

Staff photos featured on the cover, from left to right, top to bottom:

- School Integrated Pest Management workshop in Humboldt.
- Example of personal protective equipment (PPE).
- Almond spraying.
- IPM Innovator Award ceremony in 2016.
- Tomato harvesting near Stockton.
- Air Monitoring Network.
- Water sampling near Folsom.
- Product Compliance inspection.
- Strawberry grower in Ventura.
- Food residue inspection at a distribution center in Tracy.
- Aerial applicator.
- Fumigation demonstration.
- California Department of Food and Agriculture laboratory in Anaheim.
- Fieldworker training.
- Water sampling at the Salton Sea.
- Maintenance gardener.
- Apiary training in San Diego.

A Guide to
Pesticide Regulation in California

2017 Update



California Department of Pesticide Regulation

California Environmental Protection Agency



California Department of Pesticide Regulation

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A Guide to Pesticide Regulation in California—2017 Update

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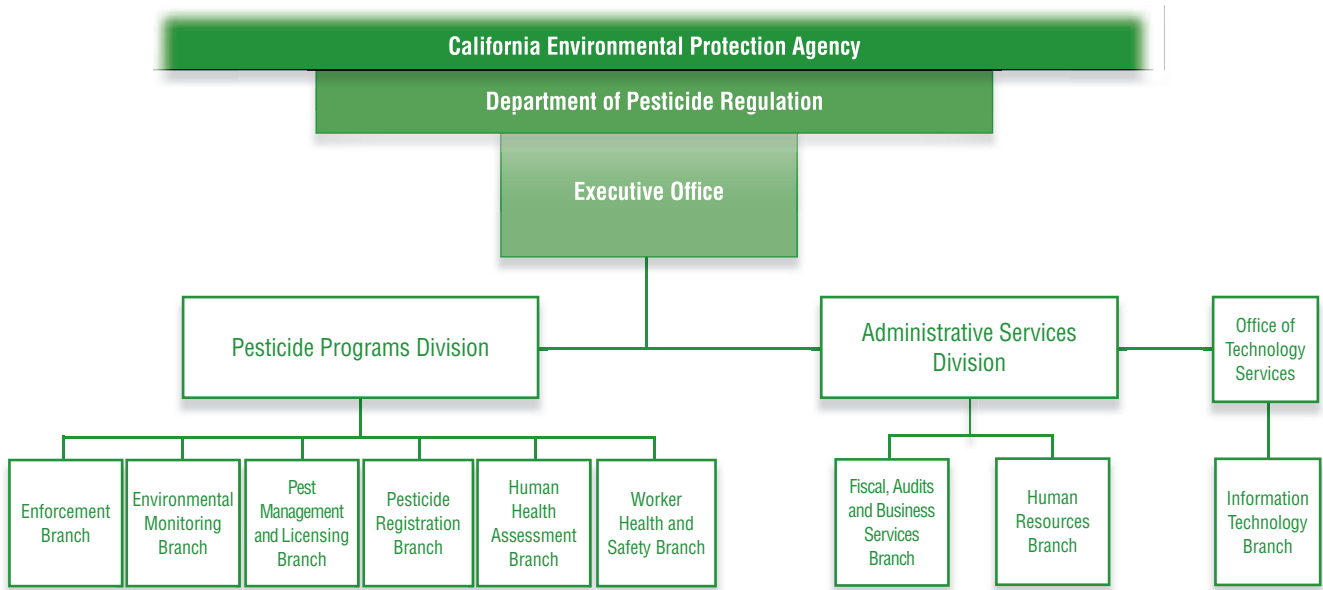
Editor's note

The California Department of Pesticide Regulation (DPR) was created in 1991, when the state's pesticide regulatory program was incorporated into the newly created California Environmental Protection Agency. Earlier, pesticides were regulated by the California Department of Food and Agriculture and its predecessor, the California Department of Agriculture.

The Department of Agriculture published annual reports from 1919 through 1958, which are cited throughout this guide. In addition to these reports, the collective knowledge of our dedicated staff of experts, both past and present, was critical to the project.

A Guide to Pesticide Regulation in California was first published in 2011. The guide contains information on pesticide laws and regulations, DPR's organizational structure, an explanation of regulatory and registration processes, a description of local and state enforcement activities, and details on DPR initiatives to protect people and the environment. The 2011 guide was an update to a 2001 DPR publication, *Regulating Pesticides: The California Story, a Guide to Pesticide Regulation in California*.

Organizational Chart



Mission and Organization

Since its creation about a quarter century ago, the mission of the Department of Pesticide Regulation (DPR) has been to protect human health and the environment by regulating pesticide sales and use, and by fostering reduced-risk pest management.

DPR's strict oversight begins with pesticide product evaluation and registration and continues through statewide licensing of commercial applicators, dealers, consultants, and other pesticide professionals; evaluation of health impacts of pesticides through illness surveillance and risk assessment; environmental monitoring of air, water and soil; field enforcement (with county agricultural commissioners) of laws regulating pesticide use; residue testing of fresh produce; and encouraging development and adoption of least-toxic pest management practices through incentives and grants.

California's Food and Agricultural Code authorizes the state's pesticide regulatory program and mandates it to:

- *Provide for the proper, safe and efficient use of pesticides essential for production of food and fiber, and for protection of public health and safety.*
- *Protect the environment from environmentally harmful pesticides by prohibiting, regulating or ensuring proper stewardship of those pesticides.*
- *Assure agricultural and pest control workers have safe working conditions where pesticides are present.*
- *Authorize agricultural pest control by competent and responsible licensees and permittees under strict control of DPR and the state's county agricultural commissioners.*
- *Assure pesticides are properly labeled and appropriate for the use designated by the label, and that state or local governmental dissemination of information on pesticidal uses of any registered pesticide product is consistent with the uses for which the product is registered.*
- *Encourage the development and implementation of pest management systems, stressing application of biological and cultural pest control techniques with selective pesticides when necessary to achieve acceptable levels of control with the least possible harm to public health, nontarget organisms, and the environment.*

The state's pesticide regulatory program had its beginnings in the early 1920s as a function of the California Department of Agriculture—later called the Department of Food and Agriculture. (*See Appendix C for more on DPR's history*).

DPR was created in 1991, within the then-newly-created California Environmental Protection Agency.

DPR today has a staff of about 400, including a large number of scientists from many disciplines. In 2016-17, the department had an annual operating budget of about \$100.8 million.

DPR is organized into the Pesticide Programs Division, Administrative Services Division, and the Office of Technology Services, with 9 branches between them. DPR's Executive Office also has offices for legal affairs, legislation and



To protect human health and the environment by regulating pesticide sales and use, and by fostering reduced-risk pest management.

— DPR Mission Statement



DPR Worker Health and Safety scientists travel throughout the state to share information with workers, farmers, community members and experts.

policy, communications, and outreach and public engagement.

In carrying out its mission, DPR also partners with county agricultural commissioners and their staffs who enforce pesticide laws in their counties.

PESTICIDE PROGRAMS DIVISION

Pesticide Registration Branch

One of seven branches in the Pesticide Programs Division, the Pesticide Registration Branch is responsible for the scientific evaluation and registration of pesticide products. A pesticide product must be registered (licensed) with the state before it can be used, possessed or offered for sale in California.

The Pesticide Registration Branch coordinates the required scientific data evaluation process among branches within the Pesticide Programs Division and with other state agencies. The branch also serves as primary liaison to companies applying to register their products (called registrants). It prepares public notices and corresponds with registrants regarding data requirements, determinations of the health effects of pesticides, and final actions on registrations.

Branch scientists share scientific data review responsibilities with staff scientists in other branches. The branch also manages all data received and oversees call-ins of data on environmental fate and acute and chronic toxicology. It maintains label files and the pesticide data library, and provides information to pesticide enforcement agencies and the public on the registration status of pesticides and about product label instructions.

Human Health Assessment Branch

The Human Health Assessment Branch has two major functions: review of toxicology studies and preparation of risk assessments. DPR requires registrants of certain products to submit data on a product's potential chronic, sub-chronic, and acute health effects.

Branch staff scientists review the data for new active ingredients and new products containing currently registered active ingredients; label amendments on currently registered products; and reevaluation of currently registered active ingredients. Staff scientists review toxicology data for adequacy and indications of possible adverse health effects. They use the results of these reviews and exposure information from other branches to assess the adequacy of product labels, and to conduct health risk evaluations and risk assessments that estimate the potential for adverse health effects in humans.

Worker Health and Safety Branch

The Worker Health and Safety (WHS) Branch is responsible for human safety (workers and the public) during and after pesticide use. The WHS Branch's Human Health Mitigation Program evaluates exposure and risk assessments to develop and implement mitigation measures that reduce the risk of worker and public exposure to pesticides.

The Pesticide Illness Surveillance Program (PISP) analyzes investigations and maintains a database of pesticide-related illnesses. The PISP database helps confirm the effectiveness of exposure control measures and identifies areas where improvements are needed. A medical consultant provides medical advice and assistance to physicians on pesticide exposures.

Exposure Monitoring and Industrial Hygiene Program scientists design and conduct field research to characterize exposure to pesticides for use in exposure assessments and investigate unsafe work conditions detected by the PISP. Industrial hygienists evaluate workplaces, application equipment and pesticide

labeling for effectiveness in controlling exposure hazards, and recommend safety measures when needed.

Pesticide Enforcement Branch

DPR oversees a multi-tiered enforcement infrastructure and is vested by the U.S. Environmental Protection Agency with the primary authority to enforce federal pesticide-use laws in California. The Pesticide Enforcement Branch’s responsibility is to enforce federal and state laws and regulations pertaining to the proper and safe use of pesticides. The branch has oversight responsibility for pesticide incident investigations and enforcement response to pesticide use violations, conducts outreach, provides guidance to county regulators, trains inspectors, and evaluates effectiveness of county pesticide use programs. The Enforcement Branch also operates the nation’s largest state monitoring and enforcement program to ensure domestic and imported produce are free from illegal pesticide residues.

Pesticide use enforcement in the field is largely carried out by California's 55 county agricultural commissioners (CACs) and their staffs (roughly 280 biologists). DPR headquarters personnel—with field staff in Anaheim, Clovis and West Sacramento—provide training, coordination, and technical support to the counties.

The branch also is charged with overseeing the Product Compliance Inspections Unit, which ensures all pesticide products sold for use in California are registered and properly labeled. They do so with field inspections of pesticide wholesalers and retailers to determine whether products are registered and if labels are identical to registered labels. When violations of pesticide sales or labeling requirements are found, the branch takes the lead in directing the investigation, collecting evidence and documenting findings that will serve to prove the violation.

Environmental Monitoring Branch

The Environmental Monitoring Branch monitors the environment to determine the fate of pesticides, analyzing potential hazards in air, soil, ground water, and surface water. It uses scientific data to develop pollution prevention strategies to protect public health and the environment from the potentially adverse effects of pesticides. The branch develops methods for collecting and analyzing environmental samples for pesticides and evaluates environmental data submitted by registrants. The branch provides environmental monitoring data required for emergency eradication projects, environmental contamination assessments, pesticide registration and reevaluation, and human exposure evaluations. The branch takes the lead in carrying out many DPR environmental protection programs, including the Pesticide Contamination Prevention Act, designed to prevent ground water pollution by pesticides.

Pest Management and Licensing Branch

The Pest Management and Licensing Branch has five major programs. The Pest Management Analysis and Planning Program evaluates pesticide and pest management problems and awards grants to develop and promote new strategies that reduce adverse environmental effects and hazards from pesticide use in agricultural, nonagricultural and urban settings. The Pesticide Use Reporting Program collects, reviews and analyzes pesticide use data in California. The Endangered Species Project maps habitats of federally listed species, evaluates pesticide exposure risks on inhabited sites, and develops protective strategies to minimize those risks. The Licensing and Certification Program examines and licenses those who sell, apply commercially, or consult on the use of pesticides. It also accredits continuing education courses and collaborates with the University of California for the development of license exam study guides and exam



DPR operates a network of air monitoring stations in farming regions.



DPR product compliance inspectors annually visit about 250 locations throughout the state—including general merchandise, grocery, hardware and sporting goods stores—to ensure pesticide products sold for use in California are registered and properly labeled.

questions. The School and Child Care IPM Program promotes and facilitates the training of California school and daycare staff in the adoption of integrated pest management strategies for public schools and public and private daycare sites.

ADMINISTRATIVE SERVICES DIVISION

The Administrative Services Division provides those services necessary for running a government agency, such as personnel, accounting, budgeting, contracting and related functions. The division provides support services to address the needs of the entire department to maintain and improve business processes.

Fiscal, Audits and Business Services Branch

The Fiscal, Audits and Business Services Branch collects revenue and pays invoices, monitors cash flow, develops and monitors DPR's annual budget, assists program staff with contracting and purchasing, oversees asset management and conducts other business services.

The branch also audits pesticide sellers throughout the United States to ensure that they comply with sales reporting and mill assessment payments (*See Chapter 13 for more on the mill assessment*). They also follow up if violations are found. The branch is also responsible for disbursing a percentage of mill assessment revenue to CACs to help support local pesticide enforcement.

Human Resources Branch

The Human Resources Branch administers and oversees all personnel activities, including recruitment, examinations, hiring, labor relations, employee health and job safety, benefits and payroll, workforce development/succession planning, administrative directives, employee recognition, training, and operational and strategic planning.

OFFICE OF TECHNOLOGY SERVICES

The Office of Technology Services provides department-wide information technology related activities and technical oversight to county agricultural commissioners in the automation and maintenance of the department's enforcement and use programs.

Information Technology Branch

The Information Technology Branch (ITB) operates under a centralized IT governance model. ITB is responsible for department-wide activities such as network services, server and desktop support, application and database development, management and support, internal and external website design and administration, and information security.

STRUCTURAL PEST CONTROL BOARD

Formerly under the direction of the DPR, the Structural Pest Control Board (SPCB) licenses and regulates structural pest-control businesses and professionals and addresses consumer complaints through mediation and enforcement of the Structural Pest Control Act.

The seven-member board and its employees:

- Develop rules and regulations for licensing, examination, training, and practice standards, and oversee the administration of licensing exams.
- Issue licenses in three categories—applicators, field representatives and opera-

Strategic planning

DPR has broad authority to regulate pesticides in California and a responsibility to regulate in a manner that is fair, effective, efficient, and responsive to our various constituencies. This mandate requires practical and productive planning. Realizing this, DPR has created a blueprint to build a dynamic organization committed to environmental protection and with the capacity to anticipate and react to a changing world. Strategic planning gives us that blueprint.

DPR, working in concert with the county agricultural commissioners (CACs), began work on its first strategic plan in the fall of 1993, in response to the passage of legislation (Chapter 418, SB 1082, Statutes of 1993) that among other things required CalEPA and all its departments, boards, and offices to “institute quality government programs to achieve increased levels of environmental protection and the public’s satisfaction through improving the quality, efficiency, and cost-effectiveness of the state programs which implement and enforce state and federal environmental protection statutes.”

The legislation stated that the quality government programs must include:

- *A process for obtaining the views of employees, the regulated community, the public, environmental organizations, and governmental officials with regard to the performance, vision, and needs of the agency implementing the quality government program.*
- *A process for developing measurable performance objectives using the views of the persons and organizations specified in the first paragraph.*
- *Processes for continually improving quality and for training agency personnel, using the information obtained from implementing the first two paragraphs.*

Strategic planning was given a further boost in 1994, with the passage of the State Government Strategic Planning and Performance and Review Act (Chapter 779, AB 2711). It required that “in developing its strategic plan, each agency, department, office, or commission shall consult with at least the following affected parties: employee organizations, the Legislature, client groups served, suppliers, and contractors.” Strategic plans were also to “identify the steps being taken to develop performance measures that could be used for a performance budgeting system or a performance review.”

The legislation also required the State Department of Finance (DOF) to annually survey agencies to obtain specified information concerning strategic plans and to recom-

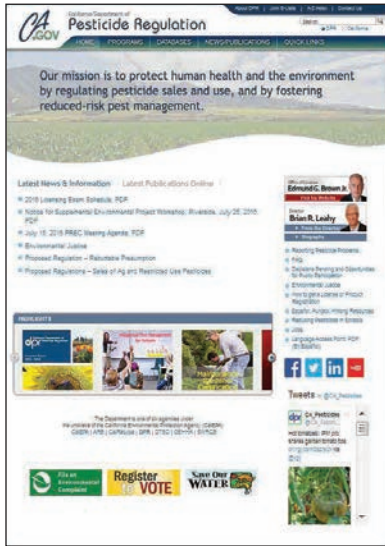
mend which agencies should develop or update a strategic plan. It also required DOF to develop a plan for conducting performance reviews of those state agencies which DOF recommended have strategic plans. In 1996, in a report to the Legislature on strategic planning, DOF recommended that all agencies have a strategic plan and, later that year, issued a strategic planning directive. It mandated that all agencies have strategic plans in place by July 1, 1997, and stated that future budgetary requests would only be approved if consistent with an approved strategic plan.

DPR’s 2013 strategic plan lays out six goals with several accompanying objectives which include:

- *Protecting people and the environment by assuring California’s environment is not adversely affected by pesticides and that all people are protected from unacceptable pesticide risks.*
- *Advancing reduced-risk pest management systems by advancing the research, development and adoption of effective pest management systems that reduce risks to people and the environment.*
- *Enforcing and achieving compliance by maintaining and continuously improving strong and equitable compliance and enforcement programs to ensure people and the environment are not exposed to unacceptable pesticide risks.*
- *Ensuring environmental justice—protecting all people in California, regardless of race, age, culture, income, or geographic location, from adverse environmental and health effects of pesticides.*
- *Continuously improving performance, accountability and organizational effectiveness by attracting and retaining a competent workforce, implementing effective business processes, and using current technology.*
- *Using communication and outreach to promote an understanding and awareness of DPR programs, priorities, initiatives and accomplishments through effective external communications, outreach and public education.*

More information on DPR’s strategic planning process can be found online at www.cdpr.ca.gov/docs/dept/planning/stratmenu.htm

Chapter 1: Mission and Organization



DPR's website, www.cdpr.ca.gov, provides access to a variety of publications, educational videos, forms and databases.

tors—and issue registrations to principal offices and branch offices.

- Review consumer complaints about licensees and work to mediate solutions.
- Investigate alleged violations of the Structural Pest Control Act or related laws and regulations, conduct records inspections, and file disciplinary actions as required.
- Conduct and evaluate research on the control of structural pests, including termites, ants and cockroaches.

Legislation in 2009 (Chapter 18, Statutes of 2009-10 Fourth Extraordinary Session) transferred the SPCB from the Department of Consumer Affairs (DCA) to DPR.

The board was transferred back to DCA in 2013, under the Governor's Reorganization Plan No. 2 of 2012.

DPR continues to regulate the pesticides used and CACs still monitor applications.

Ensuring Safe Pesticide Use

The goal of California’s pesticide regulatory program is to protect people and the environment from harm that could be caused by unsafe pesticide use.

Pesticide use is controlled by federal, state and local government agencies. The U.S. Environmental Protection Agency (U.S. EPA) sets minimum pesticide use standards and delegates pesticide enforcement regulatory authority to the states. California’s pesticide laws and regulations are typically more rigorous and carried out by regulatory programs wider in scope than any other state. Examples include:

- Scientific evaluation of products before they can be sold or used.
- Examination and licensing of individuals and businesses that recommend, perform or supervise pest control.
- Surveillance of products sold in the marketplace to ensure they are registered and meet state health, environmental and safety standards.
- Site-specific permitting for the use of certain hazardous pesticides.
- Full reporting of agricultural pesticide use.
- Sampling and residue testing of fresh produce.
- Strict laws, regulations and programs to protect workers and the environment, including field inspections and monitoring of air, soil and water.
- Grants and outreach promoting greater use of pest management strategies that lower risks associated with pesticides and reduce pesticide use where possible.
- Local enforcement agents in all 58 counties who conduct safety inspections and investigations.

Several of these programs are discussed elsewhere in this guide. This chapter focuses on use enforcement, licensing and product compliance.

ROLES OF FEDERAL, STATE AND LOCAL AGENCIES IN PESTICIDE USE ENFORCEMENT

In 1947, Congress responded to the increasing use of pesticides by enacting the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

This law governed the registration, sale, possession and use of pesticides. It required that pesticides distributed in interstate commerce be registered with the U.S. Department of Agriculture (USDA). Like earlier laws, FIFRA was more concerned with pesticide product quality and efficacy than with safety. However, the statute declared pesticides “misbranded” if they were harmful to people, animals or vegetation (except weeds) when properly used.

In 1972, amendments to FIFRA enabled U.S. EPA to delegate pesticide enforcement authority to states through cooperative agreements with state pesticide regulatory programs. (A cooperative agreement is a contract between the U.S. government and a state or local government agency when the federal government is to be substantially involved in the activities covered by the cooperative agreement.)



DPR promotes reduced-risk pest management strategies like those taught at this 2016 Integrated Pest Management workshop at a school in Redding.

Roles of U.S. EPA and the States in Regulating Pesticides

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) specifically authorizes state regulation of the sale and use of federally registered pesticides as long as state regulations are at least as restrictive as federal standards. Under FIFRA, for example, states may prohibit the distribution and sale of a federally registered pesticide or restrict pesticide use locally to protect ground water, wildlife or human health. FIFRA prohibits states from imposing state requirements on pesticide labeling or packaging.

Generally, the U.S. Environmental Protection Agency (U.S. EPA) has authority to enforce FIFRA requirements. However, FIFRA acknowledges that states have a pivotal role in regulating pesticides in their own jurisdictions, provided that their programs are at least as strict as those required under federal law. FIFRA Section 24(a) reads, “A State may regulate the sale or use of any Federally-registered pesticide or device in the state, but only if and to the extent the regulation does not permit any sale or use prohibited by this Act.”

States have primary enforcement responsibility for pesticide use/misuse violations under Sections 26 and 27 of FIFRA. FIFRA Section 26 gives states that U.S. EPA has determined have adequate enforcement procedures, laws and regulations, primary authority for enforcing FIFRA provisions related to pesticide use, including inspection authority. U.S. EPA is authorized by FIFRA Section 27 to rescind a state’s primary enforcement responsibility if a state is not adequately carrying out its duties.

FIFRA Section 11 authorizes U.S. EPA to form cooperative agreements with states, giving them the responsibility for training, inspecting and certifying applicators of restricted-use pesticides. States also may initially review and give preliminary approval to applications for emergency exemptions from registration and special local needs registrations, (although under some conditions FIFRA allows U.S. EPA later to deny state-approved applications).

The role of the states in regulating the use of pesticides is a result of lobbying by the states, which have argued successfully that control at the state level is more knowledgeable, precise and reliable. The federal role, by design, is not intended to substitute for the authority of any state to pursue a regulatory approach best suited to local conditions. A U.S. Senate staff analysis in 1996 observed:

In general, Federal authority has not increased at the expense of State authority. Even when it has, existing statutes have allowed States to set more stringent standards than Federal standards, if so desired and needed. We should permit States to set separate safety standards. States can set these standards more quickly than the U.S. EPA in response to an emergency. They can also set a standard that provides more comprehensive protection than a federal standard. Some states, for example, have formulated standards that are more stringent than federal standards and are better designed to protect individual groups of citizens.

Preemption: Federal, State and Local Jurisdiction

Preemption refers to laws at one level of government taking precedence over laws of a lower level. As such, no entity at the lower level can pass a law that allows action that would violate the higher-level law.

Federal laws take precedence over state and local law, and state law can take precedence over local law. Once Congress has passed legislation, any state or local law that conflicts with federal law is invalid. Even if there is not a direct conflict, if the federal law expressly provides that it controls the entire field regulated, or if that intent can be implied from the comprehensive nature of the regulation, federal law has control over any state or local law regulating the same field. In the field of pesticides, federal law (the Federal Insecticide, Fungicide, and Rodenticide Act, FIFRA) clearly states that only the federal government has authority over pesticide labeling. In other words, no state or local government can dictate what is on a pesticide product label. However, a state can refuse to allow registration of a product and therefore the possession, sale and use of any pesticide not meeting its own health or safety standards. States can also adopt regulations more protective of health and the environment than on a product label.

The California Constitution also allows the state to preempt local jurisdictions. The Constitution states that city councils or boards of supervisors may pass laws (called ordinances at the local level) provided they do not conflict with state law. However, California law (Chapter 1386, Statutes of 1984, FAC Section 11501.1) states that no local government “may prohibit or in any way attempt to regulate any matter relating to the registration, sale, transportation, or use of pesticides, and any of these [local] ordinances, laws, or regulations are void and of no force or effect.”

The 1984 legislation was in response to a State Supreme Court ruling that same year in *The People v. County of Mendocino*. In that case, the State Attorney General had sued the county, arguing that state law preempted a 1979 initiative approved by Mendocino County voters to ban the aerial application of phenoxy herbicides in the county. The herbicides were used by a forest products company to inhibit hardwood growth in favor of conifer growth. The initiative followed a 1977 incident in which an aerial herbicide application drifted nearly three miles onto school buses.

A lower court ruled in favor of the state, finding that California law preempted county regulation of pesticide use. However, in 1984 the State Supreme Court disagreed, ruling that “the Legislature has not preempted local regulation of

pesticide use.” The court ruled that Mendocino’s “initiative ordinance neither duplicates nor contradicts any statute,” and that voters in any California county could ban the use of pesticides in that county, even if state and federal law allowed such use.

The court stated, “The legislative history (of FIFRA) does not demonstrate a clear Congressional intention to preempt traditional local police powers to regulate the use of pesticides or to preempt state power to distribute its regulatory authority between itself and its political subdivisions.”

In response, the Legislature passed a bill stating it is “the intent of the Legislature to overturn” the Supreme Court ruling, and that “matters relating to (pesticides) are of a statewide interest and concern and are to be administered on a statewide basis by the state unless specific exceptions are made in state legislation for local administration.”

In an unpublished 1986 opinion, the Court of Appeal for the Third Appellate District found FAC Section 11501.1 constitutional and in so doing invalidated a Trinity County local pesticide ordinance.

Local governing bodies may pass ordinances that regulate or restrict pesticide use in their own operations. For example, a city council may pass an ordinance that restricts or bans pesticide use in municipal buildings and in public parks. Similarly, a school district board can decree that certain pesticides cannot be used in schools.

In 1991, in *Wisconsin Public Intervenor v. Ralph Mortier*, the U.S. Supreme Court ruled that, absent state law to the contrary, federal pesticide law does not preempt local regulations dealing with the use of pesticides. The U.S. Supreme Court ruled that FIFRA “leaves the allocation of regulatory authority to the absolute discretion of the states themselves, including the options of ... leaving local regulation of pesticides in the hands of local authorities under existing state laws.” However, the ability of states to preempt local authority was left in place. Because California law clearly forbids local ordinances, the 1991 U.S. Supreme Court decision had no effect in California.

In 1996, legislation (Chapter 361, AB 124) clarified but did not significantly alter the Department of Pesticide Regulation’s preemption authority. The legislation required the department to notify any local agency that proposes an ordinance governing the sale, use or handling of pesticides whenever the department determines state law preempts the ordinance. The bill also required the department to file court action, if necessary, to invalidate the ordinance and prohibit its enforcement.



The Federal Insecticide, Fungicide and Rodenticide Act of 1947 sought to standardize the testing and registration of pesticide products.

Under these agreements, states are authorized to enforce pesticide laws and to develop licensing, certification and training programs for applicators of restricted-use pesticides. U.S. EPA pays certain costs, with states providing a percentage of matching funds.

The 1975 U.S. EPA-California agreement was the nation's first and served as a model for federal agreements with other states.

Each year, the Department of Pesticide Regulation (DPR) identifies state priorities and reviews U.S. EPA's cooperative agreement program to ensure department activities reflect U.S. EPA's national priorities. DPR and U.S. EPA then develop a work plan to carry out their respective pesticide regulatory roles. The state work plan includes:

- Ensuring pesticides sold are legally registered by U.S. EPA and by DPR for use in California.
- Certifying commercial and private pesticide applicators.
- Performing inspections, compliance monitoring and compliance assistance that focus on protecting pesticide applicators and workers in various settings.
- Investigating all priority incidents and illnesses. (*See Chapter 8 for more information on U.S. EPA's priority criteria.*)
- Inspecting pesticide-producing establishments.
- Enforcing the requirements of pesticide product labeling and ensuring safe use.

With a cooperative agreement in place, DPR has primary responsibility for pesticide use enforcement in California. The agreement extends to county agricultural commissioners (CACs) for local enforcement.

Three DPR branches—Enforcement, Worker Health and Safety, and Pest Management and Licensing—work closely with CACs to enforce state pesticide laws and regulations in the field.

The Enforcement Branch provides statewide training of CAC staff, guidance on enforceable standards for pesticide use, technical support, incident investigation support, and oversight and evaluation of CAC enforcement. In addition to staff in Sacramento, the Enforcement Branch has regional offices in Anaheim, Clovis and West Sacramento. The branch's Product Compliance Inspections Unit inspects pesticide products in retail and wholesale outlets, and markets, for compliance with labeling and sales requirements. Inspectors also follow up on product sales complaints and conduct inspections of pesticide manufacturers.

The Worker Health and Safety Branch is responsible for worker and public safety during and after pesticide use.

The Pest Management and Licensing Branch manages licensing and certification of pest control advisors, applicators, aircraft pilots, businesses, and pesticide dealers and brokers.

In California, there are jurisdictional roles at the international border with Mexico. Pesticide use in the border area affects people in both countries. DPR has taken part in several federal and state border projects. One was the Pesticide Emergency Response Plan, a U.S. EPA-funded project that identifies individuals and agencies responsible for emergency response and investigation of pesticide incidents along the border. Another was the U.S./Mexico Pesticide Information Exchange Project, funded by U.S. EPA to cooperatively address common pesticide issues along the entire border.

RESTRICTED MATERIALS AND PERMITTING

Pesticides can be categorized as restricted either by the U.S. EPA or by DPR.

California’s system for placing certain pesticides into restricted-use categories was the outcome of incidents in the late 1940s, when newly introduced herbicides caused drift damage to nontarget crops. This prompted the 1949 passage of laws (Chapters 1294 and 1295¹) requiring the Department of Agriculture (the agency then responsible for pesticide regulation) to adopt regulations governing the use of “injurious materials. . . . Such rules and regulations shall prescribe the time when and the conditions under which such materials may be used.” The statutes also directed that pesticides “shall be used only under a permit of the commissioner. . . . Such permit shall be conditioned upon compliance with the rules and regulations of the director and upon such other conditions as the commissioner may deem necessary to avoid injury.” In response, the department in 1950 adopted regulations setting up the state’s restricted material permit system requiring users of these pesticides to have specified training and a permit from the CAC.

Federally, the 1972 amendments to FIFRA recognized that some chemicals, while too dangerous for general use, could be used safely with training. The legislation gave U.S. EPA the flexibility to regulate pesticides beyond the choice of either registration or cancellation. U.S. EPA places pesticides into either general or restricted categories, with the latter group available only to certified applicators.

The use of both federal restricted-use pesticides (RUPs) and California restricted materials is subject to limits. Federal restrictions on RUPs, requiring use only by certified applicators, are carried out through instructions on pesticide product labels. In California, controls on state-listed restricted materials are carried out through permits issued by CACs and are in addition to any controls on product labels.

The criteria DPR uses to designate a pesticide as a restricted material include hazards to public health, farmworkers, domestic animals, honeybees, the environment, wildlife, or crops other than those being treated. DPR designates a pesticide active ingredient as a restricted material through regulation. This action may be prompted by a review of data sent by registrants, information gained from field studies and incident investigations, or other information.

DPR designed the restricted material permit program to allow further restrictions to protect people and the environment in light of local conditions. It is part of DPR’s regulatory program that supports certification as a functional equivalent to an environmental impact report under the California Environmental Quality Act (*for more on functional equivalency, see Appendix C*).

Before farmers or pest control businesses can buy or use a restricted pesticide (whether federally restricted or California restricted only), they must be certified by DPR. That is, they must have had specified training and been tested in handling and using pesticides. In addition, buying or using a California-restricted pesticide (but not a federal restricted use pesticide, or RUP) requires a restricted materials permit from the CAC.

The CAC must decide if a substantial adverse health or environmental impact will result from the proposed use of a restricted material. CAC staff may conduct pre-application site monitoring if they decide that an on-site evaluation is needed to fully assess risk. If the CAC decides that a substantial risk is likely, the commissioner may deny the permit or may issue it under the condition that applicators follow site-specific use practices (beyond the label and applicable regulations) to



A tractor used to apply metam sodium, a restricted pesticide, photographed during a 2016 demonstration.

¹ *Appendix A lists these and other statutes noted in this chapter and shows the related code section it amended or added. Statutes and related code sections deleted or superseded by later legislation have been omitted.*



California's agricultural commissioners work with DPR in enforcing the state's pesticide laws. Here, commissioners pause for a photo with DPR Director Brian Leahy (front row, second from left) and DPR Agricultural Commissioner Liaison Joe Marade (front row, fourth from left) at the California Agricultural Commissioners and Sealers Association's annual meeting in 2016.

mitigate potential adverse effects.

For many California-restricted materials, DPR develops recommended permit conditions for CACs, based on the department's scientific evaluations of potential health and environmental impacts. DPR's recommended permit conditions reflect the minimum measures necessary to protect people and the environment. The commissioners use DPR's information and their own evaluations of, and experience with, local conditions to develop controls specific to each application site. To preserve the functional equivalency under CEQA of restricted-materials permitting with environmental impact reports, CACs must have flexibility to restrict pesticide use permits based on local conditions at the time of the application. Therefore, the commissioners may follow the DPR's recommended permit conditions or structure their own conditions that are equally as protective or more stringent.

CACs can issue multiyear restricted materials permits to perennial agricultural plantings (such as fruit trees or grapevines), nonproduction agricultural sites and nonagricultural sites. However, the permit holder must immediately notify the CAC of any changes in the information on the permit, for example, a newly built school, home or labor camp nearby.

Because the permits are the functional equivalent of environmental impact reports, they must be site- and time-specific. The site can be clearly described when the permit is issued. However, since permits are issued for 12 or 24 months and applications cannot be scheduled months in advance, time specificity is achieved by the grower filing a notice of intent (NOI) to apply the pesticide. The NOI must be sent to the commissioner at least 24 hours before the scheduled application to provide CAC staff with an opportunity to evaluate the site before or during the application.

The NOI must describe the site to be treated and the pesticides to be applied. It must also contain information on any changes in the environmental setting (for example, construction of homes or schools, changes in types of crops to be planted) since the permit was issued. CACs review NOIs and can disallow the proposed application if conditions warrant or apply extra controls if needed. CACs make pre-application inspections on at least 5 percent of the use sites identified by permits or NOIs to ensure accuracy of information on the permit and to confirm the application can be made safely.

STATE-COUNTY PESTICIDE ENFORCEMENT PARTNERSHIP

California law designates DPR as the agency responsible for delivering an effective statewide pesticide regulatory program. The Legislature has also delegated local pesticide use enforcement to CACs.

The Food and Agricultural Code (Section 2281) outlines these respective responsibilities:

... the commissioner shall be responsible for local administration of the enforcement program. [DPR] shall be responsible for overall statewide enforcement and shall issue instructions and make recommendations to the commissioner. Such instructions and recommendations shall govern the procedure to be followed by the commissioner in the discharge of his duties. [DPR] shall furnish assistance in planning and otherwise developing an adequate county enforcement program, including uniformity, coordination, training, special services, special equipment, and forms, statewide publicity, statewide planning, and emergency assistance. [DPR] shall develop, jointly with the commissioners, county priorities for such enforcement programs and activities.

DPR uses its statewide authority to oversee, evaluate and improve local pesticide use enforcement programs. DPR assists CACs in planning and developing

County Agricultural Commissioners

California law designates the Department of Pesticide Regulation (DPR) as the agency responsible for delivering an effective statewide pesticide regulatory program. The Legislature also delegated local administration of pesticide use enforcement to county agricultural commissioners (CACs), governed by state laws and regulations and DPR's guidance. DPR uses its statewide authority to assist CACs in planning and developing county programs.

County boards of supervisors appoint agricultural commissioners in all the state's 58 counties to direct offices staffed by county employees. All CACs must be licensed by the state. A handful of small counties share commissioners, so there are fewer than 58 CACs in the state. CACs get pesticide enforcement funding from DPR and their own county government. Other CAC funding comes from grants, fees, fines and the California Department of Food and Agriculture (CDFA). CACs enforce state laws and regulations that cover environmental protection, pest prevention, worker and consumer protection, and other special services.

The size and diversity of California agriculture and the state's large population (with many people living near agricultural fields) require a more complex partnership between state and local pesticide regulatory authorities than anywhere in the nation. Many other states have only a relative handful of inspectors, employed by the state's lead pesticide agency to conduct pesticide enforcement. California stands apart with its agricultural commissioners and their combined staffs of approximately 280 inspector-biologists who serve as the field enforcement agents for federal and state pesticide laws and regulations.

CACs inspect the operations and records of growers, nonagricultural applicators (for example, industrial, institutional), agricultural and structural pest control businesses, pest control dealers, agricultural pest control advisers, farm labor contractors and government agencies to ensure compliance with worker protection standards and other pesticide safety requirements. They certify private applicators, issue restricted material permits and operator identification numbers, train field workers, and conduct outreach to the public. Certain pesticide applications, such as aerial applications and soil fumigations with restricted materials, require CACs to provide extra regulatory oversight to reduce potential hazards. In addition, they oversee pesticide use reporting, promote best management practices and monitor applications in the field.

CACs regulate pesticide use to ensure applicators comply with label directions and pesticide laws and regulations. CAC staff conduct inspections to prevent misapplication or drift, and possible contamination of workers, the public and the environment. CAC biologists enforce regulations to protect ground and surface water from pesticide contamination, and protect endangered species and other wildlife. To do this, they may work with other regulatory agencies, such as California Department of Fish and Wildlife and regional water boards and the State Water Resources Control Board.

Among a CAC's most important responsibilities is investigating illnesses and injuries. All reported pesticide-related illnesses and injuries are investigated by the commissioner in the county in which the illness occurred. CAC biologists interview injured parties, other witnesses, and employers if the illness occurred at work. As part of the investigation, a CAC biologist may take a residue sample for laboratory analysis. (*For more information on illness and incident investigation, see Chapter 8.*) If the CAC determines a violation occurred and the law was broken, the commissioner takes a compliance or enforcement action.

In addition to pesticide laws, commissioners also enforce laws administered by CDFA, including those related to pest detection, exclusion and eradication, and quality standards for fruits and vegetables.

Although in most counties they are called agricultural commissioners, CACs have duties that range far beyond the farm gate. For example, CAC biologists check maintenance gardeners to ensure they are licensed to apply pesticides, and that their pesticides are labeled for professional landscaping and applied safely. They also inspect residential structural fumigations for termites and structural pesticide applications by professional applicators.

Since many pesticides are used in nonagricultural settings—sanitizers in municipal water treatment plants, disinfecting chemicals in food service facilities and hospitals—pesticide laws may overlap other areas where workplace safety is involved. Therefore, CACs may also work with the state departments of Industrial Relations and Public Health. They may work with the county's environmental health department on pesticide spills, and with county animal control on complaints about potential misuse of rodenticides. Commissioners also consult with state and federal forestry officials about pesticide use and invasive weeds.



Cactus pads, called nopales, seized from a Southern California produce distributor in 2014 after illegal pesticide residues were discovered.

adequate county programs; evaluates the effectiveness of the local programs; and ensures corrective actions are taken in areas needing improvement. DPR develops enforcement program standards for conducting inspections, issuing restricted materials permits, investigating pesticide-related incidents, interpreting pesticide rules, and implementing the administrative civil penalty system. DPR also conducts technical training courses for CAC inspectors and investigative staff who enforce these laws and regulations.

CACs and their combined staffs of about 280 full-time pesticide enforcement biologists/inspectors enforce state pesticide laws and regulations in agricultural, structural, and nonagricultural use settings in all 58 counties. Their duties include:

- Inspecting the operations and records of growers, pest control businesses, pesticide dealers, and agricultural pest control advisers.
- Managing the restricted materials permit program.
- Registering licensed pest control businesses, pest control aircraft pilots, structural use businesses and agricultural pest control advisers.
- Investigating pesticide incidents and illnesses.
- Taking enforcement action, including levying civil penalties if violations are found.
- Providing training to pesticide users (handlers) and field workers.

(See Page 13 for more information on county agricultural commissioners.)

CACs and DPR provide compliance assistance to the regulated community through outreach and training, including presentations to growers, applicators, government agencies, and trade and industry groups. Compliance assistance and outreach are designed to provide information on regulatory requirements and controls on use, safe handling procedures, and transport and disposal of pesticides.

PESTICIDE ENFORCEMENT AND COMPLIANCE OPTIONS

DPR and CACs have broad authority to enter public and private property for enforcement activities such as audits, inspections, investigations and taking samples for laboratory testing. The law also allows DPR and CACs to discipline violators through various sanctions and to protect the public by prohibiting or stopping hazardous activities.

CAC biologists conduct approximately 15,000 pesticide inspections annually. These inspections lead to most enforcement actions. A smaller portion of enforcement actions are based on investigations of pesticide-related illnesses and incidents, and investigations of other complaints. Enforcement tools available to DPR or CACs include:

- Administrative civil penalties (fines).
- Refusal, revocation or suspension of county registrations or licenses and certificates by CACs.
- Civil and criminal court actions filed by local prosecutors or by DPR through the State Attorney General.
- Cease-and-desist orders, compliance interviews, warning letters and violation notices.
- Orders to seize or hold fresh produce, issued by DPR.
- Crop abatement orders and crop seizures, issued by DPR.
- Orders to prohibit harvest of commodities, issued by DPR or a CAC.

Administrative actions

CACs may take actions to levy fines for violations of pesticide use laws and regulations, for example, illegal applications or drift. CACs can levy a separate penalty for each person injured by illegal pesticide use.

Commissioners may fine up to \$5,000 for each violation of pesticide use laws or regulations.

DPR's administrative authority applies to the illegal sale of unregistered or mislabeled pesticides, and for packing, shipping or selling produce containing illegal pesticide residues. DPR-imposed civil penalties can be as high as \$5,000 for each violation.

DPR can refuse, revoke or suspend the business license of a pest control operator or maintenance gardener to perform pest control, and a pesticide dealer's business license to sell pesticides. Pest control advisers, licensees, certificate holders and others are also subject to these administrative actions.

CACs have the authority to refuse, revoke or suspend the county registration of pest control business operators and maintenance gardeners and that of agricultural pest control advisers. (These registrations are required to do business in a county.) CACs may also suspend the right of a structural pest control licensee to perform work in their county for up to three days for each violation.

Persons found to have violated pesticide laws resulting in injury are also required to repay certain unreimbursed medical expenses of people who seek immediate medical attention from a pesticide incident involving production of an agricultural commodity.

If CACs believe civil penalties are not warranted, in certain instances they have an option of gaining compliance through violation notices, compliance interviews and warning letters. These are generally used to document first-time less serious violations. In addition, they can issue cease-and-desist orders to stop hazardous activities involving the illegal use of pesticides.

Criminal and civil actions

Criminal and civil actions can be taken against licensees, certificate holders, permittees and other pesticide users. These actions can also be taken against pest control advisers, sellers and manufacturers of pesticides. Criminal actions can be filed by a county district attorney, typically at the request of a CAC, or by the State Attorney General at DPR's request. Criminal penalties range from a minimum of \$500 and not more than six months imprisonment to \$50,000 and imprisonment of one year for offenses involving intentional or negligent violations that created a hazard to human health or the environment. Civil complaints can be filed only by the Attorney General. Penalties range from \$1,000 to \$25,000 for each violation. Criminal and civil proceedings are considered instead of agricultural or structural administrative civil penalties for repetitive or intentional violations, or violations that have created a hazard to human health or the environment.

Crop quarantine, crop abatement and crop seizure

DPR may quarantine and hold any lot of produce that contains pesticide residues over the federal allowable levels. In some cases, the owner of the produce has the option of reconditioning the produce to remove the illegal residues. If the illegal residues cannot be removed, the produce cannot be sold. In addition, DPR is authorized to seize lots of produce based on a suspicion they contain illegal pesticide residues. The produce is then laboratory-tested and should illegal residues be present, the seizure is maintained. Should a residue of an unregistered pesticide be found on a crop in the field, DPR can prohibit harvest and, in some cases, order the crop destroyed.



Quarantined ginger disposed of in 2013.



It is of paramount interest to California's agricultural economy that the healthfulness of its products is beyond question.

— 1946 California Department of Agriculture report

IMPROVING ENFORCEMENT

Consistent enforcement response

Consistent statewide enforcement of California's environmental laws is paramount for the protection of people, property and the environment. However, local program administration naturally can result in variable enforcement decisions and responses. In 1994, DPR and CACs finalized guidelines that acknowledged the necessity of a consistent enforcement response policy while maintaining the ability to recognize local conditions in decision making.

Using the enforcement guidelines as a starting point, in 2005 DPR and CACs jointly developed an enforcement response policy which encouraged CACs to use progressive enforcement, taking into account the severity and frequency of violations in deciding penalties.

In 2006, DPR put key elements of the policy into regulations which strengthened the CACs' ability to impose penalties and appropriately increase fines for serious or repeat violations. The regulations also encourage CACs to give district attorneys the opportunity to file civil or criminal prosecutions in serious cases. In 2011, DPR amended the regulations to improve effectiveness and clarity, allowing the counties to better focus enforcement on the most serious cases. The definitions of the violation categories were made clearer, placing all violations of laws and regulations designed to protect people and the environment into a classification requiring a fine in the middle range. When circumstances are more egregious or when health, property or the environment are harmed, the violations are placed in a category requiring a fine in the top range.

Compliance assessment

In 2001, the department completed a five-year project to assess compliance of the agricultural industry with rules governing pesticide handler and field-worker safety. The intent was to measure the effectiveness of the statewide enforcement program and identify needed improvements. Enforcement Branch staff made hundreds of field inspections, observing a wide range of pesticide activities in more than 20 counties reflecting the diversity of California's agriculture and geography. Enforcement Branch staff observed specific aspects of pesticide use in field situations and documented compliance of growers, applicators and other pesticide users.

