



PURDUE PESTICIDE PROGRAMS

Purdue University Cooperative Extension Service

PESTICIDES AND THE LABEL

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PURPOSE



The pesticide label is the primary document for conveying general and technical information from regulatory agencies and pesticide manufacturers to the agricultural community, the commercial service industry, and the general public. It is the one source where scientific review, regulatory oversight, and public policy are interwoven to achieve a common objective: to clearly and precisely convey information on handling, storing, applying, and disposing of pesticides in a manner conducive to good health and environmental stewardship.

Pesticides and the Label provides an overview of the pesticide registration process, descriptions of individual components of the label, and discussions on how to use the information on a label properly. The pesticide label is the result of a complex and interactive system and is the key to user safety, environmental protection, and the manufacturer's warranty information.

PESTICIDE LABELS AND THE REGULATORY PROCESS

SOCIETY AND SCIENCE

Pesticides in the United States are regulated under the federal statute known as the Federal Insecticide, Fungicide, and Rodenticide Act—more often referred to as FIFRA. The U.S. Environmental Protection Agency (EPA) is the federal agency that implements and enforces the mandates of FIFRA. Under this law, EPA must consider the benefits of pesticide use while also protecting human health and the environment from unreasonable adverse effects. This is known as a comparative benefit-to-risk philosophy.

Decisions on the balance between benefits and risks are reassessed in conjunction with new scientific information and changes in the views of society. This does not mean that decisions of today eventually will be proven wrong. Rather, the balance of

benefits and risks is ever-changing because of improved science and the changing expectations of society.

The ebb and flow between today's decisions and tomorrow's expectations is the essence of the pesticide regulatory arena. All pesticides—from over-the-counter products for homeowners to sophisticated agrichemicals—exist in the marketplace because of the process that blends science, laws, economics, and public policy. From this complex and ever-changing system emerges the pesticide label.

HISTORY OF PESTICIDE REGULATIONS

The federal government has regulated pesticides since the early 1900s. Originally, pesticide regulation emphasized consumer protection from fraudulent claims about product performance. The focus now has shifted to the protection of human health and the environment. Following are brief descriptions of laws applicable to pesticides regulation.

Federal Food, Drug, and Cosmetic Act of 1906 (FFDCA, or Pure Food Law)

Guaranteed the wholesomeness and truthfulness of labeling for foods, drugs, and cosmetics being offered to the public.

Insecticide Act of 1910

A consumer protection law which was intended to prevent the manufacture, sale, or transportation of impure or improperly labeled insecticides and fungicides.

FFDCA as amended in 1938

Changed FFDCA to include regulation of pesticides on food.

Required the adding of color to white insecticides to prevent their accidental use in cooking.

Federal Insecticide, Fungicide and Rodenticide Act of 1947 (FIFRA)

Replaced the Insecticide Act of 1910.

Required the U.S. Department of Agriculture to register all pesticides.

Extended coverage to include herbicides and rodenticides.

Established standards for label content.

FFDCA as amended in 1954 (The Miller Act)

Section 408 authorized the establishment of tolerances for pesticide residues in food.

FFDCA as amended in 1958

Section 409 established a general, risk-based safety standard for food additives.

The Delaney clause prevented establishment of food and feed additive tolerances for any pesticide that causes cancer in laboratory animals.

FIFRA as amended in 1964

Required USDA secretary to refuse registration of pesticides that were unsafe or ineffective and to remove them from the market.

Also required that

1. All pesticide labels contain a USDA registration number;
2. The front label of all pesticides include the words caution, warning, or danger, and “Keep Out of Reach of Children”;
3. All safety claims be removed from labels.

U.S. Environmental Protection Agency formed in 1970

A dramatic change in federal regulation of pesticides occurred in 1970 when Congress transferred administration of FIFRA from the U.S. Department of Agriculture to the new Environmental Protection Agency.

Federal policy shifted from the control of pesticides for reasonable safe use in agricultural production to control of pesticides for reduction of unreasonable risks to humans and the environment. The authority to establish pesticide tolerances on food was transferred from the Food and Drug Administration (FDA) to EPA. However, enforcement of tolerances was to remain the responsibility of FDA.

FIFRA as amended in 1972

Listed in greater detail specific methods and standards for control. Provisions included:

1. Use of any pesticide inconsistent with the label is prohibited.
2. Violation can result in fines and/or imprisonment.
3. Pesticides must be classified for general use or restricted use.
4. All persons applying restricted-use pesticides must be certified by their state (includes commercial applicators and farmers).
5. Pesticide manufacturing sites must be registered and may be inspected by EPA.
6. All pesticides must be registered by EPA prior to sale or distribution.
7. States may register pesticides on a limited basis for Special Local Needs.
8. Manufacturers must supply scientific evidence that a pesticide, when used as directed, will not injure humans, crops, livestock, nontarget organisms, or the environment, and that it will not produce illegal residues on or in food or feed.

Resource Conservation and Recovery Act of 1972 (RCRA)

Gave EPA authority to control the disposal of hazardous waste including many pesticides.

Endangered Species Act of 1973 (amendments: 1976, 1977, 1978, 1979, 1982)

Goal was to protect threatened and endangered species.

Required that pesticide labels be designed to protect specific endangered species from adverse effects of pesticides, and established restrictions on pesticide application in endangered species habitats.

Safe Drinking Water Act of 1974 (amendments: 1976, 1977, 1979, 1980, 1984, 1986, 1988)

Designed to protect underground sources of drinking water and to require contaminant levels in problem drinking water systems.

FIFRA amended in 1975

Established Scientific Advisory Panel.

Specified that USDA must be notified when EPA intends to suspend or cancel a pesticide.

FIFRA amended in 1978

Provided for conditional registration.

Provided manufacturers ten years of exclusive rights to data generated in support of their products.

Established RPAR (Rebuttable Presumption Against Registration), now called Special Review, to reevaluate the registration of pesticide products.

Federal Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)

A provision of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The goal of this law was to increase public knowledge of and access to information about the presence of hazardous chemicals, including pesticides, in their communities and the potential for release of these chemicals into the environment.

FIFRA amended in 1988

Strengthened EPA's authority in several major areas by

1. Requiring a substantial acceleration of the pesticide reregistration activity and the reevaluation for active ingredients registered before November 1, 1984;
2. Imposing statutory time limits for processing certain types of pesticide registration information;
3. Changing EPA's responsibilities and funding requirements for the storage and disposal of suspended and cancelled pesticides;
4. Authorizing collection of fees to support some of these new activities.

Food, Agriculture, Conservation, and Trade Act of 1990 (1990 Farm Bill)

Required all certified private applicators of restricted-use pesticides to maintain records comparable to records maintained by commercial applicators.

PESTICIDE LAWS AND REGULATIONS: AN OVERVIEW

The authority to create federal and state pesticide laws is delegated to elected officials. Usually, the laws provide only a basic framework and intent within which to operate. The specific mandates—called rules and regulations—are developed by a regulatory agency or agencies. Changes in federal law often result in parallel changes in state laws and regulations. State law must always meet the minimum standards assigned by federal law; however, some states may implement laws which *exceed* standards mandated by federal authority.

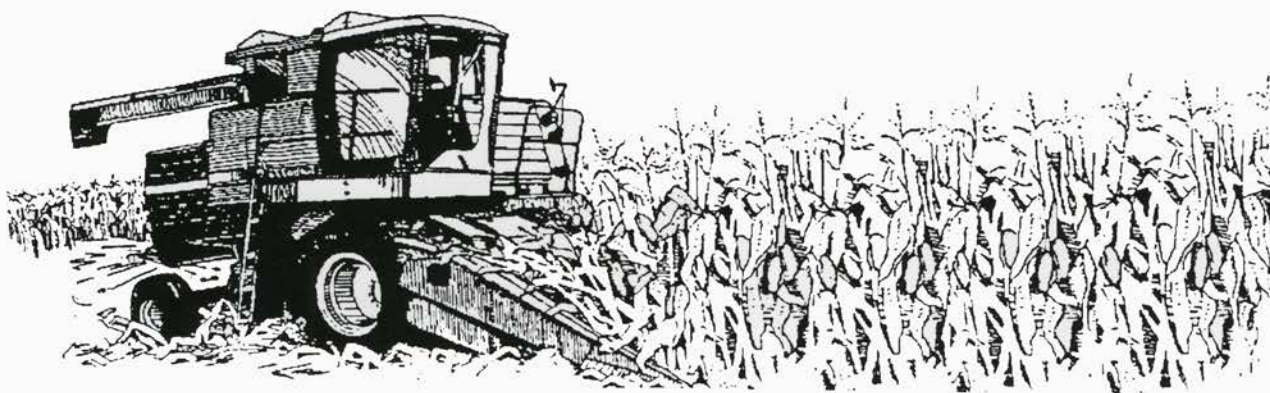
Regulations developed within an agency (EPA, USDA, state regulatory offices, etc.) are subject to a rule-making process. This process involves publishing the proposed rule in either the Federal Register (if the origin of the rule is a federal agency) or the State Register (if the origin of the rule is a state agency). Such publication informs the public of proposed changes to regulations. Both registers also announce a time frame during which the public may comment on or submit revisions to the proposed document. Public participation in the process is reinforced by the Administrative Procedures Act. After the comment period ends, the agency responsible for the rule may revise the document based on input from the public. The final rule eventually is published in the same register. Federal pesticide regulations under FIFRA are contained in the *Code of Federal Regulations*, Volume 40, Parts 150-190.

