PESTICIDE USE ANNUAL REPORT

History and Background

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DEPARTMENT OF PESTICIDE REGULATION
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For information on obtaining electronic data files, see the Pesticide Use Annual Report Data Access, References, and Definitions Guide, How to Access Pesticide Use Report Data section <https://www.cdpr.ca.gov/docs/pur/pur_references_definitions.pdf >
This report is available on DPR's Web site <www.cdpr.ca.gov/docs/pur/purmain.htm>. If you have questions concerning this report, email DPR's PUR program <PUR.Inquiry@cdpr.ca.gov>

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History

In the early 1880s, California passed legislation allowing counties to appoint horticultural commissioners to assist with pest management. These horticultural commissioners were the forerunners of present-day County Agricultural Commissioners (CACs). During that early time period, many of these commissioners required agricultural pest control operators to submit some type of monthly report of pesticide use; however the exact requirements varied depending on the county. Most reports included details such as the location, date, crop, acres treated, pest, pesticide, and use rate. Unfortunately, many of these detailed records have been lost over time.

Advertisement from the early 1940s promoting use of Paris Green as a treatment to prevent Malaria (U.S. National Archives and Records Administration Public Domain image)

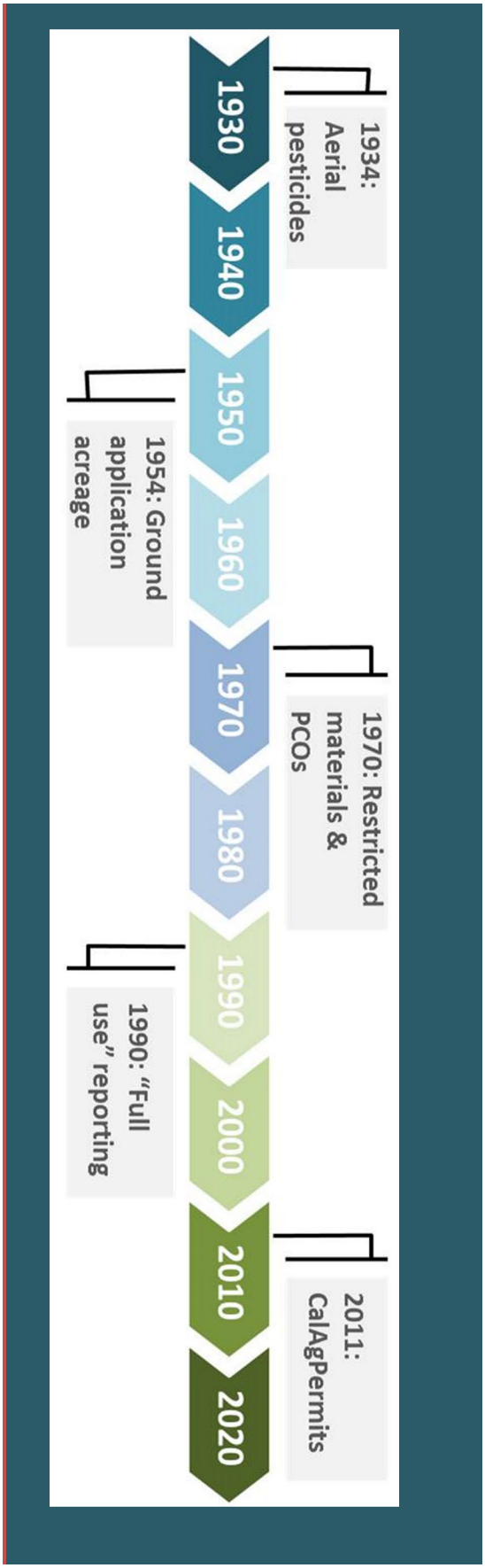
Early pesticide regulations were largely focused on the prevention of fraudulent products. Mislabeled and adulterated counterfeits of popular pesticides were common in the early 1900s. For example, the US Bureau of Chemistry analyzed 45 samples of Paris Green, a widely-used arsenical pesticide, and found only 13 of the samples contained the concentrations of arsenic needed for pesticidal efficacy. One of the first state-wide pesticide regulations was the Insecticide Law of 1901, which required that all arsenical insecticides be registered with the University of California, including the brand name, pounds in each package, manufacturer, and percentage of active ingredient. Sellers of flawed products could be charged with a misdemeanor and fined. In 1910, the federal government enacted the Federal Insecticide Act (FIA), which established chemical quality standards and required pesticide manufacturers to guarantee that their products contained specified percentages of chemical concentrations prior to sale.

