

SECTION A. INTRODUCTION

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This handbook is designed as a quick and ready reference for weed control practices and herbicides used in various cropping systems or sites in Idaho, Oregon, and Washington.

This handbook will be useful to Extension agents, company field representatives, commercial spray applicators and consultants, herbicide dealers, teachers, and producers.

Recommendations are based on research results from the Agricultural Experiment Stations and Extension Services of Oregon, Idaho, and Washington. A few suggestions are included from research conducted in other states, and from U.S. Department of Agriculture research centers. In all cases, authors make every effort to list only registered herbicides, and to ensure that the information conforms to product labels and company recommendations.

Revision and Availability This handbook is updated semiannually. Individual sections are revised once each year; revision dates are listed at the start of each section. Most sections are also available as PDF documents on the weed handbook website:

<http://pnwhandbooks.org/weed>

Some sections may include additional online content, such as photos and links to related websites, publications, and other resources.

Please send comments or suggestions to handbook editor Ed Peachey (ed.peachey@oregonstate.edu).

Important Points to Remember

- **This handbook is not intended as a complete guide to weed control or herbicide use.** Authors have assembled the most reliable information available to them at the time of publication. Due to constantly changing laws and regulations, authors can assume no liability for the recommendations.
- **Any use of a pesticide contrary to instructions on the printed label is illegal and is not recommended.** Before using any herbicide, read the label on the container. Before a herbicide can be recommended for a specific use, it must be thoroughly tested. The recommendation on the manufacturer's label, when followed, can prevent many problems arising from the improper use of a chemical.
- **Trade-name products and services are mentioned as illustrations only.** This does not mean that the participating Extension Services endorse these products and services or that they intend to discriminate against products and services not mentioned. Trade names (brand names) of some commercial pesticides are used in portions of this handbook to help identify the common name used by the Weed Science Society of America (WSSA).

Biological Control

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Revised March 2019

Classical biological weed control involves the introduction and management of selected host-specific natural enemies to reduce and suppress problematic weeds. The majority of the Pacific Northwest's weeds are exotic, originating from other continents. These newly introduced plants, freed from the natural enemies found in their native range, gain a competitive advantage over native plants which allows the introduced plants to become weedy. Once weed populations become well distributed, herbicides, cultural, and mechanical methods of weed control are not always economical or physically able to meet weed management objectives. Classical weed biological control (biocontrol) is a weed management tool that is inexpensive, self-sustaining, and host-specific and may help reduce the negative impact of weeds, particularly where other control methods are not feasible.

Biocontrol differs from other weed control methods because it does not result in immediate weed population reductions. Successful biological control reduces the competitive ability of target weeds, allowing other plants to successfully compete with and suppress target weed populations through time. Unlike other weed control options, biocontrol rarely causes substantial weed population reductions in the initial year of release; however, successful biocontrol can result in significant, sustained weed reductions over a period of years. In the Pacific Northwest, biocontrol has been successful in controlling Mediterranean sage, St. Johnswort (Klamath weed),

tansy ragwort, Dalmatian toadflax, purple loosestrife, diffuse knapweed, and leafy spurge. Preliminary information indicates emerging success for yellow toadflax using *Mecinus janthinus*.

Biocontrol is a slow process, and its efficacy is highly variable. Since it can take several years for biological control agent (BCA) populations to build to levels capable of weed suppression, many BCAs have not been present or studied long enough in the Pacific Northwest to determine their ability to control their host weed. Only after monitoring weed and BCA populations over time will the impact of newly introduced BCAs become evident.

BCAs impact weeds directly and indirectly. They directly impact weeds by destroying plant tissues and interfering with plant functions. BCAs cause indirect impact by increasing stress on the weed, which may reduce its ability to compete with desirable plants.

Biocontrol can be integrated with other management practices to reduce weed populations. For example, once weeds are weakened by BCAs, competitive plantings can reduce the availability of light, water, and nutrients to already stressed weed populations. In addition, satellite weed populations can be controlled by herbicides or physical means to reduce weed spread while BCAs attack the primary infestation.

Similar to other weed control methods, biocontrol is not a silver bullet; it will not eradicate host weeds since a BCA's survival de-

depends on the presence of the host weed. Therefore, when using BCAs, expect weed populations to persist, but at much lower levels. After host weed populations decrease, populations of BCAs will decrease correspondingly. This is a natural cycle. A resurgence of weed populations may occur due to seed reserves in the soil, host weed plants missed by the BCA, and lagging populations of BCAs. In areas where the BCAs do not provide sufficient control, other weed control methods may need to be integrated to achieve desired results, or a search for additional BCAs may be pursued.

The BCAs released in the Pacific Northwest have been tested to ensure they are host-specific (i.e., they will only feed on the host weed species). Host-specificity testing is an expensive and time-consuming task that must be done before a BCA is allowed to be introduced into the United States. Some candidate BCAs, which could be effective in reducing host weed populations, may not be approved for introduction because they are not host-specific enough. A candidate BCA that is not sufficiently host-specific will be rejected for release in the United States to ensure that the BCA, in the absence of its host weed, will not move to crops, native flora, or endangered plant species.

Biocontrol of certain weeds may not work in your area, even if it does elsewhere. BCAs require specific conditions to survive and thrive. Climate variations (e.g. cold winters), plant biotype differences, and nearby insecticidal treatments (e.g. mosquito abatement or agricultural pest insect control) may account for some past failures. To maximize success, trained personnel should supervise and monitor biocontrol efforts. To monitor BCAs, the Standardized Impact Monitoring Protocol (SIMP) is recommended. More information on SIMP can be found by accessing the ISDA/BLM biocontrol website (<http://invasivespecies.idaho.gov/bio-control-monitoring>).