REASONS FOR PESTICIDE LAWS AND REGULATIONS

- (1) To provide for the proper and beneficial use of pesticides to protect public health and safety.
- (2) To protect the environment by controlling the uses and disposal of potentially harmful pesticides.
- (3) To assure safe working conditions for farm workers, commercial pest control personnel, and consumers.
- (4) To assure users, including homeowners, that pesticides are labeled properly, that they are appropriate for their intended use, and that they contain all instructions and precautions necessary to ensure that benefits exceed risks.
- (5) To encourage the use of integrated pest management systems which emphasize biological and cultural pest control techniques with selective use of pesticides.

STATUTORY RESPONSIBILITY OF THE REGULATORY COMMUNITY

Federal and state programs governing pesticide use, storage, and disposal are faced with increasingly complex and technical issues. In recent years, demands by environmental organizations for greater accountability from regulators have resulted in a reevaluation of pesticide legislation by Congress, the EPA, and state legislatures. With increased public concern over health and environmental issues related to pesticide use, federal and state regulatory agencies are reassessing pesticide monitoring policies and methods used in risk analysis.

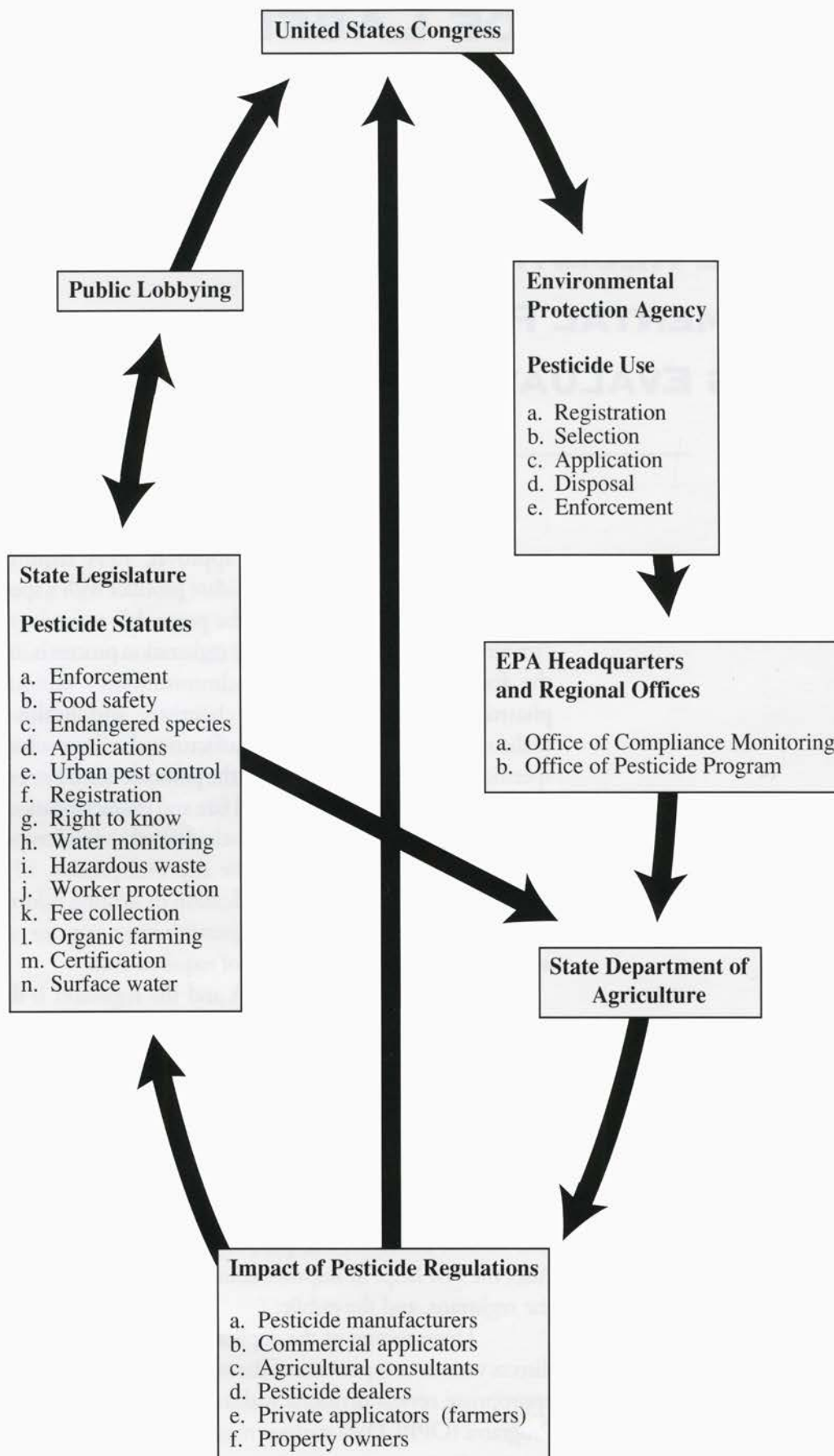


FEDERAL RESPONSIBILITIES

Congressional response to public demand for legislative reform places authority for pesticide registration, distribution, sale, application, and disposal with EPA. Amendments to FIFRA 1978 assigned primary pesticide use enforcement to state lead agencies, provided they meet certain standards. Most governors designated their state department of agriculture (or equivalent) as lead agency. EPA provides funding to and oversight of each state lead agency as it implements and enforces pesticide laws within its boundaries.

STATE RESPONSIBILITIES

A number of pesticide regulatory programs have been created since states undertook responsibility for enforcing pesticide laws: pesticide applicator training and certification, pesticide product registration, and pesticide use enforcement. In addition, most states are developing programs for direct response to environmental and public health concerns. These include pesticide disposal programs, worker protection standards, organic food production and food safety standards, surface and ground water protection, endangered species protection, and bulk storage and containment regulations. The state lead agency works closely with other state agencies responsible for occupational safety and environmental quality to develop and implement these programs. This blend of disciplines and scientific expertise allows for better regulatory scrutiny of the effects of pesticides on public health and the environment.



PESTICIDE LABELS AND THE EVALUATION PROCESS

PESTICIDE REGISTRATION: ENVIRONMENTAL PROTECTION AGENCY'S EVALUATION PROCESS

Manufacturers seeking to market a pesticide product must apply to EPA for registration approval. EPA requires each manufacturer to support the candidate product with a specific set of scientific data. The review of the pesticide's active ingredients "under the microscope" during the registration process is similar to the federal Food and Drug Administration's critique of a pharmaceutical drug. Product chemistry and health-related evaluations are required. The manufacturer also must substantiate specific use patterns predicated by the pesticide label. For example, investigation of the environmental fate and characterization of any pesticide residue is required for a pesticide used on food crops, meat, and milk. At any time during the approval process, EPA may require additional testing or clarification of existing information. The pesticide manufacturer (registrant) must pay for all costs associated with the development of required data.

The liaison between EPA and the registrant is the EPA Product Manager (PM). The role of the PM is to coordinate the agency's internal review and to monitor the status of the registration. The PM also helps facilitate discussion among agency scientists and resolve problems which occur during the registration process. EPA's policy of delegating responsibility for the documentation of data on a specific active ingredient to a PM assigns one individual to view the whole picture: health and safety issues, environmental and wildlife concerns, and product chemistry for that pesticide. Also, the PM helps to improve communication among the EPA, the registrant, and the public.

Upon receipt of the application for registration, the PM directs various components of the supporting data package to the appropriate review divisions within the EPA Office of Pesticide Programs (OPP). Data analyses may include independent reviews

by these divisions within OPP: Environmental Fate and Effects; Biological and Economic Analysis; Field Operations; Health Effects; Registration; Program Management and Support; Special Review and Reregistration.