In 1919, the California Department of Agriculture (CDA), now known as the California Department of Food and Agriculture (CDFA), was formed and began enforcing statewide pesticide laws. In 1921, California's Economic Poisons Act charged CDA with the ability to regulate the manufacture, sale, and use of pesticides. From 1934 to 1956, the CDA produced a monthly Bulletin Report which included a summary pesticide use table. Starting in the early 1930s, the CDA began collecting statistics on aerial pesticide applications from the counties. In 1954, state regulators began requiring reports on ground application acreage as well, although these reports lacked detailed information about the pesticides used or commodities treated.

The 1960s brought increasing awareness about non-target effects of pesticides on the environment and human health. At the federal level, numerous environmental statutes which restricted pesticide use or mitigated pesticide risks either directly or indirectly, such as the Clean Water Act, the Clean Air Act, the Endangered Species Act, and the Occupational Safety and Health Act were enacted. In 1970, the United States Environmental Protection Agency (U.S. EPA) was created, taking over pesticide registration and residue tolerance functions from the United States Department of Agriculture (USDA) and the United States Food and Drug Administration (USFDA). In addition, in 1972 and 2003, the 1910 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was overhauled with a stronger focus on protecting human health and the environment.

California also expanded many of its regulations during this time period, surpassing the requirements called for by FIFRA and other federal regulations to achieve even greater protection of human health and the environment. In 1970, the state broadened its pesticide use reporting requirements to include all pesticide applications by pest control operators (PCOs) as well as all restricted material pesticide applications by growers. In 1991, the California Environmental Protection Agency (CalEPA) was founded. With the establishment of CalEPA, the newly-created California Department of Pesticide Regulation (DPR) took over many pesticide regulatory roles previously performed by other government offices, with a few exceptions: for example pesticide residue laboratory testing and invasive species control remained with CDFA, and local enforcement authority largely remained with the counties, overseen by the DPR Enforcement branch.

The Food Safety Act of 1989 (Chapter 1200, AB 2161) gave DPR statutory authority to require full reporting of agricultural pesticide use, which officially began in 1990. Full-use reporting required more detail than ever before about a wider variety of pesticide applications than previous requirements. CalAgPermits was developed by the CACs in 2011 to meet demands for online access and is still in use today (See *CalAgPermits section*).



Background

Continuous Evaluation of Pesticides

In addition to requiring pesticide use reporting, California law (Food and Agricultural Code [FAC] section 12979) directs DPR to use the reports for numerous undertakings, including:

- Protecting the safety of farm workers,
- Monitoring and researching public health issues,
- Monitoring the environment for unanticipated residues,
- Setting priorities for monitoring food,
- Researching pest management practices, and
- Enforcing pesticide laws.

These actions help DPR with implementing another mandated activity: the continuous evaluation of currently registered pesticides (FAC section 12824). Information gathered during continuous evaluation is used to gauge the performance of DPR's regulatory programs and support additional measures, including the development of new regulations and mitigation methods, or the reevaluation or cancellation of pesticide registrations.

The pesticide use report (PUR) data greatly increases the accuracy and efficiency of continuous evaluation of pesticides by providing details on each application, including date, location, site (e.g., crop), time, acres and units treated, and the identity and quantity of each pesticide product applied. This data allows scientists and others to identify trends in pesticide use, compare use locations with other geographical information and data, and perform quantitative assessments and evaluations of risks that pesticides may pose to human health and the environment. In 1990, DPR significantly expanded the quantity and quality of pesticide use data collected across the state. Prior to this expansion, the regulatory program's estimates of pesticide use frequently assumed pesticide use to be equivalent to the maximum rates and number of applications as listed on the label, which was not always the case. Use of the PUR data allowed risk assessments and policy decisions to be based on the actual