DPR uses compliance assessment data to evaluate the effectiveness of laws, regulations and label requirements, and to develop measures to improve enforcement. This includes follow-up training of CAC staff to better focus pesticide use and field-worker safety inspections on areas of noncompliance. DPR also conducts outreach to inform industry groups, labor and public training organizations, and licensees about compliance problems.

DPR and CACs use compliance assessment information to identify program strengths and weaknesses, plan focused inspections, design outreach programs, make programmatic and policy changes, and adjust annual work plans. DPR also uses the data to identify statewide trends, target enforcement activities and evaluate county enforcement priorities. In 2003, compliance assessment and training evaluation of CACs were combined into the County Oversight Inspection Program.

In 2007, DPR began consolidating these enforcement standards into a compendium of manuals intended to be the single source of enforcement guidance, available online and updated regularly. They address the pesticide regulatory program, investigative and inspection procedures, laws and regulations, restricted materials and permitting, conducting hearings, and interpreting laws and regulations.

County work plans and evaluations

In 1994, DPR and the commissioners began a program to target local enforcement

on activities that directly protect worker and public health and the environment. Under this program, DPR and each CAC develop a work plan each year to focus enforcement on activities with a history of problems or potential for problems.

In 2004, DPR and CACs developed program guidance identifying three core program priorities: restricted material permitting, compliance monitoring through inspections and investigations, and enforcement response to violations. DPR’s guidance represents a simplified approach in targeting core enforcement program priorities and evaluating the effectiveness of county programs. In turn, county work plans identify state, regional and local compliance problems, and emerging issues.

DPR’s three regional offices help CACs develop work plans that detail each county’s priorities, with clearly stated goals and performance measures balancing U.S. EPA’s national priorities and DPR’s statewide goals with local conditions unique to each county.

DPR and county staff also do joint inspections to help ensure that compliance and enforcement activities are conducted efficiently and effectively throughout the state.

To help focus on CAC work plans, Enforcement Branch staff conduct regular effectiveness evaluations of all CAC offices and staff. These evaluations are required once every three years, or sooner if requested by the CAC or Regional Office. DPR uses inspection reports to document compliance rates and annual reports sent by CACs to document workload and hours, and enforcement actions. DPR staff evaluate major elements of the county’s program, describe successful program aspects and follow up with CACs on needed improvements. The evaluations consider the number, type and quality of inspections; restricted material permit accuracy; quality, thoroughness and timeliness of investigations; appropriateness of enforcement actions and adherence to enforcement guidelines; business registration and license records; and financial reports.

Enforcement databases

In 1997, the department received funding to create a statewide database of compliance and enforcement actions. The goal was to track the compliance history of agricultural pesticide applicators, dealers and advisers, particularly those who work in more than one county. In 1998, DPR expanded the database’s scope beyond the first four license categories to track enforcement and compliance actions in all nine licensing and certification programs.

The project evolved into two Enforcement Branch databases—one to track inspections and the second enforcement actions. The inspection-tracking database collects information on the thousands of inspections conducted yearly by the counties in both agricultural and nonagricultural (including structural) pesticide use settings, and compliance rates with laws and regulations. Information in this database includes the number and type of inspections, the sections of laws and regulations that were the subject of the inspections, and the compliance rates for each item.

The enforcement action tracking system collects information on enforcement actions taken by the counties and includes the sections of laws and regulations violated and the fine amounts assessed. Information in this database includes the person or firm cited, date of violation, code section violated, type of enforcement action taken, pesticide involved, date of action, date case closed, and proposed and final fines. This database is useful in finding repeat violators in a county and in pointing out regional patterns for specific individuals or businesses. Evaluation of data may be used to adjust or change performance goals for both DPR and the counties.

In 2015, DPR and CACs began working on a consolidated inspection and enforcement action database (CalPEATs Project) that will streamline reporting of this information.

To evaluate county performance and help prioritize enforcement goals for each county, in 2008 DPR created an enforcement statistical profile. These annual county



DPR maintains regional offices in West Sacramento, Clovis and Anaheim.



In the early years, a farmer applied pest control materials himself, but now, in order to secure adequate control of pests, he often finds that it is necessary to hire a specialist to apply these materials, particularly when special techniques or equipment are needed.

— California Department of Agriculture special report to the Legislature on pesticide enforcement (1953)

profiles consolidate data from several DPR databases, tracking enforcement programs in 58 counties.

CACs collectively issue about 30,000 restricted materials permits per year. CAC staff also conduct about 7,000 pre-application site inspections, 20,000 agricultural and nonagricultural site inspections, 1,700 investigations, and 4,800 compliance and enforcement actions.

The data is used by DPR and CACs to better target inspections, identify emerging problems and staff training needs, assess effectiveness, plan focused inspections, and pinpoint areas for industry outreach and compliance improvement.

CAC pesticide regulatory workload data are also used to allot DPR funding of local pesticide programs. (See Chapter 13 for more information on state and local funding.)

LICENSING AND CERTIFICATION PROGRAM

Among DPR's legislative mandates is to "ensure that people selling, possessing, storing, handling, applying and recommending the use of pesticides are knowledgeable in their safe use." Licensing of pesticide professionals is designed to ensure they have the knowledge and ability to use pesticides safely and effectively. Many individuals and businesses that sell, consult on or professionally apply pesticides are required to get a license or certificate from DPR's Licensing and Certification Program. In most cases, this licensing process includes a closed-book examination that includes questions on pesticide laws and regulations as well as questions on specific information that is applicable to each license or certificate.

The need for a pesticide license or certificate is determined by the types of pesticides applied and the circumstances under which the pesticides are applied. DPR issues licenses or certificates to:

- People and businesses that apply pesticides.
- Pesticide dealers and brokers.
- People who advise on agricultural pesticide applications.
- Pesticide applicators who use or supervise the use of restricted pesticides on property they do not own or lease.

Pest control advisers, businesses, aircraft pilots and certain structural pest control licensees and businesses must register with the CAC in each county in which they work. The law provides the CAC may revoke for cause any registration to work in that county.

DPR's Licensing and Certification Program does not license individuals or businesses that practice vector control or structural pest control. The state Department of Public Health oversees local vector control. The Structural Pest Control Board (See Chapter 1) issues licenses to structural pest control field representatives and operatives who make inspections, present bids, and contract for work for their companies.

Types of licenses and certificates

DPR's Licensing and Certification Program issues four types of business licenses:

- **Pest control business.** For businesses that engage in pest control for hire.
- **Pest control dealer.** For pesticide retailers who sell agricultural-use or dual-use products to users; those who sell any method or device for the control of agricultural pests, such as biological control agents, lures or insect-trapping devices; those who solicit sales of pesticides by making agricultural-use recommendations through field representatives or other agents; and those who sell restricted pesticides to users.
- **Pesticide broker license.** Required by any person who first sells or distributes

pesticides in California (except persons already licensed as pest control dealers, or registrants selling their own products). This license does not allow the sale of agricultural use or restricted pesticides to end-users.

- **Maintenance gardener pest control business.** For maintenance gardening businesses that occasionally engage in pest control. (If the primary purpose of the business is pest control, a maintenance gardener pest control business license is required.)

The Licensing and Certification Program also issues five types of licenses and certificates to individuals:

- **Agricultural pest control adviser (PCA) license.** Required to offer a recommendation on any agricultural use of pesticides, to sell services as an authority on any agricultural pesticide use, or to solicit services or sales for any agricultural pesticide use.
- **Pest control aircraft pilot certificate.** Required to operate an aircraft for pest control.
- **Pest control dealer designated agent license.** Required to supervise the operations of a licensed pest control dealer. Each licensed pest control dealer must have designated agents at the principal office and each branch location.
- **Qualified applicator certificate (QAC).** Required for government employees and some other categories of workers who apply or supervise the application of restricted pesticides for any purpose or on any property other than that provided by the definition of private applicator (see below); or by maintenance gardeners and some other employees who perform pest control incidental to their job or business (that is, whose primary work is not pest control). QACs cannot supervise the operations of a pest control business (except for maintenance gardener businesses). They are also not allowed to do structural pest control. That requires a license from the Structural Pest Control Board.
- **Qualified applicator license (QAL).** Required to apply or supervise the application of restricted pesticides for any purpose or on any property other than that provided by the definition of private applicator (see below); or by anyone who supervises pesticide applications made by a licensed pest control business.

In 2015, DPR licensed about 31,000 agricultural pesticide applicators, businesses and PCAs, and pesticide dealers and brokers, including about 10,100 QALs and 10,600 QACs.

Although the qualified applicator license and certificate are similar, there are differences in responsibilities. The QAL is the more rigorous of the two. All commercial pest control businesses, except maintenance gardener businesses, must have at least one QAL on staff at each business location to supervise pesticide handlers for the business.

A QAC is usually enough for individuals who work for government agencies or for businesses other than pest control businesses, such as golf courses and schools. For these individuals, as well as for the maintenance gardener businesses, pest control is not the primary reason for their businesses; thus the more rigorous QAL examination is not necessary.

Both QAL and QAC applicants are required to take a laws-and-regulations exam and an exam in one or more of 17 categories of pest control for which the operator wishes to become qualified.

DPR also licenses pest control aircraft pilots. These are pilots (also known as aerial applicators or crop dusters) who apply pesticides by aircraft. Both apprentice and journey-level pilots must pass the licensing examination and maintain an appropriate Federal Aviation Administration (FAA) pilot's license, which includes a medical certification to verify their ability to fly.



Aerial pesticide application near Knight's Landing in 2016.



DPR's product compliance inspectors ensure pesticidal products sold in California comply to state and federal registration laws.

Pest control advisor applicants must have a bachelor's degree in pest management or in an agricultural, biological or natural science that includes specific course material. People with advanced science or pest management degrees do not need specific course material to apply to be a PCA. In addition, individuals without a college degree may apply if they have enough work experience and have taken specific college courses.

Business and individual licenses and certificates are issued for two years. Individual licenses and certificates cannot be renewed unless the holder has completed certain minimum Continuing Education (CE) hours related to pesticides or pest management within each license or certificate period. All courses must be approved by DPR. CE courses are typically offered by applicator associations or third-party vendors. CACs also present some courses.

Private applicator certificates

Private applicator certificates are required for people who use or supervise the use of restricted pesticides on property owned or leased by the applicator or the applicator's employer. Until 1996, applicators could receive their certification from a CAC by applying for and being granted a restricted materials permit. SB 800 (Chapter 705, Statutes of 1995) created a separate system and set minimum standards for certifying private applicators. Under the bill, CACs conduct examinations before issuing a private applicator certificate.

The new law required DPR to develop the exam to test the applicant's knowledge of pesticide use, including label directions and restrictions on use; pest control equipment; pest problems and identification; worker protection; and environmentally sensitive areas.

Private applicator certificates are issued for three years. CACs can revoke a certificate based on failure to comply with laws governing the safe use of pesticides.

PRODUCT COMPLIANCE

Product enforcement began with a pesticide product quality program in 1911, when truth-in-labeling laws were in their infancy and adulteration and misrepresentation of products were common. A 1935 department description of the program was to prove appropriate for many years to come:

The work includes the inspection, sampling, and analyzing of all substances under (department) supervision. Many thousands of inspections take place on dealers' shelves, in warehouses, and frequently in the hands of actual purchasers or users in order to determine whether all materials are registered and properly labeled. Official sampling of registered materials is carried on throughout the state. These samples are analyzed and, if the results do not conform to the guarantee, the registrant is dealt with according to the provisions of the California statutes. ...

Over the decades that followed, modern manufacturing techniques lessened and then almost eliminated product adulteration and contamination. As a result, in the 1990s, DPR reduced its product testing while maintaining a focus on compliance with registration and labeling requirements.

In 2004, DPR consolidated product compliance activities by merging its Audits Branch with compliance staff from other branches to create the Product Compliance Branch. In February 2017, the Inspections Unit was moved to the Enforcement Branch. Mill Collection and Disbursement, as well as the Product Compliance Auditors, were moved into the ASD under the Fiscal, Audits and Business Services Branch.

Inspection and compliance activities

To ensure that pesticide products used in California are registered by DPR and the

U.S. Environmental Protection Agency (U.S. EPA), Product Compliance Inspections Unit staff perform inspection and compliance activities under both the state program and as part of DPR's cooperative enforcement agreement with U.S. EPA. Inspections include those conducted at pesticide-producing establishments, and retail and wholesale sites.

DPR conducts establishment inspections under federal authority at facilities where pesticide products are manufactured, prepared, processed, packaged, repackaged, labeled or relabeled. DPR may also conduct these establishment inspections at locations where registrants keep their records.

Most inspections are marketplace surveillance to ensure compliance with product registration, formulation, packaging and labeling requirements. Sampling sites include government agencies; retail and wholesale nurseries, hardware, home-and-garden centers; landscape material suppliers; agricultural chemical dealers; feed, farm and pet stores; and beauty and barber suppliers. Inspectors also check medical, dental and veterinary suppliers; industrial and institutional suppliers; restaurant and hospital suppliers; grocery and drugstores; pool and spa centers; marine supply dealers; and any other place that sells pesticides.

To ensure that products in the channels of trade are in compliance with state and federal pesticide laws, field staff inspect products offered for sale by reviewing labels to ensure they are registered. Staff also check that product labels are the same as those approved by DPR, for example, to ensure that there are no changes to product names, claims or uses, or changes to precautionary statements that mitigate environmental and health hazards. Violations are enforced by DPR's Office of Legal Affairs.

Pesticide product samples collected during establishment or marketplace inspections may be submitted to the California Department of Food and Agriculture's Center for Analytical Chemistry for analysis. The lab compares the percent of active ingredient in the container with the formulation declared on the label and checks for possible product contamination. Many products contain more than one active ingredient and each individual component is reviewed. When analysis reveals that a pesticide product is deficient in ingredient or otherwise varies from the ingredient statement shown on its label, DPR may bring an enforcement action for adulteration or misbranding of the product.

Product compliance auditors audit pesticide sellers throughout the country who ship or sell their products into California. Audits are designed to determine if the pesticides are registered, to verify sales and to document that mill assessments have been paid. If mill assessments were unpaid, sellers must pay any money and a late fee, and are subject to civil penalties. They cannot continue selling their product unless they get it registered in California. (*See Chapter 13 for more information on the mill assessment.*) Violations are prosecuted by DPR's Office of Legal Affairs.

In the mid-2000s, product compliance auditors found significant gaps in reporting of certain types of pesticide transactions, including Internet sales of industrial, institutional and consumer-use pesticides, sales by intermediate brokers, and sales through the distribution centers of nationwide retailers. Auditors discovered that shortcomings in state law led to underreporting of pesticide sales and underpayment of fees.

As a result, DPR sponsored legislation in 2005. The goal was to promote a safe, fair and equitable marketplace by ensuring only California-registered products are sold in the state and that fees levied on pesticides are paid on all sales. The legislation (Chapter 612, Statutes of 2005, AB 1011) expanded broker licensing to encompass all those (other than registrants) who first sell or distribute any pesticides into or within California, whether agricultural or nonagricultural products. Previously, the law required that only sellers of agricultural pesticides be licensed with DPR.



Lab equipment at the CDFA Center for Analytical Chemistry in Sacramento.



Product registration by the numbers:

- **1,200: new products registered in 2015.**
- **2,300: amendments to registered products.**
- **4,000-5,000: registration submissions per year processed by the Pesticide Registration Branch.**
- **13,600: Number of registered products as of the summer of 2016.**
- **1,050: Active ingredients registered in California.**

Pesticide Registration

The Department of Pesticide Regulation (DPR) performs a scientific evaluation of the ingredients of a pesticide product; the proposed site or crop on which it is to be used; the amount, frequency and timing of use; and its potential effects on human health and the environment. This evaluation is called the pesticide registration process.

THE PESTICIDE REGISTRATION PROCESS

Before a pesticide can be registered (licensed) in California, it must be registered with the U.S. Environmental Protection Agency (U.S. EPA). After receiving an application for registration, DPR evaluates the product thoroughly under guidelines of the Food and Agricultural Code (FAC) to ensure that it is effective and will not harm human health or the environment when used according to label directions.

DPR scientists review the pesticide product label and scientific data and must find it acceptable before the product can be registered. The product must be labeled properly and found suitable for its intended use. Pesticides that pass this scientific, legal and administrative process are granted registration that allows their distribution, sale and use in California. A small subset of low-risk pesticides are granted an exemption from registration if they meet certain criteria. (*See 25(b) Exemptions on Page 33*).

A registrant is a business or individual that holds the certification of registration and is therefore responsible for the product. A registrant can be a chemical company, government agency, importer or any person wishing to market a pesticide product in California. It may include manufacturers of technical-grade pesticidal chemicals used to prepare end-use products. It also includes formulators who prepare the end-use products, and distributors who put their own labels on pesticide products purchased from formulators. The registrant's name and address must appear on the product label.

Several DPR branches take part in the preregistration scientific evaluation. Their role is to ensure that, when a product is used under the restrictions and protective measures on the U.S. EPA-registered label, it will cause no harm (that is, significant adverse effect) on human health, non-target organisms or the environment. The Pesticide Registration Branch coordinates this process and serves as liaison to registrants.

Pesticides are substances or mixtures of substances intended for preventing, destroying, repelling or mitigating any pest. Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, antimicrobials, and various other substances used to control pests. (*See Page 24, What is a Pesticide?*). The active ingredient is the chemical or substance component of a pesticide product that can kill, repel, attract, mitigate or control a pest or the chemical that acts as a plant growth regulator, desiccant or nitrogen stabilizer. In addition to the active ingredient(s), a formulated pesticide product consists of one or more inert ingredients, such as water, solvents, emulsifiers, surfactants, clay and propellants. While these other ingredients may be chemically or biologically active (and therefore not inert), they are included in the product for reasons other than pesticidal activity. Pesticides are regulated to control the effect of both the active ingredient and inert ingredients in the formulated product.

The law requires prospective registrants to send DPR data on potential human health and environmental effects associated with use of their product, including:

- Product composition and chemistry.
- Acute and chronic toxicity—that is, the capacity of the chemical to harm humans either in limited (acute) or long-term (chronic) exposures.
- How the pesticide behaves in the environment.
- Effectiveness against targeted pests (efficacy).
- Hazards to non-target organisms.
- Effects on fish and wildlife.
- Worker exposure.

The Registration Branch manages the pesticide data studies collection. Staff catalog and maintain data received from pesticide registrants. In 2016, the Registration Resource Center housed more than 85,900 volumes of data containing about 237,000 studies. This includes studies that have been submitted to U.S. EPA, additional efficacy, safety and environmental data required by DPR, and registration-related correspondence and evaluation memoranda.

The Registration Resource Center also maintains all product files for pesticides registered in California, including Section 24(c) (Special Local Needs registrations) and Section 18 (Emergency Exemptions from registration) files. Only authorized persons may directly access these files since they contain proprietary information—primarily formulas of pesticide products, which are considered confidential business information under federal law. The Registration Resource Center responds to requests for non-confidential information from the public, registrants, county agricultural commissioners, DPR staff, Poison Control Centers, the Legislature and other government agencies.

CATEGORIES OF PESTICIDES

DPR registers the following categories of pesticides:

- **Conventional pesticides.**
- **Biochemicals and microbials (biopesticides).** Biochemical pesticides are naturally occurring substances that control pests by a mechanism other than toxicity—for example, sex pheromones used as mating disrupters for insect pests. A microbial pesticide is one in which the active ingredient is a living pathogen (for example, a bacterium) that infects a pest and then kills or inhibits it.
- **Antimicrobial pesticides.** These are substances or mixtures of substances used to destroy or suppress the growth of harmful microorganisms such as bacteria, viruses or fungi on inanimate objects and surfaces.
- **Spray adjuvants.** California law requires registration of adjuvants, which are not considered pesticides under federal law. (An adjuvant is broadly defined as any non-pesticide material used with a pesticide product or pesticide spray mixture to improve the pesticide’s performance or the physical properties of the spray mixture.)
- **Plant growth regulators.** These are substances that accelerate or slow the rate of growth or maturation of a plant, or otherwise alter behavior through physiological action.

Although all pesticides are regulated under the same state statutory standards, the different categories pose different levels of risk and exposure. As a result, antimicrobial, biochemical and microbial pesticides are subject to fewer data requirements for registration than conventional chemicals. Data requirements for



The Registration Resource Center contains nearly 86,000 volumes of information about registered pesticides.

What Is a Pesticide?

Under state and federal law, a pesticide is any substance intended to control, destroy, repel, or otherwise mitigate a pest. Any organism that causes damage or economic loss, or transmits or produces disease, may be the target pest. Pests can be insects or animals (e.g. mice), unwanted plants (weeds) or organisms that cause plant diseases. In addition, state and federal laws consider products to be pesticides if they regulate plant growth, cause plants to drop their leaves or dry plant tissue.

Therefore, the word “pesticide” is an umbrella term that includes many kinds of chemicals—not only insecticides, herbicides and other agricultural and lawn-and-garden chemicals, but also many industrial, institutional and home-cleaning products, such as algaecides (used to control algae in swimming pools and water bodies), disinfectants, sanitizers, mildew removers and insect repellents.

California also regulates adjuvants as pesticides. This class of chemicals, exempt from federal registration, must be registered in California. Adjuvants are emulsifiers, spreaders, water modifiers and other compounds added to improve the effectiveness of a pesticide.

Many products, ranging from toothbrushes to children’s toys, are treated with antimicrobial pesticides to get rid of bacteria. The antimicrobial pesticides are usually added to the product during manufacture (for example, plastic shower curtains) but may be added afterwards (for example, mixing a mold-preventing pesticide into paint). If a treated product

makes public health claims—that is, it claims to “fight germs” or “control fungus”—the article must be registered as a pesticide. If no public health claims are made, the product is exempt from federal or state regulation. However, the product label must make clear that the benefits of pesticide treatment do not extend beyond the article itself.

Some products, while considered pesticides, are exempt from the registration process in California. These include certain products that contain low-risk ingredients, such as garlic and cedar; as well as plant-incorporated protectants, which are pesticidal substances produced by genetically modified plants.

Excluded from California’s definition of pesticides are:

- Over-the-counter and prescription treatments for head lice, which are regulated by the U.S. Food and Drug Administration.
- Cosmetics and similar products intended to be applied to the human body, including antibacterial soaps and lotions, and antifungal creams. (Insect repellents applied to the human body, however, are pesticides).
- Fertilizers, nutrients and other substances used to promote plant survival and health.
- Biological control agents, except for certain microorganisms. (Biological control agents include beneficial predators such as birds or ladybugs that eat insect pests).

antimicrobial pesticides and biopesticides are organized into a tier-testing system with specified extra studies at higher tiers required if unreasonable adverse effects are seen in lower-tier studies. The lower-tier studies are a subset of those required for conventional pesticides and the studies overall are generally selected from those required for conventional pesticides. Examples of lower-tier studies are acute toxicity, developmental toxicology, mutagenicity, efficacy, and effects on fish and wildlife. Proposed uses on food generally require more studies than nonfood uses.

DATA EVALUATION

DPR scientists review toxicology and other studies from the registrant for adequacy and potential adverse effects. If scientists conclude there are potential adverse health effects, they study the pesticide's risk potential and prepare a risk evaluation. If the pesticide is a new active ingredient (that is, never registered in California), it is prioritized for risk assessment. (*See Chapter 5 for more information on risk assessment.*)

In addition, DPR scientists with expertise in chemistry, microbiology, plant physiology, pest and disease prevention, ecotoxicology, or environmental fate review data to determine the effects of pesticides on target pests and non-target effects (that is, effects on species not considered the target pest). The latter includes:

- Non-target effects on plants (phytotoxicity).
- Ecotoxicology.
- Effects on endangered species.
- Effects on the environment, including soil, ground and surface water.
- Pest protection (entomology).
- Plant pathology.
- Harmful effects on integrated pest management (IPM) systems.

Included is a review to ensure that product residues on harvested commodities will not exceed legal limits (tolerances set by U.S. EPA) when the pesticide is used according to label directions.

DPR scientists also review product labels to ensure:

- They comply with U.S. EPA labeling standards and clarity.
- They accurately reflect human health hazards suggested by toxicology data.
- They accurately reflect environmental hazards suggested by environmental data.
- The label requirements are practical and can be enforced in the field.
- Use instructions are adequate to protect pesticide users and others from over-exposure.

If any changes to the label are necessary, DPR staff work with the registrant and U.S. EPA to recommend revisions that will satisfy California's health or environmental concerns. According to federal law, pesticide label language is controlled exclusively by U.S. EPA, which must approve any changes. A state cannot require manufacturers to change labels. However, states can refuse to allow registration and therefore the possession, sale or use of any pesticide not meeting its own standards.

DPR also consults with other public agencies on proposed pesticide registrations and, more broadly, on regulatory policies through routine daily contacts



Scientific studies submitted to support an application for registration of a pesticide product.



The Pesticide Registration and Evaluation Committee meets at least every other month at the CalEPA building in Sacramento.

and, more formally, through its Pesticide Registration and Evaluation Committee (PREC). Chaired by the Registration Branch chief, the PREC usually meets every two months. It brings together public agencies that have legal jurisdiction on pesticides or whose activities or resources may be affected by use of pesticides. (In 2000, the department's Pesticide Advisory Committee, whose role overlapped that of the PREC, was merged with the latter committee.)

The PREC includes representatives of the state Departments of Public Health, Food and Agriculture, Industrial Relations, CalRecycle, and Fish and Wildlife; the Structural Pest Control Board; CalEPA's Office of Environmental Health Hazard Assessment (OEHHA), State Water Resources Control Board, Air Resources Board, and Department of Toxic Substances Control; the University of California, Department of Environmental Toxicology; U.S. EPA, Region 9; University of California, Department of Environmental Toxicology, IR-4 Program; and the California Agricultural Commissioners and Sealers Association. The PREC advises DPR on regulatory development and reform initiatives, public policy and program implementation, and science issues associated with evaluating and reducing risks from the use of pesticides. It fulfills a critical interagency consultation role mandated by DPR's certified regulatory program under the California Environmental Quality Act (CEQA).

Once reviews by DPR scientists and technical specialists are complete, DPR management decides whether to propose product registration or deny the application. Under law, denial of registration must be based on:

- Serious uncontrollable adverse effects on the environment.
- Greater harm than benefit to the environment.
- Harm to vegetation, domestic animals, or public health and safety.
- Uses considered to have little or no value.

If any reviewing DPR branch recommends against registration because of inadequate data, unacceptable studies or unmitigated adverse effects, DPR will not register the product until these questions are resolved and concerns raised by other state agencies are considered. DPR posts proposed decisions to register or deny applications weekly, beginning a 30-day period for public comment.

Before the decision can be finalized, DPR responds to public comments. Should DPR decide to proceed with registration, it issues a license for product sale and use to the registrant.

DIFFERENCES BETWEEN STATE AND FEDERAL REGISTRATION PROCESS

While California's pesticide registration parallels its federal counterpart in most respects, there are differences in application. For example, DPR and U.S. EPA may review the same group of toxicology studies sent with an application for registration. However, they may rely on different studies from the data package to reach a registration decision. Often, the two agencies reach the same conclusion. Sometimes, the conclusions differ, in part because DPR focuses on California-specific effects. For example, DPR may refuse to register a product because of potential effects on workers in California's labor-intensive agriculture.

U.S. EPA has broad authority to waive submission of some studies or to not complete data evaluations before granting conditional registrations. DPR's authority to grant conditional registration is more limited. For example, if a registrant submits preliminary efficacy data indicating that the product is effective for its proposed use, DPR may conditionally register the product for a limited period to allow the registrant to complete and submit final efficacy studies. However, if the product contains a new active ingredient, in most instances, the department

is precluded from conditionally registering the product unless the registrant has submitted a complete toxicology data package that has been reviewed by DPR scientists.

Further, DPR may require more or different studies not required by U.S. EPA. These added studies include, but are not limited to, data on worker exposure, foliar residue, indoor exposure potential, hazards to bees, and dust hazard of powdered products to workers.

There are also significant differences in how U.S. EPA and DPR consider data. In California, more than 350 different kinds of specialty crops are grown, including fruits, nuts, vegetables and horticultural crops. Most are considered “minor-use crops” for pesticides and are high in harvested value but planted on relatively small acreage compared to field crops such as corn, soybeans and wheat. These uses are not always economically attractive to the pesticide industry because the amount of pesticides sold is limited while the costs to obtain and maintain registration are substantial. Because of the state’s cropping patterns, DPR focuses more resources than U.S. EPA on these minor uses.

Field crops also require little cultural care during the growing season and are primarily harvested mechanically by tractor workers in enclosed cabs. On the other hand, California’s fruit, vegetable and horticultural crops require extensive cultural care before harvest and are harvested by hand. These activities typically result in high worker contact with foliage. (The U.S. Department of Labor’s National Agricultural Worker Survey estimates that a little more than a third of all farmworkers in the U.S. work in California agriculture. That would translate to roughly 648,000 individuals working on California farms each year.)

DPR gives specific attention to how a pesticide will be used under California climatic and cultural conditions. Some crops, such as rice, may be grown with different water and land management practices in California than in other areas of the country. California agriculture is irrigated, changing how pesticides are applied and how workers (irrigators moving pipe, for example) are exposed. For example, DPR field studies have found that pesticides that may decay rapidly elsewhere under warm, humid conditions in summer can persist longer under the hot, dry conditions typical of many of California’s agricultural areas. Algaecides and other pesticides used in swimming pools must reflect the outdoor, year-round use typical in many areas of the state.

California is also unique in that tens of thousands of its residents live in homes near the nation’s most intensively farmed acreage. The effect of pesticide use at this agricultural-urban boundary is a key evaluation factor in California. DPR, for example, has traditionally placed more emphasis than U.S. EPA on evaluating the potential for off-site movement of pesticides, and on taking steps to prevent it.

DPR sometimes denies registration to products approved by U.S. EPA. DPR has based denials on such factors as a lack of appropriate or acceptable toxicology or environmental data or an inadequate margin of safety under the label instructions. DPR has also denied state registration for federally registered products that could not show reasonable effectiveness under California conditions or which did not meet labeling claims.

Another difference between the U.S. EPA and DPR registration process is that federal pesticide law (the Federal Insecticide, Fungicide and Rodenticide Act, FIFRA) requires U.S. EPA to balance risk considerations with economic benefits. During registration and, more formally, during cancellation proceedings, U.S. EPA must determine not only whether there are “unreasonable adverse effects on the environment,” but must also consider the “economic, social, and environmental costs and benefits of the use of any pesticide.” The risk-benefit provisions of FIFRA were modified in 1996 to ensure health-based safety standards for dietary residues. However, federal law mandates U.S. EPA consider economic benefits of pesticides.



DPR scientists consider the effects of pesticide use near agricultural-urban boundaries when making registration decisions.



Pesticide products can be conditionally registered, before a full unqualified registration is granted, if health and environmental studies are completed and there is “a clear need for the use of the product in California.”

California law does not allow consideration of economic benefits unless it is not possible to mitigate any significant adverse effects, and there is no feasible alternative that would substantially reduce any significant adverse effect. Only then may DPR consider registration if the benefits clearly outweigh the risks. The department has never used this discretion. Instead, it has followed clear, legal mandates to ensure that pesticide use in the state poses no significant risk to the public, farmworkers and the state’s environment and wildlife. The basic decision rule is that DPR may approve a pesticide registration application or, if already registered, allow continued use, if it decides the pesticide can be used safely according to label directions and any DPR regulatory and permitting requirements. DPR can adopt regulations to place an active ingredient on the state’s restricted material list. Restricted materials require a permit from the county agricultural commissioner, who has broad discretion to impose site-specific control measures based on local conditions. DPR recommends conditions to be included in the permits.

CONDITIONAL AND INTERIM REGISTRATIONS

DPR may conditionally approve an application for registration if it determines that, while a registration decision can be made, further data from the registrant are needed for an unconditional registration. All required health and environmental studies must be submitted (although certain mandatory health-effects data can be waived after consultation with Office of Environmental Health Hazard Assessment). The data already on file with DPR must substantiate that use of the pesticide is not expected to cause any significant effect on health or the environment while the rest of the data are being developed.

Evidence is also needed that there is “a clear need for the use of the product in California.” Studies that are deferred are typically supplemental requirements such as final efficacy data and storage stability. Registrants must report yearly on progress made toward development of waived data. Conditional registrations are limited to no more than three years.

Legislation in 1993 (Chapter 963, AB 771) set up an interim registration that allowed DPR to defer certain data requirements for federally registered pesticides that meet specified criteria. DPR can defer efficacy data and some environmental fate studies if the Pest Management and Licensing Branch confirms the product would reduce risks when used in a pest management system. The product must reduce risks to workers, public health or the environment, lessen the risk of pest resistance problems, or reduce a substantial risk of economic loss as a result of a pest infestation for which there is no other feasible control. The registrant must agree to produce the required data within three years and DPR must consult with the PREC before approving the application. DPR charges a \$5,000 fee to cover added costs. If granted, uses are limited to those within a pest management system. DPR may require extra controls, such as a restricted material permit or a written recommendation from a pest control adviser, or a limitation on the application location, amount or method. Interim registration has seldom been requested by registrants.

Another type of provisional registration was established by 1995 legislation (SB 283, Chapter 608¹). It allows DPR to issue a certificate of emergency registration to products that previously had been used in California under a Section 18 emergency exemption (*see Page 34 for a discussion on Section 18 registration*) and which have since been granted federal registration. As of 2016, there had been no instances when DPR used a certificate of emergency registration as allowed by SB 283.

¹ *Appendix A lists this and other statutes noted in this chapter and shows the related code section it amended or added. Statutes and related code sections that have been deleted or superseded by later legislation have been omitted.*

ADVERSE EFFECTS DISCLOSURE

Adverse effects reports are an important supplement to the data generated by registrants in support of registration. If a registrant has additional information on an adverse effect or risk of a pesticide to human health or the environment during the registration process or at any time after, the registrant must immediately report that to DPR. At a minimum, the registrant must submit all of the information required to be sent to U.S. EPA under parallel provisions of FIFRA Section 6(a)(2).

This information may come in the form of studies that the registrant undertakes or learns about, or reports of incidents of adverse effects resulting from the use of pesticide products. Adverse effects may include product defects, lack of product efficacy or exposure incidents where individuals become ill or die from pesticide exposure. Thus, this reporting requirement provides an after-the-fact check on registration decisions.

No proof of a cause-and-effect relationship is required for an incident to be reportable because both U.S. EPA and DPR primarily use the reports to look for patterns of concern. Adverse effects information may lead DPR to request additional information from registrants and, in some cases, reevaluate uses of a pesticide. As a result, DPR may impose additional restrictions or even cancel the registration of the pesticide. (*See Chapter 4 for more information on continuous evaluation and reevaluation.*)

Each application for registration renewal must include a statement that the applicant has complied with adverse effects disclosure requirements.

SUSPENSION AND CANCELLATION

DPR can take action to suspend or cancel a pesticide registration if it determines that existing risks related to use of the pesticide are unacceptable and registrants either have not or cannot make necessary changes to address the unacceptable risks. DPR can also cancel a product registration when a registrant fails to submit required data for a product in reevaluation or when a registrant “repeatedly violates” provisions of the Food and Agriculture Code.

In all instances, the registrant can request a hearing. The product may be sold and distributed until DPR makes a final decision on cancellation. If no hearing is requested, DPR cancels the registration of the product or products. Once a registration is canceled, the registrant can no longer sell the product. DPR has authority to allow continued retail sales of products in the channels of trade for a specified period. If acquired when registered, or when sales were allowed, personal use of cancelled products in the possession of an individual is allowed indefinitely.

A suspension is an immediate ban on the sale and use of a pesticide product. DPR may suspend the registration of a product when it determines the “use or continued use of a pesticide constitutes an immediate substantial danger to persons or to the environment.” The suspension must be followed within 10 days by an action to cancel the registration or the suspension is lifted. DPR must conduct a hearing before making a final decision on cancellation.

Registrants may also request to voluntarily cancel the registration of a product or amend the registration to delete selected uses. Requesting voluntary cancellation sometimes reflects a registrant’s conclusion that the cost of producing more studies required by DPR is not worth the expected return from sales. When a registrant voluntarily cancels a registration, retail sales of the product in the channels of trade in California may continue for two years. Use of voluntarily cancelled products already in the possession of an individual is allowed indefinitely.



Whether a substance is a pesticide and under the jurisdiction of that law depends not only upon the nature of the substance and the information on the label, but also upon intended uses and upon printed, written, or oral claims. For example, petroleum oil sold for use solely as a fuel or lubricant is not a pesticide, but the same material is a pesticide when sold or intended for application to plants to control scale insects, or as a spray to control weeds, or for application to ponds to control mosquitoes.

— 1944 department annual report



While this department does not permit experimentation with new materials by allowing unproven materials to be sold to growers or users, it does not wish to offer any obstacle to the development of such materials.

— 1944 California Department of Agriculture annual report

STREAMLINING REGISTRATION

The process of evaluating and registering pesticide products is complex, involving interaction of several DPR branches and thousands of individuals and businesses. This core business activity is therefore a natural focus of process improvement efforts that DPR began in the early 1990s and, building on early successes, continued well into the next decade.

Among the conclusions of a 1993 study DPR commissioned of its registration process (*Challenge and Change: A Progressive Approach to Pesticide Regulation in California*) was that the department could expedite registration of reduced-risk products by greater coordination with U.S. EPA. In 1994, DPR and U.S. EPA began a “harmonization” project to more closely coordinate their registration processes. The goals were to reduce needless duplication, develop complementary, specialized expertise tailored to the capabilities of each agency, get reduced-risk products to market faster, and more quickly remove products from use that posed unacceptable risks.

A first step was to try to bridge the methodologies followed in reviewing registration actions. Beyond agreeing on acute toxicity reviews, however, this aspect of harmonization proved impractical. Beginning in 1999, DPR and U.S. EPA began a more structured “workshare” partnership to collaborate on specific product registrations. Included were three major elements: concurrent review, joint data review, and tolerance review for the fruit, nut, vegetable and horticultural crops that comprise the core of California’s agricultural economy.

With concurrent review, DPR and U.S. EPA share data evaluations to reduce time needed to evaluate applications for registration. When conducting joint data review, the two agencies split the workload of evaluating data for a reduced-risk pesticide. The final workshare element is conducted with a third partner, the Interregional Research Project No. 4 (IR-4), a U.S. Department of Agriculture program that helps develop and register pesticides for minor crops. IR-4 develops pesticide residue data needed for pesticides to be used on California crops. DPR scientists review the data; these reviews help U.S. EPA set allowable residue levels on fresh produce, expediting minor-use registrations.

The 1993 Challenge and Change report also recommended that DPR focus on getting lower-risk products registered more quickly. In 1993, DPR began accepting applications for registration of products containing new microbial and biochemical active ingredients concurrently with their application to U.S. EPA. Before that time, a pesticide had to be registered federally before a company could apply to register it in California. In 1994, “to encourage the use of pesticides that are expected to pose reduced risk compared to alternative pesticides,” DPR began accepting concurrent applications for products containing new active ingredients U.S. EPA classified as “reduced risk.” In 1996, DPR expanded the concurrent-application program to include products containing biochemicals, microbials and U.S. EPA-designated reduced-risk active ingredients already in other California-registered products.

With the 1997 passage of SB 464 (Chapter 428), DPR began accepting new human health and public health antimicrobials concurrently. However, because of budgetary constraints between 2002 and 2005, DPR suspended most programs to accept concurrent registration applications. The two exceptions are products containing new active ingredients and new human health and public health antimicrobials. In 2016, these applications could still be submitted concurrently.

The department used recommendations in the Challenge and Change report, those of registrants and its own review of registration to make changes that reduced significantly the time needed for product approval, without altering California’s safeguards. For example, in the 1990s, DPR made data review procedures more efficient and prioritized risk assessments to provide a more effective process for new, reduced-risk active ingredients. In 1999, working to remove bureaucratic

requirements that were not necessary to protect health and the environment, DPR began waiving the submission of some human health effects data and all data on fish and wildlife effects for certain low-risk pheromone products. In 2000, DPR adopted regulations exempting certain kinds of minimum-risk pesticides from registration, paralleling an earlier U.S. EPA action. Most exempt chemicals are low-risk substances that have a wide range of other, nonpesticidal uses as foods, medicines or household items.

In 2004, DPR also updated policies to no longer require submission of residue data with applications for registration, although the department can still request it. To improve tolerance-setting, DPR also worked with U.S. EPA, Health Canada and the European Union to develop a standardized statistical method for establishing tolerances.

The 2005 passage of AB 1011 (Chapter 612) removed a requirement that had essentially forced DPR to be the arbiter of business disputes over use of scientific data to support new registrations. Such disputes could delay registration actions for years. The bill created a California data-protection and cost-sharing system similar to the federal system.

Before the passage of AB 1011, DPR was prohibited from considering data sent by one company to evaluate another company's application to register a pesticide product or amend a registration without a letter of authorization from the company that originally sent the data. Data-generating companies could essentially keep competitors out of the California market by refusing to grant a letter of authorization. Many small companies could not afford to produce the required data themselves. AB 1011 did not change any of DPR's comprehensive requirements for health, safety and environmental data. However, with its passage, DPR could consider all data on file, regardless of the source. The legislation also authorized DPR to use previous evaluations of pesticide products when evaluating new registrations and label amendments.

The letter of authorization was replaced with data cost-sharing that is the responsibility of the applicant and data owners and does not involve DPR.

Applicants may still submit their own data in support of a registration application. If the applicant does not do so and wants DPR to instead use another company's data to support its registration application, the applicant may be required to offer to pay the data owner a share of the cost of producing the data. If the two parties cannot reach an agreement on the terms and amount of payment within 90 days after issuance of an irrevocable offer to pay, the applicant, source or data owner may begin or, with the consent of all parties, join a binding dispute resolution proceeding described in federal rules. If one of the parties fails to make an offer to pay or to take part in the proceeding to resolve disputes over the required offer to pay, they may ask DPR for a determination. If, after investigation, DPR finds a registrant has failed to make an offer to pay, to take part in the proceeding to resolve disputes, or to comply with an agreement, the department will cancel the registration of the product the data were used to support.

The new system resulted in a reduction in the number of applications for registration requiring scientific evaluation as well as a decrease in the average time that it takes DPR to process regular submissions from receipt to final action. Eliminating the need for DPR to evaluate duplicative data helped reduce the time to process a registration application by more than 25 percent.

The bill made it easier for generic pesticide products (typically lower in cost) to enter the California market. During legislative discussions, this raised concerns that more products containing older, more toxic ingredients would be registered and used. However, a 2009 DPR analysis found that while there was a slight increase in registration of these products, there was no correlation between this increase and the total pounds sold of these compounds.



"A vigilant and careful examination of all agricultural chemicals offered for sale in this State is necessary ..."

— 1946 California Department of Agriculture annual report

require data to assess potential adverse effects to workers, the public or the environment. If there is no applicable residue tolerance for the crop, the RA requires the crop be destroyed after harvest. DPR or the CAC may impose additional use controls to provide closer regulatory control. The CAC must be notified before an RA field trial begins. After the trial is complete, the researcher must send reports to the CAC and DPR.

Effective Jan. 1, 2016, DPR implemented regulatory changes pertaining to research authorizations. The changes included revisions to the forms used for the research authorization program, and revised the notification requirements. The changes were intended to ensure DPR and the CAC's have the necessary information to evaluate pesticides applied under the research authorization program. Researchers must provide the CAC with a copy of the approved research authorization and a notice of the intended pesticide application at least 72 hours prior to applying a pesticide requiring a research authorization, unless the CAC determines a shorter time period is adequate to evaluate the intended pesticide application. The notice of intended application must also include the location of each trial on a plot map, and a map or aerial photograph designating the location and identity of sensitive sites that could be adversely impacted by the pesticide application. The notice of intended application provided to the CAC must also be submitted to DPR at the same time.

EXEMPTIONS FROM REGISTRATION

Sterilants used in medical devices

The 1996 federal Food Quality Protection Act (FQPA) transferred jurisdiction of certain liquid chemical sterilant products used on critical or semicritical medical devices from U.S. EPA to the U.S. Food and Drug Administration. FQPA also exempted these products from registration under FIFRA.

Follow-up California legislation in 1997 (Chapter 530, SB 365) allowed DPR to exempt from state registration any liquid chemical sterilant product intended for use on critical or semicritical medical devices that had been exempted from federal registration.

Section 25(b) exemptions

In 1996, U.S. EPA exempted certain minimum-risk pesticides from registration under FIFRA Section 25(b) if they met specified criteria. State legislation that followed in 1997 (Chapter 691, SB 445) set up a similar category in California. Exempt chemicals are low-risk substances that have a wide range of other, non-pesticidal uses as foods, medicines or household items. They include substances such as garlic, peppermint, rosemary, cedar oil and castor oil.

To qualify for an exemption from registration in California, products must meet minimum requirements:

- The product must have qualified for exemption from federal registration under FIFRA Section 25(b).
- Each active ingredient in the product must be on DPR's list in regulation of exempted pesticides.
- The product must contain only those inert ingredients classified by U.S. EPA as "inert ingredients of minimal concern."
- All ingredients (both active and inert) must be listed on the label. The active ingredients must be listed by name and percentage by weight. Each inert ingredient must be listed by name.
- The label cannot include any false or misleading statements.



Some low-risk substances used as pesticides are exempt from registration requirements.

Comparing Section 18 and 24(c) Exemptions

| Section 18 | Section 24(c) Special Local Need |
|---|---|
| No tolerance yet established. U.S. EPA will establish a time-limited tolerance. | Tolerance or exemption already established. |
| For limited use to treat sudden and limited emergency pest infestations. | To meet a special local need (which may be a region of the state or the whole state). |
| Emergency situation must be well-documented and not a historical pest problem. Economics and lack of alternatives must be verified. | Justification and lack of alternatives must be documented. |
| Can be used during the 30-day public comment period. | Must be posted for a 30-day public comment period before use is allowed. |
| Request made through DPR and issued after U.S. EPA approval, which includes the use, limitations on acreage and location, and the time-limited tolerance. DPR may issue "crisis" Section 18 after consultation with U.S. EPA. | DPR issues without U.S. EPA review, although U.S. EPA has 90 days to comment. |
| Expiration date not to exceed one year, except quarantine exemptions (up to three years). Renewable if the emergency recurs or persists, although renewal difficult after the third year. | Usually issued without expiration date. May be inactivated by applicant, DPR, or U.S. EPA. |
| Applicant must be third-party (someone other than registrant). | Applicant may be first-party (the registrant) or third-party (someone other than the registrant). |
| Not subject to U.S. EPA maintenance fee. No DPR fee. | Subject to U.S. EPA maintenance fee. No DPR fee. |
| Use requires a restricted materials permit even if the product is not a restricted material. | Use requires a restricted materials permit only if the product is a restricted material. |

- The product labeling may not claim the product controls or mitigates microorganisms in a way that links the microorganism to a threat to human health, including disease-transmitting bacteria or viruses. The label may not claim to control rodent or insect pests in a way that links the pest to specific diseases.