Once release sites for BCAs have been selected, protecting those areas from disturbance so BCAs can get established is essential. Initial BCA releases often consist of a small number of individual BCAs. Establishing collectable populations of the BCA for redistribution to other weed infestations can take three to five years, and is generally the first goal of a new biocontrol program. Care should be taken to ensure that BCAs being collected for redistribution are not diseased or parasitized, as this will reduce their efficacy in the new area. The current status and types of BCAs used in the Pacific Northwest are found in the tables in this section. It may be necessary to release BCAs over successive years to ensure that the BCAs become established and reach the population levels needed to result in target weed suppression. In addition, BCAs will likely need to be reestablished in areas where disturbances, like wildfire or flooding, may have killed previously established populations. Biocontrol has many advantages but also some disadvantages. Advantages include: reducing herbicide residues in the environment; specificity on host weeds; use in areas with limited accessibility; long-term, self-perpetuating control; low cost per acre; host-finding capabilities; synchronizing BCAs to hosts' life cycles; and the unlikelihood that host weeds will develop resistance to BCAs. Disadvantages of biocontrol include: the limited availability of BCAs from their native lands; the dependence of control on plant density; the slow rate at which control occurs and uncertainty of the level of control; biotype or climate matching; and host-specificity when host populations are low.

Biocontrol programs require consistent funding, expertise, and interdisciplinary cooperation. Biocontrol of weeds is not a perfect solution for all weed management programs. It can, however, be effective as an additional tool in combination with other weed management methods. Interdisciplinary vegetation management teams are working strategically to find the best single or combination of weed control tools to minimize adverse environmental and socioeconomic impacts.

If you are considering importing BCAs from another state, be aware that federal permits are required. For more information, contact your nearest USDA APHIS PPQ office, or visit <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/import-information/permits/regulated-organism-and-soil-permits/biological-control-organism-permits>. Permits for approved BCAs are free but take time to review and issue so it is best to apply well before your anticipated ship date.

Anyone who implements classical biological weed control is encouraged to follow the *International Code of Best Practices for Classical Biological Control of Weeds*, adopted by the delegates at the 1999 International Symposium on Biological Control of Weeds. The twelve codes for safe and effective biocontrol practices can be found at <http://www.invasives.wsu.edu/Code.htm>. Briefly, the key guidelines for biocontrol implementation includes:

- Releasing only safe and approved BCAs
- Using the most effective BCAs
- Documenting releases. State agencies can provide release forms and appreciate receiving release information for their records.
- Releasing only the intended target BCA by thoroughly removing all other insects and plants from collecting material.
- Stopping releases of ineffective BCA, or when control is achieved.
- Monitoring for impacts on the host weed, non-target species, and the environment.

As highlighted in the code of best practices, do not use non-APHIS approved natural enemies as BCAs because unapproved natural enemies have the potential to cause negative nontarget impacts. Examples include accidentally introduced species such as *Larinus carlinae* (formerly *L. planus*, Canada thistle weevil), *Chaetorellia succinea* (yellow starthistle seedhead fly), *Coniatus splendidulus* (splendid tamarisk weevil), and *Cassida rubiginosa* (thistle tortoise beetle). In addition, BCAs against weedy thistle species (*Rhinocylus conicus* and *Trichosirocalus horridus*) are no longer approved for interstate shipment because of concerns over potential impacts to native thistles. As of 2009, USDA APHIS suspended all permits for the interstate movement of the saltcedar beetle, *Diorhabda carinulata* (formerly *D. elongata*). The accidentally introduced houndstongue root weevil, *Mogulones crucifer* (formerly *M. cruciger*), is listed as a pest by USDA APHIS PPQ. Movement of *M. crucifer* may result in severe penalties, as stated in the PPQ Pest Alert: "Unauthorized collection, transportation, and release of *Mogulones crucifer* as a BCA against houndstongue in the United States is a criminal violation of the Endangered Species Act, with penalties for punishable offenses ranging from a maximum fine of up to \$50,000 or imprisonment for 1 year, or both, and civil penalties of up to \$25,000 per violation. These actions are also a violation of the Plant Protection Act, with fines of up to \$250,000 per count for noncompliance, or up to \$1 million per adjudication if the violation is willful."

The following tables contain lists of target weeds, and the current status of selected BCAs by state. For more information about accessing, using, and monitoring BCAs, contact your state department of agriculture or land-grant university.

Current Status of Biological Weed Control Agents in Idaho, Oregon, and Washington

