1	<1	<1	<1	<1	<1	33	2	<1
PYTHIUM OLIGANDRUM DV74	0	0	0	0	0	0	0	0	0	2
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	40,786	54,547	58,871	56,342	64,606	67,563	75,619	81,252	99,317	116,088
QUILLAJA	0	0	0	0	3,591	18,584	27,814	22,595	22,916	29,584

Table 19: (continued) *The reported cumulative acres treated with pesticides that are 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).*

AI	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
REYNOUTRIA SACHALINENSIS	0	0	0	0	0	0	0	1,297	70,363	89,694
S-ABSCISIC ACID	0	0	0	0	0	0	34	502	5,195	9,546
S-METHOPRENE	166	21	49	2,395	9,552	30,635	47,284	47,190	65,114	62,704
SAWDUST	<1	<1	<1	23	<1	10	19	<1	<1	0
SESAME OIL	0	0	0	0	<1	888	846	1,448	1,912	1,945
SILVER NITRATE	0	0	0	0	0	0	0	0	<1	<1
SODIUM BICARBONATE	<1	0	100	0	0	0	17	57	1	967
SODIUM LAURYL SULFATE	29	<1	<1	<1	<1	<1	14	<1	<1	<1
SOYBEAN OIL	18,627	15,359	9,870	6,344	3,675	3,277	2,460	3,792	6,160	3,636
STREPTOMYCES GRISEOVIRIDIS STRAIN K61	17	14	5	20	29	12	<1	<1	<1	1
STREPTOMYCES LYDICUS WYEC 108	0	0	0	0	50	96	1,910	4,009	6,998	6,356
SUCROSE OCTANOATE	0	0	0	0	4	0	448	930	1,172	148
THYME	0	0	0	0	<1	<1	<1	68	<1	<1
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2	293	466	833	406	286	311	201	320	7,253	873
TRICHODERMA ICC 012 ASPERELLUM	0	0	0	0	0	0	0	0	0	86
TRICHODERMA ICC 080 GAMSII	0	0	0	0	0	0	0	0	0	86
VANILLIN	0	0	0	0	328	2,068	87	471	74	412
VEGETABLE OIL	103,798	125,724	214,183	211,388	275,541	144,591	231,954	211,586	292,218	458,465
XANTHINE	0	0	0	<1	0	1	0	0	0	0
XANTHOMONAS CAMPESTRIS PV. POANNUA	0	0	0	0	14	0	0	0	0	0
YEAST	5,106	6,708	4,630	4,835	5,262	4,694	4,560	3,957	1,306	5,261
YUCCA SCHIDIGERA	0	0	0	0	0	0	18	598	2,316	4,907
Z,E-9,12-TETRADECADIEN-1-YL ACETATE	13	0	0	0	0	44	0	1,622	<1	49
Z-11-TETRADECEN-1-YL ACETATE	16,870	10,335	8,836	7,351	6,637	6,166	5,040	5,589	4,931	942
Z-8-DODECENOL	33,602	39,198	41,752	33,419	37,412	49,086	54,242	46,757	49,591	45,650
Z-8-DODECENYL ACETATE	33,602	39,198	41,752	33,419	37,412	49,086	54,242	46,757	49,591	45,650
Z-9-TETRADECEN-1-OL	13	0	0	0	0	0	0	0	0	0
TOTAL	2,427,975	2,585,729	2,526,848	2,698,117	2,681,867	2,386,180	2,351,406	2,221,236	2,645,749	2,964,295

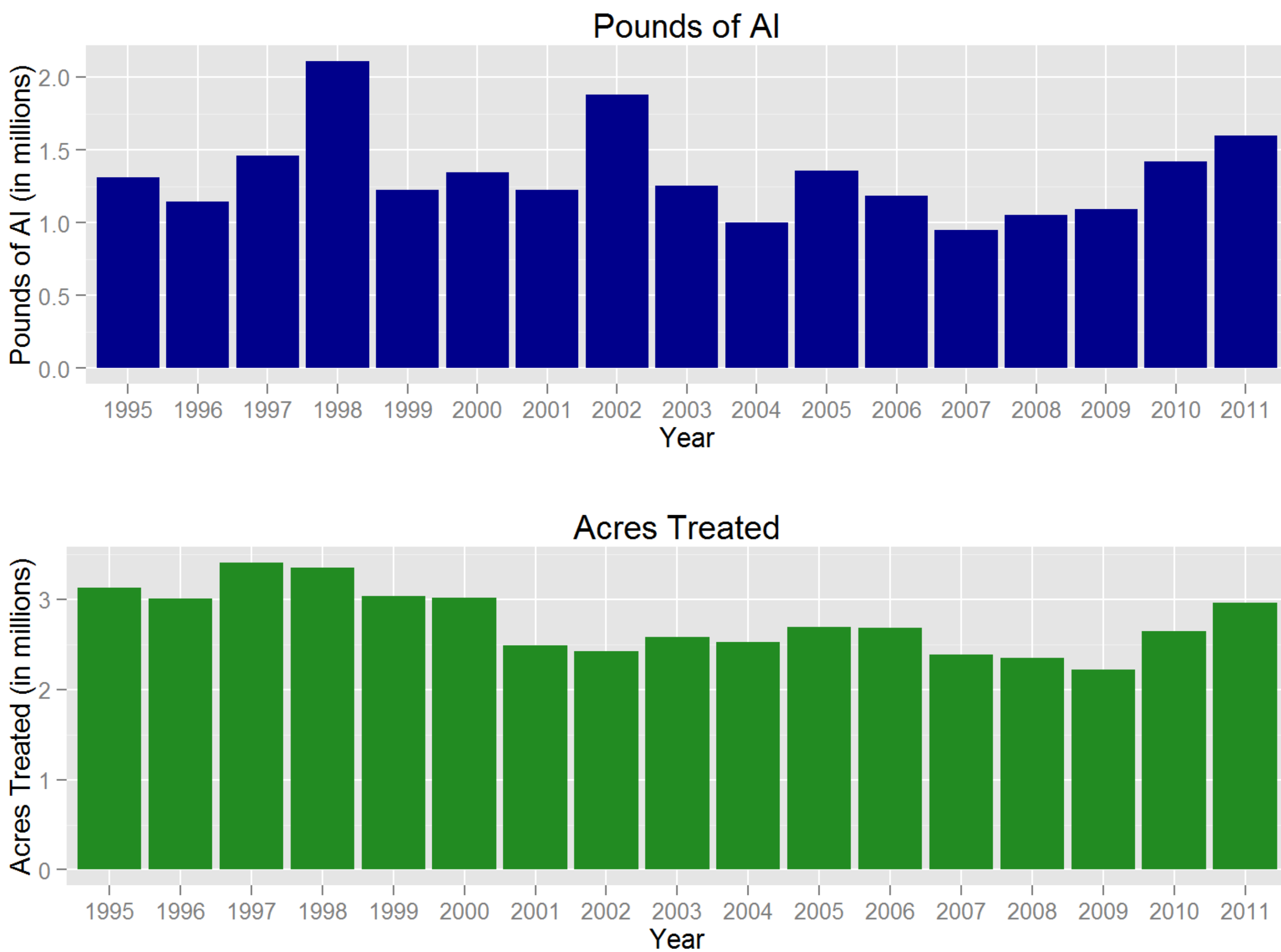

Figure 8: *Use trends of pesticides that are biopesticides. Biopesticides include microorganisms and naturally occurring compounds, or compounds essentially identical to naturally occurring compounds that are not toxic to the target pest (such as pheromones). Reported pounds of active ingredient (AI)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

5 Trends In Pesticide Use In Certain Commodities

This summary describes possible reasons for changes in pesticide use from 2010 to 2011 for the following commodities: almond, cotton, wine grape, table and raisin grape, alfalfa, processing tomato, rice, orange, pistachio, walnut, strawberry, peach and nectarine, and carrot. These 13 commodities were chosen because each was treated with more than 4 million pounds of active ingredients (AIs) or treated on more than 2 million acres, cumulatively. Collectively, this represents 73 percent of the amount reportedly used (79 percent of total used on agricultural fields) and 74 percent of the area treated in 2011.

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

Reported pesticide use in California in 2011 totaled 192 million pounds, an increase of 17 million pounds (9.7 percent) from 2010. The AIs with the largest use amounts were sulfur, petroleum and mineral oils, 1,3-dichloropropene (1,3-D), metam-sodium, and glyphosate. The amount of sulfur accounted for 27 percent of all reported pesticide use in 2011. Sulfur use increased 4.5 million pounds (10 percent) from 2010 to 2011 and was the AI with the largest increase. Sulfur is a natural fungicide favored by both conventional and organic farmers and is used mostly to control powdery mildew on grape and processing tomato. Other pesticides with large use increases included petroleum and mineral oils (4.2 million-pound increase, 15 percent), 1,3-D (2.1 million-pound increase, 24 percent), glyphosate (2.0 million-pound increase, 23 percent), chloropicrin (0.91 million-pound increase, 14 percent), calcium hydroxide (0.86 million-pound increased, 19 percent), and potassium N-methyldithiocarbamate, also called metam-potassium, (0.86 million-pound increase, 18 percent). Petroleum and mineral oils were used mostly as insecticides on almond, orange, wine grape, peach, and lemon. The fumigant 1,3-D was used mostly for strawberry, almond, table and raisin grape, walnut, and sweet potato. Metam-sodium is a fumigant used mostly for carrot, processing tomato, and potato. Glyphosate is an herbicide used mostly for rights-of-way, almond, and cotton. Metam-potassium is a fumigant used mostly for carrot, processing tomato, and dry onion. In production agriculture, fumigants are usually applied to the soil before planting a crop.

In contrast, use amounts of some major pesticides decreased. The largest decrease was seen in kaolin, which decreased 1.4 million pounds (45 percent). Other pesticides with decreases were methyl bromide (790,000 pounds, 17 percent), sulfuryl fluoride (391,000 pounds, 14 percent), maneb (316,000 pounds, 85 percent), and metam-sodium (310,000 pounds, 2.8 percent). Kaolin is a fungicide and insecticide used mostly in walnut, cherry, orange, and processing tomato.

Methyl bromide is a fumigant used mostly in fields before planting strawberry. Sulfuryl fluoride is a fumigant used mostly for treating structures. Maneb is a fungicide used mostly in lettuce.

Different pesticides are used at different rates. In California, most pesticides are applied at rates of around 1 to 2 pounds per acre. However, some AIs are applied at rates of ounces per acre, while fumigants are usually applied at rates of hundreds of pounds per acre. Thus, comparing use amounts will emphasize fumigants. Comparing use among different pesticides using cumulative area treated gives a different picture of which AIs are most used.

Cumulative area treated with all pesticides in 2011 totaled 84 million acres, a 12 percent increase over the area treated in 2010 (75 million acres). By area treated, the non-adjuvant pesticides with the greatest use in 2011 were sulfur, glyphosate, petroleum and mineral oils, copper-based pesticides, and abamectin. Most of the increase in area treated resulted from increased use of glyphosate, sulfur, petroleum and mineral oils, abamectin, and saflufenacil. The AIs with the largest decrease in area treated were maneb, malathion, spinosad, and methoxyfenozide. Most copper-based pesticides are used as fungicides or algaecides and are used in rice fields and on orange, walnut, and almond. Abamectin is an insecticide/miticide used mostly in almond, cotton, and wine grape. Saflufenacil is a recently registered herbicide used mostly in almond and pistachio.

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. The winter and spring of 2010/2011 were relatively cool and wet which probably resulted in more plant disease and weed pressure and thus greater fungicide and herbicide use. This was not a large increase because the winter of 2009/2010 was also cool and wet, and fungicide and herbicide use was high in 2010 as well. Much of the increased pesticide use can be attributed to an increase in planted acreage, especially cotton and pistachio acreage, which increased 49 and 79 percent, respectively, and generally increased crop values. The largest increase of insecticide use in any commodity was in almond: 3.2 million pounds, much of which was from increased use of oils and abamectin. Increased use of organophosphates (OPs) such as chlorpyrifos and ethephon was due mostly to greater acreage of cotton. Summer and fall temperatures were also below average, which resulted in late harvests for some crops. During mild summers, insect pest populations generally do not increase as quickly as they do in hot ones, but some pests are able to thrive. In some cases the late harvest resulted in more insect damage.

In the following tables, use amount is expressed as pounds of AI applied and as 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 treated more than once in a year. (For example, if the same acre is treated three times in a calendar year with an AI, the AI would have been applied to three acres). However, in tables where acres treated is summed over different AIs, such as the first table in each crop section, if individual applications included products that contain more than one AI, the acres treated during that application are only tallied once.

Almond

Almonds are California's most important nut crop economically and have the highest export value of any specialty crop in the United States. Almond acreage has been consistently increasing the last 15 years. In 2011, 835,000 acres were planted in almonds (Table 20), of which 760,000 acres were bearing. The total production of almonds in California in 2011 was 1.63 billion meat pounds, which was a 16 percent increase over production in 2010. The bearing acreage of almonds increased 2.8 percent, planted acreage increased 1 percent, and the price of almonds increased 10 percent from 2010 to 2011 (Table 21). The increased production was probably due to cooler weather and the increased bearing acreage.

There are three distinct almond growing regions in California: Sacramento Valley, Central San Joaquin Valley, and Southern San Joaquin Valley. Weather conditions and pest pressure vary greatly from the northern region to the southern region. Consequently, pesticide product preferences and use rates vary from region to region.

Table 20: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for almonds each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	19,666,088	19,520,395	18,887,748	20,397,873	25,938,281
Acres Treated	10,464,229	10,170,113	10,511,078	12,407,079	13,707,930
Acres Planted	765,000	795,000	810,000	825,000	835,000
Price/pound	$ 1.75	$ 1.45	$ 1.65	$ 1.75	$ 1.92

Table 21: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for almonds each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-8	-1	-3	8	27
Acres Treated	-7	-3	3	18	10
Acres Planted	1	4	2	2	1
Price/pound	-15	-17	14	6	10

In 2011, total pesticide use was close to 26 million pounds on 13.7 million cumulative acres (Table 20). Pounds of AI increased 27 percent, while area treated increased 1 percent from 2010 to 2011. Area treated with herbicides increased 11 percent, with insecticides 11 percent, and with fungicides 15 percent (Figure 9). Interestingly, the amount of sulfur used increased 250 percent. Sulfur is commonly used as a fungicide, insecticide, and miticide, but it was probably most significantly used as a fungicide due to the wet spring.

The most-used insecticides as measured by area treated in 2011 were oils, abamectin, bifenthrin, esfenvalerate, and pyriproxyfen. Acreage treated with pyriproxyfen, bifenthrin, esfenvalerate,

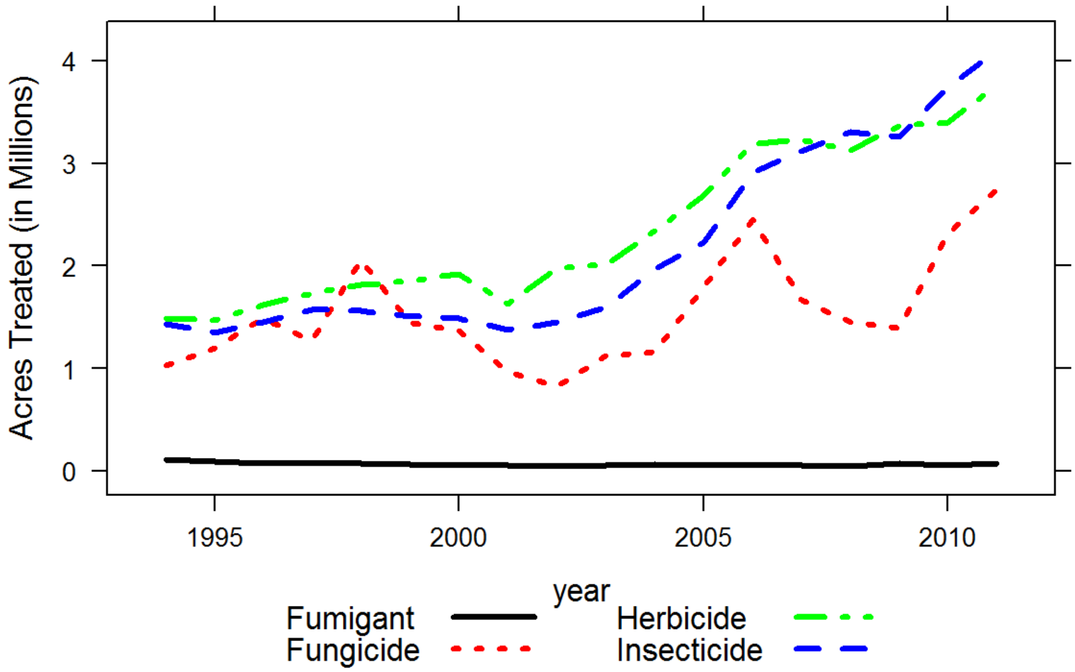

Figure 9: *Area of almonds treated by all AIs in the major types of pesticides from 1996 to 2011.*

abamectin, and oil increased 36 percent, 32 percent, 26 percent, 15 percent, and 11 percent, respectively, from 2010 to 2011 (Table 22). Abamectin, bifenthrin, and esfenvalerate are effective and relatively inexpensive, and because almond prices were high in 2011, many growers applied them to assure high yields. The area treated with some AIs declined: methoxyfenozide use decreased 14 percent and permethrin 39 percent. The decreased use of permethrin may have been partially offset by the increased use of other pyrethroids such as bifenthrin. Insecticide use data show a shift in the products used for control of specific pests, including navel orange worm (NOW) and peach twig borer (PTB). Use of pyrethroids such as bifenthrin and esfenvalerate and other broad spectrum insecticides during the growing season will often result in subsequent spider mite outbreaks. That may account for the increased use of abamectin. For controlling ants, most growers use insect growth regulators such as pyriproxyfen, methoprene, or fenoxycarb in the form of baits. Of the top five insecticides by area treated, pyriproxyfen had the greatest proportional increase (39 percent). It is the most effective option for ant management.