The regulatory staff at EPA ultimately is responsible for determining whether the manufacturer adhered to proper protocol and scientific methods in developing the data. This includes an evaluation of the completeness, accuracy, and validity of data interpretation. EPA's decisions must be scientifically based in accordance with the agency's policies and legal mandates (economic, social, and environmental impacts) so that the agency can withstand scientific peer review, public scrutiny, and legal challenges. Registration is not issued until EPA is satisfied that all data requirements have been met, that supporting studies are valid, and that the data allow the agency to evaluate the benefits and risks associated with use of the product.

EPA grants a pesticide registration only after extensive deliberation and thorough scientific review. However, granting a registration number to a pesticide is in no way a product approval, recommendation, endorsement, or determination of "safety" by EPA. Registration means that the pesticide manufacturer has submitted all necessary scientific data required by law, and that EPA review of that data supports the conclusion that the benefits of using the pesticide outweigh potential risks.

PESTICIDE REGISTRATION: MANUFACTURER'S DECISION-MAKING PROCESS

Delivering the ideal product from the research laboratory to the marketplace requires extensive testing. New compounds showing promise as a pesticide today probably will not be available for use for at least five years. Thus, in considering what products to develop, a company anticipates potential regulations, future markets, public demands, and how the product will fit into tomorrow's integrated pest, crop, or systems management scheme. To justify research expenditures, a pesticide manufacturer looks for profitable products which can enter major markets with the potential to expand into specialized markets.

Early pesticides were discovered largely by preparing and screening thousands of chemicals for potential pesticidal activity. Emphasis has shifted from massive screening programs to the development of “designer compounds” created through computer design and simulation. Conventional chemistry is still an option. However, research in the quest for future pesticide products now is channeled toward pesticides derived from bacteria, viruses, and fungi; growth or chitin inhibitors; and bioengineered genes making plants resistant to particular pests. The pesticide product for tomorrow’s needs must offer solutions: better efficacy; compatibility with pest management practices; nonleaching tendencies; less persistence in the environment; reduced residues in food; lower risks to workers and bystanders. Such solutions are the keys that enable the pesticide and the manufacturer to compete successfully in the marketplace. A commercially successful product allows the manufacturer to recover the costs of initial testing and registration and return a profit for reinvestment into future product development.

The development of any new pesticide product begins with discovery and ends with registration. Designer chemical development blends the skills of many specialists, beginning with synthetic chemists and biologists. Toxicologists evaluate the impact on various mammalian and other nontarget organisms. Residue, environmental, and metabolism chemists conduct additional tests. Research expands from greenhouse evaluations to field use and involves testing under expected environmental conditions. Formulation chemists take the active ingredient and prepare formulated products (emulsifiable concentrates, granulars, wettable powders, etc.) which influence residues, performance, toxicity, and use. Process chemists and engineers design systems for mass production of the active ingredient as well as various end use products. Product development personnel expand use pattern testing results beyond field stations to serve as a technical interface with the manufacturer and between the scientific community and the customer. Only after all data reveal a product worth producing will the manufacturer finally seek registration from EPA. The steps taken to create a commercial pesticide are many and complex:

Primary screening. Small amounts of chemicals are synthesized and tested in laboratories and greenhouses.

Secondary screening. Promising materials undergo further testing in greenhouses and on experimental farms.

Toxicological screening. An Ames test on bacteria quickly determines if the compound might cause genetic damage. Basic toxicology work calls for animal tests. Compounds showing adverse effects are dropped from further testing.





Patent search. Companies determine if they can patent their discovery and look at markets and manufacturing processes.

Initial commercial testing. Many studies are conducted over 5-7 years. More intensive, long-term toxicological research is done. Wider environmental design occurs in fields, labs, and greenhouses.

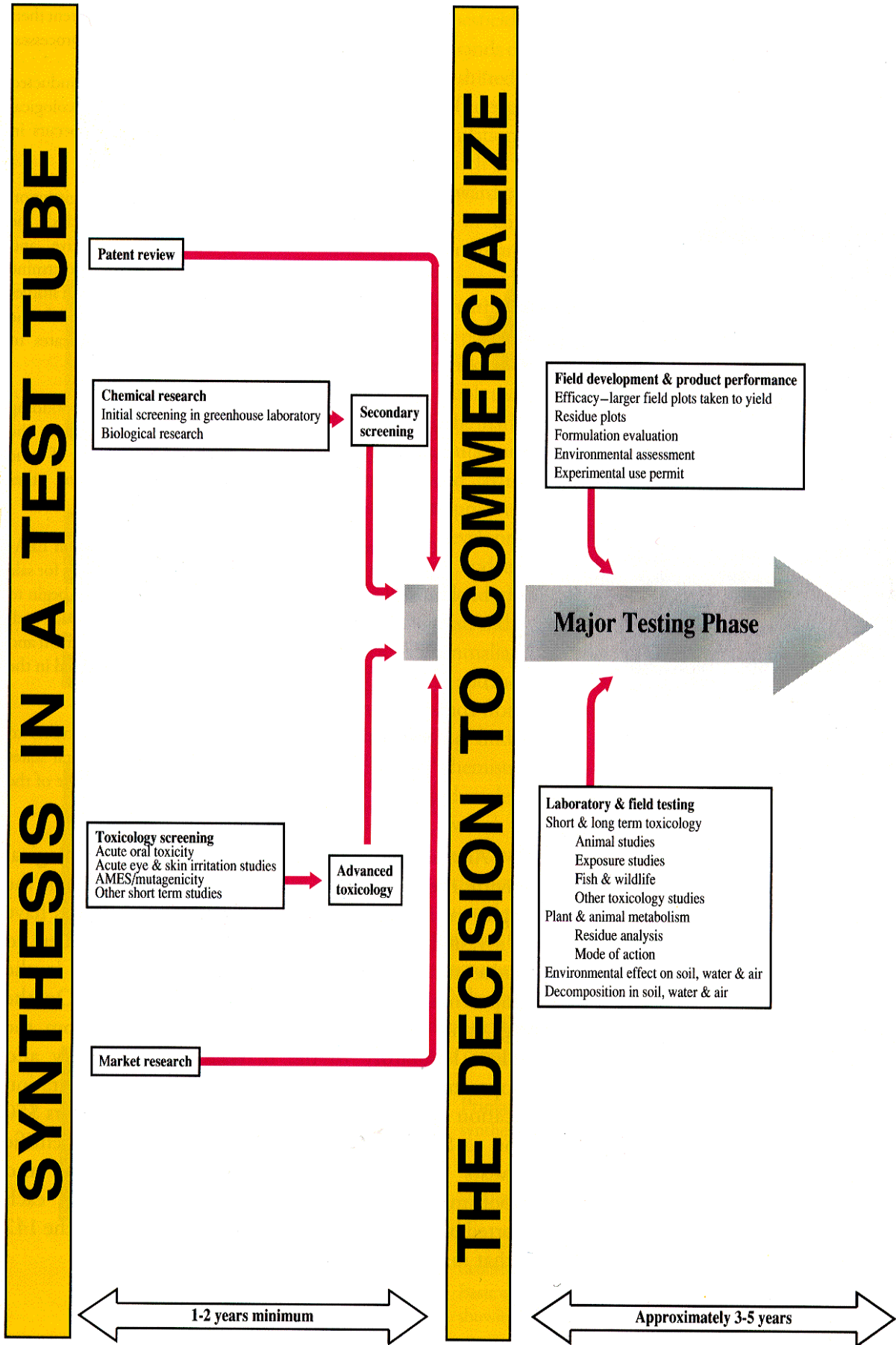
EPA application. After several years of testing, the registration data package is submitted to EPA. The data include the results of studies on acute, chronic, reproductive, and developmental toxicity; ecological studies to determine harmful effects on nontarget plants and animals; and studies of environmental fate to determine rates at which the pesticide breaks down and whether it translocates to unwanted sites.

Labeling. If the registration package and the corresponding benefit-to-risk analysis are acceptable, EPA grants the registration of the product. The label is part of the registration. The label provides use directions and other pertinent information for applicators.

Commercial introduction. A product must bear an EPA-approved label before the registrant can introduce it for sale in the United States. Only then can the registrant begin to recover its millions of dollars invested in the product; and, despite costs and time invested in product development and registration, there is no guarantee that it will succeed in the marketplace.

State application. Most states require manufacturers to register all products used within that state. Several states utilize unique registration processes similar to those of the EPA registration process.