Weed	Biocontrol Agent	Oregon				Washington				Idaho			
		Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴
Bindweed, field (<i>Convolvulus arvensis</i>)	<i>Aceria malherbae</i>	L	M	F	L	L	M	F	M	L	L	F	L
	<i>Tyta luctuosa</i>	L	L	P	L	U	U	U	U	L	L	U	L
Broom, French (<i>Genista monspessulana</i>)	<i>Bruchidius villosus</i>	W	H	G	M	—	—	—	—	—	—	—	—
Broom, Scotch (<i>Cytisus scoparius</i>)	<i>Bruchidius villosus</i>	W	H	G	M	W	H	G	M	L	U	U	U
	<i>Exapion fuscirostre</i>	W	H	G	M	W	H	G	L	L	U	U	U
	<i>Leucoptera spartifoliella</i>	W	M	F	M	L	M	P	L	—	—	—	—
Gorse (<i>Ulex europaeus</i>)	<i>Exapion ulicis</i>	W	H	G	M	M	H	G	M	—	—	—	—
	<i>Tetranychus lintearius</i>	W	L	P	L	W	L	P	L	—	—	—	—
Hawkweeds [mouse-ear (<i>Pilosella officinarum</i>); orange (<i>P. aurantiaca</i>); whiplash (<i>P. flagellaris</i>)]	<i>Aulacidea subterminalis</i>	—	—	—	—	U	U	U	U	—	—	—	—
Hemlock, poison (<i>Conium maculatum</i>)	<i>Agonopterix alstroemeriana</i>	W	L	P	L	W	L	P	L	L	L	P	L
Knapweed, diffuse (<i>Centaurea diffusa</i>)	<i>Bangasternus fausti</i>	W	H	G	M	W	H	G	M	L	L	F	L
	<i>Cyphocleonus achates</i>	L	L	F	L	L	M	E	L	L	M	G	M
	<i>Larinus minutus</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Pterolonche dispersa</i>	L	L	L	L	F	—	—	—	F	—	—	—
	<i>Sphenoptera jugoslavica</i>	W	H	G	M	W	H	G	M	W	H	G	M
	<i>Urophora affinis</i>	W	H	G	M	W	H	G	M	W	H	G	M
	<i>Urophora quadrifasciata</i>	W	H	G	M	W	H	G	M	W	H	G	M
Knapweed, meadow (<i>Centaurea x moncktonii</i> ; = <i>C. jacea</i> x <i>nigra</i> ; = <i>C. debeauxii</i> ; = <i>C. pratensis</i>)	<i>Larinus minutus</i>	L	M	F	L	L	M	F	L	—	—	—	—
	<i>Larinus obtusus</i>	W	H	G	M	W	H	G	M	—	—	—	—
	<i>Urophora quadrifasciata</i>	W	L	F	L	L	M	F	M	—	—	—	—
Knapweed, Russian (<i>Rhaponticum repens</i> ; = <i>Acroptilon repens</i>)	<i>Aulacidea acroptilonica</i>	L	M	U	M	L	M	U	M	L	M	U	L
	<i>Jaapiella ivannikovi</i>	L	L	U	M	L	M	U	M	L	M	U	L
	<i>Subanguina picridis</i>	L	U	U	U	F	—	—	—	U	U	U	U
Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>)	<i>Agapeta zoegana</i>	L	H	G	L	L	M	U	L	W	L	U	L
	<i>Bangasternus fausti</i>	W	L	G	M	L	L	U	L	L	U	U	L
	<i>Chaetorellia acrolophi</i>	L	L	F	L	L	L	U	L	L	L	U	L
	<i>Cyphocleonus achates</i>	W	H	F	L	L	M	F	L	L	M	G	M
	<i>Larinus minutus</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Larinus obtusus</i>	W	H	E	M	L	M	G	M	L	M	F	L
	<i>Metzneria paucipunctella</i>	W	L	F	L	W	L	G	L	W	H	G	M
	<i>Sphenoptera jugoslavica</i>	W	H	G	M	W	H	G	M	L	L	P	L
	<i>Terellia virens</i>	L	M	G	L	L	U	U	U	L	U	U	U
	<i>Urophora affinis</i>	W	M	G	M	W	H	G	M	W	H	G	M
<i>Urophora quadrifasciata</i>	W	H	G	M	W	H	G	M	W	H	G	M	
Loosestrife, purple (<i>Lythrum salicaria</i>)	<i>Galerucella californiensis</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Galerucella pusilla</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Hylobius transversovittatus</i>	W	H	G	M	L	M	F	L	L	L	F	L
	<i>Nanophyes marmoratus</i>	W	M	F	M	L	M	F	M	W	L	F	M