DPR does not review or issue notices of exemption for products that meet the conditions for exemption. Sale of an unregistered pesticide product that meets the exemption criteria is not a violation of state law. However, if an unregistered product does not meet all exemption criteria, sale or distribution would be a violation of the Food and Agricultural Code.

Products exempted from registration under these criteria are not subject to pesticide use reporting or the mill assessment.

SECTION 24(C) AND SECTION 18

Federal law allows special registrations and emergency exemptions from registration under specific circumstances. Under criteria in FIFRA Section 18 (emergency exemptions) and Section 24(c) (special local need, or SLN, registrations), these uses can be approved outside the regular U.S. EPA registration process. Criteria include data to support the use, and justification that no other registered products are available to meet the emergency or special local need. These special registrations and emergency exemptions have limits on use and need special labeling.

A Section 24(c) can be requested either by the manufacturer as a first party, or by a third party such as a grower association. Only a third party such as a grower association or CAC can apply for a Section 18. The supporting documentation and justification for both are supplied by growers, pest control advisers, CACs, universities and other knowledgeable experts.

Section 24(c) of FIFRA allows states to register a new pesticide product not previously registered for any use, or an added use of a federally registered product, as long as there is a demonstrated "special local need" for such a product.

The special local need can be in a region of the state or can cover the entire state. If for a food or feed use, a residue tolerance or exemption from tolerance must already be established for the active ingredient on that commodity. Sometimes a group tolerance for similar kinds of crops is already in place. Residue data to support the proposed use rates and method of application must be available for review. Some reduced-risk active ingredients are exempt from the tolerance requirement.

Before issuing an SLN, states must determine that:

- The use will not cause unreasonable adverse effects on health or the environment if the product's composition is not similar to any federally registered product.
- Its use pattern is not similar to any federally registered use of the same or similar product.
- Other uses of the same or similar products have not been denied, suspended or canceled by U.S. EPA.
- The product does not contain a new active ingredient unregistered by U.S. EPA. Once issued, an SLN remains in effect until withdrawn by the registrant, manufacturer or DPR, or until U.S. EPA cancels the use. DPR issues about 100 SLNs each year.

Section 18 of FIFRA authorizes U.S. EPA to allow an unregistered use of a pesticide for a limited time if it determines that an emergency condition exists. U.S. EPA defines "emergency condition" as an urgent, non-routine situation that requires the use of a pesticide.

Requests are made for pesticides needed for pest problems affecting production of agricultural commodities when there are no alternatives to control the pest. Requests usually involve pesticides that have other approved uses so U.S. EPA and DPR scientists have prior knowledge and understanding of the requested chemical.

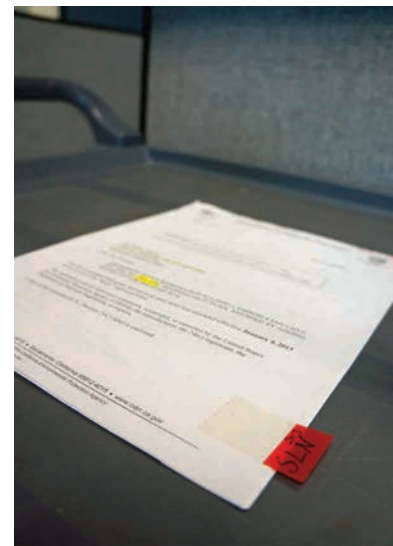
DPR forwards Section 18 requests to U.S. EPA only after a full evaluation and only for situations the department determines meet criteria for an "emergency condition." A chronic pest problem does not qualify as an emergency. The department works closely with commodity groups and other Section 18 applicants to help them develop the information needed to support the application. Significant documentation of the emergency pest problem must accompany a Section 18 request to DPR. This includes details on the nature of the emergency, costs of control, past yields, projected losses, a five-year economic profile for the crop, and evidence of the lack of registered, available alternative pest control practices.

California law requires an evaluation of the impacts of pesticide use on workers and a major focus of DPR's Section 18 review is on the potential effects of the proposed use in the state's labor-intensive agriculture. The request must also include any available residue chemistry data to support a residue tolerance.

If DPR confirms the emergency need and if its scientific review of the residue, chemistry, toxicology, ecotoxicology, phytotoxicity, and efficacy data demonstrates no unacceptable risks, the department forwards the request to U.S. EPA. If U.S. EPA determines the emergency to be valid and the risks are acceptable, it approves the emergency exemption. If the pesticide will be used on food or feed, U.S. EPA will establish a time-limited tolerance to cover any pesticide residues in food that may result.

In California, all uses under a Section 18 emergency exemption require a restricted materials permit from the CAC before purchase and use.

There are four types of Section 18s: specific, quarantine, public health and crisis. Most applications are for specific exemptions. They are requested to avert a significant economic loss, or a significant risk to endangered or threatened species, beneficial organisms or the environment. Growers or agricultural research scientists identify a pest situation that registered pesticides will not control. Specific exemp-



A Special Local Need exemption obtained to treat a fruit fly infestation.



Shirts treated with an antimicrobial pesticide, later removed from store shelves because they were unregistered.

tions may be approved for up to one year.

Quarantine exemptions are requested to control the introduction or spread of an invasive pest species not previously found in the United States. Quarantine exemptions may be authorized for up to three years.

Public health exemptions are requested to control a pest that will cause a significant risk to human health. The emergency is based on the risk to human health from the pest. Public health exemptions may be for up to one year.

Crisis exemptions may be issued only when there is an immediate need for a specific, quarantine or public health exemption and there is not enough time to have U.S. EPA review the request through normal time frames. DPR must receive verbal authorization from U.S. EPA before issuance. U.S. EPA performs a preliminary review to ensure there are no concerns and that the required safety findings can be made. If authorized by U.S. EPA, a state or federal agency may issue a crisis exemption allowing the use for up to 15 days. The applicant may follow with a request for a specific, quarantine or public health emergency exemption. This allows the use to continue until U.S. EPA decides on the corresponding exemption request.

REGISTRATION REQUIREMENTS FOR PRODUCTS MADE OF PESTICIDE IMPREGNATED MATERIALS AND BEARING PESTICIDE CLAIMS

In December 2015, DPR notified stakeholders that each person/company with products made from pesticide-impregnated material sold into or within California under their own company name will require pesticide registration. Products made from pesticide impregnated material may include apparel (e.g. jackets, shirts, hats, socks, pants, shorts) or non-apparel (e.g. bedding, tents, seat covers, chopping blocks, shower curtains, mouse pads) which bear pesticide claims. DPR will require each company to obtain at least one registration for each use category (apparel or non-apparel) of product sold. If impregnated with different pesticides or different percentages of the same pesticide, separate registrations will be required. For additional information on pesticide impregnated materials, see DPR's website: <http://cdpr.ca.gov/docs/registration/canot/2015/ca2015-13.pdf>.

SECOND GENERATION ANTICOAGULANT RODENTICIDES

In 2014, to protect California's wildlife, DPR adopted regulations designating all second generation anticoagulant rodenticides (SGARs) containing the active ingredients brodifacoum, bromadiolone, difenacoum, and difethialone as California restricted materials, adding additional use restrictions, and revising the definition of a private applicator to refer to the federal definition of agricultural commodity found in Title 40 Code of Federal Regulations Section 171.2(5). Effective, July 1, 2014, SGARs could only be sold by licensed pest control dealers and purchased and used by certified applicators. Restricting the sale of SGARs to certified applicators is expected to significantly mitigate exposure to and protect California's non-target wildlife.

In addition, in 2014, Gov. Jerry Brown signed AB 2657 (Chapter 475) prohibiting the use of any anticoagulant pesticide containing the pesticides brodifacoum, bromadiolone, difenacoum, difethialone in any state park, state wildlife refuge, or state conservancy.

REGISTRATION FEES

By law, DPR's pesticide registration process must be funded by pesticide registration and renewal fees. Pesticide registration fees are paid at the time of

application for registration and annual renewal fees are paid at the end of each year. In January 2015, DPR held a public workshop to discuss an increase in registration fees for pesticide products, followed by a notice to stakeholders, and adoption of regulations. The impetus for the fee increase was to address increases in pesticide registration program costs and to fund the Pesticide Registration Data Management System—to convert the paper-based registration process into an electronic registration process. Effective Oct. 1, 2015, DPR adopted regulations to increase the application fees for pesticide registration from \$750 to \$1,150 per product. DPR also amended regulations to set an application fee of \$25 for all amendments to currently registered products. The amendment fee applies to all types of amendments, including substantive and non-substantive label amendments, amendments to the formulation of pesticide products, notification of minor changes, and label changes required by the U.S. EPA or any other federal or state agency.

POLLINATOR PROTECTION

DPR is at the national forefront of the effort to protect bee health, taking proactive steps and a scientific approach to address concerns about the impact of pesticides on bees and pollinators health.

In 2009, DPR initiated the reevaluation of certain pesticide products containing four neonicotinoid chemicals: imidacloprid, thiamethoxam, clothianidin, and dinotefuran. Reevaluation is the legal mechanism that allows DPR to require the companies who have registered products for use in California to conduct tests and submit data for analysis by DPR scientists. The purpose of the reevaluation process is to provide DPR with a better understanding of the effects of neonicotinoids use on pollinators and provide a credible scientific basis for potential regulatory action to eliminate any significant impact resulting from their use on bee health.

DPR partnered with scientists at the U.S. EPA's Office of Pesticide Programs and Health Canada's Pest Management Regulatory Agency (PMRA) to ensure that the required studies, and methods and procedures used to conduct studies on the effects of neonicotinoids provide useful and reliable information across the board to all three agencies for use in guiding their regulatory actions. A unified approach across jurisdictions is critical as bees and beekeepers are not limited by state borders, nor are their importance to agriculture and society.

A considerable volume of scientific research has been required to be conducted in specified ways as designed by DPR or in collaboration with its partners to elicit the most important and useful data for regulatory purposes. Much of this data has been submitted and evaluated. However, there is more work to be done in order to ensure that any actions taken actually address the perceived decline in bee health.

Each of the four neonicotinoid pesticides have different application rates for specific crops, requiring a substantial number of studies to understand the impact of the different pesticides using the application methods used for each crop group. Studies were required for each of the four neonicotinoids as used in the most relevant representative situations to determine the level of residue that remains in the pollen, nectar, and leaves of plants after multiple applications – residue if found in high enough levels, could result in lethal exposure to adult pollinators. Tests were then required to determine what levels of neonicotinoid pesticide would have lethal effects on pollinator larvae. Finally, U.S. EPA required higher-tiered honey bee studies with input from both DPR and PMRA Health Canada.

Tier II studies, or honey bee feeding studies, examine the effects on colonies following exposures to known concentrations of a pesticide in a food source fed to a bee colony. The registrant for imidacloprid voluntarily agreed to conduct a Tier III study, or full field study. This study looks at long-term effects under environmentally realistic exposure conditions.



In 2014, DPR made second generation anticoagulant rodenticides a restricted class of pesticide and limited their use.



DPR and U.S. EPA, as of 2016, were studying the possible effects of neonicotinoids on pollinators.

In 2015, U.S. EPA and DPR issued a Preliminary Imidacloprid Pollinator Risk Assessment. This assessment is the first of four preliminary pollinator risk assessments for neonicotinoid-containing insecticides. Preliminary pollinator-only risk assessments for the other compounds—clothianidin, thiamethoxam, and dinotefuran—will follow. Comprehensive risk assessments for all neonicotinoids will be completed in the future.

A GUIDE FOR PESTICIDE REGISTRANTS

DPR's "A Guide for Pesticide Registrants" contains systematic instructions for registering, amending and renewing pesticide products in California. To view this guide, please visit: <http://www.cdpr.ca.gov/docs/registration/manual/guidance.pdf>

Continuous Evaluation and Reevaluation

Before the Department of Pesticide Regulation (DPR) registers a pesticide, department scientists evaluate the pesticide's toxic effects, its potential exposure to people and the relationship between the two, as well as the potential for environmental problems. Legislation passed in 1969 (Chapter 1169, SB 1140) requires DPR to "eliminate from use" any pesticide that "endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented." The law also requires the department to have "an orderly program for the continuous evaluation" of pesticides after registration.

Through continuous monitoring and surveillance, DPR can determine the fate of pesticides in the environment, detect and address unforeseen effects on human health and find ways to prevent pesticide contamination.

After registration, several DPR programs evaluate use practices to detect possible problems by:

- Completion of risk assessments on registered active ingredients. (See Chapter 5.)
- Exposure monitoring, including exposure and residue studies to collect data on potential exposure patterns and to assess the effectiveness of existing controls. (See Chapter 8 for information on exposure monitoring studies.)
- Investigation and evaluation of pesticide illnesses and incidents. (See Chapter 8 for information on investigations.)
- Investigation of mandatory registrant reports on adverse effects (for example, harm to humans, animals or the environment) that occur after their products are registered. (See *Adverse Effects Reporting in Chapter 3.*)
- Monitoring of air quality, ground water and surface water. (See Chapter 10.)

DPR uses the data collected to evaluate the effectiveness of the department's regulatory programs and assess the need for changes.

REEVALUATION

California regulations require DPR to investigate all reports of actual or potentially significant adverse effects to people or the environment resulting from the use of pesticides. Information may come from pesticide illness investigations, monitoring of air, soil and water; or similar data generated by DPR or other government agencies, or from the public. Toxicology and environmental data, and adverse effects disclosures submitted to DPR by registrants may trigger a reevaluation.

Specific factors that may trigger reevaluation include public or worker health hazard; fish or wildlife hazard; environmental contamination; unwanted damage to plants; inadequate labeling; lack of efficacy; disruption of pest management; availability of an effective and feasible alternative material or procedure which is demonstrably less destructive to the environment; discovery that data on which DPR relied to register a product is false, misleading or incomplete; or other information suggesting a significant adverse risk.



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)

If DPR has reason to believe that a pesticide may cause unreasonable adverse effects to people or the environment, DPR must formally reevaluate the pesticide to decide if it should remain registered and, if so, whether changes in use practices are needed. When a pesticide enters reevaluation, DPR reviews existing data and may require registrants to provide more data.

Legislation in 1997 (Chapter 483, SB 603) gave DPR the authority to cancel the registration or refuse to register any pesticide if the registrant fails to send data requested in a reevaluation. If DPR moves to cancel a registration, the registrant may ask for a hearing.

DPR ends reevaluations in several ways. If the data show that use of the pesticide presents no significant adverse effects, DPR closes the reevaluation without added mitigation measures. If new restrictions are necessary, DPR places controls on the use of the pesticide to mitigate the potential adverse effect. DPR may also work with registrants and the U.S. Environmental Protection Agency (U.S. EPA) to revise labels to mitigate hazards. If the adverse effect cannot be mitigated, DPR suspends or cancels the product registration.

Regulations require DPR to prepare a semiannual report describing pesticides under reevaluation or for which DPR received factual or scientific information but did not open a reevaluation.



Assessing Pesticide Risks to Human Health

Under California law (Statutes of 1969, Chapter 1169), the Department of Pesticide Regulation (DPR) must “eliminate from use” any pesticide that “endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented.” To do this, the law requires the department to have “an orderly program for the continuous evaluation” of registered pesticides. DPR uses various tools to evaluate pesticide products to determine what risks they pose and whether changes to the use or proposed use are necessary.

A human health risk assessment is how DPR estimates the nature and likelihood of adverse health effects in humans who may be exposed to pesticides, now or in the future. Exposures may be in air, water or food, at homes or in the workplace. These scientific evaluations provide health-protective estimates of risk to defined populations exposed under defined exposure conditions. Risk assessments are often the driving force behind new regulations or other use restrictions. If satisfactory controls cannot be put into place to avoid harmful exposures, DPR will not register the pesticide or, if it is already registered, can cancel its use.

A pesticide risk assessment addresses questions such as:

- What type of health problems may be caused by exposure to pesticides?
- What is the chance that people will experience health problems from exposure?
- Is there an exposure level below which any risk to health is negligible?
- What pesticides are people exposed to, at what levels and for how long?
- Are some people more likely to be susceptible to harm because of age, genetics, pre-existing health conditions, ethnic practices, gender or other factors?
- Are some people more likely to be exposed because of where they work, where they play, what they like to eat or other factors?

The department has a formal process to prioritize pesticides for risk assessment, focusing on pesticides that pose the greatest potential risk. In addition, DPR may decide to begin a risk assessment for other reasons. For example, DPR scientists may identify possible adverse health effects when they review toxicology data, which can trigger a risk assessment before a decision is made to register a product. After registration, new toxicology studies or reports of adverse effects can also prompt a risk assessment. DPR may initiate a risk assessment when air monitoring by the department or other agencies finds concentrations of concern in community air. Another trigger might be anticipated changes in use patterns, such as when a product is intended as a replacement for another widely used pesticide.

RISK ASSESSMENT PROCESS

The department’s capability to conduct formal risk assessments came after the 1984 passage of the Birth Defect Prevention Act (BDPA; see *Page 43*). This law



Toxic effects in a biological system are not produced by a chemical agent unless that agent or its metabolic breakdown products reach appropriate sites in the body at a concentration and for a length of time sufficient to produce a toxic manifestation Thus, whether a toxic response occurs is dependent on the chemical and physical properties of the agent, the exposure situation, how the agent is metabolized by the system, and the overall susceptibility of the biological system or subject.

— Casarett & Doull’s *Toxicology: The Basic Science of Poisons*

Proposition 65

In 1986, California voters passed a ballot initiative called The Safe Drinking Water and Toxic Enforcement Act, more familiarly known by its ballot position, “Proposition 65.” It is based on the premise that the public and workers have a right to be informed about exposures to chemicals that can cause cancer, birth defects or other reproductive harm. Among other mandates, it requires the state to publish a list of chemicals known to the state to cause cancer or reproductive harm and to update this list at least once a year.

Chemicals can be added to the Proposition 65 list in one of four ways:

- State experts conclude that scientifically valid testing shows the chemical clearly may cause cancer, birth defects or other reproductive harm.
- An authoritative body has formally identified it as causing cancer, birth defects or other reproductive harm. Authoritative bodies include the U.S. Environmental Protection Agency, U.S. Food and Drug Administration, National Institute for Occupational Safety and Health, National Toxicology Program and International Agency for Research on Cancer.
- If an agency of the state or federal government has formally required it to be identified or labeled as causing cancer or reproductive harm.
- If chemicals meet certain scientific criteria and are identified in the California Labor Code as causing cancer or birth defects or other reproductive harm.

Proposition 65 requires businesses to notify Californians about significant amounts of chemicals in the products they buy, use in their homes or workplaces, or that are released into the environment. Proposition 65 also prohibits California businesses from knowingly discharging significant amounts of listed chemicals into sources of drinking water.

CalEPA’s Office of Environmental Health Hazard Assessment (OEHHA) administers the Proposition 65 program. OEHHA also evaluates available scientific information on substances being considered for placement on the Proposition 65 list. The Department of Pesticide Regulation (DPR) works with OEHHA in evaluating pesticides.

DPR’s hazard communication regulations (which govern pesticide and worker safety requirements) also provide a foundation for employers to meet the Proposition 65 warning requirements for employees in the pesticide workplace. Proposition 65 regulations also allow warnings to be provided in the same manner stated in the federal hazard communication program regulations for workplace exposures.

California’s hazard communication program requires that whenever employees are working in treated fields or handling pesticides, the employer must display certain leaflets in the Pesticide Safety Information Series produced by DPR’s Worker Health and Safety Branch. The leaflets are available in English, Spanish and Punjabi and must be read on request to any employee. In addition, specific information about each pesticide application must be displayed at a central location when the operator of the property receives notice of the completion of an application and before any employees are allowed to enter the treated field. The specific information must remain displayed for 30 days or until employees are no longer present, whichever occurs earlier.

For exposures to the public, the warning may be given by various means, such as labeling a consumer product, posting signs in affected areas, sending notices to affected residents or publishing notices in a newspaper. For instance, signs can be found on most gas pumps and some utility companies include warning notices in their billings. In some instances, the companies comply with Proposition 65 by removing listed chemicals from their products.

Birth Defect Prevention Act

In 1984, the Legislature passed the Birth Defect Prevention Act (BDPA, Chapter 669, SB 950). The law mandated that registrants of pesticides registered before 1984 bring health effects data on their chemicals up to current scientific standards. It also required that the Department of Pesticide Regulation (DPR) not register new active ingredients without a full complement of health effects studies. The required studies (primarily done on experimental animals) were chronic toxicity, mutagenicity, neurotoxicity, oncogenicity, reproductive effects and teratology. The BDPA required DPR to use these and other data to determine if a pesticide would cause human health problems. If continued use of a pesticide presents a significant health hazard that cannot be adequately mitigated, DPR is required to cancel the registration of products containing that active ingredient.

The BDPA mandated that DPR begin by developing a list of 200 active ingredients that would be the first focus of enforcement. These were chemicals with the most significant data gaps, widespread use, and which were suspected of being of greater health concern. (A data gap means that DPR lacks adequate health effects studies in any one of the required categories noted above.)

In January 1986, DPR notified registrants of data gaps for pesticide products containing any of the 200 priority active ingredients. DPR found that much of the data submitted in response to the data call-in notice did not meet U.S. Environmental Protection Agency guidelines. Because these studies had been performed years earlier, many registrants were unable to get the data necessary to upgrade the studies from the laboratories that did the original work. Although registrants contracted with laboratories for new studies, most failed to complete and submit new chronic health effects studies within the time frames set by law. The BDPA

required submission of data on priority-list pesticides by March 1991, a deadline the Legislature later extended to March 1996 (Chapter 1228, Statutes of 1991, SB 550). Later legislation (Chapter 1, Statutes of 1995-1996, SB 1XXX) extended until December 1997 the deadline for submission of final studies on two pesticides, methyl bromide and pentachlorophenol.

In 2001, DPR presented its final report to the Legislature on the status of the chronic health effects studies required by the BDPA. The department reported that of the priority 200 active ingredients, 143 remained subject to the data call-in and no data gaps existed for any of these compounds, including methyl bromide and pentachlorophenol. DPR had granted exemptions for products containing two active ingredients. (Under the BDPA, a pesticide may be exempted from the data requirements if it is determined the chemical has only limited use and there is insignificant exposure to workers or the public.) Of the remaining priority pesticides, 47 had been withdrawn from the market by their manufacturers and DPR had suspended 8 for failure to submit required data. Product registrations are suspended if data for any active ingredient cannot be upgraded with additional information or if data were not submitted. Once a pesticide registration is suspended, registrants must halt all sales. Retail dealers may continue selling affected products for two years and consumers may continue to use products on hand.

In 1992, DPR began calling in data for the 703 registered active ingredients that were not on the priority list, as required by 1991 legislation (Chapter 1227, AB 1742).

As of late 2016, there remain only 57 active ingredients for which DPR is making determinations if more studies are needed to close data gaps.



Risk assessments have many uses, but a major one is to assist decision makers with the complex choices regarding the options in managing or reducing the potential human health risks associated with a substance or product. ... Using experience and judgment, the (risk) manager must determine a level of risk that is acceptable.

— Risk assessment, risk evaluation, and risk management, C.J. Henry (in *Food Safety and Toxicity*)

required the state to bring the toxicological database on pesticides up to current scientific standards and collect the data needed to find out if adverse health effects were possible. Department scientists were then to assess the risks to decide if those health effects were significant. These mandates prompted the creation of the Medical Toxicology Branch in 1985 to evaluate toxicological data and manage human health risk assessments. Exposure assessments were conducted by scientists in the Worker Health and Safety branch at that time. In 2014, the department created the Human Health Assessment Branch where scientists conduct both the risk and exposure assessments and continue to evaluate toxicological studies for pesticide registration.

To fulfill the BDPA mandate, in the late 1980s DPR set up a procedure to classify pesticides as high, moderate or low priority for risk assessment. Chemicals registered before the passage of the BDPA were on a different risk assessment track than new active ingredients not yet registered. Policy dictated that the latter, if assigned high-priority status, could not be registered without a complete risk assessment. Requiring risk assessments for new compounds postponed their entry into the marketplace. Moreover, staff resources devoted to risk assessments on newer compounds (which often posed lower risks) meant delays in evaluating older pesticides registered decades before, when little or no scientific evaluation was done.

In 1996, DPR changed this policy to make more efficient use of resources and to concentrate on the greatest risks. Provided all required toxicology and other data had been submitted, new active ingredients classified as high-priority for risk assessment could be registered after a review of data and a screening evaluation, but without a full risk assessment. DPR retains the option of conducting a full risk assessment before registration. (The U.S. Environmental Protection Agency typically conducts a comprehensive review of new pesticide active ingredients before federal registration.)

At the same time, DPR integrated its risk assessment tracks into a single priority list. The priority status of active ingredients was determined by a panel made up of scientists from DPR and CalEPA's Office of Environmental Health Hazard Assessment (OEHHA). In 2005, DPR changed its priority-setting to make it more consistent and transparent. DPR formed the Risk Assessment Prioritization Work Group of senior scientists from DPR's Medical Toxicology Branch (now Human Health Assessment), Worker Health and Safety, and Environmental Monitoring branches, as well as a senior scientist from both the Air Resources Board (ARB) and OEHHA. From a larger priority list, the work group develops a ranked list of 10 high-priority compounds for risk assessment initiation. Prioritization is based on the nature and number of the potential adverse health effects identified in toxicity studies, number of species affected, potential for human exposure and information from DPR's Pesticide Illness Surveillance Program. Other considerations include physical-chemical characteristics (such as volatility), use patterns, amount of pesticide used and U.S. EPA evaluations.

The work group's list and detailed findings are posted online for public comment. They are also presented to DPR's Pesticide Registration and Evaluation Committee for further discussion before being finalized by DPR. The work group reviews the list periodically, in part to add new chemicals to replace those deleted after risk assessment completion. Based on new information—such as new toxicology or exposure data, or recent regulatory actions by DPR or other state or federal agencies—they may also revise the rankings. The department also publishes a public notice each time it begins a risk assessment.

In 2013 DPR asked the National Academy of Sciences (NAS) to conduct an independent peer review of DPR's risk assessment practices to ensure that DPR's risk assessment process uses the best scientific information and current methods. The National Research Council (NRC), of the NAS, completed its review and issued its report, including recommendations to improve DPR's risk assessment

process and reports in April 2015. The chart and text on Page 50 describe the revised DPR risk assessment process based on the NRC recommendations.

HAZARD AND RISK

Hazard and risk are two distinct but interrelated concepts—the first a reflection of potential effect and the second of likelihood it will occur.

Toxicity is an inherent property of all substances. That is, all chemical substances can produce harmful health effects at some level of exposure. A hazardous substance has the potential to harm health if it is present in the environment and if people are exposed to it. Fortunately, many hazards can be either contained or avoided, so not every potential hazard poses a health risk. A risk, in turn, is defined as the likelihood of the hazard occurring in a given situation.

Scientists determine the potential risk in two ways. Some risks can be measured directly by exposing humans to a toxin or by observing past and present disease incidence patterns in the human population. Risks can also be calculated indirectly by estimating the theoretical level of human exposure and the potential severity of health effects as predicted by experimental studies. The health risks from low-level exposure to environmental hazards such as pesticides are commonly determined by the indirect method. This is because there is not enough consistent and reliable evidence of measurable health effects in human populations exposed to low levels of hazardous environmental agents. As a result, the expressed risks from low-level environmental exposure are the product of scientific evaluation and analysis, not observed facts.

ASSESSING PESTICIDE RISK

Before registration, DPR conducts a premarket evaluation of pesticide products based on standards used by U.S. EPA and studies required by California statutes to decide if the product can be used safely. These evaluations may prompt DPR to deny registration, propose registration conditional on receipt of additional data, or propose registration with additional oversight provided by making the pesticide a restricted material. Restricted materials require a permit and are subject to site-specific restrictions. The department may refuse to register the product under the U.S. EPA-approved label, giving the registrant the option of obtaining approval from U.S. EPA of a revised label that incorporates additional protections satisfactory to DPR. (Label changes must be approved by U.S. EPA, which has sole authority over label language.)

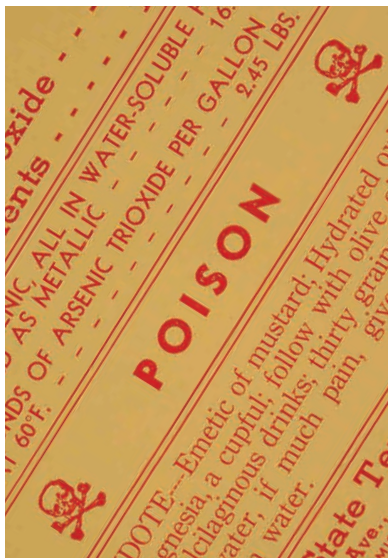
Premarket evaluations also help point out if a more comprehensive risk assessment is needed before the pesticide is registered. Pesticides already in use are also subject to periodic review to assess risks associated with use that may not have been predicted, or risks that may no longer be acceptable in light of current scientific standards. Evidence of significant hazard to health or the environment can trigger reevaluation and possible regulatory action. (See Chapter 4 for a discussion of reevaluation.)

Both premarket evaluations and full risk assessments are based on a prescribed set of scientific data provided by registrants as well as information from available scientific literature and other sources. These include exposure monitoring studies conducted by DPR’s Worker Health and Safety Branch and air and water monitoring studies conducted by the Environmental Monitoring Branch. The application for product registration must provide all information needed to support the different uses proposed. (See Chapter 3 for more information on the registration process.) Only products with a database that includes all required studies are allowed to progress through evaluation. In limited instances, some chronic health effects data may be waived in consultation with OEHHA.



Conservation of human wellbeing is of utmost importance. The commercialization of an insecticide poison often is attempted as soon as the new toxicant has emerged from the laboratory, frequently with little or no pharmacological information. Before there is commercial exploitation and introduction into homes for intimate contact with unsuspecting users, more data as to acute or chronic intoxication should be available. The determination of toxicities of pesticides is imperative.

— 1943 California Department of Agriculture annual report



The concept of a poison is considered by many people to be an all-or-none phenomenon; a chemical is either a poison or it is not, with no shades of gray in between. Nothing could be further from the truth. Such simplistic reasoning is counterproductive to an understanding of how and why chemicals cause harm.

— *The Dose Makes the Poison: A Plain Language Guide to Toxicology*, by M. Alice Ottoboni

If toxicologists decide more data are needed and the pesticide is not yet registered in California, the department can require applicants to submit more data. If the pesticide is already registered and concerns of either environmental or public health issues are received from reports, DPR may conduct its own studies to validate those concerns or request the data from registrants through a formal reevaluation process.

CONDUCTING A HEALTH RISK ASSESSMENT

If scientists launch a full risk assessment, they begin with a planning and scoping stage to decide the purpose and scope. The next phases can be divided conceptually into four elements:

- Hazard identification. What toxic effects are caused by the pesticide?
- Dose-response assessment. At what dose levels do these effects occur?
- Exposure assessment. How much of the pesticide are people exposed to during a specific period (long-term, short-term) and in what situations (work, home, play)? Also, who is most vulnerable (for example, farmworkers, children, women of childbearing age)?
- Risk characterization. What are the significant uncertainties inherent in the nature (animal studies) and quality of the data on which the analysis relied? At what exposure levels are harmful effects not likely to occur?

Hazard identification

Hazard identification determines the various toxic effects associated with the chemical. Adverse effects may be acute (arising from short-term exposure), subchronic (exposures longer than a few days but less than a year), or chronic (the result of exposure of a year or more, including lifetime). Risk assessments commonly examine certain critical effects, including:

- Carcinogenic (cancer).
- Genotoxic (heritable traits or impacts).
- Developmental (birth defects and miscarriages).
- Reproductive (male and female fertility).
- Endocrine (hormonal function).
- Neurological (brain and nervous system disorders).
- Immunological (resistance to infectious diseases; occurrence of hypersensitivity disorders and autoimmune diseases).

Controlled clinical studies on humans can provide the best evidence linking a chemical to a resulting effect. However, data from poorly conducted human studies can be inferior to other available data. Moreover, human studies are usually not available since there are significant ethical concerns associated with human testing of environmental hazards.

Epidemiological studies involve a statistical evaluation of human populations to examine whether there is an association between exposure to a chemical and a human health effect. The advantage of these studies is that they involve humans. However, these studies typically do not have accurate exposure information. It is also difficult to tease out the effects of exposure to one pesticide from the effects of exposures to the many chemicals of daily life.

The main source of information for identifying pesticide hazards and the relationship between dose and response are animal toxicity studies, which are considered well-understood predictors of toxicity in humans. Scientists rely on data from

laboratory animals (for example, rats, mice or rabbits) to draw conclusions about the potential hazard to humans.

Although effects seen in animals can also occur in humans, there may be subtle or even significant differences in the ways humans and experimental animals react to a chemical. When relying on animal studies, scientists decide whether a chemical's health effects in humans are likely to be similar to those in the animals tested. Evaluation may also involve characterizing behavior of a chemical within the human body and chemical interactions within organs, cells or even parts of cells.

Dose-response assessment

The dose-response assessment (often combined with hazard identification in a single step) documents the quantitative relationship between dose and toxic effect. Scientists consider the toxic properties of a chemical and determine the lowest dose of the chemical that results in a harmful effect. The dose-response relationship can be defined in toxicity studies by administering increasing doses to groups of animals and measuring the percentage of animals exhibiting pathological changes or disease symptoms at each dose level, and the severity of the effects. State and federal guidelines require that laboratory animals receive high enough doses to produce toxic effects, including doses that may be much higher than those to which people might be exposed. The results of such studies defines the dose-response relationship across a wide range of dose levels, from high doses where pathological changes are frequent to low doses where changes are infrequent or absent.

Dose-response relationships seen in animal studies must be adjusted to account for differences in dose from typical human exposures, and to predict how the responses seen in animals relate to what humans might experience. These extrapolations, among others, introduce uncertainty into the dose-response analysis. Scientists apply several uncertainty factors to compensate for the variation of responses within animal species and between humans and animals.

Uncertainty factors are mathematical adjustments used when scientists have incomplete information. The uncertainty factors differ depending on the chemical, on the quality of the studies evaluated, and on the severity of the effects seen in those studies. As they review data for a risk assessment, scientists continually make judgment calls on the completeness of the information and its applicability to human beings. These uncertainty factors consider:

- Known differences between laboratory animals and humans, and the uncertainty introduced by extrapolating from animal data to humans. Humans are much more diverse than the inbred strains of laboratory animals used in studies, so varied susceptibility among humans must be considered.
- The strength of the evidence that the chemical presents a hazard to human health.
- The kind of potential health effects seen in the studies, and their severity.
- The potency of the toxic agent.
- Quality of the experimental data, and known differences between experimental conditions and realistic exposures.

Usually the dose-response relationship used for risk assessments will be based on data collected from the most sensitive species of test animal available, an example of the health-protective approach taken in regulatory risk assessment.

Exposure assessment

Exposure is a critical connection between potentially harmful substances like pesticides and human health effects. Exposure assessment examines what is known about the duration, frequency (continuous or intermittent), and level of contact



Risk assessment entails the evaluation of information on the hazardous properties of substances, on the extent of human exposure to them, and on the characterization of the resulting risk. Risk assessment is not a single, fixed method of analysis. Rather, it is a systematic approach to organizing and analyzing scientific knowledge and information for potentially hazardous activities or for substances that might pose risks under specified conditions.

— *Science and Judgement in Risk Assessment, National Academy of Sciences*

Dietary Risk Assessment

Dietary exposure is a function of the type and amount of food consumed and the pesticide residues in or on that food.

There are three elements to calculating dietary risk from pesticide exposure:

- Estimating the toxicity of a pesticide (*see discussion of hazard identification, Chapter 5*).
- Estimating the amount of pesticide residues that might be in or on food, and in drinking water.
- Finding out how much food might be eaten by various subpopulation groups (considers cultural dietary practices).

Scientists in the DPR's Human Health Assessment Branch use available data, standard analytical methods and predictive models, together with assumptions designed to be protective of public health, to produce separate exposure estimates for each exposed subgroup of the general population.

Estimating how much residue might be in or on food and in drinking water involves several things. If the pesticide is used on food crops, field trials are always done to determine the maximum legal residue (tolerance) that could result from maximum permissible use of the pesticide, that is, the maximum application rate as close as possible to harvest. Because this data may overestimate typical residues, the U.S. Food and Drug Administration (FDA), U.S. Department of Agriculture (USDA) and DPR all have programs in which they test random samples of fresh produce for residues. The

FDA and USDA also test for residues in cooked and processed foods. Because these samples are analyzed closer to the point of consumption, the resulting data can characterize pesticide residues in food to more closely approximate real-world exposures. Nonetheless, DPR may rely on field trial data when scientists believe the information will provide more accurate exposure estimates.

USDA conducts nationwide surveys every several years to estimate the kinds and amount of food that people eat. Food consumption is reported for people of different racial and ethnic groups, age groups, genders, geographical regions and seasons. The consumption rate is expressed in terms of body weight and accounts for a potentially higher intake by children, as compared to adults, per pound of body weight.

Dietary exposure to a pesticide is based on the estimated food consumption coupled with the estimated pesticide residue levels on the food. These dietary exposure estimates are combined with the toxicity data to assess the risk to various population subgroups, including infants and children, from the exposure to pesticide residues in food. Both chronic and acute dietary exposures are generally considered. Chronic exposure occurs over a long period; therefore, it is calculated using average consumption and residue values. In contrast, acute exposure considers the highest single (acute) exposure. It is calculated using individual consumption data. The resulting information on dietary risk is then included in an overall assessment of the risk posed by the pesticide for all uses.

with a pesticide. In this phase of risk assessment, scientists examine potential exposure to a pesticide at work, at home, in air, and from dietary food and water. Scientists then calculate a numerical estimate of exposure or dose.

Toxicologists determine who might be exposed and then evaluate subpopulations by occupation, age, gender, ethnicity and other factors. Subpopulation groups might include pesticide handlers, farmworkers, other pesticide users (for example, people using home-and-garden products), bystanders (people near treated areas), and others who may be exposed (for example, by entering treated areas or eating treated food). The intent is to characterize exposure to the most vulnerable or highly exposed populations. For example, for some (but not all) substances, children may be more at risk than adults. This can be because they eat, drink and breathe more in proportion to their body size. Their bodies are still developing and may process the pesticide differently. They also behave differently—for example, crawling and hand-to-mouth activity can expose them more to chemicals. DPR, like other regulatory agencies, makes it a high priority to identify and assess environmental health risks that may disproportionately affect children.

Exposure assessments begin with an evaluation of the physical and chemical characteristics of a pesticide. Scientists evaluate whether pesticide breakdown products occur, the half-lives of the chemical in various media (for example, air or water), and other properties. To better understand exposure, scientists review human exposure studies, pesticide product labeling, worker activity information and pesticide use data to identify every situation where a pesticide is used. Scientists also review pesticide illness and injury data to identify potential health problems caused by exposure to the pesticide. To evaluate dietary exposure, scientists review data to find out potential residues on and in food and drinking water. (See Page 48 for more information on dietary risk assessment.)

Scientists prefer to use chemical-specific and activity-specific exposure data to derive exposure estimates for the risk assessment. However, when such data are unavailable (which is often the case), they may use a surrogate approach. Surrogate data are substitute data or measurements on one substance (or population) used to estimate analogous or corresponding values for another substance (or population). Scientists can use data from surrogate studies or from generic databases such as the Pesticide Handlers Exposure Database (PHED) developed by Health Canada, U.S. EPA and the pesticide industry. PHED is a generic (multiple products and studies as opposed to activity- and product-specific) pesticide worker exposure database containing measured values of dermal and inhalation exposures from dozens of field studies.

To improve the accuracy of exposure information, DPR scientists conduct field studies to monitor human exposure, using surveys, measurements of residues in soil, in air, in water, in food, and on plants, skin and clothing, as well as blood and urine analyses. (See Chapter 8 for more information on exposure monitoring studies.)

Exposure assessment considers both the exposure pathway (the course a pesticide takes from its source to the person) as well as the exposure route (how the pesticide enters the body). DPR's risk assessors consider all likely exposure routes: inhalation (breathing), dermal (skin or eyes), and oral (dietary food and water). They also look at all exposure scenarios, including occupational, residential, industrial, institutional, environmental and bystander (exposure to off-target drift).

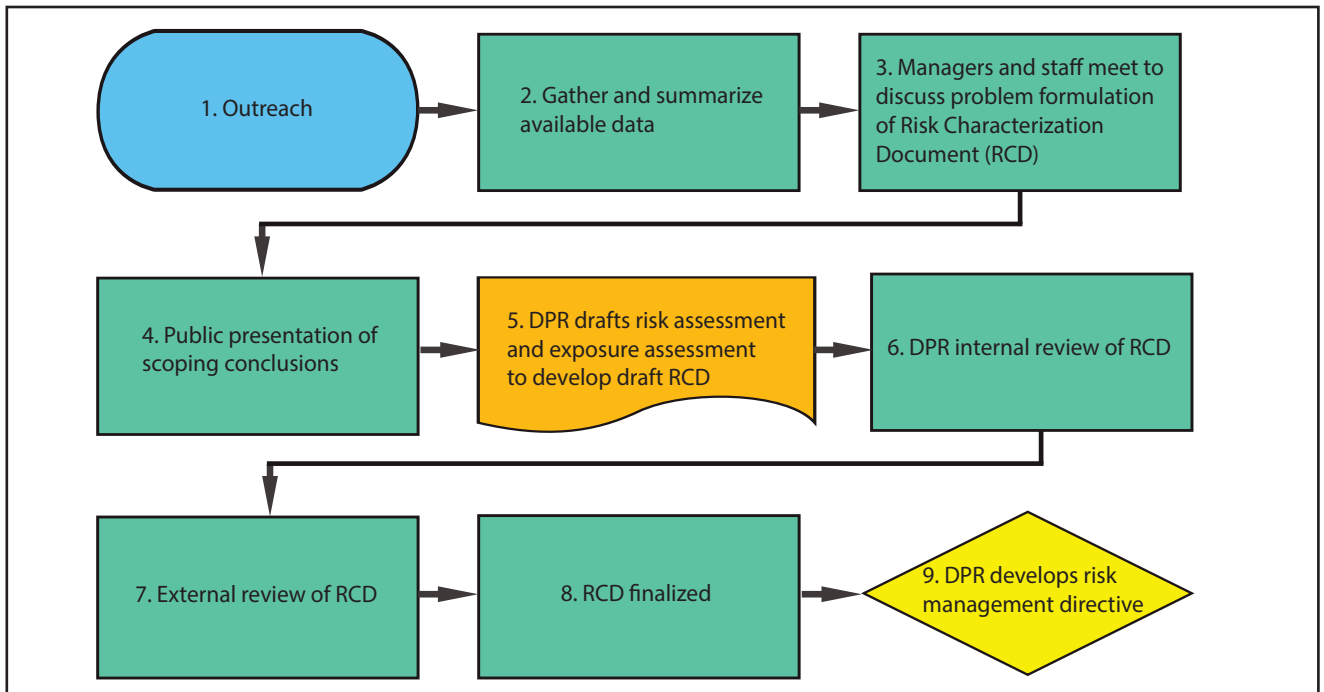
Likely routes of exposure are chiefly inhalation of air containing dusts and vapors, skin contact either with the pesticide spilled on skin or by contact with treated foliage, soil or other surfaces (for example, carpets), and eating foods and drinking water with pesticide residues. Depending on the chemical and physical properties of the substance, a particular exposure might not be considered significant. For example, a given chemical might not be absorbed by the body when spilled on the skin (because of a low dermal absorption rate) but may be absorbed



Risk assessment is a set of tools, not an end in itself.

— ***Science and Judgment in Risk Assessment, National Academy of Sciences***

Developing a Risk Characterization Document



when present in drinking water. On the other hand, with some chemicals, such as those that cause significant irritating effects (for example, eye or breathing irritation), and those with rapid entry into the body, exposure may be the driving factor in an exposure assessment. Exposure to a chemical, therefore, is not necessarily synonymous with how much chemical is absorbed by body fluids and tissues.

In all health risk assessments, scientists must make assumptions to estimate human exposure to a chemical. To avoid underestimating human exposure to a chemical, scientists typically look at the range of possible exposures. Some individuals may have a high degree of contact for an extended time (for example, agricultural applicators). Other individuals may have a lower degree of contact for a shorter time (for example, people using home-and-garden products).

RISK CHARACTERIZATION

A risk characterization presents qualitative or quantitative estimates of the likelihood that any of the hazards associated with the pesticide will occur in exposed people. It examines how well the data support conclusions about the nature and presence or absence of risks, and describes how the risk was assessed and where assumptions and uncertainties exist.

In practice, each part of the risk assessment—hazard identification, dose-response assessment and exposure assessment—has an individual risk appraisal describing key findings, assumptions, limitations and uncertainties. These risk appraisals provide the basis for an integrative risk characterization document (RCD). The RCD informs risk managers and others about the rationale behind the scientists' approach to the risk assessment—why the assessors did what they did to assess the risk.

Although scientists can estimate risks caused by toxins in animals exposed experimentally or in humans who have unusual exposures, extrapolating these estimates to those expected in people under a wide range of conditions is difficult and complex. By their nature, risk estimates rely on the underlying data and assumptions and may not be completely accurate. Scientists seldom have enough

information on actual exposure and on how toxins harm human cells. The exposure assessment often draws its conclusions from multiple sources that include physical chemical properties, monitoring data and computer models. To convert results of animal experiments at high doses to human exposures at low doses, dose-response relationships often rely on assumptions about the effects of toxins on cells.

