RUTGERS
New Jersey Agricultural
Experiment Station

This is a section from the

2023/2024
New Jersey Commercial
Tree Fruit Production Guide

The recommendations are **NOT** for home gardener use.

The **full guide** can be found on the Rutgers New Jersey Agricultural Experiment Station (NJAES) website at: *https://njaes.rutgers.edu/pubs/publication.php?pid=e002*. The guide is revised biennially.

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and New Jersey Board of County Commissioners. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.

PESTICIDE USE DISCLAIMER

THE LABEL IS THE LAW

A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Before using a pesticide, check and always follow the **labeling distributed with the product at the point of sale for legally enforceable rates and restrictions**.

In addition to the pesticide products listed in this Production Guide, other formulations or brands with the same active ingredient(s) may be commercially available.
ALWAYS CHECK THE LABELING ON THE PRODUCT CONTAINER ITSELF:
a) to ensure a pesticide is labeled for the same use,
b) to ensure the pesticide is labeled for the desired crop,
c) for differences in rates and percent active ingredient, and
d) additional restrictions.

Check the physical product label for the maximum amount of pesticide per application and the maximum number of applications per year.

IMPORTANT: DO NOT RELY ON ELECTRONIC LABELING (unless it is "web labeling" found directly on the product container)**.** *Online pesticide* labels may not be the same as the labeling distributed with the product. Some services include: Proagrica's CDMS *http://www.cdms.net/*; Agworld DBX powered by Greenbook *https://www.greenbook.net*; or Agrian *https://www.agrian.com/labelcenter/results.cfm.*

These electronic label services provide use disclaimers, and in some cases legally binding User Agreements assigning ALL liability to USER of service. For example, Agrian's webpages***** cite (in red): The *material and content contained in the Agrian Label Database is for general information only. Agrian Inc. does not provide any guarantee or assurance that the information obtained through this service is accurate, current, or correct, and is therefore not liable for any loss resulting, directly or indirectly, from reliance upon this service. This Label Database does not replace the official manufacturer issued label. Users of this database must read and follow the actual product label affixed to the container before use of the product. Use of the Label Database is subject to the Terms of Use and Privacy Policy* ***** [*date accessed: 12/23/2022*].

See a detailed regulatory discussion of this and other essential information on Pesticide Safety and the Pesticide Label in Chapter 1. Electronic labeling is discussed in section 1.3.1.

If you are having a medical emergency after using pesticides, always call 911 immediately.

POISON Help®
1-800-222-1222

In Case of an Accident

- Remove the person from exposure
- Get away from the treated or contaminated area immediately
- Remove contaminated clothing
- Wash with soap and clean water
- Call a physician and/or the National Poison Control Center (1-800-222-1222). Your call will be routed to your State Poison Control Center.
- Have the pesticide label with you!
- Be prepared to give the EPA registration number to the responding center/agency

1 Pesticide Safety

1.1 General Information

Pesticides are hazardous substances that can cause serious harm if used improperly. Federal and state pesticide laws and regulations control product sale and distribution, storage, transportation, use, and disposal of pesticides. For food and feed crops, EPA establishes legal amounts of pesticide residue allowed on a crop at harvest (or in processed foods). State pesticide laws and regulations may be more restrictive, and would take legal precedence over federal.

Pesticide Registration

All pesticides sold or distributed in the United States are required to be registered by the United States Environmental Protection Agency (EPA) under the requirements of the Federal Insecticide Fungicide Rodenticide Act As Amended (FIFRA), unless they qualify for an exemption. State product registration is also required, and can be more restrictive. For example, some states require state registration of "minimum risk pesticides" which are exempt from federal registration. But, in no case can a State allow registration of a pesticide, or a use of it, without prior registration or exemption by the federal EPA.

Pesticides have an inherent toxicity, or capacity to cause harm to living organisms. Under FIFRA, EPA may only register those pesticide uses that do not pose unreasonable risk of harm to human health and the environment. EPA's determination of whether and how a pesticide is registered for sale is based on evaluation of scientific data and assessment of risks and benefits of a product's use.

The process of registering a pesticide is a scientific, legal, and administrative procedure through which EPA examines: the ingredients of the pesticide, the particular site or crop where it is to be used, the amount, frequency, and timing of its use, and storage and disposal practices.

EPA requires extensive scientific data on the potential health and environmental effects of a pesticide before granting a registration. The process EPA uses for evaluating the potential for health and ecological effects of a pesticide is called **risk assessment**. This includes evaluating the potential for harm to humans, wildlife, fish, and plants, including non-target organisms and endangered species. It also includes evaluating contamination of surface water or ground water from runoff, leaching, or spray drift.

As a condition of registration, EPA must review and approve the label. EPA then assigns an **EPA Registration Number** which is a unique product number for regular registrations, distributor registrations, Special Local Needs registrations, and Experimental Use Permits.

In order to mitigate the risk of harm to human health and the environment, EPA will impose a set of conditions, directions, and precautions that define who may use a pesticide, as well as where, how, how much, and how often it may be used. These mandatory requirements for registration are incorporated into pesticide product label statements. Pesticide product labels are legal documents. In other words, the label is the law.

IMPORTANT

This statement is found on all registered pesticide product labels in the United States:
"It is a violation of Federal law to use this product in a manner inconsistent with its labeling"

EPA Registration Review is required a minimum of every 15 years. EPA is legally authorized to initiate this process or other actions earlier, at any time in the product life cycle. EPA has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks. Pesticides (or particular pesticides uses) that no longer meet the safety standard of not posing unreasonable risk of harm to human health and the environment may be cancelled, or reregistered only with strict limitations and changes in labeled uses.

Pesticides and Food Safety

For food and feed crops, EPA is required to establish maximum pesticide residue limits allowed on a crop at harvest called “tolerances” by commodity. Tolerances, or exemptions from the requirement of a tolerance, are published in the Code of Federal Regulations at 40 CFR 180.

The Food Quality Protection Act (FQPA) of 1996 required that all existing tolerances be re-evaluated by EPA so that pesticides used on food and feed would meet a legal safety standard of “a reasonable certainty of no harm” when used according to the pesticide label. Once registered, a Registration Review of a pesticide’s registration and tolerances are conducted by EPA a minimum of every 15 years to ensure that a pesticide’s FQPA safety standard is still being met.

Tolerances are legally enforceable by the United States Department of Agriculture and Food and Drug Administration. **Meeting established food safety standards requires strict adherence to the pesticide label**. ***It is illegal and unsafe when a grower exceeds the rate of application on the label; uses a product on a crop that is not on the label; or harvests a crop before the pre-harvest interval on the label.*** If the residue exceeds the set tolerance, the crop may not be marketed or sold. It is subject to condemnation and seizure by federal or state regulatory agencies. For example, EPA issued a Final Rule cancelling all tolerances for chlorpyrifos for all food use commodities effective February 2022; see section 1.3.3 for details.

1.2 Certification and Licensing of NJ Pesticide Applicators

EPA considers certain pesticides to have the potential to cause unreasonable adverse effects to the environment and injury to applicators or bystanders unless users are specially trained in handling and application. As a condition of registration, EPA may restrict use of a pesticide, (or certain of its uses) solely to certified applicators, or someone under that applicator's direct supervision. A “**restricted use pesticide**” (RUP) is a pesticide that EPA requires may only be applied by or under the direct supervision of **trained and certified** users.

In 1972 under FIFRA, EPA required states to set up a program to train and certify applicators of RUP to use them safely without endangering human health or the environment. Pesticide applicators become certified by demonstrating that they are competent to apply or supervise the use of RUPs, generally by examination. Many states approve recertification courses that certified applicators can take to maintain their certification. The examinations and training courses pertain to a category or type of pesticide application (*e.g.*, agricultural plant pest control, seed treatment, structural pest control, etc.).

Certified users of pesticides are further classified as either private applicators or commercial applicators. Certification requirements and processes are somewhat different for each group, and may differ by State when state requirements are more stringent than federal. **New Jersey requires that each applicator also becomes licensed after passing a certification exam**. The definitions of private and commercial applicators are as follows:

Private Applicator. Any person who uses, or supervises the use of, pesticides for the purpose of raising some type of agricultural commodity. The application can be done on land owned or rented by the applicator or the applicator's employer. However, any applications done on a "for-hire" basis for the purpose of raising an agricultural commodity are considered commercial applications. Examples of private applicators are dairy farmers, vegetable or fruit growers, greenhouse growers, and ranchers that apply pesticides only within their own confines.

Commercial Applicator. Any person who uses, or supervises the use of, pesticides on a "for-hire" basis; any person who applies pesticides for non-agricultural purposes; or any person who applies pesticides as a part of their job. This includes employees using pesticides in the course of their job working with any governmental agency such as a County mosquito control commission.

Examples of commercial applicators in agriculture are those individuals who work for a commercial pesticide handling establishment that provide handler services to growers or nurseries during the growing season. When hiring application services, verify that the supervising handler is licensed as a *commercial* applicator, as well as the *corresponding category of use* required by New Jersey regulations for the application being made (for example, Agricultural Pest Control, Plant Agriculture Pest Control, or Aerial Application). Individuals providing soil fumigation services for hire must be licensed as commercial applicators by the State where they **perform** fumigation.

IMPORTANT

In New Jersey, private and commercial applicators, including organic growers, must be certified AND possess a valid applicator license to make applications or supervise the use of ANY* EPA-registered pesticide (*as required NJAC 7:30; limited exemptions exist).

Licensed commercial applicators must always be physically present when an unlicensed individual is making a commercial pesticide application. New Jersey licensed commercial pesticide "operators", acting under the direct supervision of a licensed commercial applicator, may legally make applications without that applicator being physically present. However, the supervising licensed applicator must be immediately available by phone, beeper, text, etc., and be able to be present within three hours ground transportation.

To become a licensed pesticide applicator in New Jersey, one must first pass a State certification exam. Private applicator certification is accomplished by passing the New Jersey Department of Environmental Protection (NJDEP) Private pesticide applicator certification exam. This exam is based on the training manual entitled **"Pesticide Applicator Training Manual - Private."** This training manual can be ordered online and directly shipped to you. Or you may continue to obtain manuals from your County Cooperative Extension Office. See Rutgers PSEP Applicator Manual website at: *https://pestmanagement.rutgers.edu/pat/manuals/* for details.

In 2020, New Jersey pesticide regulations were revised to specifically allow DEP to designate a third party to administer pesticide examination registration. NJDEP's approved third party exam registration system **P**esticide **A**pplicator **C**ertification **E**xam **R**egistration (**PACER**) is managed by the Rutgers NJAES Office of Continuing Professional Education (OCPE). See section 1.7 for specifics on exam registration using PACER.

In January 2021, NJDEP and Rutgers OCPE announced the availability of online pesticide examinations. Once registered, you may take your pesticide exams online 24/7. In-person exams are also offered. Rutgers OCPE publishes a schedule on their website of in-person examinations in different geographic locations with morning and afternoon sittings available. Registration is accepted via PACER's online system; see section 1.7.

Once having successfully become certified, a private pesticide applicator must then complete and file a license application with the NJDEP. This must be completed within 12 months after a person has become fully certified and eligible to become licensed as a private pesticide applicator. Any certified pesticide applicator who fails to file for a license within 12 months following certification will lose their certification status and shall again have to become certified in accordance with the exam process.

If there are any questions on the certification program for Private Pesticide Applicators, please call the PCP at (609) 984-6568. Once you have passed your certification exam, your certification is good for a minimum of 5 years. There is no fee charged for Private Certified Pesticide Applicator licenses. In order to maintain a valid Pesticide Applicator Certification in the state of New Jersey, pesticide applicators must earn a minimum of 24 recertification credits within the subsequent 5 year period by attending continuing education courses.

Private applicators must accumulate 8 units of credit (one unit equals 30 minutes of instruction time) in Core subject matter and 16 units of credit in Private Part 2 (PP2) subject matter over the 5 years. Examples of Core subject matter are topics such as pesticide regulations, the hazards of pesticide use, and the use of personal safety equipment. Examples of PP2 subject matter are topics such as pest identification, methods of pest control, including integrated pest management, and the proper use of specific pesticides.

Check the NJDEP Recertification Course page at *https://www.nj.gov/dep/enforcement/pcp/bpo-recert.htm* for courses currently being offered by Rutgers Cooperative Extension, professional associations, and private companies. As the land-grant university for the state of New Jersey, Rutgers University's New Jersey Agricultural Experiment Station Cooperative Extension (RCE) provides cutting-edge programs and conferences, with sessions eligible for recertification credit. Rutgers is tapped for the expertise of its Cooperative Extension Specialists, County Agents/Program Coordinators, and Pesticide Safety Education Program (PSEP).

You will receive an update of your recertification status from the NJDEP at least once a year. The "Recertification Update Form" will tell you when your 5-year recertification period is up; how many recertification units you have accumulated; and how many more you need. If you have not accumulated the required 24 recertification credits within the 5-year period, your Recertification Update Form will notify you that your

license is about to expire due to lack of recertification credit; you have until October 31st of that year to get your credits. You always have the option of taking the Private Applicator Exam to become certifiable to become a licensed Private Pesticide Applicator in NJ. **New licenses are NOT sent automatically.**

IMPORTANT

New licenses are NOT sent automatically, even if you have accrued the required credits.
Hardcopy licenses are generated for both private and commercial applicators within the NJDEP computer system first through the generation of an "invoice" sent to the applicator. In the case of private applicators, **you will receive an invoice for $0.00 because there are no licensing fees for private applicators**.

Next, if you have accumulated the requisite number of credits within the 5-year recertification period, the Recertification Update Form provides instructions for you to **process your zero invoice *online* in order to receive your new hardcopy license**.

NJDEP's online Invoicing System (versus mail) is now required for use by private applicators to process the zero-fee license. See the NJDEP Licensing and Registrations webpage for specific directions at: *https://www.state.nj.us/dep/enforcement/pcp/bpo.htm*.

1.3 The Pesticide Label

The correct, safe, and legal use of any pesticide is always found on the product label. Pesticide labels contain such important and pertinent information as the brand or trade name, the amount of active ingredient, directions for use, environmental hazards, what to do in the case of an accident, and storage and disposal directions.

Each product is required to have its EPA registration number and EPA establishment number as part of the container label. These numbers are valuable to pesticide applicators as unique identifiers in case of: accidental poisoning; claims of misuse; faulty product (poor control or phytotoxicity, for example); or liability claims.

1.3.1 Labels and Labeling

A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Labels are the written, printed, or graphic matter on, or attached to, the pesticide or device or any of its containers or wrappers. "Labeling" means the label and any technical bulletins, circulars, leaflets, or other printed or graphic material to which the label refers to, or which accompanies the product when distributed or sold. Advertising material not accompanying the product is not considered labeling.

Literature such as Safety Data Sheets legally become a part of the pesticide labeling, **but only when accompanying a pesticide (*i.e.*, during distribution and sale).** The SDS (formerly called a MSDS) is written or printed material concerning a hazardous chemical that is prepared by the manufacturer or the company importing the product describing the physical and chemical properties of the product according to specific guidelines.