Key arthropod pests in almonds are NOW, San Jose scale (SJS), PTB, web-spinning mites, and ants. Winter sanitation to eliminate mummy nuts has become a standard practice to reduce the number of overwintering NOW larva and reduces the need to spray for NOW during the growing season. Almonds can be treated with oil alone in the dormant season to control low to moderate populations of SJS and brown and European red mites. Summer oils can be used during the growing season to control mites. Other insecticides are often co-applied with oil to control higher

Table 22: *The non-adjuvant pesticides with the largest change in area treated of almonds from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
SAFLUFENACIL	HERBICIDE				17,548	252,219	234,671	1,337
OIL	INSECTICIDE	892,133	975,771	1,018,563	1,098,471	1,221,521	123,050	11
GLYPHOSATE	HERBICIDE	1,316,550	1,254,586	1,308,761	1,347,441	1,464,525	117,083	9
ABAMECTIN	INSECTICIDE	625,930	644,537	660,743	734,299	845,614	111,316	15
DIFENOCONAZOLE	FUNGICIDE		10,164	29,324	36,715	134,988	98,273	268
AZOXYSTROBIN	FUNGICIDE	79,259	39,527	39,398	122,704	212,010	89,305	73
METCONAZOLE	FUNGICIDE				88,479	174,398	85,920	97
BIFENTHRIN	INSECTICIDE	96,955	103,113	123,986	205,436	271,201	65,764	32
GLUFOSINATE-AMMONIUM	HERBICIDE	129,008	204,604	272,551	340,434	281,938	-58,496	-17
ESFENVALERATE	INSECTICIDE	192,555	228,868	185,698	200,769	253,060	52,292	26
COPPER	FUNGICIDE	146,403	152,664	118,757	170,757	221,529	50,773	30
CHLORO-THALONIL	FUNGICIDE	35,410	36,215	34,475	77,203	127,402	50,199	65
SULFUR	FUNGICIDE/ INSECTICIDE	70,482	44,575	39,125	41,773	91,862	50,089	120
2,4-D	HERBICIDE	124,117	147,653	154,868	156,446	106,632	-49,814	-32
PYRIPROXYFEN	INSECTICIDE	99,925	161,565	159,322	139,201	188,792	49,591	36

populations of SJS and PTB. Pesticide treatments in the dormant season or during bloom in February typically target PTB, treatments in July and August typically target NOW, and treatments in May may target either one. Most May treatments north of Fresno are primarily for PTB and secondarily for NOW, while most south of Fresno are for NOW.

Overall, the area treated with fungicides increased 15 percent from 2010 to 2011. 2011's spring was wetter, but warmer, than 2010's and was more conducive to the development of fungal and bacterial diseases. A wet winter led to the use of more copper-based pesticides and sulfur in the dormant season. Fungicides with the greatest area treated in 2011 were iprodione, boscalid, pyraclostrobin, propiconazole, and cyprodinil. Acreage treated with difenoconazole, sulfur, metconazole, azoxystrobin, chlorothalonil, and copper-based pesticides increased the most: 268, 120, 97, 73, 65, and 30 percent, respectively. The use of ziram, myclobutanil, and maneb decreased 44, 44, and 99 percent, respectively. Because some disease organisms are becoming resistant to particular fungicides, growers tend to rotate the use of fungicides with those in other chemical classes to forestall the development of resistance. Difenoconazole and metconazole are in a different chemical class than azoxystrobin and are therefore rotated with azoxystrobin to manage resistance. Additionally, the increased use of difenoconazole, metconazole, and others was possibly due to their relatively recent registration in the California.

The overall increase in acreage treated with herbicides in 2011 (11 percent) is likely due to the increased almond bearing acreage and the relatively wet and warm spring weather. The widest-used herbicides in 2011 were glyphosate, oxyfluorfen, glufosinate-ammonium, saflufenacil, and paraquat dichloride. The use of saflufenacil, which was first registered in 2010, increased to 252,000 acres. Conversely, the use of glufosinate-ammonium and 2,4-D decreased 17 and 32 percent, respectively. These were the only 2 of all 15 pesticides in Table 22 for which usage decreased. Interestingly, glufosinate-ammonium use increased dramatically after 2007 and almost tripled by 2010 as concerns with glyphosate-resistant weeds increased. Coincidentally, glufosinate-ammonium products were reformulated and prices dropped. However, in 2011 glufosinate-ammonium use declined, possibly due to the widespread popularity of the new herbicide saflufenacil, but use still remained above 2007-2009 levels. Among other high-use herbicides, oryzalin use increased 48 percent while paraquat dichloride use decreased 3 percent. Simazine use remained almost the same.

Cotton

Cotton is grown for fiber, oil, and animal feed. Total planted acreage in 2011 was 456,000, a 49 percent increase from 2010 to 2011 (Tables 23 and 24). This increase was a result of favorable cotton prices, and the planting of alternative crops, such as processing tomatoes, appeared financially more risky to growers. Two main kinds of cotton are grown: upland and Pima. In the last several years, the percent of cotton acreage in Pima has generally increased so that in 2011, 60 percent of cotton acreage was in Pima. Most upland and Pima cotton varieties have also been genetically modified to be tolerant to the herbicide glyphosate. Most cotton is grown in the southern San Joaquin Valley, but a small percentage is grown in Imperial and Riverside counties and a few counties in the Sacramento Valley.

Table 23: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for cotton each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	3,474,243	2,435,168	1,445,747	3,070,472	5,052,680
Acres Treated	6,306,290	4,950,596	2,887,558	6,105,428	9,895,424
Acres Planted	455,000	275,000	190,000	306,000	456,000
Price/pound	$ 0.88	$ 0.82	$ 1.00	$ 1.51	$ 1.41

Total amount of pesticides used on cotton increased from 3.1 million to 5.1 million pounds from 2010 to 2011, or 65 percent (Table 23); use per acre planted also increased. Use in every cotton-growing county increased, and use of nearly all major AIs and AI types increased. The use of all AI types increased more than the increase in planted acreage, except for the use of fungicides, which increased 27 percent in amount of AI and 43 percent in cumulative area treated (Figure 10). The pounds of herbicides used increased the most of any AI type (68 percent), while the acreage treated with insecticides increased the most (74 percent).

Table 24: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for cotton each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-39	-30	-41	112	65
Acres Treated	-35	-21	-42	111	62
Acres Planted	-19	-40	-31	61	49
Price/pound	16	-7	22	51	-7

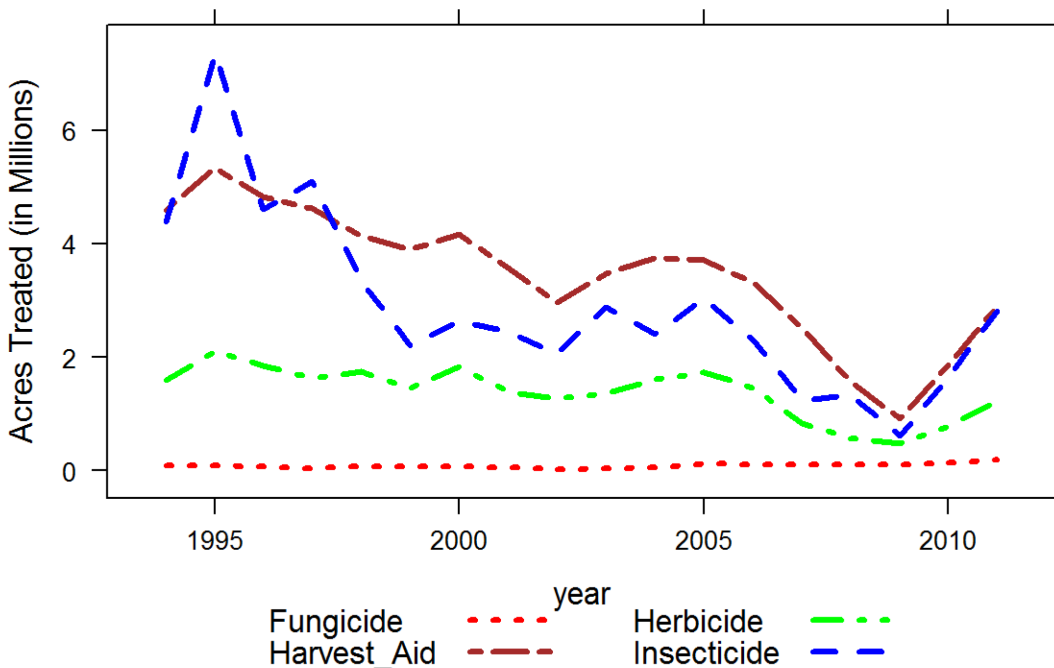

Figure 10: *Area of cotton treated by all AIs in the major types of pesticides from 1996 to 2011.*

Insecticide use increased partly because of increased area planted but also because of increased pest problems. The most-used insecticides as measured by area treated in 2011 were flonicamid, abamectin, clothianidin, acetamiprid, chlorpyrifos, imidacloprid, and bifenthrin. The applications of all the most-used insecticide AIs increased except aldicarb, which decreased 63 percent in amount applied, and indoxacarb, which decreased 28 percent. A few years ago both of these were among the most-used insecticides. The largest increase in area treated was with flonicamid, which increased 274,000 acres (Table 25). Of the major insecticides, the largest percent increases in area treated were phorate (509 percent), gamma-cyhalothrin (337 percent), spiromesifen (237 percent), and emamectin benzoate (232 percent). When expressed as amount applied, the largest percent increases were seen in methamidophos (2,148 percent), phorate (600 percent), propargite (348 percent), and spiromesifen (228 percent). Clothianidin, a recently registered pesticide, was first

Table 25: *The non-adjuvant pesticides with the largest change in area treated of cotton from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
GLYPHOSATE	HERBICIDE	263,930	210,913	183,253	446,881	746,752	299,871	67
FLONICAMID	INSECTICIDE	184,070	184,789	107,873	171,994	445,555	273,562	159
MEPIQUAT CHLORIDE	HARVEST AID	338,816	213,817	99,132	286,101	539,985	253,885	89
CLOTHIANIDIN	INSECTICIDE				10	232,686	232,676	2,326,765
ABAMECTIN	INSECTICIDE	211,551	121,842	76,135	168,394	343,036	174,642	104
ETHEPHON	HARVEST AID	385,164	244,343	150,197	290,810	444,421	153,611	53
DIURON	HARVEST AID	373,162	233,184	152,484	287,414	435,558	148,144	52
THIDIAZURON	HARVEST AID	370,921	238,852	152,781	292,290	427,089	134,799	46
PYRAFLUFEN-ETHYL	HERBICIDE/ HARVEST AID	292,443	212,506	143,257	236,205	354,258	118,053	50
PARAQUAT DICHLORIDE	HARVEST AID	264,366	182,235	131,255	216,056	318,120	102,064	47
UREA DIHYDROGEN SULFATE	HARVEST AID	266,547	155,050	94,090	188,311	277,331	89,020	47
ACETAMIPRID	INSECTICIDE	98,057	67,957	55,880	139,941	225,475	85,533	61
CHLORPYRIFOS	INSECTICIDE	46,862	74,817	39,943	125,998	206,923	80,925	64
NOVALURON	INSECTICIDE	2,954	5,638	4,337	53,343	127,728	74,385	139
NALED	INSECTICIDE	7,699	30,604	14,812	56,363	100,187	43,824	78

used to any extent in 2011. The increase in propargite was mostly in Kings County. Most use of spiromesifen was in Kern County.

The growing season started cool and rainy, which delayed planting. This was a bigger problem for Pima than for upland cotton because Pima takes a long time to mature properly. These conditions also promoted a buildup of lygus bugs. By July daytime temperatures were high and nighttime temperatures low, which is ideal for cotton plants. Weather in August and September was also beneficial for cotton, resulting in good cotton production. However, aphids and whiteflies can also be a problem during these months because they produce sugary excretions, which drop on the cotton lint creating "sticky cotton."

Flonicamid, abamectin, clothianidin, imidacloprid, bifenthrin, novaluron, and oxamyl were all applied from June through August; these applications mostly targeted lygus bugs. Acetamiprid, chlorpyrifos, and naled were applied in August and September and were used mostly to manage aphids and whiteflies. Abamectin, etoxazole, spiromesifin, propargite, and fenproximate mostly targeted mites. Spider mite populations during the late seasonwere among the highest in many years. Aldicarb use has decreased probably because the producer/registrant, Bayer, will voluntarily phase out its production by December 31, 2014, and has already reduced its supply.

Phorate is applied at planting as an alternative to aldicarb. Use of indoxacarb decreased because growers are using newer products, such as flubendiamide, for caterpillar control and because caterpillars were not much of a problem in 2011.

The amount of herbicide AIs used increased 68 percent and the area treated 57 percent; the use of nearly all individual herbicides increased. The most-used herbicides by area treated in 2011 were glyphosate, pendimethalin, oxyfluorfen, trifluralin, and flumioxazin. Glyphosate was by far the most-used herbicide by amount, accounting for 71 percent of all herbicide use. Trifluralin had the greatest increase in use of major herbicides, increasing 114 percent in amount and 129 percent in area treated (Table 25). Some AIs, such as paraquat dichloride, are used both as harvest aids and herbicides. Here it is assumed if use occurred between August and November it was used as a harvest aid, otherwise as an herbicide. The increase in herbicide use was due mostly to the increase in planted acreage. The increased use of glyphosate was probably due to increased plantings of Roundup-Ready cotton, which is genetically engineered to be resistant to glyphosate.

Harvest aid use increased 61 percent in amount of AI and 60 percent in area treated. Harvest aids are chemicals used to defoliate or desiccate cotton plants before harvest. Although mepiquat chloride is included here among the harvest aids, it is actually a growth regulator and is typically used mid-season. The most-used harvest aids by area treated were mepiquat chloride, ethephon, diuron, thidiazuron, and pyraflufen-ethyl. The largest increase in use was that of mepiquat chloride which increased about 87 percent by area treated and 90 percent by amount. Use of all other main harvest aids increased between 35 to 100 percent (Table 25), and use increased in all counties. Use of harvest aids increased relatively more than the area planted in 2011 because the late start in the growing season made it difficult to defoliate the plants before harvest.

Fungicide use increased 27 percent in amount of AI and 43 percent in area treated. The use per acre planted decreased in 2011 mostly because use was unusually high in 2010: use per acre planted in 2010 was the second highest in the last 10 years. The most-used fungicides as measured by area treated were azoxystrobin, iprodione, and pyraclostrobin. Most of the fungicides were applied in Kings County where azoxystrobin and iprodione were most popular; pyraclostrobin was applied mostly in Riverside County. Fungicides are not widely used in cotton, but use, especially of azoxystrobin and iprodione, has been increasing in recent years because of increased incidence of seedling diseases, especially the disease caused by *Rhizoctonia solani*. Pyraclostrobin is also applied to cotton fields, mostly in July. Most of the other fungicides are used as seed treatments and are not applied to the field.

Fumigant use increased by 497 percent by amount of AI and 502 percent by area treated. The main fumigants were metam-sodium and metam-potassium (also called potassium n-methyldithiocarbamate). Most fumigants were applied in Kings and Fresno counties. Although there was a great increase in fumigant use, the area treated with fumigants still accounts for only 0.02 percent of total pesticide use in cotton. Fumigants are used to treat the soil before planting for a range of soil pathogens, nematodes, and weeds. However, in cotton the increased use may be the result of concern with the soil-inhabiting fungus *Fusarium oxysporum* f. sp. *vasinfectum* race 4, more commonly known as FOV race 4. In the last few years, this has become a major concern for cotton growers because once a field is infected, it is impossible to achieve economic yields with many cotton varieties, and the disease is spreading throughout the San Joaquin Valley. The pathogen cannot be controlled by pesticides, but some people believe soil fumigation may reduce pathogen inoculum.

Wine grape

In 2011, roughly 64 percent of California vineyards produced wine grapes. Chardonnay and Cabernet Sauvignon were once again the two most widely-planted wine grape varieties in California; bearing acreage planted to these varieties increased 2 percent in 2011, while total wine grape acreage increased 1.5 percent for a total of 543,000 acres (Tables 26 and 27). There are four major wine grape production regions: 1) North Coast (Lake, Mendocino, Napa, Sonoma, and Solano counties); 2) Central Coast (Alameda, Monterey, San Luis Obispo, Santa Barbara, San Benito, Santa Cruz, and Santa Clara counties); 3) Northern San Joaquin Valley (San Joaquin, Calaveras, Amador, Sacramento, Merced, Stanislaus, and Yolo counties); and 4) Southern San Joaquin Valley (Fresno, Kings, Tulare, Kern, and Madera counties).

Table 26: *Total reported amount of all active ingredients (AI), area treated, acreage planted, and prices for wine grapes each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	24,469,737	21,286,864	22,101,217	26,274,031	29,448,653
Acres Treated	7,867,022	7,173,088	7,740,909	8,901,829	9,665,896
Acres Planted	523,000	526,000	531,000	535,000	543,000
Price/ton	$ 564	$ 609	$ 613	$ 576	$ 638

Table 27: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for wine grapes each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	1	-13	4	19	12
Acres Treated	0	-9	8	15	9
Acres Planted	-1	1	1	1	1
Price/ton	-3	8	1	-6	11

The total amount of pesticide AIs applied to wine grapes increased from more than 26 million in 2010 to nearly 29.5 million pounds in 2011 (12 percent increase) and cumulative area treated increased from 8.9 million in 2010 to 9.7 million acres in 2011 (9 percent increase) (Tables 26 and 27). Factors that influence changes in pesticide use on wine grapes include weather, topography, pest pressures (which vary by region), competition from newer pesticide products,

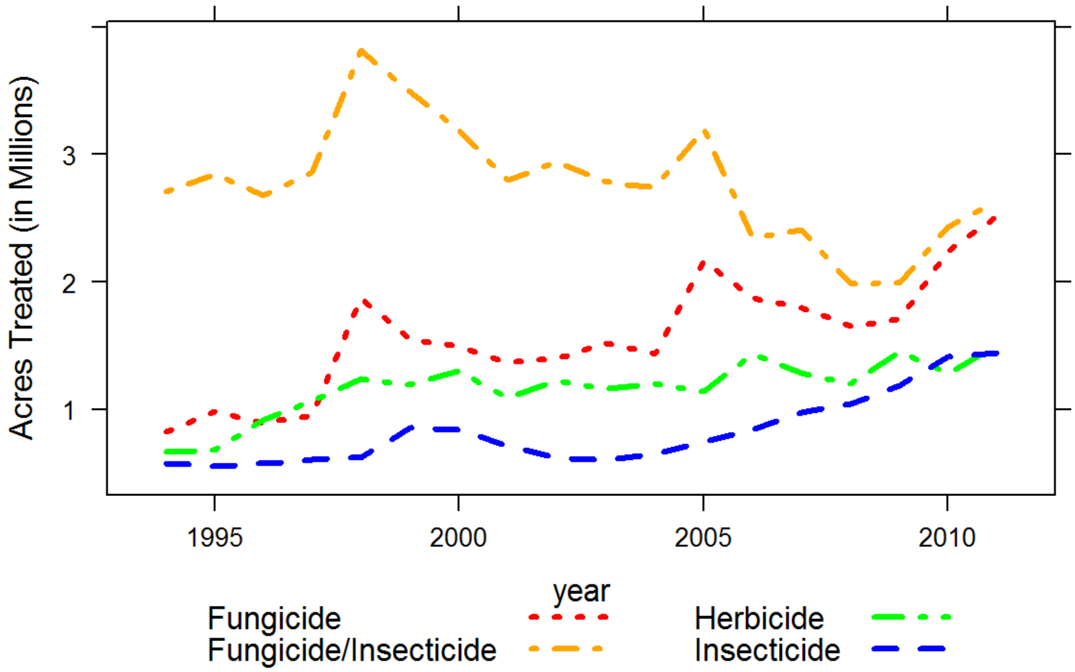

Figure 11: *Area of wine grapes treated by all AIs in the major types of pesticides from 1996 to 2011.*

application restrictions, efforts by growers to reduce costs, and increasing emphasis on sustainable farming. The figures in this report are comprehensive for statewide use and may not reflect differences in pesticide use patterns between production regions.