"The Department shall endeavor to eliminate from use in the state any economic poison which endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented. In carrying out this responsibility, the department shall develop an orderly program for the *continuous evaluation of registered pesticides."*

— 1969 legislation (Chapter 1169)

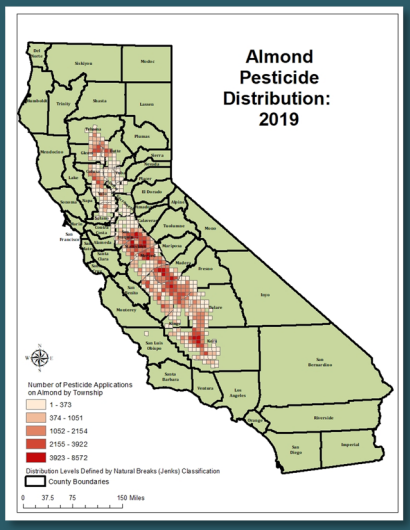
reported pesticide use rates from the PUR database, rather than the label rate assumptions previously used. Over the years, PUR data has been used by a variety of individuals and groups, including government officials, scientists, growers, policy makers, and public interest groups.

DPR uses the PUR data throughout its pesticide regulatory programs in ways that can be broadly grouped as temporal (time), geospatial (place), and quantitative (amount), often combining 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 data to see what applications were made in an area at a particular time. Protection of ground and surface waters, assessments of acute and chronic risks to human health, and allocation of monitoring and enforcement resources often include analyses of the PUR data from numerous years to better evaluate pesticide use trends.

Geospatial analyses may be local or expansive. Local analyses are used to help set priorities for surface and ground water monitoring programs by determining pesticide use and runoff potential in specific watersheds or other defined areas. DPR scientists calculate contributions of smog-forming volatile organic compounds (VOCs) in the atmosphere from pesticide products using the pesticide use data in combination with emission potential data of products. DPR further refines the analyses to specific air basins that are particularly vulnerable to air pollution to 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 examine the proximity of pesticide use to endangered species habitat, resulting in the development of best use practices to protect these species. These analyses are invaluable 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



Production agricultural ("Ag") pesticide use can be mapped to the square mile section, allowing for spatial analyses of pesticide use in proximity to vulnerable or sensitive groups or ecosystems.

and depth of the information provided in the PUR data allows researchers to apply realistic assumptions when modeling pesticide exposure. PUR data has been used to model pesticide exposure for people who live near agricultural land, workers in the field, handlers preparing and applying pesticides, and aquatic organisms inhabiting waterways that receive agricultural runoff. Analysis of the PUR data enables well-informed and realistic assessments for risk management decisions.

The passage of the federal Food Quality Protection Act (FQPA) of 1996 launched the PUR database into a more integral role as a tool for monitoring and achieving compliance with updated food safety regulations. 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. PUR data became increasingly important to commodity groups, University of California (UC) specialists, the U.S. EPA, and other interested parties as they reassessed tolerances and calculated dietary risks from pesticides based on actual reported uses.

PUR information such as pesticide types, use rates, geographical locations, crops, and timing of applications help researchers understand how various pest management options are implemented in the field. Analysis of this data is the basis for grant projects that DPR funds to promote the development and adoption of integrated pest management practices in both agricultural and urban settings.

PUR data is used by state, regional, and local agencies, scientists, and public interest groups. The data is an invaluable tool for understanding pesticide use in order to protect human health and the environment and provide for proper, safe, and effective use of pesticides for the production of food and fiber.

The pesticide use report data plays a role in ensuring crops are safe for consumption.