Webpages cited in/on the label are legally considered labeling. This includes when a label has a Quick Response Code (QR Code) barcode that leads to consumer information. Another example is when a label requires the completion of EPA-approved training and provides its web link. A condition of legal use by the applicator of the pesticide product would be completion of the online training (*see example for paraquat under section 1.3.3*).

"Web-distributed labeling" is a legally valid, enforceable labeling for a pesticide product that is accessible online. The product label provides a link that directs users to the website with the web-distributed labeling. The complete online label must be printed and in the possession of the applicator when using the product. Web-distributed labeling is **currently voluntary for pesticide manufacturers to adopt**, and not supported by the vast majority of pesticide manufacturers.

With the exception of "web-distributed labels" or specific links found directly on the product label, **pesticide**

labels downloaded from the web are NOT legal documents. Sources of online labels include: State regulatory agencies; EPA; and labeling services such as Kelly Solutions, CDMS, National Pesticide Information Retrieval System (NPIRS), Agrian, and others. Almost all provide disclaimers that they are only "specimens" of a label. Online labels may be helpful, but they should not be substituted for the label distributed with and on the container itself. Product formulations and directions periodically change. Although a product container may appear the same, never assume that a replacement container has exactly the same contents and labeling as what you last purchased.

Labeling can include **Supplemental Labels** that are distributed with the product. These partial labels are EPA-approved new, not previously registered uses of the product. These new uses will typically be included in subsequent product labels. Supplemental labels must bear the product's EPA registration number, and direct users to the product label for complete directions and precautions. Another example of a Supplemental Label is a "Section 24C Local Needs" label (Section 24C) where a State issues a Supplemental Label with an additional use of a federally registered pesticide product, or a new end use product to meet special local needs. Compliance with both the product label and supplemental labeling is required to safely and effectively use these products. **Important: Both the product label AND supplemental labeling must be in the possession of the user when using the product.**

1.3.2 Label Statements: Restricted Use Classification, Signal Words, First Aid, and Other

FIFRA requires that each product label bears both hazard and precautionary statements for humans and domestic animals. Hazard statements describe the type of hazard that may occur, while precautionary statements will either direct or inform the user of actions to take to avoid the hazard or mitigate its effects. EPA's decision to register a product is based, in part, on the assumption that mandatory use directions, restrictions, and precautions of the pesticide label will be followed by the applicator. This section contains information on selected statements that will be found on a pesticide label.

Restricted Use Classification Statement

The "**Restricted Use Pesticide**" (RUP) classification, and the reason for RUP classification must appear at the very top of the label's front panel directly under the phrase "Directions for Use". EPA may assign a restricted use classification when it has determined that the pesticide product, or its use, has a high acute toxicity; has a history of accidents; may cause oncogenic effects (tumors), teratogenic effects (birth defects), fetotoxic effects (harm to a developing fetus), or reproductive effects (such as a lowered sperm count); can leach into ground water; or can harm wildlife.

As a condition of product registration, a pesticide (or certain uses of it), that are classified as restricted use, must bear the statement: "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".

The RUP statement must also include the reason for restricting use. ***The RUP statement for a particular pesticide product containing the active ingredient atrazine is depicted in the box directly below***. The label signal word for this product is "Caution", and would not warrant RUP classification by acute toxicity. However, note that in this instance, EPA restricted use to certified applicators and those under their direct supervision due to ground and surface water concerns.

RESTRICTED USE PESTICIDE

(GROUND AND SURFACE WATER CONCERNS)

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.

THIS PRODUCT IS A RESTRICTED-USE HERBICIDE DUE TO GROUND AND SURFACE WATER CONCERNS. USERS MUST READ AND FOLLOW ALL PRECAUTIONARY STATEMENTS AND INSTRUCTIONS FOR USE IN ORDER TO MINIMIZE POTENTIAL FOR ATRAZINE TO REACH GROUND AND SURFACE WATER.

On a case-by-case basis, some product-specific RUP statements may be more restrictive based on risk management decisions by EPA. Paraquat is a recent example; see section 1.3.3 for details on its more restrictive RUP statement: "Restricted Use Pesticide Due to Acute Toxicity For Retail Sale To and Use By Certified Applicators Only - Not to Be Used by Uncertified Persons Working Under the Supervision of a Certified Applicator". Also, some states may impose further restrictions on a RUP, such as limiting sale to certified applicators only.

IMPORTANT

Only certified applicators possessing a valid New Jersey applicator license may purchase restricted use pesticides. At no time can either licensed pesticide operators or unlicensed handlers purchase RUPs in New Jersey.

Signal Words

An important feature of pesticide labels is that they are required by law to carry certain "signal words" on the front panel of the label that indicate their **relative acute toxicity to humans**. The signal word on EPA pesticide products can be **DANGER**, **WARNING**, or **CAUTION**. Signal words help alert users to the **acute (short-term)** toxicity of the formulated pesticide product.

The signal words are typically determined by the results of the six acute toxicity studies performed with the product formulation: acute oral, acute dermal, acute inhalation, primary eye irritation, primary skin irritation, and sensitization. The acute toxicity studies measure systemic toxicity by route of exposure; while the primary eye and skin studies measure irritation or corrosion; and the dermal sensitization study evaluates the potential for allergic contact dermatitis.

EPA signal words designated on a product label are based on the LD_{50} acute toxicity data of the pesticide product as formulated. Data are collected from small mammal population studies where a common measure of acute toxicity is the lethal dose (LD_{50}) or lethal concentration (LC_{50}) that causes death (resulting from a single or limited exposure) in 50 percent of the treated animals.

EPA categorizes acute toxicity of pesticides into four toxicity categories (I - IV) using LD_{50} data according to regulations at 40 CFR §156.62 and its draft revision in 1984. Chemicals are considered highly toxic when the LD_{50}/LC_{50} is small (Toxicity Category 1) and practically non-toxic (Toxicity Category IV) when the value is large.

Assignment of Signal Word

The signal word is determined by the most severe toxicity category assigned to the five acute toxicity studies (see Table 1.1). Dermal sensitization is simply positive or negative and is not assigned a Toxicity Category. So, for example, if a pesticide product was assessed as Toxicity Category III for inhalation but a Toxicity Category II for oral, the Signal Word placed on the label would be WARNING corresponding to the more highly toxic Category II. A signal word is required for all registered pesticide products, unless the pesticide product is classified as Toxicity Category IV for all routes of exposure, and is negative for dermal sensitization.

Signal words alert the applicator to the relative acute toxicity for short term exposure, during the application itself. It is important for applicators to understand that LD_{50}/LC_{50} data has limited use for comparing pesticides (other than acute toxicity). They do not reflect what dose may lead to other less serious, acute systemic effects, or to other, possibly equally serious contact effects or delayed systemic effects.

- LD_{50}/LC_{50} data does not reflect any effects from long-term exposure (*i.e.*, cancer, birth defects or reproductive toxicity) that may occur at levels below those that cause death.
- Also, they do not translate directly to humans because our body systems are slightly different from those of test animals (*e.g.*, rats, mice, etc.).
- Lastly, the LD_{50} and LC_{50} are measures of a single exposure, not the potential buildup of effects resulting from multiple exposures.

Most importantly, the results of the six acute toxicity studies determine the appropriate precautionary statements for the hazards to humans and domestic animals, personal protective equipment, and first aid statements. Hazards to Humans and Domestic Animals statements are required for products classified as toxicity categories I, II, or III, or positive for skin sensitization. Hazards to Humans and Domestic Animals statements may specify both mandatory actions and advisory information.

IMPORTANT

Hazard is a function of both toxicity as well as the amount and type of exposure…
The danger in handling pesticides does not depend *exclusively* on toxicity values. Relatively nontoxic pesticides can be hazardous if label instructions are not followed. Don't collapse the acute **HAZARD** that Signal Words signify with **RISK** of hazard! A compound may be highly toxic but presents little hazard to the applicator if the label precautions are followed carefully.

Table 1.1 EPA Signal Words According to Toxicity Categories (I, II, III, IV) of Pesticide Products[1]

Study	Category I		Category II	Category III	Category IV
	 **Danger Poison** (*in red*)	**Danger**	**Warning**	**Caution**	**None or Caution**
Acute Oral	$LD_{50} \leq 50$ mg/kg	_	$LD_{50} > 50$ - 500 mg/kg	$LD_{50} > 500$ - 5,000 mg/kg	$LD_{50} > 5{,}000$ mg/kg
Acute Dermal	$LD_{50} \leq 200$ mg/kg	_	$LD_{50} > 200$ - 2,000 mg/kg	$LD_{50} > 2{,}000$ - 5,000 mg/kg	$LD_{50} > 5{,}000$ mg/kg
Acute Inhalation	$LC_{50} < 0.05$ mg/liter	_	$LC_{50} > 0.05$ - 0.5 mg/liter	$LC_{50} > 0.5$ thru 2 mg/liter	$LC_{50} > 2$ mg/liter
Primary Eye Irritation	_	Corrosive; irreversible destruction of ocular tissue; corneal involvement or irritation persisting more than 21 days	Corneal involvement or irritation clearing in 8-21 days.	Corneal involvement or irritation clearing in 7 days or less	Minimal effects clearing in less than 24 hours
Primary Skin Irritation	_	Corrosive (tissue destruction into the dermis and/or scarring)	Severe irritation at 72 hours (severe erythema or edema)	Moderate irritation at 72 hours (moderate erythema)	Mild or slight irritation (no irritation or slight erythema)
Dermal Sensitization	Positive		Negative		
	Product is a sensitizer or is positive for sensitization		Product is not a sensitizer or is negative for sensitization		

[1] Adapted from EPA Label Review Manual Chapter 7, rev March 2018.

PESTICIDE SAFETY

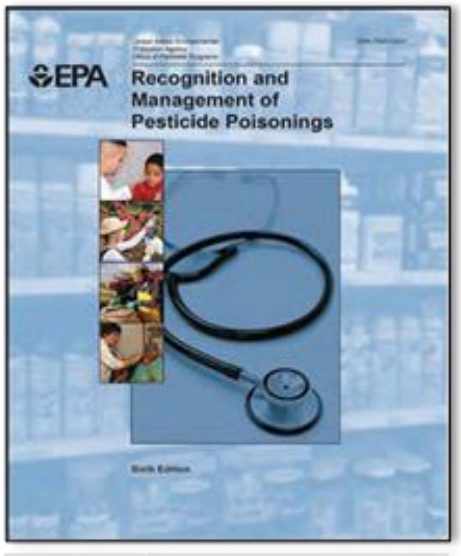
- **EPA Toxicity Category I: DANGER POISON** (*in red*).

Highly toxic, causing acute *systemic* illness if eaten, absorbed through the skin, or inhaled. The approximate lethal dose to kill the average person by ingestion is a taste to a teaspoon. The product labels of any products with "Danger-Poison" must have: 1) the skull and crossbones; 2) the word "POISON" prominently printed in red on a background of distinctly contrasting color; and 3) A statement of an antidote or a practical treatment in case of poisoning by the pesticide.

- **EPA Toxicity Category I: DANGER**.
  Highly toxic, through corrosivity causing irreversible damage to the skin or eyes. The term "Poison" should not be used for products Category I Toxicity when the determining effect is not systemic illness (by oral, respiratory, or skin absorption routes of exposure).
- **EPA Toxicity Category II: WARNING**.
  Moderately toxic if eaten, absorbed through the skin, inhaled; or it causes moderate eye or skin irritation. The approximate lethal dose to kill an average person through ingestion is a teaspoon to an ounce.
- **EPA Toxicity Category III: CAUTION**.
  Slightly toxic if eaten, absorbed through the skin, inhaled; or it causes slight eye or skin irritation. Ingestion of an ounce to more than a pint is the approximate amount needed to kill the average person.
- **EPA Toxicity Category IV: None Required (or CAUTION as optional)**.
  Lowest EPA toxicity category (IV) by all routes of exposure (oral, dermal, inhalation); and does produce the other effects of eye or skin irritation. They do not require a signal word. However, a manufacturer may voluntarily use the signal word "Caution" for Toxicity Category IV.

First Aid Statements

First aid statements generally provide initial first steps to take when accidental exposure occurs, and may inform physicians and emergency responders of appropriate medical procedures for victims of poisoning. Pesticide labels are required to have First Aid statements if the product has systemic effects in EPA Toxicity Category I, II, or III, or skin or eye irritation effects in Category I or II. Some labels will have First Aid statements for use dilutions specified by the label.



Be alert for the early symptoms of pesticide poisoning and contact effects in yourself and others. Recognizing symptoms early and providing an immediate first-aid response may save a life or prevent permanent injury. The ***Recognition and Management of Pesticide Poisonings: 6th Edition*** manual gives healthcare providers a quick reference resource for the best toxicology and treatment information for patients with pesticide exposures. Downloadable in its entirety or by chapter at: *https://www.epa.gov/pesticide-worker-safety/recognition-and-management-pesticide-poisonings*. The fifth edition is available in Spanish. Free copies of the manual (EPA publication # 735K13001) are available from the National Service Center for Environmental Publications at: *https://www.epa.gov/nscep*.

Do not wait until you or someone else gets dangerously ill before calling a physician or going to a hospital. It is better to be too cautious than to act too late. **Any time after using pesticides, if you are having a medical emergency or require immediate medical attention, call 911 immediately.** Prompt action and treatment may save a life. **Seek medical attention immediately if you or any of your fellow workers have unusual or unexplained symptoms that develop within 24 hours of a pesticide exposure**. If you have any of the following symptoms during or shortly after using pesticides: headache, blurred vision, pinpoint pupils, weakness, nausea, cramps, diarrhea, and discomfort in the chest, **call a physician and/or the National Poison Control Center hotline (1-800-222-1222).**

Anyone with a pesticide exposure or poisoning emergency can call the national toll-free Poison Control Center telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary.

Take the pesticide label with you, either a duplicate copy or the one attached to the container (or at a minimum, the EPA registration number of the product). To avoid contamination and exposure, do not carry pesticides in the passenger space of the vehicle.

If you are having a medical emergency after using pesticides, always call 911 immediately.

POISON Help®
1-800-222-1222

In Case of an Accident

- **Remove the person from exposure**
- **Get away from the treated or contaminated area immediately**
- **Remove contaminated clothing**
- **Wash with soap and clean water**
- **Call a physician and/or the National Poison Control Center (1-800-222-1222). Your call will be routed to your State Poison Control Center.**
- **Have the pesticide label with you!**
- **Be prepared to give the EPA registration number to the responding center/agency**

Other Label Statements

If risks of concern are identified in the risk assessment, EPA evaluates potential risk management measures. Precautionary statements that reduce risk will be included on the label, such as:

- reductions in application rates and changes to directions for use;
- extending the length of time for the restricted-entry interval;
- requiring engineering controls, such as use of closed systems for mixing and loading to reduce potential exposure to those who mix and load pesticides;
- safe handling procedures to avoid spills;
- not spraying the pesticide when a crop blooms to protect pollinators; or
- create buffers of unsprayed zones along water bodies to reduce exposure to surface water, etc.