Insecticide use in wine grapes increased marginally in 2011: the amount applied increased 6 percent, while area treated increased 1 percent (Figure 11). The insecticides applied to the greatest acreage in 2011 were oils, imidacloprid, methoxyfenozide, abamectin, spirotetramat, *Bacillus thuringiensis*, and chlorantraniliprole. Imidacloprid is used during warmer weather between budbreak and harvest to control mealybug infestations, though it may not be effective where heavy clay soils exist, such as in the coastal regions, due to poor plant uptake. The area treated with chlorantraniliprole, which was first used in 2008 and showed a dramatic increase in use in 2010, decreased 17 percent in 2011, and the area treated with methoxyfenozide decreased 34 percent. Chlorantraniliprole is relatively selective and methoxyfenozide is highly selective for lepidopteran pests. Both AIs are used in the control of the European grapevine moth, an invasive pest that recently arrived in California. The decreased uses of chlorantraniliprole and methoxyfenozide may be associated with reduced incidence of the European grapevine moth in 2011. Far fewer individuals of the European grapevine moth were trapped in 2011 than in 2010 (146 vs >100,000, mostly in Napa county), which may have reduced the perceived threat to growers. On the other hand, use of indoxacarb, also used to control lepidopteran pests, increased

Table 28: *The non-adjuvant pesticides with the largest change in area treated of wine grapes from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
SULFUR	FUNGICIDE/ INSECTICIDE	2,388,461	1,973,333	1,983,560	2,415,644	2,609,477	193,833	8
SPIROTETRAMAT	INSECTICIDE		6,600	19,647	13,111	97,569	84,458	644
METHOXY- FENOZIDE	INSECTICIDE	88,820	86,226	75,440	191,093	126,869	-64,224	-34
DIFENOCONAZOLE	FUNGICIDE					61,823	61,823	
GLYPHOSATE	HERBICIDE	471,086	410,636	454,662	412,685	465,459	52,774	13
BUPROFEZIN	INSECTICIDE	34,357	29,572	53,167	59,406	11,505	-47,901	-81
CYPRODINIL	FUNGICIDE	51,275	51,179	62,668	86,765	129,626	42,861	49
OIL	INSECTICIDE	314,973	410,048	427,337	477,835	517,294	39,459	8
GLUFOSINATE- AMMONIUM	HERBICIDE	92,699	180,175	197,314	203,895	240,474	36,579	18
QUINOXYFEN	FUNGICIDE	126,863	137,160	174,901	198,568	232,851	34,283	17
OXYFLUORFEN	HERBICIDE	202,006	196,561	222,466	179,233	211,974	32,741	18
ABAMECTIN	INSECTICIDE	40,806	33,904	55,156	83,839	115,650	31,810	38
TETRACONAZOLE	FUNGICIDE			2,730	70,133	101,451	31,317	45
SIMAZINE	HERBICIDE	96,437	69,102	85,381	54,668	85,473	30,805	56
COPPER	FUNGICIDE	329,255	318,593	272,908	310,618	338,544	27,926	9

dramatically (from 2,173 to 26,314 acres treated). Of the major insecticides noted above, the largest increase in insecticide use was of spirotetramat, which increased 644 percent over that in 2010 (Table 28). Registration for products containing spirotetramat was cancelled by the U.S. EPA in April 2010 due to procedural errors, but existing stocks were allowed to be distributed and used, and registration was then conditionally approved in early 2011. During the cancellation process growers expressed strong support for continuing registration. Spirotetramat provides control of mealybugs, a continuing problem for grape growers. This sequence of events may account for the increase in use of this AI. In 2011, the area treated with oils increased only 8 percent, though their use has increased steadily over the past 9 years. Oils have many attractive, broad-spectrum properties and are low-risk. Increasingly mixed with fungicides, oils can replace a surfactant and eradicate mildew growth, as well as suppress mites and insects such as grape leafhoppers. The area treated with buprofezin and chlorpyrifos decreased substantially in 2011 (81 and 63 percent, respectively).

The area treated with sulfur increased 8 percent in 2011, but the use of other fungicides/insecticides was relatively modest. The area treated with all other fungicides increased 9 percent (Table 28), and sulfur, copper-based pesticides, quinoxyfen, boscalid, pyraclostrobin, myclobutanil, and trifloxystrobin were used most in terms of area treated. The area treated with cyprodinil increased 49 percent, as did two recently registered fungicides, tetraconazole and difenoconazole (difenoconazole was approved as a mixture with cyprodinil in early 2011). The area treated with lime sulfur in early and late 2011 to defend against overwintering disease inoculum increased 56 percent. Disease pressure was relatively high from powdery mildew in most regions in 2011, and very high from botrytis in the North Coast region due to a cool spring, late rains, and a cooler-than-normal summer. These factors and relatively slow development of the grapes account for the marked increase in fungicide use.

The area treated with herbicides increased 17 percent from 2010 to 2011, and the herbicides used most were glyphosate, glufosinate-ammonium, oxyfluorfen, flumioxazin, pendimethalin, and simazine. Use of each of these herbicides increased in 2011, the increases ranging from 13 percent (glyphosate) to 56 percent (simazine) (Table 28). The area treated with paraquat decreased (27 percent) for the second consecutive year, but that treated with glufosinate-ammonium increased (18 percent). This may be due to the continued prevalence of glyphosate-resistant weeds, such as marestail and fleabane, in vineyards; glufosinate-ammonium is used specifically to control these weeds. Marestail is also host to the glassy-winged sharpshooter, a vector of Pierce's disease, making it a double threat.

Though the area treated was small, reflecting the relatively small number of new vineyard plantings, in terms of amount applied, use of the fumigant 1,3-D increased 67 percent (446,349 pounds). This was the fourth largest amount of active ingredient applied, across all types, after sulfur, oils, and glyphosate. The area treated increased 78 percent.

The area treated with plant growth regulators (PGR) increased 16 percent from 2010 to 2011, though the cumulative acres treated totaled only 16,432. Gibberellins accounted for 91 percent of all area treated with PGRs. Gibberellins are applied in early spring in order to lengthen and loosen grape clusters. Less compact clusters may be less vulnerable to berry splitting and bunch rot.

Table and raisin grape

Total acreage of table and raisin grapes decreased slightly from 307,000 to 305,000 acres (<1 percent decrease) from 2010 to 2011 (Tables 29 and 30). This acreage comprised approximately 36 percent of California's total grape crop in 2011, the rest being wine grapes. The southern San Joaquin region accounts for 95 percent of California's raisin and table grape production. Acreage used for raisins decreased 1.9 percent, while acreage used for table grapes increased 2.1 percent. These values tend to shift yearly depending on market conditions, since some grape varieties can be used for more than one purpose. Thompson Seedless was the most widely planted raisin grape variety, while Flame Seedless was the most widely planted table grape variety. California produced 2,194,000 tons of raisin grapes and 1,031,000 tons of table grapes in 2011. Statewide table grape and raisin tonnage increased 3 percent and 2 percent, respectively, relative to 2010 production.

The total area treated with insecticides increased 8 percent in 2011 (Figure 12). The major insecticides applied in 2011 by area treated were oils, imidacloprid, spirotetramat, methoxyfenozide, abamectin, cryolite, and spinetoram. While use of methoxyfenozide decreased

Table 29: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for table and raisin grapes each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	16,594,230	13,879,151	12,832,254	14,040,970	16,349,140
Acres Treated	5,522,968	5,536,012	5,500,788	5,879,615	6,781,557
Acres Planted	325,000	318,000	312,000	307,000	305,000
Price/ton	$ 422.09	$ 305.94	$ 345.67	$ 359.41	$ 524.94

Table 30: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for table and raisin grapes each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	8	-16	-8	9	16
Acres Treated	-4	0	-1	7	15
Acres Planted	-2	-2	-2	-2	-1
Price/ton	-6	-28	13	4	46

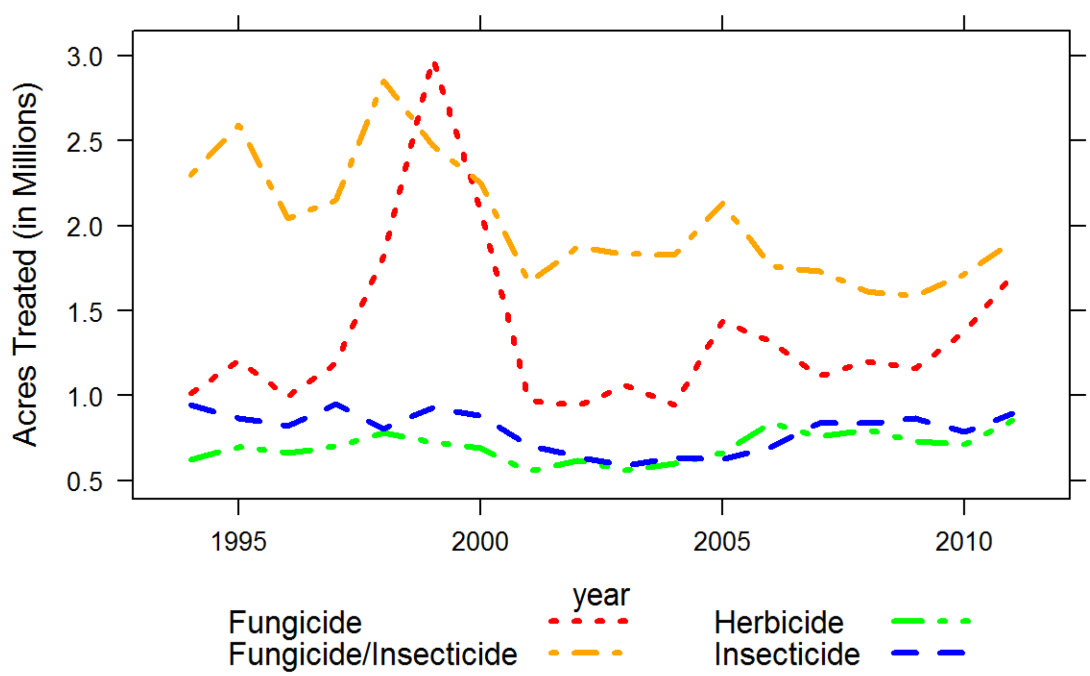

Figure 12: *Area of table and raisin grapes treated by all AIs in the major types of pesticides from 1996 to 2011.*

Table 31: *The non-adjuvant pesticides with the largest change in area treated of table and raisin grapes from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
SULFUR	FUNGICIDE/ INSECTICIDE	1,714,833	1,595,586	1,558,697	1,700,839	1,883,622	182,783	11
OIL	INSECTICIDE	132,814	162,759	134,328	95,574	150,075	54,501	57
COPPER	FUNGICIDE	262,193	252,507	227,212	277,937	330,980	53,043	19
SPIROTETRAMAT	INSECTICIDE		7,262	40,367	48,195	93,172	44,978	93
GLYPHOSATE	HERBICIDE	223,529	221,809	200,023	184,033	225,236	41,203	22
CYPRODINIL	FUNGICIDE	39,553	49,904	53,477	56,092	93,395	37,303	67
GLUFOSINATE-AMMONIUM	HERBICIDE	63,141	130,798	144,755	140,184	169,619	29,435	21
OXYFLUORFEN	HERBICIDE	70,969	69,351	58,216	74,192	101,465	27,273	37
TRIFLOXY-STROBIN	FUNGICIDE	101,991	128,330	127,347	140,370	166,204	25,834	18
TRIFLUMIZOLE	FUNGICIDE	13,222	11,596	43,298	39,477	64,851	25,374	64
TEBUCONAZOLE	FUNGICIDE	92,743	97,753	89,373	127,849	152,311	24,462	19
DIFENOCONAZOLE	FUNGICIDE				59	24,339	24,280	41,448
GIBBERELLINS	PLANT GROWTH REGULATOR	340,104	382,892	388,359	356,725	380,691	23,966	7
IMIDACLOPRID	INSECTICIDE	113,083	93,724	103,351	93,993	117,319	23,327	25
QUINOXYFEN	FUNGICIDE	42,572	56,372	61,386	67,455	90,641	23,186	34

16 percent and use of cryolite remained stable, area treated with oil increased 60 percent, imidacloprid 24 percent, spirotetramat 93 percent, abamectin 36 percent, and spinetoram 46 percent (Table 31). Imidacloprid and buprofezin are used during warm weather between budbreak and harvest to control mealybug infestations, though they may not be effective where heavy clay soils exist, such as in the coastal regions, due to poor plant uptake. Registration for products containing spirotetramat was cancelled by the U.S. EPA in April 2010 due to procedural errors, but existing stocks were allowed to be distributed and used, and registration was then conditionally approved in early 2011. During the cancellation process growers expressed strong support for continuing registration because spirotetramat provides control of mealybugs and offers an alternative to chlorpyrifos for that purpose. These details may account for the increase in use of this AI. Cryolite is applied early in the season to control lepidopteran pests, such as omnivorous leafroller. Methoxyfenozide controls similar pests, but can be used later in the growing season than cryolite. Use of buprofezin, spinosad, and chlorpyrifos decreased in 2011. Chlorantraniliprole treatments had increased dramatically in 2010 but only increased 7 percent in 2011(Table 31). This insecticide is relatively selective for lepidopteran pests and was used to control the invasive pest European grapevine moth, which was eradicated in table grape and raisin growing regions.

The area treated with sulfur increased 11 percent (Table 31), while area treated with all other fungicides, as a whole, increased 21 percent. Sulfur, copper-based pesticides, trifloxystrobin, myclobutanil, tebuconazole, boscalid, and pyraclostrobin were the most-used fungicides in terms of area treated. Area treated with lime sulfur in early 2011 against overwintering disease inoculum increased 86 percent, to the highest level in the past eight years. Copper-based pesticides, used to treat botrytis bunch rot, were applied to 17 percent more acres compared to 2010. The overall increase in fungicide use can be attributed to a cool, wet spring; these conditions increased the need for applications early in the season and into June, when 453,166 acres were treated (the most in that month in the past 10 years).

The area treated with herbicides increased 20 percent from 2010 to 2011. Herbicides used most in table and raisin grapes by area treated were glyphosate, glufosinate-ammonium, oxyfluorfen, paraquat dichloride, pendimethalin, and simazine. The area treated with all these herbicides increased 22, 21, 37, 24, 24, and 6 percent, respectively. Late rains, concerns over low yields, and increasing weed resistance may have led to greater herbicide use to control weeds in 2011.

Though the number of acres treated was relatively small, reflecting the relatively small number of new vineyard plantings, the use of the fumigant 1,3-D increased 104 percent. This was the second largest amount of any active ingredient applied, across all types, after sulfur. Most of these applications were in Kern County (68 percent), where nematodes are a particular problem. The area treated there increased 119 percent.

The area treated with PGRs increased 8 percent in 2011. The most commonly used PGRs were gibberellins, which are applied in early spring to lengthen and loosen grape clusters and increase berry size. Less compact clusters may be less vulnerable to berry splitting and bunch rot. Gibberellin-treated area increased 7 percent in 2011. Ethephon use increased 6 percent.

Alfalfa

Alfalfa hay is produced for animal feed in California, and the dairy industry remains the biggest market. Harvested alfalfa acreage was 880,000 in 2011, an 8 percent decrease from 2010 (Tables 32 and 33). Most counties produce some alfalfa hay, but more than half of the state's production is in Fresno, Kern, Imperial, Merced, and Tulare counties. The total amount of pesticide AIs applied to California alfalfa increased 29 percent between 2010 and 2011, from 2.7 million to 3.5 million pounds (Table 32). The cumulative area treated with pesticides increased 22 percent, and the price received per ton of hay increased 78 percent (Table 33). The increased price was due to reduced acreage, increased demand for locally grown hay, and increased export. High fuel costs reduced imports from other western states that usually ship large quantities of hay into California to augment local production.

Statewide, insecticide use amounts on alfalfa increased 40 percent between 2010 and 2011, whereas the cumulative area treated increased 20 percent (Figure 13). Insecticide use depends on the intensity of pest pressure during the season and varies with hay values. As the price of hay

Table 32: *Total reported amount of all active ingredients (AI), area treated, harvested acreage, and prices for alfalfa each year from 2007 to 2011. Harvested acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	2,927,396	3,223,588	3,364,284	2,727,249	3,524,770
Acres Treated	4,445,444	5,349,955	4,415,277	4,557,711	5,541,035
Acres Harvested	1,015,000	1,050,000	1,020,000	960,000	880,000
Price/ton	$ 165	$ 204	$ 107	$ 133	$ 237

Table 33: *Percent difference from previous year for reported amount of all AIs, area treated, acres harvested, and prices for alfalfa each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-4	10	4	-19	29
Acres Treated	-20	20	-17	3	22
Acres Harvested	-9	3	-3	-6	-8
Price/ton	42	24	-48	24	78

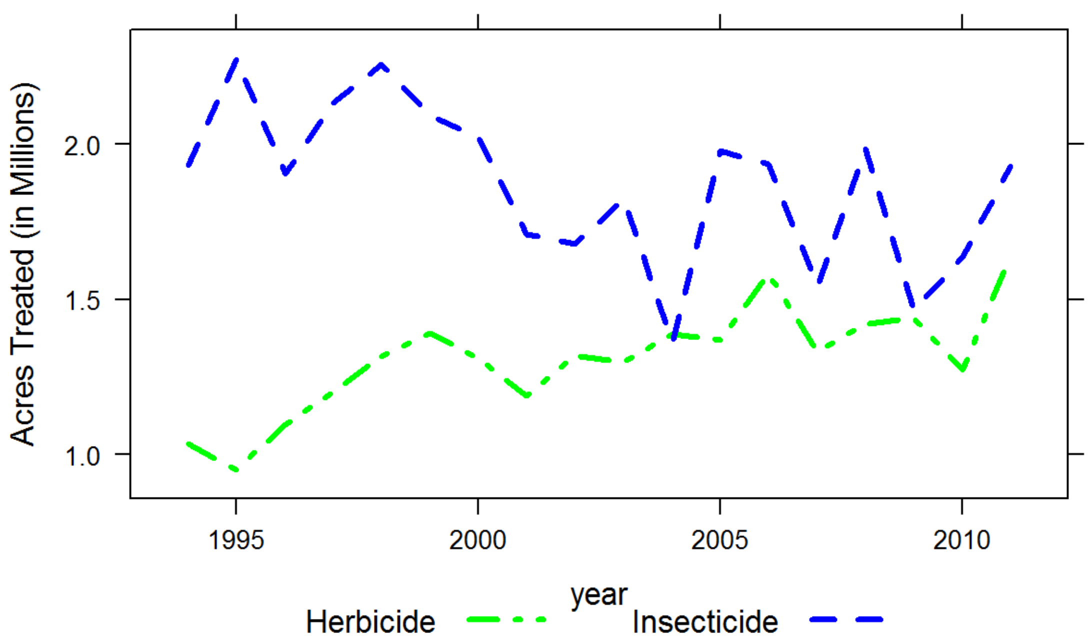

Figure 13: *Area of alfalfa treated by all AIs in the major types of pesticides from 1996 to 2011.*

Table 34: *The non-adjuvant pesticides with the largest change in area treated of alfalfa from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
LAMBDA-CYHALOTHRIN	INSECTICIDE	255,170	371,605	357,926	349,372	435,170	85,798	25
DIMETHOATE	INSECTICIDE	145,513	152,695	151,948	102,528	185,007	82,479	80
PENDIMETHALIN	HERBICIDE	46,138	169,095	231,876	221,571	294,714	73,142	33
CLETHODIM	HERBICIDE	97,803	107,196	95,517	114,154	177,486	63,332	55
FLUBENDIAMIDE	INSECTICIDE					59,384	59,384	
PARAQUAT DICHLORIDE	HERBICIDE	196,254	228,496	261,443	224,419	274,939	50,520	23
HEXAZINONE	HERBICIDE	124,286	110,872	124,611	99,748	147,822	48,075	48
INDOXACARB	INSECTICIDE	246,318	424,764	201,822	257,273	216,269	-41,003	-16
CHLORPYRIFOS	INSECTICIDE	386,498	406,013	327,938	378,427	415,471	37,044	10
BETA-CYFLUTHRIN	INSECTICIDE	66,154	92,130	107,306	83,763	114,490	30,727	37
4-(2,4-DB), DIMETHYLAMINE SALT	HERBICIDE	42,622	56,343	42,944	48,845	76,409	27,564	56
FLUMIOXAZIN	HERBICIDE		25,896	73,120	58,866	86,227	27,361	46
METHOXY-FENOZIDE	INSECTICIDE	330	80,119	25,054	72,930	97,310	24,379	33
CHLOR-ANTRANILIPROLE	INSECTICIDE				42,660	65,004	22,344	52
IMAZETHAPYR, AMMONIUM SALT	HERBICIDE	68,426	89,263	71,739	64,664	85,425	20,760	32

increased significantly in 2011, growers managed the fields more intensely and treated frequently to avoid insect damage. The statewide increase in insecticide use both in amount and area treated targeted western yellow-striped armyworm, leafhopper, beet armyworm, alfalfa caterpillar, and Egyptian alfalfa weevil. The increase in area treated was mainly from increased uses of lambda-cyhalothrin, dimethoate, chlorpyrifos, beta-cyfluthrin, methoxyfenozide, chlorantraniliprole, and the introduction of flubendiamide (Table 34). In contrast, the area treated with indoxacarb, gamma-cyhalothrin, and permethrin declined substantially.

