

Identifying and Reducing Pesticide Risks

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Background

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is the Federal statute that governs the registration, distribution, sale, and use of pesticides in the US. Before EPA may register a pesticide under FIFRA, the applicant must show, among other things that using the pesticide according to specifications “will not generally cause unreasonable adverse¹ effects on the environment.”

In evaluating a pesticide registration application, EPA assesses a wide variety of potential human health and environmental effects associated with the use of the product. EPA develops risk assessments that evaluate the potential for:

- Harm to humans, ranging from short-term toxicity to long-term effects such as, cancer and reproductive system disorders.
- Harm to wildlife, fish, and plants, including endangered species and non-target organisms.
- Contamination of surface water or ground water from leaching, runoff, and spray drift.

EPA also evaluates and approves the language that appears on each pesticide label to ensure the directions for use and safety measures appropriately mitigate potential risks. Following label directions is required by law and is necessary to ensure safe use.

Who and What is Protected by Mitigation Measures?

Through one or more their risk assessments, EPA may determine that specific mitigation measures are required to sufficiently reduce risk. Below are example entities commonly protected by mitigation measures:

- Pesticide applicators and other handlers
- Agricultural and forestry workers
- Bystanders (Non-occupational exposure)
- Residents (Non-occupational exposure)
- Consumers of food products (Dietary), particularly infants and children, taking into account the potential for pre- and postnatal toxicity
- Consumers of drinking water (Dietary), protecting ground and surface water
- Non-target plants and animals, including pollinators
- Aquatic habitats and resources, including fish and other aquatic organisms

The types of mitigation (risk reduction) measures may vary and depend on numerous factors. In addition, some mitigation measures are advisory (e.g., "the most effective way to reduce drift potential is to apply large droplets") while others are mandatory (e.g., " apply only as a coarse spray (ASAE standard 572) or a volume mean diameter of 385 microns or greater").

Pesticide Risk Mitigation Measures

Historically, federal and state regulatory agencies have relied on a variety of methods to reduce risk to bystanders, pesticide handlers, agricultural workers, consumers and the environment. Many, but not all, of the federal requirements are reflected in label statements. FIFRA takes into account both risk and benefit when developing mitigation measures.

Required or advised mitigation measures are dependent on a long list of complex factors. Many factors are taken into account when determining appropriate mitigation measures, including:

- Use site (the crop on which the pesticide is intended to be applied, whether the application will be made indoors or outdoors, whether the application is aquatic or terrestrial, whether the product will be applied in a residential or non-residential setting)
- Pesticide users (whether the intended users are licensed or unlicensed);
- Application methods
- Types of possible occupational “post-application” exposure (e.g., hand-labor associated with growing or harvesting the crop)
- Product formulation (fumigant, liquid, granular etc.)
- Pesticide characteristics, including potential toxicity, irritation and sensitization hazard; half-life, and propensity to volatilize, drift or leach).

Examples of Common Mitigation Measures

- Designate products as Restricted Use Pesticides (RUP) ¹
- Limit access based on container size (e.g., chlorpyrifos and certain rodenticides).
- Limit allowable types of application methods (e.g., only allow soil applications) or formulations (e.g., only allow granular formulations).
- Limit allowable application sites (e.g., only allow applications on specific crops).
- Limit when (e.g., time of year or time of day) applications can take place
- Reduce the application rate, maximum number of applications per season, maximum amount that can be applied per season, and/or increase the minimum intervals for retreatment.
- Require that all applicators are certified and licensed.
- Require product-specific training for pesticide use.
- Require general knowledge pesticide training for handlers and workers.
- Increased Personal Protective Equipment (PPE) requirements.
- Increase Restricted Entry Intervals (REI) and/or Pre-harvest Intervals (PHI).
- Require notifications, signs and wash water for decontamination.
- Require buffers next to sensitive sites or increase their width.
- Increase spray droplet size.
- Reduce spray release heights.

- Limit application when weather conditions (e.g., wind speed, temperature, humidity) are adverse.
- Limit application when rainfall or irrigation is expected within a certain amount of time.
- For aerial applications: require that nozzles be a certain distance apart and/or oriented in a particular direction. Adjusting boom length and/or swath width
- Require engineering controls (e.g., closed-system packaging designed to prevent transfer or removal of the pesticide except directly into proper application equipment).
- Require particular devices when applying the product (e.g., requiring a functional check valve, vacuum relief valve, or low pressure drain to prevent water source contamination when applying a product through chemigation).
- Require additional advisory or precautionary label statements.
- Recommend use of pesticides only as part of a larger Integrated Pest Management program.
- Eliminate all uses for a product, formulation or active ingredient (usually in a progressive manner).