Any unexpected adverse finding, either toxicological or environmental, during product development ends the testing even if several years and several million dollars have been invested. For this reason, manufacturers are alert to recognize and acknowledge problem products early in the developmental process in order to minimize cost. On the average, only one in 35,000 chemicals survives from the chemist's laboratory to the market. The discovery and development of a product and the subsequent registration application to EPA take many years, cost manufacturers \$50 million to \$100 million, and use a wide base of scientific specialists (i.e., biologists; residue, environmental, and metabolism chemists; toxicologists; and engineers), each supported by a technical and clerical staff, to conduct the 142 tests that may be required.



REGISTRATION PACKAGE COMPILED

Applicant submits data package to EPA Office of Pesticide Programs, Registration Division

Data may include:

- | | | |
|------------------------------|--------------------------------------|---|
| Formulation data | Aerobic soil metabolism | Lifetime mouse feeding |
| Analytical methods | Anaerobic aquatic metabolism | Mutagenicity: dominant lethal gene test |
| Boiling point | Anaerobic soil metabolism | Mutagenicity: heritable translocation |
| Chemical nomenclature | Ecosystem study | Teratology: rat & rabbit |
| Color | Hydrolysis | Reproduction |
| Corrosiveness | Leaching, adsorption, decomposition | Sub-chronic rat & dog feeding |
| Explosiveness | Off target movement | Hazards to nontarget plants & animals |
| Flammability | Photodegradation: water, soil, & air | Aquatic ecosystem |
| Manufacturing process | Rotational crop residue & response | Avian oral studies |
| Melting point | Soil dissipation | Bee studies |
| Odor | Water dispersal | Beneficial insects |
| PH | Crop residue & exposure data | Bluegill accumulation |
| Purity of materials | Hazards to human & domestic animals | Bluegill & trout toxicity |
| Solubility | Acute delayed neurotoxicity | Catfish accumulation |
| Specific gravity | Acute oral toxicity | Crab toxicity |
| Stability | Acute inhalation toxicity | Daphnia toxicity |
| Storage stability | Eye irritation | Fish & invertebrate life cycle |
| Structural formula | Dermal irritation | Mallard & quail dietary toxicity |
| Vapor pressure | Dermal sensitization | Mallard & quail reproduction |
| Environmental chemistry data | Excretion, metabolism, accumulation | Marine fish toxicity |
| Adsorption | First aid & antidote | Micropods |
| Aerobic aquatic metabolism | Lifetime rat feeding | Oyster, shrimp, and worm toxicity |

EPA EVALUATION & APPROVAL PROCESS

Registration support & emergency response branch
Log-in petition & application
Review for completeness
Assign to appropriate product manager
Process section 18 exemptions

Product manager
Detailed review of petition & application
Assign & coordinate appropriate scientific review
Set priorities and timetables
Coordinate administration actions
Communicate with applicant
Process section 24(c) registrations

Product manager
Assemble decision package
Final scientific review
Final administrative review
Prepare notice for *Federal Register*
Notify applicant when approved
Submit notice to *Federal Register*
Publish notice of registration

Technical evaluation
Review data
Evaluate health & safety
Prepare risk assessment
Assess environmental consequences
Establish tolerances for all registration
Product regulatory actions

Technical support section

← **Approximately 1-2 years** →

COMMERCIAL LABEL ACCEPTED

ENVIRONMENTAL PROTECTION AGENCY OVERSIGHT AFTER REGISTRATION

The special review process is the mechanism that provides EPA the regulatory flexibility to reevaluate the registration of a pesticide. A special review may be initiated when new evidence suggests that legal use may cause unreasonable risks to human health or the environment. The general criteria for initiating a special review of a registered pesticide are:

- Acute toxicity to humans or domestic animals.
- Chronic health effects in humans.
- Hazards to nontarget organisms.
- Risks to threatened or endangered species.
- Risks to critical habitat of threatened or endangered species.
- The possibility that risks may outweigh the benefits for continued registration.

The special review process includes a comprehensive review of the suspected risk. A risk review then is prepared and compared with the benefits offered by the active ingredient. EPA also reviews availability, efficacy, and cost of alternative controls, then formulates a preliminary benefit to risk analysis. That analysis is forwarded to the FIFRA Scientific Advisory Panel, USDA, and to the public (via the *Federal Register*) for comments on the scientific accuracy, data interpretation, and rationale behind proposed risk reduction measures. EPA then has five choices:

- Take no action.
- Alter the pesticide label language to further minimize risk.
- Classify for restricted use.
- Eliminate specific uses.
- Cancel or suspend the registration entirely.

PESTICIDE LABEL COMPONENTS

DIRECTIONS FOR USE AND THE LAW

Pesticides are developed by the manufacturer, registered with EPA, and sold to the public with the assumption that users read, understand, and follow instructions found on the product label. Specific information on use, personal protective equipment, environmental precautions, and storage and disposal are found on the pesticide label. The purpose of the label is to provide clear directions to allow maximum product benefit while minimizing risks to human health and the environment. All research, testing, and regulatory processes ultimately are reflected through the language on the label.

Every pesticide label includes the statement, “It is a violation of federal law to use this product in a manner inconsistent with its labeling.” This language obliges the purchaser or user of any pesticide to assume all legal responsibilities for the use of the product. Further, courts of law and regulators recognize the pesticide label as a binding contract which requires the person using the product to do so *exactly as directed*. Terms such as *must*, *shall*, *do not*, and *shall not* mean that the user is responsible for specific actions when applying or handling the given product; any departure from such directions is, in the eyes of the law, an illegal use of the pesticide.

“Use” means more than just the application of the pesticide. Federal and state regulations define pesticide use to include handling, mixing, loading, storage, transportation, and disposal, as well as human and environmental exposure. This all-encompassing definition covers every activity that involves a pesticide—from purchase to container disposal.

The pesticide label is more than just a piece of paper. It serves a dual function: The label instructs the user how to use the product safely and effectively, and it serves as a legal measuring stick. Many statements on the label result from rigorous scientific investigation and governmental regulatory decisions. Pesticide users should read, understand, and follow pesticide label directions to ensure effective pest control, personal safety, environmental protection, and legal compliance.

TYPES OF PESTICIDE LABELING

A pesticide product can be used only according to the directions on the label accompanying it at the time of sale or according to labeling amended by the registrant through subsequent federal or state approval. The most comprehensive registration is granted under Section 3 of FIFRA. Section 3 registration means that EPA has reviewed and approved all information required to support all uses listed on the product label. Most pesticides bear Section 3 labeling.

Under FIFRA Section 24(c), states can grant registrations for additional uses of a pesticide product to meet special local needs. Section 24(c) labeling applies only to the use pattern for crops, commodities, or sites already listed by the label issued under Section 3. Both Section 3 and 24(c) labels must be in the possession of and followed by the applicator at time of application. Additional uses permitted by Section 24(c) registration are legal only in the state which issued that registration.

Under certain conditions, a state may petition EPA for a Section 18 emergency exemption from full Section 3 registration requirements for a particular product. If granted, the emergency exemption temporarily expands the terms of that specific pesticide label to include an additional (emergency) use of the product. Exemptions under Section 18 may be granted by EPA only when certain carefully defined emergency, crisis, or quarantine conditions prevail. Users of products covered under this seldom-used exemption must obtain use directions from their respective state lead agency and may be required to report the amount of product used and/or areas treated.



ORGANIZATION OF THE PESTICIDE LABEL

Becoming familiar with pesticide label content and design is crucial to selecting the most appropriate pesticide products and receiving maximum benefit from their use. While label information may seem overwhelming at first, it takes only a few minutes to understand the entire content once the general format has been mastered.

FIFRA mandates that every pesticide product bear a label that clearly shows the brand name, name and address of the registrant, net contents, product registration number, establishment number, ingredient statement, warning or precautionary statements, use classification, signal words, and use directions. Although EPA establishes standards for location and content of certain label information, manufacturers control much of the design and layout. Information contained on most labels can be divided into four major categories: safety information, environmental information, product information, and use information. Thus, before selecting a pesticide product, the potential user should become familiar with the product label.

Labels change! Do not attempt to memorize the pesticide label. Reading the label each time you select and use a pesticide product allows you to recognize changes and achieve effective control while protecting yourself, others, and the environment from the consequences of misuse.

Safety Information

Child hazard warning. The front panel of every pesticide product label must bear the statement, “Keep Out Of Reach Of Children.” The EPA may waive this requirement only in cases where the likelihood of contact with children is extremely remote, or when the product is approved for use on children.

A **signal word** must appear prominently on the front of the pesticide container, providing, in essence, a one word summary of the product’s potential toxicity to humans. The three signal words, in decreasing order of toxicity, are DANGER (highly toxic), WARNING (moderately toxic), and CAUTION (slightly toxic).