In some cases, the use of a pesticide may only be acceptable if one or more risk mitigation measures are implemented. In other cases, pesticides will not be reregistered for certain use sites or for all uses because of unacceptable worker risk. When EPA determines that labeling cannot sufficiently mitigate the risk of pesticide harm, it may include special risk mitigation measures. See Soil Fumigants and Paraquat Dichloride (Paraquat) in section 1.3.3 for recent label changes to allow continued registration for these highly toxic pesticides.

1.3.3 Significant Labeling Changes: Soil Fumigants, Paraquat Dicloride, and Chlorpyrifos

Soil Fumigants

EPA required specific safety measures to increase protections for handlers, re-entry workers, and bystanders from risk of exposure for use of the **soil fumigants chloropicrin, dazomet, metam sodium/potassium, 1,3-dichloropropene (Telone), iodomethane, dimethyl disulfide (DMDS), and methyl bromide**. As gases, fumigants move from the soil to the air at the application site and may move off site at concentrations that produce adverse health effects in people from hours to days after application. These health effects range from mild and reversible eye irritation to more severe and irreversible effects, depending on the fumigant and the level of exposure.

Revised safety measures were incorporated in the product labels to increase protection for agricultural workers and bystanders - people who live, work, or otherwise spend time near fields that are fumigated. **Each of these fumigants have been reclassified as restricted use pesticides due to acute toxicity, and can only be used by a certified applicator or persons under their direct supervision.** Additionally, the labels of these pesticides were amended to require that only trained handlers can assist with application and apply these soil fumigants.

In 2012, each manufacturer was required to develop and implement **training programs for applicators in charge of soil fumigation,** so these applicators are better prepared to effectively manage fumigant operations. Training must be completed every 3 years. Currently **EPA-approved soil fumigant training** for certified applicators may be found at: *https://www.epa.gov/soil-fumigants/soil-fumigant-training-certified-applicators*.

Soil fumigant labels require users to prepare a site-specific **fumigation management plan** (FMP) before the application begins. EPA has developed fumigant management plan templates that fulfill the elements required by the labels; see *https://www.epa.gov/soil-fumigants/fumigant-management-plan-templates-phase-2-files-listed-chemical.* Alternately, users may develop their own fumigant management plan or use one developed through an outside vendor to meet the label requirements rather than using these templates.

Some states currently require pesticide applicator certification categories for soil fumigation. These states may develop separate manuals, or they may use a national manual/certification study guide, the "Soil Fumigation Manual" produced by the National Association of State Departments of Agriculture Research Foundation can be downloaded: *http://s3.amazonaws.com/nasda2/media/Pages/Fumigation_lo.pdf?mtime=20171025135626*.

Additionally, some states will be requiring applicators to notify their state's licensing agency prior to use of these fumigants. If you use commercial fumigators, be sure to verify their category license for your State.
Currently, New Jersey does not have a separate license requirement for use of soil fumigants. Private applicators do not have to have an additional license to apply soil fumigants in New Jersey. And commercial soil fumigation may be performed by those commercial applicators possessing a category license in Agricultural Plants. However, private or Agricultural Plant category applicators are still required to read and follow all elements of the soil fumigant label, just like any other pesticide. In New Jersey there is no requirement for notification of soil fumigant use to the NJDEP. Rutgers has a limited stock of the national Soil Fumigation Manual (cited above) available to NJ applicators to use as a reference.

Based on revision of federal pesticide applicator certification regulations, some method of separate **method-specific soil fumigation certification** will be required by all state pesticide regulatory agencies, if not already in place. **These changes will require revision of state regulations in most cases**.
Earliest anticipated implementation in New Jersey is 2024.

Paraquat Dichloride (Paraquat)

Paraquat dichloride (commonly referred to as "paraquat") is highly toxic to humans. One small accidental sip can be fatal, and there is no antidote. Dermal or eye contact can also have serious lasting effects. A combination of public concern and EPA's evaluation of incident data prompted an in-depth statistical analysis of paraquat incidents ahead of the typical mitigation phase of Registration Review.

EPA's "Paraquat Dichloride Human Health Mitigation Decision" required changes in allowed uses of paraquat to mitigate risk to human health incidents involving paraquat. Risk mitigation measures that must be implemented to address accidental ingestion and worker exposure incidents were based on the high number and severity of human health incidents associated with the pesticide.

Sample revised RUP statement on paraquat product label with "acute toxicity" reason for RUP status.

RESTRICTED USE PESTICIDE
DUE TO ACUTE TOXICITY
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS ONLY – **NOT TO BE USED BY UNCERTIFIED PERSONS WORKING UNDER THE SUPERVISION OF A CERTIFIED APPLICATOR.**

In order for pesticide products containing paraquat to meet the FIFRA standard for registration, EPA determined the following risk mitigation measures were necessary for continued registration:

1. Use of paraquat is restricted to certified pesticide applicators only (*see RUP statement graphic above*).
2. Noncertified persons working under the supervision of a certified applicator are prohibited from using paraquat (including mixing, loading, applying the pesticide, and other pesticide-related activities);
3. Applicators are required to take an EPA-approved paraquat training program every 3 years in order to mix, load, apply, or handle paraquat;
4. Changes to the pesticide label and warning materials (*see cap seal to right*) to highlight the toxicity and risks associated with paraquat; and
5. New closed-system packaging designed to make it impossible to transfer or remove the pesticide except directly into the proper application equipment.

Paraquat Cap Sticker

All persons handling paraquat are expected to take the training every 3 years and retain documentation of successful completion. The pesticide label provides the link *www.usparaquattraining.com* to access the training; this redirects to the Extension Foundation Online Campus site where the EPA-approved paraquat training is hosted at *https://campus.extension.org/enrol/index.php*. The one-hour training is available in both English "How To Safely Use and Handle Paraquat-Containing Products" and Spanish "Cómo Utilizar y Manejar con Seguridad los Productos que Contienen Paraquat." After completion, a training certificate is generated for applicators to keep in their records for three years.

Chlorpyrifos

Growers should NOT use chlorpyrifos after February 28, 2022 on any food or feed crop that will be marketed *in the United States* because there will be no tolerance or exemption from a tolerance for the use of chlorpyrifos. This includes apples, nectarines, plums, and peaches. If the residue exceeds the set tolerance, the crop may not be marketed or sold. It is subject to condemnation and seizure by federal or state regulatory agencies. The tolerance revocation does NOT impact application to non-bearing fruit/nut trees *(see narrative below for details).*

Chlorpyrifos is an organophosphate insecticide, first registered in 1965; labeled product names have included Lorsban, Dursban and other trade names. It has been used for a **large variety of agricultural uses**, including soybeans, **fruit and nut trees**, broccoli, cauliflower, and other row crops, **as well as non-food uses**. Chlorpyrifos is a cholinesterase inhibitor, requiring medical monitoring (see section 1 4.1. for requirements).

Currently, chlorpyrifos remains registered as it undergoes registration review, a program that re-evaluates all pesticides on a 15-year cycle.

In 2020, EPA issued its Third Revised Human Health Risk Assessment incorporating all use restrictions. **EPA has determined that the current aggregate exposures from use of chlorpyrifos do NOT meet the legally required safety standard that there is a reasonable certainty that no harm will result from such exposures.** Accordingly,

in August 2021, **EPA revoked all tolerances for chlorpyrifos** published in the Code of Federal Regulations at 40 CFR 180 when it released the "Final Tolerance Rule for Chlorpyrifos"**.**

The rule set the revocation of ALL chlorpyrifos food tolerances to be at the end of 6 months of publication of the August 2021 rule (*i.e*., **February 28, 2022**). Any applications of chlorpyrifos made after that date will render any food so treated adulterated and unable to be distributed in *interstate* commerce (see box with stop use date).

The tolerance revocation does not impact application to non-bearing fruit/nut trees. EPA's FAQ addresses this and states: "…Applications of chlorpyrifos to or around fruit/nut trees may be considered a non-food use provided applications are made to non-bearing trees" (*i.e*., **trees without fruit present at the time of application and that will not bear fruit within one year**). For example, LORSBAN 50W IN WATER SOLUBLE PACKETS INSECTICIDE is registered in New Jersey for 2023 for **foliar, dormant, and delayed dormant treatments on apple,** and **bark treatment on fruit trees**.

AND **if growers are in possession of chlorpyrifos products labeled for application to fruit/nut trees**, growers may apply those products consistent with the labeling after Feb. 28, 2022, in the following manner: application is **permitted to fruit and nut trees that are in their first year of planting (or grafted onto existing roots) and will not bear any fruit or nuts within one year, and to any non-bearing fruit trees**. Chlorpyrifos products used in the way described above will still be consistent with the label directions. [*See Question 7A at https://www.epa.gov/ingredients-used-pesticide-products/frequent-questions-about-chlorpyrifos-2021-final-rule#question-7*].

The tolerance rule issued on August 30, 2021, **does NOT prohibit sale and distribution of registered pesticide products**. Non-agricultural, non-food uses of chlorpyrifos remain in the United States. EPA's registration review of chlorpyrifos is due in 2022. However, sale and distribution of chlorpyrifos products *labeled for use on food crops* would be considered misbranded; therefore, it would be a violation of FIFRA to sell and distribute those products. Accordingly, all registrants of chlorpyrifos with food uses have either voluntarily requested cancellation or have been issued a "Notice of Intent to Cancel" by EPA. Non-food uses of chlorpyrifos remain registered.

Please contact the New Jersey Department of Environmental Protection or your Rutgers Extension Pesticide Safety Education Program for further assistance. See section 1.7 for contacts.

1.4 Handling Pesticides

1.4.1 Prior to Pesticide Application

Use pesticides for only those crops specified on the label, and use only those that have both state and federal registration. Using a pesticide for any other uses or in any other manner than specified on the label is against the law.

Verify, prior to application, that a commodity-specific tolerance or tolerance exemption exists for a particular pesticide prior to use on food or feed crops. For a list of pesticides that have tolerances or exemption from the requirements of an tolerance, see *https://www.epa.gov/pesticide-tolerances/how-search-tolerances-pesticide-ingredients-code-federal-regulation*s. Contact your Rutgers Cooperative Extension Specialists, Agents, and IPM Program for assistance if in doubt.

In advance of the application itself, applicators should **read and review the label carefully**, and make preparations to be able to follow all directions and precautions specified by the label. Determine in advance proper safety equipment, protective clothing, and measuring equipment you will need for the pesticide task that you will be performing. The protective equipment necessary may include socks, shoes, long pants, long-sleeved shirt, and a hat. Additional safety equipment may also be required by the label. Consult the Precautionary Statements of the pesticide label for the minimum Personal Protection Equipment (PPE) required by law. See sections 1.5.2.1, Body Protection for Early Entry Workers and Pesticide Handlers, and 1.5.2.2, Respiratory Protection for Pesticide Handlers, for further directions on selection and use of the protective equipment according to the pesticide label.

New Jersey pesticide regulations require that all application equipment that will be used has been **properly maintained and calibrated, and is in good working order** prior to application.

Prior to application, be sure to **check the First Aid statements on the label**. Have any label-specified antidotes on hand in advance.

Your physician should be advised of the types of pesticides you use in your work. They may determine the need for medical monitoring for continued use; this includes certain uses of cholinesterase-inhibiting organophosphate and N-methyl carbamate pesticides (*see box below*). When a pesticide is a cholinesterase inhibitor, this is identified in the First Aid statements of the label.

When you will be using a pesticide that requires the use of a respirator, you will need to be medically evaluated and receive a medical clearance for your use of that respirator under its conditions of use. See section 1.5.2.2, Respiratory Protection for Pesticide Handlers, for details.

Prior to applying or otherwise handling pesticides, be sure to have a supply of clean water and liquid detergent available for drenching and washing in case of an accident. When the label requires eye protection, handler employers must provide at least one pint of water per handler in portable containers that are immediately available to each handler. Whenever a handler is mixing or loading a pesticide product whose labeling requires protective eyewear during handling (or is mixing or loading any pesticide using a closed system operating under pressure), the handler employer must provide at each mixing/loading site, at least one system that is capable of delivering gently running water at a rate of least 0.4 gallons per minute for at least 15 minutes; or at least six gallons of water in containers suitable for providing a gentle eye-flush for about 15 minutes.

Medical Monitoring Cholinesterase-inhibiting Pesticides*:
It is recommended that you advise your physician if: you will be using Class 1 and Class 2 organophosphates (OPs) and N-methyl carbamates; or simply OPs. Monitoring of blood cholinesterase level is recommended for those who will be using these pesticides for greater than a total of 30 hours in 30 consecutive days. **Before the start of the spray season**, each applicator should have a baseline blood cholinesterase level determination. The level of blood cholinesterase should be re-evaluated using the same lab during the spray season when 30 hours use within 30 days is reached or exceeded. **The Migrant Clinicians Network website "Cholinesterase Testing Protocols for Healthcare Providers" outlines protocols, when medical removal from the job is necessary, and return to duty can be allowed. See: https://www.migrantclinician.org/toolsource/resource/cholinesterase-che-testing-protocols-and-algorithm-healthcare-providers.html*

1.4.2 Pesticide Application

Always have the label readily available when applying a pesticide.

- Do **not** handle or apply pesticides if you have a headache or are not feeling well.
- **Never** smoke, eat or drink (or use cell phones) while handling pesticides.
- **Avoid** inhaling pesticide sprays, dusts, and vapors. If the pesticide is dangerous to your respiratory system, the label will tell you to wear a respirator and specify which type (see section 1.5.2.2, Respiratory Protection for Pesticide Handlers).
- Thoroughly wash exposed areas of yourself before eating, drinking, using tobacco products, using the bathroom, or using your cell phone. Wash your gloves with soap and water before you take them off. Then wash your hands and face.
- If hands, skin, or other body parts become contaminated or exposed, wash the area immediately with clean water and a liquid detergent. If clothing becomes contaminated, remove it immediately. If you splash a concentrate of a pesticide labeled with a "Danger "or "Warning" signal word, take your contaminated clothing off immediately. Dispose of garments drenched with concentrates of any pesticides labeled with Danger or Warning signal words; do not wash these items.
- After each spraying or dusting, bathe and change your clothing; always begin the day with clean clothing. Wash contaminated clothing separately from other garments and run an extra rinse cycle afterwards. Always have someone with you or close by if you are using highly toxic pesticides (those with the signal word **DANGER** plus skull and crossbones).

Application Rate

Always follow the pesticide label 'Directions for Use' regarding who may use, where, how, how much, and how often the pesticide may be used. In addition to those mandatory statements, pesticide manufacturers also provide additional advisory information on the label on how to use a pesticide most effectively.

Application Records

Records document proper application. Records are one of the first things that regulators review when they have received a complaint. Consider treating each record as documentation of a lawsuit going forth in court. Always keep a record of all pesticides used (dates, locations, quantities, etc.) as required by the NJDEP.