Note - This list of example mitigation measures is not exhaustive and not specific to any active ingredient or product.

Reducing Risk By Modifying Requirements, Increasing Restrictions or Phasing-Out Products

There are many instances of phase-outs (of certain use sites or even entire active ingredients), rate reductions, changes in allowable application methods, modifications of application timing, and other label changes. Listed below are a few examples.

Chlorpyrifos

In 2000, because of risks to children in schools and parks, EPA prohibited the use of chlorpyrifos in residential areas both indoors and outdoors, except for use as roach bait in child-resistant packaging and mosquito control. EPA limited non-agricultural, non-residential uses to golf course turf (with a reduced application rate) and certain industrial uses. Furthermore, post-bloom applications to apples and use on tomatoes were prohibited.

Endosulfan

In 2010, EPA took action to end the use of the insecticide endosulfan because it can pose unacceptable health risks to farmworkers and wildlife and can persist in the environment. Within two years after the announcement, most crop uses of endosulfan were phased out. Other uses took longer to phase out, in order to ensure a successful transition to lower risk pest control strategies among growers. EPA required additional mitigation measures during this longer phase-out period to minimize risks to workers associated with endosulfan use on these crops.

Table 1. Examples of Currently Required Mitigation Measures on the Lorsban Advanced¹ (chlorpyrifos) Label.

Mitigation Measures	Reduces Risk to:
<p>Restricted Use Pesticide Classification² Only a certified applicator can buy and use, or in some situations supervise the use by a non-certified applicator.</p>	<p>***Mixers, loaders, applicators and other handlers. In some cases, water quality and non-target plants or animals.</p>
<p>Personal Protective Equipment (PPE)³</p> <ul style="list-style-type: none"> • Coveralls over long-sleeved shirt & long pants • Chemical-resistant gloves • Chemical-resistant apron when mixing or loading or exposed to the concentrate • Chemical-resistant footwear plus socks • Chemical-resistant headgear for overhead exposure • Respirator (see label for details) <p>User Safety Recommendations</p>	<p>***Mixers, loaders, applicators and other handlers</p>
<p>Human Flaggers: Are prohibited.</p>	<p>***Workers</p>
<p>First Aid Statement</p>	<p>*Mixers, loaders, applicators and other handlers. Workers.</p>
<p>Worker Protection Standard (WPS), including Restricted Entry Interval (REI)⁴</p>	<p>***Mixers, loaders, applicators and other handlers. Workers. REI is specific to workers, and is 24 hrs for most crops grown in Oregon.</p>
<p>Spray Drift Management: Buffers⁵ See Table 2 for number of feet. Buffers or setbacks protect bystanders from acute inhalation exposures, and dermal exposure.</p>	<p>*Bystanders / Sensitive sites</p> <p>Areas frequented by non-occupational bystanders (especially children). These include residential lawns, pedestrian sidewalks, outdoor recreational areas such as school grounds, athletic fields, parks and all property associated with buildings occupied by humans for residential or commercial purposes. Sensitive sites include homes, farmworker housing, or other residential buildings, schools, daycare centers, nursing homes, and hospitals.</p>