A product's signal word is assigned on the basis of laboratory tests conducted on that particular product. Data are compiled from animal studies on exposure through ingestion, inhalation, and dermal (skin and eye) absorption; and the route of exposure which shows the highest human toxicity potential determines the signal word assigned to the label. For example, if laboratory test results indicate Product XYZ to be moderately toxic if ingested, highly toxic if inhaled, and slightly toxic if absorbed through the skin or eyes, the signal word would be danger based on inhalation studies.

Hazards to humans and domestic animals. Precautionary statements indicating specific hazards, routes of exposure, and precautions to be taken to avoid human and animal injury are required on the label. Example: "Harmful if swallowed, inhaled, or absorbed through the skin." Precautionary warnings might include the language, "Do not breathe vapors or spray mist"; "Avoid contact with eyes, skin or clothing"; or "Handle concentrate in a ventilated area."

You cannot change the acute toxicity of a product. However, adherence to precautionary warnings and protective clothing and equipment statements will minimize exposure.

The **protective clothing and equipment statement** directs the applicator to reduce the potential for exposure by using protective clothing or equipment. Most pesticide labels contain very specific instructions concerning the type of clothing that must be worn during the handling and mixing processes.

Potential routes of exposure determine the types of protective clothing designated on the label. Generally, a long-sleeved shirt, long pants, and waterproof footwear are the minimum requirements. The label will state whether specific items such as respirators and chemical-resistant gloves, aprons, goggles, and boots are needed. Common label language includes "Wear full face shield, rubber gloves, apron, and waterproof footwear when pouring concentrate or when exposure to concentrate is possible," and "Eye protection and chemically resistant gloves and footwear, a long-sleeved shirt, and long-legged pants or coveralls are recommended."

The **Statement of practical treatment** (first aid) provides valuable information to persons at the scene of a pesticide poisoning. Some examples: "In case of contact with skin, wash immediately with plenty of soap and water"; "If swallowed, call a physician or poison control center immediately"; "Immediately wash eyes with water for at least 15 minutes and get medical attention"; "After first aid is given, take victim to clinic or hospital"; or "If inhaled, remove victim to fresh air."

The statement of practical treatment informs physicians and emergency responders of appropriate medical procedures for poisoning victims. For example, the statement might indicate to a physician: “There is no specific antidote”; “If the product is ingested, induce emesis or stomach lavage”; or “The use of an aqueous slurry of activated charcoal may be considered.” Products labeled DANGER also bear an 800 number which physicians may call for further treatment advice. Emergency telephone numbers are provided on the Material Safety Data Sheet (MSDS). The pesticide distributor or manufacturer should be contacted for the MSDS.

Environmental Information

Environmental hazard statements are required to state the nature of potential hazards and appropriate precautions to avoid accident, injury, or damage if the product presents risks to nontarget organisms or the environment. Potential hazards are determined by a series of tests which evaluate a pesticide’s toxicity to wildlife such as mammals, fish, birds, aquatic invertebrates, and pollinating insects. Statements might include label language such as, “This product is highly toxic to bees,” or “This product is highly toxic to fish,” or “...toxic to aquatic invertebrates.” To reduce the risks, the label may direct measures such as, “Do not allow drift to contact nontarget plants,” or “Do not apply directly to water or wetlands.”

If the pesticide has the potential to harm an endangered or threatened species or its habitat, statements will indicate where not to apply the pesticide or refer the user to an endangered species bulletin for further information. For example, the label might read “Use of this product in a manner inconsistent with the Pesticide Use Bulletin for Protection of Endangered Species is a violation of federal law,” “Restrictions for the protection of endangered species apply to this product,” or “If restrictions apply to the area in which this product is to be used, you must obtain the Pesticide Use Bulletin for Protection of Endangered Species for that county.”

Statements on environmental impact may indicate that the product “...may travel through soil and can enter ground water,” or “...has been found in ground water.” The label instructions will tell how to reduce the impact on the environment: “This product may not be mixed, loaded, or used within 50 feet of all wells, including abandoned wells, drainage wells, and sink holes”; or “This product has been shown to leach under certain conditions. Do not apply to sand and loamy sand soils where the water table (ground water) is close to the surface.”

Safety and Environmental Information

Child Hazard Warning

Signal Word

Hazards to Humans and Domestic Animals

Protective Clothing and Equipment

Statement of Practical Treatment

Environmental Hazard Statements

Keep Out of Reach of Children

WARNING

May cause eye injury. Harmful if swallowed, inhaled, or absorbed through the skin. Do not get in eyes or on clothing. Avoid breathing vapor or spray mist.

Wear goggles, face shield, or safety glasses when handling the undiluted material.

Statement of Practical Treatment

If swallowed call a physician or Poison Control Center. Do not induce vomiting.

If in eyes flush eyes with plenty of water for at least 15 minutes. Get medical attention.

If on skin remove contaminated clothing and wash skin immediately with soap and water.

Note to Physician: Treat the patient symptomatically.

Environmental Hazards

This pesticide is extremely toxic to fish and wildlife. Do not apply directly to wetlands. Do not contaminate water by cleaning equipment or disposal of wastes. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds.

Safety and Environmental Information

Child Hazard Warning

Signal Word

Hazards to Humans and Domestic Animals

Protective Clothing and Equipment

Statement of Practical Treatment

Environmental Hazard Statements

Keep Out of Reach of Children

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Product Information

The **brand (trade) name** under which a pesticide product is sold always appears on the front panel and often is the most conspicuous part of the label.

The **name and address of the producer, registrant, or person for whom the product was produced** must be shown on the label. If the registrant's name appears on the label and the registrant is not the producer, it must be qualified by appropriate wording such as "Packed for...," "Distributed by...," or "Sold by...."

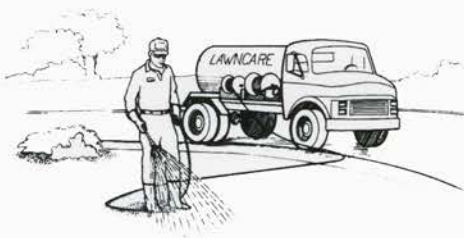
The **net weight or volume of the contents** of the formulated pesticide product is displayed prominently on the label or stamped on the container.

The **product registration number** appears on the label, preceded by the phrase "EPA Registration No." or "EPA Reg. No." The registration number identifies a specific pesticide product and signifies that federal registration requirements have been met. At a minimum, registration numbers consist of two sets of digits: e.g., 491-005. The first set of digits identifies the registrant. The second set represents the specific registration issued to the company by EPA. Together, these numbers clearly identify the product.

The **establishment number** is preceded by the phrase "EPA Est." EPA requires pesticide production sites to be registered with EPA. A pesticide-producing establishment is assigned an EPA establishment number that clearly identifies that location. All pesticides produced at that location must bear its EPA establishment number on the label or container. Farm service centers which repackage bulk pesticides must be registered as pesticide-producing establishments; and, like all pesticide producers, they must keep records of their pesticide production and file annual production reports.

The **ingredient statement** normally is found on the front panel of the label. It identifies the name and percentage by weight of each active ingredient. The active ingredient, identified by its chemical or common name, is the component of a pesticide product that affects the target pest. Chemical names often are complex; for example, *2-chloro-4-ethylamino-6-isopropylamino-s-triazine* is the active ingredient in the product *AAtrex*. To aid communication, EPA-approved common names may be substituted for chemical names. In the example given, atrazine may be substituted for the chemical name.

Inert ingredients allow active ingredients to be formulated into many different products. As part of the formulation, they determine a product's handling properties and influence toxicity, release rates, residual activity, persistence, and methods of



application. Also, there are no pest controlling claims for inert ingredients; and, because product formulations are confidential, the total percent by weight of inert ingredients usually is the only information about inert ingredients found on the label.

The **formulation** of the product often appears on the front panel of the label, either near the brand name or in the general information section. Pesticides may be formulated into many products; currently, in the United States, some 450 active ingredients are formulated into 25,000 different products. Information about the type of product formulation—granular, liquid flowable, dry flowable, microencapsulated, emulsifiable concentrate, etc.—provides insight about application equipment, handling properties, and performance characteristics.

General-use versus restricted-use classification. EPA may classify a certain pesticide product for restricted use due to the complexity of the designated use, concerns about environmental safety, or potential human toxicities. A restricted-use product may be bought and used only by a certified applicator or persons under the direct supervision of a certified applicator. A restricted-use statement appears conspicuously at the top of the front panel of the label to make oversight unlikely. All restricted-use pesticides are identified by the following language: “For retail sale to and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the certified applicator’s certification.”

Pesticides which remain unclassified are referred to as general-use pesticides and may be purchased by the general public; most pesticides used by homeowners are general-use products. It should be noted that there is no such thing as a general-use statement; no general-use statement ever will appear on the product label.