New Jersey regulations (NJAC 7:30-8.8 Records) require **private applicators** to maintain records of all applications of pesticides (both general and restricted use) for 3 years. All records should be recorded in writing as soon as possible, but no later than 24 hours after the application. These records must be made available to the New Jersey Department of Environmental Protection and medical personnel (for emergencies) upon request. Rutgers Pesticide Safety Education Program's website provides templates designed for private applicators, and operations covered by the WPS to keep records of all their pesticide applications; see: *https://pestmanagement.rutgers.edu/pat/record-forms-2/.* These templates are provided as a courtesy and are not regulatory documents. **For additional information on pesticide application recordkeeping, contact the New Jersey Department of Environmental Protection, or Rutgers Cooperative Extension Pesticide Safety Education Program. See section 1.7 for contacts.**

1.4.3 Pesticide Transport

When pesticides are transported, containers must be well secured to prevent breakage or spillage. If pesticide containers are glass, pad and secure them to prevent breakage. When containers are larger than 5 gallons, tightly brace them to a structural part of the vehicle to prevent accidental spills. Carry a supply of absorbent material to soak up or contain any liquid spills. Keep a shovel and/or broom and pan in the transport vehicle to help quickly contain any spills. Carry a working fire extinguisher (10 - B: C dry chemical, or carbon dioxide) immediately accessible on board as well.

While under transport, pesticides must be stored in a separate compartment from the driver such as the bed of a pick-up truck or a van equipped with a partition. All pesticide containers and equipment must be secured to the vehicle so as to prevent removal by unauthorized person(s) when the vehicle is unattended. The door or hatch of any service vehicle tank containing a pesticide must be equipped with a cover that will prevent spillage when the vehicle is moving. The above requirements would not apply if the vehicle is being used to hold and/or transport pesticides within the boundaries of a private applicator's property.

For additional information on pesticide transport, contact the New Jersey Department of Environmental Protection, or Rutgers Cooperative Extension Pesticide Safety Education Program. See section 1.7 for contacts.

1.4.4 Pesticide Storage

Improper storage of pesticides can lead to accidental poisonings, contamination of the environment, and deterioration of the chemicals themselves. Pesticides should always be stored in their original containers and kept tightly closed. **NEVER** transfer pesticides to food or beverage containers. Store pesticides in a cool, dry, well-ventilated area that is not accessible to children and others who do not know and understand their safe and proper use. For the protection of others, and especially in case of fire, the storage area should be posted as *Pesticide Storage* regardless of the use classification, and kept securely locked when unattended.

Minimize the amount of product you need to store. Plan pesticide purchases so that supplies are used by the end of the growing season, and will not have to be overwintered. Write the purchase or delivery date of the product on the label with indelible ink on the product container. Check and record expiration dates listed on the product label. EPA regulations require that pesticide manufacturers must place the statement "**Not for sale or use**

after [date]" in a prominent position on the label on product labels where the formulation changes in chemical composition significantly. The product must meet all label claims from the point of sale to the expiration time indicated on the label.

Always read the label. Most, if not all, pesticide labels will contain a general statement such as "do not contaminate water, food, or feed by storage, disposal, or cleaning of equipment." Special storage recommendations or restrictions will often be included. Moisture is a critical concern with dry pesticides, including granular materials and wettable powders, which have a strong affinity for water. When this is the case, the label may have the statement, "store in a dry place."

In New Jersey, any restricted use pesticide (or empty containers still contaminated with their residues) must be stored in a secure, locked enclosure while unattended. That enclosure must bear a warning that pesticides are stored there. If any pesticide must be stored in other than its original container (for example if the original container is leaking), that container must be labeled with the brand or trade name; EPA registration number; name and percentage of the active ingredient(s); the signal word; and precautionary statements for the pesticide. If the pesticide in the new container has been diluted, also write the dilution of the mixture. Keep an inventory of all pesticides held in storage and locate the inventory list in an accessible place away from the storage site, so it may be referred to in case of an emergency at the storage site.

Keep your local fire department informed of the location of all pesticide storage locations. Fighting a fire that includes smoke from burning pesticides can be extremely hazardous. A fire with smoke from burning pesticides may also endanger the people of the immediate area or community. The people of an area or community may have to be evacuated if the smoke from a pesticide fire drifts in their direction.

In **New Jersey**, applicators are required maintain a list of pesticides in storage or likely to be stored during the license year. Applicators must **send this inventory to their local fire department by May 1st each year**. It must also include a written description or depiction of the exact location of the pesticide storage area. For inventory and cover letter templates, see Rutgers Pesticide Safety Education Program's website at: *https://pestmanagement.rutgers.edu/pat/record-forms-2/.*

Inspect Product and Container Conditions:

Inspect the condition of products stored and containers you have in storage routinely. Maintain pesticides within the temperature and moisture range specified on the product label. Poor storage practices impact product efficacy, and accelerate product deterioration.

General signs of deterioration per formulation type are:

- EC - Evidence of separation of components, such as the formation of a sludge or sediment. Milky appearance does not occur when water is added.
- Oils - Milky appearance does not occur when water is added.
- WP, SP, WDG - Excessive lumping; powder does not suspend in water.
- D, G, WDG - Excessive lumping or caking.

Cold Weather Storage:

Consult the "**Storage and Disposal**" statements listed on the label to determine whether a pesticide can freeze with no adverse effects. Some pesticide labels may indicate that if freezing occurs and crystals form, then the product may be reused if it is warmed up. However, BEFORE attempting to thaw the pesticide, check the integrity of the pesticide container to make sure it is not ruptured or cracked from expansion of the frozen liquid. To thaw a pesticide, place the container in warm storage, 50-80°F (10-27°C), and shake or roll the container every few hours to mix product or eliminate layering. If layering persists or if all crystals do not completely dissolve, do not use product. If in doubt, call the manufacturer for guidance.

Additional information can be obtained from manufacturer websites, or consult "Cold Weather Storage & Handling of Pesticides, January 2018" by Montana State University Extension, available at: *https://store.msuextension.org/publications/AgandNaturalResources/MT201801AG.pdf.*

See section 1.4.6 below regarding disposal of deteriorated product.

1.4.5 Disposal of Pesticide Containers

EPA's pesticide container regulations [40 CFR 156] establish standards for pesticide containers and repackaging. They also now provide standards for label instructions to ensure the safe use, reuse, disposal, and adequate cleaning of the containers. **Cleaning the container before final disposal is the responsibility of the person disposing of the container. Applicators must follow the label instructions for cleaning and handling empty containers prior to disposal.**

Container handling statements will also be found in the **Storage & Disposal Statements** of the pesticide label state whether: 1) is it refillable or non-refillable; 2) can the container be reused, recycled, or reconditioned; 3) how to dispose of the container if recycling or reconditioning are not an option; and 4) how to clean the container if cleaning is required.

For non-refillable bags of granulars and powders, completely empty bag into application equipment by shaking and tapping sides and bottom to loosen clinging particles. If not emptied in this manner, the bag may be considered an acute hazardous waste and must be disposed of in accordance with local, state, and federal regulations. Other similar dry pesticides that have not been combined with liquids include dusts, wettable powders, dry flowables, water-soluble powders, granules, and dry baits.

After emptying a non-refillable or refillable product container containing a dilutable pesticide, triple rinse container (or equivalent*) promptly (see below)*. **Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal according to label directions (see next section 1.4.6)**. Rinsate may be disposed of when applied to a labeled site in accordance with the pesticide label.

To prepare pesticide containers for recycling or reconditioning, either the **triple rinse-and-drain** procedure or the **pressure-rinse** procedure are acceptable methods. When either of these methods is used, a farmer can consider the container 'empty' legally; but it cannot be reused for other purposes.

- **Triple Rinse-and-Drain Method** (for refillable containers larger than 5 gallons): To empty a pesticide container for disposal, drain the container into application equipment or mix tank by holding container in a vertical position for 30 seconds. Add a solvent, capable of removing the pesticide, to the pesticide container, so that it is approximately one-fourth full. Only use solvents as specified on the label, such as water. Agitate the container thoroughly, and then drain the liquid (rinsate) into the application equipment or mix tank by holding the pesticide container in a vertical position for 30 seconds. Repeat two more times. **Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal.**
- **Pressure Rinse Method**: An optional method to rinse small pesticide containers is to use a special rinsing device on the end of a standard water hose. The rinsing device has a sharp probe (called a "stinger") to puncture the container and several orifices to provide multiple spray jets of water. After the container has been drained into the sprayer tank (container is upside down), jab the pointed pressure rinser through the bottom of the inverted container. Rinse for at least 30 seconds. The spray jets of water rinse the inside of the container and the pesticide residue is washed down into the sprayer tank for proper use. Thirty seconds of rinse time is equivalent to triple rinsing. An added benefit is the container is rendered unusable.

Always refer to the current pesticide label "Storage and Disposal" requirements. Disposal **options for empty pesticide containers may be limited by local regulations** and ordinances (**and recycling program availability**). Crushed/punctured containers may be accepted by sanitary landfills or landfills that accept industrial waste; check with landfill operators prior to taking empty containers for disposal.

The **New Jersey Agricultural Recycling Programs** are promoted by the New Jersey Department of Agriculture (NJDA). Pesticide container disposal is offered to agricultural, professional, and commercial pesticide applicators who hold a NJDEP pesticide license as well as state, county and municipal government agencies. One core credit will be given to pesticide license holders who follow required processing steps and bring their license with them at time of collection. The program **accepts non-refillable, high-density polyethylene #2 (HDPE) containers that are no larger than 55 gallons and that have been triple rinsed.**

For more details on recycling requirements, scheduling, and locations, see the NJDA Division of Agricultural and Natural Resources webpage at *https://www.nj.gov/agriculture/divisions/anr/nrc/recycling.html*. Year-round collection is located at the Rutgers Fruit and Ornamental Research Extension Center at Cream Ridge in Monmouth County. Two seasonal locations for 2023/2024 are Helena Chemical in Woodstown in Salem County and

Helena Chemical in Hammonton in Atlantic County. Contact the Recycling Program Manager for the New Jersey Department of Agriculture at (609) 913-6491 for additional information on New Jersey's various agricultural recycling programs.

1.4.6 Disposal of Pesticides

Pesticide wastes may be hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. Do not contaminate water, food, or feed by storage or disposal; never bury pesticides or pesticide waste. **Always refer to the current pesticide label "Storage and Disposal"** requirements because there may be product-specific requirements on the disposal of: pesticides themselves (leftover or unused pesticides); or unrinsed containers; or rinsate. If pesticide wastes cannot be disposed of by use according to label instructions, contact the NJDEP (see contacts at end of this section). A general summary on disposal of waste pesticides for New Jersey agricultural producers follows.

The federal **Resource Conservation and Recovery Act (RCRA) governs the management and disposal of hazardous wastes, including pesticides**. Agricultural producers (or their commercial applicator contractor) may dispose of excess pesticide or rinsate by applying to a labeled site on the farm according to the label directions (see box to right). However, if for whatever reason, that is not feasible, farmers are subject to the hazardous waste provisions of RCRA.

For a detailed guide to RCRA requirements, please refer to EPA's "**MANAGING YOUR HAZARDOUS WASTE: A Guide for Small Businesses**" at *https://www.epa.gov/hwgenerators/managing-your-hazardous-waste-guide-small-businesses* (date accessed 02/28/2023).

According to RCRA, all generators are first responsible for determining whether a material is a solid and hazardous waste. **Check the pesticide label under "Storage & Disposal Statements"** for a statement that characterizes waste pesticide for you. When labels specifically indicate that pesticide wastes are **"hazardous"; "acutely hazardous" or" toxic"**, they must be disposed of according to RCRA regulations.

Next, a generator needs to determine their **generator category**. EPA defines three categories of hazardous waste generators based upon the quantity of hazardous waste they generate **per month**: 1. **Very Small Quantity Generators (VSQGs)**, which generate less than 100 kilograms (kg) or 220 pounds (lbs) per month. 2. **Small Quantity Generators (SQGs)**, which generate between 100 and 1,000 kg (220 and 2,200 lbs) per month. 3. **Large Quantity Generators (LQGs)**, which generate more than 1,000 kg (2,200 lbs) per month.

FARMER EXCLUSION

"…Although a farmer may be a generator of hazardous waste, waste pesticides disposed of on a farmer's own property in compliance with specified waste management requirements, including the disposal instructions on the pesticide label, are not subject to the generator requirements. This exclusion is intended to prevent the double regulation of farmers under both RCRA and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)…"

*(excerpted from **RCRA Orientation Manual**. 2014. USEPA. URL: https://www.epa.gov/sites/default/files/2015-07/documents/rom.pdf (date accessed 01/23/2023).*

In New Jersey, **Very Small Quantity Generators** (VSQGs) are exempt from the RCRA requirement of obtaining EPA identification numbers, manifesting their waste, or complying with storage requirements. However, VSQG must comply with three basic waste management requirements. VSQG must first identify all hazardous waste they generate. Second, VSQG may not store more than 1,000 kg (2,200 lbs) of hazardous waste or 1 kg (2.2 lbs) of acute hazardous waste on site at any time. Finally, VSQG must ensure delivery of this hazardous waste to an off-site treatment or disposal facility that is one of the following:

- A state or federally regulated hazardous waste **Treatment, Storage, or Disposal Facility (TSDF)**.
- A facility permitted, licensed, or registered by a state to manage municipal or industrial solid waste. *VSQGs are prohibited from disposing of liquid hazardous wastes in municipal or hazardous waste landfills*.
- Although waste recycling is a regulatory option; per NJDEP, this is currently not a viable disposal option for pesticides in New Jersey.

New Jersey County Household Hazardous Waste (HHW) Programs may accept infrequent amounts of hazardous waste pesticides from farmers that qualify as VSQGs on a case-by-case basis if they are labeled and in their original container. Contact your County HHW program to check; see list of HHW Coordinators for New Jersey at *https://njhazwaste.com/counties/*. Burlington County will accept these types of pesticide wastes from out-of-county residents; see *http://www.co.burlington.nj.us/346/Hazardous-Waste*.

All RCRA requirements for disposal must be followed by those farmers that qualify as **Small Quantity Generators (SQG)** and **Large Quantity Generator**s **(LQG)**. Additionally, those **Very Small Quantity Generators** that have liquid hazardous waste may not dispose of these wastes in a municipal landfill; they must be disposed of in a state or federally regulated hazardous waste treatment, storage, or disposal facility (TSDF).

Some generators hire a waste management company to address all hazardous waste management obligations. New Jersey generators are responsible for ensuring their hazardous waste is removed by a licensed transporter who is registered with the NJDEP and all equipment displays a current (HW transporter) decal. Generators must use transporters and hazardous waste brokers that have an **A901 license** which is issued by the NJDEP in the form of a letter. Generators should request a copy of this letter from all brokers and transporters they engage. This provides a level of assurance they have been properly vetted by the NJDEP, Attorney General's Office, and NJ State Police. **The current list of A-901 Licensed transporters and brokers is available through DEP DataMiner accessed at *https://njems.nj.gov/DataMiner***. *Click Search by Category, select Vehicle Registration (2009 Forward) and click Submit. The individual reports are titled "Transporters - A-901 Licensed - Hazardous Waste," and "NJDEP Approved Waste Brokers."*

New Jersey State Regulatory Information

New Jersey Hazardous Waste Regulations: The requirements for hazardous waste generators are specifically found at N.J.A.C. 7:26G-6 et seq., which references 40 CFR Part 262 of the Federal regulations (with some exceptions and/or changes). Please refer to the New Jersey Department of Environmental Protection **Compliance Assistance Packet for Hazardous Waste Generators** at *https://www.nj.gov/dep/enforcement/docs/compliance-assistance-packet-2020-v20-3.pdf* (date accessed 02/28/2023).