Growers generally deal with three major pest groups in alfalfa production: the weevil complex in late winter to spring, an aphid complex starting in late fall through spring and continuing throughout summer, and a complex of lepidopterous larvae in the summer. In 2010, emergence of adult weevils occurred over an extended period in the fall. Consequently, weevil larvae damaged subsequent spring growth over a long period, prompting growers to treat more. Chlorpyrifos and pyrethroids such as lambda-cyhalothrin and beta-cyfluthrin are the primary AIs used against weevils and have been implicated in causing adverse effects on water quality. Aphid problems were severe in the summer of 2011, especially in the Imperial Valley. Chlorpyrifos is the recommended AI for aphids, thus explaining its increased use. The summer lepidoptera complex presented problems to growers in 2011 and accounted for the increased use of methoxyfenozide and chlorantraniliprole. The uncertainty surrounding water availability, environmental concerns, reduced shipments from other states, and hay values affected management practices. In 2011, growers chose to spray for summer armyworms and other lepidopterous larvae, and increased costs associated with pesticide applications were more than offset by higher yields and high hay values. The reported decrease in gamma-cyhalothrin use was mainly in the San Joaquin and Sacramento valleys. Indoxacarb use declined most significantly in the Sacramento Valley. Permethrin use decreased predominantly in the San Joaquin and Sacramento valleys. Increased use of lambda-cyhalothrin was mainly in the Imperial and San Joaquin valleys. Chlorpyrifos and beta-cyfluthrin uses increased mainly in the Imperial Valley while the applications of chlorantraniliprole increased predominantly in the Sacramento Valley.

Statewide, herbicide use in amount and area treated increased 21 and 30 percent, respectively, from 2010 to in 2011. The increased use, even as harvested acreage decreased, was not due to greater weed pressure, but instead to growers managing the fields more intensely to get a premium price. Applications of the most-used herbicides, as measured by area treated, increased except for trifluralin, which decreased marginally. The increased use of clethodim, a selective post-emergence herbicide used to control annual and perennial grasses, and 4-(2,4-DB), dimethylamine salt, also a selective herbicide used to control many broadleaf weeds, may reflect the growers' goal to produce high quality hay for a premium price. Although reasons why growers select certain herbicides over others are unclear, growing awareness of herbicide use and groundwater contamination may affect how growers manage their crop and choose herbicides.

Use of fungicides and fumigants for alfalfa is minimal compared to that of insecticides and herbicides.

Processing tomato

Processing tomato growers planted 255,000 acres in 2011, a 6 percent decrease from 2010. Total production decreased 3 percent, but the price increased 4 percent. The highest concentration of processing tomato acreage continues to be in the southern San Joaquin Valley. Fresno County leads the state in acreage with 38 percent (96,000 acres) of the statewide total, followed by Yolo County (35,000 acres), Kings County (29,000 acres), and San Joaquin County (21,000 acres).

Overall, use amounts of all pesticide AIs increased 2 percent, from 13.8 million pounds in 2010 to 14 million pounds in 2011 (Table 35). Total cumulative treated acreage of processing tomatoes decreased 2 percent. Sulfur, metam-sodium, and potassium N-methyldithiocarbamate (metam-potassium) accounted for 87 percent of the total amount of pesticide AIs applied, while sulfur, chlorothalonil, copper-based pesticides, glyphosate, trifluralin, azoxystrobin, imidacloprid, and s-metolachlor were applied to the most acreage. The most-used category as measured by area treated was fungicides, which increased 25 percent from 2010 to 2011 (Figure 14). The most-used category as measured by amount AI applied was fungicide/insecticide (mostly sulfur

Table 35: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for processing tomatoes each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	10,676,517	11,576,264	14,540,733	13,803,058	14,035,941
Acres Treated	2,683,605	2,667,080	3,269,116	3,211,079	3,135,772
Acres Planted	301,000	281,000	312,000	271,000	255,000
Price/ton	$ 70.30	$ 78.60	$ 86.10	$ 71.40	$ 74.30

Table 36: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for processing tomatoes each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-13	8	26	-5	2
Acres Treated	-9	-1	23	-2	-2
Acres Planted	6	-7	11	-13	-6
Price/ton	7	12	10	-17	4

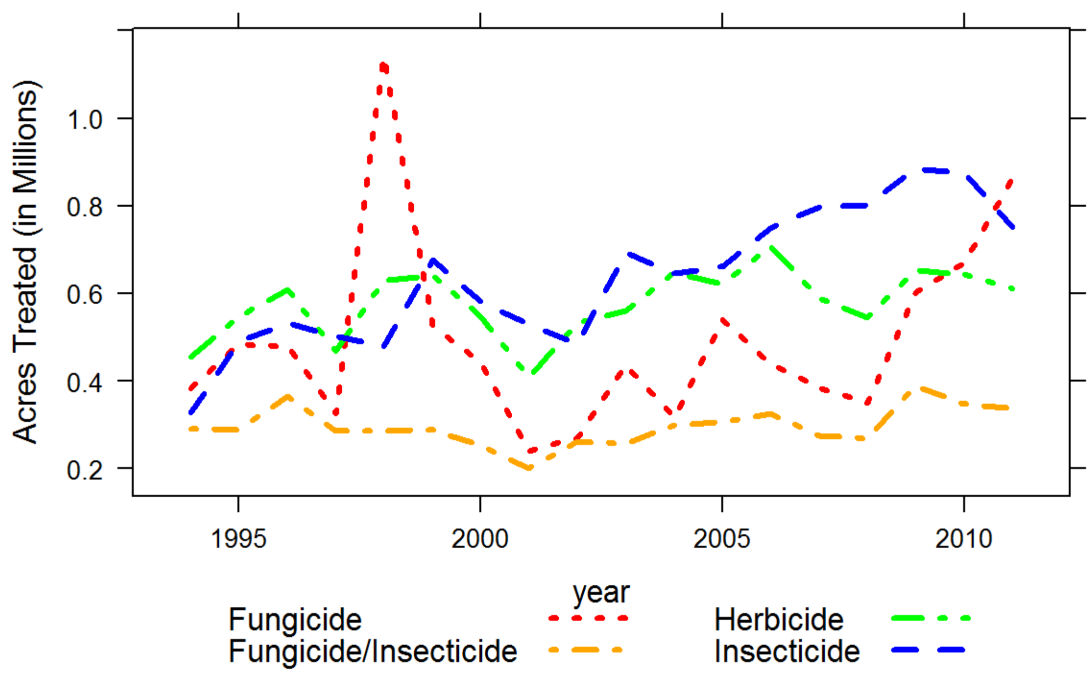

Figure 14: *Area of processing tomatoes treated by all AIs in the major types of pesticides from 1996 to 2011.*

Table 37: *The non-adjuvant pesticides with the largest change in area treated of processing tomatoes from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
CHLORO-THALONIL	FUNGICIDE	140,933	78,676	135,792	128,116	181,698	53,582	42
COPPER	FUNGICIDE	26,846	14,931	39,273	131,460	181,678	50,218	38
DIFENOCONAZOLE	FUNGICIDE			20,401	30,644	76,109	45,465	148
AZOXYSTROBIN	FUNGICIDE	31,462	34,426	84,149	90,417	124,514	34,097	38
MYCLOBUTANIL	FUNGICIDE	37,307	68,747	86,764	54,928	23,236	-31,692	-58
INDOXACARB	INSECTICIDE	70,068	72,162	41,811	43,463	18,114	-25,350	-58
METOLACHLOR	HERBICIDE	293			240	21,988	21,748	9,061
OIL	INSECTICIDE	34,290	40,419	44,010	53,423	31,909	-21,514	-40
METHOXY-FENOZIDE	INSECTICIDE	106,233	81,312	46,428	49,637	28,364	-21,273	-43
S-METOLACHLOR	HERBICIDE	155,503	133,211	151,061	139,423	118,614	-20,809	-15
CHLOR-ANTRANILIPROLE	INSECTICIDE		34,718	69,108	69,984	50,814	-19,169	-27
EMAMECTIN BENZOATE	INSECTICIDE	59,650	55,308	39,338	39,648	21,367	-18,280	-46
SPINETORAM	INSECTICIDE		8,966	18,189	21,871	39,701	17,830	82
ESFENVALERATE	INSECTICIDE	40,570	33,633	43,234	42,784	24,958	-17,827	-42
GLYPHOSATE	HERBICIDE	76,016	86,792	123,514	145,168	128,585	-16,583	-11

and kaolin); use in this category decreased 5 percent. The overall increase in pesticide use may have been in response to increased incidence of early season diseases (copper-based fungicides are popular for these diseases) and a later-than-usual production season (fungicides are used to protect fruit that remains in the field until fall).

Fungicide use, expressed as cumulative area treated, increased 25 percent, as amount AI used increased 21 percent. The most-used fungicides were sulfur, chlorothalonil, copper-based pesticides, azoxystrobin, mancozeb, difenoconazole, pyraclostrobin, mefenoxam, and myclobutanil. Sulfur and azoxystrobin are applied to control powdery mildew; sulfur use decreased 3 percent, while azoxystrobin use increased 38 percent (Table 37). Use of difenoconazole, used to combat powdery mildew and black mold, increased from 2,000 pounds of AI in 2010 to 5,000 pounds in 2011. This increase coincides with decreased use of myclobutanil, which has lost efficacy against powdery mildew. The area treated with copper-based pesticides increased 38 percent in response to the wet spring and increased incidence of bacterial speck, particularly in northern growing areas. The use of mefenoxam, used to control late blight, increased 18 percent in terms of area treated. Pyraclostrobin use increased 7 percent, perhaps due to increased incidence of black mold. Mancozeb use increased 15 percent and chlorothalonil use 42 percent. Overall, increased fungicide use may be due to late spring rains and increased incidence of early season bacterial speck, heightened concern for powdery mildew in the summer months, and early fall rains in 2011.

The acreage treated with herbicides decreased 5 percent from 2010 to 2011; the amount used decreased 2 percent (Figure 14). The most-prominent herbicides used in processing tomato production were glyphosate, trifluralin, s-metolachlor, rimsulfuron, pendimethalin, oxyfluorfen, and metolachlor. Primary weeds of concern for processing tomatoes are nightshades and bindweed. The area treated with rimsulfuron, a pre-emergent herbicide used to control nightshades, decreased 11 percent. Trifluralin and pendimethalin are used to control bindweed; the area treated with trifluralin decreased 1 percent and pendimethalin 15 percent. The area treated with glyphosate, commonly used for preplant treatments in late winter and early spring, decreased 11 percent. The area treated with oxyfluorfen, often used in conjunction with glyphosate for difficult-to-control winter and early spring weeds, increased 4 percent. The area treated with s-metolachlor, used to control nightshade and nutsedges, decreased 15 percent. From 2010 to 2011, metolachlor use increased from 240 to 22,000 acres. Metolachlor is a relatively inexpensive generic alternative, which may account for its increased use and the decreased use of s-metolachlor.

In 2011, 703,000 acres were treated with insecticides, a 12 percent decrease from 2010. In terms of amount applied, however, insecticide use decreased 13 percent. Recurring arthropod pests in processing tomatoes are russet mite, tomato fruitworm, armyworm, and potato aphid. Imidacloprid, dimethoate, bifenthrin, lambda-cyhalothrin, chlorantraniliprole, abamectin, spinetoram, oil, thiamethoxam, and carbaryl were used over the greatest acreage in 2011. Dimethoate, used for aphid control, remained the most-used insecticide in 2011 in terms of the amount of AI applied, but use was unchanged compared to 2010. However, dimethoate use decreased 2 percent in terms of area treated. The area treated with imidacloprid, the most-used in terms of area treated in 2011, increased 9 percent to control leafhoppers which vector the virus that causes curly-top disease (Table 37). The area treated with lambda-cyhalothrin, used to control thrips, decreased 6 percent. Bifenthrin use was unchanged in terms of area treated. It is used to manage western flower thrips, which transmits tomato spotted wilt disease, as well as mites and stinkbugs. Use of spinetoram, which is also used to control thrips, increased 82 percent. This increase also coincides with a decrease in the use of spinosad, also used on thrips, which is now used mostly on tomatoes grown for export. The use of chlorantraniliprole, a larvicide used against lepidopterous pests, decreased 27 percent due to low larval pest populations in 2011. Oil use decreased 40 percent likely because of the availability of more effective products. Abamectin and thiamethoxam use increased 10 percent and 4 percent, respectively. The amount of carbaryl used decreased 9 percent. Although not a highly used insecticide, clothianidin had the largest increase in use, largely because products containing clothianidan were only recently registered for use in California. In 2010, 8 acres were treated, and in 2011, 1,400 acres, primarily to control stink bugs.

Processing tomato growers primarily use three fumigants (metam-potassium, metam-sodium, and 1,3-dichloropropene [1,3-D]) to manage root-knot nematodes and weeds, particularly those of the nightshade family. In 2011, fumigant use increased 26 percent and accounted for about 25 percent of the total amount of pesticide AIs applied. In terms of area treated, fumigant use increased 7 percent. The area treated with metam-potassium and metam-sodium increased 4 and 14 percent, respectively. The increase in fumigant use is likely due to a permanent shift to fumigant application using drip irrigation. Since growers are installing drip lines in their fields for multi-year use, they are rotating crops less often. This practice increases nematode populations and explains an increase in fumigant use. The use of 1,3-D decreased 43 percent, likely due to decreased availability of 1,3-D-containing products and the greater expense and difficulty when they are applied in fields under drip irrigation.

Rice

The total rice acreage was 585,000 in 2011, a 5 percent increase from 2010 (Tables 38 and 39). Ninety-five percent of California's rice is grown in the Sacramento Valley. The leading rice-producing counties are Colusa, Sutter, Glenn, Butte, Yuba, and Yolo. Approximately 500,000 acres in the Sacramento Valley are of a soil type that limits crops to rice or pasture. Pesticide use increased from 4.7 million pounds of AI in 2010 to 4.9 million pounds in 2011 (4 percent increase) and the cumulative acreage treated from 2.6 million to 3.0 million acres (12 percent increase). The price per unit weight of harvested rice decreased 10 percent (Tables 38 and 39).

Table 38: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for rice each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	4,937,750	4,731,653	5,634,595	4,668,558	4,864,471
Acres Treated	2,292,628	2,468,221	2,805,673	2,635,786	2,961,618
Acres Planted	534,000	519,000	561,000	558,000	585,000
Price/cwt	$ 16.20	$ 27.50	$ 19.60	$ 17.80	$ 16.00

Table 39: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for rice each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-10	-4	19	-17	4
Acres Treated	9	8	14	-6	12
Acres Planted	2	-3	8	-1	5
Price/cwt	25	70	-29	-9	-10

Herbicides were the most-used pesticide type in 2011 (Figure15). They accounted for 73 percent of non-adjuvant pesticide cumulative area treated and 68 percent of the total amount applied. The area treated with herbicides increased 12 percent in 2011 from 2010 and total amount of herbicide AI increased 10 percent. Among pesticides with the largest change in area treated, nine were herbicides (Table 40). The area treated with cyhalofop-butyl, fenoxaprop-p-ethyl,

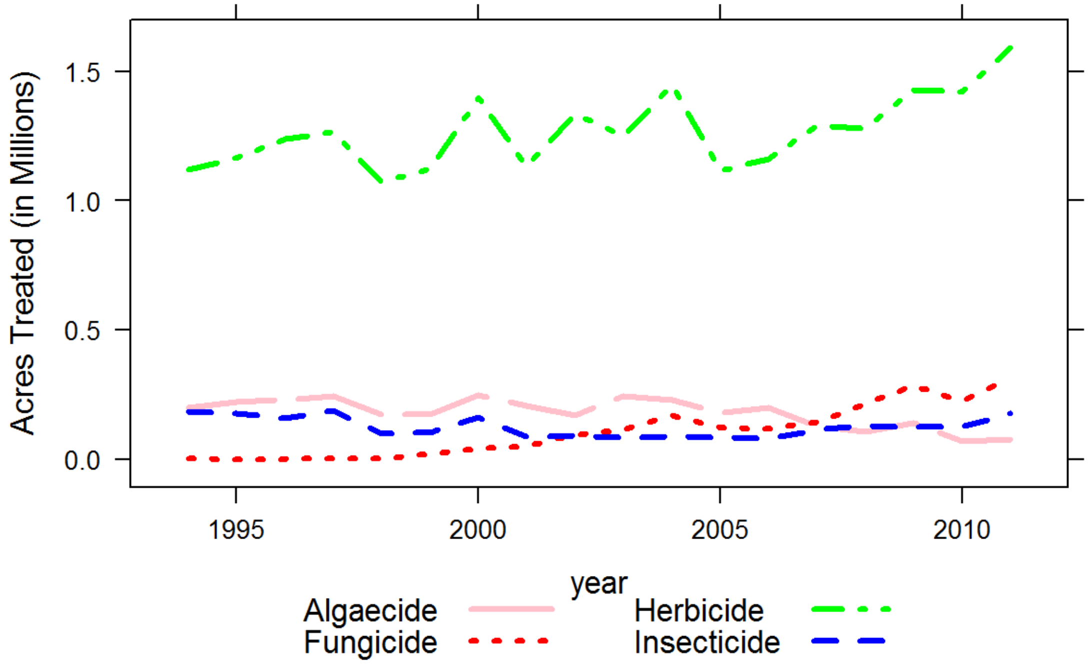

Figure 15: *The area of rice treated by all AIs in the major types of pesticides from 1996 to 2011.*

bispyribac-sodium, and pendimethalin decreased 13, 80, 6, and 37 percent, respectively, while the area treated with clomazone, propanil, triclopyr, bensulfuron methyl, and penoxsulam increased 53, 9, 11, 26, and 7 percent, respectively. Clomazone and propanil use increased probably because they are increasingly competitive with thiobencarb for sprangletop control. Thiobencarb can be difficult to use because it has a short application period during which it is effective; plus, one of the target weeds, sprangletop, has developed resistance to thiobencarb. The increase in penoxsulam use may be because broadleaved weeds and sedges, especially ricefield bullrush, are less likely to exhibit resistance to aceto-lactase synthase inhibiting herbicides when penoxsulam is used in preference to other herbicides. Use of penoxsulam may also have increased because it is available in both granular and liquid formulations, which allow early and mid-season applications. The increase in use of bensulfuron methyl products may be due to price, marketing, difficulties in controlling ricefield bulrush with other products, and rice's tolerance to their herbicidal effects. However, bensulfuron methyl use in 2011 is still much less than its peak use in 1994 due to widespread resistance in weed populations. Fenoxaprop-p-ethyl use declined 80 percent because the manufacturer/registrant discontinued its sale in 2010 and has been buying back existing inventory.