Weed	Biocontrol Agent	Oregon				Washington				Idaho			
		Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴
Puncturevine (<i>Tribulus terrestris</i>)	<i>Microlarinus lareynii</i>	L	M	F	L	L	M	P	L	L	L	P	U
	<i>Microlarinus lypriformis</i>	F	—	—	—	U	U	U	U	L	L	P	U
Ragwort, tansy (<i>Jacobaea vulgaris</i> ; = <i>Senecio jacobaea</i>)	<i>Botanophila seneciella</i>	W	H	F	M	W	H	G	M	L	L	F	U
	<i>Longitarsus jacobaeae</i>	W	H	E	M	W	H	E	M	W	H	G	L
	<i>Tyria jacobaeae</i> *	W	H	E	M	W	H	E	M	—	—	—	N
Sage, Mediterranean (<i>Salvia aethiopsis</i>)	<i>Phrydiuchus tau</i>	W	H	G	M	L	M	L	N	W	H	G	M
St. Johnswort (<i>Hypericum perforatum</i>)	<i>Agrilus hyperici</i>	W	H	E	M	L	H	E	L	W	H	E	M
	<i>Aplocera plagiata</i>	W	M	P	M	W	M	F	M	W	M	F	M
	<i>Chrysolina hyperici</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Chrysolina quadrigemina</i>	W	H	E	M	W	H	E	M	W	H	E	M
Saltcedar (<i>Tamarix ramosissima</i>)	<i>Diorhabda carinulata</i> * (formerly <i>D. elongata</i>)	L	M	F	L	U	U	U	U	L	H	G	L
Skeletonweed, rush (<i>Chondrilla juncea</i>)	<i>Aceria chondrillae</i> (formerly <i>Eriophyes chondrillae</i>)	W	H	E	M	W	H	G	M	W	H	E	M
	<i>Bradyrrhoa gilveolella</i>	L	S	P	U	U	U	U	U	L	M	F	L
	<i>Cystiphora schmidti</i>	W	H	G	M	W	H	G	M	W	H	E	M
	<i>Puccinia chondrillina</i>	W	H	G	L	W	H	G	M	W	H	G	M
Spurge, leafy (<i>Euphorbia virgata</i> ; = <i>E. esula</i>)	<i>Aphthona cyparissiae</i>	L	H	E	M	L	M	F	L	L	L	G	M
	<i>Aphthona czwalinai</i>	L	H	E	M	L	L	U	U	L	L	G	M
	<i>Aphthona flava</i>	L	H	F	L	L	M	F	L	L	L	G	M
	<i>Aphthona lacertosa</i>	W	H	E	M	L	M	U	L	W	H	E	M
	<i>Aphthona nigricutis</i>	W	H	E	M	L	M	F	U	W	H	E	M
	<i>Hyles euphorbiae</i>	F	—	—	—	—	—	—	—	W	M	G	M
Starthistle, yellow (<i>Centaurea solstitialis</i>)	<i>Oberea erythrocephala</i>	W	L	G	M	U	U	U	U	W	M	E	M
	<i>Bangasternus orientalis</i>	W	L	P	L	W	L	P	L	W	L	P	M
	<i>Chaetorellia australis</i>	W	H	E	M	W	M	G	M	W	M	G	M
	<i>Eustenopus villosus</i>	W	H	E	M	W	H	E	M	W	H	E	M
	<i>Larinus curtus</i>	W	H	E	M	W	M	F	L	W	H	E	M
	<i>Puccinia jacea</i> var. <i>solstitialis</i>	L	S	U	L	U	U	U	U	U	U	U	U
<i>Urophora sirunaseva</i>	W	L	P	L	W	L	U	L	W	L	U	L	
Thistle, bull (<i>Cirsium vulgare</i>)	<i>Urophora stylata</i>	W	H	G	M	L	M	F	L	L	L	U	L
Thistle, Canada (<i>Cirsium arvense</i>)	<i>Hadroplontus litura</i> (formerly <i>Ceutorhynchus litura</i>)	L	L	F	U	L	M	F	L	L	L	F	L
	<i>Puccinia punctiformis</i>	L	H	G	L	U	U	U	U	U	U	U	U
	<i>Rhinocyllus conicus</i> *	W	H	F	N	W	H	F	N	W	F	F	N
	<i>Urophora cardui</i>	W	H	P	M	W	H	F	M	L	M	F	M
Thistle, Italian (<i>Carduus pycnocephalus</i>)	<i>Cheilosia grossa</i> (formerly <i>C. corydon</i>)	W	H	L	L	—	—	—	N	—	H—	G—	N
	<i>Rhinocyllus conicus</i> *	W	H	G	N	—	—	—	N	L	H	G	N
	<i>Trichosirocalus horridus</i> *	W	H	U	N	—	—	—	N	L	L	U	N
Thistle, milk (<i>Silybum marianum</i>)	<i>Rhinocyllus conicus</i> *	W	H	G	N	—	—	—	N	—	—	—	—
Thistle, musk (<i>Carduus nutans</i>)	<i>Rhinocyllus conicus</i> *	W	H	G	N	W	H	G	N	W	H	G	N
	<i>Trichosirocalus horridus</i> *	L	M	G	N	—	—	—	N	L	M	G	N

Weed	Biocontrol Agent	Oregon				Washington				Idaho			
		Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴	Distribution ¹	Attack Rate ²	Control ³	Availability ⁴
Thistle, plumeless (<i>Carduus acanthoides</i>)	<i>Rhinocyllus conicus</i> *	L	H	G	N	W	H	G	N	W	H	G	N
	<i>Trichosirocalus horridus</i> *	U	U	U	U	L	L	U	N	L	L	U	N
Thistle, slenderflower (<i>Carduus tenuiflorus</i>)	<i>Cheilosia grossa</i> (formerly <i>C. corydon</i>)	W	M	F	M	—	—	—	—	—	—	—	—
	<i>Rhinocyllus conicus</i> *	W	H	G	N	—	—	—	N	—	—	—	—
	<i>Trichosirocalus horridus</i> *	W	H	F	N	—	—	—	N	—	—	—	—
Toadflax, Dalmatian (<i>Linaria dalmatica</i>)	<i>Brachyterolus pulicarius</i>	W	M	P	M	W	M	P	M	W	H	E	M
	<i>Calophasia lunula</i>	L	L	F	U	W	H	F	M	W	L	U	L
	<i>Mecinus janthiniiformis</i> (formerly <i>M. janthinus</i>)	W	H	E	M	W	H	E	M	W	H	E	M
Toadflax, yellow (<i>Linaria vulgaris</i>)	<i>Brachyterolus pulicarius</i>	L	M	F	L	L	M	F	L	L	M	P	L
	<i>Calophasia lunula</i>	L	U	U	U	L	M	F	L	L	M	F	L
	<i>Rhinusa antirrhini</i> (formerly <i>Gymnetron antirrhini</i>)	W	M	U	L	L	H	G	L	L	M	U	L
	<i>Rhinusa pilosa</i> *	—	—	—	—	—	—	—	—	—	—	—	—
	<i>Mecinus janthinus</i>	L	H	E	L	U	U	U	U	L	H	E	L
Watermilfoil, Eurasian (<i>Myriophyllum spicatum</i>)	<i>Euhrychiopsis lecontei</i> *	L	L	U	L	W	M	F	L	W	L	F	L
Whitetop or hoary cress (<i>Lepidium draba</i>)	<i>Aceria drabae</i> *	—	—	—	—	—	—	—	—	—	—	—	—

¹ Distribution within host range: W = widespread; L = limited sites; F = failed to establish; U = unknown status; — = not released
² Attack rate host: H = heavy (> 70%); M = medium (> 30%); L = light (> 10%); S = slight (< 1%); U = unknown status
³ Control ability on seeds and/or plant density: E = excellent; G = good; F = fair; P = poor; U = undetermined
⁴ Availability for redistribution: M = mass collections; L = limited (Limited availability indicates biocontrol agent populations are slow in building or are recently introduced. Work on these species should be coordinated through biological control specialists at the state department of agriculture or state university); U = unavailable; N = not recommended. These biocontrol agents may attack native species and interstate shipments are no longer permitted.
*Indicates biocontrol agents where redistribution limitations may apply. See Table 2 for additional information.