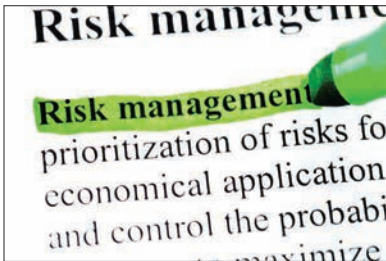
When data are lacking or uncertain, risk assessors must use a combination of scientific information and their best judgment to characterize risks. Risk analysts generally make health-protective assumptions that tend to prevent them from underestimating the potential risk—that is, they err on the side of safety to better prevent harmful effects.

After review by DPR scientists, draft RCDs undergo external peer review by scientists at OEHHA. DPR also sends each RCD to U.S. EPA for review and may call on other scientific experts for external review. In addition, state law requires draft RCDs for pesticides that are potential toxic air contaminants to be evaluated by a scientific review panel. Peer review is intended to uncover any technical problems or unresolved issues in a draft work product through the use of independent experts. DPR scientists use the information provided by reviewers to revise the draft as necessary so the final work product reflects sound scientific information and analyses. Peer review is designed to strengthen a scientific work product so that the decision or position taken by DPR, based on that product, has a sound, credible basis.



OEHHA scientists perform external peer reviews on DPR's risk characterization documents.

Risk Management



Closely related to risk assessment is risk management, the process by which the results of risk assessment are integrated with other information—such as political, social, economic, and engineering considerations—to arrive at decisions about the need and methods for risk reduction.

— *Science and Judgment in Risk Assessment, National Academy of Sciences*

Risk management reduces adverse risks by reducing the likelihood of the risk or its effects.

The risk-based approach to safety is applied in such diverse areas as marine operations, building construction and financing, and environmental regulation. Successful risk management applies practical, useful solutions to deal with the uncertainty that characterizes risk.

Because of the properties and characteristics that make them effective for their intended purposes, pesticides may also pose risks to people and the environment. Most pesticides require use controls to keep exposures below unsafe levels. In each case, the selected risk-reduction strategy provides the basis for specific use controls. These may include label restrictions, permit limits, application controls, buffer zones, and reentry and preharvest intervals. All registered pesticides are thus restricted in that they can be used only for specified purposes and in a manner specified on the label.

ABOUT RISK MANAGEMENT

For Department of Pesticide Regulation (DPR) risk managers to develop limits that are appropriate and effective, the department's risk assessors must first identify the types of risks to be controlled, the activities from which those risks may arise, and the means available to assess the extent of the risks.

Risk managers also identify the means available to mitigate and minimize the risks. That is, while risk assessment provides information on potential health risks, risk management is the action taken based on consideration of that information and other data. Risk managers evaluate and select mitigation options, and develop effective measures to reduce potential unsafe pesticide levels in air, water, food or the workplace. (See *Chapter 5* for more information on risk assessment.)

Risk management is defined by the U.S. Environmental Protection Agency (U.S. EPA) as the process of identifying, evaluating, selecting and carrying out actions to reduce risk to human health and the environment. Although risk management is presented here as a series of sequential steps, the underlying process is interactive and dynamic. If a pesticide's use is associated with an unacceptable level of risk, DPR risk managers will consider controls on use or other regulatory options to reduce the risk to acceptable levels. The process usually produces many possible approaches to risk reduction. Regulators must develop each alternative and combination of alternatives in enough detail to find out if they reduce risk to acceptable levels. The goal is to select a risk-reduction strategy of integrated measures that are scientifically sound and cost-effective, and that reduce or prevent risks while taking into account social, cultural, ethical, political and legal considerations.

Risk assessment is conducted largely by staff from the Human Health Assessment Branch, while risk managers are comprised by a team of executive and program managers.

Discussions between risk assessors and risk managers early in risk assessment can help focus the overall purpose, identify information gaps and establish expected risk management needs. The risk assessment is designed and presented in a way that addresses the needs of decision makers who must decide if a pesticide can be used safely and, if so, what the use limits should be. Risk assessors should pro-

vide risk managers with reasonable conclusions about risk based on the available information, with evaluations of the scientific weight of evidence supporting those conclusions and descriptions of major sources of uncertainty and alternative views.

The basic steps in risk management include:

- Deciding whether the proposed or current use of a pesticide results in an unacceptable risk—that is, exposures likely to cause harm to workers, the public or the environment.
- Identifying options to minimize those risks.
- Evaluating those options according to a value system that includes scientific, social, legal and economic factors, as well as practicality and enforceability. Regulators may also review what other states and nations have done to evaluate similar measures.
- Selecting an effective course of action to reduce or eliminate unacceptable health or environmental risks.
- Monitoring the mitigation measures after they are in place to ensure they are effective and adjusting them if necessary.

IDENTIFICATION AND ANALYSIS OF RISK MANAGEMENT OPTIONS

The goal of risk management is to identify a range of options that can reduce exposure and to analyze them to determine if they achieve acceptable risk standards for human health and the environment. The identification and analysis must focus on and be responsive to the nature and extent of risk, its source or sources, and the affected human population identified in the risk assessment or evaluation of potential effects to the environment.

Often the choice is not between individual risk management options, but from various combinations of options. There may be competing risks within the range of possible risk mitigation alternatives. What may be a reasonable strategy to reduce risk to applicators, for example, may pose unacceptable risks to the environment. Thus, development of options must provide a clear basis to ensure that all risk elements are considered and are acceptable.

The range of risk management options is constrained by legal and practical considerations. The options must be consistent with federal and state law and be legally enforceable. The available alternatives under these legal constraints can include denial or cancellation of registration, or imposition of conditions and controls on use.

The practicality of risk management options is guided by the regulators' thorough understanding of the use situations, use practices, application technology, extent of use, and California use conditions. This level of understanding is necessary for regulators to focus their development of options on those that are appropriate and can be achieved. For example, because application rates, frequency, equipment and other practices influence the effective use of a pesticide, management options are necessarily limited to those that do not make the pesticide ineffective for its intended use. Practicality in use is also considered.

DPR does not conduct economic analyses as part of risk management and does not consider economic benefits in making registration decisions. Economic considerations, however, can inform an evaluation of alternative risk mitigation options. In discussing risk management at the federal level, the Presidential/Congressional Commission on Risk Assessment and Risk Management said in a 1997 report, "Considering incremental costs and benefits in regulatory decision-making can help to clarify the tradeoffs and implications associated with alternative regulatory policies and help regulatory agencies to set priorities."



Risk management is the control of risk by eliminating or modifying the conditions that produce the risk. People practice risk management in all aspects of daily life, often without realizing it. The parent who stores medicines and household chemicals out of a child's reach... The driver who fastens his seat belt... The gardener who puts on protective clothing before spraying pesticides is practicing risk management. ...
(Continues on next page)



Government practices risk management by passing rules and regulations that specify procedures for controlling risks and penalties for disregard of the procedures.

The risks that governments manage are those that affect the public in general or specific groups of people.

— **The Dose Makes the Poison: A Plain Language Guide to Toxicology**, by M. Alice Ottoboni

Cost-effectiveness analysis can, as the Framework for Environmental Health Risk Management states, “be used to help to choose among options that are expected to attain [the specified health or environmental goal] but use different approaches, generate different costs, and may have different probabilities of success.”

Regulators must also consider if an alternative mitigation option may cause any adverse effects and decide what the trade-offs among the different risks may be. For example, requiring a pesticide be worked into the soil reduces the risk of airborne drift but may affect drinking water. If the pesticide is chemically unlikely to reach ground water, this trade-off may be worthwhile.

Similarly, banning a pesticide because it might cause one health risk may increase the use of another pesticide or substance known to cause another health risk or other effects not well understood.

To ensure that the various factors are considered, DPR management may also consult with outside stakeholders, including farmworker representatives, environmental advocacy groups and the regulated industries (registrants, licensees and agricultural interests). If needed, DPR may schedule workshops to get public comment on the most feasible and effective approaches to mitigation.

SELECTION OF A RISK MANAGEMENT STRATEGY

Regulators must base their decisions on the best available scientific, practical and other technical information. Since available information is usually incomplete, decision makers often must rely on:

- Predictions about human hazards based on experiments in laboratory animals.
- Predictions about how much exposure occurs in a lifetime based on few or no measurements of the actual levels of exposure in people (because most studies are done on laboratory animals).
- Assumptions and models of exposure, exposure-response relationships, and estimates of the feasibility and effectiveness of different options.

Because regulators must make judgments based on limited information, it is critical they consider all reliable information. Risk assessors must provide decision makers with the best technical information available or reasonably attainable, including evaluations of the weight of the evidence that supports different assumptions, uncertainties and conclusions. Risk managers are constrained by the scientific, legal, social, technological and behavioral factors they must consider. The process is necessarily subjective in that it requires value judgments on safety margins and the reasonableness of control measures.

Selecting a risk management strategy requires an understanding of the risk assessment, mitigation approaches, California agriculture and the practical aspects of pesticide application. The selection is based largely on data suggesting the expected risks will be sufficiently reduced and the pesticide will remain effective. Risk managers must also be able to decide if the selected strategy is practicable from both a use pattern and a compliance and enforcement perspective.

Selecting management options, therefore, is case-specific. It is a search for the best combination of choices that reduce exposure below unsafe levels, are enforceable in the field, preserve acceptable product efficacy, and do not result in other, unacceptable health or environmental risks.

IMPLEMENTATION OF THE STRATEGY

The selected risk management strategy is at the core of a regulatory decision. It is carried out as part of a decision to approve or deny a proposed registration, or to put into place greater controls on an already registered pesticide.

DPR risk managers consider a range of decision options.

Revised label language

If the product is not yet registered, DPR may work with a registrant and U.S. EPA on amended label language to ensure that it meets California’s requirements. Under federal law, U.S. EPA has sole authority over label language and no state can require changes on pesticide labels. DPR can deny registration to a product unless the manufacturer obtains a U.S. EPA-approved label incorporating needed protections. Any use in conflict with the label is illegal under state and federal law.

If the product or products are already registered, DPR may request that registrants work voluntarily with U.S. EPA to revise label language.

California-restricted material

DPR can also adopt regulations making the pesticide a California-restricted material. This limits the purchase and use of these pesticides to trained individuals and only under time- and place-specific permits issued by county agricultural commissioners (CACs). DPR typically develops extra controls for restricted materials in the form of suggested permit conditions designed to be part of the permit. CACs use this information and their knowledge of local conditions to develop controls suitable for each site at the time of application.

Additional regulatory controls

Another alternative is for DPR to adopt regulations placing specific controls on a pesticide that are more restrictive than those on the federal product label. Examples include longer preharvest and reentry intervals, reduced application rates and acreage, controls on timing and frequency of application, and limits on crops and other sites to be treated. Other controls include personal protective equipment, special licensing for applicators, and buffer zones to protect people or wildlife near treated fields.

If occupational exposures will lead to worker safety regulations, state law requires that DPR and the state Office of Environmental Health Hazard Assessment (OEHHA) work together to develop the regulations. DPR must base its regulations related to health effects on OEHHA’s recommendations; the risk management decision and strategies are the responsibility of DPR management. When the risk management decision is not related to occupational exposures, OEHHA is provided with the opportunity to provide input before the regulations are adopted. (This is separate from OEHHA’s peer reviews of DPR risk assessments.)

Depending on the issue, DPR may also consult CACs, the Department of Industrial Relations, Department of Food and Agriculture, Air Resources Board, State Water Resources Control Board and the University of California.

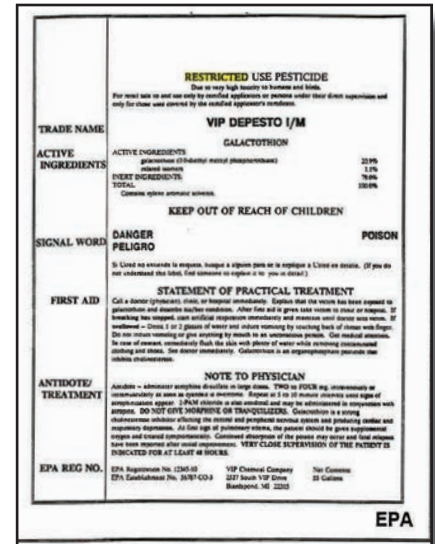
Denial of registration or cancellation

If mitigation measures cannot reduce the risk sufficiently, DPR can deny or cancel the registration of the pesticide product or products of concern.

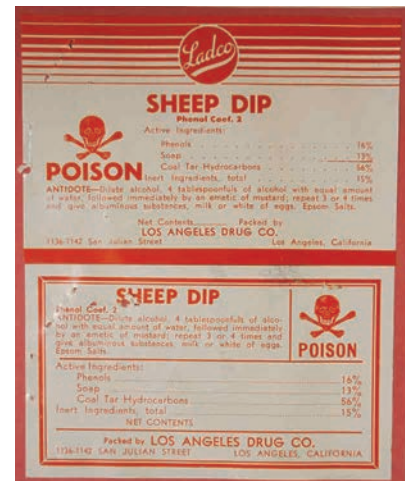
MONITORING AND EVALUATION OF RESULTS

Decisions to register pesticides or to allow continued use after registration reflect the state of knowledge and regulatory practices at the time the decision is made. Continuous evaluation by DPR plays an essential role in ensuring the continued safety of registered pesticides. (See Chapter 4 for more information on DPR’s mandate to conduct continuous evaluation.)

Post-registration developments in scientific knowledge and in experience may point to a need for information in addition to the data on which DPR based its risk



A sample pesticide label frequently used in training manuals.



Historical pesticide label.



Several factors are weighed in DPR's risk-management process.

assessment, mitigation and registration decisions. Situations that may signal the need for a reassessment include:

- New scientific knowledge of toxicological endpoints of concern, often combined with new investigative methods.
- Adverse effects reporting, illness reporting and results from epidemiological, exposure monitoring or environmental studies.
- Age of the supporting database. Over time, data requirements may have expanded, quality and scientific rigor increased and a wider range of risks must be considered. DPR may place an active ingredient into formal reevaluation to require registrants to develop needed data.

Post-registration monitoring may include:

- Evaluation of compliance with regulations and other control measures put into place to reduce exposure.
- Routine inspections and special studies (for example, monitoring environmental levels and effects), food residue surveys and illness surveillance.
- Discussions with stakeholders on observed effects and potential problems.

Monitoring can encompass several pesticides or can be focused on a single one. It can be limited to certain areas or be statewide. It can apply to one environmental medium (for example, air) or several. It can target certain types of pesticides (for example, fumigants) or certain commodities or activities.

Key questions to address when evaluating results include:

- Has the risk management strategy minimized risk enough to bring exposures below potentially harmful levels?
- Are the assumptions, including those made about the environment, technology and resources, still valid?
- Is the risk management strategy comparatively efficient and cost-effective?
- Can improvements be made and, if so, what might they be?

Pesticide Residue Monitoring

In 1906, Upton Sinclair’s novel *The Jungle* exposed conditions at Chicago meat-packing plants and triggered a public revulsion that pushed Congress into passing the Pure Food and Drug Act. It put the U.S. Bureau of Chemistry (later to become the U.S. Food and Drug Administration, FDA) in charge of protecting consumers against adulterated food and drugs.

FOCUS ON PESTICIDE RESIDUES

Residues of toxic pesticides on food were but one of many food safety concerns beginning in the 1890s. It became a more frequent problem in the two decades that followed when farmers began using arsenic more often and in greater quantity to fight codling moth, potato beetle, grasshoppers and other pests. Federal authorities began a program to periodically examine fruit for pesticide residues, to educate farmers on the problem and to encourage them to not spray fruit excessively. Farmers also developed techniques to wipe or wash residues from their harvested crops.

Between 1920 and 1925, there were a number of reported illnesses, and well-publicized seizures of fruit with high arsenic levels by health officers. Despite these incidents, state and federal officials continued to stress farmer education and persuasion about potential problems of excessive pesticide use, rather than regulation.

In Great Britain, government control was stricter. After a 1900 tragedy in which 70 people died after drinking arsenic-contaminated beer, England imposed a limit on arsenic allowed in food, including fresh fruit. In 1925, English authorities began testing imports after a series of illnesses among British consumers of American-grown fruit. Finding arsenic residues above the allowable level, the British Health Ministry issued a warning not to eat imported apples. Sales of fruit grown in California plummeted. In response, California began analyzing small quantities of produce for pesticide residues in 1926. In 1927, the U.S. Bureau of Chemistry set the first federal limits (called tolerances) on arsenic residues on apples and pears in interstate commerce and for export. A tolerance is the amount of pesticide that may safely remain in or on fresh produce at time of sale.

CALIFORNIA’S FIRST LEGISLATION

In response to Britain’s 1926 threat of an embargo, the California Legislature passed the Chemical Spray Residue Act (Statutes of 1927, Chapter 807) “to prevent the seizure of California fruits and vegetables on interstate and foreign markets.” The legislation made it illegal to pack, ship or sell fruits or vegetables with harmful pesticide residues. It gave the California Department of Agriculture (CDA) the authority to seize fresh products which, in the “judgment” of inspectors, “carry spray residue or other added deleterious ingredients,” pending chemical analysis. If analysis showed illegal residues, shippers were allowed to try to wash off the residues. The new law also set residue tolerances identical to those set by the federal government.



DPR scientists collect produce samples at a Southern California farmers market in 2013.



The spray residue program protects the health of consumers of fresh and dried fruits and vegetables through sampling and analyzing produce to make certain that it does not carry spray residue in excess of the tolerances permitted by law.

— 1947 California Department of Agriculture annual report

A second bill in 1927, the California Fruit and Vegetable Certification Act (Chapter 562), set up a fee-based program to allow farmers to get state certification that their crops were free of harmful residues.

By 1935, the California Department of Agriculture (CDA) was taking 22,000 samples a year in its voluntary certification program. (The department phased out this service by the 1940s.) It was also taking about 3,000 enforcement samples checking for illegal residues. For enforcement monitoring, inspectors made daily visits to wholesale and retail markets in Los Angeles, San Diego and San Francisco. Laboratories in those cities analyzed the samples. When illegal residues were found, the produce was quarantined and growers instructed on how to remove residues with an acid wash. Growers whose crops repeatedly had residues over allowable levels faced hefty fines and even jail sentences.

In 1934, the federal government set tolerances for residues of fluorine and lead. California followed suit and expanded monitoring to test for these residues. With the introduction of many new synthetic organic pesticides in the late 1930s and 1940s, the residue program began to test for DDT and other compounds. In 1949, the Spray Residue Act was amended to give the department authority to set pesticide residue tolerances. State laws passed in 1967 and 1983 reinforced California's right to review federal tolerances—to adopt them or to set stricter tolerances. In 1996, the federal Food Quality Protection Act (FQPA) preempted states from setting their own tolerances.

By 1950, with increased use of the new synthetic chemicals, CDA found few residues of arsenic, lead and fluorine. DDT was the most common residue found. Despite the wide variety of chemicals used, there were only four tolerances on the books: arsenic, lead, fluorine and DDT. In 1955, the FDA issued tolerances for 60 different pesticides on many crops.

In 1953, the California Legislature amended the Spray Residue Act to cover grains used to feed livestock or poultry. This was in response to the agriculture department's concerns that it could not take legal action in cases where pesticide misuse contaminated anything other than fruits or vegetables.

At the federal level, Congress amended the Food, Drug, and Cosmetic Act (FDCA) in 1954 to prohibit registration of any food-use pesticide that left residues unless the FDA issued a tolerance that sanctioned "safe" residue levels. In 1958, an amendment to FDCA, commonly referred to as the Delaney Clause, prohibited the use of any food additive shown to cause cancer in humans or experimental animals. Pesticide residue concentrations in processed foods at levels higher than those found in the raw agricultural commodity (e.g. whole tomatoes) were considered food additives and were thereby subject to the provisions of the Delaney Clause. However, pesticides that did not concentrate in processed foods were not considered additives and thus were not subject to the Delaney Clause. The 1996 passage of FQPA removed pesticide use from the Delaney Clause.

INCREASING CONCERN PROMPTS EXPANDED PROGRAMS

The 1980s saw a dramatic increase in public concern about pesticide residues in food, particularly fresh produce. In 1984, the Natural Resources Defense Council (NRDC) published a report, *Pesticides in Food, What the Public Needs to Know*. Its theme was like many to follow: that government pesticide residue monitoring programs were not protecting public health.

In 1985, the Commission on California State Government Organization and Economy (Little Hoover Commission) published a report, *Control of Pesticide Residues in Food Products: A Review of the California Program of Pesticide Regulation*. The report called California's pesticide regulatory program "a leader in the country and in many ways exemplary in comparison to other states" but nonetheless noted "great uncertainties" in pesticide science. The report criticized

the California Department of Food and Agriculture (CDFA) regulatory program for failing to focus on “pesticides of greatest concern” and called enforcement sanctions “cumbersome, ineffective and inadequate.” The report also mentioned that CDFA lacked “the residue data necessary for estimating risk (and) detection methods for many pesticides.” The commission also faulted the Department of Health Services (DHS, later named the Department of Public Health) for failing to maintain an adequate program for pesticide testing of processed food. The commission described DHS’s monitoring program as “so minimal that it could not be said to be ‘routine’” and recommended transferring responsibility for testing produce destined for processing to CDFA.

Potentially harmful pesticide residues in food received worldwide attention in July 1985 when widespread illnesses were reported by consumers of California-grown watermelons. The fruit contained illegal residues of the pesticide aldicarb. This illegal application—a criminal act by a handful of growers—was cited in the years that followed as an example of the failure of the CDFA pesticide regulatory system.

Federal agencies that monitor the food supply were not free from criticism. The U.S. General Accounting Office targeted them in two 1986 reports—Pesticides: Better Sampling and Enforcement Needed on Imported Food, and Pesticides: Need to Enhance FDA’s Ability to Protect the Public from Illegal Residues.

In 1987, the National Academy of Sciences (NAS) issued a report that further reinforced public concerns about food safety. This report, *Regulating Pesticide Residues in Food: The Delaney Paradox*, examined the effect the Delaney clause of the Federal Food, Drug, and Cosmetic Act had on regulation of pesticide residues in food by the U.S. Environmental Protection Agency (U.S. EPA). As part of its examination, the NAS committee developed theoretical estimates of risk from dietary exposure to 53 potentially carcinogenic pesticides used on food crops. (The Delaney Clause, added to law in the 1950s, banned additives in processed foods that are found to induce cancer in humans or animals. The Delaney Clause was later repealed by FQPA.)

In 1988, the State Assembly Office of Research published *The Invisible Diet: Gaps in California’s Pesticide Residue Detection Program*, which was critical of both DHS and CDFA. And in March 1989, the NRDC issued the report, *Intolerable Risk: Pesticides in Our Children’s Food*. Its conclusion that preschoolers were exposed to dangerous levels of pesticides in both fresh and processed foods generated intense media attention and controversy.

The NRDC report also contributed to passage of California’s Food Safety Act of 1989 (Chapter 1200, AB 2161). The legislation declared that California “has the safest food in the world as a result of a combination of federal and state programs of pesticide registration, pesticide use controls, licensing persons who recommend and use pesticides, and monitoring food for pesticide residues and other contaminants.” At the same time, the bill noted that “(r)ecent events have heightened public awareness relative to food safety and led to a desire for additional regulatory practices to advance California’s food safety protections even further.” The statute:

- Required increased priority pesticide monitoring, focusing on pesticides of greatest health concern and dietary exposure, especially in children.
- Established a scientific advisory committee to review residue analytical methods and a committee to fund research into alternative pest management practices.
- Required risk assessments on the dietary exposure to pesticides in both raw and processed foods.
- Gave state pesticide regulators authority to call in acute toxicity studies where



Illegal pesticide residues found on watermelons in 1985 helped spur reforms in the state's residue monitoring program.



There should be neither misunderstanding nor ill feeling if shippers everywhere met spray residue regulations, and it cannot be too strongly stated that it is economically entirely practicable to meet them.

— 1938 California Department of Agriculture annual report

needed to support risk assessments.

- Required DHS to start a processed food monitoring program.
- Required private residue testing laboratories to be accredited and to send to the state findings of illegal pesticide residues in the channels of trade.
- Gave the CDFA clear statutory authority to require full pesticide use reporting. The data was to “be considered in setting priorities for food monitoring, pesticide use enforcement, farm work safety programs, environmental monitoring, pest control research, public health monitoring and research, and similar activities.”

The legislation (AB 2161) also mandated that CDFA and DHS jointly review state and federal pesticide registration programs to determine if infants and children were adequately protected from dietary pesticide residues. The review was to consider an evaluation of federal registration being done by NAS. When NAS released its report in June 1993, the California Environmental Protection Agency (CalEPA) formed the Pesticide Exposure to Children Committee (PECC), with scientists representing the California Department of Pesticide Regulation (DPR), DHS, the Office of Environmental Health Hazard Assessment, CDFA, U.S. EPA and the University of California.

In a 1994 report to the Legislature, the PECC concluded that “the current California and federal pesticide regulatory systems adequately protect infants and children from risks posed by pesticide residues in the diet.” The committee, however, noted “potential areas for improvement of the pesticide registration and food safety programs.” The committee called on DPR “in its role as the lead agency for pesticide regulation” to continue efforts to work with U.S. EPA “to achieve greater harmony in pesticide regulatory programs.” The committee also made several recommendations to improve risk assessments, many of which have been carried out. For example, the committee recommended that DPR and U.S. EPA assess pesticide risk not only from dietary food but also from other routes of exposure, including drinking water and home pesticide use. This approach was adopted by the end of the 1990s. Improvements in laboratory analytical methods answered the committee’s recommendation that residue detection limits be at levels “pertinent for risk assessment.”

CALIFORNIA’S RESIDUE MONITORING PROGRAM

The flurry of interest and reports in the 1980s sparked many responses. In 1985, partly in response to the 1985 Little Hoover Commission report, the CDFA expanded the pesticide residue monitoring program. The Legislature added more than \$2 million to the department’s budget to almost double the samples analyzed and to create three new monitoring programs to supplement the Market-place Surveillance Program, which focused on retail channels of trade. The new programs, which began in 1987, were:

- Preharvest sampling of crops in the field, designed to detect the use of illegal pesticides before harvest.
- Postharvest sampling of raw produce destined for processing (established and funded by Chapter 1285, Statutes of 1985, AB 1397).
- Postharvest sampling of commodities known to have been treated with pesticides of health concern. This was called the Focused Monitoring Program and later the Priority Pesticide Program. The goal was to collect data to help make more accurate assessments of dietary risk.

With the passage of the Food Safety Act in 1989, the number of samples taken in the four monitoring programs reached an annual high of more than 12,500 samples in 1989. It remained high through the early 1990s before declining to

about 8,000 samples a year in 2000 and about 3,400 samples a year in 2014. Although smaller than in past years, the California Pesticide Residue Monitoring Program remains the most extensive state residue-monitoring program in the nation. DPR now contracts with the CDFA's Center for Analytical Chemistry to analyze samples.

During the 1990s, DPR improved its analytical capabilities. In 1988, residue program chemists were using multi-residue analytical methods (called screens) that could detect 108 pesticide active ingredients, metabolites and breakdown products. By 1991, that number had increased to more than 200. Today, CDFA's laboratories in Sacramento and Anaheim screen samples for more than 300 pesticide compounds and pesticide breakdown products. Results are usually available within 24 hours.

Budgetary cutbacks in 1992 and 1993 prompted DPR to first cut back and then end the preharvest and produce-destined-for-processing programs. They had been designed to address specific concerns and had achieved many of their goals. DPR concluded that their cessation would not adversely affect food safety because both programs had shown consistently lower percentages of detectable residues and lower rates of violations than in the broader Marketplace Surveillance Program.

In mid-2000, DPR combined the remaining two programs (Priority Pesticide and Marketplace Surveillance) to improve quality control over sampling and analysis. Combining the two programs resulted in significantly more data for dietary risk assessors. Under the earlier Priority Pesticide Program, there had been a limited number of samples taken of each commodity and each sample was typically analyzed for a single pesticide from among a small group of chemicals under regulatory scrutiny. In contrast, under the combined program, DPR takes a larger number of samples of each commodity and each is analyzed for multiple pesticides.

An added benefit is that all results are enforceable. Because the focus of the Priority Pesticide Program was data gathering, samples were typically not analyzed until days or weeks after the sample was collected. If illegal residues were found, no enforcement action could be taken because of the difficulty of investigative follow-up.

The combined program continues today as the California Pesticide Residue Monitoring Program. DPR samples individual lots of domestic and imported fresh produce (raw agricultural commodities) and analyzes them for pesticide residues. Sampling of processed food is the responsibility of the Department of Public Health (DPH) and the FDA. DPR collects samples from throughout the channels of trade—at packing sites, wholesale and retail markets, and farmers markets. DPR Enforcement Branch scientists collect most samples and county agricultural commissioners collect follow-up samples when investigating possible pesticide misuse.

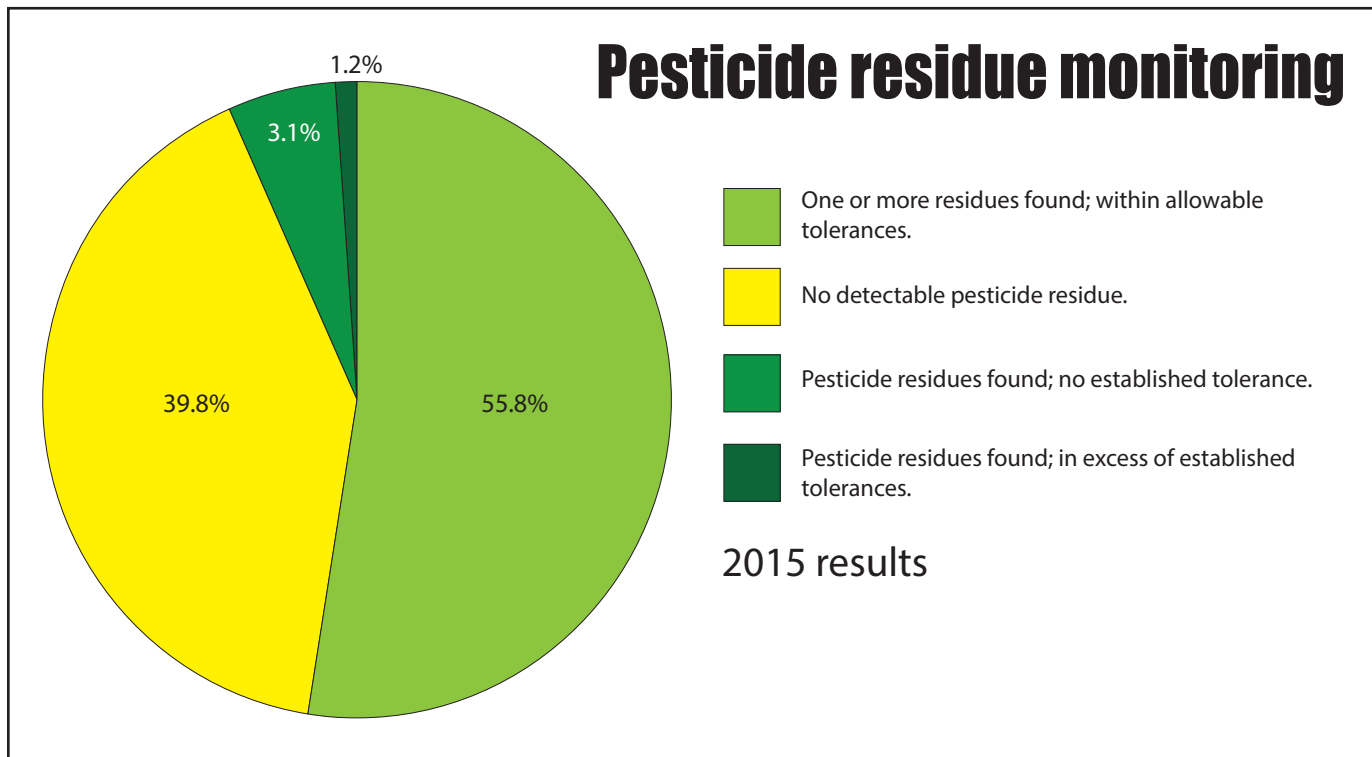
DPR samples commonly consumed commodities, with special emphasis on food consumed by infants and children and pesticides listed as causing cancer or reproductive toxicity. In addition, to ensure protection of all subpopulations, DPR selects commodities and sampling locations to reflect differences in consumption patterns of different cultural, ethnic and socioeconomic groups.

Residue monitoring is directed toward enforcement of U.S. EPA tolerances. If illegal residues are found (either above the tolerance or with no tolerance for that combination of commodity and pesticide), DPR immediately removes the illegal produce from sale, then verifies that the produce is either destroyed or returned to its source. In addition, if the owner of the commodity has similar produce from the same source, DPR quarantines those lots until the laboratory verifies it is free from illegal residues. Further, DPR traces the distribution of the illegal produce by contacting distributors throughout California, imposing quarantines



Enforcement work must be reasonable, avoiding hysteria, and simultaneously evaluate all factors With continuation of careful enforcement, the proportion of low-residue fruits and vegetables continues to be satisfactory.

— Dr. Alvin J. Cox, head of the department's pesticide regulatory program, in a 1941 article for the *American Journal of Public Health*



and conducting extra sampling as needed. DPR works with FDA and federal Immigration and Customs Enforcement to identify and eliminate sources of illegal residues in imported produce.

If investigators find there was illegal pesticide use, violators can be fined. For recurring or egregious violations, DPR can invoke additional sanctions.

DPR toxicologists review illegal residue detections to determine if adverse health effects can be expected by eating the tainted produce. Tolerances are set with a margin of safety so this seldom occurs. However, should it be necessary, DPR works with DPH to issue a health alert to warn consumers who may have purchased the produce.

DPR works actively with partners, including FDA, to identify and eliminate sources of illegal residues. (*See Coordination with Federal Agencies on Page 63.*) In addition, DPR collaborates with trade organizations and farmer-training projects, encouraging them to educate producers about pesticide residues in their commodities.

Nonetheless, DPR's sampling program is designed primarily to meet the goal of preventing "public exposure to illegal pesticide residues" (Statutes of 1986, Chapter 1375, SB 1889). For that reason, the data are not statistically representative of the residues typical for a particular pesticide, commodity or place of origin. Some sampling bias may be incurred by intentionally concentrating on such factors as commodity, place of origin with a history of violations, or large volume of production or import. In addition, the total number of samples of a given commodity analyzed for a particular pesticide each year may be insufficient to draw specific conclusions about overall residues for a commodity in commerce.

Under a statutory mandate (Statutes of 1986, Chapter 1375, SB 1889), DPR annually publishes a summary overview of the residue monitoring program in

the Pesticides in Fresh Produce report. The report and residue data are posted online at: <http://www.cdpr.ca.gov/docs/enforce/residue/rsmonmnu.htm>

ANALYTICAL METHODS

DPR's samples are analyzed by the two laboratories of the CDFA Center for Analytical Chemistry located in Sacramento and Anaheim. Samples are analyzed as unwashed, whole (unpeeled), raw commodities as required by U.S. EPA regulations. Between 1991 and 2011, the CDFA laboratories analyzed all samples using multi-residue screens that could detect more than 200 pesticide active ingredients and breakdown products at the parts per billion level. In addition, selected samples were analyzed for nonscreenable pesticides of enforcement concern, using analytical methods capable of detecting residues well below U.S. EPA tolerances.

In 2012, the CDFA Center for Analytical Chemistry improved its capacity to detect pesticide residues. During that year, the CDFA laboratory in Sacramento replaced the "old" multi-residue screens with two new analytical techniques, LC-MS/MS (liquid chromatography—tandem mass spectrometry) and GC-MS/MS (gas chromatography—tandem mass spectrometry). These two techniques were implemented in CDFA's Anaheim laboratory in 2014. With LC-MS/MS and GC-MS/MS, CDFA can detect more than 350 pesticide active ingredients and breakdown products at the parts-per-billion level. The pesticide residues detected by these new analytical techniques include the residues detected using the "old" screens as well as residues of many active ingredients registered by U.S. EPA and DPR in the 1990s and beyond. The implementation of LC-MS/MS and GC-MS/MS increased the overall proportion of DPR samples on which pesticide residues are detected. Prior to 2012, CDFA detected pesticide residues in less than 40 percent of samples tested. In 2014, the proportion of DPR samples with detected pesticide residues was greater than 59 percent.

COORDINATION WITH FEDERAL AGENCIES

The effectiveness of DPR's pesticide residue monitoring program is enhanced by collaboration with the FDA, which monitors raw and processed food nationwide. The two agencies share monitoring results and cooperate on investigations.

In addition, DPR carries out the California portion of the U.S. Department of Agriculture (USDA) Pesticide Data Program (PDP). California is one of 12 participating states. PDP is a national program that analyzes pesticide residues on agricultural commodities in the U.S. food supply, with an emphasis on those commodities consumed by infants and children. USDA also analyzes drinking water submitted by participating utilities. U.S. EPA uses the data to estimate dietary pesticide exposure.

Because accurate dietary exposure assessment requires data on even minute traces of residues, multi-residue methods were enhanced to be sensitive to residue levels of significantly less than 50 parts per billion. California's participation in PDP helped produce significant improvements to the multi-residue screens that can simultaneously detect many pesticides.



A DPR scientist collects produce samples for residue testing from a grocery distribution center.



Many pesticides are toxic to human beings and practically all are capable of causing some type of damage or injury if improperly handled.

— 1950 California Department of Agriculture annual report

Protecting Workers and the Public

The mission of the Department of Pesticide Regulation (DPR) is to protect human health and the environment from risks posed by pesticides and to promote safer means of pest control. DPR programs are oriented to those goals through:

- Evaluating the safety of pesticides before registration, sale, and use.
- Monitoring places where pesticides are sold to remove unregistered products from the channels of trade.
- Training of professional pesticide handlers and others who may be exposed to pesticides in the workplace.
- Ensuring that only specially trained and certified workers handle the most toxic pesticides (restricted materials) and requiring site- and time-specific permits for use of these compounds.
- Monitoring of air, water, and fresh produce to find out if there are residues of concern.
- Monitoring of pesticide exposure in the workplace and other settings.
- Investigating and tracking pesticide illnesses and injuries.
- Local enforcement to ensure laws and regulations are being obeyed.
- Promoting adoption of pest management strategies that stress pest prevention and the use of nonchemical or least-toxic methods in farm fields, homes, parks, schools and child care centers.

Many of these topics are discussed in other chapters. This chapter focuses on health and safety programs managed by DPR's Worker Health and Safety (WHS) Branch.

DPR'S PIONEERING WORKER SAFETY PROGRAM

Following the 1972 passage of Assembly Bill 246, which amended the Food and Agriculture Code, the state departments of Agriculture and Public Health established training requirements for pesticide handlers and set up a pesticide illness reporting and investigation system, then unique in the nation. California was also the first state to establish a policy on the use of closed systems for mixing and loading highly toxic liquid pesticides. Closed systems are a preferable engineering alternative to personal protective equipment.

Worker protection standard

In 1992, the U.S. Environmental Protection Agency (U.S. EPA) issued a new federal Worker Protection Standard (WPS), which became final in 1995. This federal regulation was designed to reduce the risk of pesticide poisonings and injuries among pesticide handlers and other agricultural workers exposed to pesticides. Although the federal standard drew on California's worker safety program as a model, there were differences between the two. In 1997, after DPR made conforming changes in its regulations, U.S. EPA approved the department's request for equivalency of California's pesticide safety program.

In November 2015, the U.S. EPA published revisions to the 1992 version of the WPS. The new WPS requirements were implemented starting Jan. 2, 2017. DPR revised its worker protection regulations to conform to these changes and maintain its pesticide safety program equivalency.

In addition, DPR has several regulatory requirements stricter than those in the 2015 federal WPS. For example, the federal WPS applies only to pesticide use in production agriculture. DPR’s worker safety regulations apply to all employees who handle pesticides and all employees exposed to pesticide residues.

Hazard communication

DPR requires employers to provide and maintain a mandated written hazard communication program for their employees and provide unimpeded access to pesticide use records and Safety Data Sheets (SDSs). In ongoing efforts to improve worker protection, DPR and technical experts met with public interest and farm labor groups; county agricultural commissioners (CACs); state and local public health officials; migrant health clinic directors; and agricultural production representatives to improve the notification and hazard communication regulations. Following up on the information gathered, DPR studied the effectiveness of warning signs posted around treated fields that tell workers and others when it is safe to reenter. DPR also studied how workers received verbal notification of when a field was scheduled to be treated, information about the hazards of working with pesticides, and about symptoms of illness.

The studies found problems with notification and hazard communication rules that led DPR to make changes in the regulations. In 2009, DPR put regulations into place to ensure employees get information about pesticides being used in the fields where they work, before and after an application. The changes were also designed to strengthen safeguards already in place to prevent employees from entering a treated field during a restricted-entry interval. The rules made several changes, including:

- Requiring pesticide applicators to notify the grower before and after a chemical is used, and re-notify if the scheduled application date changes.
- Requiring the grower to manage his or her property as if the application could occur any time within a 24-hour window.
- Requiring growers, and any hired contractor notified by the grower of a scheduled application, to ensure prior notification for any employees who walk within one-quarter mile of a field to be treated.
- Requiring growers to notify persons who they know will likely enter a field to be treated (other than their employees or contractors) before and after an application.
- Requiring growers and labor contractors to provide uncomplicated directions to where employees can find information about the pesticides used where they work, and to provide unimpeded access to these records (Application information is usually posted at a central location for a farming operation, not in the field where the application was made.)

Training

DPR requires training each year of employees who handle pesticides (for example: mixers, loaders, applicators, and application equipment mechanics). Starting Jan. 2, 2017, DPR required annual training for fieldworkers which is a new requirement contained within the 2015 revision to the WPS. California regulations require that pesticide handler and fieldworker training incorporate the Pesticide Safety Information Series (PSIS) leaflets produced by the WHS Branch. PSIS leaflets are available for workers in both agricultural and nonagricultural settings. Subjects include hazard communication (worker rights), first aid, medical



Signs posted in fields alert workers and others about pesticide applications.



Maintenance gardener certification exam in 2016.

supervision, pesticide handler safety, pesticide storage and transport, protective equipment and engineering controls, minimal exposure pesticides, and respiratory protection. The leaflets are available on DPR's website in English, Spanish and Punjabi.

Personal protective equipment (PPE)

In 2016, DPR revised the closed systems regulations to require a tiered mitigation scheme to establish specific closed mixing system and PPE requirements based on the Human Hazard and Precautionary Statements specified on the label. Pesticides with the following Precautionary Statements "Fatal if absorbed through skin," "May be fatal if absorbed through skin," "Corrosive, causes skin damage," or other comparable language are required to use one of two types of closed mixing systems. Closed systems place the responsibility on employers to protect workers, which is more effective than requiring employees to wear protective clothing. Where PPE is required, DPR has a more extensive set of requirements than U.S. EPA. In addition, DPR has adopted a full respiratory protection program equivalent to Cal/OSHA (and federal OSHA).

Restricted entry intervals

DPR has established longer restricted-entry intervals (REIs) than U.S. EPA for 12 pesticide active ingredients. REIs reduce potential worker exposure to pesticide residues by specifying the period following the application of a pesticide during which unprotected workers should not enter a field.

Soil fumigants

DPR has several rules related to soil fumigants. They are more restrictive than U.S. EPA's soil fumigant rules, implemented in 2010, and include pesticide-specific buffer zones around application sites and reduced application rates. In addition, pest control businesses conducting fumigations in California must have a supervisor with a special field fumigation license from DPR.

Outreach

State law was amended in 2003 (Chapter 741, SB 1049) that required DPR to "create a program to conduct outreach and education activities for worker safety ... and proper pesticide handling and use ... (including) rights and procedures of workers and those potentially exposed to pesticides and how to file confidential complaints." In response, DPR assigned a bilingual specialist to coordinate outreach for Hispanic workers, their families and their communities. This specialist works with other WHS, Enforcement Branch, CAC, and U.S. EPA staff to promote pesticide safety with health and safety workgroups. The specialist also conducts outreach at safety and health fairs, and through radio and television public service announcements.

Medical supervision

For more than 40 years, DPR has required employers to provide medical supervision for agricultural employees who regularly handle specific organophosphate and carbamate insecticides. Employers arrange with a physician to medically supervise workers who regularly handle these cholinesterase-inhibiting pesticides by monitoring their blood cholinesterase (ChE) levels. Cholinesterase is an enzyme that helps regulate nerve impulses. Overexposure to these compounds can inhibit ChE levels enough to induce serious illness and routine monitoring of ChE handlers allows physicians to detect excessive exposure before workers become clinically ill. Physicians compare the blood test results with baseline measurements taken before the worker was exposed to cholinesterase-inhibiting pesticides. If excessive exposure is detected, the employer must reexamine the workplace and pesticide handling procedures. If the employee becomes ill or cholinesterase falls

below specified levels, the employee must be removed from further exposure until new blood tests show it is safe to work with cholinesterase-inhibiting pesticides again. Only one other state (Washington) requires regular testing of organophosphate and carbamate pesticide handlers to prevent illness.

Legislation in 2010 (Chapter 369, AB 1963) required that laboratories doing blood tests to determine worker exposure to cholinesterase-inhibiting pesticides report the results electronically to DPR. The department manages reporting, keeps a database of the information and shares it with the Office of Environmental Health Hazard Assessment (OEHHA) and the Department of Public Health (DPH).

COORDINATION WITH COUNTY AGRICULTURAL COMMISSIONERS

DPR manages the state’s occupational pesticide safety enforcement program with field enforcement carried out by staff from each CAC office. Enforcement and Worker Health and Safety branches provide coordination, oversight, and technical and legal support to CACs.

Working under an interagency agreement with DPR, CACs perform certain pesticide enforcement activities. These range from investigations of pesticide-related illnesses to checking training and pesticide storage records of pest-control companies.

Each CAC also must work with DPR to negotiate an annual pesticide enforcement work plan that gives higher priority to such enforcement activities as worker protection inspections, illness investigations, applications of certain high-toxicity pesticides, and agricultural applications of pesticides near parks or schools. Lower priority is given to routine inspections of growers or businesses with no recent violations. *(For more information on enforcement and the role of CACs, see Chapter 2.)* When DPR and CACs collaborate on developing the annual enforcement work plans, they review pesticide illness statistics to see where extra emphasis may be needed in education or enforcement.