The area treated with fungicides increased 40 percent, following a generally increasing trend since the late 1990s. Azoxystrobin is the major fungicide used on rice in California, accounting for 84 percent of all acreage treated with a fungicide. It also showed the biggest change in area treated,

Table 40: *The non-adjuvant pesticides with the largest change in area treated of rice from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
CLOMAZONE	HERBICIDE	159,161	191,798	197,208	205,176	313,747	108,571	53
AZOXYSTROBIN	FUNGICIDE	139,787	202,683	248,038	196,265	266,899	70,634	36
LAMBDA-CYHALOTHRIN	INSECTICIDE	59,505	85,828	87,355	97,877	143,888	46,011	47
PROPANIL	HERBICIDE	377,903	382,926	415,344	393,128	428,320	35,192	9
TRICLOPYR, TRIETHYLAMINE SALT	HERBICIDE	295,644	310,298	322,929	322,804	356,787	33,983	11
BENSULFURON METHYL	HERBICIDE	11,742	12,446	52,232	52,225	65,985	13,760	26
CYHALOFOP BUTYL	HERBICIDE	119,979	98,322	83,896	90,180	78,513	-11,667	-13
PENOXSULAM	HERBICIDE	82,492	79,515	90,565	128,850	137,730	8,880	7
PROPICONAZOLE	FUNGICIDE	1,046	5,109	14,928	13,101	21,924	8,823	67
TRIFLOXY-STROBIN	FUNGICIDE	1,046	5,109	14,928	13,101	20,593	7,493	57
FENOXAPROP-P-ETHYL	HERBICIDE	28,099	14,161	12,932	7,236	1,423	-5,813	-80
BISPYRIBAC-SODIUM	HERBICIDE	62,019	68,448	93,945	93,789	88,447	-5,342	-6
SODIUM CHLORATE	DEFOLIANT	622	346	779	10,747	5,561	-5,186	-48
COPPER	ALGAECIDE	127,024	106,035	140,368	70,126	75,227	5,101	7
PENDIMETHALIN	HERBICIDE	9,946	10,136	10,356	12,894	8,170	-4,725	-37

an increase of 71,000 acres treated between 2010 and 2011. The area treated with propiconazole or trifloxystrobin increased 67 and 57 percent, respectively. Azoxystrobin, propiconazole, and trifloxystrobin are reduced-risk fungicides often used in preventative treatments. In 2010 and again in 2011, growers experienced a higher-than-normal incidence of blast disease. In 2010, the increased disease incidence was unexpected. However, in 2011, growers were better prepared and treated fields prophylactically where high levels of blast were documented in 2010.

Copper sulfate is the key algaecide used in California ricefields and is acceptable for organic rice production. The cumulative area treated with copper sulfate increased 7 percent in 2011 from 2010, but the amount of AI used was relatively unchanged. Copper sulfate's primary use is for algae control, but it also doubles as a control agent for tadpole shrimp. Several factors may have contributed to the increased copper sulfate use including increased planted acreage and increased organic rice production.

The total area treated with insecticides increased 41 percent from 2010 to 2011 and the amount of

AI used increased 53 percent. Only one insecticide, lambda-cyhalothrin, was among the pesticides with the largest change in area treated; its use increased 47 percent. The other commonly used insecticide on rice is (S)-cypermethrin; the acreage treated with it increased 16 percent. Increased use of both insecticides may be due to the increase in planted acreage and substantial drops in rice values in recent years. Lambda-cyhalothrin and (S)-cypermethrin are used primarily for rice water weevil control and secondarily for armyworm and tadpole shrimp. Rice water weevil is the major insect pest on California rice. Growers have limited options among insecticides and often rely on these pyrethroids for use on weevil and tadpole shrimp soon after flooding.

Orange

Total bearing acreage of oranges was 180,000 in 2011, a decrease of 2 percent from 2010 (Tables 41 and 42). California accounts for 31 percent of the citrus production in the United States. In 2011 oranges were ranked the 18th highest-valued commodity in California. Oranges on average account for about two-thirds of California's citrus crop. Eighty-six percent of California oranges are grown in the San Joaquin Valley (Fresno, Kern and Tulare counties); the rest are grown in the interior region (Riverside and San Bernardino counties) and on the south coast (Ventura and San Diego counties). The number of bearing acres declined slightly (2 percent) in 2011 (Table 42). Orange production was 9 percent higher in 2011 compared to 2010 (navel production was up 13 percent and Valencia production was down 3 percent), and the resulting price per box decreased 17 percent.

Table 41: *Total reported amount of all active ingredients (AI), area treated, bearing acreage, and prices for oranges each year from 2007 to 2011. Bearing acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	10,276,607	9,417,674	8,493,535	8,799,142	10,059,959
Acres Treated	2,397,546	2,329,284	2,252,967	2,413,127	2,443,686
Acres Bearing	190,000	188,000	186,000	183,000	180,000
Price/box	$ 11.27	$ 9.82	$ 12.82	$ 12.67	$ 10.50

Table 42: *Percent difference from previous year for reported amount of all AIs, area treated, bearing acreage, and prices for oranges each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-16	-8	-10	4	14
Acres Treated	-5	-3	-3	7	1
Acres Bearing	0	-1	-1	-2	-2
Price/box	9	-13	31	-1	-17

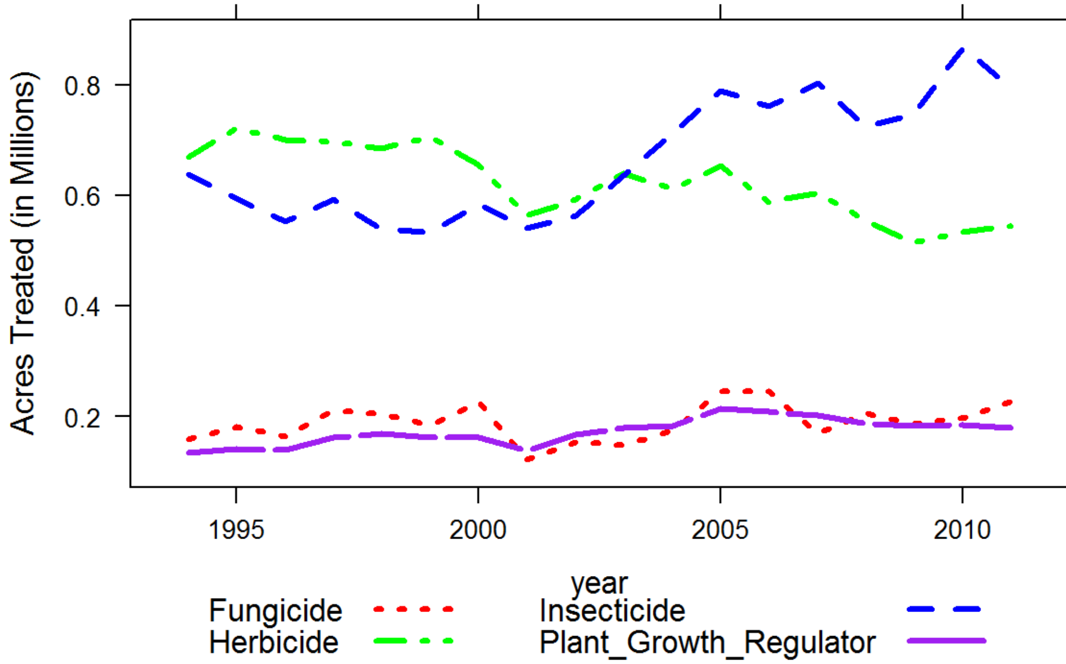

Figure 16: *The area of oranges treated by all AIs in the major types of pesticides from 1996 to 2011.*

Weather conditions in citrus-growing regions in 2011 had a considerable effect on the kinds and amounts of pesticides used. There was persistent fog in the San Joaquin Valley in February, followed by a long, wet spring. Spring low pressure systems dropped temperatures much below normal and were accompanied by high winds. Fall had heavy rains, and December had record high temperatures and winds.

The total amount of pesticides used increased 14 percent from 2010 to 2011 (1,260,000 pounds) (Table 41). This was 6 percent higher than the five-year average from 2007 to 2011. Cumulative area treated increased one percent in 2011 (30,600 acres), which was a 3 percent increase from the five-year average.

Overall, the amount of insecticides used in 2011 increased 22 percent (610,000 pounds) relative to 2010 (Figure 16). However, insecticide use increased only 1.9 percent above the 2007 to 2011 average. Insecticide use prior to 2008 was much higher than use in the last four years. The majority of the increase in amount was from increases in the use of oil, chlorpyrifos, and imidacloprid. Cumulative area treated with insecticides decreased 7 percent from 2010, however, the area treated was 4 percent higher from the five-year average. Oil, chlorpyrifos, cryolite, imidacloprid, *Bacillus thuringiensis*, buprofezin, malathion, and fenpropathrin were the insecticides used the most based on amount of AI applied. Use of oil increased by 606,034

Table 43: *The non-adjuvant pesticides with the largest change in area treated of oranges from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
MALATHION	INSECTICIDE	10,842	5,710	5,192	87,161	6,264	-80,897	-93
CORN PRODUCT, HYDROLYZED	INSECTICIDE			8	78,840	950	-77,890	-99
SPINETORAM	INSECTICIDE		14,124	24,939	25,671	74,810	49,139	191
SPINOSAD	INSECTICIDE	119,426	67,634	86,055	78,357	33,612	-44,745	-57
COPPER	FUNGICIDE	163,975	199,270	175,130	191,684	222,207	30,523	16
OIL	INSECTICIDE	260,836	201,778	201,079	180,765	206,278	25,513	14
SAFLUFENACIL	HERBICIDE				974	24,417	23,443	2,408
GLYPHOSATE	HERBICIDE	364,657	316,841	308,445	319,693	305,491	-14,201	-4
FENPROPATHRIN	INSECTICIDE	19,787	19,597	22,073	10,901	23,659	12,757	117
SPIROTETRAMAT	INSECTICIDE		1,829	6,181	5,780	18,120	12,340	213
BETA-CYFLUTHRIN	INSECTICIDE	41,872	50,527	48,797	44,674	55,919	11,245	25
ACEQUINOCYL	INSECTICIDE	9,242	11,281	8,339	3,400	11,124	7,724	227
CHLORPYRIFOS	INSECTICIDE	46,149	43,917	46,343	58,202	65,584	7,382	13
ABAMECTIN	INSECTICIDE	22,410	46,465	46,496	44,688	51,535	6,848	15
DIPHACINONE	OTHER	18,561	13,038	12,807	7,951	14,400	6,448	81

pounds (25 percent), chlorpyrifos by 34,514 pounds (20 percent), imidacloprid by 8,055 pounds (34 percent), buprofezin by 1,306 pounds (15 percent), and fenpropathrin by 4,541 pounds (112 percent). The amounts of cryolite, *Bacillus thuringiensis*, and malathion applied to oranges were lower than 2010's amounts.

The use of oils increased in 2011, however its use has seen a steady decline since 2007. Oil is a broad spectrum pesticide that kills soft-bodied insects such as aphids, immature whiteflies, immature scales, psyllids, immature true bugs, thrips, and some insect eggs, as well as mites. Oil also controls powdery mildew and other fungi. The increase in oil prices in the last few years resulted in lower application rates of oils applied.

Chlorpyrifos is a broad-spectrum insecticide used primarily for citricola scale control, but chlorpyrifos resistance in citricola scale populations has been documented. Increased chlorpyrifos use may be in response to difficulties controlling the scale, prompting more frequent applications. The treatment protocol for commercial citrus calls for late fall or early spring pyrethroid applications plus a summer soil treatment with a neonicotinoid, usually imidacloprid. Additionally, growers are being urged to treat for other pests with broad spectrum products that also kill Asian citrus psyllid, an invasive pest that can transmit the fatal citrus disease Huanglongbing, so chlorpyrifos use is likely to increase.

Imidacloprid is increasingly being used to help suppress populations of citricola scale that have developed a resistance to chlorpyrifos. Its use has steadily increased since 2007, and it is used by many large operations that make calendar applications in the spring. It has the positive effect of a growth stimulant for orange trees, possibly because it suppresses nematodes. Imidacloprid is also used by the glassy-winged sharpshooter treatment program to reduce the pest. Orange growers are required to treat for the pest to reduce the spread of Pierce's disease in grapes. The sharpshooter populations are increasing in some areas. Acetamiprid is also used by the sharpshooter treatment program. Its use decreased 5 percent in 2011 but had previously increased 169 percent (1,915 pounds) in 2010. The use of malathion decreased 7,761 pounds (47 percent) in 2011, which is probably due to the termination of the melon fruit fly eradication treatments in 2010.

Oil, spinetoram, chlorpyrifos, beta-cyfluthrin, imidacloprid, abamectin, spinosad, and *Bacillus thuringiensis* were the insecticides used over the largest area. There was an increase in area treated with oil, spinetoram, chlorpyrifos, beta-cyfluthrin, and abamectin. Spinosad and spinetoram are primarily used to treat citrus thrips. Spinetoram was introduced in 2008 and its persistence and effectiveness has resulted in less use of spinosad. Spinetoram is more effective against citrus thrips populations that have developed resistance to carbamate insecticides. Spinosad and spinetoram are recently registered insecticides and are very selective, allowing natural enemies to survive. They may eventually erode the market share of older insecticides and miticides. The area treated with spinosad decreased 57 percent in 2011, while spinetoram use increased 191 percent to 49,139 acres. These two chemicals are in the same chemical category, and the overall acreage treated with them in the last three years has been similar when considering both chemicals together.

Mite populations have increased in recent years and there has been a concomitant increase in miticide use. This is possibly due to the increased use of imidacloprid which reduces natural enemy and predatory mite populations.

Fenpropathrin is used to control red mites, citrus thrips, Asian citrus psyllid, katydids, and other miscellaneous pests. The insecticidal activity of fenpropathrin is largely interchangeable with that of beta-cyfluthrin, but use of both insecticides increased in 2011. Fenpropathrin use increased by 12,757 acres (an increase of 117 percent), and beta-cyfluthrin by 11,245 acres (25 percent increase).

Abamectin is used for thrips, mites, and citrus leafminer, and it is preferred because it is broad spectrum and inexpensive and has long residual activity, low worker risk, and a short pre-harvest interval. The increase in use was relatively low, perhaps because of reduced effectiveness controlling citrus leafminer.

Dimethoate is used for a variety of pests such as scales and thrips. Reduced use is likely due to the growing popularity of replacement insecticides such as neonicotinoids (imidacloprid and acetamiprid) and spinetoram. The area treated with dimethoate declined 21 percent (2,150 acres), following a trend seen in the last nine years. The use of pyriproxyfen, which is used almost exclusively for California red scale control, has also been declining. The area treated with pyriproxyfen declined 9 percent in 2011, preceded by a 30 percent decline in 2010.

Use of fungicides, both acreage treated and amount applied, increased 16 percent between 2010 and 2011. The increase was primarily due to increased use of copper-based pesticides: a 16 percent increase in area treated and 15 percent increase in amount of AI applied (the highest since 2005 and 2006). Copper-based pesticides are the most widely used fungicides on oranges. They are used to prevent Phytophthora gummosis, Phytophthora root rot, and fruit diseases such as brown rot and Septoria spot. These diseases are exacerbated by wet, cool weather during harvest, which occurred during the spring of 2011. Copper treatments are required for citrus exported to Korea to control Septoria spot fungus. Similarly, imazalil is used as a post-harvest treatment to control storage decay and its use amounts increased 3 percent in 2011, following a 44 percent increase in 2010.

The area treated with herbicides increased only 1 percent between 2010 and 2011, and the amounts applied decreased 8 percent (59,721 pounds). The decrease in herbicide amounts was predominantly due to decreases in the use of glyphosate, pendimethalin, and simazine. Glyphosate, a post-emergent herbicide, was the most-used herbicide. The amount of glyphosate applied in 2011 decreased 5 percent (21,104 pounds). There is a growing problem with resistance of horseweed and fleabane to glyphosate, and saflufenacil is a contact herbicide that is a good replacement.

Pendimethalin use amounts decreased 48 percent (26,453 pounds) in 2011, and the area treated decreased 8 percent (1,136 acres). The use of simazine decreased 7,978 pounds (6 percent). Simazine is a pre-emergent herbicide, as are oryzalin and diuron. Oryzalin use decreased 12 percent in 2011, but diuron use increased 2 percent (2,439 pounds). However, diuron's use has been steadily decreasing since 2003 (126,551 pounds were used in 2011 compared to 180,356 pounds in 2003). The area treated with diuron increased 7 percent in 2011, but was similar to the area treated in 2009. Decreased use of some herbicides is partially due to ground water regulations, particularly those that affect the use of simazine and diuron, which are classified as ground water contaminants and regulated accordingly. Trifluralin and oryzalin are probably replacing diuron as a pre-emergent herbicide.

The area treated with diphacinone, a ground squirrel control agent, increased 6,448 acres (81 percent) between 2010 and 2011. Prior to 2011, there had been a steady decrease since 2001 in the area where this rodenticide was used. In 2011, diphacinone was applied to the highest number of acres since 2007. This may be explained by the improved rodent breeding success brought on by two long, wet springs in a row, which provided ample food and cover for ground squirrels.

The area treated with metaldehyde decreased 8 percent (3,268 acres) contrasting to the 74 percent increase (18,358 acres) in 2010. The area treated with metaldehyde was higher in both 2010 and 2011 than in the previous nine years. The amount used increased 2 percent (403 pounds) in 2011, which followed the 110 percent increase (9,753 pounds) in 2010. Metaldehyde is used for snail and slug control, and the rainy, cool spring favored growth in the populations of these pests. Dimethoate is used for a variety of pests such as scales and thrips. Reduced use is likely due to replacement insecticides such as neonicotinoids (imidacloprid and acetamiprid) and spinetoram. The area treated with dimethoate declined 21 percent (2,150 acres), following a trend seen in the last 9 years. The area treated with pyriproxyfen decreased 9 percent in 2011, following a 30 percent decrease in 2010. There has been a decline in its use over the past nine years. Pyriproxyfen is used almost exclusively for California red scale control.