Biological Control Agents and Their Roles

Classical biological control agents introduced into the Pacific Northwest for the management of weeds and the general role of each biocontrol species.

HIGHLIGHTED SPECIES (GREY) ARE NO LONGER APPROVED BY USDA-APHIS FOR INTER-STATE COLLECTION AND RE-DISTRIBUTION.

Biocontrol Agent	Role	Weed Species
<i>Aceria chondrillae</i> (formerly <i>Eriophyes chondrillae</i>)	bud gall mite	Skeletonweed, rush (<i>Chondrilla juncea</i>)
<i>Aceria drabae</i> ^F	gall mite	Whitetop or hoary cress (<i>Lepidium draba</i>)
<i>Aceria malherbae</i>	bud/leaf gall mite	Bindweed, field (<i>Convolvulus arvensis</i>)
<i>Agonopterix alstroemeriana</i>	defoliating moth	Hemlock, poison (<i>Conium maculatum</i>)
<i>Agapeta zoegana</i>	root-boring moth	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>)
<i>Agrilus hyperici</i>	root-boring beetle	St. Johnswort (<i>Hypericum perforatum</i>)
<i>Aplocera plagiata</i>	defoliating moth	St. Johnswort (<i>Hypericum perforatum</i>)
<i>Aphthona cyparissiae</i>	root/defoliating flea beetle	Spurge, leafy (<i>Euphorbia esula</i> , = <i>E. virgata</i>)
<i>Aphthona czwalinai</i>	root/defoliating flea beetle	Spurge, leafy (<i>Euphorbia esula</i> , = <i>E. virgata</i>)
<i>Aphthona flava</i>	root/defoliating flea beetle	Spurge, leafy (<i>Euphorbia esula</i> , = <i>E. virgata</i>)
<i>Aphthona lacertosa</i>	root/defoliating flea beetle	Spurge, leafy (<i>Euphorbia esula</i> , = <i>E. virgata</i>)

Biocontrol Agent	Role	Weed Species
<i>Aphthona nigricutis</i>	root/defoliating flea beetle	Spurge, leafy (<i>Euphorbia esula</i> , = <i>E. virgata</i>)
<i>Aulacidea acroptilonica</i>	gall wasp	Knapweed, Russian (<i>Rhaponticum repens</i> ; = <i>Acroptilon repens</i>)
<i>Aulacidea subterminalis</i> F	gall wasp	Hawkweeds [mouse-ear (<i>Pilosella officinarum</i>); orange (<i>P. aurantiaca</i>); whiplash (<i>P. flagellaris</i>)]
<i>Bangasternus fausti</i>	seedhead weevil	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Bangasternus orientalis</i>	seedhead weevil	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Botanophila seneciella</i>	seedhead fly	Ragwort, tansy (<i>Jacobaea vulgaris</i> ; = <i>Senecio jacobaea</i>)
<i>Brachypterolus pulicarius</i>	flower beetle	Toadflax, yellow (<i>Linaria vulgaris</i>); toadflax, Dalmatian (<i>L. dalmatica</i>)
<i>Bradyrrhoa gilveolella</i>	root-boring moth	Skeletonweed, rush (<i>Chondrilla juncea</i>)
<i>Bruchidius villosus</i>	seed beetle	Broom, Scotch (<i>Cytisus scoparius</i>); broom, French (<i>Genista monspessulana</i>)
<i>Calophasia lunula</i>	defoliating moth	Toadflax, yellow (<i>Linaria vulgaris</i>); toadflax, Dalmatian (<i>L. dalmatica</i>)
<i>Chaetorellia acrolophi</i>	seedhead fly	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>)
<i>Chaetorellia australis</i>	seedhead fly	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Cheilosia grossa</i> (formerly <i>C. corydon</i>)	stem fly	Thistle, slenderflower (<i>Carduus tenuiflorus</i>); thistle, Italian (<i>C. pycnocephalus</i>)
<i>Chrysolina hyperici</i>	defoliating beetle	St. Johnswort (<i>Hypericum perforatum</i>)
<i>Chrysolina quadrigemina</i>	defoliating beetle	St. Johnswort (<i>Hypericum perforatum</i>)
<i>Cyphocleonus achates</i>	root-boring/gall weevil	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Cystiphora schmidti</i>	stem/leaf gall midge	Skeletonweed, rush (<i>Chondrilla juncea</i>)
<i>Diorhabda carinulata</i> C (formerly <i>D. elongata</i>)	leaf beetle	Saltcedar (<i>Tamarix ramosissima</i>)
<i>Euhrychiopsis lecontei</i> E	stem weevil	Watermilfoil, Eurasian (<i>Myriophyllum spicatum</i>)
<i>Eustenopus villosus</i>	seedhead weevil	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Exapion fuscirostre</i>	seed weevil	Broom, Scotch (<i>Cytisus scoparius</i>)
<i>Exapion ulicis</i>	seed weevil	Gorse (<i>Ulex europaeus</i>)
<i>Galerucella californiensis</i>	leaf beetle	Loosestrife, purple (<i>Lythrum salicaria</i>)
<i>Galerucella pusilla</i>	leaf beetle	Loosestrife, purple (<i>Lythrum salicaria</i>)
<i>Hadroplontus litura</i> (formerly <i>Ceutorhynchus litura</i>)	crown/stem-mining weevil	Thistle, Canada (<i>Cirsium arvense</i>)
<i>Hyles euphorbiae</i>	defoliating moth	Spurge, leafy (<i>Euphorbia virgata</i> ; = <i>E. esula</i>)
<i>Hylobius transversovittatus</i>	root-boring weevil	Loosestrife, purple (<i>Lythrum salicaria</i>)
<i>Jaapiella ivannikovi</i>	shoot tip gall midge	Knapweed, Russian (<i>Rhaponticum repens</i> ; = <i>Acroptilon repens</i>)
<i>Larinus curtus</i> D	seedhead weevil	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Larinus minutus</i>	seedhead weevil	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, meadow (<i>C. x moncktonii</i> ; = <i>C. jacea x nigra</i> ; = <i>C. debeauxii</i> ; = <i>C. pratensis</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Larinus obtusus</i>	seedhead weevil	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, meadow (<i>C. x moncktonii</i> ; = <i>C. jacea x nigra</i> ; = <i>C. debeauxii</i> ; = <i>C. pratensis</i>)
<i>Leucoptera spartifoliella</i>	twig mining moth	Broom, Scotch (<i>Cytisus scoparius</i>)
<i>Longitarsus jacobaeae</i>	root/defoliating flea beetle	Ragwort, tansy (<i>Jacobaea vulgaris</i> ; = <i>Senecio jacobaea</i>)
<i>Mecinus janthiniformis</i> (formerly <i>M. janthinus</i>)	stem-boring weevil	Toadflax, Dalmatian (<i>Linaria dalmatica</i>)
<i>Mecinus janthinus</i>	stem-boring weevil	Toadflax, yellow (<i>Linaria vulgaris</i>)