DPR provides technical support for CAC investigators. DPR scientists are subject-matter experts in their respective fields and are available to assist the CAC investigators. WHS and Enforcement Branch scientists have developed training modules covering basic to advanced investigation procedures, and provide these trainings to CAC every two or three years, or upon request. Topics include health effects of pesticides, evidence collection (including collection of foliage, clothing or surface residue samples to document environmental exposure), interview techniques, and writing investigative reports.

INVESTIGATING PESTICIDE EPISODES

CACs, assisted by DPR, investigate pesticide-related episodes reported in their counties that result in harm to people or the environment. The primary objective of an investigation is to determine and document the circumstances of the episode, to identify continuing hazards or violations, and gather evidence to support regulatory changes or enforcement action.

Investigations are critical to evaluating pesticide use patterns, emerging risks and the effectiveness of the label directions, regulations, and regulatory policies and practices. Pesticide episodes investigated include:

- Human health effects while handling pesticides, pest control aircraft accidents, exposure to residues in treated areas (fields, offices, homes), and exposure from drift.
- Economic loss or damage to property, equipment or livestock (including bees) resulting from drift, accidents or residues that result in the inability to market a



A farm labor contractor conducts worker safety training in Tulare County, 2015.



Cilantro tested for pesticide residue at the CDFA lab in Anaheim in 2015.

crop or animal.

- Environmental effects including contamination or damage to the environment, such as fish or wildlife kills, domestic animal poisonings, lake, stream or ground water contamination, or phytotoxic effects because of persistent residues in the soil.
- Illegal residues on crops.

Pesticide episodes come to the attention of the department and CACs in various ways, including employee or public complaints, pesticide illness reports from local health officers, Poison Control Center and physician reports, and news media stories. Information may also come from government agencies, pest control operators, growers and public interest groups. State and county surveillance and compliance monitoring can also bring problems to light. DPR routinely forwards pesticide-related episode reports it receives to the appropriate CAC for investigation. DPR and CACs take joint responsibility for investigation of illegal pesticide residues on fresh produce. (*See Chapter 7 for information on DPR's residue monitoring program.*)

The commissioner's office in the county where the episode occurred is the lead investigative agency. CAC staff work in consultation with an environmental scientist in DPR's Pesticide Enforcement Branch, who can in turn draw on the expertise of other branches in the department. For example, scientists from the WHS and Human Health Assessment branches can provide support for illness episodes. Environmental Monitoring scientists may assist when incidents involve environmental effects and the Pesticide Registration Branch can provide experts in plant physiology and chemistry when pesticides adversely affect crops, fish and wildlife. In some incidents involving human illness or injury, WHS and Enforcement staff participates directly in the investigation. DPR also works with the California Department of Fish and Wildlife on wildlife investigations and with the U.S. EPA on episodes that cross jurisdictional boundaries between states, or between California and tribal lands or Mexico.

CAC investigators try to locate and interview everyone with knowledge of the incident, collect samples appropriate and according to the investigative plan, and review relevant records. When appropriate, they ask for authorization from the affected people to get relevant portions of their medical records to include with the investigative reports.

Investigative samples can provide physical evidence to prove violations of pesticide laws, to assess the nature and degree of exposure, or to guide DPR development of mitigation strategies to prevent future episodes. Depending on the episode, investigative samples may include:

- Commodity samples to determine the presence and amount of pesticide residue.
- Foliage to determine the amount of residual pesticides on leaves.
- Material wiped from surfaces to detect contamination or drift onto cars, windows and similar surfaces.
- Air, water or soil.
- Clothing worn by affected workers.
- Dead bees, animals, birds or fish.
- Pesticide mixtures in application equipment.

DPR contracts with the California Department of Food and Agriculture Center for Analytical Chemistry to analyze samples.

When their investigations are complete, CACs send reports to DPR describing their findings. These reports describe the circumstances that may have led to incident and the effects on any exposed individuals. In their role as enforcement

agents, CACs also find out whether pesticide users complied with safety requirements. The CAC may file enforcement actions or ask local prosecutors to do so. DPR attorneys monitor and may help develop case files. DPR may prosecute administrative cases or serve on prosecution teams with county district attorneys or the California Attorney General’s Office. (For information on the types of enforcement actions, see Chapter 2.) On request, DPR scientists will provide guidance to the CAC during an investigation or administrative civil penalty hearing.

DPR uses investigative reports to evaluate pesticide use patterns and trends, and to identify broader statewide or national issues. Complete, well-documented investigations establish the basis for taking appropriate enforcement actions and for determining whether an episode was pesticide-related and, if so, what the circumstances and effects were. Considering investigative and other data, DPR may adjust the restricted entry interval following pesticide application, specify buffer zones or other application conditions, or require pesticide handlers to use protective equipment that meets certain standards. Since many incidents result from illegal practices, investigations direct the attention of state and county enforcement staff to the reasons for noncompliance. Sometimes, no violation is found and changes to pesticide labels provide the most suitable mitigation measure. Since the U.S. EPA has exclusive authority to require label changes, DPR cooperates with U.S. EPA to revise instructions for pesticide users throughout the country or, alternatively, for a California-specific label. If an incident results from illegal practices, DPR or CAC staff can take enforcement action to deter future incidents.

U.S. EPA PRIORITY EPISODES

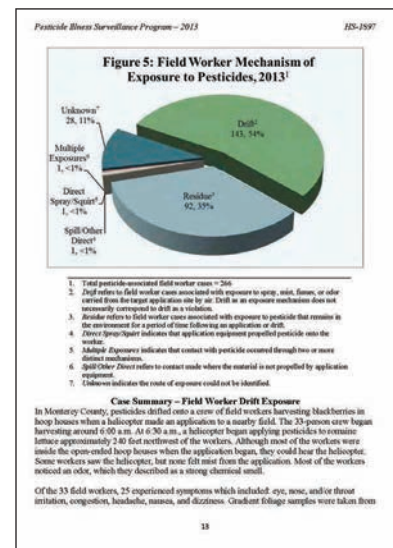
Certain episodes are considered “priority” investigations and trigger special handling under a cooperative agreement between DPR, CACs and U.S. EPA. The agreement sets criteria that define a priority episode and establishes reporting requirements and timeframes for the submission of investigation reports on these episodes. Criteria triggering priority investigation status include episodes involving death, serious illness or injury requiring in-patient hospitalization, or illness to five or more persons; aircraft accidents; significant environmental contamination; property loss; fish and wildlife kills; or episodes occurring at or near California’s state, tribal or international borders.

Counties must report these episodes to DPR immediately. DPR in turn reports priority episodes to U.S. EPA, DPH, Department of Industrial Relations (DIR), the Office of Environmental Health Hazard Assessment (OEHHA) and other affected government agencies. Cooperating agencies with relevant expertise may become involved in a priority episode investigation.

PESTICIDE ILLNESS SURVEILLANCE PROGRAM

Most pesticides are toxic to certain life forms by design. Pesticides also have the potential to cause adverse health effects on humans and other non-target species. Health effects may result from intentional misuse, unintentional exposures or use according to the product label. Pesticide handlers in the agricultural, retail food and service industries are most likely to face exposure to pesticides given the nature of their frequent contact with pesticides, including sanitizers. However, people can be exposed to pesticides in water, soil and air because of misuse or drift from sprayed areas, whether from agricultural fields or in office workplace settings. People may also face exposure from home-use pesticides or residues in food or drinking water.

Scientists from DPR’s Pesticide Illness Surveillance Program (PISP) evaluate information gathered by CACs during their illness investigations to determine the likelihood the pesticide(s) caused the resulting symptoms. California has the



A page from 2013's PISP report. California has the nation’s longest-standing and comprehensive program to investigate, track and evaluate pesticide illnesses.



Adequate analytical technique is essential ... in securing accurate information on dosages, dilutions, and applications of the chemicals and in following the fate of chemicals in mixtures and as residues on treated plants. ...

— 1945 California Department of Agriculture annual report

nation's longest-standing and comprehensive program to investigate, track and evaluate pesticide illnesses.

DPR collects information on adverse effects resulting from any component of a pesticide product, including the active ingredients, inert ingredients, impurities and breakdown products. Health effects evaluated include not only classic toxic effects but also illnesses that occur when products act as irritants or allergens, make people ill with their odor, or cause fires or explosions.

Illness episodes may be use-related or not use-related, and occupational or non-occupational. Use-related pesticide exposures result from pre-application (mixing/loading), application and post-application activities. Examples are mixing, loading and applying pesticides (including antimicrobials), operating equipment to move fumigated commodities, workers exposed to pesticide residue in fields and offices, exposure to pesticide drift, or cleaning spray equipment.

Occupational, use-related episodes affect people who were at work when they were exposed. They may be pesticide handlers, field workers, office workers, or others exposed to residue or drift from a pesticide application. Non-occupational, use-related illnesses are those that affect bystanders, for example, residents of homes affected by pesticide drift from nearby fields.

Non-use related exposures occurring at work fall under the jurisdiction of the Department of Industrial Relations (DIR). Non-use related exposures result from activities incidental to other tasks, such as: 1) pesticide manufacturing, formulating and packaging, 2) commercial transport and storage, 3) emergency response to fires and spills, or 4) exposure at disposal sites. Although non-use related exposures may be outside DPR/CAC jurisdiction, involvement by the commissioner or DPR may be requested because of their knowledge about pesticide toxicology, effects and hazards.

Records of pesticide-related illnesses and injuries among California workers have been maintained by various state agencies since the beginning of the 20th century, first by DIR and then DPH. In 1972, the Legislature gave the Department of Agriculture primary authority over the safety of pesticide use in the agricultural workplace. In 1988, the regulations were revised to cover other, nonagricultural workplaces where pesticides are used (except for exceptions under DIR jurisdiction). In 1991, with the creation of CalEPA, authority for regulating pesticide use was moved to DPR.

Since 1971 (Chapter 1415, Statutes of 1970), California law has required physicians to report all pesticide-related illnesses or injury to the local health authority, usually a county department of health. The law applies to all types of pesticides (for example, insecticides, herbicides and disinfectants) and to any location (such as farm, home or office). The health officer must send copies of the pesticide illness report to the county agricultural commissioner, OEHHA and DPR. Although DPR receives some illness reports from direct physician reporting, most come through the workers' compensation program or the California Poison Control System (CPCS).

In California, any employed person may visit a doctor and report that an illness or injury occurred on the job. DPR has a formal agreement (a Memorandum of Understanding) with DIR and DPH which allows WHS scientists to regularly review workers' compensation reports and select for investigation by the agricultural commissioners any report that mentions a pesticide or suggests a chemical likely used as a pesticide as a possible cause of injury. From 1983 through 1998, review of workers' compensation reports identified most cases investigated.

In 1999, through a contract with DPR, the California Poison Control System began aiding in pesticide illness reporting by offering to report on behalf of physicians who call CPCS for consultation on pesticide-related illness and injuries. Cooperation with CPCS identified hundreds of symptomatic exposures—primarily

non-occupational—that otherwise would have escaped detection. The 2002 state budget crisis prevented continuation of the contract after federal funding ended. When DPR's financial footing improved, the department renewed its contract with CPCS in 2006. DPR also continues to work with OEHHA in its efforts to not only provide the healthcare community with information on pesticide safety but to also increase their awareness of pesticide illness reporting requirements.

Information gathered through investigation can be used to detect whether particular populations are at greater risk or whether there are activities associated with overexposure that can be adjusted to prevent illness. Evaluation by PISP scientists can reveal a pattern of problems associated with a particular pesticide active ingredient or a product formulation. Investigation can discover whether a pesticide made someone ill despite use according to the pesticide label, whether it was because of a violation of label instructions, or whether the label instructions were unclear, confusing or inaccurate. This information can be used to find out if the product was used inappropriately or whether changes are needed in label instructions, product design, or personal protective equipment to prevent more illnesses.

As part of DPR's program to continuously evaluate pesticides in use, scientists regularly consult the illness data to evaluate the effectiveness of DPR's pesticide safety programs and assess the need for changes. (*For more information on continuous evaluation, see Chapter 4.*) New regulatory initiatives may spring from analysis of the cumulative database or in direct response to illness episodes. For example, DPR traced a series of field worker illnesses in the 1980s to propargite exposure. In response, DPR extended the restricted entry interval beyond what was on the U.S. EPA-approved product label.

In 1988, a series of illnesses among vineyard workers prompted an in-depth field study by WHS scientists. They found that in late summer, residues of the insecticide methomyl dissipated slower than expected. This prompted DPR to adopt regulations extending the restricted-entry intervals from seven days to 21 days after July 1 each year.

In 2010, DPR received reports of two workers exposed intermittently to methyl bromide over several months as part of their job inspecting produce in a cold-storage facility. The imported produce had been fumigated earlier at the Port of Los Angeles, as required by U.S. law. After this incident, DPR conducted air monitoring at produce storage facilities and in transport trailers and determined that methyl bromide can off-gas for several days after fumigation and build up to potentially harmful levels in storage or transport. DPR worked with U.S. Department of Agriculture, U.S. EPA, the Los Angeles CAC, cold storage operators, fumigators, Chilean grape growers and import firms to develop new work practices to reduce post-fumigation exposure and prevent worker illness.

WHS has prepared annual summaries and analyses of reported pesticide illnesses since 1973. Annual summaries since 1996 are posted on DPR's website. In 2009, DPR launched a web-based search engine of the illness database. The California Pesticide Illness Query, or CalPIQ, includes illness and injury data since 1992. Users can seek data based on customized variables, including year and county where the incident occurred, whether the use was in agriculture or not, and specific pesticide by toxicity category, active ingredient or intended use.

WHS physicians and other staff are also available to consult with healthcare providers and local health authorities, often with active illness investigations. In addition, DPR staff is available to consult with the medical community about pesticide-related concerns.

EXPOSURE MONITORING STUDIES

For more than four decades, DPR scientists have conducted studies designed to



DPR contracts with the California Poison Control System and uses data to track reported pesticide incidents or poisonings.



DPR scientists study the movement of pesticides in the air during a drone demonstration in Arbuckle in 2016.

increase knowledge of how workers and others are exposed to pesticides and, in doing so, improve protective measures.

The WHS exposure monitoring program designs and conducts studies to characterize human exposure to pesticides in the workplace and elsewhere; evaluate new application strategies (e.g. unmanned aerial vehicles); evaluate mitigation measures; and provide data for risk assessments (*see Chapter 5 for more information on exposure assessment*) and regulatory purposes. These studies monitor various activities such as mixing, loading and applying pesticides, worker reentry into treated fields, and fumigations (soil and structural). In each situation, the goal is to identify factors influencing the degree of exposure, as well as to measure exposure.

Exposure monitoring studies help WHS scientists evaluate the effectiveness of protective clothing and equipment (e.g. gloves and respirators), engineering controls (e.g. closed mixing systems for preparing pesticides for application, enclosed cabs), and work practices in mitigating exposures.

Many methods are used to obtain data. For example, clothing worn by agricultural workers performing routine tasks is collected and analyzed to determine residue levels and estimate the amount of dermal exposure. This information identifies factors affecting transfer of a pesticide from foliage to work clothing or skin. In addition, urine and blood samples may be collected and analyzed for biological indicators of exposure. Studies may compare the effect of various application methods on worker exposure (e.g., helicopter vs. unmanned aerial vehicles). Studies involving human subjects require formal protocols approved by an independent review board.

DPR scientists also collect data on the amount of pesticide residue deposited on plants following various application methods and rates. These data allow scientists to characterize residue decay rates that may differ under varying environmental conditions. This information may be critical in determining potential worker exposures and is used in developing mitigation measures.

Besides evaluating the effectiveness of mitigation measures, exposure monitoring studies may be used directly for regulatory purposes such as setting reentry intervals, determining needed protective gear, and developing safe handling practices.

DPR scientists review pesticide exposure protocols for studies conducted in California that involve human subjects. As part of the Human Subjects Protocol Review process, DPR scientists provide feedback on the protocol to the study's principal investigator and make recommendations to WHS managers whether or not to approve the protocol. Prior to making a recommendation for approval, DPR scientists ensure the protocol meets DPR's scientific and ethical standards. DPR scientists also travel to study sites to observe the study and ensure it is conducted according to the approved protocol.

REDUCING PESTICIDE EXPOSURE

DPR scientists develop mitigation (exposure reduction) measures when health risk assessments and risk managers determine the need to reduce the risk of potential exposure. These exposures may occur at home or in the workplace from direct contact or through air, water or food. WHS and Environmental Monitoring scientists review available pesticide data to assess public health and worker impacts of pesticide use. WHS scientists may also conduct field studies to monitor pesticide exposure to workers performing routine tasks to find out if extra protective measures are needed.

DPR bases mitigation measures on scientific data, field implementation, enforceability and risk management guidance. (*See Chapter 5 for information on exposure assessment and Chapter 6 for information on risk management.*) DPR may put

mitigation measures into place as permit conditions—protective use practices a CAC may require before issuing a permit to use a restricted material. DPR may also put mitigation measures into statewide regulations or ask registrants to revise product labeling (U.S. EPA must approve label changes). If a product is not yet registered, DPR may place conditions on registration, such as restricting use to sites where there are no exposure concerns.

Once mitigation measures are in place, WHS and Environmental Monitoring scientists coordinate implementation with other DPR branches, registrants, agricultural organizations and other stakeholders. WHS and Enforcement Branch staff train CAC staff when new mitigation measures are introduced. WHS staff meets with growers and applicators to observe applications made using the mitigation measures, to discuss any problems the measures may cause, and to check that the measures are effective. WHS staff also develops outreach materials for farmworkers and pesticide applicators, and prepares health and safety recommendations for reevaluations managed by the Registration Branch.

INDUSTRIAL HYGIENE

WHS industrial hygienists evaluate pesticide products and labeling and recommend control methods when needed to ensure protection for pesticide users and others who may be exposed. Their evaluation includes review of labels and hazard communication literature (such as Safety Data Sheets), application work-site evaluations and on-site monitoring. They provide recommendations on engineering and administrative controls, heat stress, personal protective equipment (PPE) and airborne monitoring methods. WHS industrial hygienists evaluate equipment and workplaces after accidents in agricultural settings to help discover how incidents occurred and collaborate with other organizations to develop preventive measures. Industrial hygienists also provide PPE training to pesticide handlers and government enforcement staff, and train emergency responders who deal with pesticide exposure events.



Reports of injury or damage from agricultural chemicals in California are investigated, partly to determine if a violation was involved, but mainly to secure information that might suggest suitable precautions that would prevent similar accidents.

— 1953 California Department of Agriculture annual report



California's pesticide use reporting program is recognized as the most comprehensive in the world. In 1990, California became the first state to require full reporting of agricultural pesticide use in response to demands for more realistic and comprehensive pesticide use data. Under the program, all agricultural pesticide use must be reported monthly to county agricultural commissioners, who in turn, report the data to DPR.

Pesticide Use Reporting

California has had limited pesticide use reporting since 1934. County agricultural commissioners (CACs) required agricultural pest control operators to send monthly reports. County requirements varied but many included a statement for each application showing the grower's name, location, treatment date, crop, acres or other units treated, target pest, type of pesticide used, and the strength and amount of the pesticide applied. Before 1954, only statistics on aerial pesticide applications were forwarded to the state for tabulation. In 1954, state regulators asked for reports on ground application acreage but dropped requirements for detailed reporting of pesticides used and commodities treated.

In 1970, state regulations were amended to require that farmers report all applications of restricted pesticides and that pest control operators report all pesticides used, whether restricted or non-restricted. Production agricultural reports had to include the pesticide applied, amount applied, area treated, application method, date and location (section, township and range) of the application, and the crop treated. Reports of other kinds of applications made by pest control operators included pesticide, total amount applied each month, county, site treated, and after 1978 the area or volume treated. 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 1200, AB 2161) gave the Department of Pesticide Regulation (DPR) clear statutory authority to require full reporting of agricultural pesticide use. 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. In the late 2000s, the counties worked together to develop a new standardized system, called CalAgPermits, which began operating in 2011. It helps CACs in issuing 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 subscriber-based firms and directly via the web.

HOW USE REPORTING WORKS

California's pesticide use reporting program is the most comprehensive of its kind. Each year, DPR collects and processes more than 2.5 million records of pesticide applications, where each record represents one production agricultural application of a pesticide product or a monthly summary of other kinds of applications. California was the first state in the U.S. to require full reporting of all pesticide use in agriculture.

The reporting requirements apply to a range of uses partly due to the California

legal definition of agricultural use. (See Page 77 for information on what constitutes 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 California code 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 includes agricultural and structural applicators and professional landscape gardeners.

The primary exceptions to the use reporting requirements are consumer home-and-garden uses and most industrial and institutional uses, including schools and childcare facilities.

Operator and site identification codes

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 use the number obtained by the property operator so they do not have to get operator ID numbers.

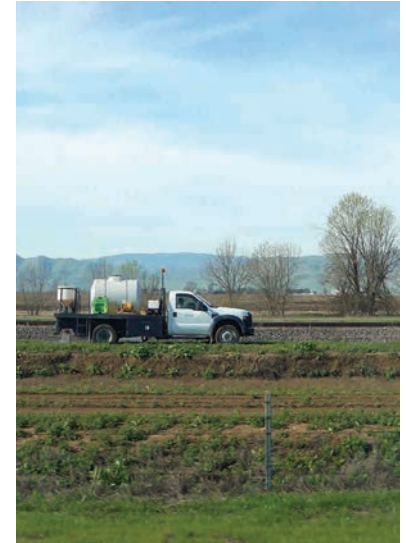
A site identification code must be assigned for each location or field where pesticides will be used for production of an agricultural commodity. This alphanumeric code is also recorded on any restricted material permit the grower gets for the location.

What must be reported

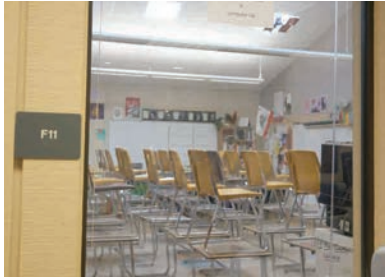
Reports of pesticides not used in production agriculture are reported in monthly summaries that include pesticide product name and manufacturer, the product registration number, amount used, number of applications, the kind of site treated (for example, roadside, structure), the month of application, county, and the OIN or pest control license number.

Agricultural pesticide use reports also must be sent monthly to the CAC. They are more detailed and include:

- Date and time of application.
- Geographic location including the section, township, range, and base line/meridian.
- Operator identification number.
- Operator name and address.
- Field location and site identification number.
- Commodity, crop or site treated.
- Acres or units planted and treated.
- Whether the application was by air, ground or other means.



Herbicide application along a right-of-way in Glenn County.



DPR collects use-reporting data for schools throughout the state.

- For field fumigations in ozone nonattainment areas, more details on fumigation method (for example, shallow shank injection with a tarp). This is to allow the department to estimate pesticide VOC emissions. (*See Chapter 12 for more information on the VOC reduction program.*)
- Amount of product applied with its name and U.S. Environmental Protection Agency (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.)

School pesticide use reports

Since 2002, DPR has collected use information from businesses that apply pesticides at California public K-12 schools and licensed childcare centers (school sites). The Healthy Schools Act was amended in 2014 to expand pesticide use reporting to school district and child care center staff.

The California School Pesticide Use Report, or CSPUR, is a unique database of structural and landscape pesticide use at school sites. Through the use of CSPUR, DPR hopes to assist businesses and school site staff in adopting effective, least-toxic pest management practices. CSPUR, a public resource, allows for outreach programs and policies to be based on real statewide data and provide transparency for anyone interested in pesticide use around children.

School pesticide use reports are due annually on Jan. 30 for the previous year. School-site staffers who apply pesticides are only required to submit a monthly summary to the CAC for restricted use materials. The reporting detail of individual pesticide applications includes:

- Pesticide product name.
- Product registration number.
- Amount used.
- Name and address of school or childcare facility.
- Date and time of application.
- Name and address of business/organization which applied the pesticide.
- County where the pest control was performed.

IMPROVING ACCURACY

More than 50 different validity checks are made against the pesticide-use data, both in CalAgPermits and at DPR. 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. If the pesticide is a restricted material, the computer checks the pesticide reported used to ensure it is listed on the grower's restricted materials permit. 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 found to have errors at DPR are returned 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. 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. 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 1 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

Agricultural and Non-Agricultural Pesticide Use

Many pesticide licensing, sales and use requirements are tied to California's definition of agricultural and non-agricultural pest control.

For example, to properly use a pesticide one must fully understand its label and pesticide labels often differentiate between legal agricultural, industrial or institutional uses.

Another example is the 1985 Pesticide Contamination Prevention Act that focused on pesticides labeled for agricultural use.

There are some pesticide products labeled for dual-use. That is, they have both agricultural and non-agricultural uses.

Agricultural uses

The law (Food and Agricultural Code Section 11408) identifies agricultural uses as:

- **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.** Includes 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.

Non-agricultural uses

Non-agricultural uses are 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 facilities, or use for or in a manufacturing, mining or chemical process. In California, industrial use does not include use on rights-of-way. Post-harvest commodity fumigations at facilities 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.
- **Veterinary.** Use according to a written prescription of a licensed veterinarian.



Pesticide Use Report data are posted on DPR's website.

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. This error was corrected by DPR staff when it was discovered).

IMPROVING ACCESS TO THE DATA

Since 1971, DPR has produced annual reports that summarize pesticide use by crop or site treated and active ingredient. These are available as printed reports.

In 1999, DPR made the entire database since 1974 available on CDs and, in the early 2000s, compressed files of the database were posted online for downloading.

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 1 square-mile area.

DPR also began examining trends in pesticide use, analyzing critical crops, pest problems and trends in pounds used, number of applications and acres treated. The pesticide trends from 1991 to 1996 were published as a separate report, but since 1997 the trend analyses were included in the annual reports. The trend analyses examine pesticide trends on specific crops and in specific pesticide categories:

- Reproductive toxins.
- Carcinogens.
- Insecticide organophosphate and carbamate chemicals.
- Chemicals classified by DPR as groundwater contaminants.
- Chemicals listed by DPR as toxic air contaminants.
- Fumigants.
- 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 review publications and conduct phone interviews with pest control advisers, growers, researchers, commodity association representatives, and University of California (UC) Cooperative Extension farm advisers and specialists. Based on their knowledge of pesticides, California agriculture, pests and pest management practices, staff formulate conclusions about possible reasons 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.

HOW PESTICIDE USE DATA ARE USED

DPR expanded pesticide use reporting based on the value of the data to concerned individuals and others, including government officials, scientists, farmers, legislators and public interest groups. Key areas in which data are useful include risk assessment, worker safety, public health, endangered species, water and air quality, pest management alternatives, local enforcement, and processor and retailer requirements.

Risk assessment

Without reliable information on how much pesticide is used on a commodity, regulatory agencies doing risk assessments assume all planted crop acreage is treated with many pesticides even though most crops are treated with just a few chemicals. If the assumptions used by regulatory agencies are incorrect, regulators could make judgments on pesticide risk that are too cautious by several orders of magnitude, reducing the credibility of risk management decisions. The use report data, on the other hand, provides actual use data so DPR can more accurately assess risk and as a result make more 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 California commodity groups and to U.S. EPA. FQPA contained a new food safety standard against which all pesticide tolerances must be measured. (Tolerances are the amount of pesticide residue allowed by federal law to remain on a harvested crop.) California grows half the nation's fresh produce and FQPA increased interest in the state's pesticide use data, especially for calculating percent of crop treated. DPR can provide recent use data and summaries to commodity groups, University of California specialists, U.S. EPA programs and other interested parties as they develop the necessary information for reassessing tolerances and calculating dietary risk from pesticides.

Worker safety

Pest control operators are required to give farmers a notice, orally or in writing, after every pesticide application. The notice must include the pesticide applied, location of the application, the date and time the application was completed, and the restricted-entry and preharvest intervals. This notice gives the farmer accurate information to help keep workers from entering fields prematurely and lets the farmer know when a commodity can be harvested.

DPR's Worker Health and Safety Branch uses the data to guide and inform worker exposure studies, aid in the development of mitigation measures to protect workers from pesticide exposure, and help determine where to focus outreach on worker safety regulations and new mitigation measures.¹

Public health

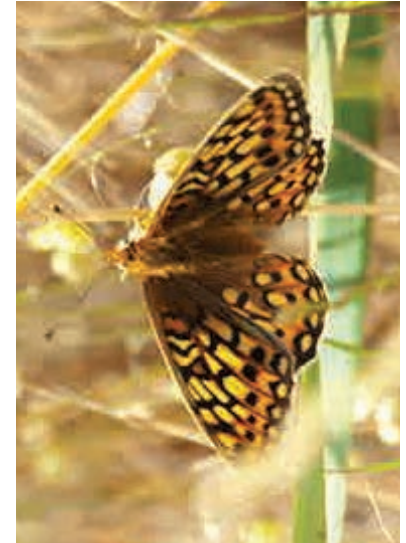
The reporting system provides DPR, the State Department of Public Health and the Office of Environmental Health Hazard Assessment with more complete pesticide use data for evaluating possible human illness clusters in epidemiological studies.

Endangered species

DPR works with CACs to combine site-specific use report data with geographic information system-based data on locations of endangered species. The resulting data help commissioners resolve potential conflicts over pesticide use near or in endangered species habitat. DPR and the commissioners can also examine patterns of pesticide use near habitats to determine the potential effects of proposed use limits. With location-specific data on pesticide use, controls on use can be better designed to protect endangered species while still allowing needed pest control.

Water quality

California law requires site-specific records to help track pesticide use in areas known to be susceptible to ground water contamination. Pesticide use records can tell DPR whether a contaminated well is physically associated with agricultural practices. These records also provide data to help researchers find out why certain soil types are more prone to ground water contamination. Use report data are used to refine surface water monitoring strategies and help focus mitigation efforts on specific active ingredients or uses. Pesticide use data can identify high-use watersheds to focus water quality investigations to worst-case situations. The data are also



The callippe silverspot butterfly is an endangered species, found only in grasslands in the San Francisco Bay Area.

¹Updated December 2017.



Volatile organic compounds (VOCs) contribute to air quality issues throughout much of the San Joaquin Valley.

used in after-the-fact investigations where a pesticide is detected and a characterization of upstream use is needed. Pesticide use data is also used to help corroborate the validity of inputs into computer simulations. The data offer investigators the best documentation of sources of nonpoint source pollutants for watershed-level water quality investigations.

Air quality

Many pesticide products contain volatile organic compounds (VOCs) that contribute to forming smog. In 1994, DPR worked with the state Air Resources Board to develop a plan under the federal Clean Air Act to reduce emissions of all sources of VOCs, including pesticides, in nonattainment areas of the state. DPR's contribution to the plan included its ability to calculate the amount of VOCs contained in pesticides and to create an inventory of VOC emissions using pesticide use reports.

Beginning in 2008, regulations went into effect to reduce emissions of VOCs from fumigant pesticides. Pesticide use reports include details on fumigation methods, which help in calculating VOC emissions. This information is then compared with targeted emission reduction goals to ensure the state remains in compliance with its commitment to improve air quality.

Pest management alternatives

To decide on use controls or prohibitions, regulators must consider how pesticide users are likely to respond. Substituting one chemical for another may only shift the problem from one area of concern to another. For example, as fewer chemical alternatives are available, resistance to the remaining pesticides is more likely to develop among targeted pests. Or there may be situations when loss of a particular pesticide may result in the use of others that are more toxic to beneficial organisms or the environment. DPR uses the pesticide use data to understand patterns and changes in pest management practices.

The data have also been used to support and assess grant projects for DPR's Alliance program. The Alliance Grants are designed to demonstrate and carry out reduced-risk pest management strategies.

Many commodity groups have created crop profiles that include information on pest management practices and available options, both chemical and nonchemical. Pesticide use data is critical to developing recommendations on best management practices and alternatives.

Local enforcement

CACs use pesticide data to help focus enforcement efforts and compliance outreach on areas or sites with the highest pesticide use or most frequent applications. Pesticide use data also helps determine if a product was applied that is not registered for that commodity, especially in residue tolerance investigations. In investigations, pesticide use information can help CACs determine how, when and where pesticides were used and if the requirements for restricted materials permits were followed. Use report data helps in investigating if a product was used in conflict with its label. The data are also used when responding to complaints of crop or environmental damage from drift, or to reports of exposure to an application.

Processor and retailer requirements

Farmers must often provide a record of pesticide use to food processors, produce packers and retailers. Information collected for pesticide use reporting can fulfill that requirement.

Protecting the Environment

The Food and Agriculture Code (FAC) directs the Department of Pesticide Regulation (DPR) to protect the environment and continuously evaluate currently registered products. The continuous evaluation of pesticides supports the certification of DPR's regulatory program as the functional equivalent of an environment impact statement under the California Environmental Quality Act.

DPR has more than 25 years of experience in monitoring the environment for pesticides, evaluating pesticide sources and mitigating adverse effects of pesticide use on air, ground water and surface water quality. Environmental data collected by DPR are critical to the department's continuing evaluation of pesticide use and helps it carry out programs to prevent pesticide pollution. Scientists design and conduct studies to provide data that help assess human exposures and ecological effects of pesticide residues in the environment. Specific examples include:

- Evaluating the effect of application methods and management practices on the movement of pesticides.
- Monitoring the off-site movement of pesticides after application to evaluate the potential for contamination of air, surface water, ground water, or crops.
- Conducting studies to develop and evaluate measures designed to mitigate the adverse effects of pesticides.

Monitoring the environment involves taking samples and analyzing them for specific chemical residues. DPR develops sampling methods for pesticide residues and contracts with the California Department of Food and Agriculture (CDFA) Center for Analytical Chemistry for analytical method development.

The Environmental Monitoring Branch has the lead role in carrying out the department's environmental protection programs.

Projects focus on monitoring under environmental conditions specific to California. Other agencies that may also sample for pesticides in the environment include the U.S. Geological Survey (USGS), the U.S. Environmental Protection Agency (U.S. EPA), and state agencies such as the Air Resources Board (ARB), State Water Resources Control Board, Regional Water Quality Control Boards, Department of Fish and Wildlife (DFW) and Department of Public Health (DPH). Although these data are useful to DPR, the purpose of such sampling is to meet their specific legal mandates or program objectives and not necessarily DPR's. If pesticides are detected by other agencies, DPR may do more sampling to confirm the detections, characterize the nature and extent of the detections and, if necessary, determine how the off-site movement of pesticides may be mitigated.

DPR's statutory authorities allow it to change pesticide use practices quickly. For example, through restricted material permit conditions, DPR can place limits on the quantity, area and method of application to reduce pesticide problems. Site-specific permits to use restricted materials are issued by county agricultural commissioners (CACs), who can require applicators to use extra control measures if needed to reduce the potential for environmental harm on surrounding areas. DPR has oversight of the permit process and uses data from scientific studies to develop suggested mitigation measures that CACs may include in their permits. The department may also adopt regulations that impose regional or statewide pesticide use requirements on all affected applicators.



DPR scientists take soil core samples in an alfalfa field at the University of California, Davis, to determine various soil properties.



Monitoring pesticide runoff from a California alfalfa field.



It is the public policy of the state that emissions of toxic air contaminants should be controlled to levels which prevent harm to the public health.

— Toxic Air Contaminant Act (1983)

EVALUATING PESTICIDES IN AIR

The Air Program conducts air monitoring, evaluation and mitigation under its general reevaluation mandate and under the mandates of the Toxic Air Contaminant Act (Chapter 1047, Statutes of 1983, AB 1807, amended by Chapter 1380, Statutes of 1984, AB 3219).

Activities to prevent or reduce the adverse effects of pesticides on air include:

- Measures to reduce pesticide sources of volatile organic compounds.
- Air monitoring, evaluation and mitigation as part of DPR's continuous evaluation mandate, including establishment of an air monitoring network.

Toxic Air Contaminant (TAC) Program

The TAC program is one of several options DPR can use to control airborne pesticide residues. TACs are air pollutants that may cause or contribute to increases in serious illness or death, or may pose a present or potential hazard to human health. The law focuses on identifying, evaluating and controlling pollutants in ambient community air. In carrying out the law, DPR must:

- Review the physical properties, environmental fate and human health effects of the candidate pesticide.
- Find out the levels of the pesticide in air.
- Estimate human exposure and the potential human health risk from those exposures.

The law requires DPR to list in regulation both those pesticides previously identified under federal laws as Hazardous Air Pollutants (HAPs) and those identified by DPR through the evaluation process of the TAC statute. For the latter group, DPR must then decide the appropriate degree of control measures.

DPR's TAC Program consists of two phases: risk assessment (evaluation and identification) and risk management (control). The first phase involves an extensive evaluation of the candidate pesticide to assess the potential adverse health effects and to estimate levels of exposure associated with its use. DPR, in consultation with CalEPA's Office of Environmental Health Hazard Assessment (OEHHA) and ARB, first prioritizes pesticides for risk assessment based on how much of the pesticide is used and sold in California, its persistence in the atmosphere and health effects information. DPR then requests ARB to conduct monitoring studies to measure the air concentrations of pesticides.

For each candidate pesticide, ARB collects samples near an application site and in ambient air of nearby communities. Because most large-scale pesticide applications are seasonal and occur in agricultural areas, ARB conducts monitoring in areas of high use and at times when use is at its peak. This worst-case information can help determine the ambient exposures of people living in all areas where the pesticide is used.

Continuing the evaluation for each pesticide, the law requires DPR to prepare a report that includes:

- An assessment of exposure of the public to ambient concentrations of the pesticide.
- A risk assessment which includes data on health effects, including potency, mode of action and other biological factors.
- A review of the environmental fate and use of the pesticide.
- The results of monitoring studies conducted in California to measure the levels of the candidate pesticide in ambient air.

The report is peer-reviewed by OEHHA, ARB and the TAC Scientific Review Panel (SRP), a panel of experts representing a range of scientific disciplines. Based on this comprehensive evaluation, DPR receives a recommendation from the SRP on whether

the pesticide meets the criteria for listing as a TAC. If the pesticide meets the criteria, DPR adopts a regulation listing it as a TAC.

Once a candidate pesticide is listed as a TAC, it enters the mitigation phase. When a TAC pesticide that is a HAP goes through a risk assessment, it enters the mitigation phase as well. Consulting with OEHHA, ARB and local air pollution control districts, DPR examines the need for and suitable degree of controls. If reductions in exposure are needed, DPR must develop control measures to reduce emissions to levels that adequately protect public health. DPR must use the best practicable control techniques available, which may include:

- Requesting that the registrant work with U.S. EPA to change use instructions on the product label.
- Requiring applicator training.
- Limiting application methods, crops or locations.
- Reclassifying the pesticide as a restricted material, meaning that a site-specific permit would be required and added controls imposed, based on local conditions.
- Banning the use by canceling a product's registration.

The Air Program conducts monitoring studies and data analysis to determine potential mitigation measures that are finalized in consultation with ARB, OEHHA, the Department of Food and Agriculture, CACs and air pollution control districts.

Reducing Volatile Organic Compounds (VOCs) in the air

Under the federal Clean Air Act, each state must have a State Implementation Plan (SIP) for achieving and maintaining federal ambient air quality standards, including the standard for ozone. VOCs are carbon compounds that are released or evaporate into the atmosphere. There, they can react with other substances to form ground-level ozone, a component of smog. In California, the primary source of VOCs is vehicle exhaust. Industrial operations also emit VOCs, as do thousands of products, including pesticides.

Nonattainment Areas (NAAs) are regions in California that do not meet either federal or state ambient air quality standards. A state's SIP, which must be approved by U.S. EPA, identifies reductions in emissions from different sources in each region to meet the standard and the controls needed to do so.

ARB, which coordinates the overall development of the SIP, is responsible for developing measures to reduce pesticide VOC emissions from consumer products. DPR has responsibility for reducing VOC emissions from agricultural and structural pesticides. The project resulted in the nation's first-ever regulations to control pesticide VOCs by reducing emissions from agricultural fumigants. ARB and DPR worked together to develop a plan to track and reduce pesticide VOC sources in NAAs as part of the 1994 California SIP. In the SIP, DPR committed to reduce agricultural and commercial structural pesticide sources of VOCs by 20 percent compared with the 1990 base year in four of five NAAs that exceeded federal ozone standards: Sacramento Metro, Southeast Desert, South Coast, and Ventura. In the San Joaquin Valley NAA the SIP goal is to reduce pesticide VOCs by 12 percent compared to the 1990 base.

DPR's approach to reducing pesticide VOC emissions includes:

- Finding out the VOC emission potential of pesticide products.
- Estimating and tracking pesticide VOC emissions based on use reporting and emission potential data.
- Allowing only low-emission methods of field fumigant applications in three of the NAAs that require a reduction in pesticide emissions.



Data collection at an air monitoring station in Salinas in 2014.



Heavily agricultural San Joaquin County is a "nonattainment" area for ozone pollution.

- Placing prohibitions on the use of certain “high-VOC” products in the San Joaquin Valley NAA.
- Developing a VOC emission inventory and tracking emissions. Accurate data on the amount of VOCs emitted by pesticides are critical to developing practical emission control measures.

In 1994, DPR began data call-ins asking registrants to determine the VOC emission potential of their products, preferably by analyzing products using the thermogravimetric analysis (TGA) method. If TGA analysis is not available, DPR uses other approaches to decide emission potentials, such as estimation based on the confidential statement of formula on file with DPR or by assigning a default value based on formulation.

DPR uses data on VOC content and pesticide use to estimate emissions from reported agricultural and commercial structural applications in each NAA. Pesticide use reports provide the quantity of pesticide used. Under state law, all agricultural pesticide use must be reported to DPR, as does the use of pesticides by pest control businesses.

A further adjustment is made when estimating emissions from applications of field fumigants. Because DPR has air monitoring data from fumigant applications, the calculation is adjusted to account for how emissions vary depending on fumigation method.

DPR’s VOC emission inventory database includes only pesticide applications made between May 1 and Oct. 31, the peak ozone season in California. It contains data for every year since 1990. The department updates the database when pesticide use report data from the previous year become available. Each year contains about 2.5 million pesticide use records and emission potential (EP) values for about 5,000 products.

DPR prepares an annual estimate of VOC commercial structural pesticide applications in the five NAAs. Only agricultural and commercial structural pesticide applications are included. (ARB tracks emissions from consumer pesticide products.) DPR uses the VOC inventory to identify the various pesticide sources of VOCs, track changes in pesticide VOC emissions over time, suggest and evaluate potential VOC emission reduction strategies, and track progress in meeting VOC reduction goals.

Voluntary measures to reduce VOC emissions

DPR continues to promote the reduction of VOC emissions through various nonregulatory approaches, which include:

- Pesticide manufacturers altering formulations to remove or reduce VOC-emitting ingredients.
- Pesticide users switching to low-VOC formulations.
- Registration of new products designed to be used at low rates.
- Encouraging greater use of integrated pest management practices, which typically reduce pesticide use.
- Assisting ARB, U.S. Department of Agriculture and others in researching methods to reduce VOC emissions.

These measures, combined with DPR restrictions on fumigants designed to reduce air toxins, cut pesticide VOCs below the target level in the Sacramento Metro and South Coast NAAs. However, pesticide VOCs in the Southeast Desert, Ventura and San Joaquin Valley NAAs remained above the SIP goal in some years. DPR continued its nonregulatory measures (particularly outreach to reduce applications of VOC-emitting pesticides) but in the mid-2000s began developing regulatory controls.

Regulatory controls

In January 2008, DPR put regulations in place that included specific emission target levels for each of the five NAAs. The regulations require low-emission fumigation methods in certain NAAs. If, despite these application method restrictions, pesticide VOC emissions exceed specified trigger levels, DPR is required to ensure the benchmark is achieved by establishing a fumigant limit and grower emission allowance system. The regulations also required that pesticide use reports in the five NAAs specify the application method for field fumigations. This allows DPR to better estimate and therefore track VOC emissions in each NAA and make any needed changes in controls to ensure that VOC reductions meet the SIP goal each year.

Many liquid pesticide products contain solvents that emit VOCs. In 2005, DPR began a formal reevaluation of certain nonfumigant pesticide products, a necessary first step to requiring reformulation of pesticides to lower the VOC content and restricting use of products with higher VOCs. As a result, pesticide makers reformulated several high-use, high-VOC pesticide products, replacing them with low-VOC versions.

In each of the three NAAs that required the use of low-emission methods for fumigant use, VOC emissions from fumigants were reduced. However, data showed that VOC emissions in the San Joaquin Valley NAA, were not low enough to ensure that SIP goals would be met in the future. Therefore, in 2013, DPR adopted regulations that set a trigger level of emissions that, if exceeded, would invoke pesticide use limitations to reduce VOC emission from certain nonfumigant pesticide products. If the trigger level is exceeded, the use of high-VOC products containing one of seven active ingredients is prohibited. The restrictions apply to the use of certain products of abamectin, chlorpyrifos, gibberellins, and oxyfluorfen for use on seven crops during the peak ozone season that contribute the most to nonfumigant VOC emissions.

Community air monitoring

Past air monitoring focused on short-term monitoring for a single chemical. To generate better data on long-term exposure, DPR had begun planning a network of monitoring stations to sample for pesticides in the air over two or more years. In 2000, methods were developed for a study conducted in a small agricultural city in Santa Barbara County that enabled the Air Program to monitor for multiple chemicals in a single sample. The study monitored air concentrations at several locations in the community during a 10-week period. In 2006, the Air Program used the methods developed for a year-long study that monitored ambient air in Parlier, a Fresno County community, as part of CalEPA's Environmental Justice Action Plan to learn what pesticides were in the air of a rural farm community. The Parlier project served to test and perfect sampling protocols, develop health screening levels, improve and expand laboratory analytical methodology, and fine-tune approaches to data analysis.

To learn more about pesticides in air and improve protective measures as necessary, DPR established the nation's first Air Monitoring Network to sample community air for pesticides in early 2011. DPR set up monitoring stations in two San Joaquin Valley communities and one in the Salinas Valley. Project objectives are to:

- Identify common pesticides in air and determine seasonal, annual and multiple-year concentrations.
- Compare concentrations to subchronic and chronic health screening levels.
- Track trends in air concentrations over time.
- Estimate cumulative exposure to multiple pesticides with common modes of action.
- Work to correlate concentrations with use and weather patterns.