The **physical and chemical hazard statements** identify a given pesticide’s flammability or explosiveness. These statements show specific hazards and state conditions to be avoided. Examples: “Extremely Flammable”; “Contents Under Pressure”; “Keep away from fire, sparks, and heated surfaces”; “Do not puncture or incinerate containers”; “Exposure to temperatures above 130° F cause bursting.”

The **warranty** information is the manufacturer’s assurance that the product conforms to the chemical description on the label and that it is fit for labeled purposes if used according to directions under normal conditions. The warranty does not extend to any use of the product contrary to label instructions, nor does it apply under abnormal conditions such as drought, tornadoes, hurricanes, or excessive rainfall.

procedures allowed by state and local authorities”; “Improper disposal of excess pesticides, spray mixture, or rinsate is a violation of federal law”; “If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA regional office for guidance.” While numerous pesticide labels still state that properly rinsed containers may be burned, almost every state has clean air laws which prohibit such disposal.

EVALUATION OF PESTICIDES

The selection of pesticide products involves more than a visit to the nursery, agrichemical dealer, or other retailer. It is a matter of considering the pest problem, the efficacy of products available to control that problem, the price, environmental impact, and personal safety. Quality dealers do more than just sell products. They also provide information as a service. Because this service is as valuable as the pesticide products themselves, it is a wise consumer who knows that cheaper is not always better.

The following evaluation and pesticide selection process provides a method for comparing products. It encourages a more comprehensive approach to product selection.

PEST IDENTIFICATION

Pest identification and an understanding of pest biology are crucial to any successful pest management program. Before selecting a pesticide treatment, the applicator needs to know which pest is causing the problem; otherwise, a crop or commodity may be lost and money wasted. Once the pest is identified, one needs to know its specific life cycle and recognize that certain stages within the life cycle are optimum for pesticide effectiveness. This expertise is available from county extension educators, university research and extension specialists, university plant and pest diagnostic laboratory personnel, master gardeners, and representatives from pesticide suppliers, dealerships, and retail outlets.

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PESTICIDE LIST DEVELOPMENT

Integrated pest management (IPM) is the control strategy of choice for homeowners, growers, and commercial applicators. IPM is an approach to pest management that blends all available management techniques—nonchemical and chemical—into one strategy: Monitor pest problems, use nonchemical pest control, and resort to pesticides only when pest damage exceeds an economic or aesthetic threshold.

Labels and regulations change and new products are introduced routinely. Therefore, the pesticide selection process should be conducted just prior to each growing season.

The selection of a pesticide requires planning and knowledge of the alternatives. Begin by developing a comprehensive pesticide list for a specific crop, turf, or home garden pest. Pesticide recommendations for controlling any insect, weed, or disease can be suggested by numerous helpful sources: the Cooperative Extension Service; consultants; agrichemical and urban pesticide dealers; product manufacturers; garden and nursery centers; association newsletters; trade journals; and expert applicators. After developing a pesticide list, the user should obtain labels of all products under consideration so that their strengths and weaknesses can be analyzed on a product profile worksheet. Labels generally are available locally from retail outlets or their suppliers.



PRODUCT PROFILE WORKSHEET

The completed product profile worksheet becomes a ready reference to information shown on the product label. Compile information for the product profile worksheet by reviewing the label and asking pertinent questions of various experts. Prepare a product profile worksheet for each product under consideration, and attach the labels to the corresponding worksheets when finished.

Product Profile Worksheet

Product Name _____ Crop to Be Planted _____
EPA Registration Number _____ Pest to Be Managed _____
Signal Word _____ Date of Label Review _____

Product Cost and Restrictions

Costs and Efficacy

Registered for crop/pest complex (Y/N)
Cost per acre \$_____, per 1000 sq.ft. \$_____
Application costs (per acre,
per field, per yard) \$_____
Relative efficacy _____%

Certification Requirements

Federal Restricted-Use Pesticide (Y/N)
State Restricted-Use Pesticide (Y/N)

Specific Recommendations for Use (If yes, list specific information requested.)

State restrictions on use (Y/N) _____
Buffer zones from sensitive crops (Y/N) _____
Application equipment requirements (Y/N) _____
Application timing requirements (Y/N) _____
Potential crop injury (Y/N) _____
Preharvest interval (Y/N) _____
Frequency of applications _____
Rate(s) per acre or per 1000 sq.ft. _____
Compatibility with other pesticides/fertilizers (Y/N) _____
Limitations on use with surfactants (Y/N) _____
Wind speed (Y/N) _____
Temperature (Y/N) _____
Height above crop canopy (Y/N) _____
Rotational crop restrictions (Y/N) _____
Grazing restrictions (Y/N) _____

Special Comments

Product Profile Worksheet For _____

(Enter name of pesticide brand)

Applicator/Worker Safety

Signal Word

Personal Protective Equipment (List specific clothing and equipment.)

Mixer/loader _____

Applicator _____

Worker _____

Re-entry or Restricted Entry Interval Requirements

Mixer/loader _____

Applicator _____

Worker _____

First Aid Advice _____

Posting/Notification

Oral (Y/N) _____

Written (Y/N) _____

Posted (Y/N) _____

Water Quality

Ground water advisory statements (Y/N) _____

Surface water advisory statements (Y/N) _____

Pesticide Physical Properties

(Definitions are found on page 36. Consult university personnel manufacturer representatives and the USDA Soil Conservation Service for specific values.)

Soil adsorption value _____ Water solubility value _____

Hydrolysis half life value _____ Soil half life _____

continued

Site Characterization

Classification of soil _____
Percent soil organic matter _____
Depth to ground water _____
Number of abandoned wells _____
Sinkholes _____
Rivers, streams, lakes, ponds _____

Movement off Target

Buffer zones (Y/N) _____
Specific adjuvant information (Y/N) _____
Wind speed restrictions (Y/N) _____
Sensitive areas identified (Y/N) _____
Nozzle type, size, pressure (Y/N) _____

Wildlife Species and Habitat

Endangered Species Named (Y/N) _____

Toxicity Statements

Fish (Y/N) _____
Birds (Y/N) _____
Pollinators (Y/N) _____
Other wildlife (Y/N) _____

Wetlands Restrictions (Y/N) _____

PRODUCT COST AND RESTRICTIONS

The product comparison process is designed to make a broad evaluation of products. First, information is developed through the product profile worksheets for a general assessment. Then, each statement in the following five worksheets should be answered by reviewing the product profile worksheets and assigning a relative ranking of 1 for highly acceptable, 2 for acceptable, or 3 for unacceptable.

Worksheet #1: Product Cost and Restrictions Ranking
(Consult your Product Profile Worksheets.)

Write in brand name of each product being considered..... _____

1. <i>Certification requirements</i>	_____	_____	_____	_____
2. <i>Economic factors</i>	_____	_____	_____	_____
3. <i>Specific recommendations for use</i>	_____	_____	_____	_____
4. <i>Past experiences with product</i>	_____	_____	_____	_____
5. <i>Past experiences with company</i>	_____	_____	_____	_____
6. <i>Product availability</i>	_____	_____	_____	_____

Add the columns for each brand and place the sum in the *Total* space.

Total (Add lines 1 -6): _____

If the *Total* is 6-9, the suggested *Overall Ranking* is 1.
 If the *Total* is 10-14, the suggested *Overall Ranking* is 2.
 If the *Total* is 15-18, the suggested *Overall Ranking* is 3.

Overall Ranking: _____

1 = highly acceptable; 2 = acceptable; 3 = unacceptable

Transfer the Overall Ranking to the *PESTICIDE EVALUATION CRITERIA CHART* (pg. 41).

APPLICATOR/WORKER

SAFETY

Label directions that call for use of personal protective equipment (PPE) or closed handling systems have great bearing on pesticide selection.

Worksheet #2: Applicator / Worker Safety Ranking (Consult your Product Profile Worksheets.)

Write in brand name of each product being considered.....

1. How acceptable is the signal word?

2. How acceptable are the product's PPE requirements?

3. How acceptable are the product's reentry requirements?

4. Do you have the ability to administer first aid in case of an accident?

5. Level of safety training that dealer or manufacturer can provide

6. How acceptable are posting and notification requirements?

7. Your past performance in following "Hazards to Humans and Domestic Animals" precautions

Add the columns for each brand and place the sum in the *Total* space.

Total (Add lines 1-7):

If the *Total* is 7-11, the suggested *Overall Ranking* is 1.

If the *Total* is 12-16, the suggested *Overall Ranking* is 2.

If the *Total* is 17-21, the suggested *Overall Ranking* is 3.