Biocontrol Agent	Role	Weed Species
<i>Metzneria paucipunctella</i>	seedhead moth	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>)
<i>Microlarinus lareynii</i>	seed weevil	Puncturevine (<i>Tribulus terrestris</i>)
<i>Microlarinus lypriformis</i>	stem weevil	Puncturevine (<i>Tribulus terrestris</i>)
<i>Nanophyes marmoratus</i>	flower bud weevil	Loosestrife, purple (<i>Lythrum salicaria</i>)
<i>Oberea erythrocephala</i>	stem-boring beetle	Spurge, leafy (<i>Euphorbia virgata</i> ; = <i>E. esula</i>)
<i>Phrydiuchus tau</i>	crown/root weevil	Sage, Mediterranean (<i>Salvia aethiopsis</i>)
<i>Pterolonche dispersa</i>	root-boring moth	Knapweed, diffuse (<i>Centaurea diffusa</i>)
<i>Puccinia chondrillina</i>	rust fungus	Skeletonweed, rush (<i>Chondrilla juncea</i>)
<i>Puccinia jacea</i> var. <i>solstitialis</i>	rust fungus	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Puccinia punctiformis</i>	rust fungus	Thistle, Canada (<i>Cirsium arvense</i>)
<i>Rhinocyllus conicus</i> ^A	seedhead weevil	Thistle, slenderflower (<i>Carduus tenuiflorus</i>); thistle, plumeless (<i>C. acanthoides</i>); thistle, musk (<i>C. nutans</i>); thistle, milk (<i>Silybum marianum</i>); thistle, Italian (<i>C. pycnocephalus</i>); thistle, Canada (<i>Cirsium arvense</i>)
<i>Rhinusa antirrhini</i> (formerly <i>Gymnetron antirrhini</i>)	seedhead weevil	Toadflax, yellow (<i>Linaria vulgaris</i>)
<i>Rhinusa pilosa</i> ^F	shoot-galling weevil	Toadflax, yellow (<i>Linaria vulgaris</i>)
<i>Sphenoptera jugoslavica</i>	root-boring/gall beetle	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Subanguina picridis</i>	stem/leaf gall nematode	Knapweed, Russian (<i>Rhaponticum repens</i> ; = <i>Acroptilon repens</i>)
<i>Terellia virens</i>	seedhead fly	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>)
<i>Tetranychus lintearius</i>	spider mite	Gorse (<i>Ulex europaeus</i>)
<i>Trichosirocalus horridus</i> ^A	root/crown weevil	Thistle, slenderflower (<i>Carduus tenuiflorus</i>); thistle, plumeless (<i>C. acanthoides</i>); thistle, musk (<i>C. nutans</i>); thistle, Italian (<i>C. pycnocephalus</i>)
<i>Tyria jacobaeae</i> ^B	defoliating moth	Ragwort, tansy (<i>Jacobaea vulgaris</i> ; = <i>Senecio jacobaea</i>)
<i>Tyta luctuosa</i>	defoliating moth	Bindweed, field (<i>Convolvulus arvensis</i>)
<i>Urophora affinis</i>	seedhead gall fly	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Urophora cardui</i>	stem gall fly	Thistle, Canada (<i>Cirsium arvense</i>)
<i>Urophora quadrifasciata</i>	seedhead gall fly	Knapweed, spotted (<i>Centaurea stoebe</i> ; = <i>C. stoebe</i> ssp. <i>micranthos</i>); knapweed, meadow (<i>C. x moncktonii</i> ; = <i>C. jacea x nigra</i> ; = <i>C. debeauxii</i> ; = <i>C. pratensis</i>); knapweed, diffuse (<i>C. diffusa</i>)
<i>Urophora sirunaseva</i>	seedhead gall fly	Starthistle, yellow (<i>Centaurea solstitialis</i>)
<i>Urophora stylata</i>	seedhead gall fly	Thistle, bull (<i>Cirsium vulgare</i>)

^A *Rhinocyllus conicus* and *Trichosirocalus horridus* are not recommended. They attack native thistles and interstate permits are suspended.

^B *Tyria jacobaeae* is not recommended east of the Cascades, particularly in Idaho. It attacks several native plant species.

^C *Diorhabda carinulata* (formerly *D. elongata*) interstate shipment permits have been suspended.

^D *Larinus curtus* may be infected with a disease that can reduce insect populations. It should not be redistributed to avoid spreading the disease to healthy *L. curtus* populations.