Pistachio

In 2011, California accounted for more than 245,000 bearing acreage of pistachios, or almost 99 percent of the U.S. crop (Table 44). Worldwide, U.S. pistachio production in 2011 ranked second to that of Iran. In California, pistachios are grown from San Bernardino County in the south to Tehama County in the north. In 2011, 97 percent of all pistachio acreage in California was located in the San Joaquin Valley (Kern, Madera, Fresno, Tulare, Kings, Merced, Stanislaus, Alameda, San Joaquin, and Contra Costa counties), 2 percent in the Sacramento Valley (Colusa, Glenn, Butte, Yolo, Tehama, and Sutter counties), and 1 percent in Santa Barbara, San Bernardino, San Luis Obispo, Placer, Calaveras, and Riverside counties. In 2011, the counties with the highest number of bearing acreage were Kern, 44 percent; Fresno, 17 percent; and Madera, 12 percent. The southern San Joaquin Valley counties of Kern, Madera, Fresno, Tulare, Kings, and Merced comprise 97 percent of the bearing acreage in California.

Pistachio trees alternate between high and low production each year. Projected as an off year, California's 2011 pistachio crop had the highest total production and yield ever recorded at 446 million pounds. The wet, mild weather in spring and early summer of 2010 encouraged a heavy flush of growth. During early 2011, ample winter chilling encouraged adequate bloom and pollination. From 2010 to 2011, the number of bearing acreage increased 79 percent (Tables 44 and 45). This increase will continue over the next few years due to a surge in planting around 2005.

Table 44: *Total reported amount of all active ingredients (AI), area treated, acres bearing, and prices for pistachios each year from 2007 to 2011. Bearing acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	2,661,937	2,415,057	3,016,924	2,828,481	4,031,449
Acres Treated	1,526,327	1,400,233	1,767,390	2,167,399	2,363,176
Acres Bearing	115,000	118,000	126,000	137,000	245,000
Price/pound	$ 1.41	$ 2.05	$ 1.67	$ 2.22	$ 1.98

Pesticide use on pistachios fluctuated from 2007 through 2011 (Table 44, Figure 17). Use of all classes of pesticide as measured by acres treated increased 9 percent from 2010 to 2011, primarily

Table 45: *Percent difference from previous year for reported amount of all AIs, acres treated, acres bearing, and prices for pistachios each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-40	-9	25	-6	43
Acres Treated	-16	-8	26	23	9
Acres Bearing	3	3	7	9	79
Price/pound	-25	45	-19	33	-11

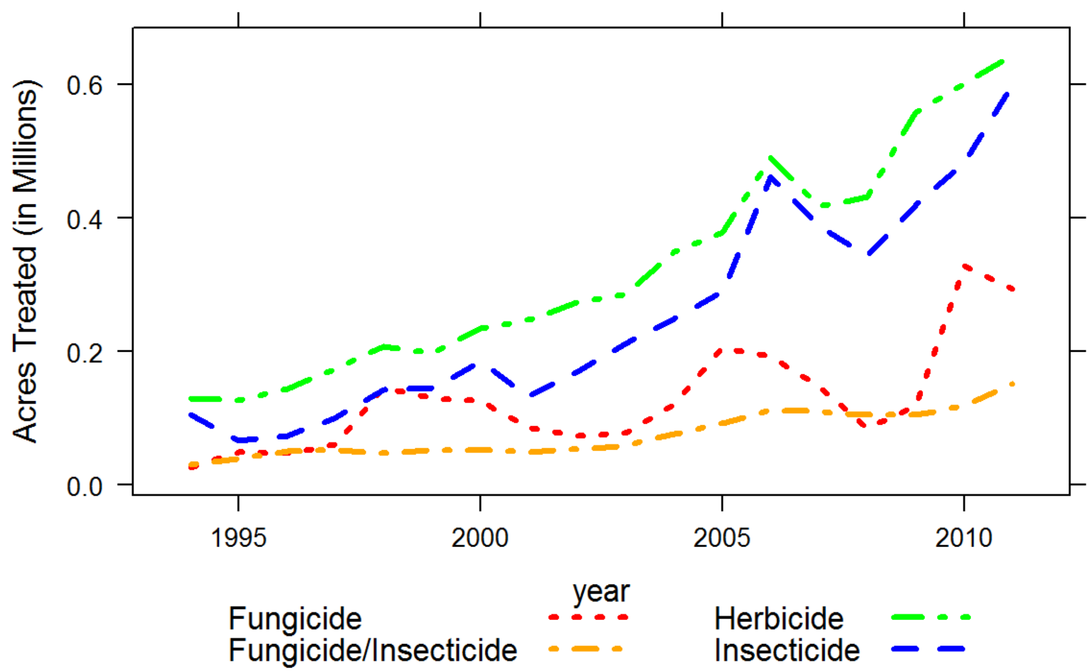

Figure 17: *area of pistachios treated by all AIs in the major types of pesticides from 1996 to 2011.*

resulting from the rise in bearing acreage (Table 45).

The major pesticides with the largest increase in cumulative acreage treated were the insecticides lambda-cyhalothrin, bifenthrin, beta-cyfluthrin, and chlorantraniliprole; the miticide sulfur; and the herbicides saflufenacil, glyphosate, and penoxsulam (Table 46). Several pesticides decreased in use by acres. These included the insecticide permethrin; the fungicides thiophanate-methyl, pyraclostrobin, boscalid, and propiconazole; and the herbicide glufosinate-ammonium.

During 2011, the top insecticides, as measured by acres treated, were lambda-cyhalothrin, bifenthrin, oil, permethrin, and beta-cyfluthrin. Sulfur was the dominant miticide used. The main fungicides used were pyraclostrobin, boscalid, metconazole, pyrimethanil, and a newly registered

Table 46: *The non-adjuvant pesticides with the largest change in area treated of pistachios from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
LAMBDA-CYHALOTHRIN	INSECTICIDE		14,701	48,162	91,568	163,399	71,830	78
PERMETHRIN	INSECTICIDE	203,728	122,770	130,182	126,330	64,877	-61,453	-49
BIFENTHRIN	INSECTICIDE		29,214	53,839	53,849	111,629	57,780	107
GLUFOSINATE-AMMONIUM	HERBICIDE	1,580	38,917	55,841	94,673	53,923	-40,750	-43
SAFLUFENACIL	HERBICIDE				4,383	43,674	39,291	896
SULFUR	FUNGICIDE/ INSECTICIDE	109,879	104,573	104,775	118,314	150,374	32,060	27
BETA-CYFLUTHRIN	INSECTICIDE	16,458	31,447	32,704	36,735	59,631	22,896	62
DIFENOCONAZOLE	FUNGICIDE					20,973	20,973	
THIOPHANATE-METHYL	FUNGICIDE	13,875	12,647	18,279	29,761	9,172	-20,589	-69
PYRACLO-STROBIN	FUNGICIDE	52,686	23,103	25,124	79,317	65,079	-14,238	-18
GLYPHOSATE	HERBICIDE	184,859	185,604	246,098	256,499	270,700	14,200	6
BOSCALID	FUNGICIDE	50,198	21,770	21,711	79,119	64,947	-14,172	-18
CHLOR-ANTRANILIPROLE	INSECTICIDE			8,248	12,068	25,810	13,742	114
PENOXSULAM	HERBICIDE				2,664	16,017	13,354	501
PROPICONAZOLE	FUNGICIDE		4,910	9,563	12,127	1,794	-10,333	-85

fungicide, difenoconazole. Three herbicides dominated: glyphosate, oxyfluorfen, and glufosinate-ammonium. Aluminum phosphide, which is used for burrowing rodents, was the main fumigant.

Insecticide use, as measured by pounds applied, increased 43 percent from 2010 to 2011, primarily due to use of oil, which comprised 92 percent of insecticide use and 30 percent of total pesticide use. From 2010 to 2011, use of oil shot up by 153 percent. Horticultural oil, considered a low-risk material, sharpens bloom when applied in late January to early February and suppresses scale insects when used during the dormant stage and in-season. Its label specifies use of several pounds per acre.

Another contributor to increased insecticide use was the late, rainy spring, which encouraged lush weed growth in undisturbed areas surrounding orchards. The weeds provided food for potential pests, keeping them away from pistachio trees later in the season. But, the weeds could also harbor true bugs, which opportunistically fly to the trees and feed voraciously, causing early- and late-season damage to nuts. Several species of true bugs cause early- and late-season damage to nuts. In early spring, plant bugs such as lygus will fly into pistachio orchards and may cause epicarp lesion, characterized by direct damage to the nut as shells harden during May. Like lygus bug, false chinch bugs may also migrate to pistachio orchards from cruciferous weeds during spring, especially during years such as 2011 with wet springs. Feeding can lead to leaf drop. Feeding by the leaffooted plant bug can cause epicarp lesion to the nuts shortly after bloom and lead to kernel necrosis after shell hardening in June, darkening and ruining the flavor of the nutmeat. These bugs usually appear late in the season during August and September. Stink bugs are also mostly late-season pests, causing kernel necrosis during July and August. Often growers apply pyrethroids —permethrin, lambda-cyhalothrin, bifenthrin, and beta-cyfluthrin— preemptively for all of the bugs. Although numbers of leaffooted plant bug and stink bug were low in 2011, growers protected their crop by spraying before the bugs could do much damage. Use of permethrin peaked during May, although its use that month was 47 percent lower compared with 2010. From 2010 to 2011, acreage treated with permethrin decreased 49 percent, while use of lambda-cyhalothrin increased 78 percent. Beta-cyfluthrin use peaked during June and its overall use increased 62 percent from 2010 to 2011.

Two lepidopteran pests can cause late-season damage. From June through August, the obliquebanded leafroller (OBLR) can feed on the stems of the nut clusters, causing them to dry and shrivel, thus reducing crop yield. The navel orangeworm (NOW) causes much more damage than OBLR by feeding directly on the nutmeat. NOW attacks nuts beginning in July, but insecticide sprays target the third generation that coincides with the beginning of the nut harvest. NOW infestations were relatively light in 2011 because the cool summer reduced the number of generations. Because of the late harvest, growers applied 107 percent more bifenthrin and 114 percent more chlorantraniliprole than they did in 2010. The latter is also used for OBLR.

Use of buprofezin for Gill's mealybug climbed 99 percent from 2010 to 2011. Most applications were made in June and targeted immature crawlers moving into the clusters.

Sulfur use increased 27 percent from 2010 to 2011, as measured by acres treated. Used as a low-risk miticide, sulfur is applied at several pounds per acre. During 2011, sulfur comprised 35 percent of all pesticides used. Citrus flat mite feeds on the stems of nut clusters as well as the nut hulls and nuts themselves, which can lead to shell stain. As the weather warms up in June, mite populations thrive and peak in late July and August. In 2011, growers began applying sulfur for mites in April, applied most in May and June, and continued applications through September.

From 2010 to 2011, fungicide use decreased 10 percent as measured by acres treated. Although the spring was cool and wet, growers in the San Joaquin Valley made fewer fungicide applications. The mild summer pushed harvest to late September, a two-week delay. Rain arrived in early October, but by then most of the nuts were harvested, and crop loss from the diseases Alternaria, Botryosphaeria, and Botrytis was avoided. During 2011, fungicide application peaked in April with additional applications of two combination products during June for Botryosphaeria: one product contains pyraclostrobin and boscalid, and a new product contains difenoconazole and cyprodinil. Use of the pyraclostrobin-boscalid product fell by 17 percent because pyraclostrobin lacks efficacy against Alternaria and fungal resistance to boscalid is becoming more widespread.

During 2011, growers substituted other fungicides such as the biofungicide polyoxin D, which increased in use 177 percent.

Acreage treated with herbicide increased 7 percent from 2010 to 2011. The post-emergence herbicides glyphosate and glufosinate-ammonium are applied year-round, but mostly during the summer months to manage weeds such as field bindweed and cheeseweed. From 2010 to 2011, use of glyphosate increased 5 percent; that of glufosinate-ammonium decreased 43 percent. Saflufenacil, a post-emergence burn-down herbicide first used in 2010, effectively treats spring and summer weeds such as nettle, puncturevine, and Russian thistle. Its use from 2010 to 2011 increased almost nine-fold. Use of the pre-emergence herbicide oxyfluorfen decreased 8 percent from 2010 to 2011, while that of pendimethalin, a pre-emergence herbicide for cool-weather weeds, increased 15 percent. Use of flumioxazin, another pre-emergence herbicide used mostly during winter, decreased 10 percent. Flumioxazin provides long residual pre-emergence control of annual grasses, hairy fleabane, and other annual broadleaf weeds. Use of oryzalin, a cool-weather pre-emergence herbicide that controls annual grasses, increased 10 percent.

Walnut

Walnut bearing acreage was 245,000 in 2011, a 3 percent increase from 2010 (Tables 47 and 48). California produces 99 percent of the walnuts grown in the United States and about 78 percent of the world's production. In 2011, walnut production, at 461,000 tons, was down 9 percent from the previous year, in part because spring rains caused blanks and undeveloped nutlets in early varieties. The price per ton of harvested nuts increased 36 percent from 2010 and the total production was valued at $1.3 billion, a 29 percent increase. The area treated with pesticides increased 1 percent, and the amount of applied active ingredients decreased 1 percent (Table 48).

Table 47: *Total reported amount of all active ingredients (AI), area treated, bearing acreage, and prices for walnuts each year from 2007 to 2011. Bearing acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	4,019,905	3,375,867	3,274,033	3,992,888	3,951,571
Acres Treated	2,084,581	1,781,210	1,856,395	2,316,414	2,348,332
Acres Bearing	218,000	223,000	227,000	237,000	245,000
Price/ton	$ 2,290	$ 1,280	$ 1,710	$ 2,040	$ 2,870

Ninety-nine percent of total cumulative acreage treated and amount of active ingredient applied occurred in the Sacramento and San Joaquin valleys in 2011. Sacramento Valley walnuts received 53 percent of the total amount applied; San Joaquin Valley walnuts received 46 percent. Of these pesticides, fumigants showed the greatest increase in use from 2010 to 2011: area treated and amount applied increased 9,662 acres (127 percent) and 118,692 pounds (21 percent), respectively. The soil fumigants 1,3-D, chloropicrin, and methyl bromide had the highest use amounts and were applied to the highest acreage. Methyl bromide use increased 7,392 acres since

Table 48: *Percent difference from previous year for reported amount of all AIs, the The area treated, bearing acreage, and prices for walnuts each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	13	-16	-3	22	-1
Acres Treated	7	-15	4	25	1
Acres Bearing	1	2	2	4	3
Price/ton	40	-44	34	19	41

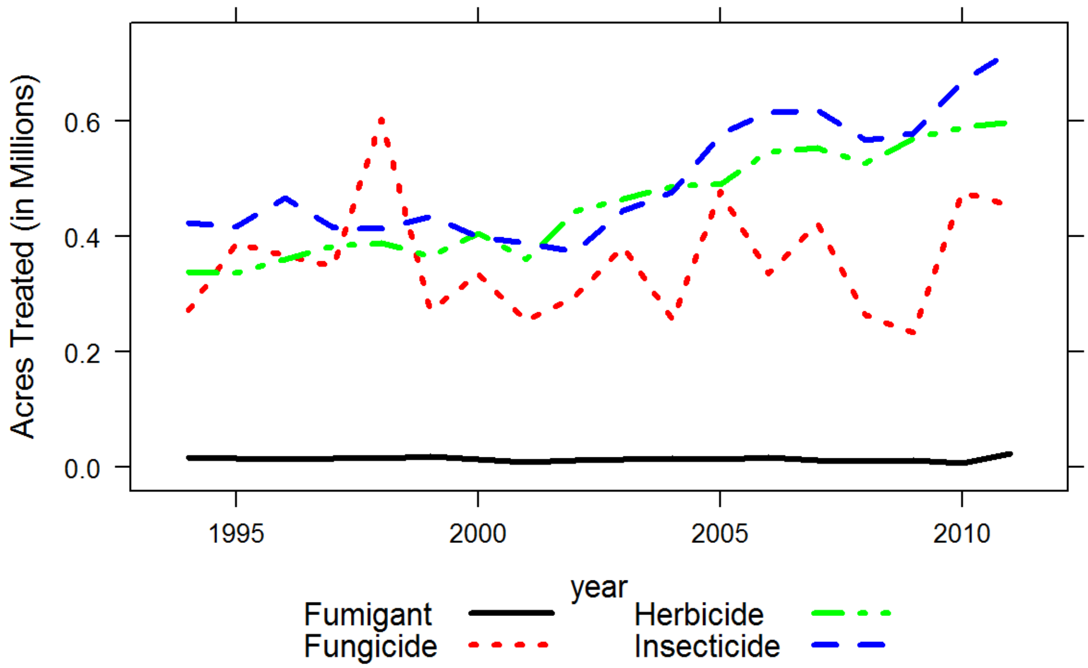

Figure 18: *The area of walnuts treated by all AIs in the major types of pesticides from 1996 to 2011.*

2010 (Table 49). Increases in fumigant use likely reflects the increases in new plantings and re-plantings of walnuts in the Central Valley.

In addition to fumigants, use of plant growth regulators and herbicides also increased. The increase in plant growth regulators (8,599 pounds, 10,176 acres) was largely due to use of ethephon products, which acts on walnut trees to spread out harvest and thus optimize use of existing harvesting, hulling, and drying equipment. In addition, plant growth regulators can enable growers to harvest earlier in the year, thereby avoiding potential harvest-time rains, which have caused economic losses in recent years. Plant growth regulators hasten hull cracking and shell separation and can advance harvest 4 to 7 days.