Overall Ranking:

1 = highly acceptable; 2 = acceptable; 3 = unacceptable

Transfer the Overall Ranking to the *PESTICIDE EVALUATION CRITERIA CHART* (pg. 41).

WATER QUALITY

Four factors influence ground water vulnerability to pesticide contamination: chemical properties of the pesticide (low soil adsorption and persistence); soil types (sandy or gravel texture and low organic matter content); site characteristics (shallow water table, sinkholes, and abandoned wells); and management practices (improper chemical storage, handling, and use). If aware of these considerations, the careful applicator can select and handle pesticides in ways that will prevent ground water contamination.

Pesticides also can contaminate surface water supplies throughout the year if washed off treated urban and rural landscapes into streams or lakes. Options for protecting surface water near application sites include no-spray strips around surface water supplies, wells, or irrigation ditches; grass waterways and grass buffers to resist runoff; use of conservation practices on erodible lands; and plow berms around sinkholes.

Water quality evaluations of ground water and surface water initially may be difficult to complete, but not impossible. The best method for selecting pesticide products relative to water quality is to find specific soil/water adsorption coefficients and water hydrolysis, and soil half-life values. These can be obtained from manufacturers, university personnel, and the United States Department of Agriculture Soil Conservation Service.

Pesticides are less likely to leach or occur as surface runoff when the soil/water adsorption coefficient (K_d) is greater than 5. The K_d value is simply a measure of how tightly the pesticide binds or sticks to soil particles. The greater the K_d value, the less likely a chemical will leach or contribute to runoff. A very high value means it is strongly adsorbed onto soil and organic matter and does not move throughout the soil: Higher is better.

Pesticides are less likely to leach when their water solubility is less than 30 parts per million. In other words, the less a chemical dissolves in water, the less likely it is to move with water through the soil: Lower is better.

Pesticides are less likely to leach when their hydrolysis (breakdown in water) half-life is less than six months and their soil half-life less than three weeks. The longer a chemical can remain in water or soil without breaking down, the more likely it is to leach through the soil: Shorter is better.

Worksheet #3: Water Quality Ranking
 (Consult your Product Profile Worksheets.)

Write in brand name of each product being considered..... _____

1. Product's characteristics for ground water contamination _____

2. Product's characteristics for surface water contamination _____

3. Application site characteristics for ground water contamination _____

4. Application site characteristics for surface water contamination _____

5. Your ability to meet ground water advisories on labels _____

6. Your ability to meet surface water advisories on labels _____

Add the columns for each brand and place the sum in the *Total* space.

Total (Add lines 1-6): _____

- If the *Total* is 6-9, the suggested *Overall Ranking* is 1.
- If the *Total* is 10-14, the suggested *Overall Ranking* is 2.
- If the *Total* is 15-18, the suggested *Overall Ranking* is 3.

Overall Ranking: _____

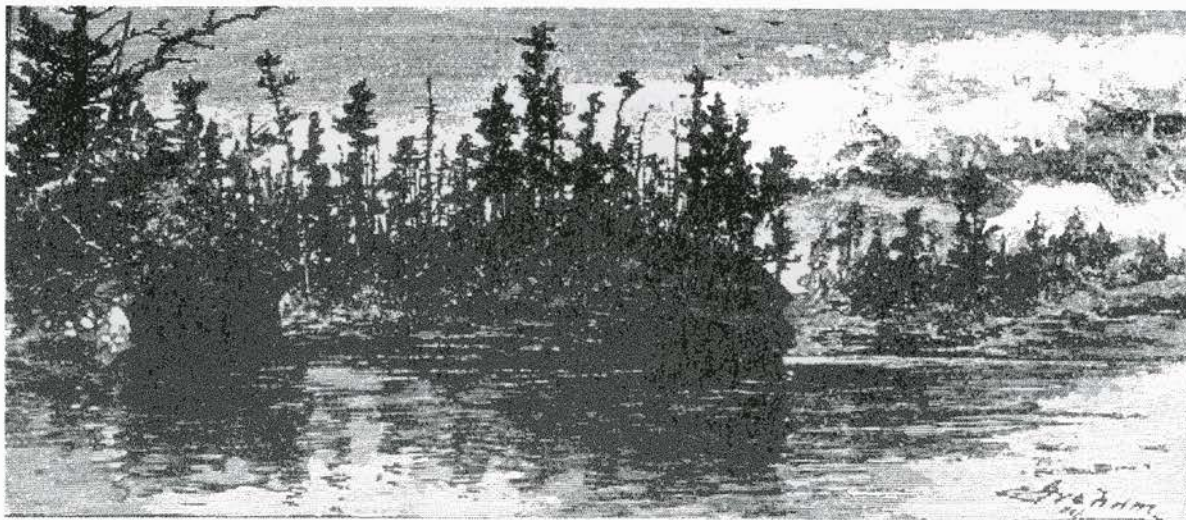
1 = highly acceptable; 2 = acceptable; 3 = unacceptable

Transfer the Overall Ranking to the *PESTICIDE EVALUATION CRITERIA CHART* (pg.).

MOVEMENT OFF TARGET

Pesticide particle drift and volatilization pose risks to neighbors, field workers, and the environment. Keeping products on the target site increases effectiveness of pest control while reducing injury to nontarget susceptible plants, domestic animals, and wildlife. The proximity of an application site to sensitive areas such as nursing homes, subdivisions, schools, day-care centers, parks, playgrounds and hospitals is a critical factor requiring extra safety precautions. Misapplication can endanger public health and violate the law.

Two options exist for the applicator who is concerned about drift: Alter routine spray practices or switch to products which can be more easily managed to prevent particle drift or volatilization. Management decisions that can help prevent off-target movement include allowing for buffer zones and planting setbacks, incorporating pesticides into the soil, slowing the speed of the equipment, altering application methods, applying sprays nearer the target pest, applying at lower pressure, and altering the time of application. Products may vary in their likeliness to move out of the target treatment area. Evaluate each product to determine the best choice for your site requirements. If a product is selected for its drift control characteristics, then it is especially important for the applicator to understand the product label directions on wind speeds, adjuvants, nozzle selections, and other special instructions.



Worksheet #4: Movement Off Target Ranking
(Consult your Product Profile Worksheets.)

Write in brand name of each product being considered..... _____

1. *How clear are label directions on drift prevention?* _____

2. *How acceptable are buffer zone restrictions?* _____

3. *How acceptable are wind speed and temperature restrictions?* _____

4. *Your ability to prevent drift onto sensitive areas* _____

5. *Prior experience with product* _____

Add the columns for each brand and place the sum in the *Total* space.

Total (Add lines 1-5): _____

If the *Total* is 5-7, the suggested *Overall Ranking* is 1.

If the *Total* is 8-12, the suggested *Overall Ranking* is 2.

If the *Total* is 13-15, the suggested *Overall Ranking* is 3.

Overall Ranking: _____

1 = highly acceptable; 2 = acceptable; 3 = unacceptable

Transfer the Overall Ranking to the *PESTICIDE EVALUATION CRITERIA CHART* (pg. 41).

WILDLIFE SPECIES AND HABITAT

Pesticide labels may require special actions to protect endangered species or other wildlife and their habitats.

Worksheet #5: Wildlife Species and Habitat Ranking
(Consult your Product Profile Worksheets.)

Write in brand name of each product being considered..... _____

1. How acceptable are endangered species restrictions? _____

2. Your ability to avoid exposure to wildlife _____

3. Your ability to reduce mortality to pollinators _____

4. Wetlands restrictions can be managed _____

Add the columns for each brand and place the sum in the *Total* space.

Total (Add lines 1-4): _____

- If the *Total* is 4-6, the suggested *Overall Ranking* is 1.
- If the *Total* is 7-9, the suggested *Overall Ranking* is 2.
- If the *Total* is 10-12, the suggested *Overall Ranking* is 3.

Overall Ranking: _____
1 = highly acceptable; 2 = acceptable; 3 = unacceptable

Transfer the Overall Ranking to the *PESTICIDE EVALUATION CRITERIA CHART* (pg. 41).

PESTICIDE COMPARISON AND SELECTION

Selection of a pesticide product is not a simple process. Although they may be registered for use on the same crop and against the same pests, products differ in many ways. Differences include performance against target pests, relative toxicity, approved application methods, environmental safety, and cost. In assessing relative strengths and weaknesses, applicators should consider their own ability to handle and apply pesticides safely. Information necessary to make an informed decision about which product is best for your particular needs can be compiled through proper identification of the pest species and development of a list of pesticides registered to manage those species, and by completion of the product profile worksheet and pesticide evaluation criteria chart provided in this manuscript.