^E *Euhrychiopsis lecontei* is a native insect, and thus, not a classical biological control agent. The weevil is co-evolved with native milfoil, *Myriophyllum sibiricum*, but also attacks Eurasian watermilfoil, *M. spicatum*. It is naturally-occurring at many lakes in the Pacific Northwest but is not currently available for redistribution.

^F *Aceria drabae*, *Aulacidea subterminalis*, and *Rhinusa pilosa* are new biocontrol agents that are still undergoing testing and establishment. It is unclear when they will be available for widespread distribution or how effective they will be on their host plant.

Using Pesticides Safely

Ronda E. Hirnyck

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Always Read the Label

The single most important approach to pesticide safety is to read the pesticide label before each use and then follow the directions. If still in doubt after reading the label, contact a person qualified to help evaluate the hazard of the chemical and its use. Qualified people include extension specialists, county educators, pesticide product representatives, and retailers.

Pesticides are toxic and should be handled with care—but pesticides can be used safely if you follow recommended precautions. Follow all label requirements and strongly consider any recommendations for additional personal protective clothing and equipment. In addition to reading and following the label, other major factors in the safe and effective use of pesticides are the pesticide applicator's qualifications, common sense, and good attitude. Always take all safety precautions when using pesticides.

In case of accidents involving pesticides, see your doctor at once. It will help your doctor to know exactly which pesticide is involved. The label on the container gives this information. Take to the physician the pesticide label or information from the label, such as the product name, registration number of the U.S. Environmental Protection Agency (EPA), common name and percentage of active ingredient, and first aid instructions. If the label cannot be removed, take along the pesticide container (if not contaminated), but do not take it into the hospital or doctor's office.

Pesticide Safety Checklist

- Use pesticides only when necessary and as part of an Integrated Pest Management (IPM) program.
- Always read the label and follow the instructions.
- Do not allow children to play around sprayers or mixing, storage, and disposal areas.
- Wear appropriate protective clothing and equipment.
- Never eat, drink, or smoke while handling pesticides.
- Avoid drift into non-target areas and pesticide runoff into streams, rivers, lakes, irrigation ponds and canals.
- Avoid spilling materials on skin or clothing.
- Have access to clean water, soap, and first aid supplies.
- Keep pesticides in a dry and locked storage area away from food and feed.
- Triple rinse or pressure rinse empty containers and dispose or recycle in accordance with state and local regulations.
- Stay out of recently sprayed areas until spray has dried, and observe the restricted entry intervals (REI) specified on the pesticide label.
- Follow the pre-harvest interval (PHI) on pesticide label before harvesting crops or gardens and before allowing livestock to graze fields.

What to Do in Case of Pesticide Poisoning

Follow the specific first-aid instructions on the pesticide label.

If someone has unexplained symptoms that MAY be related to pesticides, DO NOT DELAY. Get medical advice quickly:

Call the Poison Center (toll free) 1-800-222-1222 or call your doctor.

Take the pesticide label (or information from the label—the product name, EPA registration number, common name, percentage of active ingredient, and first aid instructions) to the physician. If the label cannot be removed, take the pesticide container (if not contaminated), but do not take it into the hospital or doctor's office.

Information regarding pesticides can also be obtained from the **National Pesticide Information Center (NPIC)**

1-800-858-7378 (7:30 am to 3:30 pm PST, Monday - Friday).

Email: at npic@ace.orst.edu

or visit www.npic.orst.edu at any time

Information is printed in English and Spanish and available in over 170 languages through the use of an over-the-phone language service.

If labeling instructions are not available, follow these general guidelines for first aid.

- **The best first aid in pesticide emergencies is to remove the source of pesticide exposure as quickly as possible.** Removing the victim from the source not only protects him or her from further poisoning but also protects you while you administer first aid.
- **First aid is the initial effort to help a victim while medical help is on the way.** If you are alone with the victim, make sure the victim is breathing and is not being further exposed to the pesticide before you call for emergency help. Apply artificial respiration if the victim is not breathing. **Do not become exposed to the pesticide yourself while you are trying to help.**
- **Pesticide on skin**—Drench contaminated exposed skin with plenty of water. Remove personal protective equipment and contaminated clothing. Wash skin and hair with a mild detergent and water. Dry victim and keep him or her comfortable.
- **Pesticide in eye**—Wash the eye quickly but gently with clean running water. Rinse eye for 15 minutes or more.
- **Inhaled pesticide**—Get the victim to fresh air immediately. Loosen tight clothing on the victim that would constrict breathing. Apply artificial respiration if the victim is not breathing. If pesticide or vomit is in the victim's mouth or on the face, avoid direct contact and use a shaped airway tube, if available, for mouth-to-mouth resuscitation.
- **Pesticide in mouth or swallowed**—Rinse mouth with plenty of water. Do not induce vomiting or give high-potency activated charcoal unless a physician or the label tells you to do so.
- **Induce vomiting only if the label indicates.** Position the victim face down or kneeling forward and carefully put a

finger or the blunt end of a spoon at the back of the victim's throat.

- **Do not induce vomiting** if the victim is unconscious or convulsing, or if the victim has swallowed a corrosive poison or an emulsifiable concentrate or oil solution.
- **Atropine should be administered only by a physician.** It can be poisonous if misused and can mask the symptoms of poisoning, thus delaying proper treatment.
- **First-aid kit**—A properly equipped portable first-aid kit can be important in a pesticide emergency. Make sure one is available at each work site.

Personal Protective Equipment (PPE) Definitions

Personal protective equipment (PPE)—Apparel and devices worn to protect the body from contact with pesticides or pesticide residues include:

- Coveralls
- Chemical-resistant suits, gloves, footwear, aprons, and headgear
- Protective eyewear
- Respirators

While the following attire is not defined as PPE, the labeling might require pesticide handlers or early-entry workers to wear it for some tasks:

- Long-sleeved shirts
- Long pants
- Shoes and socks
- Other items of regular work clothing

If such non-PPE attire is required, the employer must make sure that it is worn.