<p>Spray Drift Management: Buffers (cont.) See Table 2 for number of feet</p>	<p>***Surface Water (Possible drinking water sources and Aquatic Habitats): Permanent bodies of water such as rivers, natural ponds, lakes, streams, reservoirs, marshes, estuaries, and commercial fish ponds</p>
<p>Specific application directions, related to method/timing, dilution, and droplet size. Droplet size may mitigate against direct acute inhalation exposures (and dermal); large droplet sizes cannot be inhaled.</p>	<p>***Bystanders /Sensitive sites), Workers, Consumers and Aquatic Habitats: Reduces the possibility of drift and protect ground and surface water.</p>
<p>Specific application directions, related to types of applications that can be made and their timing, including:</p> <ul style="list-style-type: none"> • Maximum application rates • Maximum number of applications per season • Required timing of applications (pre-bloom, preharvest, postharvest) • Minimum time intervals between applications • Preharvest intervals (time period between the last application and when harvest is allowed) 	<p>***Workers, & Consumers (particularly vulnerable populations). Non-target Impacts⁶: Reduce the possibility of excessive residues, particularly an exceedance of the tolerance* on harvested food or feed crops. *The tolerance is the maximum amount of pesticide residue allowed to remain in or on each treated food or feed commodity at harvest. Chronic pesticide exposures are those exposures lasting greater than three months (mostly by ingestion).</p>
<p>Pollinator Statements</p> <ul style="list-style-type: none"> • Lorsban Advanced is highly toxic to bees... • Do not apply if nearby bees are clustered outside of hives and bees are foraging in the treated area. • Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area. 	<p>*Bees. This label language would not allow applications while crops or weeds within the treatment area are in bloom due to an extended residual toxicity greater than 8 hours, meaning that even if applied in the evening, there would still be acute toxicity effects to bees returning to the site the next morning.</p>
<p>Environmental Hazards Statement</p>	<p>***Fish, *aquatic invertebrates, *small mammals, ***birds, and*bees.</p>
<p>Storage and Disposal</p>	<p>***Contaminations of: water, other pesticides, and people handling containers.</p>

- * Mitigation measure designed to reduce acute pesticide exposure
- ** Mitigation measure designed to reduce chronic pesticide exposure
- *** Mitigation measure designed to reduce both acute and chronic pesticide exposures

Citations and Definitions

Table 2. Synopsis of Buffers⁵ Currently in Effect for Chlorpyrifos

To Be Protected	Source	Required Setback (Buffer Zones) (feet)		
		Aerial	Airblast***	Ground
Bystanders / Sensitive areas*	Pesticide Label ⁵	10 - 80	10	10
Aquatic	Pesticide Label	150	50	25****
Salmonids	Court-Ordered**	300	60	60

* Includes all listed sensitive sites

** Neither ODA nor EPA have the legal authority to enforce court-ordered buffers.

*** Airblast application equipment is most typically used in fruit orchards and some nurseries, and on hazelnuts and berry crops.

**** Does not include application by airblast

¹ Dow (Corteva Agriscience) /Lorsban Advanced (EPA Reg. No. 62719-591) is used as an example, because it was the most common product involved in chlorpyrifos-related use incidences in Oregon. One factor that possibly contributed to this is the fact that Lorsban Advanced is a widely-used and well-known product.

² EPA Classifies Pesticides As:

- Restricted use pesticides (RUPs); or
- General use (unclassified) pesticides.

RUPs have the potential to cause unreasonable adverse effects to the environment and injury to applicators or bystanders without added restrictions. The "Restricted Use" classification restricts a product, or its uses, to use by a certified applicator or someone under the certified applicator's direct supervision. Classification is based upon consideration of toxicity data, including acute toxicity, exposure, and intended use. In this context, acute pesticide exposure is defined as exposure to a chemical for less than 24-hours (can occur by dermal or inhalation).

³ There are slightly different PPE requirements for mixers and loaders using a mechanical transfer loading system, and applicators using aerial application equipment. Certain engineering controls, such as an enclosed cockpit for aerial applications, are also required.

⁴ The restricted entry interval (REI) means the time after the end of a pesticide application during which entry into the treated area is restricted. The REIs for most crops grown commercially in Oregon is 24 hours, except for certain types of sprays onto specific fruit and nut trees, for which the REI is 4 days.

There are significant restrictions and limitations on early entry, which is defined as entry by a worker into a treated area on the agricultural establishment after a pesticide application is complete, but before any restricted-entry interval for the pesticide has expired.

Treated area means any area to which a pesticide is being directed or has been directed. For additional information regarding early entry, see <http://pesticideresources.org/wps/htc/index.html> (pages 49-55)

⁵ Buffer distances specified are the distances in feet that must exist to separate sensitive sites from the targeted application site. Buffers are measured from the edge of the sensitive site to the edge of the application site.

- Only pesticide handlers are permitted in the setback area during application of this product.
- Use of this product is prohibited if anyone other than a mixer, loader, or applicator, is in the setback area.
- Exception: Vehicles and persons riding bicycles that are passing through the setback area on public or private roadways are permitted.

Some labels have wider buffers for higher application rates. These were not included because either the crop is not grown in Oregon (e.g., citrus); or the application method is not employed (e.g., airblast on turf grown for sod)

⁶ Non-target impacts could for example refer to: adjusting timing or application rates or methods to protect pollinators, nesting birds, endangered or threatened species, or aquatic organisms.