Table 49: *The non-adjuvant pesticides with the largest change in area treated of walnuts from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
COPPER	FUNGICIDE	234,115	143,463	145,832	290,098	261,120	-28,978	-10
ABAMECTIN	INSECTICIDE	31,778	39,395	45,514	63,491	85,835	22,345	35
SAFLUFENACIL	HERBICIDE				1,729	22,002	20,273	1,173
MANCOZEB	FUNGICIDE				163,308	183,201	19,894	12
LAMBDA-CYHALOTHRIN	INSECTICIDE	13,827	20,355	19,965	22,176	38,339	16,163	73
REYNOUTRIA SACHALINENSIS	FUNGICIDE			9	20,121	7,167	-12,955	-64
OXYFLUORFEN	HERBICIDE	116,304	110,262	117,185	108,486	121,303	12,817	12
ACETAMIPRID	INSECTICIDE		3,580	6,140	12,841	23,166	10,325	80
CARFENTRA-ZONE-ETHYL	HERBICIDE	16,591	13,757	17,870	18,882	9,650	-9,232	-49
ETHEPHON	PLANT GROWTH REGULATOR	27,672	28,022	27,203	47,267	56,328	9,061	19
2,4-D	HERBICIDE	22,981	26,868	24,253	26,218	17,615	-8,603	-33
CORN PRODUCT, HYDROLYZED	INSECTICIDE	41,896	45,125	47,953	67,716	75,497	7,781	11
METHYL BROMIDE	FUMIGANT	4,421	3,028	4,939	1,674	9,067	7,392	442
SPIROTETRAMAT	INSECTICIDE		22	436	1,136	7,647	6,510	573
BIFENTHRIN	INSECTICIDE	27,168	24,763	27,443	30,733	36,790	6,057	20

Glyphosate remained the herbicide with both the highest use amounts (284,308 pounds) and area treated (215,506 acres) in 2011, followed by oxyfluorfen (use amounts increased 12,001 pounds or 42 percent and area treated increased 12,817 acres or 12 percent since 2010). Use of saflufenacil, an herbicide newly registered for use in California in 2010, increased by 647 pounds and 20,273 acres treated since 2010, reflecting its ability to effectively control glyphosate-resistant weeds such as horseweed. Use of glufosinate-ammonium, paraquat dichloride, pendimethalin, and oryzalin remained high. Use of carfentrazone-ethyl, which is not very effective against *Conyza* species, and 2,4-D decreased as measured by area treated and pounds applied.

Use of fungicides decreased from 2010 to 2011 in both amount applied and area treated. These decreases were largely due to reductions in the use of copper-based pesticides, extracts of *Reynoutria sachalinensis*, and potassium phosphite. In contrast, mancozeb use amounts increased 11 percent (31,656 pounds) and treated acreage increased 12 percent (19,894 acres).

Use of insecticides, including miticides, increased 10 percent from 2010 to 2011 as measured by acreage treated, but decreased 10 percent by amount applied. Oil remained the most heavily applied, although it decreased in both area treated (3,793 acres) and amount applied (44,952 pounds) since 2010. Chlorpyrifos remained the highest in area treated, but use, as determined by area treated and amount applied, decreased 4,205 acres and 9,419 pounds, respectively. Insecticides with use increases include abamectin (increased 22,245 acres and 607 pounds), lambda-cyhalothrin (16,163 acres and 686 pounds), acetamiprid (10,325 acres and 1,134 pounds), all of which are relatively inexpensive pesticides used to control codling moth or mites. Increased use of hydrolyzed corn product baits (7,781 acres and 7,016 pounds) and spirotetramat (6,510 acres and 102 pounds) reflect the increasing prevalence of walnut husk fly.

Strawberry

In 2011 California produced 2.57 billion pounds of strawberries—over 90 percent of the total U.S. production—valued at more than $1.90 billion. Market prices determine how much of the crop goes to fresh market and how much is processed, and in 2011, about 93 percent of the crop went to fresh market. About 38,000 acres of strawberries were planted and harvested in 2011, primarily along the central and southern coast, with smaller but significant production occurring in the Central Valley.

Table 50: *Total reported amount of all active ingredients (AI), area treated, harvested acreage, and prices for strawberries each year from 2007 to 2011. Harvested acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	9,670,667	9,920,980	10,046,019	11,038,412	12,041,978
Acres Treated	1,357,345	1,515,882	1,661,396	2,000,497	1,966,209
Acres Harvested	35,500	37,600	39,800	38,600	38,000
Price/cwt	$ 65.50	$ 69.60	$ 69.40	$ 69.60	$ 75.70

Table 51: *Percent difference from previous year for reported amount of all AIs, area treated, harvested acreage, and prices for strawberries each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	3	3	1	10	9
Acres Treated	5	12	10	20	-2
Acres Harvested	-1	6	6	-3	-2
Price/cwt	16	6	0	0	9

Total acreage treated with pesticides declined 2 percent from 2010 to 2011 as harvested acreage declined 2 percent (Table 51). Amounts of pesticide applied increased 9 percent from 2010 to 2011. Fungicides, followed by insecticides, account for the largest proportion of pesticides applied on a per acre basis (Figure 19). The total area treated with fungicides decreased 1 percent, while use of insecticides showed no appreciable change and herbicide use increased by 28 percent. The major pesticides with greatest increase in area treated from 2010 to 2011 were abamectin, spinetoram, chlorantraniliprole, thiamethoxam, triflumizole, novaluron, myclobutanil,

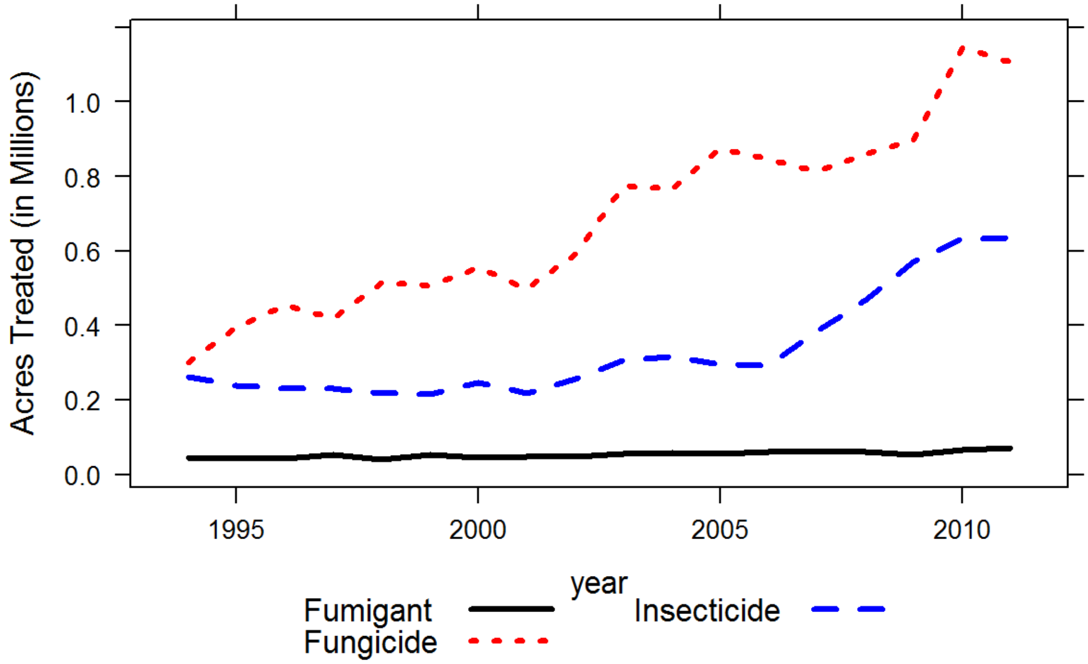

Figure 19: *The area of strawberries treated by all AIs in the major types of pesticides from 1996 to 2011.*

and sulfur (Table 52). The major pesticides with decreased use were naled, fenpyroximate, spinosad, malathion, and pyrimethanil.

Fungicides continue to be the most-used pesticides, as measured by area treated. The major fungicides in 2011 were captan, sulfur, pyraclostrobin, boscalid, fludioxonil, cyprodinil, fenhexamid, myclobutanil,quinoxyfen, and pyrimethanil. In general, use of fungicides effective against Botrytis fruit rot and powdery mildew, the most important fungal diseases in strawberries, were unchanged or slightly decreased in 2011. The older registered fungicides, captan, boscalid, cyprodinil, fludioxonil, fenhexamid, thiophanate-methyl, thiram, chlorothalonil, and the more recently registered QST 713 strain of *Bacillus subtilis*, pyrimethanil, and propiconazole are generally used to control Botrytis fruit rot. The area treated with all of these products decreased in 2011 due to reduced Botrytis pressure, except for area treated with propiconazole, which increased 21 percent.

As in 2010, low free moisture on leaves but high humidity favored powdery mildew in 2011. Conventional strawberry growers primarily used sulfur, pyraclostrobin, boscalid, myclobutanil, quinoxyfen, triflumizole, and propiconazole to control powdery mildew. Sulfur is inexpensive and is also used by organic growers. In 2011 the cumulative area treated with sulfur increased 5 percent, with pyraclostrobin 1 percent, with myclobutanil 16 percent, with triflumizol 30 percent,

Table 52: *The non-adjuvant pesticides with the largest change in area treated of strawberries from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
CAPTAN	FUNGICIDE	127,086	135,997	142,150	197,399	171,558	-25,841	-13
NALED	INSECTICIDE	23,819	33,916	51,937	44,587	21,043	-23,544	-53
ABAMECTIN	INSECTICIDE	16,962	26,103	29,751	35,876	49,928	14,052	39
MALATHION	INSECTICIDE	34,528	51,226	76,419	71,448	57,887	-13,561	-19
SPINETORAM	INSECTICIDE	246	32,379	25,162	25,747	36,306	10,559	41
SULFUR	FUNGICIDE	139,486	134,436	146,790	158,796	167,514	8,717	5
CHLOR-ANTRANILIPROLE	INSECTICIDE				1,100	9,247	8,147	741
MYCLOBUTANIL	FUNGICIDE	51,487	39,554	47,757	51,789	59,899	8,110	16
THIAMETHOXAM	INSECTICIDE	8,968	12,338	13,208	9,650	17,458	7,807	81
TRIFLUMIZOLE	FUNGICIDE	24,963	19,972	20,996	24,392	31,819	7,427	30
SPINOSAD	INSECTICIDE	49,814	22,924	13,329	19,080	11,775	-7,305	-38
BACILLUS THURINGIENSIS	INSECTICIDE	57,842	51,296	55,451	61,175	54,450	-6,724	-11
NOVALURON	INSECTICIDE			24,497	41,149	47,712	6,563	16
PYRIMETHANIL	FUNGICIDE	16,080	22,390	24,659	33,519	27,166	-6,353	-19
FENPYROXIMATE	INSECTICIDE				12,085	5,762	-6,323	-52

and with trifloxystrobin 52 percent. Use of the relatively new products quinoxyfen (introduced in 2007) and propiconazole (introduced in 2008) increased 12 percent and 21 percent, respectively. Quinoxyfen provides a new multi-site mode of action to control powdery mildew that is different from the demethylation inhibitors (DMIs) (e.g., propiconazole) and the strobilurins (e.g., pyraclostrobin). It is generally used as a preventative treatment, allowing use of other fungicides to be reduced. The newly introduced trifloxystrobin, like other strobilurins, acts on the mitochondrial respiratory pathway to inhibit sporulation and mycelial growth. Pyraclostrobin is frequently used in combination with boscalid. For these two fungicides, both area treated and amount of active ingredient applied increased in 2011 despite concerns about their declining efficacy. Use of mefenoxam, which is effective against *Phytophthora fragariae* (red stele) and *P. cactorum* (leather rot and crown rot), decreased 17 percent in 2011.

The major insect pests of strawberries are lygus bugs and worms (various moth and beetle larvae), especially in the Central and South Coast growing areas. Until recently, lygus bugs were not considered a problem in the South Coast, but lygus has become a serious threat probably due to warmer, dryer winters and increased diversity in the regional crop complex that supports this pest. The major insecticides used in 2011 as measured by total area treated were malathion, *Bacillus thuringiensis*, oil, naled, novaluron, bifenthrin, bifenazate, abamectin, spiromesifen, spinetoram, fenpropathrin, spinosad, acetamiprid, methoxyfenozide, chlorpyrifos, and thiamethoxam.

The area treated with each of these major insecticides generally decreased except spinetoram (increased 41 percent), abamectin (39 percent), bifenazate (15 percent), and methoxyfenozide (3 percent). *Bacillus thuringiensis*, spinosad, and spinetoram are biological pesticides primarily used against lepidopeteran larvae. Spinosad and spinetoram are also effective against thrips. *Bacillus thuringiensis* use decreased 11 percent while spinosad use decreased 38 percent. Spinosad and spinetoram have longer residual action and are generally more effective than *Bacillus thuringiensis*, so they do not need to be applied as frequently. Spinetoram, which has the same mode of action as spinosad, appears to have partially replaced spinosad and *Bacillus thuringiensis*.

Increasing lygus bug populations in the South Coast growing areas and widespread resistance to pyrethroid pesticides led to an increase in the acreage treated with insectides such as abamectin (increased 39 percent), acetamiprid (5 percent), and novaluron (16 percent), which have different modes of action than pyrethroids. Novaluron is an insect growth regulator acting on chitin synthesis in immature stages of Coleoptera, Hemiptera, and Lepidoptera. Fenpropathrin, spiromesifen (area treated decreased 7 and 9 percent, respectively), malathion, bifenthrin, and pyriproxyfen are effective against whiteflies. Pyriproxyfen is an insect growth regulator registered in 2002. *Bacillus thuringiensis* and spinosad, as well as pyrethrins (area treated increased 15 percent), are available for use by organic growers. Like *Bacillus thuringiensis*, pyrethrins have short residual activity and so may require multiple applications to be effective.

Increased two-spotted spider mite and red spider mite pressure resulted in 15 percent more use of bifenazate, which is effective against spider mites but has low toxicity to predatory mites. Most conventional growers continue to use bifenazate. Other pesticides with increased use for mite control, as measured by area treated, were abamectin and hexythiazox (increased 25 percent). Increased mite problems may be due to carryover of mite populations from susceptible summer-planted berries to winter-planted.

Herbicide use increased 28 percent from 17,411 treated acres in 2010 to 22,266 acres in 2011. Acreage treated with flumioxazin increased 44 percent, with pendimethalin 54 percent, oxyfluorfen 15 percent, and glyphosate 59 percent. Napropamide use decreased 37 percent. These herbicides, when used in combination with clear plastic mulches, are cost effective in controlling weeds with hard coated seeds compared to hand weeding and are also less expensive than sequential metam-sodium applications.

Strawberry production relies on several fumigants. Fumigants accounted for about 86 percent (as measured by pounds applied) of all pesticide AIs applied to strawberries in 2011, but only two percent of the planted acreage was treated. The area treated with fumigants in 2011 increased 7 percent. Chloropicrin and 1,3-dichloropropene (1,3-D) use increased 9 and 10 percent, respectively, while methyl bromide and metam-sodium use decreased 1 and 6 percent respectively. Methyl bromide is used primarily to control pathogens and nut sedge. Metam-sodium is generally more effective in controlling weeds, but less effective than 1,3-D or 1,3-D plus chloropicrin against soilborne diseases and nematodes. Fumigants usually are applied at higher rates than other pesticide types, such as fungicides and insecticides, in part because they treat a volume of space rather than a surface such as leaves and stems of plants. Thus, the amounts applied are large relative to other pesticide types even though the number of applications or number of acres treated may be relatively small.

Peach and nectarine

Peach and nectarine bearing acreage was 74,500 in 2011, a 4 percent decrease from 2010 (Tables 53 and 54). California grew 72 percent of all U.S. peaches (including 56 percent of fresh market peaches and 100 percent of processed peaches) and 96 percent of nectarines in 2011. Most freestone peaches and nectarines are produced in Fresno, Tulare, and Kings counties in the central San Joaquin Valley and sold on the fresh market. Clingstone peaches, largely grown in the Sacramento Valley, are used exclusively for processing into canned and frozen products including baby food and juice. Peach and nectarine are discussed together because pest management issues for the two crops are similar.

Table 53: *Total reported amount of all active ingredients (AI), area treated, bearing acreage, and prices for peaches and nectarines each year from 2007 to 2011. Bearing acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	5,162,863	5,371,378	5,033,794	4,469,233	4,566,980
Acres Treated	1,407,695	1,438,882	1,381,892	1,341,670	1,336,386
Acres Bearing	88,500	87,000	81,500	78,000	74,500
Price/ton	$ 343	$ 351	$ 483	$ 428	$ 452

Table 54: *Percent difference from previous year for reported amount of all AIs, area treated, bearing acreage, and prices for peaches and nectarines each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	-24	4	-6	-11	2
Acres Treated	-17	2	-4	-3	0
Acres Bearing	-4	-2	-6	-4	-4
Price/ton	-20	2	38	-11	6

Peach and nectarine acreage treated with the major categories of pesticides has fluctuated from year to year since 1994. Data for most types of pesticide do not show substantial increasing or decreasing trends (Figure 20). Bearing acreage of peaches and nectarines continued to decline in 2011, decreasing 4 percent. Reduced production helped raise overall prices 6 percent compared to 2010, but patterns differed by crop. Low competing production in southeastern states contributed to higher prices for freestone peaches and nectarines, whereas the price per ton of clingstone peaches was 7 percent lower than in 2010.

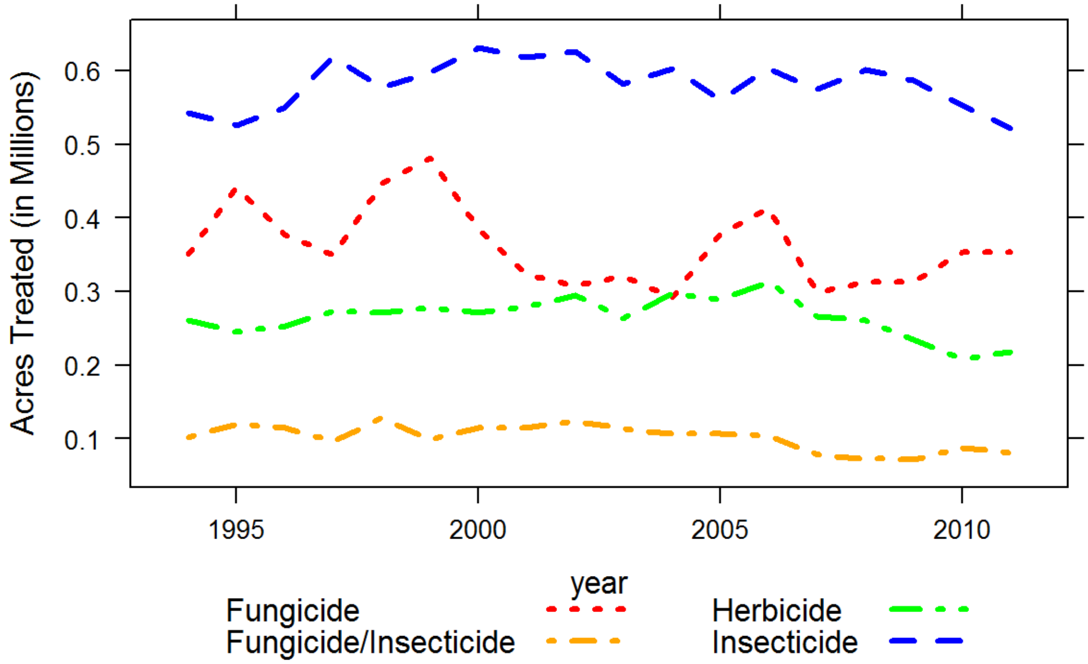

Figure 20: *area of peaches and nectarines treated by all AIs in the major types of pesticides from 1996 to 2011.*

Total pounds of pesticide AI applied increased 2 percent to approximately 4.6 million pounds, but the number of total acres treated remained almost unchanged (Tables 53 and 54). The area treated with fungicides and herbicides increased while the area treated with fungicide/insecticides and insecticides declined (Figure 20).