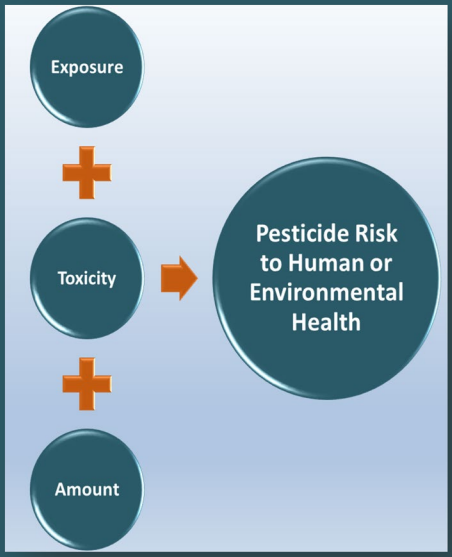
Evaluating Risk

Increases in the pounds applied, acres treated, or number of applications of pesticides do not necessarily correspond to higher risk to human health or the environment. Risk is a function not only of the pesticide amount used, but also the toxicity of the active ingredient (AI) to human health or the environment and the potential human or environmental exposure to the AI. For example, kaolin clay is often a large contributor to the total pounds of pesticides used in California. Kaolin clay is a fine-grained mineral that is sprayed on plants to form a particle film which acts as a fungicide, insecticide, or sunburn protectant. Although many pounds of kaolin clay were used during the year, kaolin is a biopesticide and considered a minimum risk chemical. Increased use of lower risk chemicals may serve to reduce overall risk if they are used as alternatives to higher risk chemicals.

In contrast, some AIs with high toxicity are only needed in very small amounts to be effective pest control agents, and therefore have low total pounds applied. However, if the toxicity, mode of action, or broad-spectrum nature of the AI can cause unintended harm to human health or the environment, then a small amount of an AI with a high toxicity could pose a greater risk than a large amount of an AI with a lower toxicity.

In addition to toxicity, exposure plays a large role in determining potential human health or environmental risks. Minimizing exposure to an AI can reduce risk of harm from the AI. Risk can therefore be mitigated through integrated pest management and several other tools and practices that minimize exposure, such as:

- Personal protective equipment (PPE),
- Buffer zones,
- Drift reduction practices and equipment,
- Timing of applications with favorable environmental conditions to prevent off-site pesticide movement,
- Vegetative filter strips,
- Tailwater ponds, and
- Many other innovative techniques.



Pesticide risk can be thought of as a function of three variables: potential for exposure, toxicity of the pesticide, and the amount of pesticide used.

In summary, when using PUR data to assess risk from an AI, the AI's toxicity and exposure potential should be considered in relation to the amount of pesticide used. Increases in pounds applied or acres treated do not necessarily equate to increases in risk to human health or the environment. The toxicity and exposure potential of the pesticide needs to be evaluated as well.

CalAgPermits

In 2011, the CACs implemented CalAgPermits, a standardized, web-based system for issuing pesticide use permits and operator identification numbers to track pesticide use information. CalAgPermits greatly enhanced the efficiency of data entry and transfer for PUR, and thus the accuracy and integrity of the PUR database by allowing individuals and businesses the option of reporting pesticide use electronically. The use of CalAgPermits further improved data quality assurance by introducing automated data validation and error checking of submitted pesticide use reports, an added quality assurance checkpoint that occurs in addition to the data verification activities undertaken after data transmission to DPR. The many improvements in electronic data sharing and data validation between DPR and CACs has significantly improved the efficiency and effectiveness of PUR data quality control activities.

Data Collection

PUR information required to be reported is first sent to the CAC in the county where the application took place. PURs can be submitted to the counties through individual electronic CalAgPermit accounts, paper forms, or through third party software programs. After being sent to the CAC, the PUR is entered into the county CalAgPermit database and checked for errors. The CAC then electronically sends a subset of required data to DPR, where additional validation and error checks take place. From 2015 to 2019, DPR collected an average of four million pesticide use records a year. As of 2020, the PUR database contained over 90 million pesticide use records, going back to 1990 (Earlier PUR records from 1974 to 1989 are kept in a separate database since these early records vary in the type and quality of data collected. PDF documents of scanned microfiche

pesticide records from 1970 to 1973 are available upon request).