For regulatory assistance related to hazardous waste disposal in New Jersey, please contact the NJDEP Bureau of Hazardous Waste Compliance & Enforcement at your closest regional office listed below:

- **Northern Regional Office**
  Serving Bergen, Essex, Hudson, Hunterdon, Morris, Passaic, Somerset, Sussex & Warren Counties,
  7 Ridgedale Avenue Cedar Knolls, NJ 07927, Phone: (973) 656-4470
- **Central Regional Office**
  Serving Mercer, Middlesex, Monmouth, Ocean & Union Counties,
  9 Ewing Street, 3rd Floor Mail Code 09-03 P.O. Box 420 Trenton, NJ 08625-0420, Phone: (609) 943-3019
- **Southern Regional Office**
  Serving Atlantic, Camden, Cape May, Cumberland, Gloucester, Salem & Burlington Counties,
  One Port Center 2 Riverside Drive, Suite 201 Camden, NJ 08102, Phone: (856) 614-3658

1.4.7 Pesticide Spills

Keep a supply of an absorbent agent on hand to contain liquid spills in the area that you store pesticides, as well as transport pesticide product. Industrial sorbents rated by sorption capacity and type of liquid are commercially available for absorbing the liquids in a cleanup. Use label-prescribed PPE including chemical resistant gloves to clean up spills. Barrier laminate gloves have a broad range of chemical resistance and are a good choice to keep in a spill kit. Depending upon the specific glove type, rubber gloves might break down depending on the pesticide. Let it soak a couple of hours to absorb the spilled pesticide from the floor. This procedure is also recommended for cleaning truck beds that are contaminated.

Specific information concerning pesticide cleanup can be obtained by calling the manufacturer directly or consulting the product Safety Data Sheet (SDS). **EPA encourages, but does not require, pesticide manufacturers**

to include a company telephone number or toll-free hotline number for emergency information in the first aid section of pesticide labels.

In New Jersey, the licensed dealer, dealer business, commercial pesticide operator, applicator, or applicator business, shall *immediately* notify the NJDEP at 1-877-927-6337 of **any reportable pesticide spill** occurring under such person's direct supervision and/or direct observation. **New Jersey "**reportable spills" of pesticides include:

1. **Outside a structure** –
   only if more than 1 pound active ingredient;
2. **Inside a structure** –
   only if more than 1 pound active of dry pesticides; or 1 gallon of liquid (pesticide and/or diluent); and
3. **Indoor spill of termiticide** –
   only if more than 50 in^2 organochlorine termiticide contamination at one injection point; or greater than 1 yd^2 aggregate contaminated by organochlorine termiticide on/at interior wall base; and/or when heating duct/system is contaminated.

Reporting of Pesticide Spills in New Jersey: the following eight elements are required to be included during the reporting of a reportable pesticide spill to the NJDEP:

1. Date and time
2. Name/address/phone of the pesticide applicator
3. Name /address/phone of the applicator or dealer business (if any, not applicable to Private Applicators)
4. Name/phone of the property owner or operator
5. Location of the incident
6. Name and EPA registration number of the pesticide(s)
7. Estimated amount & dilution rate of pesticide(s) involved
8. Corrective action(s) taken

Within 10 days of the spill, a written report must be submitted to the NJDEP at Pesticide Control Program, P.O. Box 411, Trenton, NJ 08625-0411 outlining the eight elements listed above. You may download a template "Spill Report Card" from the Rutgers NJAES PSEP website at *https://pestmanagement.rutgers.edu/pat/record-forms-2/*.

Contact the Rutgers New Jersey Extension Pesticide Safety Education Program (PSEP) for further assistance. Rutgers New Jersey PSEP provides outreach to agricultural producers at conferences, meetings, its website, and the Rutgers NJAES Plant and Pest Advisory Commercial Agriculture blog. **See section 1.7 for State Contacts for NJ Pesticide Applicator Programs.**

IMPORTANT

In the event of a fire, explosion, or other release that could threaten human health outside the facility, OR, if you know that the spill has reached surface water:

Call the National Response Center at its 24 hour number: 1-800-424-8802

1.5 Reducing Risks to Handlers and Workers

1.5.1 Agricultural Worker Protection: Inform, Protect, and Mitigate

EPA first implemented the Federal Worker Protection Standard – CFR Title 40, Part 170 (WPS) regulations in 1994 to provide specific safety requirements for both general **agricultural workers** and **pesticide handlers**. The 1992 WPS regulations were revised on November 2, 2015.

- **Agricultural "Workers**" are those persons who are employed by the agricultural establishment to perform tasks such as harvesting, weeding, or watering, relating to the production of agricultural plants on a farm, forest, nursery, or greenhouse.
- **Pesticide** "**Handlers**" are those persons who are employed by an agricultural establishment or commercial pesticide application company who mix, load, or apply pesticides; who handle opened pesticide containers; who act as flaggers; who clean, maintain, or repair application equipment; who assist with the application of a pesticide; who enter a treated greenhouse to operate ventilation equipment; who adjust or remove coverings or check air levels; who enter an outdoor area that has been fumigated to adjust or remove soil coverings; who perform tasks as a crop advisor; or who dispose of pesticides or their containers.

The WPS regulations are applicable to any agricultural establishment that employs either pesticide handlers or agricultural workers where <u>any EPA-registered pesticides</u> are used in the production of agricultural commodity(ies). The WPS also applies to custom pesticide applicators and labor contractors supplying employees or independent crop consultants who are hired by these establishments.

State regulations may differ, and when more stringent take precedence over federal regulations. The NJDEP Agricultural Worker Protection regulations [N.J.A.C. 7:30 Subchapter 12] were revised on April 6, 2020, and incorporate or exceed the revisions of the federal WPS (*see box to right for details*). The Revised WPS requires that handlers, except for immediate family, be at least 18 years old. New Jersey labor laws are more stringent, and minors under 18 years old cannot be employed as applicators of pesticides or be permitted in any area where pesticides are applied.

Agricultural employers of workers or handlers, or commercial applicator businesses providing handler application services in New Jersey will be in full compliance with both federal and State laws for agricultural worker protection when they adhere to New Jersey's revised N.J.A.C. 7:30 regulations; *see <u>https://www.nj.gov/dep/enforcement/pcp/pcp-regs.htm</u>.*
For specific questions or concerns about NJDEP's implementation of the revised WPS, please contact Supervisor of the Worker Protection Unit Nancy Santiago at 609-984-6568, or contact her by email at: pcp@dep.nj.gov.

Only "WPS-labeled" pesticides may be used in the production of an agricultural commodity. These pesticides are identified by a box on the product label with the title "**AGRICULTURAL USE REQUIREMENTS**". The first paragraph within the box **invokes by reference a requirement for compliance with <u>all of the</u> WPS regulations**. Specifically, the paragraph reads: "Use this product **only in accordance with labeling and with the Worker Protection Standard 40 CFR part 170**. The Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to statements on the label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered under the Worker Protection Standard…".

This section provides a brief overview of some of these regulations with special notation where New Jersey worker protection regulations differ. Compliance resources for regulation specifics and other information are

provided at the end of this section. The WPS reduces risks of occupational illness and injury from exposure to pesticides in three ways: **INFORM** workers and handlers about potential exposures to pesticides, **PROTECT** worker, handlers, and others from exposure to pesticide(s); and **MITIGATE** any pesticide exposures that workers or handlers receive.

INFORM

To ensure that employees are informed about exposure to pesticides, employers must provide certain information to their farmworkers. This includes providing **annual pesticide safety training** to both pesticide handlers and agricultural workers. Grace period for worker training is eliminated. Workers must be trained before they work in an area where a pesticide has been used or a restricted-entry interval has been in effect in the past 30 days.

Training content under the 2015 Revised WPS has expanded and is freely available (*see "Compliance Assistance" at the end of this section for free training resources, including videos*). Worker training topics have been expanded to 23 items, and handler training has been expanded to 36 items. Resources developed for the training of workers and handlers per the requirements of the 1992 Worker Protection Standard (as amended) can no longer be used, effective December 2018. Training of employees using the old materials does NOT have the new content required under the 2015 Revised WPS and would be invalid. Do not use training materials unless they are approved for use with the 2015 Revised Worker Protection Standard. **Download approved training resources and videos at the Rutgers NJAES Worker Protection webpages: *https://pestmanagement.rutgers.edu/worker-protection/worker-handler-training/*.**

IMPORTANT **Make sure to replace your old 1992 WPS training videos or booklets.**	**Rutgers "Quick-Connect":** **EPA-approved** **Handler/Worker Training **** **(NEW! Expanded 2015 Content)**

Trainers must be either: certified applicators; designated as a qualified trainer by EPA or their state pesticide regulatory agency; or have completed an EPA-approved "Train the Trainer" course. Approved trainers must use EPA-approved training materials. Employers are required by federal regulations to retain records of WPS training for 2 years. The 2020 revised **New Jersey** regulations on worker and handler training recordkeeping are more stringent, requiring that **training rosters be maintained by both the trainer and the agricultural employer for 3 years.**

The NJDEP Worker Protection website has downloadable forms for trainer recognition, worker training rosters, and handler training rosters; *see https://www.nj.gov/dep/enforcement/pcp/pcp-wps.htm* for forms and retention times and responsible parties. Training records of handlers must be sent to the NJDEP by the trainer or agricultural employer within 30 days after each training session. Worker training records are no longer required to be sent to the NJDEP but must be available upon request. All rosters must be maintained in New Jersey on file for 3 years by BOTH the WPS trainer and the agricultural employers.

Other requirements for providing information include **displaying WPS-required pesticide safety information** at a central location (and certain decontamination sites). Safety information may be displayed in any format, including a poster that meets the requirements. The Pesticide Education Resource Collaborative (PERC) has developed for EPA a WPS safety information poster.

Agricultural employers must also provide workers and handlers access to both **Safety Data Sheet (SDS)** and **pesticide application information** for applications at the establishment. An SDS is required to have specific information set forth by the OSHA Hazard Communication Standard, but they are not reviewed or approved by government officials like pesticide labels. EPA requires that employers maintain SDS and pesticide application information on file for two years; but **New Jersey's** revised regulations are more stringent and require that the **agricultural employers maintain copies of both SDS and pesticide application information for three years.** Employers must provide access/copies of records to workers, handlers, treating medical personnel, or a "designated representative".

The EPA Revised WPS also requires that the following **pesticide application information** be displayed in a centrally located area: 1. Pesticide product name, EPA registration #, and active ingredients(s); 2. Crop or site treated, & location and description of treated area; 3. Date(s), times application started and ended; and 4. Duration of REI. **In New Jersey**, pesticide application information must be displayed **either before workers enter treated fields or prior to workers entering fields at the beginning of the next workday**, whichever occurs first. This is more stringent than the Federal rule. Once posted, this information must remain posted for 30 days following the date for safe reentry. New Jersey pesticide application information display requirements are more specific including posting a **map of the farm** for designation of treated areas. **NJDEP requires column headings for posted pesticide application information** that include: 1. Crop; 2. Pesticide name; 3. Safe Reentry Time; 4. Application Date; 5. Application start and finish times; and 6. Application Location.

PROTECT

Employers are required to ensure that employees will be protected from exposures to pesticides. Employers must take measures that applications do not expose *unprotected* workers during applications. The Revised WPS has requirements for restricting access around application equipment in a defined area called the "**Application Exclusion Zone**" surrounding applications in progress. Employers must also provide personal protective equipment (PPE) to handlers, and early entry workers per the pesticide label (see section 1.5.2 for information on PPE).

Employers must notify early-entry workers of application specifics, tasks to be performed, conditions of the early-entry exception, and hazard information from the pesticide label.

All WPS-labeled pesticide products are required to have a prescribed REI. These range from 4 to 48 hours or longer. Check your pesticide's label for the reentry time in effect. Some pesticides have one REI, such as 12 hours, for all crops and uses. Other products have different REIs depending on the crop or method of application. When two (or more) pesticides are applied at the same time, and have different REIs, you must follow the longer interval. To protect farmworkers, employers are required to **post warning signs** (see above) around treated areas when the **product applied outdoors has an REI greater than 48 hours**; and when the **product applied indoors has an REI greater than 4 hours**. When a product applied outdoors has an REI of 48 hours or less; or a product applied indoors has an REI of 4 hours or less, the employer may choose either to post the treated area or give oral notification, unless the labeling requires both types of notification.

However, there are situations where the WPS allows workers to enter treated areas before the end of an REI to do non-hand labor tasks but is limited to a maximum of one hour per day. Early entry cannot be made until four full hours have passed since the completion of the application. The Revised WPS requires that "early-entry workers", with the exception of immediate family, be at least 18 years old. **Note: New Jersey regulations require that both handlers and early entry workers be at least 18 years old.** Early-entry workers must be given label-prescribed PPE for early entry prior to entry if they will contact treated surfaces.

MITIGATE

To mitigate or lessen the impact of pesticide exposures that employees do receive, employers must provide decontamination sites and emergency assistance. Employers must provide supplies for emergency eye flush at all pesticide mixing and loading sites when handlers use products that require eye protection. Decontamination sites must contain a supply of water, soap, and towels for both routine washing and emergency decontamination. Employers must provide emergency assistance which includes transportation to medical care facilities in the event of a pesticide-related injury and providing information about the pesticide(s) involved to the medical staff.

Immediate Family Exemptions:

The Revised WPS has expanded the definition of immediate family to include spouse, parents, stepparents, foster parents, father-in-law, mother-in-law, children, stepchildren, foster children, sons-in-law, daughters-in-law, grandparents, grandchildren, brothers, sisters, brothers-in-law, sisters-in-law, aunts, uncles, nieces, nephews, and first cousins.

Owners of agricultural establishments and their immediate family members are exempt from most WPS requirements. If only immediate family members are employed by the agricultural establishment, owners are exempt from providing themselves and their family members:

- pesticide safety training and information;
- providing, cleaning, and maintaining PPE;
- information at a central location;
- decontamination facilities;
- emergency assistance requirements;
- notifications of pesticide applications; and
- handler monitoring.

EPA's WPS does not exempt owners of agricultural establishments from providing themselves or their family members from compliance with the respiratory protection requirements when using pesticides requiring respirators to be worn. The Revised WPS requires that when a WPS-covered pesticide label requires a handler to wear a respirator, the handler's employer must provide them with a medical evaluation, fit test, and respirator training. These requirements (see section 1.5.2.2 for details).