The network supplements TAC monitoring by providing data for long-term exposures to multiple pesticides. DPR selected up to 32 pesticides to monitor based on use and volatility (both indicators of exposure), their DPR risk assessment priority



Air monitoring in Parlier in 2006.



An unmanned aerial vehicle demonstration at a vineyard near Napa in 2015.

(an indicator of toxicity), and their suitability for laboratory analysis using available methods. DPR selected the communities based on several factors, including the amount of pesticides used and demographics related to risk assessment (for example, numbers of children and farmworkers).

The Air Program collects one 24-hour sample each week in each community. Based on the results from the department's Parlier study, sampling a single location weekly will provide enough data to estimate long-term concentrations.

DPR reassessed and secured additional resources for the Air Monitoring Network in 2016, in consultation with its Pesticide Registration and Evaluation Committee and stakeholders. DPR (with assistance from the Air Resources Board) will conduct year-round air monitoring at eight locations in the San Joaquin Valley and Central Coast regions for two years. DPR selected four communities primarily based on high use of four fumigants and four communities based on high use of 11 organophosphates. These are the pesticides with higher exposures according to the monitoring since 2011, but all sites will be monitored for the 32 pesticides included in the original Air Monitoring Network.

Other air monitoring programs

Separate from the TAC program, the Air Program conducts air monitoring as part of its continuing evaluation of pesticides. The Air Program takes the lead in characterizing the source and recommending mitigation measures for off-target movement of pesticide residues in air that have resulted in crop damage, illegal crop residues, environmental contamination, or public complaints of odor or other problems. These monitoring studies help DPR evaluate the likelihood of pesticides causing health problems for workers using pesticides and for people living near treated areas, and to provide data to develop new use practices designed to prevent harm. DPR periodically monitors to evaluate the effectiveness of its risk reduction measures. If air monitoring finds unacceptable levels of pesticides in ambient air, the data help fine-tune control measures. As part of the evaluation, the Air Program conducts monitoring targeted at specific application methods. For example, studies are conducted to determine emission rates of new field fumigation methods, and off-site concentrations of fumigants from commodity treatments. In addition, the Air Program conducts studies to determine potential drift from new application equipment, such as unmanned aerial vehicles.

PROTECTING WATER QUALITY

DPR's programs to protect ground and surface water address both agricultural and nonagricultural sources of pesticide residues in water and include pollution prevention and response elements.

In California, DPR and the State and Regional Water Boards have mandates and authorities bearing on pesticides and water quality. DPR is the lead agency for regulating the registration, sales and use of pesticides in California. The State Water Board is the lead agency for coordinating and controlling water quality in California. The State Water Board and the nine Regional Boards carry out state-wide and regional programs under the Porter-Cologne Act and federal programs mandated by the Clean Water Act.

Management Agency Agreement: DPR and the State Water Board have a management agency agreement (MAA) that identifies primary areas of responsibility and authority and provides methods to ensure continuing coordination at the state and regional levels. It identifies the roles of the water boards regarding water quality protection and the role of DPR in pesticide regulation. The MAA and its implementation plan describe how staff-level communication and collaboration can be effectively used to prevent and respond to the occurrence of pesticides in surface water. The MAA and implementation plan also promote the sharing of program

information, monitoring data, best management practices, and scientific studies related to pesticide residues in surface water. The MAA and associated implementation plan are undergoing updates and revisions in 2016. The updated plan will go beyond providing guidance on staff level interactions and incorporate an executive charter between DPR and State Board management. In addition, the updated plan will include the Surface Water Response Process established in 2003 that delineates interagency interactions in response to pesticide detections in surface water.

SURFACE WATER PROTECTION PROGRAM

The goals of DPR's Surface Water Protection Program (SWPP) include:

- Preventing pesticide pollution by working with the Pesticide Registration Branch through the registration evaluation process.
- Characterizing pesticide residues in surface water bodies (including rivers, streams and agricultural drains).
- Identifying sources of contamination.
- Determining the mechanisms of off-site movement of pesticides to surface water.
- Evaluating monitoring data and water quality effects thresholds as part of continuous evaluation to identify potential risk of pesticides to the aquatic environment.
- Developing and promoting site-specific mitigation strategies.
- When warranted, adopting restrictions to further protect surface water from contamination.

As a part of the registration process, SWPP scientists evaluate new active ingredients and selected products that have the potential to adversely impact surface water. When possible, our scientists use computer modeling tools that utilize pesticide application scenarios, physicochemical properties, and toxicity data to predict off-site transport and risks to sensitive aquatic organisms. Models provide consistent and reliable information that our scientists can use, along with their expert knowledge, to provide recommendations to the Pesticide Registration Branch.

SWPP designs and conducts monitoring to assess pesticide contamination of surface water in both agricultural and urban watersheds. This involves identifying and prioritizing active ingredients and breakdown products that warrant surface water monitoring through consideration of pesticide use data, aquatic toxicity, physicochemical properties, product application information, and historical monitoring data. SWPP analyzes pesticide monitoring data as part of DPR's continuous evaluation process. SWPP monitoring data, as well as those from external sources, are collected and made publicly available through our Surface Water Database (SURF).

SWPP also conducts research to characterize the factors that lead to off-site movement of pesticides and to develop use practices to prevent such movement. The program supplements in-house research studies by contracting with university researchers for studies related to the impacts of pesticides in agricultural and urban environments. Research areas include source identification, management practices, analytical method development, aquatic toxicity, and outreach. Scientific findings from SWPP research studies and urban and agricultural monitoring programs are summarized in departmental reports and journal articles. SWPP also takes part in DPR's formal reevaluation of already registered products that may have caused or are likely to cause a significant adverse impact to the aquatic environment. When a pesticide enters reevaluation, DPR reviews existing data and may require registrants to provide additional data. Examples of reevaluations that were initiated at SWPP's request include those for diazinon, chlorpyrifos, copper antifouling paint, and pyrethroid products.



Surface water sampling in Roseville in 2014.



Stormwater sampling at Salt Creek, Orange County.

In coordination with the State and Regional Water Boards, DPR investigates occurrences of pesticides of concern and determines the course of action to reduce or eliminate the impact of pesticides on surface water quality. Staff develops mitigation measures through a scientific understanding of pesticide sources and transport mechanisms. DPR may seek to reduce contamination initially through voluntary and cooperative efforts, which may include outreach programs to educate specific user groups (e.g. growers, professional applicators) or the public on ways to reduce pesticide contamination in both urban and agricultural settings.

If voluntary efforts do not adequately mitigate the impacts, DPR can use its regulatory authority to impose restrictions. DPR may modify the use of pesticides by regulation or permit conditions to prevent excessive residues from reaching surface water.

Urban Pyrethroid Surface Water Regulations

In the early 2000s, increased applications of pyrethroids for outdoor residential pest control led to frequent detections and occasional observed toxicity in urban streams and creeks. DPR evaluated available pyrethroid surface water data and subsequently initiated a reevaluation on pyrethroid products in 2006 to determine the pesticide application practices and transport pathways that resulted in surface water contamination. In 2012, surface water regulations were adopted to restrict pyrethroid application practices to reduce off-site transport. DPR has been engaged in outreach and education efforts aimed towards urban pest control professionals to emphasize the importance of these regulations and promote compliance. Monitoring and focused research studies are underway to evaluate efficacy of the adopted regulations.

Dormant Spray Water Quality Program

Spraying of Central Valley orchard crops during cold weather, when the trees are dormant, kills overwintering insects and diseases. However, organophosphate insecticides used as dormant sprays cause problems when drift occurs or when storm runoff washes residues into rivers and streams. To deal with the problem, DPR established its Dormant Spray Water Quality Program in 1996. Rather than immediately move to mandatory restrictions, DPR and CACs asked local resource conservation districts, farmers and pesticide manufacturers to develop methods to control off-site movement of these chemicals. However, DPR monitoring conducted over several years determined that voluntary practices had not been enough to reduce the movement of harmful pesticides to surface water. In 2007, DPR adopted regulations requiring the use of alternative pesticides, a buffer zone between the application and waterways, or other means to prevent potential contamination.

Rice Pesticides Monitoring Program

In the early 1980s, rice herbicides killed fish in Sacramento Valley agricultural drains and created taste problems in Sacramento city drinking water. Beginning in 1983, CDFA (and later DPR), CACs, DFG (later CDFW), the State and Central Valley Water Boards, and the rice industry worked together to develop and put into place a plan to control discharges of pesticides from rice fields. Holding water in the rice fields, the pesticides could degrade enough to reduce toxicity to acceptable levels in receiving waters.

DPR and CACs put in place controls on the use of rice herbicides to meet water quality standards established by the Central Valley Water Board. Through a combination of mandated restricted materials permits issued by CACs and management practices carried out by rice growers, this program has been successful in reducing pesticide loading in waterways receiving rice field runoff. CACs continue to conduct water-hold and other inspections to enforce controls.

Until 2003, DPR monitored for rice pesticides each year in agricultural drains

next to rice fields and in areas of the Sacramento River that receive rice field water. In 2003, the California Rice Commission, a commodity group representing California rice growers and handlers, took over responsibility for monitoring surface water and documenting grower compliance with the rice pesticides program. DPR provides oversight and continues to work with the Regional Water Board and the rice industry to ensure continued protection of water quality.

GROUND WATER PROTECTION PROGRAM

The State Water Board began monitoring ground water for toxic metals, nitrates and organic pesticides in 1978, finding widespread contamination by the fumigant DBCP, which had been canceled in 1977.

A more limited CDFA monitoring project in 1982 of 217 well sites found DBCP, simazine, ethylene dibromide and carbofuran. It was followed in 1983 by a Water Board report—the first comprehensive analysis of pesticides in California ground water—which found that more than 50 pesticides had been found in 23 counties. DBCP alone was found in more than 2,000 wells.

In 1984, CDFA began developing a plan to selectively control the application of ground-applied pesticides. At the same time, reports of pesticides in ground water also came to the attention of the Legislature. In 1985, the Assembly Office of Research published *The Leaching Fields: A Nonpoint Threat to Groundwater*, which reported detection of 57 pesticides in ground water, 22 of which were because of agricultural use. The report predicted that more widespread contamination would be found and recommended more sampling to find out its extent.

The Pesticide Contamination Prevention Act (PCPA)

This law (Statutes of 1985, Chapter 1298, AB 2021; amended in 2014 by SB 1117) was designed to prevent further pollution of drinking water sources, based on an assumption that movement of a pesticide to ground water could be predicted by its physicochemical and environmental fate characteristics. The PCPA placed several mandates on the department, registrants and government agencies that test well water for pesticides.

- **Environmental fate data.** Registrants of agricultural-use pesticides must submit data to DPR on the physical and chemical properties of pesticide products that describe their persistence and mobility. California’s definition of “agricultural use” encompasses use not only in production agriculture but also along rights-of-way and in landscaped areas such as golf courses, parks and cemeteries. (See discussion of the agricultural-use definition in Chapter 11.)
- **Identify potential contaminants.** DPR scientists use this environmental fate data to identify pesticides with the potential to pollute ground water. DPR identifies specific trigger values (called specific numerical values, SNVs) by comparing chemical properties between pesticides or their degradation products known to contaminate ground water to other pesticides, including their degradation products that were sampled but not detected in ground water. The last update to the SNVs occurred in 1991. The amount of well sampling data and chemical analysis has greatly increased since then so the lists will be updated to reflect current knowledge. This new list will be subject to statistical analyses whereby the results will likely warrant an update of the current SNVs.

Groundwater Protection List

As mandated in the PCPA, DPR adopts regulations placing an active ingredient on its Groundwater Protection List (GWPL) if the chemical properties indicate a potential to pollute ground water. The requirement for the data call-in of chemical properties used for identification and listing an active ingredient now includes consideration of their major degradation products.



DPR monitors private drinking water wells for traces of pesticides.



Well water sampling is an important component of DPR's Ground Water Protection Program.

DPR was also required to develop a database of wells sampled for pesticides. Under the PCPA, all state and local agencies must report to DPR results of wells sampled for pesticides.

Monitoring

DPR must also sample ground water in areas where agricultural pesticides are used to find out if these pesticides have moved to ground water. In 2016, there were 105 registered pesticide active ingredients on the GWPL, about a third of all pesticide active ingredients used in agriculture. Because analytical methods are usually not available to measure each at the low concentrations normally found in well water, substantial work is needed to develop a method before monitoring can be done. Therefore, to increase the efficiency and reduce the cost of monitoring, the GWPL list has been prioritized using data on:

- Detections in ground water in the United States or other countries.
- Amount of pesticide used in California.
- Results from a calibrated model that uses environmental fate data to compare pesticide movement among active ingredients.

The result is a list of active ingredients identifying the priority for analytical method development and monitoring. DPR scientists also developed spatial information that allows targeted sampling that produces the highest probability of detecting residues in wells. Spatial databases used to determine sampling sites include pesticide use, soil properties, depth to ground water and previous detections.

Detection process

When a pesticide or pesticide degradate is detected in ground water, DPR takes several actions, including:

- Confirming the detection by analyzing a backup sample or resampling the well.
- Locating and sampling wells in the area near the original detection to find out the extent of contamination and if the detection was a result of legal agricultural use. (If there is evidence of illegal pesticide use or point sources, the detection is referred to the State Water Board.)
- Determining if the detected concentration poses an immediate threat to public health. If so, DPR can suspend the use of the pesticide. If residues do not pose an immediate threat to public health, it triggers a response outlined in the PCPA. This includes convening a three-member subcommittee of DPR's Pesticide Registration and Evaluation Committee to decide if use can continue and, if so, under what limits. The subcommittee is comprised of staff from OEHHA, the Water Board and DPR.
- Putting measures into place to prevent further contamination.

Regulatory controls to prevent ground water contamination

By 2010, DPR had reviewed eight pesticide active ingredients under the formal review process and adopted regulations to prevent their continued movement to ground water. The first set of regulations DPR put into place in the 1990s targeted only geographical sections of land where residues had been found in well water. A new approach based on years of research by DPR scientists resulted in regulations in 2004 that provide an extra layer of prevention by including areas with soil and depth-to-ground-water properties similar to areas where residues had previously been found. These vulnerable areas are denoted as ground water protection areas (GWPA's). More than 3,700 GWPA's cover roughly 2.3 million acres in California.

GWPA's are designated by the pathway for movement of residues to ground water. Areas classified as "leaching" have coarse-textured, sandy soil where residues move

directly down from application sites with water as it recharges the aquifer. GWPA's labeled as "runoff" areas are where residues move in rainfall or irrigation runoff that facilitates rapid movement to subsurface soils.

Use of listed pesticides in a GWPA requires a permit from the CAC. Growers are required to select a management practice described in regulation. Applicability of management practices is based on soil characteristics. For example, in a runoff area, the applicator could choose to hold all irrigation and rainfall drainage or runoff through the field for six months after the application. The management practice is an enforceable condition of the permit and CACs have the authority to conduct inspections to determine whether permit conditions have been met.

Among other restrictions to protect ground water are runoff protections for well-heads, regulating pesticide use on roadsides and preventing backflow of pesticides during chemigation.

To help carry out mandated activities, DPR's staff has incorporated scientific approaches to:

- **Understand pathways of movement to ground water.** DPR did its first investigations on how pesticides moved to ground water in the 1980s. It was followed by dozens of other studies on monitoring and analytical methods, modeling approaches, determination of the sources of contamination and pathways to soil, and the effects of agronomic and geologic factors on pesticide movement into soil.
- **Develop mitigation measures matched to the specific pathway of pesticide movement to ground water to prevent contamination.** In coarse-textured soils, control of irrigation percolation water is most important. In contrast, for soils where runoff is the pathway of off-site movement, one key option is incorporating residues from the surface application into the soil.
- **Evaluate pesticide products before registration to identify and, if needed, mitigate potential hazards to ground water.** If a pesticide is identified as having high potential to affect ground water, DPR may request the registrant to add restrictions to the label or conduct more studies on the environmental fate of the product. If mitigation is not possible, DPR could also decline to register the pesticide.
- **Track the effectiveness of regulations.** In 1999, DPR began a program to monitor the concentration of pesticide residues in wells known to be contaminated. Collected data and statistical analysis are posted online. Since initiation of DPR's monitoring of domestic wells in Fresno and Tulare counties in regulated Ground Water Protection Areas in 2000, decreases in well water have been measured for residues of simazine, diuron, and bromacil, providing an indication that mitigation measures have been effective.

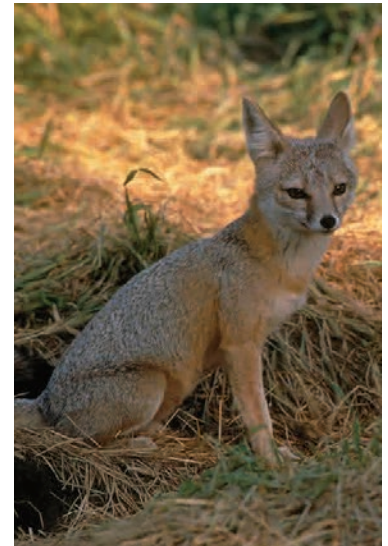
ENDANGERED SPECIES PROJECT

In California, DPR has been studying endangered species protection issues through an interagency agreement with U.S. EPA since 1988. DPR activities include mapping sites occupied by federally listed species, evaluating pesticide exposure risks to inhabited sites, classifying risk and developing protection strategies.

As of 2016, there were 316 federally listed endangered or threatened species in California. The nine listed populations of salmon and steelhead occupy the most area, defined as watersheds that cover roughly 40 percent of the state, including several entire coastal counties. All other terrestrial and inland aquatic species cover about 20 percent of the state, overlapping to some extent with the salmon and steelhead watersheds. Of the terrestrial species, San Joaquin kit fox has the greatest overlap with agricultural areas, accounting for about 10 million acres over 14 counties, mostly in the agriculturally rich southern San Joaquin Valley.



Salt marsh harvest mice (above) and kit foxes (below) are among the species monitored by DPR scientists.



Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)
Status - Federal: Endangered California: Endangered



The riparian brush rabbit is a medium-sized (about 1 foot long, weighs less than 2 lbs) cottontail. It can be distinguished from the desert cottontail (*Sylvilagus auduboni*), by size and some coloration patterns. The tail of the brush rabbit is small and inconspicuous compared to the desert cottontail, and its ears are uniformly colored. The tail of the desert cottontail shows much white viewed from behind, and the inner tips of the ears are black. When looked at from above, the cheeks of the brush rabbit protrude whereas those of the desert cottontail are slightly concave. Riparian brush rabbits are known to have occurred in riparian forests along the San Joaquin River and Stanislaus rivers in Stanislaus and San Joaquin counties. They probably also



A field identification card created
by DPR's Endangered Species
Project.

The risks of pesticide exposure to nontarget and endangered species are evaluated from registered use patterns, history of fish or wildlife impacts from pesticides and a comparison of the biology of the nontarget species with the pesticide use pattern.

DPR's Endangered Species Project (part of the Pest Management and Licensing Branch) coordinates endangered species protection strategies with California Department of Fish and Wildlife (CDFW), California Department of Food and Agriculture (CDFA) and the California Agriculture Commissioners (CACs). Alternative protection strategies and the State Plan developed under this project are subject to U.S. EPA authorization and U.S. Fish and Wildlife Service approval.

The distribution of most endangered species has not been officially defined. Surveying for the presence of many species is expensive and unreliable. Changing land uses, including field rotations, land development and natural variables such as the mobility of some species, food supply, droughts, floods and wildfires cause many species to redistribute faster than surveys can be completed. Surveying for the current distribution of species is therefore reserved for special cases where no other approach is feasible to limit pesticide exposure to nontarget species.

Usually, the best estimate of current distribution comes from past sightings and current evaluations of land use in these areas. The best available compilation of sightings for federally listed species (and other species of special status) in California is CDFW's Natural Diversity Database (NDDB). Sites in the NDDB are often defined by a central point and a radius (up to one mile) that encompasses the area of an occurrence of a species. More precise information is used where available.

DPR converts the NDDB data into a list of sections appended through the Public Land Survey System (PLSS) of township, range and section (TRS) coordinates for each location where these species may be found. Within these sections, a habitat description accompanies protection strategies. This limits strategies to areas that meet the conditions of habitat for a species.

Endangered species are not economic pests. There is no essential conflict between using pesticides and protecting endangered species if nontarget hazards of pesticides are understood and satisfactory protection strategies developed and used to avoid nontarget exposures. Protection strategies rely on the differences between endangered species and the species that are the target of pesticide applications. Differences in the size, activity patterns, food preferences, seasonal presence and behavior can be used to selectively expose pests to a pesticide while minimizing the risk to endangered species.

Pesticide applicator training is essential to the success of DPR's Endangered Species Project. Beginning in 1996, DPR developed endangered species field identification cards, slide presentations and other instructional materials to help pest control professionals, farmers and other pesticide applicators identify endangered species and their habitats. DPR staff distributes these materials at continuing education seminars. They are also posted online.

DPR staff also works with federal agencies such as the National Marine Fisheries Service and the Fish and Wildlife Service to help develop more accurate pesticide exposure assessments of endangered species used in biological opinions. These assessments, which are key to determining the need for additional protective measures, are often based on conservative assumptions because data on pesticide use and the presence of pesticides in the environment are scarce. In California, however, these data are detailed and extensive enough to help explain historic conditions in endangered species habitat and predict possible impairments in the future. These data sets, especially when used with pesticide dispersion and exposure models, can help refine understanding of how pesticide use may affect endangered species and what protective measures are appropriate.

PRESCRIBE SEARCH TOOL

In 2005, DPR introduced a web-based tool to give pesticide users and CACs customized information to protect endangered and threatened species. Called PRESCRIBE (Pesticide Regulation Endangered Species Custom Real-time Internet Bulletin Engine), it allows users to select a geographical area and pesticides of interest and receive a computer-generated “prescription” of applicable use limits to protect endangered species in that area. PRESCRIBE provides pesticide users with current, authoritative, comprehensive information on species distribution, pesticide products and corresponding pesticide use limitations to protect endangered species while maintaining the widest array of pest control alternatives.

With the increased popularity of smart phones and tablets, mobile internet usage has increased dramatically over the years. In response to the rising number of mobile users, DPR launched PRESCRIBE Mobile in February of 2014. PRESCRIBE Mobile identifies a user’s location by using the mobile device (smart phone, tablet) global positioning capabilities to reference geographic coordinates. It then identifies listed species that may be present, down to a one-square-mile area, and provides use limitations to protect the species from the pesticide to be used in that site.

Until PRESCRIBE went online, CACs and pesticide users had to extract information from DPR’s lengthy, printed county endangered species bulletins. It was difficult to figure out if an endangered species was in an area and if the pesticide to be applied was a problem for it.

The pesticide use limits presented by PRESCRIBE are the same as those in the paper bulletins. However, they are delivered in a one- or two-page report that provides the user with instructions relevant to the locations where the pesticide will be used, and only for the pesticide that will be used.

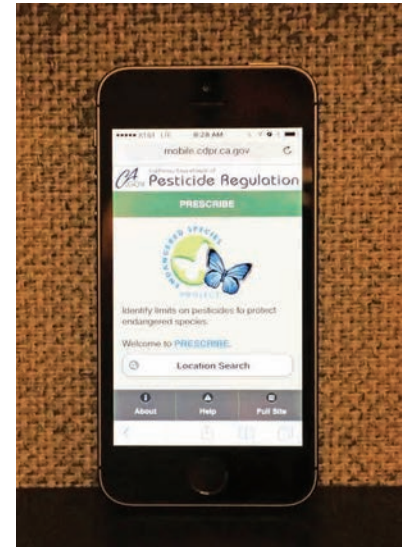
EMERGENCY PROJECTS MONITORING

CDFG uses ground applications of pesticides to eradicate infestations of exotic pests, such as the Mediterranean fruit fly and gypsy moth. DPR scientists monitor selected treatments to provide information on pesticide concentrations in soil, air, foliage and turf, and in fresh produce grown in treated areas. Surface water and runoff from irrigation and rainfall is also sampled and analyzed. DPR selects sampling sites in consultation with CDFG, CACs, CDFW, and the Regional Water Boards. DPR shares monitoring results with government agencies and other stakeholders, and posts them online. This information is used to help ensure the public is not exposed to levels of pesticides that may cause adverse health effects. If monitoring indicates levels of concern, DPR works with other agencies to identify the sources of the problem and investigates how to resolve them.

PESTICIDE CONTAINER RECYCLING

Although other states have programs to recycle pesticide containers, California’s 2008 legislation (SB 1723, Chapter 533) was the nation’s first pesticide container recycling law. It was amended in 2010 (AB 2612, Chapter 393). Under the law, registrants of production agricultural and commercial pesticides (including spray adjuvants), packaged in rigid, nonrefillable, high-density polyethylene containers of 55 gallons or less must establish or take part in a container recycling program. Participating registrants must report each year to DPR on their recycling.

As of 2014, more than 16 million pounds of containers had been collected. The recycling rate for pesticide containers is posted on the DPR website: http://www.cdpr.ca.gov/docs/mill/container_recycling/pest_container.htm



DPR’s PRESCRIBE app provides users with information on pesticide-use requirements in place to protect local endangered species.



A 2016 agricultural pesticide container drop-off event in Imperial County was overseen by DPR and funded by U.S. EPA.

Reducing the Risks of Managing Pests



Our goal in agriculture should be the production of high-quality food and fiber at low cost and with minimal deleterious effects on humans or the environment.

We will have to use the best combination of available technologies ... integrated into ecologically balanced programs.

— ***The Future Role of Pesticides in U.S. Agriculture, National Academy of Sciences (2000)***

In the latter part of the 20th century, California saw significant advances in reduced-risk pest management and its widespread adoption on farms, and in businesses, schools and homes. This evolution affected both the practices of pesticide users and policies of pesticide regulatory agencies like the DPR. It highlighted DPR's broad statutory mandate "to encourage the development and implementation of pest management systems, stressing application of biological and cultural pest management techniques with selective pesticides when necessary to achieve acceptable levels of control with the least possible harm to the public health, nontarget organisms, and the environment" (Chapter 735¹, Statutes of 1972). This mandate's importance is shown by its prominence in DPR's mission statement "to protect human health and the environment by regulating pesticide sales and use and by fostering reduced-risk pest management."

In 1993, regulatory analyst Charles Benbrook recommended that DPR reorient its programs toward risk-driven priorities: getting lower-risk products registered more quickly and focusing regulatory controls on higher-risk products and activities. DPR had contracted with Benbrook to evaluate DPR's registration program. Among other recommendations in his report, *Challenge and Change: A Progressive Approach to Pesticide Regulation in California*, Benbrook urged the department to use its regulatory powers to increase the adoption of biologically based pest management programs.

In 1994, based on a year of discussions with staff and stakeholders, the department completed its Pest Management Strategy. The department's proper role, the strategy concluded, was to encourage the voluntary adoption of reduced-risk practices.

The strategy's goals and objectives were considered and incorporated into DPR's strategic plans². While the other goals in each plan differed to some degree, every plan included advancing reduced-risk pest management as a department goal. The department's 2013 plan, for example, cited three objectives to carry out the goal:

- Encourage and support research and development of reduced-risk pest management practices and technologies.
- Promote adoption of reduced-risk pest management systems and practices.
- Provide policy, scientific and technical leadership and collaboration at local, state, national, and international forums to further advance reduced-risk pest management systems.

To achieve what *Challenge and Change* and the Pest Management Strategy envisioned, and to carry out strategic plan objectives, the department has embarked on several policy and programmatic initiatives.

¹ Appendix A lists this and other statutes noted in this chapter and shows the related code section it amended or added. Statutes and related code sections deleted or superseded by later legislation have been omitted.

² DPR Strategic Plans 1997, 2001, 2008 and 2013.

EASING REGISTRATION OF “LOW-RISK” PESTICIDES

In 1993, DPR began accepting applications for registration of products containing new microbial and biochemical active ingredients concurrently with their application to the U.S. Environmental Protection Agency (U.S. EPA). Before that time, all pesticides had to be registered with U.S. EPA before a registration application could be submitted to DPR. The next year, “to encourage the use of pesticides that are expected to pose reduced risk compared to alternative pesticides,” DPR began accepting concurrent applications for products containing new active ingredients classified by U.S. EPA as “reduced risk.” In 1996, DPR expanded the type of applications it would accept concurrently to include products containing biochemicals, microbials and U.S. EPA-designated reduced-risk active ingredients already in other California-registered products.

In 1998, with passage of SB 464 (Statutes of 1997, Chapter 428), DPR also began accepting new human health antimicrobials and public health antimicrobials concurrently. Because of budgetary constraints, between 2002 and 2005 DPR suspended some programs to accept concurrent registration applications. DPR did not accept reduced-risk pesticides, including biopesticides, concurrently.

In 2006, DPR began accepting applications for registration of any pesticide containing a new active ingredient concurrently with U.S. EPA. In 2016, these applications could still be sent concurrently.

IPM ACHIEVEMENT AWARDS

In 1994, DPR created its IPM Innovator Award to recognize growers and other leaders in alternative pest management practices.

DPR hosts an annual event to recognize each year’s award recipients. Awardees over the years have ranged from vineyards, farms, nurseries, and industry researchers and commissions to municipalities, schools, pest management companies, task forces and conservation groups. By 2016, DPR had presented 149 IPM Innovator awards.

An IPM Innovator typically has a history showing its approach is economically viable, uses a pest management system to reduce the risks posed by traditional pest management practices, and documents its system so others can learn and apply it. An IPM Innovator’s organizational structure may be formal, such as a commodity advisory board, a resource conservation district or a school district, or less formal, such as a community organization that promotes reduced-risk pest management.

An IPM Innovator also displays a willingness to share information with others. Many IPM Innovators have training and educational programs to work with participants to encourage the sharing of ideas and information. Their outreach programs identify potential new participants and encourage them to join.

In 2016, the IPM award's scope was changed, as was the name. The new IPM Achievement Awards recognize agricultural and nonagricultural groups, organizations, companies or schools for their achievements in IPM and reduced-risk pest management. The expanded IPM award program includes a variety of accomplishments in areas of innovation, education and outreach, and leadership in promoting IPM practices. The new awards program include a wider possibility of award winners and more-diverse IPM practitioners.

SUPPLEMENTAL ENVIRONMENTAL PROJECTS

Beginning in the mid-1990s, DPR began using innovative enforcement actions to encourage the appropriate use of pesticides, including the adoption of IPM. To settle an enforcement action, individuals or companies typically must pay penalties and take actions needed to eliminate noncompliance. In suitable instances, DPR



Four Winds Growers, a dwarf-citrus pioneer which adopted special greenhouse technology to deflect disease-carrying Asian citrus psyllids, was among 2015's IPM Innovator Award winners.



There is too little acknowledgment of the years of work it takes to establish an effective and economically viable IPM program. We thought it was time for that overdue recognition. The systems DPR recognized today embody the spirit of innovation that we want to encourage. They are models for others to follow.

— DPR 1994 news release announcing the first IPM Innovator Awards

may waive part of the penalty and allow the violator to perform a “Supplemental Environmental Project” (SEP).

SEPs are environmentally beneficial projects that a violator voluntarily agrees to undertake in settlement of the action and to offset a portion of the penalty. For example, DPR agreed to offset part of a penalty for selling unregistered pesticides when a violator agreed to develop pamphlets for consumers that stress the appropriate and safe use of pesticides in and around the home to reduce environmental impacts. In another DPR case, besides paying a fine, a company that had violated rules for the registration and storage of large chlorine tanks agreed to produce brochures describing proper storage and use of chlorine gas and distribute them to industry trade group members. In another instance, DPR worked with manufacturers of copper-based boat paints to produce leaflets to be placed in stores explaining alternatives to these products that were less harmful to water quality.

In 2015, the Legislature passed AB 1071 adding section 71118 to the Public Resources Code that requires each board, department, and office within CalEPA to establish a policy for SEPs that focuses on benefitting disadvantaged environmental justice communities. The law specifies that the policy include a process to solicit potential projects and requires the posting of available projects on the CalEPA website. The policy complying with this legislation can be found at http://www.cdpr.ca.gov/docs/enforce/enfornds/sep_policy/policy.pdf.

PESTICIDE USE REPORTING

Information on pesticide use trends is critical to identifying the success or failure of efforts to promote reduced-risk pest management. It also helps researchers identify emerging challenges and avenues to solutions and provides insight to help regulators make environmentally and economically sound policy decisions. To provide this data, beginning with the 1997 annual pesticide use report, DPR scientists have presented their review and analysis of changes in pesticide use for about a dozen crops, selected based on their pesticide use or planted acreage. (*For more information on pesticide use reporting, see Chapter 9.*)

GRANT PROGRAMS

Legislation in 1994 (Chapter 545, SB 1752) allowed the department to set up a competitive grants program. In 1996, DPR began its “Innovations in Pest Management” grant program. That first year, more than \$600,000 in small grants went to projects to encourage nontraditional, least-toxic solutions to agricultural and urban pest problems. The next year, DPR launched a complementary project of larger Pest Management Alliance grants. They focused on developing partnerships with private and nonprofit organizations to “help agricultural commodity, non-agricultural, urban, and other groups address important pest management issues on a regional or statewide scale.”

The department designed the Alliance program to promote the implementation of new practices on a wider scale than was taking place. By creating partnerships with commodity groups and urban organizations, DPR aimed for extensive, sector-wide projects with broad application in pest management to achieve measurable reduction in the risk from pesticides. The grants also provided an opportunity for staff to better understand pest management challenges for the affected commodity. This can help DPR make more informed regulatory decisions.

When the Alliance program began, DPR’s approach was to first award a small Innovations grant to localized projects. The goal was to help groups take research results and move them into the field through applied research and demonstration that, if successful, could be funded for broad geographic implementation with an Alliance grant. DPR originally oriented the Alliance program to involve groups, state- or industry-wide, and target important regulatory concerns associated with pest management.

By the end of the 1990s, Alliance projects included demonstration, education and outreach. Their focus was on protecting surface and ground water, finding alternatives to high-toxicity pesticides and reducing worker exposure in agricultural and urban settings. At the time, grant recipients began with a DPR-funded pest management evaluation the first year, which allowed them to apply for full Alliance funding the following year. Recipients had to provide matching funds or in-kind services equal to each year's grant.

By 2002, when budgetary cutbacks forced the department to suspend its grant programs, DPR had given out \$7.2 million in Innovation and Alliance grants. That same year, under contract to DPR, the Center for Agricultural Partnerships (CAP) completed an evaluation of the Alliance program procedures, data management and outcomes. CAP praised the Alliance program, calling it "unique" in the nation. "Valuable new information on pest management alternatives has been generated," CAP reported. "DPR has provided an opportunity for commodity groups to increase awareness of alternative pest management practices and to leverage funding to accomplish work more rapidly and on a wider scale."

CAP recommended several changes to improve DPR oversight of projects, including more clarity in requests for proposals and greater interaction with DPR staff on the projects. Pointing out that "achieving sustainable reductions in pesticide risks requires the commercial adoption of effective pest management practices," the report recommended DPR require Alliance recipients to demonstrate and document both qualitative and quantitative, physical changes resulting from their projects.

In 2007, the Legislature reinstated Alliance funding, and by 2015 DPR had awarded another \$3.4 million in Alliance grants. In restarting the program, DPR eliminated the pest management evaluation and the need for matching funds from Alliance recipients. Staff rewrote the requests for proposals to provide more direction on priority areas and to ensure that proposals included baselines against which to measure intended outcomes and the methodology for doing so. As defined in 2011, an Alliance is a collaborative team that may include commodity group representatives, growers, university researchers, urban or industry representatives, landscape professionals, conservation agencies and sustainability certification programs. Alliance grant projects must provide evidence that adoption is taking place by the end of the grant period. Research may be a minor part of the overall project, but DPR will not fund Alliance grant projects that focus on research.

In 2012 the Legislature expanded DPR's grant program to include funding for research projects that develop effective alternatives to fumigants and other pesticides that pose undue risks to public health and the environment, and encourage collaborations with the industry to identify realistic solutions to the emerging impacts of regulations especially to the use of fumigants in the field. Grant recipients may include public and private entities such as accredited institutions of higher learning, commodity boards, licensed pest control businesses, nonprofit organizations, and urban pest managers of institutional buildings. As of 2016, DPR had awarded \$4.26 million in research grants. Projects must be designed to increase implementation and adoption of proven, effective IPM practices that reduce pesticide risks to human health and the environment.

Since the grant programs began, DPR's Pest Management Advisory Committee has had a statutory duty to review the proposals and make recommendations on funding.

IPM TRAINING

In 1999, DPR adopted regulations requiring prospective pest control advisers (PCAs) to take more college courses related to IPM. The new rules went into effect in 2002. Because students were having difficulty finding classes matching the detailed requirements in the new regulations, in 2007 DPR amended the rules to



Integrated pest management (IPM): An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

— University of California
Statewide IPM Program



IPM training for school employees in Redding in 2016.

provide more flexibility in achieving some of the academic requirements. At least one course stressing IPM is still required, however, and applicants need an extensive knowledge of IPM to pass the PCA exam.

IPM IN SCHOOLS AND CHILD CARE FACILITIES

In 1993, DPR staff began working with public school districts across the state to help them set up reduced-risk pesticide programs. In 1994, DPR sent each school district a 43-page booklet designed to help school officials examine and improve their pest management practices and set up IPM programs. In 1996, DPR completed a survey about pest management practices, policies and programs. It found that school districts throughout the state were developing and adopting innovative ways to manage weeds, insects, rodents and other pests. However, DPR also found that technical, institutional or economic constraints were significant obstacles. In response, DPR scientists moderated several urban IPM workshops, which led to helping three school districts with their IPM programs: Fontana, Pajaro Valley and Los Angeles Unified. DPR also recognized several school districts with IPM Innovator awards for their pioneering work in finding reduced-risk solutions to school pest problems.

Between 1998 and 2000, DPR awarded \$170,000 in Alliance funding to several school districts to develop model school IPM programs and resources for district administrators. For the 2000-01 fiscal year, the Legislature appropriated \$634,000 for DPR to establish a statewide voluntary program for school IPM. In 2000, the Legislature also passed the Healthy Schools Act (HSA, AB 2260, Chapter 718). It was prompted by concern about the risk to children from potential exposure to pesticides. It encouraged the voluntary adoption of IPM by public K-12 schools and public child care centers.

The HSA required DPR to help public K-12 school districts comply with the law and to promote and facilitate the adoption of school IPM programs for districts that voluntarily choose to do so. The department was required to:

- Develop criteria for identifying least-hazardous pest management practices and encourage their adoption as part of a school IPM program.
- Create a model program guidebook that prescribes essential program elements for a district that has adopted a least-hazardous IPM program.
- Develop a school IPM website as a comprehensive directory of resources describing and promoting least-hazardous practices at schools. The site also had to provide the public with information about public health and environmental effects of pesticides.
- Make school-site pesticide use reporting forms. The HSA requires pest control businesses that apply pesticides in schools to submit annual reports to DPR of those applications.

The HSA was amended in 2005 (AB 405, Chapter 566) to prohibit canceled or suspended pesticides, or those given conditional registration by DPR, from being used on school sites. A 2006 amendment (AB 2865, Chapter 865) expanded HSA requirements to private child care centers (but not family day care homes). In 2014, the HSA was again amended (SB 1405, Chapter 848) to require school sites to develop an IPM plan and report pesticide use by school employees, and for anyone applying pesticides on school sites to be trained in IPM and the safe use of pesticides in relation to the unique nature of school site and children's health. Three one-hour online courses are available to school custodians, child care providers, licensed pesticide applicators and others.

IPM programs for both schools and child care centers

DPR began its statewide school IPM program in 2000 and the child care IPM

program in 2007. The school IPM program consists of statewide IPM training for district staff, IPM-focused educational publications and a website for school IPM. “Growing Up Green,” DPR’s child care IPM program, also includes IPM training for child-care providers, educational materials specific to the child-care setting and a website for child-care providers, parents and pest management professionals.

DPR’s School IPM staff sends regular e-mail notices to school staff about topics such as DPR-produced school IPM calendars, upcoming workshops, back-to-school IPM reminders, how to evaluate contractors and pest-specific information.

IPM materials

In 2011, DPR released the third edition of its *School IPM Guidebook*. A reference tool for school IPM coordinators for adopting IPM programs in their districts, it includes guidance on:

- Adopting an IPM policy.
- Identifying and monitoring pest populations and damage.
- Setting up a community-based school district advisory committee.
- Contracting for IPM services.
- Establishing a community-based, right-to-know standard for notification and posting of pesticide applications.
- Recordkeeping and program review.

In 2008, DPR awarded a three-year Alliance grant to the University of California (UC) San Francisco Childcare Health Program, UC Berkeley and the UC Statewide IPM program to develop an IPM toolkit for child care centers. The toolkit includes an IPM curriculum, pest fact sheets, posters and an IPM checklist. It is available online as well as in a print version.

The School IPM program developed and distributed pest-specific school IPM fact sheets on ants, cockroaches and rodents. The Child Care IPM program adapted and distributed those fact sheets for use by child care providers.

DPR staff develop and publish a school IPM record keeping calendar. Sent to school districts and child care centers each year, it is designed as a planning tool for managing major pests of school buildings and grounds. It reminds school maintenance and operations staff of pest management procedures by month to help integrate pest management with other school maintenance. It also provides a way to record monitoring results and management practices.

IPM training

Each year, DPR conducts about six training sessions for school district IPM coordinators and other staff responsible for pest management, such as administrators, maintenance and operations directors, facilities directors, groundskeepers and custodians. These daylong, hands-on workshops are presented statewide and offer an opportunity to learn about both structural and landscape IPM practices in a school setting. By 2011, the department had conducted 38 workshops for 1,245 IPM coordinators from 741 of the state’s 1,047 school districts. Recently, specialized workshops on turf weed and gopher management have been added to expand the knowledge of those who need more in-depth training.

DPR, in cooperation with the UC Statewide IPM Program, also developed four interactive school IPM training DVDs. They supplement the training workshops by providing IPM coordinators with an added tool to train personnel in their districts. In 2013, a seven part video series on integrated pest management in child care centers was produced. These succinct segments offer applied ways



Under Food and Agricultural Code section 13183, DPR is directed to promote the voluntary adoption of integrated pest management (IPM) programs for school sites and child care facilities and to facilitate adoption of these practices by creating educational and informational materials on IPM for the child care setting.

— *DPR School IPM Guidebook*



A Pest Management Advisory Committee meeting in 2015.

for child care centers to transition into using IPM. In 2014, the Integrated Pest Management for Schools video series was produced. These entertaining, English and Spanish short videos contain practical integrated pest management tips from experts. Topics covered in this video series include pest prevention in school buildings; inspecting and monitoring for pests; and IPM for ants, cockroaches, gophers, and turf grass weeds.

Child care providers receive IPM training through presentations DPR staff members make at six to eight child care conferences each year. Providers also receive information and training from Department of Social Services (DSS) licensing staff. DPR trains DSS staff so they can in turn conduct training in IPM practices.

Webpages

DPR staff developed the Health and Environmental Lookup Resource (HELPR) webpages to provide information in a user-friendly format about human health and environmental effects of pesticide use in schools. Starting with a specific pest, users can read the appropriate management recommendations from the Pest Notes series produced by UC Statewide IPM. Another page summarizes toxicological and exposure data for management tactics mentioned in the Pest Note.

Pest management surveys

Beginning in 2001, DPR surveyed the state's school districts on their implementation of the Healthy Schools Act. The survey was also designed to measure adoption of IPM policies, programs and practices and to identify barriers to IPM adoption. The surveys, which DPR conducts every three years, measure changes compared with previous surveys and relate demographic and geographic factors to survey responses.

The surveys have helped DPR improve its training and written materials. Based on survey results, DPR focused its attention on resources of most interest to school staff: preventing pest problems, IPM practices, pest management practices at other schools, and lists of alternative, IPM-friendly products and tools. The first pest management survey of child care centers was conducted in 2008 in association with UC Berkeley's Center for Children's Environmental Health. Information gathered helped guide DPR's Child Care IPM program in developing presentations, training materials and effective avenues to distribute them. A follow-up survey in 2013 showed changes on pest management and Healthy Schools Act compliance since the baseline survey. It also described regional differences that DPR uses to help target its outreach efforts.

PEST MANAGEMENT ADVISORY COMMITTEE

DPR, in cooperation with the California Department of Food and Agriculture (CDFA), established the Pest Management Advisory Committee (PMAC) in 1992 "to help find alternative crop protection strategies which can reduce the environmental problems associated with pesticide use." In announcing the committee, the department said, "The future of crop protection is being driven in part by the public's strong desire to reduce risks associated with pesticide exposure. The private sector and government agencies must join together for a broad-based, systematic approach toward the use of less disruptive pest management methods." Legislation in 1994 (Chapter 545, SB 1752) formally recognized the PMAC in law and gave it the task of evaluating applications for DPR grants and making funding recommendations to the Director.

The DPR Director chairs the committee and the CDFA Secretary is vice chair. Under regulation, the PMAC includes representatives of the University of California, California State Universities, U.S. EPA and the county agricultural

commissioners. There are also 24 at-large members appointed by DPR based on their expertise and diversity of perspectives, and representing various categories of external stakeholders. There are six representatives from agricultural production; five from academia and public foundations; four representing registrants and trade associations; four from environmental and public interest groups; one from a farm labor organization; two from nonagricultural pesticide user groups; one representing the public and consumer advocacy; and one representing pest control advisers.

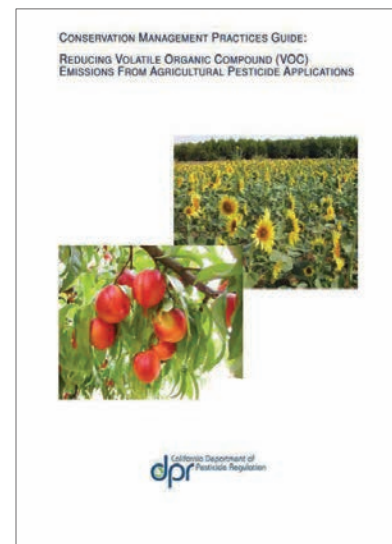
OTHER MEASURES

DPR's mission is to prevent or reduce the harmful effects of pesticide use. In doing so, its regulatory programs also can advance the use of lower-toxicity pesticides. For example, DPR's evaluation of certain agricultural insecticides used on fruit and nut trees during the dormant season found that runoff into streams and rivers compromised water quality.