Improving Data Quality

DPR conducts quality control checks of submitted PUR data before publicly releasing the data. CalAgPermits checks for data entry errors, such as whether the pesticide applicator has the correct permits for any restricted materials reported or whether the pesticide product is allowed on the reported application site. Once the data has been received by DPR, the department performs more than 50 different validity checks on the data, such as identifying missing data, invalid entries, and confirming that the reported pesticide unit of measurement corresponds to the pesticide's dry or wet formulation. The PUR database may include products that do not have an active registration since end-users may continue using stocks of some pesticides purchased prior to a product's registration becoming inactive (unless the inactive registration is due to a DPR or U.S. EPA cancellation or suspension indicating that the use has to end sooner). Records flagged for suspected errors are returned electronically to the county for resolution. If an error cannot be resolved, the record is transmitted to the database, but is logged as an error or outlier in a separate table, which is publicly available.

Additional data checks are performed to identify errors and outliers in pesticide use amounts. For production agricultural (Ag) PURs, the errors are identified using statistical algorithms that flag high use rates. If a reported use rate (amount of pesticide per acres treated) greatly exceeds typical use rates of that AI, it is flagged as an error and sent back to the CAC to confirm. If the county is unable to identify the correct rate, an estimated rate equal to the median rate of all other applications of the pesticide product on the same crop or site is used instead. Although less than one percent of the reports are flagged with this type of error, some of these errors are so large that, if included, they would significantly affect the total cumulative amount of applied pesticides.

Non-agricultural (NonAg) PUR records include all pesticide use applications legally required to be reported that are not

DID YOU KNOW?

Pesticide use reports undergo more than

50 different data error and validation checks.

Reports with potential errors that cannot be corrected are flagged in a publicly available table.

The pesticide use report records are stored in a "living" database that is constantly being updated and refined with corrections when clarifying information becomes available.

defined as Ag PURs. Examples include applications to structures, golf courses, landscapes, rights-of-way, cemeteries, and others. (For more information on the difference between agricultural and nonagricultural pesticide use, see the Pesticide Use Annual Report References and Definitions Guide's Agricultural (Ag) versus Nonagricultural (NonAg) Pesticide Uses section [1]).

Unlike Ag PURs, NonAg PURs cannot be statistically evaluated for errors using a use rate of amount per acre since current regulations do not require reporting of acres treated on many NonAg PURs. In NonAg PURs where the acres treated value is missing, the use rate is instead calculated as the amount of pesticide per application rather than per acre. These 'amount-per-application' use rates are statistically evaluated against similar applications using a variety of statistical algorithms to determine if there may be an error. In cases where the majority of PURs of a specific type of application come from a single company, application rates tend to be consistent within the company and the statistical algorithms can identify errors when they occur. However, for many other NonAg pesticide uses, a single application may vary in size and scale depending on the applicator. For example, one company may treat ten wooden utility poles for wood rot and report it as 10 applications, while another company may cover an entire district, treating each city block of poles as a single application. This type of variation in the definition of a single application among multiple companies can result in very different amount-per-application use rates for two otherwise similar applications.

An additional method, such as using the total amount of pesticide use rather than a use rate, is therefore employed to identify errors that the amount-per-application use rate algorithms may not catch. The intent of this additional method is to compare the use amount value in the PUR to previously identified threshold values which are multiple magnitudes greater than the median value for similar uses. These threshold values are very high, providing a backup means for ensuring the largest errors are flagged.

City of Monterey Public Library tented for termite abatement. Structural pesticide use applications such as termite treatments are not required to report as much information as production agricultural applications. Photo listed under Creative Commons Attribution 2.0 Generic License

[1] <https://www.cdpr.ca.gov/docs/pur/pur_references_definitions.pdf >

Identifying errors is particularly challenging for structural pesticide applications, a type of NonAg application which is exempted from reporting acres treated or other area units under California Code of Regulations Title 3, 6627(b)(7). In addition to lack of an area treated value, PURs for structural applications have not required the reporting of the number of applications since 2015 (On January 1, 2015, Senate Bill 1244 (Chapter 560, Statutes of 2014) amended section 8505.17(c) of the Business and Professions Code (BPC) to eliminate the requirement that monthly summary structural PURs include the number of applications made). Since neither an amount-per-acre or amount-per-application use rate is available, structural PURs rely heavily on the previously described method comparing the total amount to threshold values. In addition, there has been a concerted effort by DPR staff to manually identify exceptionally high structural PUR amounts and contact the applicators for verification, a process which over time has fine-tuned the threshold values to catch more structural application errors. In many cases, these high amounts were mistakenly entered due to a misunderstanding that DPR wanted the diluted amount of pesticide rather than the undiluted amount. Many of these incorrect PURs have since been updated with the correct, undiluted amounts.