Federal Compliance Assistance Resources

EPA is providing resources to agricultural employers and handler employers to assist with compliance with the Revised WPS in conjunction with the Pesticide Educational Resources Collaborative (PERC).

Key resources developed and posted at the PERC website (*http://pesticideresources.org/*) are:

- "Quick Reference Guide to the Worker Protection Standard (WPS) as Revised in 2015"; see *http://pesticideresources.org/wps/hosted/quickrefguide.pdf*. This one-page double-sided chart outlines requirements with direct hyperlinks to the text of the regulation for each item being cited in the chart.
- "How to Comply With the 2015 Revised Worker Protection Standard For Agricultural Pesticides"; see *http://pesticideresources.org/wps/htc/index.html*. The purpose of this online guide is to help users of agricultural pesticides comply with the requirements of the revised federal Worker Protection Standard.
- The Revised WPS requires that specific pesticide safety information with newly expanded content be accessible to workers at any time during normal work hours. EPA does not require a specific format. PERC has produced an updated "WPS Safety Poster" meeting EPA's new requirements for "Central Posting" areas and certain decontamination sites.
- WPS Safety Posters in English, Spanish, Chinese, Haitian-Creole, Ilocano, Karen, Russian, Tagalog, and Vietnamese may be downloaded from *http://pesticideresources.org/wps/cp.html*, or may be purchased from the National Pesticide Safety Education Center's online store at *https://npsecstore.com/pages/perc-page*.

PERC will use email distribution lists to keep interested parties informed about new publications. PERC has developed lists for several target groups, including "Agricultural Employers and Handler Employers" to distribute notices relevant to agricultural employers and commercial pesticide handler employers, as defined by the WPS. See *http://pesticideresources.org//lists.html* to enroll in the email list(s) of your choice.

PERC is collaborating with the National Pesticide Safety Education Center (NPSEC) as its distributor for printed resources and posters. You can purchase printed copies of PERC's resources, including laminated WPS Safety Posters, at the NPSEC Store at: *https://npsecstore.com/*.

Contact the Rutgers New Jersey Extension Pesticide Safety Education Program (PSEP) for further assistance. Rutgers New Jersey PSEP provides WPS outreach to agricultural producers at conferences, meetings, its Worker Protection webpages at: *https://pestmanagement.rutgers.edu/worker-protection/* and the Rutgers NJAES Plant and Pest Advisory Commercial Agriculture blog. See section 1.7 for State Contacts for NJ Pesticide Applicator Programs.

1.5.2 Personal Protective Equipment for Pesticides

Personal Protective Equipment (PPE) refers to apparel and devices worn to protect your body from contact with hazardous materials, including pesticides or pesticide residues. PPE includes such items as coveralls or protective suits, aprons, gloves, footwear, headgear, eyewear, and respirators. *More details follow in subsequent sections about Body Protection for Early Entry Workers and Pesticide Handlers (section 1.5.2.1) and Respiratory Protection for Pesticide Handlers (section 1.5.2.2).*

Wearing PPE can greatly reduce the potential for dermal, eye, oral, and inhalation exposure; and thereby significantly reduce the chances of pesticide illness, poisoning, or injury. Employers have a responsibility to make available any necessary or appropriate safety equipment required by the pesticide label to employees who use, apply, transport, or otherwise handle pesticides. It has to be clean and in good working order. Under EPA's Worker Protection Standard, **employers of handlers of pesticides used in the production of agricultural plants are legally required to provide and train users in the use of label-required PPE.**

Selection of PPE

The **pesticide label** lists the **minimum PPE** that a person must wear to be **adequately protective while performing any handling or early-entry activities**. Wearing any less than this is **illegal** and **dangerous.** Applicator PPE requirements are listed in the "Precautionary Statements" section of the pesticide label (see example to right). Look for additional specific PPE requirements in the "Agricultural Use Requirements" box on the label. This might include, for example, PPE for early-entry workers.

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

CAUTION: Causes moderate eye irritation. Avoid contact with eyes. Wear protective eyewear. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Prolonged or frequently repeated skin contact may cause allergic reaction in some individuals.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Some of the materials that are chemical–resistant to this product are listed below.

Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Chemical resistant gloves such as barrier laminate, butyl rubber >14mils, nitrile rubber > 14mils, neoprene rubber > 14 mils, viton > 14 mils
- Shoes plus socks
- Protective eyewear

PPE label requirements vary, depending upon the toxicity, formulation, dilution, and route of exposure of the pesticide product and activity. For example, a single label may have one set of PPE requirements for applicators and a different set for agricultural early-entry workers going into areas during the restricted-entry interval. Even very low hazard pesticides require a long-sleeved shirt, long pants, shoes, and socks.

For pesticides that are hazardous when inhaled, the pesticide label "Precautionary Statements" will include the type of respiratory protection (respirator type including filters or chemical cartridges, if needed) required to minimize your exposure to an acceptable level (See section 1.5.2.2, Respiratory Protection for Pesticide Handlers).

1.5.2.1 Body Protection for Early Entry Workers and Pesticide Handlers

Different types of clothing, protective coveralls or suits, aprons, hats, boots, and gloves are not equally protective against all pesticides and under all conditions. To be protective, they must:

- Keep pesticides **away from your body** (head, face, neck, trunk, arms, legs, and feet) throughout the pesticide-handling activity.
- Be **resistant** to punctures and tears during normal use.
- Be **comfortable** enough without restricting your movement so you will wear it.

To protect your skin, your normal **work clothing** must cover most of your body. Depending upon the product's toxicity and use, other PPE (such as coveralls or chemical resistant suits, aprons, hats, boots, and gloves) may also be required. Protective clothing, gloves, and boots must provide a barrier to pesticide for the duration of the task.

In some instances, the pesticide label requires that you wear gloves and other PPE that is "chemical resistant." Generally speaking, this is required when you need protection from highly toxic (label signal word "Danger") or moderately toxic (signal word "Warning") pesticides. When a pesticide label lists chemical-resistant PPE, it means that you need a barrier to that pesticide for the duration of the task.

PPE materials ("barriers") perform differently when exposed to different pesticides. Some degrade the PPE material; it essentially starts to break down. In some instances, degradation of protective fabric is easy for applicators to recognize. PPE may **swell, discolor, shrink, soften, become brittle, or change texture**. So, be **alert for these signs and replace compromised clothing immediately to minimize your exposure to pesticides.**

Some PPE materials restrict pesticide entry for a long time, while others allow the pesticide to pass through quickly. Pesticides can move through by the process of permeation until the chemical actually "breaks through" to the inside. If a PPE garment material is not very chemical resistant to a particular pesticide, passage to the inside can occur very quickly, in just minutes. Once "breakthrough" takes place your bare skin is directly exposed to the pesticide.

Permeation into a PPE material may begin as soon as it gets on the surface. Once a pesticide is absorbed on the surface of PPE, it continues to move into and through the PPE, molecule by molecule. In these cases, the pesticide is difficult to detect or decontaminate. And pesticide residues that contact PPE are likely to continue to permeate through the material. So, washing gloves and other PPE does not necessarily make them safe for reuse. Things that can affect the extent of permeation are contact time, concentration, temperature, and the physical state of the product itself. When selected correctly, protective clothing reduces the risk of dermal exposure but does not eliminate it.

Work Clothing

Your work clothes provide a basic barrier to minimize pesticide contact with your skin. Always wear - at a minimum - a long-sleeved shirt, long pants, closed-toed shoes, and socks whenever you handle pesticides or work around pesticide residues.

Select work clothes made of tightly woven fabrics to reduce pesticide penetration. Make sure they are free of holes and tears. Fasten the shirt collar completely to protect the lower part of your neck.

Do not use these work clothes for anything other than handling pesticides. Store and launder fabric work clothing separately from all other clothing after each day's use.

Coveralls

Some pesticide labels require coveralls (a second layer of clothing) over work clothes. A coverall can be made of woven (like cotton or twill) or nonwoven fabrics. It should be sturdy enough for laundering and repeated use. According to regulations, coveralls must be loose-fitting, one- or two-piece garments that cover the entire body except head, hands, and feet.

In rare instances, a pesticide label may require wearing a chemical-resistant coverall or suit. Using one that is disposable reduces decontamination time and lowers the risk of contaminating yourself, your application equipment, and your vehicle. Most importantly, wearing coveralls lessens the chance that you will take pesticides home. Handle disposable coveralls carefully so as to not contaminate other people.

Apron for Mixing

Some pesticide labels require you to wear a chemical-resistant apron when mixing or loading a pesticide, or when cleaning application equipment. Select aprons that cover the front of your body from the middle of the chest to the knees.

Gloves

Pesticide handlers get by far the most exposure from pesticides on their hands and forearms. Research has shown that workers mixing pesticides received 85 percent of the total exposure to the hands and 13 percent to their

forearms. The same study showed that wearing chemical-resistant gloves reduced exposure by 99 percent *(Source: The Farm Family Exposure Study, John Acquavella)*. Protective gloves are essential to dermal protection.

Wear the type of chemical-resistant glove specified by the product labeling. For gloves, labels will often specify materials that are highly chemical resistant for that product. Older pesticide labels may add another statement that you can consult an EPA chemical resistance category chart for more options. In these cases, the glove type that provides highest protection is listed. Use only those listed.

There are many types of gloves on the market including nitrile, butyl, natural rubber, polyethylene, neoprene, and barrier laminates. Each has different chemical resistance properties. Each type of glove has to be considered on a case-by-case basis. Read the label carefully to make sure you have the correct protective glove material. Explain to your supplier which glove types you need.

When the pesticide label specifies waterproof or chemical-resistant gloves, do not use those constructed with any kind of absorbent material, lining, or flocking. This includes leather or cloth. These all absorb pesticide and trap it closely against your bare skin, greatly increasing skin absorption.

Some pesticide labels specify both the glove material and its thickness. As a general rule, the thicker the glove (of the same material under identical conditions), the longer the breakthrough time. A pesticide label's specification of glove type is generally based upon a thickness of 14 mils, except for polyethylene and barrier laminate gloves. Use the 14 mils thickness as a rule of thumb when selecting glove materials that appear on the pesticide label.

Glove durability is another important consideration. Select a glove that is protective, does not tear or puncture easily, and protects you for the duration of the task. A glove that is rated highly chemical-resistant, but tears or punctures easily, will likely not protect you for the duration of the task. Discard the gloves if there is any sign of wear or if the gloves leak.

Also choose a glove size that fits you comfortably. Gloves that fit well give you increased dexterity for equipment maintenance or calibration. Gloves that are too tight stretch the material and pesticide can directly penetrate through enlarged pore spaces. And too tight gloves restrict movement of your fingers and can cause hand fatigue. Gloves that are too large can get caught in equipment. If a glove is too loose, pesticides can run down the inside and be directly absorbed by your skin.

Select gloves designed to give you extra protection when needed for the job, such as elbow length gloves when mixing and loading. Do not use a glove beyond the breakthrough time provided by the PPE manufacturer. Lastly, gloves should be disposed of frequently because absorbed pesticides will continue to permeate through the material.

When using reusable gloves rinse them at each break and wash them thoroughly at the end of the workday. Make sure your gloves are in top condition. Replace your gloves immediately if they get cut, torn, or damaged. Throw out any gloves showing wear. Check glove integrity before each use. Rinse and slash all gloves before discarding them.

Footwear

If the product labeling specifies "chemical-resistant footwear", EPA regulations prescribe use of any chemical-resistant shoes; boots; or shoe coverings worn over shoes or boots. Do not wear leather boots or canvas shoes in these cases. Leather and canvas absorb pesticides and cannot be decontaminated.

Regulations allow you to substitute leather for chemical-resistant boots only when the chemical-resistant footwear required by the pesticide label is not durable enough for use in rough terrain. Consult manufacturers or suppliers of footwear for guidance in selecting chemical resistant footwear that has the durability you need. Do not use these boots for other purposes.

Headgear

When a pesticide product label specifies 'chemical-resistant headgear', you may use either a chemical-resistant hat with a wide brim that goes all around your head, or a chemical-resistant hood. Chemical-resistant hoods attached to jackets or coveralls protect your neck and back from pesticides sprays that would otherwise run down your back. When handling pesticides, do not use headgear made of any absorbent material such as cotton, leather, or straw. These absorb pesticides and cannot be decontaminated.

Eye Protection

Eyes readily absorb pesticides. When a label simply says to "wear protective eyewear", you may use any of the following: goggles; face shield; safety glasses with shields at front, brow, and temple; or a full-face respirator. Use common sense and select eyewear that protects you for the task at hand. Eyewear made of impact-resistant material, such as polycarbonate, can protect you from flying objects, such as granular pesticides. However, safety glasses will not protect your eyes from pesticide splashes.

Labels may be more specific and require that a particular type of eyewear be worn. For example, goggles may be specified when there is a concern about protecting your eyes from liquids or particulates for that application or use. Goggles that have covered air baffles reduce lens fogging while keeping liquids out.

Under the agricultural Worker Protection Standard, if the label requires eye protection, then the handler must have immediate access to eyewash of 1 pint of water at all times.

Maintenance and Disposal of PPE

All PPE should either be disposable, OR easy to clean and sturdy enough for repeated use. Gloves, non-woven (including coated non-woven) coveralls and hoods, such as Tyvek®, usually are designed to be disposed of after use. Most are intended to be worn for only one workday. For example, you might use disposable gloves, shoe covers, and an apron while pouring pesticide into a hopper or tank, cleaning or adjusting a nozzle, or making minor equipment adjustments. If using "reusable" PPE, pay close attention and be ready to change and dispose of them whenever the inside surface is contaminated. And, be sure to clean all reusable PPE items between uses, even if worn for only a brief period of exposure.

Pesticide residues that remain on PPE are likely to continue to permeate through the material once contaminated. Even if you do not see any signs of wear, replace reusable chemical-resistant items regularly - the ability of a chemical-resistant material to resist the pesticide decreases each time an item is worn.

In addition, PPE worn several times between launderings may build up pesticide residues. The residues can reach a level that can harm you, even if you are handling pesticides that are not highly toxic. So, disposable PPE is a preferred option to reusable PPE. They are low-cost, and their use minimizes clean-up and spread of contamination. **Rinse and slash used/unusable PPE prior to disposal.**

1.5.2.2 Respiratory Protection for Pesticide Handlers

Occupational users of pesticides can be exposed to toxic gases and vapors, particulates, or both. Various pesticide formulations, environments, and application methods require different types of respiratory protection devices (respirators).

EPA requires that pesticide manufacturers determine and specify respiratory protection according to the anticipated hazards and risk of inhalation. Manufacturers provide requirements for respiratory protection on the pesticide label that are product- and task-specific. **It would potentially be life-threatening to assume that all products with the same active ingredient have the same respiratory protection requirements**. R**ead and follow each individual product's label for respirator requirements since pesticides may have different formulations and use directions**.