In the late 1990s, DPR and commodity organizations began a project to encourage voluntary adoption of alternative pest management practices. Although insecticide use decreased, it was not enough to reduce water quality problems. In 2006, DPR adopted regulations to restrict the use of dormant-season insecticides shown to cause problems, resulting in a further decrease in use of these toxic pesticides.

DPR launched its Air Quality Initiative in 2006 as a comprehensive effort to improve air quality related to pesticide use. One goal was to promote more environmentally friendly and efficient technologies that reduce pesticide use and associated drift. DPR has funded research into application equipment that delivers pesticides more precisely to the target and remote-sensing technologies that can reduce pesticide use by mapping the most heavily infested areas of a field (*For more information on the Air Quality Initiative, see Chapter 10*).

In 2010, DPR published a conservation management guide to help farmers find ways to reduce emissions of volatile organic compounds (VOC) that contribute to formation of smog. The guide encourages greater use of IPM programs that can decrease pesticide use and in doing so, VOC emissions. Staff also created online calculators that can estimate emissions from both fumigant and nonfumigant pesticides. This allows farmers to compare emissions from different products and methods of application.



DPR's Conservation Management Practices Guide is available on the department's website: www.cdpr.ca.gov/docs/emon/vocs/vocproj/reducing_voc_emissions.pdf

Addressing Public Concerns about Pesticides



DPR helps fund Spray Safe, a grower-sponsored program that encourages communication between farmers about planned pesticide applications.

As California's population continues to grow, increasing numbers of people live and work near farms. This presents a continuing challenge for pesticide regulators, in part because urban residents and farmers may have different perspectives on the purpose and value of farmland. To growers, farmland is an economic resource supplying food and fiber to the world. For farmers, encroaching development often means constraints on routine operations such as pesticide applications, liability for trespassers, problems with theft and vandalism, and urban drivers on rural roads. Urban-oriented Californians value the open space farmland provides, a bucolic vision at odds with the noise of tractors at night, odors of animals, dust during plowing, and pesticides and fertilizers being sprayed near homes and schools. Those living next to farms often fear that agricultural pesticide use puts them at risk.

California has the nation's strictest pesticide laws and regulations. Pesticide sales and use are tightly controlled. However, many of agriculture's newest urban neighbors consider these controls inadequate. They are concerned about toxic chemicals, including pesticides, and want a say in what will be used and when. Some farmers may view this as unwarranted interference in their business. The resulting friction has often escalated into conflicts that see disputing parties turn to local officials, including county agricultural commissioners (CACs), pesticide regulators, and the media for resolution.

PROMOTING COOPERATION AND UNDERSTANDING

Since pesticide use is often the flash point of ag-urban conflicts, DPR has launched several projects to promote better understanding and cooperation among neighbors.

For example, DPR contracted with the University of California (UC) Agricultural Issues Center to hold a 1995 workshop to address conflicts and solutions where urban development lies next to commercial agriculture. UC published workshop proceedings and continues to study the issue. DPR has provided training to CAC staff on how to hold public meetings on volatile issues.

Spray Safe and Neighbors at the Edge

In 2006, DPR provided a \$50,000 grant to help expand Spray Safe, a grower-sponsored effort aimed at reducing drift incidents by strengthening farmer-to-farmer communication when pesticides are scheduled for application. Spray Safe was first established in Kern County after series of incidents where drift affected large numbers of residents in several rural communities. Spray Safe distributes a checklist to remind farmers and applicators about precautions to take when applying pesticides. The program also sponsors annual meetings with growers, applicators and regulators to review regulations governing pesticide use.

The Spray Safe Kern Project complemented a DPR-funded pesticide application notification system pilot effort in Kern County designed to improve protections to workers and others from pesticide drift. Set up in 2007 in southeast Kern County, this notification and communication system sends an e-mail to every neighboring grower regarding proposed application of a restricted material. The e-mail includes the name of the grower, the location, the name of the restricted material to be applied and the date of the proposed application. The e-mail also contains a map of the pro-

posed application site along with grower contact information in case a neighboring grower needs to confer with the grower of the proposed application.

In 2014, DPR contracted with the UC Cooperative Extension to hold four workshops statewide entitled *Neighbors at the Edge*, which allowed land use planners, CACs and other public officials to meet and discuss solutions to mitigating agricultural-urban conflict.

Northwestern California Tribal Territories Herbicide Monitoring Project

In parts of California, Native Americans have voiced concerns over the use of herbicides in private and public forests, in agricultural areas near ancestral territorial lands and along roadsides and other rights-of-way. Their concerns have focused not only on the effect applications may have on forest plants that are the source of traditional foods, medicines and basketry materials, but also on the effect of off-site movement to rivers, streams and other sources of drinking water, and fish and wildlife habitats.

These unique exposure scenarios are not specifically addressed in risk assessments conducted by regulatory agencies. Although the U.S. Forest Service and the California State Transportation Agency have programs to work with tribal representatives to identify and protect designated areas from herbicide spraying, not all tribes participate. In addition, tribal members may collect plant materials in unidentified locations.

At the request of several tribes in northwestern California, DPR in the mid-1990s began working with the U.S. Environmental Protection Agency to resolve their concerns. U.S. EPA provided funds to DPR and area CACs to hold community meetings with Native Americans to identify joint projects to address concerns about the effect of pesticide use on their communities. As a result, the Environmental Monitoring Branch began a multiyear project in 1996 to monitor surface waters, plants and other natural resources for residues of pesticides used in reforestation, weed control and agriculture. The final project report in 1999 found that some herbicide residues drifted outside the forest areas treated. However, pesticide concentrations in water samples were below U.S. EPA's drinking water standards and any other federal or state-recommended level for freshwater protection. Four plant species were monitored to determine the dissipation time for herbicides after application. Eighty days after treatment, low residue levels were found. Samples of fish showed no measurable levels of herbicides tested.

Lompoc Air Contaminant Project

In 1993, DPR began looking into health concerns of residents in the Santa Barbara County community of Lompoc and the surrounding valley (population roughly 43,500). Residents were concerned that pesticide applications in the vegetable- and flower-growing region were causing health problems. Working with the CAC, DPR staff held several community meetings to discuss health symptoms, pesticide exposure, exposure to dust and pollen, effectiveness of regulatory controls in protecting citizens from pesticide exposure, quantities of pesticides used in the area, and available alternatives to pesticides. To allay community concerns, the CAC had placed several restrictions on pesticide applications in the area, including buffer zones around schools and homes. In 1995, DPR staff completed a report on pest management practices in the Lompoc Valley with an emphasis on crops grown, their associated pests and pest control practices, including use of pesticides and alternative pest control methods. In 1998, DPR completed an analysis of weather patterns in Lompoc. This analysis compared weather in Lompoc to 11 other coastal areas in California. The analysis indicated that pesticide air concentrations could be higher than the comparison areas because of differences in weather during some periods of the year.



In response to community public health concerns, DPR conducted air studies in the 1990s in Lompoc, Santa Barbara County.



DPR participated in a 2010 CalEPA investigation into birth defects in the Kings County town of Kettleman City.

In 1997, DPR formed the Lompoc Interagency Work Group (LIWG) to better coordinate efforts to find out if Lompoc residents suffered a disproportionate rate of illness and if so, to discover the cause. The LIWG included community representatives and scientific staff from federal, state and county agencies. The LIWG formed several committees to develop recommendations addressing health concerns, to conduct a pesticide air monitoring strategy and to consider potential exposures from other environmental factors found in the area, such as crystalline silica, radon, pollen and mold.

At DPR's request, California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) evaluated illnesses in the Lompoc area. OEHHA examined 1991 through 1994 hospital discharges, birth defect rates and cancer incidence. OEHHA reported in 1998 that respiratory illnesses, in particular asthma and bronchitis, appeared to be elevated in Lompoc with respect to comparison areas. However, a later analysis that included data through 1997 found few significant differences in illness rates between the Lompoc area and similar communities.

To find out if pesticides were moving from farm fields to nearby residential areas, DPR conducted preliminary monitoring for 12 pesticides in 1998. In 2000, DPR conducted more extensive air monitoring for 29 pesticides or breakdown products widely used in the area and of potential health concern. Of the 31 pesticides or breakdown products monitored in the two parts of the study combined, DPR detected 27 pesticides in one or more of the 241 samples collected. However, air concentrations were low compared with health screening levels.

Because diatomaceous earth is mined in the Lompoc Valley, CalEPA's Air Resources Board monitored for crystalline silica in 2001. No significant amounts were found.

Kettleman City project

In 2010, CalEPA and the state Department of Public Health (DPH) conducted environmental monitoring as part of an investigation of an apparent increase in the number of infants born with birth defects after 2006 in Kettleman City, in Kings County. Scientists from each of CalEPA's board and departments, including DPR, participated in the project, assessing potential contaminants and testing for chemicals that could cause birth defects and other adverse health effects.

Experts from various scientific disciplines worked collaboratively to examine a wide range of medical, environmental and other factors that might reasonably be associated with the reported birth defects. DPR compiled information for 19 pesticides used within five miles of Kettleman City between late 2006 and 2009. DPR then estimated airborne pesticide levels in the community during that period. In the summer of 2010, DPR also tested air for 27 pesticides, including four that could cause birth defects. The results showed that it was very unlikely pesticides caused the birth defects. Tests of agricultural soil found no evidence of pesticide levels that pose a health risk concern.

CalEPA's investigation found levels of environmental pollutants in the air, water and soil of Kettleman City comparable to those found in other San Joaquin Valley communities. The agency's comprehensive investigation did not find a specific cause or environmental exposure among the mothers that would explain the increase in the number of children born with birth defects in Kettleman City.

INCORPORATING ENVIRONMENTAL JUSTICE CONSIDERATIONS INTO DPR PROGRAMS

Environmental justice (EJ) is defined in law as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations and policies" (Chapter 690, Statutes of 1999). CalEPA is designated as the lead agency in state

government for environmental justice programs. The law requires the agency and its boards, departments and offices to:

- Ensure their programs are conducted in a manner that provides fair treatment of all races and income levels.
- Promote greater public participation in the development and implementation of environmental policies.
- Improve research data collection for environmental programs related to the health and safety of minorities and low-income populations.

Parlier Air Monitoring Project

In 2002, CalEPA developed its Environmental Justice Action Plan which tasked the boards, departments and offices to conduct pilot projects that “focus on environmental risk factors (including emissions/discharge, exposure, and health risk) that impact children’s health.” Because rural, agricultural communities may have higher concentrations of pesticides in ambient air compared with their urban counterparts, CalEPA asked DPR to postpone its planned Air Monitoring Network and instead conduct focused air monitoring for one year in a Central Valley farming community.

DPR’s goal was to find out what amounts of pesticides, if any, were in the air of a rural community. DPR also wanted to evaluate people’s exposure to these pesticides and identify opportunities to reduce health risk, particularly to children. The project differed from those conducted previously by DPR in that before work began, the department sought extensive public comment on project priorities and in selecting a community for monitoring. DPR evaluated 83 Central Valley communities on several EJ-related demographic factors (for example, number of children and nonwhite population), and for the relative use of pesticides the project was to monitor. DPR also considered air sampling feasibility, weather patterns, monitoring stations for other air pollutants, availability of data on pesticides in ground water, and the potential for collaboration with organizations planning complementary or related studies.

With their EJ orientation, all Action Plan projects stressed public participation. A key element was inclusion of Local Advisory Groups (LAGs) to provide input on how each project should be carried out. Although not a decision-making group, the 18-member Parlier LAG formed by DPR had a significant impact on how the department conducted the project. The LAG helped select pesticides to monitor, sampling sites and monitoring frequency. The LAG approved delaying the start of monitoring until January 2006 so DPR could spread the costs of the project over two fiscal years, allowing monitoring to be done more often and at more sites. CalEPA also encouraged use of the Internet to widen opportunities for public participation. DPR posted LAG meeting agendas and minutes, preliminary project results and the final project report on its website. (*For more information on the Parlier project, see Chapter 10.*)

Air Monitoring Network

In 2010, DPR began a long-term project to sample ambient air in the farming communities of Ripon, Shafter and Salinas. DPR uses data gathered to evaluate and improve protective measures against pesticide exposure. To select monitoring sites, DPR staff evaluated 226 candidate communities. Among other factors, staff considered demographic criteria related both to environmental justice and DPR programmatic priorities, for example, number of children under 18, representing a subpopulation DPR considers in its risk assessments. (*For more information on the Air Monitoring Network, see Chapter 10.*)

In 2016, DPR reassessed its monitoring locations and other aspects of its Air Monitoring Network. DPR selected eight communities for monitoring, including



The air monitoring station in Parlier.



DPR's toll-free Pest Line aids callers in contacting a local agricultural commissioner to report pesticide incidents.



DPR's 2013 Strategic Plan and information about DPR's strategic planning can be found online: <http://www.cdpr.ca.gov/docs/dept/planning/stratmenu.htm>

continuing monitoring at Shafter. DPR evaluated 1,267 communities and selected four communities based on high use fumigant pesticides and four communities based on high use of organophosphate pesticides. (For more information on the Air Monitoring Network, see Chapter 10).

Strategic planning

DPR has also incorporated EJ considerations into the strategic plans that guide department priorities and programs. DPR's 1997 Strategic Plan called for the department to improve its "responsiveness to public concerns about pesticide application and potential impacts." In the next strategic plan in 2001, one of four goals was to "Ensure environmental justice." The objectives to achieve it focused on improving enforcement, "recognizing that strong enforcement of pesticide laws is the cornerstone of improving the regulatory program and reducing potential risk."

DPR's 2008 and 2013 Strategic Plan revisions ensured environmental justice was among five goals. "All Californians, regardless of race, age, culture, income, or geographic location, are protected from adverse environmental and health effects of pesticides," the 2013 plan says.

Meeting EJ concerns

DPR has also worked to meet EJ concerns identified by stakeholders. For example, in a series of "listening sessions" DPR sponsored in 2004, community members brought several EJ issues to the department's attention. Community members asked the department to improve public participation, outreach, field enforcement, and recognition and reduction of pesticide-related illnesses. They also advocated reinstatement of the Integrated Pest Management grants and doing more to encourage the adoption of least-toxic pest management strategies, particularly in public housing and government buildings. (The Alliance program was restored in 2007. See Chapter 11 for more information. For improvements to enforcement, see Chapter 2.)

In 2005, DPR formed a workgroup of stakeholders from EJ organizations, regulated industries and other interested parties to develop advisory recommendations to guide the department's development of an EJ implementation plan. The workgroup had 10 facilitated meetings between July 2006 and April 2007. With the assistance of a consulting firm that managed and facilitated the meetings, the workgroup presented a series of recommendations to DPR.

DPR moved to address concerns raised in the listening sessions of the 2006-2007 EJ Work Group. DPR had been criticized for failing to provide information on how to recognize and report pesticide problems to communities affected by pesticide use. To help address this, in late 2006 DPR launched the automated, toll-free phone line Pest Line (1-87PestLine) that provides CAC phone numbers and then offers to transfer the caller to the appropriate CAC office. The automated service, in English and Spanish, is designed to encourage timely filing of pesticide complaints—a key to successful investigation.

In 2008, DPR expanded worker safety outreach by assigning a full-time, bilingual staff member to liaise with worker advocates, health professionals and community workers. This outreach specialist works with other DPR staff to provide information on pesticide safety and the rights of employees to file confidential complaints about pesticide exposure. Each year, DPR staff takes part in more than 30 community meetings, health conferences and other events to promote pesticide safety for workers and their families. Staff also promotes pesticide safety in guest appearances on Spanish-language media outlets in the Central Valley

In 2008, DPR published its *Community Guide to Recognizing and Reporting Pesticide Problems* in both English and Spanish. The 34-page guide offers plain-language explanations that focus on practical solutions for real-world situations. The guide has become a popular reference for public health agencies, emergency

responders, community advocates, industry, local government officials and individuals with pesticide questions or complaints. Topics include step-by-step instructions on what to do in a pesticide emergency, a discussion of pesticide drift and odor, and a checklist to use when reporting a pesticide incident. The guide was prepared in consultation with CACs, who act as DPR's local enforcement agents. The first printing of 5,000 English copies ran out quickly. DPR printed several thousand more copies early in 2009, including a Spanish-language version targeted for distribution at ethnic venues. DPR posted the guide online and sent it to more than 900 community health centers, county health departments and to every public library in the state. California Poison Control Centers use it for staff training. DPR outreach specialists distribute it at and other safety information at health and community fairs in Latino communities.

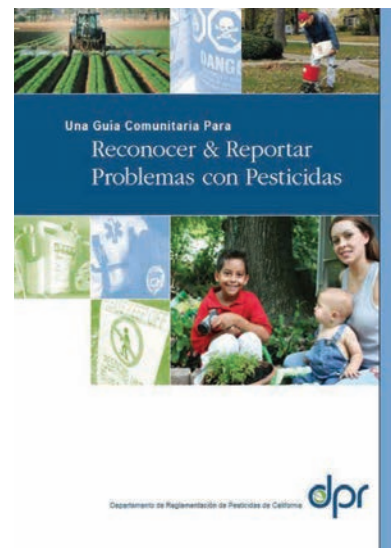
DPR staff have also conducted training for emergency personnel on how to respond to pesticide incidents. In cooperation with CalEPA's Office of Environmental Health Hazard Assessment, they also worked with community clinics and medical organizations to conduct physician training on recognition of pesticide-related illnesses. In 2011, DPR funded a project to train Latino community members who serve as liaisons between their community and health and social service organizations on how to recognize symptoms of pesticide exposure, the importance of reporting suspected exposure, and where to refer exposed persons to obtain advice, and/or medical care.

The department has taken steps to ensure public participation in regulatory processes, in particular potentially affected parties that might otherwise be overlooked or excluded. In 2006, DPR opened the process of selecting pesticides for risk assessment to public comment and posted more than two dozen completed risk assessments online. DPR is also making risk management more transparent and open to public comment. (Risk management is how DPR decides whether an assessed risk presents a public health concern and, if so, what can be done to reduce the risk.) For example, in 2007, DPR held two public workshops in Tulare to obtain feedback on proposed controls for pesticides that generate methyl isothiocyanate (MITC). These workshops were held in English and Spanish.

DPR routinely schedules regulatory hearings outside the Sacramento area at times and places convenient to local residents, with simultaneous translation into Spanish. Key rulemaking documents are routinely translated into Spanish. To further increase transparency in decision-making, in 2007 DPR required all program managers and supervisors to take five days of training on how to ensure the public was more involved in the decisions they make on policies and activities. DPR set up an e-mail Listserv focusing on EJ and routinely sends out announcements about web postings of interest, public meetings, regulatory developments and activities of interest to EJ stakeholders.

DPR staff also took part in the U.S. EPA Border 2012 project, a state and federal initiative to help Mexican agencies set up and manage pesticide safety programs. For example, DPR staff assisted in training Mexican growers and applicators on the safe use of pesticides.

For information on DPR's Environmental Justice programs, see <http://www.cdpr.ca.gov/docs/envjust/>



Community Guide to Recognizing and Reporting Pesticide Problems.



As part of its environmental justice efforts, DPR works with community groups like the Fresno Environmental Reporting Network to monitor and help solve issues that threaten the health of community members.



Fines and fees, like the mill assessment on pesticide sales, provide most of DPR's funding.

Funding and Accountability

The Department of Pesticide Regulation (DPR) is funded by regulatory fees, penalties and a small amount of federal funds. Some revenue sources are:

- Pesticide product registration and renewal fees.
- Fees from pesticide-related licenses issued to people and businesses that sell, apply or recommend the use of pesticides.
- Civil penalties (for example, selling unregistered or misbranded pesticide products).
- Miscellaneous fees and various reimbursements.
- Funds from the U.S. Environmental Protection Agency (U.S. EPA) and U.S. Department of Agriculture (USDA). Federal funding supports DPR activities performed jointly or for these federal agencies. For example, under a cooperative agreement, U.S. EPA transfers funds to DPR to conduct pesticide enforcement and program development, including worker safety and endangered species protection. (The grant covers a small portion of enforcement costs in DPR's wide-ranging program.)

The largest revenue source is the mill assessment—a fee levied on pesticide sales at the point of first sale into the state.

Pesticide Regulatory Program Funding and the "Mill"

As of 2016, the mill assessment is at the statutory maximum of 21 mills—that is, 2.1 cents per dollar of sales of registered pesticide products sold in California. (A mill is equal to one-tenth of a cent.) Exempt from the mill assessment are products registered for manufacturing use—that is, sold to other firms that repackage it as their own product or use it to manufacture other pesticide products. The company that repackages or uses the pesticide to make another product must register the product and pay the mill assessment on its California sales.

An extra three-fourths mill is assessed on agricultural and dual-use products (pesticides labeled for both agricultural and nonagricultural use). These funds are transferred to the California Department of Food and Agriculture (CDFA) to support its pesticide consultation unit.

Even when the mill rate stays the same, the revenue collected from the mill assessment varies depending on the total dollar sales of pesticides in California. In the last 20 years ending in 2015, yearly mill revenue had increased in all but three years, with the increase ranging from 0.3 to 11 percent, averaging about 6 to 7 percent. In 2015-16, mill revenue was \$74 million.

The mill assessment is self-reported and the law requires those subject to the assessment to keep records and be subject to audit by DPR. Pesticide registrants, dealers and brokers are audited to find out if pesticides are registered, to verify sales and to document that mill assessments were paid. If investigators find sales of unregistered products or unpaid mill assessments, the sellers must pay any money owed and a 10 percent late penalty. They are also subject to civil penalties. DPR annually distributes the required proportion of mill assessment revenue to the county agricultural commissioners (CACs) to support local pesticide use enforcement.

Pesticide and pest control legislation in the early part of the 20th century was sponsored by the regulated industry and focused on preventing fraudulent practices and unfair competition. Activities clearly related to registration and product quality were fully funded by industry fees, which were increased as necessary to keep the programs self-supporting. Public health protection became part of the regulatory program mission with the passage of the Chemical Spray Residue Act of 1927 and the initiation of residue testing in fresh produce. With this, General Funds began supporting some of the pesticide regulatory program although the mix between this and special funds varies over the years.

In 1971, a mill assessment on pesticide sales was passed (Chapter 1367, SB 825). The law set the rate at 8 mills (\$0.008), with the counties receiving 62.5 percent of these funds for local pesticide enforcement.

The assessment did not change until the 1989 passage of the Food Safety Act (Chapter 1200, AB 2161), which increased the assessment to 9 mills. The bill sanctioned full pesticide use reporting and increased produce monitoring, among other food safety measures. Five-eighths of the extra 1.0 mill went to CACs to cover costs of the new programs.

In 1990, DPR's General Fund support was reduced as part of the state's effort to address a statewide budget crisis. To compensate, the mill assessment was increased from 9 to 18 mills (Chapter 1679, Statutes of 1990, AB 2419), with CACs receiving 31.25 percent of the mill revenues to keep funding consistent with the amount they had been receiving previously. The bill also required that the department "conduct a study to evaluate the pesticide regulatory programs funded with the (mill) assessment ... to determine which program components can be modified or eliminated in order to avoid duplication of any other state or federal requirements." DPR submitted the report to the Legislature in May 1991.

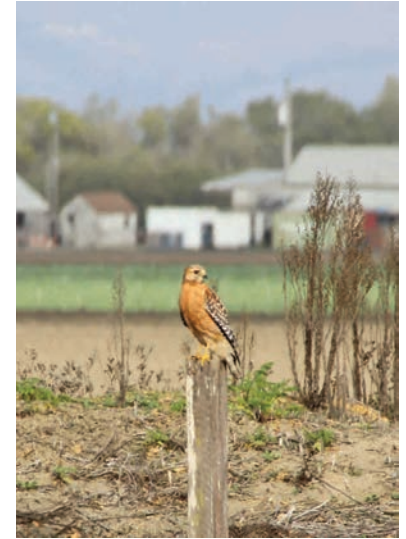
The 1990 legislation included a new sunset on the mill assessment, which was scheduled to revert to 9 mills on July 1, 1992. In September 1992, the Legislature again reduced General Fund support and increased the mill assessment (Chapter 706, SB 1850) to 22 mills, with a new sunset of July 1, 1997. (Because SB 1850 was enacted with the urgency clause and went into effect before the July - September 1992 assessment was due, the mill rate did not revert to 9 mills.)

Twenty-one mills were divided between DPR and the counties. Revenue from the 22nd mill was divided between CDFA and the counties. The counties received 32.5 percent of the extra mill to defray costs associated with collection of pesticide use data. CDFA received 67.5 percent of one mill (later increased to three-fourths mill), which under the law could only be used to fund its pesticide consultation unit. A later amendment (Chapter 695, Statutes of 1997, SB 1161) prohibited CDFA from using the funds for pesticide risks assessment.

As required by SB 1850, DPR must consult with CDFA on Section 18 and Section 24(c) special local need registrations, denial of new active ingredient registrations, suspension or cancellation of pesticide registrations or uses, and "other measures adopted to mitigate unacceptable adverse pesticidal effects." In 1992, DPR and CDFA signed an agreement to detail their consultative relationship and "ensure that CDFA is provided an opportunity to submit information to DPR, including, but not limited to, the impacts on agriculture resulting from the specified actions, benefits derived from the use of a pesticide, and any recommended alternative action."

In 1993, legislation (Chapter 1176, AB 770) closed a loophole in collecting the mill assessment by identifying the person who first sold the pesticide into or within the state, whether the registrant, a pesticide broker or a pesticide dealer, as the responsible party for paying the assessment.

In 1997, legislation (Chapter 695, SB 1161) reauthorized the mill assessment, capping the mill at 15.15 from January 1998 through March 1999, then raising it



It remains to be seen whether or not the income derived from licenses required by the Economic Poison Law will be sufficient for its full enforcement. It is probably that some support by State appropriation will be needed if the law is to be made effective

— 1921 California Department of Agriculture annual report



Mill payment reminders being prepared in 2015.

to a maximum of 17.5 mills through December 2002 when, without subsequent legislation, it would have reverted to 9 mills. The Legislature set the 17.5-mill maximum artificially low to allow the department to spend down a large reserve in the DPR Fund. The bill increased the assessment that funded CDFA's pesticide consultation to three-quarters of a mill and changed it to apply only on agricultural and dual-use products. The law requires CDFA to decide each year "the necessity of this additional assessment" and it may choose not to have it collected in any given year.

The 1997 mill reauthorization legislation also changed the funding formula for CACs so, beginning on July 1, 1998, the counties were to receive the revenue from 6 mills. The funds are distributed based on each county's pesticide control activities, costs, workload and performance.

Another pending sunset to 9 mills prompted the 2001 passage of AB 780 (Chapter 523). The bill provided for a continuation of the mill assessment rate at 17.5 mills plus the extra three-fourths mill on agricultural and dual-use products. The law extended the mill assessment sunset to June 30, 2004, when it would revert to 9 mills.

AB 780 required DPR to form a subcommittee of stakeholders to help the department prepare a report to the Legislature to recommend "a funding solution ... that would eliminate the need to reauthorize the mill assessment ... every five years and that would preserve the accountability of the department to the entities contributing to the financing of the department." (*See section on Function-based Accounting, page 111.*) The report was also to analyze ongoing funding needs and potential business process improvement measures. DPR submitted the report to the Legislature in January 2003.

AB 780 also clarified the law to make it explicit that products purchased over the Internet or by telephone and sent from out of state were subject to the mill assessment.

SB 1049 (Chapter 741, Statutes of 2003) was a budget trailer bill that provided for new and increased fees for natural resources and environmental protection agencies. It put into place the most significant changes in DPR funding in more than two decades: removing all general funds and making the department a fee-based agency. The legislation capped the mill assessment at 21 mills and preserved DPR's authority to adjust the mill fee under that cap. It also removed the mill assessment sunset and made permanent DPR's authorization to collect the extra three-quarter mill on agricultural and dual-use products to support CDFA's pesticide consultation, unless requested not to do so by CDFA.

SB 1049 required DPR to make its product registration and professional licensing programs self-supporting and gave the department authority to adjust fees to support spending in each program. Fees had previously been set in statute and could only be changed by the Legislature. Before the 2003 passage of SB 1049, the last fee adjustment had been in the 1980s. As program costs increased, fees no longer covered costs. Because fees were set in statute, the department could not adjust them or institute added fees for services that created significant workload. SB 1049 gave DPR authority to use rulemaking to set registration and licensing fees. The legislation also allowed the department to charge separate fees for various activities related to its licensing program. For example, separate fees could be levied for conducting examinations, approving continuing education courses and issuing duplicate licensing cards. It also allowed the department to charge fees for amendments to pesticide registrations.

In late 2003, DPR adopted regulations to increase licensing and registration fees and raise the mill assessment from 17.5 to 21 mills, plus three-quarters mill on agricultural and dual-use products. (*See page 112 for more information on licensing and registration fees.*) These changes became effective in January 2004.

Function-based Accounting

California state government agencies typically use a financial accounting system designed to track or report costs by organizational units—that is, by divisions and branches. However, DPR wanted its accounting to more accurately capture and track functional costs and program management responsibilities across organizational units. To do so, DPR undertook a function-based costing initiative to identify and assign the department’s costs to specific activities. A function is a set of activities that produces a key service to meet program mandates. If budgeting is based on organizational units, it is difficult to know the costs associated with each function or its resulting service. Most DPR functions are handled by more than one of its branches.

Function-based costing allows DPR to see more clearly how it uses funds because the system is based on services provided. Instead of assigning costs to a specific product, the goal is to estimate the cost of providing a service. For DPR, the service might be processing a registration application, conducting an environmental assessment or managing a grant program. The allocation provides important information to management and to stakeholders about how DPR uses its funds and what the costs are of providing various services. Knowing what it costs to run a particular branch or division is not as helpful in evaluating programs as knowing how much it costs to process a new product registration package or collect pesticide use reporting data. Since most processes and activities within government agencies change only gradually, function-based costing provides DPR with a tool to monitor costs over fiscal years.

Eleven operational functions were identified:

- Product registration.
- Human health and environmental assessments.
- Licensing and certification.
- Permitting and pesticide use reporting.
- Monitoring/surveillance.
- Mitigation of human health risks.

- Mitigation of environmental hazards.
- Pest management.
- Use enforcement and compliance.
- Product compliance and mill assessment.
- Distributed program/executive management and administration.

In 2010, “structural pest control” was added as a business function when the Structural Pest Control Board (SPCB) was transferred to DPR. In fiscal year 2013-14, SPCB was transferred back to the Department of Consumer Affairs.

The functions and their supporting activities represent what DPR does to produce specific services, not how the department is organized. For example, the pesticide registration function contains everything DPR does to register a product. This function includes intake of the application and its technical evaluation, a scientific evaluation of the product and other activities. However, they do not all occur in the Pesticide Registration Branch. For example, health evaluation of a product involves staff from the Worker Health and Safety and Human Health Assessment branches, and for environmental effects, the Environmental Monitoring Branch.

DPR adopted function-based accounting in 2004. The information provided by functional accounting allows DPR to refine its budget and fees to accurately recover costs associated with specific services. In each year’s State Budget, funding is appropriated to DPR based not on its programmatic divisions (such as branches), but on its business functions.

Function-based accounting is linked to DPR’s operational plan, which describes what DPR plans to accomplish during the fiscal year, with performance measures for each function. DPR’s operational plans and performance measures are posted each year on the department’s website, as are the functional accounting year-end reports and detailed descriptions of activities within each function. This allows stakeholders to review specific goals, costs associated with them and clearly see whether goals are being met.



Number of pesticide products registered in California:

- 1913: “well toward 10,000”
- 1935: 3,500
- 1945: 7,136
- 1950: 9,070
- 1956: 11,904
- 2011: about 13,000
- 2016: 13,600

AB 1011 (Chapter 612, Statutes of 2005) expanded broker licensing requirements to close loopholes in previous laws that allowed some pesticide sellers to avoid paying the mill assessment. Internet sales of pesticides and industrial, institutional and consumer-use pesticide sales by intermediate brokers and through the distribution centers of nationwide retailers were often not held accountable to report and pay mill fees. Before AB 1011 passed, only sellers of agricultural-use pesticides had to be licensed by DPR. The legislation expanded broker licensing to encompass all those who first sell or distribute any pesticides into California, whether agricultural or nonagricultural products.

Product Registration Fees

Each year, manufacturers, importers or dealers who wish to label and sell a pesticide product for use in California must get certificates of product registration from DPR. The certificates expire Dec. 31 of each year.

Until 2003, registration fees were set in statute. In 1986, the Legislature approved an increase in product registration fees from \$40 to \$200, even though that did not cover program costs at the time. With the 2003 passage of SB 1049, DPR was given authority and required to increase fees to cover program costs.

In 2003, DPR adopted regulations to raise to \$750 the fee for each pesticide product submitted for registration or renewal, effective January 2004. Late penalties were increased to \$150. The department also established a \$100 fee for each application to amend a pesticide product registration. Some minor amendments were exempted.

Effective Oct. 1, 2015, DPR revised its regulations to raise the application fee for each pesticide product submitted for registration or renewal to support current and future business functions of the Pesticide Registration Branch, including the development and implementation of the Pesticide Registration Data Management System (PRDMS) project. PRDMS will take the place of the current paper-based pesticide registration process and allow for new products, and amendments and renewals to currently registered pesticides, to be submitted and accepted electronically. DPR increased the application fee for each new pesticide product submitted for registration and for annual renewal of each pesticide product from \$750 to \$1,150 per product. The department established a \$25 application fee for all pesticide product amendments, including substantive and non-substantive label amendments, amendments to the formulation of the pesticide product, notifications of minor changes, and label changes required by the U.S. Environmental Protection Agency or any other federal or state agency.

The revised fee level generates more than \$15 million a year.

In 2015, the department processed 1,539 applications for registration of new products, 2,895 amendments to registered pesticide products, and renewed the registrations of 13,128 pesticide products.

No fees are charged for applications for Section 18 emergency exemptions from registration, Section 24(c) special local need registrations, and research authorizations.

Licensing and Certification Fees

DPR’s Licensing and Certification Program examines and licenses qualified applicators, aircraft pilots, pest control dealer designated agents, and agricultural pest control advisers; and certifies pesticide applicators who use or supervise the use of restricted pesticides. It also licenses businesses that sell or apply pesticides or use pest control methods or devices for hire (that is, pest control businesses, maintenance gardener pest control businesses, pest control dealers and pesticide brokers).

Major exemptions from licensing requirements include individuals and businesses performing preservative treatment of fabrics or structural materials; household

or industrial sanitation services; treatment of seed when this activity is incidental to the person's regular business; and removal of pests without the use of pesticides.

DPR conducts about 9,000 examinations yearly and issues or renews about 15,000 licenses and certificates each year. Licenses are issued for two years. DPR also accredits more than 2,200 continuing education courses.

Before 2003, licensing fees were last adjusted in the mid-1980s, set in statute at \$15 to \$100, a level designed to cover program costs at the time. With the implementation of SB 1049, DPR had authority to adjust fees to support spending in each program and charge for services that required significant staff time. In January 2004, the new fees went into effect. They range from \$25 to \$160.

Local Assistance

Among other duties, CACs are charged with local enforcement of pesticide laws and regulations, working under supervision of and contract with DPR. Funding for local pesticide enforcement comes from four sources: the mill assessment, local fees and penalties, county general funds and unclaimed gas tax. (State law requires that fuel taxes attributable to the use of off-highway agricultural vehicles be transferred to CDFA. Food and Agricultural Code Section 224 identifies how these funds are to be expended, with \$9 million each year going to CACs for pesticide use enforcement.)

The 2004 passage of SB 1107 (Chapter 230) changed how funds were divided among the counties. Among other requirements that had been imposed by the 1978 passage of AB 3765 (which set up the functional equivalency program for pesticide regulation), CACs carry out the restricted materials permit program. They issue site- and time-specific permits for the use of restricted pesticides, review notices of intended applications and perform pre-application site inspections to a minimum of 5 percent of application sites.

In 1980, CDFA (which then managed the pesticide program) contracted with the counties for the state to reimburse the costs of this new mandated workload, drawing from a \$2.88 million General Fund appropriation. The amount remained the same (although its source shifted between the General Fund and the DPR Fund) until the 2004-05 fiscal year. SB 1107, a budget trailer bill, consolidated funding to CACs for restricted material permits with DPR's other CAC funding. Instead of a fixed dollar amount, the appropriation to counties to manage their restricted material permit programs was converted to an extra 1.6 mill, increasing the total CAC share to 7.6 mills. That same legislation also ended the distribution to the counties of 50 percent of pesticide dealer license fees collected by DPR.

DPR disburses to the counties the revenue from 7.6 mills of mill assessment as partial reimbursement for their costs in carrying out pesticide use enforcement. In addition, the law allows DPR to disburse up to 0.5 mill out of existing fees for local assistance to counties in an ozone nonattainment area affected by a fumigant emissions limit. (See Chapter 10 for more information on the volatile organic compound program.) As of 2015, no county was eligible for this funding.

Under contract with DPR, CACs are also reimbursed for electronically entering PUR data. In July 2012, the individual contracts for PUR data entry are scheduled for conversion to a single contract with the California Agricultural Commissioners and Sealers Association (CACASA).

By law, pest control advisers (PCAs) and pest control businesses must register with the agricultural commissioner in each county where they plan to conduct business. Most of the state's 58 counties charge fees for these registrations. Counties use this revenue for pesticide use enforcement.



Noncompliance does not necessarily call for additional or more stringent laws, but more often for education as to observance. Education concerning the purpose of law and with the backing of law can be made exceptionally effective because acceptance usually comes with understanding.

— Economic Poisons: California Law and Its Administration (1944)

Code Sections Enacted or Amended by Referenced Legislation

This appendix lists legislation noted in this publication and shows the related code section the legislation amended or added. Statutes and related code sections deleted or superceded by later legislation are not included.

- B&P = Business and Professions Code
- FAC = Food and Agriculture Code
- H&S = Health and Safety Code
- PRC = Public Resources Code
- EC = Education Code

| Chapter in this book | Legislative chapter (year) | Code and section |
|----------------------|----------------------------|---|
| Chapter 1 | 18 (2009) | B&P 101, 130, 149, 8502, 8520, 8525 and FAC 11451.5 |
| Chapter 2 | 705 (1995) | FAC 14090 et seq. |
| | 612 (2005) | FAC 12400 |
| | 1386 (1984) | FAC 11501.1 |
| | 361 (1996) | FAC 11501.1 |
| | 963 (1993) | FAC 13162 |
| Chapter 3 | 608 (1995) | FAC 12833 |
| | 428 (1997) | FAC 12837 |
| | 530 (1997) | FAC 12804 |
| | 691 (1997) | FAC 12803 |
| | 651 (1998) | FAC 15301 et seq. |
| | 612 (2005) | FAC 12811.5 |
| | 1169 (1969) | FAC 12824 |
| Chapter 4 | 483 (1997) | FAC 12825 |
| | 1169 (1969) | FAC 12824 |
| Chapter 5 | 669 (1984) | FAC 13121 et seq. |
| | 1227 (1991) | FAC 13127 et seq. |
| | 1228 (1991) | FAC 13127.31 |
| | 1 (1995/96) | FAC 13127.32 |

Appendix A: Code Sections Enacted or Amended by Referenced Legislation

| Chapter in this book | Legislative chapter (year) | Code and section |
|----------------------|----------------------------|--------------------|
| Chapter 7 | 1285 (1985) | FAC 12582 |
| | 1375 (1986) | FAC 12532 |
| | 1200 (1989) | FAC 12979 |
| Chapter 8 | 1415 (1971) | H&S 105200 |
| | 741 (2003) | FAC 12841.2 |
| | 369 (2010) | H&S 105206 et seq. |
| Chapter 9 | 1200 (1989) | FAC 12535 |
| Chapter 10 | 1047 (1983) | FAC 14021 et seq. |
| | 1298 (1985) | FAC 13141 et seq. |
| | 533 (2008) | FAC 12841.4 |
| | 393 (2010) | FAC 12841.4 |
| | 1380 (1984) | H&S 39650 et seq. |
| Chapter 11 | 735 (1972) | FAC 11501 |
| | 545 (1994) | FAC 12536 |
| | 428 (1997) | FAC 12837 |
| | 718 (2000) | FAC 13180 et seq. |
| | 566 (2005) | EC 17610.1 |
| | 865 (2006) | FAC 13183 |
| Chapter 12 | 690 (1999) | PRC 7110 |
| Chapter 13 | 1176 (1993) | Became FAC 12841 |
| | 695 (1997) | FAC 12841 |
| | 741 (2003) | FAC 11502.5 |
| | 230 (2004) | FAC 12841 |
| | 612 (2005) | FAC 12400 |
| | 1200 (1989) | FAC 12535 |
| | 1169 (1969) | FAC 12824 |
| Appendix C | 1092 (1970) | FAC 12824 |
| | 225 (1972) | FAC 1 |
| | 794 (1972) | FAC 12980 |
| | 308 (1978) | PRC 21080.5 |
| | 1047 (1983) | FAC 14021 et seq. |
| | 669 (1984) | FAC 13121 et seq. |
| | 1298 (1985) | FAC 13141 et seq. |
| | 612 (2005) | FAC 12400 |
| | 1176 (1993) | Became FAC 12841 |
| | Appendix D | 295 (1997) |

Acronyms and Abbreviations

AB: Assembly Bill
AI: pesticide active ingredient
ARB: California Air Resources Board
B&P Code: Business and Professions Code
BDPA: Birth Defect Prevention Act of 1984 (SB 950)
CAC: county agricultural commissioner
CACASA: California Agricultural Commissioners and Sealers Association
CalEPA: California Environmental Protection Agency
CalPIP: California Pesticide Information Portal (DPR)
CalPIQ: California Pesticide Illness Query (DPR)
CCR: California Code of Regulations
CDA: California Department of Agriculture (former name of CDFA)
CDFA: California Department of Food and Agriculture
CDFW: California Department of Fish & Wildlife
CE: continuing education
CEQA: California Environmental Quality Act
CFR: Code of Federal Regulations
CPCS: California Poison Control System
DIR: Department of Industrial Relations
DPH: Department of Public Health
DPR: Department of Pesticide Regulation
EF: emission factor
EJ: environmental justice
EIR: environmental impact report
EUP: experimental use permit
FAC: Food and Agricultural Code
FDA: U.S. Food and Drug Administration
FDCA: U.S. Food Drug and Cosmetic Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
FQPA: U.S. Food Quality Protection Act
GWPA: ground water protection area
GWPL: Ground Water Protection List
HAP: hazardous air pollutant
IPM: integrated pest management
MAA: management agency agreement
MOU: memorandum of understanding
MSDS: material safety data sheet
NAA: nonattainment area
NOEL: no-observed-effect level
NOI: notice of intent

Appendix B: Acronyms and Abbreviations

OEHHA: CalEPA Office of Environmental Health Hazard Assessment
OSHA: Occupational Safety and Health Administration, U.S. Department of Labor
PCA: pest control adviser
PCPA: Pesticide Contamination Prevention Act of 1985
PDP: Pesticide Data Program (USDA)
PISP: Pesticide Illness Surveillance Program (DPR)
PMA: Pest Management Alliance
PPE: personal protective equipment
PMAC: Pesticide Management Advisory Committee
PPE: personal protective equipment
PREC: Pesticide Registration and Evaluation Committee
PRESCRIBE: Pesticide Regulation’s Endangered Species Custom Realtime Internet Bulletin Engine
PSIS: Pesticide Safety Information Series
PUR: pesticide use reporting
QAC: qualified applicator certificate
QAL: qualified applicator license
RA: research authorization (DPR)
RCD: risk characterization document
REI: restricted entry interval
RUP: restricted-use pesticide (federal)
SB: Senate Bill
SIP: State Implementation Plan
SLN: special local need registration (FIFRA Section 24(c))
SPCB: Structural Pest Control Board
SRP: Scientific Review Panel
TAC: toxic air contaminant
TGA: thermogravimetric analysis
Title 3: Title 3, California Code of Regulations (3 CCR) Food and Agriculture
UC: University of California
USDA: U.S. Department of Agriculture
U.S. EPA: U.S. Environmental Protection Agency
U.S. FDA: U.S. Food and Drug Administration
VOC: volatile organic compound
WHS: Worker Health and Safety Branch
WPS: federal Worker Protection Standard

A History of Pesticide Regulation in California

California has regulated pesticides for more than a century.

Through the legislative process, state lawmakers have established a comprehensive body of law to give California pesticide regulators the tools needed to control pesticide sales and use, and to assess and control potential adverse effects.

The state's first pesticide-related law was passed in 1901 and, since the 1970s, a body of increasingly science-based pesticide law and regulation has come into being. As we begin the second century of pesticide regulation, we build and improve upon these developments.

Today, DPR's mission is: "To protect human health and the environment by regulating pesticide sales and use, and by fostering reduced-risk pest management."

EARLY PESTICIDE REGULATION: FOCUS ON CONSUMER FRAUD

Arsenic, cyanide and other natural poisons have been used for centuries to kill insects and rodents in homes and on farms. In the mid-1800s, farmers found they could use a common, arsenic-containing paint pigment, called Paris green, to kill insects in their fields. Other arsenic-based insecticides followed in the 1880s.

French grape growers accidentally discovered that a combination of hydrated lime and copper sulfate could fight powdery mildew fungus. Since labor for weed removal was cheap and readily available, farmers were not generally interested in using herbicides.

Into the early decades of the 20th century, insecticide and fungicide use was not widespread, and was confined largely to high-value tree fruit crops. Although a few scientists expressed concerns over pesticide residues, arsenic was not considered harmful in the small amounts remaining on sprayed produce. The chemical was used to color paper, candles, artificial flowers, fabrics, toys, plates, carpets and clothing. Little thought was given to the potential hazards of cumulative exposure.

Government regulation of pesticides focused on protecting users from fraud by ensuring product quality. Pesticides and many products of the time, including foods and drugs, were often adulterated or mislabeled. It was not unusual for manufacturers to make extravagant claims for pesticide products that were useless at best and sometimes even destructive to the plants on which they were used.