Rainfall in California during winter 2010/11 was heavy, with many Central Valley peach and nectarine growing areas reporting 120-150 percent of normal precipitation. The second long, cool, wet spring in a row was followed in northern California by record-breaking cold and rain at the end of June. The unseasonable June weather caused scattered frost damage and some split pits and brown rot in clingstone peaches. Crops matured later than usual. Freestone peach and nectarine growers had to cope with October rains, but escaped significant damage. Some early fruit had reduced sugar content due to cool weather, but in general fruit quality was average. Freestone peach and nectarine yields per acre increased 6 and 1 percent, respectively, compared to 2010. In contrast, yield per acre of clingstone peaches was 7 percent lower.

Insect and mite pressure was probably reduced by cold weather and moisture. Total peach and nectarine acreage treated with insecticides and miticides decreased 5 percent in 2011, slightly more than the decrease in bearing acreage. Price as well as efficacy affects choices of pesticide products. The most-used AIs were oils; esfenvalerate; and the Oriental fruit moth (OFM) mating

Table 55: *The non-adjuvant pesticides with the largest change in area treated of peaches and nectarines from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
ZIRAM	FUNGICIDE	54,144	58,629	36,809	40,530	63,728	23,198	57
ABAMECTIN	INSECTICIDE			2	10,677	24,607	13,930	130
OIL	INSECTICIDE	115,746	127,964	125,071	105,841	95,294	-10,546	-10
DIFLUBENZURON	INSECTICIDE	10,993	8,472	8,976	13,280	5,624	-7,655	-58
SPINOSAD	INSECTICIDE	35,337	32,899	16,834	20,131	12,854	-7,277	-36
CAPTAN	FUNGICIDE	632	1,174	443	7,622	788	-6,834	-90
SPINETORAM	INSECTICIDE		8,551	14,855	17,271	23,888	6,617	38
COPPER	FUNGICIDE	43,872	40,648	60,431	43,856	37,385	-6,471	-15
PROPICONAZOLE	FUNGICIDE	64,695	65,731	67,489	73,983	80,339	6,356	9
HEXYTHIAZOX	INSECTICIDE	22,574	22,219	20,869	14,757	9,120	-5,637	-38
SULFUR	FUNGICIDE/ INSECTICIDE	76,428	70,892	71,272	85,735	80,236	-5,498	-6
LAMBDA-CYHALOTHRIN	INSECTICIDE	16,395	13,778	18,242	17,828	23,258	5,431	30
BACILLUS THURINGIENSIS	INSECTICIDE	16,497	18,225	14,627	15,404	10,461	-4,943	-32
FLUBENDIAMIDE	INSECTICIDE			4,090	3,058	7,944	4,885	160
SPIRODICLOFEN	INSECTICIDE	12,066	16,916	23,104	16,091	11,374	-4,718	-29

disruption pheromones E-8-dodecenyl acetate, Z-8-dodecenyl acetate, and Z-8-dodecenol. Table 55 lists pesticide AIs with the largest changes in acres treated from 2010 to 2011. Oils are applied during the dormant season and/or during the growing season to forestall outbreaks of scales, mites, and moth pests. Their use during this wet year may have decreased for fear of potential damage to flowers and small twigs when warm weather follows rain. Esfenvalerate is a broad-spectrum chemical used during dormancy and/or during the growing season and offers an alternative to OFM pheromones. Acres treated with six of the ten insecticide and miticide AIs listed in Table 55 declined. Reduced use of the miticides spirodiclofen and hexythiazox may reflect low mite pressure. On the other hand, low mite risk lessens the disincentive for using lambda-cyhalothrin and abamectin, AIs that can flare mites but are cheap. Production of spinosad products, which are effective against thrips, katydids, OFM, and peach twig borer (PTB), has declined since successor products containing spinetoram came onto the market. The reduced-risk AIs diflubenzuron and *Bacillus thuringiensis* may require two applications in wet years, making them less attractive. Flubendiamide is a relatively new insecticide that controls lepidopterous pests, San Jose scale, mealybugs, and leafhoppers. It is being recommended as a tool for managing pest resistance to pyrethroids.

Disease pressure was promoted in 2011 by the wet winter and spring, late season rains, and inocula persisting from similar conditions in 2010. Accordingly, peach and nectarine acreage treated with fungicides increased 3 percent and total amount applied increased 19 percent. The most-used fungicides as measured by acres treated were propiconazole, sulfur, ziram, copper-based fungicides, iprodione, pyraclostrobin, boscalid, and tebuconazole. Strong brown rot pressure may help explain some of the significant 2011 changes in fungicide use patterns (Table 55). Contrary to the general trend of increased fungicide use, total acreage treated with captan, sulfur, and copper-based fungicides declined. None of those AIs provide reliable control of brown rot. Sulfur is the standard treatment for preventing powdery mildew infection. It has no curative effect, unlike the low-dose chemical propiconazole and the reduced-risk AIs pyraclostrobin and boscalid, all of which control powdery mildew and brown rot reliably. Many growers use propiconazole to control sour rot, especially mid- to late-season during fruit ripening. Ziram provides excellent control of leaf curl and is also effective against shot hole and scab diseases. Some growers may have moved to ziram from copper-based fungicides, which have become expensive, or from captan, which has maximum residue level (MRL) limitations for export and may adversely affect pollinators. Iprodione is reliable for brown rot control. Tebuconazole controls brown rot and is also effective against powdery mildew and rust.

High rainfall stimulates weed growth and often results in greater herbicide use. In addition, higher crop prices in 2011 may have lessened some growers' inclination to save money by cutting back on weed control. Four percent more peach and nectarine acres were treated with herbicides in 2011 than in 2010. The most-used herbicides by area treated were glyphosate, oxyfluorfen, 2,4-D, pendimethalin, rimsulfuron, and paraquat dichloride. Oxyfluorfen, pendimethalin, and rimsulfuron are pre-emergence herbicides applied to soil before the growing season to prevent weed sprouting. Post-emergence herbicides such as glyphosate, 2,4-D, and paraquat dichloride kill existing weeds on contact.

Fumigants are used in peach and nectarine orchards for rodent control and for pre-plant soil treatments to suppress arthropod pests, nematodes, pathogens, and weeds. Acres treated with aluminum phosphide for rodent control increased eightfold. A number of factors may have played a role: the current trend of conversion from flood irrigation to micro-sprinklers improves field conditions for gophers and squirrels; food and shelter for rodents are plentiful during a wet year; aluminum phosphide requires and works best in moist soils, whereas baits may lose effectiveness in wet weather; and there are concerns about wildlife poisoning risks posed by some other rodenticides. Acres treated with the most widely-used pre-plant soil fumigants 1,3-D, chloropicrin, and methyl bromide increased in 2011 54, 158, and 137 percent, respectively. Increased use is generally associated with increased replanting, including rotation into newer cultivars with attractive market potential. Dynamic interactions among nematode infestations, pathogen infections, rootstock choices, and application patterns also affect fumigant selection and use from year to year. Very few acres were treated with the post-emergence fumigant sodium tetrathiocarbonate, which was taken off the market in 2011.

Methyl bromide is currently the only post-harvest fumigant used to treat fresh peaches and nectarines for export. The amount used reflects export market requirements or specific quarantine treatments with methyl bromide, which may be a condition for moving fruit within or outside the state to prevent movement of invasive pests.

Only 941 cumulative acres of peaches and nectarines were treated with plant growth regulators (PGRs) in 2011, but that is nearly double the number of acres treated in any previous year and thus may be worthy of note. Gibberellins, which are plant hormones that regulate growth and development, were applied to 892 cumulative acres. Amino ethoxy vinyl glycine hydrochloride, an ethylene synthesis inhibitor, was applied to 48 acres. Both chemicals can enhance the firmness, size, and storability of fruit. In many cultivars, gibberellins applied from May through July can reduce the percentage of buds that produce flowers the following year. As a result, fruit numbers are reduced, the need for hand thinning is reduced and in some cases eliminated, and fruit quality is better. There are risks associated with “chemical thinning” because it is impossible to predict weather conditions during bloom and fruit set, but scarcity of field labor may have motivated some growers to experiment with PGRs for that purpose.

Carrot

Total carrot acreage was 63,000 in 2011, a 5 percent increase from 2010 (Tables 56 and 57). Pounds of pesticide active ingredient (AI) applied decreased 18 percent from 2010 to 2011 while pesticide use as cumulative area treated increased 3 percent from 2010 to 2011 (Table 57). California is the largest producer of fresh market carrots in the United States, accounting for 87 percent of the U.S. production of 2.3 billion pounds in 2011. California has four main production regions for carrots: the southern San Joaquin Valley (Kern County) and Cuyama Valley (San Luis Obispo and Santa Barbara counties), the central coast (Monterey County), the low desert (Imperial and Riverside counties), and the high desert (Los Angeles County). The San Joaquin Valley accounts for more than half the state’s acreage.

Table 56: *Total reported amount of all active ingredients (AI), area treated, planted acreage, and prices for carrots each year from 2007 to 2011. Planted acreage and prices are from USDA, 2012. Acres treated means cumulative acres treated (see explanation p. 10).*

	2007	2008	2009	2010	2011
Pounds AI	7,944,057	9,382,895	5,238,641	8,106,698	6,615,698
Acres Treated	523,431	601,827	427,434	444,512	457,665
Acres Planted	73,400	65,000	64,500	60,000	63,000
Price/cwt	$ 22.40	$ 25.20	$ 25.70	$ 27.20	$ 34.90

In terms of area treated with the major types of pesticide, reported use of fungicides and herbicides increased while fumigant and insecticide use decreased (Figure 21). From 2010 to 2011 the area treated with herbicides increased 13 percent while the amount of AI applied increased 7 percent. In terms of area treated, fungicide use increased 4 percent. However, the amount of fungicides applied decreased 8 percent from 2009. In terms of the amount of AI applied, insecticide use increased from 7,000 pounds to 8,000 pounds. The most-used non-adjuvant pesticides as measured by pounds of AI applied were metam-sodium, potassium

Table 57: *Percent difference from previous year for reported amount of all AIs, area treated, planted acreage, and prices for carrots each year from 2007 to 2011.*

	2007	2008	2009	2010	2011
Pounds AI	1	18	-44	55	-18
Acres Treated	16	15	-29	4	3
Acres Planted	2	-11	-1	-7	5
Price/cwt	6	13	2	6	28

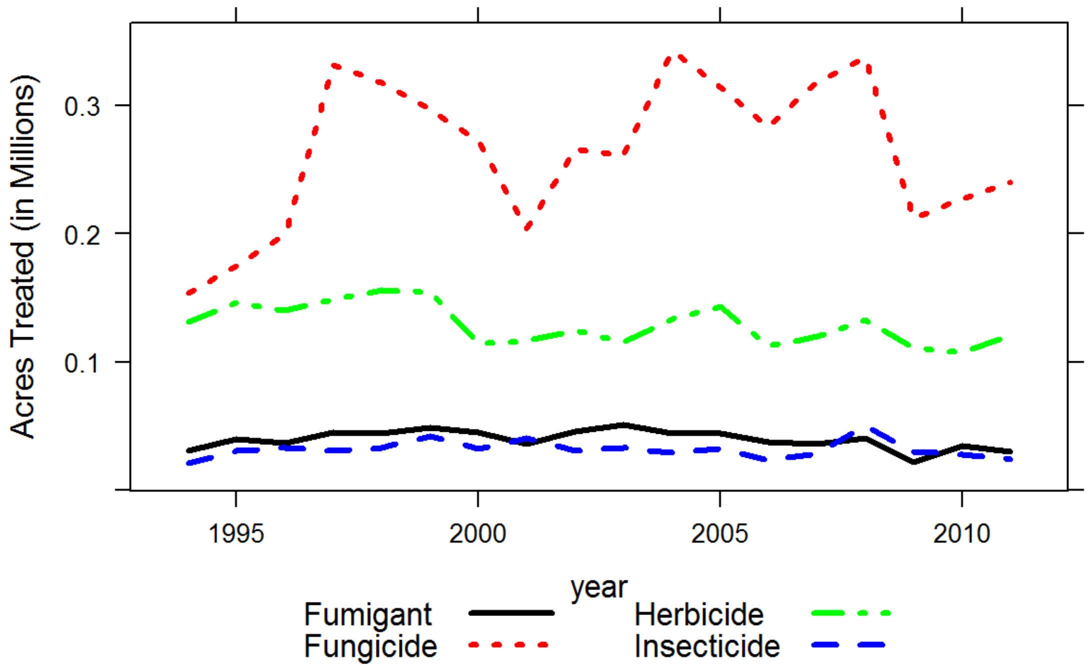

Figure 21: *area of carrots treated by all AIs in the major types of pesticides from 1996 to 2011.*

N-methyldithiocarbamate (metam-potassium), sulfur, and 1,3-dichloropropene (1,3-D). As determined by acres treated, mefenoxam, linuron, sulfur, pyraclostrobin, pendimethalin, metam-sodium, iprodione, and chlorothalonil were the most-used in 2011.

The fungicides applied to the greatest acreage in 2011 were mefenoxam, sulfur, pyraclostrobin, iprodione, chlorothalonil, boscalid, cyazofamid, azoxystrobin, copper-based pesticides, and fenamidone. Alternaria leaf blight, a foliar disease, is generally controlled using iprodione, chlorothalonil, and pyraclostrobin. Iprodione use increased 10 percent, pyraclostrobin 9 percent, and chlorothalonil 5 percent. Powdery mildew is primarily controlled by sulfur, and sulfur use increased 3 percent in 2011. Higher incidence of powdery mildew in 2011 may have accounted for increased sulfur use. The number of acres treated with azoxystrobin, also used to control

Table 58: *The non-adjuvant pesticides with the largest change in area treated of carrots from 2010 to 2011. This table shows acres treated with each AI in each year from 2007 to 2011, the change in acres treated and percent change from 2010 to 2011.*

AI	AI Type	2007	2008	2009	2010	2011	Change	Percent Change
LINURON	HERBICIDE	64,667	67,684	54,775	54,687	61,016	6,329	12
METAM-SODIUM	FUMIGANT	24,156	27,445	16,610	26,035	20,737	-5,298	-20
AZOXYSTROBIN	FUNGICIDE	6,087	5,844	3,409	4,043	7,937	3,893	96
ESFENVALERATE	INSECTICIDE	12,130	25,770	12,001	11,391	7,920	-3,472	-30
POTASSIUM N-METHYLDI-THIOCARBAMATE	FUMIGANT	1,470	3,434	1,551	2,376	5,597	3,220	136
PROPICONAZOLE	FUNGICIDE				27	3,219	3,192	11,822
PENDIMETHALIN	HERBICIDE	17,574	24,877	21,549	19,568	22,425	2,857	15
REYNOUTRIA SACHALINENSIS	FUNGICIDE				137	2,487	2,350	1,715
1,3-DICHLORO-PROPENE	FUMIGANT	9,866	9,501	3,424	5,969	3,758	-2,212	-37
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	FUNGICIDE	1,111	3,594	3,186	6,436	4,232	-2,204	-34
PYRACLO-STROBIN	FUNGICIDE	23,844	27,799	18,403	22,634	24,666	2,032	9
METRIBUZIN	HERBICIDE				1,007	2,934	1,927	191
SULFUR	FUNGICIDE	78,574	82,856	44,931	52,721	54,525	1,804	3
IPRODIONE	FUNGICIDE	33,657	30,364	15,374	17,558	19,355	1,797	10
MEFENOXAM	FUNGICIDE	77,159	87,561	64,019	59,604	61,222	1,618	3

powdery mildew and Alternaria leaf blight, increased 96 percent. Copper-based pesticides have a history of low efficacy against powdery mildew, which may account for the 17 percent decrease in use. Acres treated with boscalid, used to treat cottony soft rot, decreased 5 percent in 2011. As in most recent years, cavity spot is a major soil-borne fungal disease that is commonly controlled by applying mefenoxam, fenamidone, or the soil fumigant metam-sodium.The acres treated with mefenoxam increased 3 percent and with fenamidone decreased 15 percent from 2010 to 2011. Acres treated with cyazofamid, also used to control cavity spot, increased 4 percent. Growers have recently begun using propiconazole to control cavity spot, which may account for the large increase in use – from 27 treated acres in 2010 to 3,200 acres in 2011.

The main herbicides used in carrot production as measured by acres treated were linuron, pendimethalin, fluazifop-p-butyl, trifluralin, clethodim, EPTC, and metribuzin. Acres treated with linuron, a post-emergence herbicide that provides good control of broadleaf weeds and small grasses, increased 12 percent from 2010 to 2011. Trifluralin is a pre-emergence herbicide that complements linuron for weed management; its use increased 7 percent. Use of pendimethalin, another selective herbicide, increased 15 percent. The number of clethodim-and EPTC-treated acres increased 19 percent and 3 percent, respectively. Use of fluazifop-p-butyl, a selective postemergence phenoxy herbicide used for control of annual and perennial grasses, increased 4 percent. Acres treated with metribuzin, used to control preemergent weeds, increased significantly – from 1,000 acres treated in 2010 to 2,900 acres in 2011. Sowthistle is a growing problem and may account for the increase in metribuzin use.

Insects are not generally a major problem in carrot production except for whiteflies, which are controlled with esfenvalerate and methomyl. The major insecticides used in 2011 in terms of acres treated were esfenvalerate, diazinon, methomyl, imidacloprid, bifenthrin, methoxyfenozide, beta-cyfluthrin, and s-cypermethrin. The area treated with esfenvalerate decreased 30 percent in 2011. Although generally used against whitefly, esfenvalerate is also used to control flea beetles, leafhoppers, and cutworms. Diazinon-treated acres increased 50 percent in 2011; methomyl-treated acres increased 16 percent. Methomyl is effective against cutworms and leafhoppers as well as whiteflies. Acres treated with bifenthrin, a pyrethroid used to control cutworms and crown root aphids, increased 7 percent. Methoxyfenozide use decreased 25 percent and s-cypermethrin use decreased 22 percent, while beta-cyfluthrin use decreased 2 percent. Imidacloprid, which is effective against aphids, flea beetles, leafhoppers and whiteflies, had the largest increase in acres treated of insecticides used – from 540 treated acres to 2,000 acres. A severe leafhopper infestation in the Cuyama and Antelope valleys and an aphid infestation in the Imperial Valley may account for the increased use of insecticides, particularly imidacloprid, in 2011.

Carrot production relies on the fumigants metam-sodium, metam-potassium, 1,3-dichloropropene (1,3-D), and to a lesser extent, chloropicrin. These fumigants are used to manage nematodes and provide other benefits such as weed and soil-borne disease control. In 2011, fumigants accounted for about 88 percent of the total pounds of pesticide AIs applied to carrots. Fumigant use, in terms of pounds of AI, decreased 8 percent from 2010 to 2011. Similarly, the area treated with fumigants decreased 12 percent. The number of acres treated with metam-sodium and 1,3-D decreased 20 and 37 percent, respectively. Acres treated with chloropicrin, used in conjunction with 1,3-D, decreased 87 percent. The decrease in chloropicrin use is directly related to the decrease in 1,3-D use since the two are typically used in combination. Metam-potassium use increased from 2,300 treated acres in 2010 to 5,600 acres in 2011. This increase is possibly in response to a push by manufacturers to use metam-potassium rather than metam-sodium. Additionally, growers are opting for metam-potassium over metam-sodium because it provides an additional source of potassium, an important nutrient.

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