The pesticide label states whether you must use a respirator and, if so, which type. Atmosphere-supplying respirators provide clean, breathable air from an uncontaminated source, while air-purifying respirators remove contaminants from the air that you breathe. Both may be configured with either tight- or loose-fitting face pieces. When a tight-fitting respirator is used, **fit testing** is required to select the correct size, model, and manufacturer. **Occupational users of pesticides must understand the capabilities and limitations of each respirator they will use.**

The pesticide label specifies use of **"NIOSH-approved" respirators**. The NIOSH-approval certificate that accompanies the respirator indicates the approved configuration, protection, and cautions and limitations of the respirator. For example, air purifying respirators do not supply oxygen, and must not be used in an environment containing less than 19.5% oxygen.

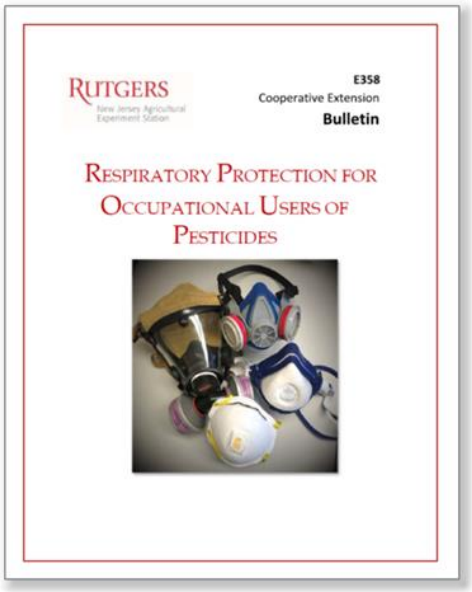
When air-purifying respirators are required, the label will specify the type of particulate filter and/or chemical cartridge or canister. For example, non-powered particulate filters differ according to their oil resistance. When a pesticide contains oil or an oil-like substance, an N-series (not oil proof) cannot be used; and the pesticide label will specify R-series (oil-resistant) or P-series (oil-proof) filters. Powered air purifying respirators only have a single type of particulate filter, HE. EPA regulations [40 CFR 170.507(d)] require replacement of particulate filters when damaged, torn, soiled, or it becomes uncomfortable for the wearer to breathe. Additionally, particulate filters should be replaced according to respirator manufacturer recommendations or pesticide labeling (whichever is more frequent).

Always use the type of purifying element required by the pesticide label. The most typical chemical cartridge or canister specified by the label for pesticide use is an organic vapor (OV) cartridge or canister. They contain activated carbon that adsorbs organic vapor gas or vapor molecules from the air being drawn in through the container. A chemical cartridge/canister is effective until the sorbent bed is filled and the gas or vapor "breaks through." Breakthrough is the penetration of a gas or vapor through a chemical air-purifying element to inside the wearer's mask. Any taste, smell, or irritation is a warning that breakthrough of the pesticide through the sorbent may have occurred, and that you should exit the area. Respirator manufacturers recommend that OV cartridges/canisters should not be used beyond one day. Change cartridges/canisters earlier if contaminant odor, taste, or irritation is detected inside the face piece.

The Revised WPS requires that when a WPS-covered pesticide label requires a handler to wear a respirator, the handler's employer must provide them with a medical evaluation, fit test, and respirator training.

Prior to use of respirators, users must be **medically evaluated** to determine that they can safely use the respirator under the conditions of use. When use of a respirator is required by the pesticide label, both commercial applicator and agricultural employers must provide pesticide handlers a medical evaluation per OSHA 29 CFR 1910.134(e) to determine their ability to safely use the respirator specified.

Annual respirator training is required. Employers of occupational users of pesticides must provide effective respirator training per OSHA 29 CFR 1910.134(k) to those employees required to wear respiratory protection by the product label. Respirator users must know how to properly inspect, recognize danger signals during use and what to do; don and doff (put on and remove). After use, proper care, maintenance, and storage of their respirator can prolong the life of the respirator.



Consult **Rutgers Bulletin E0358**
"Respiratory Protection for Occupational Users of Pesticides" for detailed guidance on the different types of respirators; their limitations, use, care, maintenance, and storage; as well as requirements for the medical evaluation, fit testing, and training of respirator users. It outlines regulatory requirements of EPA and OSHA that apply to commercial users and also agricultural operations that use pesticides.

The publication may be downloaded at: *https://njaes.rutgers.edu/pubs/publication.php?pid=E358*. Hardcopies are available at the NPSEC online store at: *https://npsecstore.com/collections/respiratory-guides*.

Call your Pesticide Safety Education Program if you have any questions about pesticide safety equipment. Your Rutgers Extension Pesticide Safety Education Program will be able to assist you in selecting and using the correct respirator and any component parts from the pesticide label. See section 1.7 for contact information.

1.6 Protect the Environment

Generally speaking, to protect the environment from pesticide exposure:

- **Avoid off-target drift** by proper selection of application methods, droplet size, nozzle types, and tank mix partners.
- **Avoid using excess quantities of pesticides**. Calibrate your sprayer to make sure the output is within the label rate.
- **Always read the pesticide label** prior to selection of a pesticide, and check for environmental concerns and restrictions. The "Environmental Hazard" section of the label addresses concerns for surface water and groundwater contamination, non-targets, and endangered species protection requirements.

1.6.1 Minimize Off-Target Drift

Agricultural chemicals applied through spraying have the potential to drift away from the intended target areas. Drift is defined as "the movement of **spray particles** and **vapors** off-target causing less effective control and possible entry to susceptible wildlife vegetation and people." Spray drift has the potential to cause injury or damage to plants, animals, environment, or property, and can affect human health. Surveys indicate that approximately 65% of the drift complaints involved application procedures in violation of the label (Sumner 1997). **ALWAYS READ AND FOLLOW THE PESTICIDE LABEL**.

- **Vapor drift** is associated with the volatilization of a pesticide spray into a gas or fume. Off-target drift increases with pesticides with higher vapor pressures, and with higher ambient air temperatures. For pesticides that are quite volatile and pose harm when the vapor moves off target, the pesticide label may state a cut-off temperature for application, or the label may require soil incorporation after application.
- **Particle drift** is the movement of spray particles during or soon after the spray application. 'Particle' means the active ingredient of a pesticide as a liquid (spray droplet), granule, pellet, dust, fumigant, etc. The four factors which impact particle drift are: 1) wind speed; 2) boom height; 3) distance from susceptible vegetation; and 4) spray particle size.

Sample drift mitigation label language:

Controlling Droplet Size. The most effective way to reduce drift potential is to apply the largest droplets that provide sufficient coverage and control.

Volume. Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.

Pressure. DO NOT exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Always assess weather conditions before and DURING application. Use a wind gauge and **avoid spraying in winds above 10 mph**. Drift potential is lowest at wind speeds between 3 and 10 mph blowing in a direction away from sensitive non-targets. **"Dead calm" (0 to 3 mph winds) are NEVER recommended** because temperature inversions can cause long distance drift. Maintain boom heights as low as possible within manufacturer guidelines; the shorter the distance a droplet has to travel, the less chance for drift.

Related to spray particle size, the larger the droplet size the greater the deposition rate or the less drift. **Pesticide labels will have mandatory drift requirements**, **as well as manufacturer's advisory statements for best management practices to control drift**. This may include application methods, droplet size, nozzle types, and tank mix partners.

Generally speaking, to minimize off-target drift:

- Select low or nonvolatile pesticides.
- Choose days with better weather. Avoid spraying when windy, high temperature without low humidity, or inversion conditions. Spray when soil is coolest and relative humidity is highest.

- Use lowest spray pressure and largest droplets that provide sufficient coverage and control.
- Do not use nozzles or nozzle configurations that produce small droplets; consider use of "low drift" nozzles.
- Adjust boom height as low as is recommended by manufacturer or is practical.
- Adjust equipment to keep spray on target.
- Use lower travel speeds.
- Use drift control additives when permitted by the pesticide label.

1.6.2 Protect Surface and Ground Water

Pesticides can be transported from the atmosphere to streams and ground water with rainfall or by the deposition of particles from off-target drift. Streams are particularly vulnerable to pesticide contamination because surface water runoff from agricultural and urban areas flows directly into streams as both dissolved and particle-associated (sediment) pesticides. The timing of pesticide application relative to precipitation occurrence and intensity controls, for the most part, transport to streams and surface water, and ultimately groundwater.

Pesticides are transported to ground water mostly by recharge resulting from rainfall or irrigation within agricultural and urban areas where they are used. Other locally important sources include transport down leaky well casings and contaminated streams that lose water to ground water. Alternately, ground water can be a major portion of streamflow during low-flow periods and if contaminated, could be a source of pesticides to some streams.

Factors That Affect Movement of Water and Contaminants

The depth of aquifers, in conjunction with soil types, influences how much surface water reaches the aquifer. Their depth also affects how quickly water and contaminants reach an aquifer. Thus, shallow water tables tend to be more vulnerable to contamination than deeper ones.

This tendency, however, depends on the soil type. Soils with high clay or organic matter content may hold water longer and retard its movement to the aquifer. Conversely, sandy soils allow water to move downward at a fast rate. High levels of clay and/or organic content in soils also provide a large surface area for binding contaminants that can slow their movement into groundwater. Soil texture also influences downward water movement. Finer textured soils have fewer spaces between particles than coarser ones, thus decreasing movement of water and contaminants.

Pesticide Characteristics

The characteristics of an individual pesticide affect whether it remains adsorbed to surface soil or sediment; is dissolved and transported in surface runoff; or is leached to groundwater. The most important characteristics are solubility in water, adsorption to soils, and persistence in the environment.

Pesticides that are highly soluble in water have a higher potential for contaminating groundwater than those which are less soluble. The water solubility of a chemical indicates how much chemical will dissolve in water and is measured in parts per million (ppm). Those chemicals with a water solubility greater than 30 ppm may create problems. A chemical's ability to adhere to soil particles plays an important role. Chemicals with a high affinity for soil adsorption are less likely to reach the aquifer. Adsorption is also affected by the amount of organic matter in the soil. Soils with high organic matter content are less vulnerable than those with low organic matter content.

Finally, how persistent a chemical is in the environment may affect its ability to reach groundwater. Persistence is measured by the time it takes *half* of a given pesticide to degrade (*half-life*). Half-life is a measure of how quickly a chemical breaks down in soil (soil half-life) or water (hydrolysis half-life). US Geological Survey National Water-Quality assessment (NAWQA) data from agricultural areas across the Nation indicate that pesticides with greater persistence in soil are more likely to be detected in shallow ground water than compounds that are less persistent (1999). The longer a chemical remains in water or soil without breaking down, the more likely it is to leach through the soil. Pesticides are less likely to leach when their hydrolysis half-life is less than six months and their soil half-life is less than three weeks.

Transformations or degradation of pesticides proceed at widely varying rates, depending on the structure of the compound and environmental conditions. Half-lives vary widely from hours to decades. Generally, persistent pesticides or degradates (what they degrade into) may accumulate in soils, sediment, or biota; or be transported for long distances. In some cases, such as several of the historically used organochlorine pesticide (*e.g.*, DDT), both long-distance transport and accumulation have been observed.

How to Prevent Contamination of Your Ground Water

Apply pesticides only when needed.

The use of extraneous pesticides can increase the threat of contamination. Check your irrigation practices as well. Do not irrigate immediately after a pesticide application, unless required by a pesticide's label. The increased water content in the soil might speed up the movement of a pesticide into ground water.

Examine the chemical properties of the pesticides that you use.

If you are using materials which persist for long periods of time, are very water soluble, or are not tightly held by the soil, then you may be contaminating your groundwater. You may wish to select another material that has a shorter persistence, lower water solubility or higher potential for soil adsorption. **To compare product leachability, refer to the OSU Extension Pesticide Properties Database at:**
*http://npic.orst.edu/ingred/ppdmove.htm***.**

This database provides a qualitative Pesticide Movement Rating (*i.e.*, low, moderate, high) for each pesticide listed, as well as individual values or ranges for soil half-life (days), water solubility (mg/l), and the Sorption Coefficient (soil Koc).

Determine your local soil and geologic circumstances.

If you are in an area with a shallow water table or your soil is low in organic matter or sandy in nature, you have a greater risk of contaminating your groundwater. In these cases, choose a pesticide that has a low water solubility and is not persistent (has a short half-life).

Evaluate your management practices.

They may be the most important factor in determining your risk of contaminating your groundwater. If you use the same materials year after year, or many times a season, you can increase the potential for contamination due to the amount of pesticide in your soil.

The timing of pesticide applications has an effect on groundwater contamination.

If you make applications during periods of high rainfall or heavy irrigation, it is more likely that contamination may occur. Also, the water table in the spring may be higher than at other times. Early season applications, therefore, may pose a greater chance for groundwater contamination. Finally, the method of application may have an effect on ground water contamination. Direct injection, incorporation, and chemigation all increase the chance of contamination. If you use these techniques, be sure to follow the procedures listed on the material's label.

The location of your wells can be important.

The ground surrounding the wellhead should be sloping away from the well to divert surface runoff. If your sprayer loading area or pesticide storage building is too close to your well, the risk of contamination may be greater. **Wells used for drinking water or other purposes should be at least 50 feet away** from pesticide storage buildings and loading areas. In the event of an accident, this distance should prevent contamination. This minimum distance should also be followed for field irrigation wells. If they are too close to application areas, contamination might occur.

Check the condition of all wells in the vicinity of sprayer loading areas, pesticide storage areas, or field applications.

The National Ground Water Association recommends routine annual maintenance checks to ensure the proper operation of the well and prolong its years of service, as well as monitor the water quality. Periodically check the

well cover or well cap on top of the casing (well) to ensure it is in good repair and securely attached. Its seal should keep out insects and rodents. Cracks in a well casing provide a direct point of entry for pesticide-contaminated water in the soil around the well. Always replace cracked casings before the growing season.

Incorporate an anti-backflow device in any system used for chemigation or to fill your sprayer with water.
In the event of a pump shutoff or other failure, if any backflow into the water system occurs, these devices will prevent pesticides from entering your well. **New Jersey pesticide regulations at 7:30-10.2** require that "whenever any water is being added to any pesticide handling, storage, or application equipment via a hose, pump, or other equipment, the hose, pump, or other equipment is fitted with an effective valve or device to prevent backflow of pesticides or liquids containing pesticides into water supply systems, streams, lakes, other sources of water or other areas". The NJDEP has provided Rutgers with a policy interpretation that an "air gap" between the water source and pesticide which is sufficient to prevent backflow is acceptable to the Department.

The care and maintenance of your equipment is also an important consideration.
If your equipment does not function properly, you may be applying more than is needed and increasing the chance of groundwater contamination.

- Prior to the season, inspect all of the working parts of your sprayer or chemigation system. Check the pump to see if it is working properly.
- For both sprayers and chemigation systems, check the water lines for clogs and leaks. For sprayers, check the nozzles for wear and clogs. Clogged, leaking, or worn lines and nozzles can cause pesticides to be delivered excessively or in unwanted areas.
- Be sure to calibrate your equipment. Uncalibrated equipment can cause over delivery as well. Calibrate your equipment at the beginning of the season, periodically during the remainder of the season, and any time you make changes or adjustment to the equipment.