An electronic warning flag was implemented in January 2019, that notifies CalAgPermit account holders that undiluted amounts should be reported if they enter an extremely high value for various NonAg PURs. This error flag appears if a product containing beta-cyfluthrin, bifenthrin, cyfluthrin, cypermethrin, fipronil, imidacloprid, or permethrin is reported with an amount higher than a statistically derived threshold value when the application is:

- Structural pest control,
- Landscape maintenance,
- Rights-of-way,
- Pest control related to public health,
- Vertebrate control,
- A commodity fumigation or other non-agricultural fumigation,
- Pest control for a research commodity, or
- CAC or other regulatory pest control.

Additional active ingredient warning flags may be added in the future.

Improving Access to the Data over Time

Data access methods have evolved and improved over time providing several ways to access the PUR data:

1. **Pesticide Use Annual Report:** The Pesticide Use Annual Reports serve as an accessible snapshot summary of the much larger PUR database. Before the late 1990s, Pesticide Use Annual Reports were available by request and were only hard copy. As use of online resources increased, DPR improved public access to the data by posting reports and data on the web.

   Pesticide Use Annual Reports are available on the main PUR website <www.cdpr.ca.gov/docs/pur/purmain.htm> (If you do not see the Pesticide Use Annual Report for a particular year, please email <PUR.Inquiry@cdpr.ca.gov> to request summaries from years not found online).

2. **Data files:** Text files of PUR data are available for download for the years 1974 through to the most recently released Pesticide Use Annual Report. Scanned microfiche tables of PUR data from 1970 to 1973 are also available. Pesticide Use Annual Reports and the associated data files are static documents – they do not include any updates to PURs that may have occurred after the release of each report. Additionally, there have been changes in data quality and quantity over time:

    - Much of the procedures for error checking data from 1974-1989 have been lost over time. The data from this early period may therefore contain significant errors.
    - In 1990, the amount and types of data collected increased significantly, improving standardization of pesticide use reporting across the California.
    - Although there were various methods of error checking starting in 1990 with the new data collection, the current rigorous data quality control measures in place today began in 2002.

    Files of the PUR data used in each Pesticide Use Annual Report are available for download on the File Site. <https://files.cdpr.ca.gov/pub/outgoing/pur_archives/>

    Starting in 2016, text files <https://files.cdpr.ca.gov/pub/outgoing/pur/data/> of all the Pesticide Use Annual Report tables and graphs are available for download.

3. **CalPIP:** In 2003, DPR launched the web-based California Pesticide Information Portal (CalPIP) <https://calpip.cdpr.ca.gov/main.cfm> to increase public access to the PUR database. CalPIP provides pesticide use information including:
    - Date,
    - Site or crop treated,
    - Pounds used,
    - Acres treated,
    - Pesticide product name,
    - AI name,
    - Application pattern (ground, air, or other),
    - County,
    - Zip code, and
    - Location where the application was made to within a one-square-mile area.

    Note that many of these data fields only apply to production agricultural ("Ag") PURs (e.g. date, acres treated, application pattern, zip code, and square mile section) and are not available for non-agricultural pesticide use. For more information on the difference between agricultural and nonagricultural pesticide use, see the Pesticide Use Annual Report Data Access, References, and Definitions Guide's Agricultural (Ag) versus Nonagricultural (NonAg) Pesticide Uses section <https://www.cdpr.ca.gov/docs/pur/pur_references_definitions.pdf >.

DPR annually updates the previous few years of CalPIP data to account for any changes due to errors identified after the Pesticide Use Annual Report has been released, so it is the most accurate source of pesticide information available online from DPR.

4. **Email DPR's PUR program** at <PUR.Inquiry@cdpr.ca.gov> with your data request.

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