PESTICIDE EVALUATION CRITERIA CHART

Write in brand name of each
product being considered.....

1. *Product Cost / Restrictions*

2. *Applicator / Worker Safety*

3. *Water Quality*

4. *Movement Off Target*

5. *Wildlife Species and Habitat*

1 = highly acceptable; 2 = acceptable; 3 = unacceptable

The numerous factors involved in selecting a pesticide product can be digested by ranking the acceptability of each characteristic. An example using this approach is illustrated in the following chart.

PESTICIDE EVALUATION CRITERIA CHART

Write in brand name of each product being considered.....	A	B	C	D
<i>1. Product Cost and Restrictions</i>	2	3	2	1
<i>2. Applicator / Worker Safety</i>	1	3	3	2
<i>3. Water Quality</i>	2	1	1	3
<i>4. Movement Off Target</i>	2	1	1	2
<i>5. Wildlife Species and Habitat</i>	2	1	1	3

1 = highly acceptable; 2 = acceptable; 3 = unacceptable

In order to develop the example, first we completed a product profile worksheet on each of four products. Then, five worksheets—product cost/restrictions, applicator/worker safety, water quality, movement off target, and wildlife species and habitat—were used to summarize each product profile worksheet; and the ranking values from those worksheets were transferred to the pesticide evaluation criteria chart example.

Comparison of data compiled in this manner ultimately will result in the selection of a single product which best suits the situation. The same approach will work for any criteria and combination of factors deemed important. For purposes of this discussion, we will base our pesticide choice on the product cost/restrictions, water quality, and applicator/worker safety criteria as stated in the example.

First, let's look at product cost/restrictions. Reading across the table, one sees that Brand B has the worst ranking (3, unacceptable); Brand D has the best ranking (1, highly acceptable); and Brands A and C are ranked in the middle (2, acceptable). If price and use restrictions were the only criteria considered, Brand D would be the product of choice.

The second criterion we have chosen is environmental impact on water quality. From our product profile worksheets we have determined the characteristics of the application site to be conducive to leaching of pesticides into ground water. Thus, it is important to select a pesticide product that minimizes the potential for ground water contamination. The table shows that from a water quality perspective Brands B and C are the best choices (1, highly acceptable); Brand A's characteristics are acceptable (2); and Brand D is unacceptable (3).

Now we have two criteria to balance against one another: product cost/restrictions, and water quality. If we place more importance on environmental safety than price and restrictions, we can eliminate Brand D immediately because its water quality factor is unacceptable. That leaves Brands A, B, and C from which to choose.

The water quality factor of Brand A is acceptable (2), as is its cost factor; thus, Brand A is a potential choice. The water quality factor of Brand B is highly acceptable (1), but its cost factor is unacceptable (3); thus it is not a candidate. That leaves Brands A and C.

Since we have chosen to place more importance on water quality than on product cost/restrictions, Brand C is our choice *at this point in the evaluation process* based on its superior water quality rating of 1 (compared to Brand A's rating of 2 in that category). But still we must consider our third criterion: applicator/worker safety.

This is where personal ability to change pesticide management practices might allow the selection of a superior product over an average product. A review of the product profile worksheet for Brand C revealed an unacceptable ranking (3) on applicator/worker safety. That ranking was based on the fact that the mixer and applicator were required by the label to wear a respirator and chemical resistant gloves and boots; and the pesticide applicator was required to prevent workers from entering areas treated with Brand C for 24 hours after application. On the other hand, the label requirements for Brand A stipulated only that those mixing the product wear chemical resistant gloves.

If pesticide handling procedures could be adapted to meet label requirements, Brand C would be an ideal choice because the pesticide evaluation criteria in general were rated highly acceptable (1). However, if the applicator is unwilling to implement the safety procedures required by the label on Brand C, then Brand A would be a better choice.

The best decision is an informed decision, and that is what professionalism and product stewardship are all about. Remember, you have control over pesticide selection and your ability to use and apply your chosen product safely.

READING THE PESTICIDE LABEL

Read the label again *before* buying the product. Reading pesticide labels during the off-season allows ample time to understand their content. Make reading the label your first priority every time you reach for any pesticide product. Reading, understanding, and strictly adhering to label instructions will result in effective pest control with minimum risk to human health or the environment.

READ THE LABEL BEFORE PURCHASING THE PESTICIDE.

- Make sure it is registered for your intended use.
- Confirm that no prohibitions exist against the use of the pesticide
- Review the environmental precautions.
- Have the equipment needed for dispensing the pesticide.
- Review the requirements for protective equipment.

READ LABEL BEFORE MIXING AND APPLYING PESTICIDE.

- Understand how to mix and apply the material properly.
- Determine what first aid and medical treatment is necessary should an accident occur.
- Follow application methods.

READ THE LABEL WHEN STORING PESTICIDES.

- Know how to store the pesticide properly.
- Understand the precautions to prevent fire hazards.
- Be sure storage areas are posted properly.

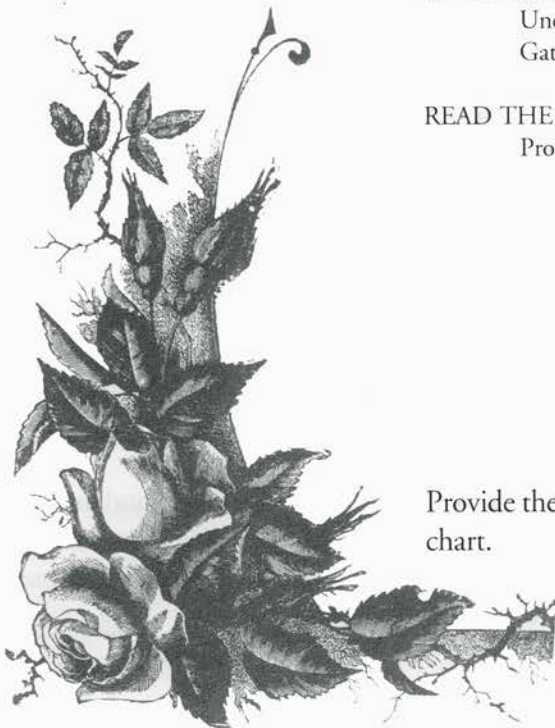
READ THE LABEL BEFORE DISPOSING OF THE PESTICIDE.

- Understand how to rinse pesticide containers properly.
- Gather all information about how to dispose of surplus pesticides.

READ THE LABEL TO EDUCATE YOUR EMPLOYEES.

- Provide the following information to employees:
 - Where and in what form pesticides may be encountered during work activities.
 - Hazards of pesticides resulting from toxicity and exposure.
 - Routes through which pesticides can enter the body.
 - Signs and symptoms of common types of pesticide poisoning.
 - Emergency first aid for pesticide poisonings.
 - Environmental precautions provided by the label.
 - Mixing, loading, and application procedures.

Provide the information in a simple format such as the following chart.



Brand Name _____ EPA Registration Number _____

Active Ingredient _____

SPECIAL APPLICATION INSTRUCTIONS

SIGNAL WORD

DANGER

WARNING

CAUTION

MIXING

APPLICATION

long sleeved shirt _____
long pants _____
coveralls _____
respirator _____
goggles _____

Chemical resistant:

apron _____
protective suit _____
gloves _____
footwear _____

EMERGENCY PHONE NUMBERS

ambulance _____
hospital _____
manufacturer _____
Poison Control Center (800) 382-9097
Chem Trek (800) 424-9300

PRECAUTIONARY STATEMENTS AND ENVIRONMENTAL HAZARDS

RE-ENTRY STATEMENTS

POINTS TO REMEMBER

The pesticide label is the primary source of general and technical information. It provides product, safety, and environmental information, and directions for use.

The pesticide label is vital for user safety and environmental protection.

All the research, testing, and regulations are reflected in the language on the label.

The pesticide registration and use processes are highly regulated, require extensive data, apply conservative decisions, and are continually reviewed and updated.

An EPA registration number on a pesticide product is in no way a product recommendation or endorsement. It is an approval of the registration documentation.

Pesticides are developed by the manufacturer, registered with EPA, and sold to the public with the assumption that users will read, understand, and follow instructions that accompany products.

The intent of the label is to provide clear directions for maximum product performance while minimizing human health and environmental risks.

It is a violation of federal and state law to use a pesticide in a manner inconsistent with its labeling. The label is a legal document, and courts consider it to be a binding contract.

The purchase and use of pesticides should include a comprehensive approach to pest control including applicator safety, environmental considerations, and product stewardship.

Reading, understanding, and strictly adhering to label instructions allow for effective pest control while minimizing health consequences to the user or family members.

ACKNOWLEDGEMENTS

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