New York passed the nation's first pesticide law in 1898. California's first law, passed in 1901, was concerned only with preventing consumer fraud in sales of Paris green, the most widely used insecticide. Dealers were required to submit product samples to the University of California (UC) agricultural experiment station with documentation describing brand name, pounds in each package, name and address of manufacturer, and percentage of Paris green. UC analyzed samples and sellers of deficient products were guilty of a misdemeanor. Resulting fines ranged from \$50 to \$200 (\$1,100 to \$4,700 in 2015 dollars).

In 1910, Congress passed the Federal Insecticide Act, a labeling law focused on protecting consumers from ineffective pesticides or deceptive labeling. The statute



Paris green was a popular pesticide in the late 19th and early 20th centuries. The arsenic compound was used to kill rats in Parisian sewers, thus the name.



"The laws previous to 1901 had, as their principal concern, the regulation of the sale of Paris green, as this substance was the first to be made commercially."

— *The Workings of the California Insecticide Law (1914)*

applied to both insecticides and fungicides, not previously covered by any laws. However, the legislation contained neither a federal registration requirement nor any significant safety standards.

California's parallel legislation, the State Insecticide and Fungicide Act of 1911 (Chapter 653), was also concerned mainly with mislabeling and adulteration but went beyond federal law. It required manufacturers, importers and dealers of insecticides and fungicides to register their products for a \$1 fee with UC, submitting a statement on "the component parts of the substances which they proposed to offer for sale." Proper labeling was required with the product name, manufacturer's name and address, and place of manufacture. The registration application had to be accompanied by a chemical analysis showing "the percentage of each substance claimed to have insecticidal value, the form in which each is present and the materials from which derived, and the percentage of inert ingredients." This was "to enable the user to know the insecticidal value of the material, and also to make the manufacturer more careful as to the composition of his products." This provision was described as the "most radical of any of the requirements, and was the one most seriously objected to by those who wished to oppose the law ... Practically the only serious objections came from the makers of 'secret' remedies who had been profiting by the use of fictitious names."

The statute required UC to analyze all registered pesticides yearly. However, by 1913, the number of registered products grew to about 10,000, making annual analysis impractical. The law was amended that year (Chapter 612) to delete the requirement for yearly analysis. At the same time, lobbying by manufacturers and dealers prompted the California Legislature to delete the mandate for detailed product labeling, requiring instead a "general" statement of the contents. Another 1913 bill (Chapter 211) exempted several classes of products from registration, including household insecticides (for example, flypaper, mothballs and ant poison), sheep dip, lice killer and sulfur. Amendments in 1916 provided for an extra registration fee and for UC to issue certificates of registration.

In 1919, the Legislature created (Statutes of 1919, Chapter 325) the California Department of Agriculture (CDA). Transferred to the new department were duties previously handled by several state boards and commissioners, including those overseeing horticulture, dairy farms, viticulture, cattle protection, produce marketing, and weights and measures.

In 1921, legislation (Chapter 352) brought the county horticultural commissioners (later called county agricultural commissioners) under CDA's "supervision and control." Commissioners had no statutory role in overseeing pesticide use. Their assigned duties included "protection of [agriculture and preventing] the introduction of insects and diseases, or animals, injurious to fruit, fruit trees, vines, bushes or vegetables." Another duty was "standardization of fruits, vegetables, and other plant products," ensuring that fruits and vegetables met minimum quality and labeling standards.

In its first annual report in 1920, CDA said a new law was needed to regulate pesticide manufacture and sale to:

- *Encourage the manufacture and sale of standard and well-tried remedies.*
- *Discourage the sale of poorly compounded or low-grade remedies prepared in a poorly equipped factory, or by the careless manufacturer.*
- *Prohibit the sale of worthless preparations placed on the market either through ignorance or with intent to defraud.*
- *Prohibit the sale of preparations which are injurious to cultivated plants or domestic animals, or are a menace to the public health.*

The Legislature responded by passing the Economic Poison Act of 1921 (Chapter 729). (Economic poison is a synonym used for pesticide. Legislation in the

1990s substituted code references to economic poison with the more commonly understood term pesticide.) It transferred regulatory authority over pesticides from UC to the agriculture department and expanded regulatory authority beyond insecticides and fungicides. A related statute (Chapter 606) allowed the new department to set up a “division of agricultural chemistry” to better carry out its new responsibilities.

A 1921 CDA report called the Economic Poison Act “a novelty in legislation of this type, there being no other law, state or national, regulating the manufacture and sale of rodent poisons and weed poisons.” The legislation gave CDA authority to control not only the manufacture and sale but also the use of pesticides.

The CDA recognized local pesticide enforcement as essential: “The state is a large one,” the department said, “and to attempt to distribute a corps of inspectors large enough to detect fraudulent practices would be a hopeless task ... Arrangements are now being made for the appointment of five or six county horticultural commissioners to act as collaborators in the enforcement of the Economic Poison Act.”

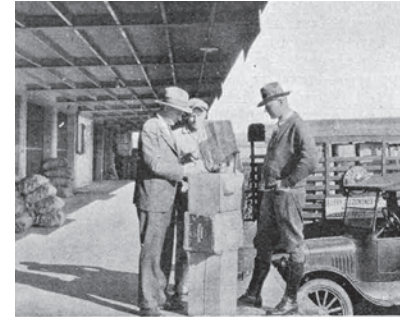
The Economic Poison Act required that applications for pesticide registration submit information on how the product was formulated (but not necessarily its ingredients), and a sample to ensure quality standards. CDA was authorized to cancel or deny registration of products found detrimental to agriculture or public health or “shown to have little or no value for the purpose ... intended.” Throughout the 1920s, CDA used its in-house labs to “test the efficacy of insecticides and fungicides for which it appears extravagant claims have been made.” Evidence gathered was used to file misdemeanor charges against the manufacturer if the product was already registered, or to cancel or refuse registration.

CDA’s authority to deny or cancel registration of pesticides from a manufacturer “attempting to sell fraudulent or worthless insecticides” was upheld in a 1925 appellate court decision, overturning a lower court that had declared the 1921 Economic Poison Act unconstitutional (*Gregory v. Hecke*).

Although CDA had the authority to refuse to register a pesticide if it was proven ineffective, without accompanying authority to require data to evaluate a product before it was registered, the department was forced to grant registration. The Legislature closed this loophole in 1929 (Chapter 604) when it gave the department authority to require “practical demonstration as may be necessary” to determine that products were effective and were not “generally detrimental or seriously injurious to vegetation.” Although the statutes allowed cancellation based on health or environmental problems, the acknowledged focus of programs of the time was adulteration and misbranding. CDA’s 1934 annual report said its program “affords protection to the consumer as to quality and quantity and to the manufacturer by preventing unfair competition.” Hundreds of product samples were analyzed each year and about 30 percent were routinely found “extensively deficient.” By the 1940s, that percentage had dropped to about 10 percent and deficiencies were attributed more to “irreducible error in manufacturing technique and not to an attempt to defraud.” Modern manufacturing techniques in recent decades have all but eliminated product quality problems.

THE 1920s: FOOD PESTICIDE RESIDUES BECOME A CONCERN

Public concern about pesticide residues on food did not arise until the 1920s. Pesticide use by farmers was increasing, as were reports of illnesses and well-publicized seizures of fruit with high arsenic levels by health officials in major cities. In 1927, CDA began analyzing small quantities of fresh produce for residues. In 1927, the Legislature passed the Chemical Spray Residue Act (Chapter 807) which made it illegal to pack, ship, or sell fruits or vegetables with harmful pesticide



It remains to be seen whether or not the income derived from licenses required by the Economic Poison Law will be sufficient for its full enforcement. It is probably that some support by State appropriation will be needed if the law is to be made effective ...

— 1921 California Department of Agriculture annual report



The 1921 Economic Poisons Act gave the California Department of Agriculture authority to control not only the manufacture and sale but also the use of pesticides.



We should not encourage spraying ... unless we know just exactly what we are spraying for. Perhaps you do not all agree with this statement because it is a common thing to talk about spraying insurance ... but as a general rule the man who sprays with that idea in mind and doesn't know just exactly what he is spraying for, or what he ought to use, is not getting results in his spraying. Spraying requires a knowledge of the pests which are on the trees. It requires a thorough knowledge of insecticides and fungicides, and until we have that knowledge, we can not do spraying that is altogether effective.

— 1922 California Department of Agriculture annual report

residues. It also set allowable residue levels (tolerances) that mirrored those set by the federal government that same year. The legislation established monitoring programs designed not only to safeguard the consumer but also to certify California-grown fruit as free of excess residues.

In 1934, the Economic Poison Act was amended to prohibit pesticide sales in anything other than the registrant's container, with "name and percent of every ingredient ... intended for use on or sold for application to any food crop in such a way as to leave a residue deleterious to health must be plainly stated on label." Deleterious residues were defined as residues of arsenic, fluorine and lead, the only chemicals for which the federal government had tolerances established. CDA expanded its monitoring program to sample for these residues.

In the late 1930s and 1940s, pesticide residue sampling expanded to test for newly introduced synthetic organic pesticides like DDT. In 1949, the Spray Residue Act was amended to expand the definition of potentially harmful spray residues to encompass "any pesticide or constituent thereof which on produce is harmful to human health in quantities greater than a maximum amount or permissible tolerances established by rules and regulations of the director."

Today, DPR's residue monitoring program is the largest state program of its kind. It continues to sample fresh produce, taking samples from wholesale and retail outlets, distribution centers, and farmers markets. (See Chapter 7 for more information on DPR's residue monitoring program.)

NEW PESTICIDES PROMPT NEW CONTROLS

By the mid-1930s, a wider variety of pesticides was being used, including pyrethrins, rotenone, zinc sulfate, petroleum oils and the new products of organic chemistry. In addition, as CDA reported in 1944, "chemists (have) synthesized emulsifiers, wetting agents, solvents and similar adjuvants or accessory substances which ... greatly facilitate accomplishment of pest control." That same year, the department expressed concern about the "hazards of new products":

The rapid increase in the use of synthetic organic chemicals illustrates the need for study to provide for intelligent handling of products of this nature. Possible industrial health hazards of new products should be anticipated. Problems constantly arise as to hazards to workers not only in mixing of chemicals but in making field applications. When a chemical is not acutely poisonous, generally little is known as to the extent of its injuriousness. Information should be at hand with regard to insidious chronic poisoning of newly developed materials, as well as to their acute toxicity.

It would be another 40 years before the state's pesticide regulators received legal authority and developed the scientific expertise to begin the task of collecting data and analyzing the potential long-term effects of pesticide exposure. By the late 1940s, farmers were using far less inorganic arsenic-, lead- and fluorine-based compounds. New organic compounds like DDT, 2,4-D and ethyl parathion were revolutionizing agriculture, increasing yields and reducing the need for labor-intensive weed and insect control methods.

The number of registered pesticides continued to grow as manufacturers rushed to market the new products of organic chemistry. In 1925, there were about 1,700 products marketed in California for pest control. In the next 10 years, the total had doubled to about 3,500 products and in 1945, more than 7,100 pesticide products were offered for sale. Eleven years later, there were nearly 12,000 pesticide products on the market.

As of 2016, there were about 13,000 pesticide products registered in California, containing about 1,000 active ingredients, including spray adjuvants. Federally, more than 19,000 products are registered by the U.S. Environmental Protection

Agency (U.S. EPA).

In 1947, Congress responded to the increasing use of pesticides by enacting the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This law governed the registration, sale, possession and use of pesticides. It required that pesticides distributed in interstate commerce be registered with the U.S. Department of Agriculture (USDA). Like earlier laws, FIFRA was more concerned with product quality and efficacy than with safety. However, the statute declared pesticides “misbranded” if they were harmful to people, animals or vegetation (except weeds) when properly used.

Major defects in the new law soon became clear. The registration process was largely a hollow formality since USDA had no power to refuse registration, even for a chemical considered dangerous. The only way USDA could deal with an unsafe product was to take legal action for misbranding or adulteration, with the burden of proof on the government. Congress did not address this aspect of FIFRA until it changed the law to strengthen regulatory authority in 1964.

In California, regulators had clearer authority. Since the passage of the Economic Poison Act of 1921 and its 1929 amendments, CDA (later, DPR) could cancel or refuse the registration of any pesticide determined to be ineffective, damaging to non-target organisms, or detrimental to public health and safety when properly used. CDA also had authority to cancel or refuse registration to registrants who made false or misleading statements about their products.

FIFRA provided no authority to the federal government to regulate pesticide use in the field. That was not true in California, where state regulators had some authority over use practices since the 1920s. This became important with the dramatic increase in pesticide use in the late 1940s. Growers experimented with the new products, applying them in various ways on a variety of crops, sometimes with inadequate knowledge of their effects or toxicity. Pesticide drift caused damage to nontarget crops and killed livestock and honeybees. Improper applications caused injury and death to workers and others. State regulators realized they needed stronger, more targeted control measures.

Legislation in 1949 put a clear emphasis on safety and led to the state’s first regulations that governed pesticide handling and imposed controls on certain pesticides with the potential to cause injury to people, crops or the environment. Permits were required to possess or use these pesticides. With passage of this statute, regulation of professional applicators moved from the county level to become a responsibility shared by the state and county agricultural commissioners (CACs).

In 1949, state law was amended to expand state labeling requirements to adjuvants. In 1967, legislation gave the CDA clear authority to require registration and oversee the use of adjuvants. Adjuvants (emulsifiers, spreaders, wetting agents and other efficacy enhancers) must be registered as pesticides in California. The federal government does not require registration.

California’s regulations continued to be fine-tuned throughout the 1950s as an increasing number of chemicals were introduced to the market. Detailed regulations were adopted, including buffer zones to protect crops and homes, and restrictions on nozzle sizes, wind speeds and other factors to limit pesticide drift. Also, in 1954, pesticide use reporting in the state was strengthened when state regulators asked for reports on ground application acreage.

California has had limited pesticide use reporting since 1934. County agricultural commissioners (CACs) required agricultural pest control operators to send monthly reports. County requirements varied but many included a statement for each application showing the grower’s name, location, treatment date, crop, acres or other units treated, target pest, type of pesticide used, and the strength and amount of the pesticide applied. The Food Safety Act of 1989 gave the Department of Pesticide Regulation (DPR) clear statutory authority to require full reporting of



Less than five percent of the registrants cause more than 95 percent of the enforcement problems. It is believed that in time uniformly handled regulations not only will outlaw the bad practices of the few but will protect the many from unscrupulous competition and in addition provide a bulwark of consumer confidence throughout the agricultural chemical business.

— 1934 California Department of Agriculture annual report



These are good laws and everyone knows they work. Under them, the department has endeavored to work with vision and does those things that are generally accepted as honestly sound by the best informed persons.

— 1938 California Department of Agriculture annual report

agricultural pesticide use, and DPR adopted regulations for full use reporting in 1990. (For more information on Pesticide Use Reporting, see Chapter 9)

The 1960s forever changed the way society viewed pesticides. Although problems had been apparent for some time—most noticeably, concerns about possible acute health effects and the increasing resistance of some pests to the new products—the signal event was the publication in 1962 of *Silent Spring*. Author Rachel Carson presented compelling arguments that pesticides and other chemicals were being used with little regard for their effect on human health or the environment. *Silent Spring* is widely considered to have sparked the modern environmental movement.

In subsequent years, Congress passed several environmental statutes touching on pesticide regulation to various degrees, including the Clean Water Act, Clean Air Act, Endangered Species Act and Occupational Safety and Health Act. In 1969, Congress passed the National Environmental Policy Act (NEPA), which required federal agencies to consider environmental matters before undertaking new actions. In 1970, Congress created the U.S. EPA to bring cohesion to expanding federal environmental programs. Both the USDA pesticide registration functions and U.S. Food and Drug Administration's tolerance-setting authority were transferred to U.S. EPA.

FUNCTIONAL EQUIVALENCY UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

The California Environmental Quality Act (CEQA), passed in 1970, requires state and local agencies to follow a protocol of analysis and public disclosure of environmental impacts of proposed projects. CEQA applies to most projects conducted by a public agency, supported by public funds or which must be permitted, licensed or approved in some way by a public agency.

In 1976, the state Attorney General issued an opinion on the roadside use of herbicides in Mendocino County. The Attorney General determined that when the county issued permits for the use of pesticides, it was a government activity subject to the provisions of CEQA. This meant that CACs throughout the state would have to prepare an environmental impact report (EIR) or a determination of no significant adverse impacts (negative declaration) before approving any of the more than 60,000 restricted material permits issued each year. Similarly, the department would be required to prepare an EIR or negative declaration before issuing any of roughly 11,000 pesticide product registrations each year.

The Legislature immediately placed a moratorium on applying CEQA to the pesticide regulatory program. In 1977, the state formed an Environmental Assessment Team to prepare a “master” (programmatic) EIR covering the use of all registered pesticides throughout the state. After more than a year's work, the team concluded that the regulatory program lacked mechanisms to meet CEQA procedural requirements and that existing processes could not be easily adapted to serve. Also, the team concluded, “the magnitude of the state program prevents any reasonable attempt to consider in a single report all of the information CEQA requires for each pesticide regulatory decision.”

The determination that the program was inadequate to meet the needs of CEQA led to the passage of AB 3765 (Chapter 308, Statutes of 1978). It required CDFA to establish rules and regulations that could be certified by the Secretary of the Resources Agency as the functional equivalent of an EIR or negative declaration. This certification means the agency managing the program does not have to prepare an EIR or negative declaration on each activity it approves. Instead, the certified program has to include guidelines for the evaluation of the department's actions consistent with the department's environmental purpose. The program provides for consultation with other agencies, and public notice and comment.

To gain approval for certified status, CDFA expanded its review of data before registration, changed regulations relating to pesticide registration and evaluation, and set up procedures to ensure public notice of its proposed registration actions and decisions.

Regulations were also added to require CACs, before issuing restricted material permits, to evaluate the proposed application site and to consider feasible alternatives and mitigation measures if significant risk exists. The department also established the Pesticide Registration and Evaluation Committee to create a mechanism for interaction between the department and other state agencies that have responsibility for resources affected by pesticides.

In December 1979, the CDFA pesticide regulatory program was certified by the Resources Agency as functionally equivalent to the EIR requirements of CEQA. Any substantial changes in the certified regulatory program must be submitted to the Secretary of the Resources Agency for review. The Secretary has the authority to decide if the change alters the program so that it no longer meets the qualification for certification.

CREATING A SCIENCE-BASED REGULATORY AGENCY

In 1969 (Chapter 1169) and 1970 (Chapter 1092), California passed landmark legislation that required a “thorough and timely evaluation” of pesticides before registration and gave the California Department of Agriculture (CDA) clearer authority to establish criteria for studies to be submitted by pesticide manufacturers. This legislation also gave the department distinct authority to place restrictions on how pesticides may be used. The CDA was required to begin “an orderly program of continuous evaluation” of pesticides already registered and eliminate from use those posing a danger to the agricultural or nonagricultural environment. (*More information on pesticide registration is in Chapter 3; for continuous evaluation, see Chapter 4.*) In 1972, the CDA hired its first scientists to review data submitted to support registration requests. The department previously had relied on scientists at the University of California and other state agencies.

Legislation in 1972 (Chapter 225) changed the CDA’s name to the California Department of Food and Agriculture (CDFA) and the “Agricultural Code” to “Food and Agricultural Code.” The changes recognized a broader mandate not only to promote and protect agriculture but also protect public health, safety and welfare.

Also in 1972, legislation (Chapter 794) gave CDFA primary responsibility for ensuring “the safe use of pesticides and for safe working conditions for farmworkers, pest control applicators, and other persons handling, storing or applying pesticides, or working in and about pesticide-treated areas.” CDFA was directed to adopt regulations to carry out the mandate, including rules on pesticide handling, pesticide storage, protective clothing, worker entry into treated fields and field posting. The legislation made enforcement of the rules the joint responsibility of CDFA and CACs. The statute made the development of pesticide worker safety regulations the “joint and mutual responsibility” of CDFA and the Department of Health. With the formation of the California Environmental Protection Agency (CalEPA) in 1991, those roles were transferred to DPR and CalEPA’s Office of Environmental Health Hazard Assessment (OEHHA), respectively.

In 1972, Congress overhauled FIFRA to strengthen enforcement and shift its emphasis from labeling and efficacy to protection of human health and the environment. U.S. EPA was given exclusive authority over product labeling (preempting states from requiring their own label language). The law established national standards for certifying restricted-pesticide applicators. It also prohibited states from registering pesticides not registered federally. After California imposed extra data requirements as a condition of pesticide product registration, industry groups sued the state in 1980. They argued FIFRA preempted states from imposing their



The staff of the Bureau consists of the administrative, laboratory, inspection, and sampling forces, who make investigations of suspected violations of law, conduct hearings, draw and analyze official samples of, and observe and report upon, products sold to the public. Farm advisers, county agricultural commissioners, branches of the Department and the University, and other official agencies have cooperated as experts on technical problems.

— 1940 California Department of Agriculture annual report

Appendix C: A History of Pesticide Regulation in California



In the 1970s, a series of laws and regulations bolstered worker protections.

own registration requirements and fees. A federal district court found in favor of the state, ruling there was no federal preemption of state registration requirements. The litigants also tried unsuccessfully to persuade Congress to amend FIFRA to prevent states from requiring data that were different from, or in addition to, data required by U.S. EPA.

In California, pesticide use enforcement and workplace safety provisions expanded in the 1970s. Federal grant money that accompanied the passage of the 1972 FIFRA amendments allowed the department to upgrade its enforcement field offices with added staff. This made possible more training and improved supervision of local pesticide enforcement by CACs. Field inspection procedures were standardized, their scope widened to include all aspects of pesticide use (with an emphasis on worker safety), recordkeeping, storage and disposal. (*For more information on enforcement, see Chapters 1 and 2.*)

Regulations adopted in the 1970s required pesticide handlers to receive safety training, that they be provided protective clothing and equipment, and mandated longer intervals before workers could reenter treated fields. California also became the first state to require handlers to use closed systems when mixing and loading certain highly toxic pesticides into application equipment. The department also established a pesticide illness reporting and investigation system still unique in the nation. (*For more information on DPR's worker safety program, see Chapter 8.*) Each year, a report is issued to the public with a summary of illness data.

In 1977, CDFA recognized the increasing importance of pesticide regulation by elevating the program to division status. From the 1920s through the 1950s, pesticide registration and regulation had been one function of the department's bureau (later division) of chemistry. When the department's chemistry laboratories were consolidated, regulation of both pesticides and fertilizers became the province of the Bureau of Agricultural Chemicals and Feed within the Division of Inspection Services. In 1977, pesticide functions were split off to CDFA's new Division of Pest Management, Environmental Protection and Worker Safety.

With the 1980s came far-reaching legislation that added authority and responsibilities to the regulatory program. CDFA's pesticide expertise encompassed multiple media (air, water, soil, and impacts on human health and wildlife), prompting a 1983 gubernatorial executive order giving the pesticide program primacy over pesticide regulation. This lead role was reinforced by the Legislature, which in passing several legislative mandates, maintained the department's primacy in pesticide safety and enforcement and in evaluating and controlling the environmental effects of pesticides.

Increasing concern about air pollution resulted in the 1983 passage of the Toxic Air Contaminant Act (Chapter 1047, AB 1807) to give state agencies clear authority to control airborne toxins. DPR evaluates pesticides in air and, in cooperation with scientific reviewers, determines potential risks. Pesticides identified as TACs are subject to extra controls. (*See Chapters 4 and 10 for more information on DPR's toxic air contaminant program.*)

In 1984, the Legislature passed the Birth Defect Prevention Act (Chapter 669, SB 950). It requires DPR to collect chronic health effects studies on all pesticides. This increased the responsibilities of the Registration Branch and led to creation of the Medical Toxicology Branch (later renamed the Human Health Assessment Branch), which evaluates toxicological data and prepares risk assessments. California has the only pesticide regulatory program in the country with a large scientific and technical staff that evaluates toxicology, environmental and other data required for pesticide registration, and that conducts comprehensive risk assessments. (*See Chapter 5 for more information on risk characterization and the Birth Defect Prevention Act.*)

The Pesticide Contamination Prevention Act (*Chapter 1298, Statutes of 1985, AB 2021*) focused on mitigating the effects of pesticides in ground water. The law

required the department to set up a database of wells sampled for pesticides, to collect data on the physical properties of pesticides that might lead to ground water contamination, and to control the use of and monitor for these pesticides. (*See Chapter 10 for more information on the ground water monitoring program.*)

The 1980s also marked the continued expansion of the department's pesticide enforcement program. Enforcement Branch staffing was increased and legislation passed to strengthen enforcement authority. AB 1614 (Chapter 943, Statutes of 1985) authorized CACs to levy direct civil penalties for violations of specified provisions relating to pesticides. Later legislation (Chapter 843, Statutes of 1989, AB 1873) gave CDFA (and, later, DPR) authority to levy civil penalties for the sale of unregistered or mislabeled pesticides, and for packing, shipping or selling of produce containing illegal pesticide residues. AB 1142 (Chapter 908, Statutes of 1988) improved the director's authority to seize and destroy a crop treated with a pesticide not registered for that crop.

In 2000, DPR was given authority to levy civil penalties up to \$5,000 per violation for serious cases resulting from high-priority investigations or multi-jurisdictional violations (Chapter 806, SB 1970). Also in 2000, CACs were given the authority to refuse, suspend or revoke restricted materials permits of individuals who ignore fines or lawful orders. In 2002, AB 947 increased the fines CACs could impose to \$5,000 per violation. In 2005, SB 391 became law, allowing DPR and CACs to impose penalties for each person exposed as a result of a violation.

ENSURING STABLE FUNDING

A long-standing policy of CDFA was that the state's General Fund should be used for programs that directly benefited the public or agriculture in general. Programs of direct benefit to an identifiable part of industry were to be supported by special charges or fees. However, these distinctions were seldom easy to decide and quantify as programs grew in responsibility and complexity. In any case, departmental policies did not have the force of law. The governor and the Legislature determined the source and division of funding.

Pesticide and pest control legislation in the early part of the 20th century was sponsored by the regulated industry and focused on preventing fraudulent practices and unfair competition. Activities clearly related to registration and product quality were fully funded by industry fees, which were increased as necessary to keep the programs self-supporting. Public health protection became part of the regulatory program mission in 1927, when the Chemical Spray Residue Act became law and residue testing of fresh produce began. The General Fund provided all or most of the funding for this program until 2003, when the department became funded by special funds.

In 1971, the mill assessment on pesticide sales was enacted (set then at \$0.008 per dollar of pesticide sales) to help support the pesticide regulatory program. Beginning in the 1990s, the Legislature approved a series of increases in the mill assessment and, at the same time, decreased the General Fund support for the department. In the 1989-90 fiscal year, the General Fund comprised two-thirds of the regulatory program budget. By 2000-01, the percentage was reversed, with the DPR Fund funding 69 percent of program costs. Since 2003, the department's budget has been based almost entirely on fees and the mill assessment on pesticide manufacturers' sales. In 2006, the mill assessment was increased to 2.1 cents per dollar of pesticide sales (*for more on DPR's funding, see Chapter 13*).

In 1993, the Legislature passed AB 770 (Chapter 1176) to ensure that all people or businesses that were the first sellers of agricultural pesticides into California—whether a pesticide registrant, broker or dealer—pay the required assessment on their sales. Pesticide dealers already had to be licensed; the bill created a new license category for agricultural pesticide brokers, requiring them to have a DPR



DPR's programs are funded in large part by the "mill," which is an assessment paid by pesticide manufacturers based on sales.



The California Environmental Protection Agency was established in 1991. That same year, DPR was created.



license to conduct business with or within California. The law also made it illegal for anyone to buy a pesticide labeled for agricultural use except from a person licensed as a pest control dealer or broker. The 2005 passage of AB 1011 (Chapter 612) expanded broker licensing to include first sellers of nonagricultural pesticides. (*See Chapter 13 for a more detailed discussion of regulatory funding.*)

PESTICIDE REGULATION BECOMES A CALEPA DEPARTMENT

In 1991, California's environmental authority was unified in a single cabinet-level agency—the California Environmental Protection Agency (CalEPA). This brought the Air Resources Board (ARB), State Water Resources Control Board, and Integrated Waste Management Board (IWMB) under an umbrella agency with the newly created Department of Toxic Substances Control (DTSC) and Office of Environmental Health Hazard Assessment (OEHHA). As part of this reorganization, the pesticide regulation program was removed from CDFA and given departmental status as the Department of Pesticide Regulation within CalEPA. Pesticide-related statutory responsibilities and authorities were transferred to DPR. The pesticide residue laboratory remained with CDFA and local enforcement authority with CACs.

In 2009, legislation transferred the Structural Pest Control Board from the Department of Consumer Affairs (DCA) to DPR. It was transferred back to DCA in 2013, as directed under the Governor's Reorganization Plan No. 2 of 2012. The Structural Pest Control Board licenses businesses and individuals who conduct structural pest control.

CalEPA was created to improve environmental protection by coordinating multimedia issues in a single agency. DPR long had a cross-media program addressing water, air, soil and biological organisms. Other regulatory agencies have jurisdiction and authority over specific media, such as CalEPA's Air Resources Board and State Water Resources Control Board. DPR has entered into formal agreements with these and other agencies to ensure a coordinated and effective approach to pesticide regulation regardless of the media affected. Besides these written agreements, DPR engages in frequent interagency consultations. Such consultations may be program-specific. For example, in the early 1990s DPR worked with DTSC, ARB and the Integrated Waste Management Board to address proper disposal or burning of empty agricultural pesticide bags and containers.

In other instances, the consultation may be more systematic, as with DPR's Pesticide Registration and Evaluation Committee, which brings together representatives of public agencies whose activities or resources may be affected by the use of pesticides. It meets about six times a year to advise DPR on regulatory development and reform initiatives.

By the early 1990s, DPR grew into a fully functional environmental regulator, addressing mandates and needs that had been neglected or underserved. These included legislative mandates imposed in the 1980s—most notably requirements to collect and evaluate health effects and ground water data on pesticides. These mandates—the Birth Defects Prevention Act and Pesticide Contamination Prevention Act—gave DPR the authority to require the data it needed to more thoroughly evaluate the health and environmental effects of the products it registers to guide its regulatory decisions.

DPR also stepped up efforts to carry out its mandate to encourage the development of reduced risk pest management. These efforts included working with school districts across the state to implement reduced-risk pesticide programs utilizing Integrated Pest Management (IPM)—which emphasizes prevention and non-chemical controls—and, in 1998, awarding a consortium of school districts to develop a training curriculum for school IPM and a school pesticide record-keeping system. In 1994, DPR also established its IPM Innovator Award program to recognize individuals and organizations that emphasize pest prevention, favor

least-hazardous pest control, and share their successful strategies with others.

In 1997, DPR's IPM Alliance Grant Program was created to help fund projects that increase implementation and adoption of IPM practices. DPR is one of the few government agencies nationally awarding grants to help develop and demonstrate innovative pest management practices that reduce the risks associated with pesticide use.

DPR IN THE 21ST CENTURY

Since its creation, DPR has significantly strengthened its programs protecting public health and the environment, and has promoted public involvement, outreach and transparency. In addition, DPR has adopted programs to stimulate research and collaboration to develop products or practices to reduce risk in pest management.

In 2001, DPR adopted new regulations that placed restrictions on how the field fumigant methyl bromide could be used to protect both pesticide workers and those near applications. These restrictions included notifications to neighboring properties, limitation on work hours, and application methods. In 2010, additional regulations were adopted to limit the risks to both workers and bystanders from methyl bromide use that included a limit on the amount that could be used monthly in any township.

In 2005 and 2006, DPR launched major initiatives to reduce volatile organic compounds (VOCs) emitted into the air by pesticides that contribute to poor air quality (smog). DPR conducted several reevaluations of nonfumigant pesticides which resulted in pesticide makers reformulating several high-use and high-VOC contributing pesticide products and replacing them with low-VOC contributors. The next year, DPR began the process of developing and adopting regulations to limit the methods used to apply field fumigants to reduce VOC emissions. In early 2008, regulations went into effect that restricted fumigation methods in those areas of the state most impacted by poor air quality. In 2012, DPR adopted regulations to further reduce and control emissions by placing restrictions on certain nonfumigant pesticides in the San Joaquin Valley during the months when air quality is typically the worst.

Another fumigant, sulfuryl fluoride, used primarily to protect structures from termites and related insects, went through a risk assessment and reevaluation process. As a result, in 2013, measures required by regulation for some structural fumigations were made more stringent to protect workers.

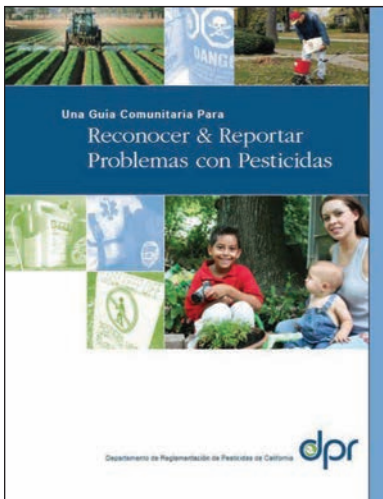
In 2015, based upon a risk assessment that provided an in-depth scientific analysis, and after a series of three community meetings, DPR developed a number of measures restricting the use of the field fumigant chloropicrin to protect the public. The measures are implemented by permit condition and labels requirements, and include increasing the buffer zone around an application, the size of the application, and time when an application can occur.

Beyond protection of human health, several actions were taken to protect the environment. In 2012, DPR adopted regulations that identified 17 pyrethroid pesticides with a high potential to contaminate surface water used in outdoor nonagricultural (structural, residential, institutional, and industrial) settings and that require users to take certain measures to minimize the potential for such contamination. In 2014, DPR passed other regulations to limit the use of certain rodenticides (second generation anticoagulant rodenticides, SGARs) that create a hazard to wildlife that prey on the rodents targeted.

In recent years, DPR has increased both outreach and regulatory efforts to protect those whose job requires them to work with pesticides. DPR employees attend workshops, training sessions, and other events that draw farmworkers,



DPR Worker Health and Safety outreach at the Mexican Consulate in Sacramento.



DPR's *A Community Guide to Recognizing & Reporting Pesticide Problems* is available online at:
www.cdpr.ca.gov/docs/dept/comguide/

In Spanish: http://www.cdpr.ca.gov/docs/dept/comguide/spanish/index_sp.htm

farmers, applicators, and others. Since 2012, to protect workers at risk of pesticide exposure, DPR has produced numerous publications, radio public service announcements, and videos addressing pesticide safety and what to do if a worker is exposed or becomes ill. In 2014, DPR created a bilingual brochure with information on licensing requirements for maintenance gardeners who apply pesticides. Learning that a license is required and qualifying for one will give these individuals information to ensure their safety and the safety of others as they use pesticides in their work. DPR, working with the U.S. EPA, also produced a video series in Spanish, Mixteca and Zapoteca on pesticide safety. The videos are used in training in both agricultural and urban outreach settings. In 2015, DPR also updated its Pesticide Safety Information Series, published in English, Spanish and Punjabi. The series provides information on safety requirements for workers.

DPR has been continuously strengthening regulations to protect persons handling pesticides and working in and about pesticide-treated areas. Regulations in 2008 specified more stringent respiratory protection and, in 2009, improved hazard communication was required. In 2015, existing regulations requiring specific types of protective equipment be used by workers using pesticides were clarified and improved, including requiring protective eyewear and gloves that meet nationally recognized standards. In the same year, additional regulations were adopted to better protect workers mixing pesticides. In 2016, DPR moved forward to align any of its regulations that did not already meet or go beyond the new federal agricultural worker protection standard by the effective date of January 2017.

Communication, access

To bring the public into the regulatory discussion, DPR has been active in communicating and working with the public on pesticide issues. In 2006, as part of CalEPA's Environmental Justice Action Plan, DPR collaborated with a community advisory group to set up a monitoring project in a rural farm community to determine pesticide levels over an extended period. The committee provided input on key elements of the project including its goals and the monitoring sites. Parlier in Fresno County was selected. Besides involving the public for the first time in planning a monitoring project, other aspects of the project broke new ground: DPR released preliminary results and evaluations as the project continued, posting interim reports online and discussing them with the local advisers at public meetings; DPR conducted pesticide air monitoring for over 12 months in a single community; and the project monitored a substantial number of pesticides—40 in all, including pesticide breakdown products. That same year, continuing its efforts to engage the public, DPR launched an automated, toll-free phone line (1-87PestLine) that gives callers their county agricultural commissioner's phone number and then offers to transfer the call.

In 2008, DPR published a 34-page *Community Guide to Recognizing and Reporting Pesticide Problems*. Topics include what to do in a pesticide emergency, a discussion of pesticide drift and odor, and a checklist to record details about a pesticide incident. After the first printing of 5,000 copies ran out, DPR printed several thousand more, including a Spanish-language version. DPR sent the guide to more than 900 community health centers, county health departments and to every public library in the state. It may be downloaded from the DPR website and free copies are available on request.

In addition, since 2012, DPR has continued to build a presence on social media to connect with the public. The department uses Facebook, LinkedIn, Twitter, and YouTube to communicate its mission and achievements and to disseminate training materials in English and Spanish. In 2014, DPR also held a series of four workshops for CACs—"Neighbors at the Edge"—to generate dialog about pesticide use concerns in areas where development abuts agricultural land.

In 2003, DPR launched the web-based California Pesticide Information Portal—CalPIP. CalPIP provides access to pesticide use data that must be reported

by agricultural and structural applicators. It allows the public to search the data pesticide, crop, and location (*see Chapter 9 for more on pesticide use reporting*). Users can then tie this knowledge to information about specific pesticide products using DPR's database of more than 13,000 registered pesticide products including the manufacturer, active ingredient, target pests, sites where the product can be applied, and certain chemical and environmental characteristics.

In 2005, DPR introduced an online tool that gives pesticide users and CACs customized information to protect California's 300-plus endangered and threatened species. The Pesticide Regulation Endangered Species Custom Real-time Internet Bulletin Engine (PRESCRIBE) allows users to check for use-limitations intended to protect sensitive species based on geographical area and pesticides of interest.

In 2009, DPR introduced a web-based search engine of DPR's database of pesticide-related illnesses and injuries. California Pesticide Illness Query (Cal-PIQ) includes illness and injury data since 1992. Users can request data based on customized variables, including year and county where the incident occurred, whether the use was in agriculture or not, and specific pesticide by toxicity category, active ingredient or intended use.

Other activities

The Healthy Schools Act of 2000 (HSA) mandated DPR to work with schools to implement integrated pest management (IPM) programs that encourage effective pest control with less risk of harm to people and the environment. The HSA required DPR to develop a model program guidebook, resource information, and training program. In 2007, amendments to the HSA expanded DPR's responsibility to include working with daycare centers. DPR actions included developing educational materials, training school district staff, and creating an extensive web-site of information oriented toward school employees. In 2010, DPR extensively updated an earlier booklet, originally created before the HSA and later improved to assist schools in implementing IPM programs. In 2013, DPR developed a Child Care IPM Video Series, with outreach materials and training. In 2014, further amendments to the HSA required any person applying pesticides at a schoolsite to be trained annually. In 2016, DPR began providing online IPM training modules for school and daycare employees, volunteers, and contractors.

DPR has embraced its role to encourage research, innovation, and collaboration to improve pest management systems that achieve acceptable levels of pest control with the least impact on people and the environment. In 2012, DPR and the California Strawberry Commission launched a three-year, \$500,000 research partnership to explore ways to grow strawberries in substances other than soil which are less pest-susceptible. That same year, DPR convened the Nonfumigant Strawberry Production Work Group—a diverse group of scientists and stakeholders—to explore the best way forward to find practical and cost-effective alternatives to soil fumigants used by strawberry growers. In April 2013, the group produced an action plan to guide future research to find production practices to maintain a viable industry without reliance on fumigants. The fiscal year 2013-14 and 2014-15 budgets allocated \$500,000 to award research grants to improve pest management systems with a focus on nonfumigant alternatives in production practices. A legislative augmentation in fiscal year 2014-15 added an additional \$600,000 annually for three years to expand the Pest Management Grant program to support research projects that develop effective alternatives to fumigants.

In 2014, DPR hosted the Soil Health Symposium that assembled experts to explore and gain a better understanding of soil ecology with the view that it could lead to advances in reduced risk practices. DPR has continued its IPM Innovator Award program (now called the IPM Achievement Award) which emphasizes sharing successful production strategies that favor least-hazardous pest control. As of 2015, 149 awards had been given out.



DPR training videos in Spanish, Mixteco and Zapoteco.

Appendix C: A History of Pesticide Regulation in California

Going forward, DPR will continue its broad focus on evaluating and regulating pesticides to protect human health and the environment. It will continue to give special attention to those who work with pesticides and to those communities where they are used. It will actively promote IPM and research to improve pest management for the benefit of all in society.



Appendix D

Rulemaking

Statutes are laws passed by the California Legislature or by the people of California by initiative or referendum. Regulations are rules put in place by state agencies in the executive branch of California government. Agencies receive power to adopt regulations from statutes. An agency adopts regulations to carry out, interpret or make specific the statutes it enforces or administers, or to govern its procedures. Properly adopted regulations have the force of law. However, in the event of an inconsistency or conflict, statutes take precedence over regulations. The process of writing and adopting regulations is called rulemaking.

The California Administrative Procedures Act (APA) prescribes procedures designed to ensure proposed regulations are necessary, not duplicative, clear and consistent, go through open public review, and are allowed by law. The APA requires state agencies to give public notice when proposing regulations, to provide the public with a meaningful opportunity to participate, and to consider public comments before making the rules final. Text and notices of proposed regulations and supporting documents must be posted on an agency's website. If the agency makes substantial changes in its proposed regulations, the public must again be given an opportunity to comment. Agencies must submit documentation to support the need and authority for the regulation, including a response to public comments to the Office of Administrative Law (OAL) for review to ensure compliance with the APA. After the regulations are adopted by the rulemaking agency, approved by OAL and filed with the Secretary of State, they are published in the California Code of Regulations (CCR).

OAL's role is to ensure that state agency regulations are authorized by statute and within the agency's conferred authority, consistent with other law, written in an understandable manner, not duplicative of other law, and necessary to accomplish a statutory purpose. OAL also ensures that all APA procedures are followed.

The CCR consists of 28 titles. Title 3, Food and Agriculture, Division 6, Pesticides and Pest Control Operations, contains most pesticide-related regulations. Title 16, Professional and Vocational Regulations, Division 19, contains most Structural Pest Control Board regulations. The CCR is available at offices of county clerks, county law libraries, many public libraries, and OAL's website. Regulations overseen by the Department of Pesticide Regulation (DPR) are available on DPR's website.

The regulation process typically takes six months to a year to complete. The APA also allows agencies to file emergency regulations without the regular 45-day public notice and comment period provided the agency can show the situation calls for immediate action to avoid serious harm to the public peace, health, safety, or general welfare. Unless specifically allowed by statute, emergency regulations expire in 180 days. During this time, the rulemaking agency must conduct a regular rulemaking process to permanently adopt the regulation.

EXTERNAL SCIENTIFIC PEER REVIEW

The purpose of peer review is to find technical problems or unresolved issues in a draft document so the final publication will reflect sound technical information and analyses.

As a result of a legislative mandate (Chapter 295, Statutes of 1997, SB 1320), no California Environmental Protection Agency (CalEPA) board, department or

Rulemaking flowchart

PREPARATION OF THE PROPOSED ACTION FOR PUBLIC COMMENT

The Legislature gives limited lawmaking power to a state agency or department when, by passing a statute, it gives the agency a task. An agency or department must have delegated authority from the Legislature to adopt, amend, or repeal a regulation, and must demonstrate the necessity for the proposed regulatory action in the rulemaking record.

Outreach: Outreach to parties who would be subject to the proposed regulations when they involve complex proposals.

DPR: Submits proposed action to the State Office of Administrative Law (OAL).

OAL: Reviews Notice of Proposed Action for compliance with legal criteria and filing requirements. If approved, notice is published in OAL's *California Regulatory Notice Register* and mailed to interested parties. The notice, initial statement of reasons and proposed text are posted on DPR's website, www.cdpr.ca.gov

PUBLIC COMMENT PERIOD (45-day minimum)

Public Comment: Begins when proposed action published. All rulemaking documents must be available for public review and comment. Hearings may be scheduled by DPR or by request. Written comments may be submitted via mail and e-mail. DPR must consider public input relevant to the proposal.

DPR: Reviews comments, plus any new information from other sources, and decides whether they warrant changes to proposed action.

FINAL REVIEW AND ADOPTION

After resolution of public comments and other issues, the regulation is adopted.

No changes or non-substantive changes

Substantial changes to proposed action are necessary

DPR: Changes that are "sufficiently" related require a 15-day notice for public comment on the revised text.

DPR: Major changes "not sufficiently" related require a new 45-day notice.

DPR: Completes rulemaking record, with extensive documentation, including regulation text and a final statement of reasons that includes responses to all comments relevant to proposed action. DPR must explain how proposed action was changed to accommodate comments, or reasons for no changes. Rulemaking record must be submitted to OAL within one year of publication of notice or the rulemaking action automatically closes and a new notice of proposed action needs to be issued.

OAL: Typically has 30 working days to determine whether to approve proposed action based upon legal criteria and on adequacy of response to comments.

OAL disapproves

DPR: May be possible to revise and resubmit to OAL. DPR can also abandon proposed action.

OAL approves

Filing: New regulation is filed with the Secretary of State and printed in California Code of Regulations. Regulation typically goes into effect Jan. 1, April 1, July 1 or Oct. 1.

office “shall take any action to adopt the final version of a rule [that establishes a regulatory level, standard, or other requirement for the protection of public health or the environment ... without submitting] ... the scientific portions of the proposed rule, along with a statement of the scientific findings, conclusions, and assumptions on which the scientific portions of the proposed rule are based and the supporting scientific data, studies, and other appropriate materials, to the external scientific peer entity for its evaluation.”

The legislatively mandated peer review of the scientific portions of a proposed rule is conducted by a committee comprised of members of the National Academy of Sciences, the University of California (UC), California State University, any similar scientific institution of higher learning, or individual scientists recommended by the UC president.



A Guide to Pesticide Regulation in California

2017 Update

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Editor: Craig Cassidy

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**A Guide to Pesticide Regulation in California
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