1.6.3 Protect Non-Target Organisms

Based upon the results of required ecological risk assessment or incident reports, the Environmental Hazards statements on the pesticide label for foliar application to agricultural crops must include use precautions and/or restrictions for all identified non-target birds, mammals, fish, aquatic invertebrates, and bees.

ALWAYS READ AND FOLLOW THE PESTICIDE LABEL.

Generally speaking, pesticide applicators must take measures that will minimize the risk of pollinators contacting a "bee-toxic" pesticide. "Bee-toxic" pesticides are those pesticides that have information on the label indicating that the pesticide is toxic to bees, and precautionary statements for the protection of pollinators on the product labeling.

Do not apply or allow drift of label-identified bee-toxic pesticides until all flowering of crop, cover crops, or weeds is complete/petal fall, unless you take necessary precautions to minimize exposure to foraging bees or and their hives. Do not apply bee-toxic pesticides when bees are foraging in cover crops or weeds.

Precautions may include: making applications after sunset, when the temperature has dropped below 55˚F, and notifying beekeepers in advance. Notification of beekeepers allows them to move, cover, or otherwise be protected prior to spraying. This protects a valuable agricultural resource, and avoids conflicts and possible lawsuits. Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at: *https://pesticidestewardship.org/pollinator-protection/.*

New Jersey Beekeeper Notification Regulations (N.J.A.C. 7:30-9.11)

Beekeepers that have hives overwintering in New Jersey are allowed to voluntarily register their bee yards with the NJDEP. A list of registered beekeepers is provided on the NJDEP's Beekeeper Notification webpage at: *https://www.nj.gov/dep/enforcement/pcp/bpo-bee.htm*. In New Jersey, pesticide applicators are required to notify those beekeepers within a 3-mile radius at least 24 hours prior to the application of any pesticide labeled

as toxic to bees. Once notified, it is the responsibility of the beekeeper to take action to protect their hives. Agricultural applications are exempt from the notification requirements, unless specifically listed under 7:30-9.11 (i); the list is provided in the next paragraph. See regulations at:
https://www.nj.gov/dep/enforcement/pcp/regulations/Subchapter%209%20Changes%20in%20Red%202020.pdf

Per NJAC 7:30-9.11 (i): **Beekeeper notification is mandatory** for growers using "bee-toxic" pesticides within three miles of the target site on the **following crops within the dates stated below or when in the flowering stage** (***i.e., both***). "Flowering stage" specifically means when plants bear any portion of a blossom as part of the blooming process associated with pollen and nectar production.

- **Apples, pears, strawberries, peaches, and blueberries:** April 15th to May 15th
- **Holly:** June 1st to June 30th
- **Cranberries:** June 15th to August 15th
- **Vine Crops (Cucurbits):** June 1st to August 31st
- **Sweet corn** (during flowering stage)
- **Fields where flowering weeds are present**

Notification must occur at least 24 hours prior to the date of application, and must include: intended date and approximate time of application; location of the application; brand name and active ingredients of the pesticide to be applied; and the name and license number of the pesticide applicator. Notification to the apiarist can be made in person, by phone, by fax, by email, or regular or certified mail (as long as it is received 24 hours before the application).

Pesticide Bee Incident Reporting

Immediately report pesticide incidents (*e.g.*, bee kills) to your State pesticide regulatory agency. Pesticide incidents should also be reported to the National Pesticide Information Center at: *www.npic.orst.edu* or directly to EPA at: *beekill@epa.gov*.

Product-Specific Protection of Pollinators

The New Jersey Pesticide Control Act was amended on January 20, 2022 to make the class of pesticides known as the neonicotinoids "restricted use" in New Jersey, and further prohibits any use of neonicotinoids except agricultural use. The intent of this law is to reduce pollinator exposure to these pesticides, and the practical effect is to prohibit use of these pesticides in home gardens and landscapes, golf courses, and other non-agricultural settings. The law provides a specific deadline that **beginning October 31, 2023, no sale of neonicotinoid pesticide can occur unless to a licensed applicator and for use only on agricultural plants.**

Agricultural users should take all label-required pollinator protection measures if they continue to use neonicotinoids. Due to concerns regarding pollinator health, in 2014, EPA required that all manufacturers of pesticide products containing active ingredients from the **neonicotinoid group of insecticides** relabel these products with an **advisory "pollinator protection box"** advising users to look for mandatory restrictions on the product's use indicated with a "bee icon". See **Figure 1.1** for a sample pollinator protection box with its **"bee icon"** and advisory language which alerts the applicator that there are additional application restrictions for pollinator protection.

Mandatory product-specific pollinator protection language is required in the "**Directions for Use"** of the product label for all neonicotinoid products, *i.e.*, **active ingredients clothianidin, dinotefuran, imidacloprid and thiamethoxam**. See Figure 1.2 for an excerpt of the current (February 2023) pollinator protection label language for these neonicotinoids contained in the "Directions for Use". Each statement is flagged with a "bee icon."

Each of these neonicotinoid pesticides are undergoing registration review; amended proposed decisions are anticipated for early 2023 with the registration review interim decision anticipated in 2024. See the schedule for review of neonicotinoids pesticides at:
https://www.epa.gov/pollinator-protection/schedule-review-neonicotinoid-pesticides.

PESTICIDE SAFETY

The mandatory pollinator protection language for the neonicotinoid class of pesticides is included as Figure 1.2 below. **It is notable that the EPA neonicotinoid pesticide "Directions for Use" have a more stringent beekeeper notification requirement of 48 hours versus the New Jersey 24 hour notification; the more stringent 48 hour notice must be given.**

Pesticide applicators should be continually alert for changes to pesticide labels as EPA will incorporate label directions and use restrictions as **chemical-specific pollinator assessments for the neonicotinoid and other pesticides are completed through an ongoing registration review process**.

Figure 1.1 EPA Pesticide Label Pollinator Protection Box

PROTECTION OF POLLINATORS

APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.

Look for the bee hazard icon  in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.

Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.

Bees and other insect pollinators can be exposed to this pesticide from:

- Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
- Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

When Using This Product Take Steps To:

- Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
- Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives or off-site to pollinator attractive habitat can result in bee kills.

Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at:
http://pesticidestewardship.org/PollinatorProtection/Pages/default.aspx.

Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state, go to: www.aapco.org/officials.html. Pesticide incidents should also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov

Figure 1.2 EPA Pesticide Label Excerpt of "Directions for Use" for Neonicotinoid Pesticides

DIRECTIONS FOR USE

1. FOR CROPS UNDER CONTRACTED POLLINATION SERVICES

Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless the following condition has been met. If an application must be made when managed bees are at the treatment site, the beekeeper providing the pollination services must be notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.

2. FOR FOOD CROPS AND COMMERCIALLY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS

Do not apply this product while bees are foraging. Do not apply this product until flowering is complete and all petals have fallen unless one of the following conditions is met:

- The application is made to the target site after sunset
- The application is made to the target site when temperatures are below 55° F
- The application is made in accordance with a government-initiated public health response
- The application is made in accordance with an active state-administered apiary registry program where beekeepers are notified no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying
- The application is made due to an imminent threat of significant crop loss, and a documented determination consistent with an IPM plan or predetermined economic threshold is met. Every effort should be made to notify beekeepers no less than 48-hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.

3. FOR NON-AGRICULTURAL PRODUCTS

Do not apply [insert name of product] while bees are foraging.
Do not apply [insert name of product] to plants that are flowering.
Only apply after all flower petals have fallen off.

Rutgers scientists continue to study pesticide interactions with pollinators in New Jersey. In addition to their own field studies, they collaborate with other researchers and review pollinator-specific pesticide interactions. Fruit pesticides that are either moderately or highly toxic to bees are listed in Table 1.2.

Table 1.2 Fruit Pesticides Shown to Have Moderate to High Toxicity Effects on Bees

	Active Ingredient	Trade Name[2]	Chemical Group	MOA Class	Toxicity Risk[3]
Insecticides & Miticides	acetamiprid	Assail	Neonicotinoid	4A	Moderate
	avermectin/abamectin	Agri-Mek, Avid	Avermectin	6	High
	azadirachtin	Aza-Direct, Neemix	Unknown	UN	Moderate
	bifenazate	Acramite	Unknown	UN	Moderate
	bifenthrin	Brigade, Capture	Pyrethroid	3A	High
	carbaryl	Carbaryl, Sevin	Carbamate	1A	High
	Chromobacterium subtsugae	Grandevo	Biological	UN	High
	clothianidin	Belay	Neonicotinoid	4A	High
	cyantraniliprole	Exirel	Diamide	28	High
	cyfluthrin	Baythroid	Pyrethroid	3A	High
	cyfluthrin + imidacloprid	Leverage	Pyrethroid + Neonicotinoid	3A, 4A	High
	deltamethrin	Delta Gold	Pyrethroid	3A	High
	diazinon	Diazinon	Organophosphate	1B	High
	dinotefuran	Venom, Scorpion	Neonicotinoid	4A	High
	esfenvalerate	Asana	Pyrethroid	3A	High
	fenpropathrin	Danitol	Pyrethroid	3A	High
	gamma-cyhalothrin	Proaxis	Pyrethroid	3A	High
	imidacloprid	Admire	Neonicotinoid	4A	High
	indoxacarb	Avaunt	Channel blocker	22A	High
	lambda-cyhalothrin	Warrior	Pyrethroid	3A	High
	lambda-cyhalothrin + chlorantraniliprole	Besiege	Pyrethroid + Diamide	3A + 28	High
	malathion	Malathion	Organophosphate	1B	High
	methomyl	Lannate	Carbamate	1A	High
	novaluron	Rimon	Benzoylurea	15	Moderate
	oxamyl	Vydate	Carbamate	1A	High
	permethrin	Ambush, Perm-Up	Pyrethroid	3A	High
	phosmet	Imidan	Organophosphate	1B	High
	pyrethrum + piperonyl butoxide	Evergreen, Crop Protection EC	Pyrethrin	3A	High
	pyrethrum	Pyganic, Evergreen	Pyrethrin	3A	High
	pyridaben	Nexter	METI	21A	High
	spinetoram	Delegate	Spinosyn	5	High
	spinosad	Entrust	Spinosyn	5	High
	thiamethoxam	Actara, Platinum	Neonicotinoid	4A	High
	thiamethoxam + chlorantraniliprole	Voliam Flexi	Neonicotinoid + Diamide	4A + 28	High
	tolfenpyrad	Apta	METI	21A	High
	zeta-cypermethrin	Mustang Maxx	Pyrethroid	3A	High
Fungicides	captan	Captan	Phthalimide	M4	Moderate
	dicloran	Botran	Aromatic hydrocarbon	14	High
	fenarimol	Vintage	DMI	3	Moderate
	hydrogen dioxide	Oxidate	Unclassified	NA	High

[1]Do not apply any insecticides during bloom, unless they are completely non-toxic to bees, and avoid applications of all pesticides during active foraging by pollinators. Data show that combinations of DMI FRAC group 3 (DMI fungicides including: Indar, Rally, Orbit, Bumper, Quash, Procure and Vintage) and neonicotinoid insecticides (IRAC code 4 including: Assail, Actara, Admire Pro, Belay, Calypso, Scorpion, Venom, including combinations and generics) cause increased bee mortality. Furthermore, DMI fungicide applications are not recommended during bloom for resistance management. Other data show that certain combinations of fungicides mixed with insecticides increase the toxicity of those insecticides to both adult and larval forms of honey bees and some wild bees. In some cases the fungicides by themselves or in combination with other fungicides have shown negative impacts on pollinators. [2]Note: some products may not be labeled for tree fruit use. [3] Adapted from Michigan State University. Minimizing Pesticide Risk to Bees in Fruit Crops, and recent research data.

1.7 State Contacts for NJ Pesticide Applicator Programs

Rutgers

Rutgers NJAES Pesticide Safety Education Program (PSEP)

Contact: 848-932-9802
George C. Hamilton, Extension Specialist in Pest Management, 848-932-9801.
hamilton@njaes.rutgers.edu.
Patricia D. Hastings, Extension PSEP Coordinator/WPS Lead for New Jersey. 848-932-0176.
hastings@njaes.rutgers.edu.

Rutgers Pesticide Applicator Training Resources

- Certification & Training Home Page: *https://pestmanagement.rutgers.edu/pat/*
- Rutgers Pesticide Records and Forms: *https://pestmanagement.rutgers.edu/pat/record-forms-2/*
- Rutgers Pesticide Applicator Training Manuals: *https://pestmanagement.rutgers.edu/pat/manuals/*

Rutgers Worker Protection Standard Resources

- Home Page: *https://pestmanagement.rutgers.edu/worker-protection/*
- Rutgers "Quick-Connect" - WPS Training Videos: *https://pestmanagement.rutgers.edu/worker-protection/worker-handler-training/*
- Respiratory Protection for Occupational Users of Pesticides. Rutgers Bulletin E358. March 2018. *https://njaes.rutgers.edu/pubs/publication.php?pid=E358*
- EPA's Worker Protection Standard Respiratory & Recordkeeping Requirements for Agricultural Employers of Pesticide Handlers. Rutgers Bulletin E372. February 2022. *https://njaes.rutgers.edu/pubs/publication.php?pid=E372*.

Rutgers NJAES PSEP Blog*:* Rutgers PSEP posts concurrently to the NJAES Plant & Pest Advisory on topics in applicator certification and training, and worker protection. All of these posts are archived in the PSEP Pesticide Safety & Regulatory Updates Blog Archive located at: *https://pestmanagement.rutgers.edu/news/.*

Rutgers NJAES Office of Continuing Professional Education (OCPE)

NJDEP **P**esticide **A**pplicator **C**ertification **E**xam **R**egistration **(PACER):** *https://pacer.rutgers.edu*
Responsive, courteous help desk support Monday through Friday, 8:00am-4:30pm.
Phone: 848-932-9271, Option 7; Fax: 732-932-1187; E-mail: *pacer@njaes.rutgers.edu*.

New Jersey Department of Environmental Protection **Contact:** 609-984-6507

N.J.A.C. 7:30 Pesticide Regulations: *https://www.state.nj.us/dep/enforcement/pcp/pcp-regs.htm*

NJDEP Bureau of Licensing & Registration

- Home Page: *https://www.nj.gov/dep/enforcement/pcp/bpo-licensing.htm*
- Private Applicator Certification**:** *https://www.nj.gov/dep/enforcement/pcp/bpo-appprivate.htm*
- Recertification Course Webpage: *https://www.nj.gov/dep/enforcement/pcp/bpo-recert.htm*

NJDEP Bureau of Pesticide Compliance

- Home Page: *https://www.nj.gov/dep/enforcement/pcp/pcp-bpc.htm*
- Worker Protection Unit: *https://www.state.nj.us/dep/enforcement/pcp/pcp-wps.htm*

For specific questions or concerns about NJDEP's implementation of the revised WPS, please contact Supervisor of the Worker Protection Unit Nancy Santiago at 609-984-6568, or contact her by email at *pcp@dep.nj.gov*.