Chemical-resistant—Allows no measurable amount of the pesticide to move through the material during use.

Waterproof—Allows no measurable movement of water (or water-based solutions) through the material during use.

Chemical-resistant suit—A loosely fitting one- or two-piece chemical-resistant garment that covers, at a minimum, the entire body except for the head, hands, and feet.

Coverall—A loosely fitting one- or two-piece garment that covers, at a minimum, the entire body except the head, hands, and feet. Coveralls are made of fabric, such as cotton or a cotton-polyester blend, and are not chemical resistant. The pesticide labeling might specify that the coveralls be worn over a layer of clothing. (Allowable substitution: A chemical-resistant suit can be worn instead of coveralls and any required inner layer of clothing.)

Chemical-resistant apron—One made of chemical-resistant material, covering the front of the body from mid-chest to knees. (Allowable substitution: if a chemical-resistant suit is worn, no apron is required.)

Gloves—Hand coverings of the type listed on the pesticide label. Gloves or glove linings made of leather, cotton, or other absorbent materials cannot be worn for handling or early-entry activities unless these materials are listed on the pesticide labeling as acceptable for such use. (Allowable substitution: Leather gloves may be worn over chemical-resistant liners for tasks with sharp-thorned plants. After leather gloves have been worn for such work, however, they may be worn only with chemical-resistant liners and may not be worn for any other use.)

Chemical-resistant footwear—Chemical-resistant shoes, boots, or shoe coverings worn over shoes or boots. (Allowable substitution: Leather boots may be worn in rough terrain if chemical-resistant footwear with appropriate durability and tread is unavailable.)

Protective eyewear—Goggles, face shield, or safety glasses with front, brow, and temple protection. (Allowable substitution: A full-face respirator.)

Chemical-resistant headgear—A chemical-resistant hood or hat with a wide brim.

Minimum Personal Protective Equipment (PPE) and Work Clothing for Handling Activities

Toxicity category of end-use product				
Route of Exposure	I (Danger)	II (Warning)	III (Caution)	IV (Caution)
Dermal toxicity or skin irritation potential ¹	Coverall worn over long-sleeve shirt and long pants Socks Chemical-resistant footwear Chemical-resistant gloves	Coverall worn over short-sleeve shirt and short pants Socks Chemical-resistant footwear Chemical-resistant gloves	Long-sleeve shirt and long pants Socks Shoes Chemical-resistant gloves	Long-sleeve shirt and long pants Socks Shoes No minimum ²
Inhalation toxicity	Respiratory protection device	Respiration protection device		
Eye irritation potential	Protective eyewear	Protective eyewear		

¹If dermal toxicity and skin irritation potential are in different toxicity categories, protection shall be based on the more toxic (lower numbered) category.

Chemical Resistance Categories for Selected Personal Protective Materials

Selection category listed on pesticide label	Type of personal protective material							
	Barrier laminate	Butyl rubber > 14 mils	Nitrile rubber >14 mils	Neoprene rubber >14 mils	Natural rubber >14 mils	Polyethylene	Polyvinyl chloride (PVC) > 14 mils	Viton > 14 mils
A (dry and water-based)	High	High	High	High	High	High	High	High
B	High	High	Slight	Slight	None	Slight	Slight	Slight
C	High	High	High	High	Moderate	Moderate	High	High
D	High	High	Moderate	Moderate	None	None	None	Slight
E	High	Slight	High	High	Slight	None	Moderate	High
F	High	High	High	Moderate	Slight	None	Slight	High
G	High	Slight	Slight	Slight	None	None	None	High
H	High	Slight	Slight	Slight	None	None	None	High

Pesticide Spills and Cleanup

Handling Spills

The best way to handle a spill is to prevent it from happening. Review your process for using, transporting, and storing pesticides to identify areas for additional training or precautions. Train workers to take the necessary actions if a spill should occur. Prior training on how to limit a spill and then safely clean it up is invaluable. Accidents most commonly happen when pesticides are being transported or when pesticide containers have leaked in storage.

Pesticide spills require immediate action. Keep a spill cleanup kit immediately available at all locations where pesticides are handled, transported, or stored, because you will not have time to locate all the necessary items before a significant amount of contamination has occurred. Important items in a typical spill kit include:

- Telephone numbers for emergency assistance
- Personal protective clothing and equipment as required by the label, including:
 - Sturdy gloves, footwear, and apron that are chemically resistant to most pesticides
 - Protective eyewear
 - An appropriate respirator, if any of the pesticides requires using a respirator during handling or for spill cleanup
- Containment “snakes” to confine the leak or spill to a small area
- Absorbent materials such as spill pillows, absorbent clay, dry peat moss, sawdust, “kitty litter,” activated charcoal, vermiculite, or paper to soak up liquid spills
- Sweeping compound to keep dry spills from drifting or wafting during cleanup
- A shovel, broom, and dustpan made from non-sparking and nonreactive material (foldable brooms and shovels are handy because they can be carried easily)
- Heavy-duty detergent

- Fire extinguisher rated for all types of fires
- Any other spill cleanup items specified on the labeling of any products you use regularly
- Sturdy plastic container that will hold the entire volume of the largest pesticide container being handled and that can be tightly closed
- Highway flares (do NOT use flares near flammable material)

All these items should be stored in the sturdy plastic container and kept easily accessible, clean, and in working order until a spill occurs.

Response to a pesticide spill may vary with size and location of the spill.

You must know how to respond correctly to a spill. Stopping large leaks or spills is often not simple. If you cannot manage a spill by yourself, get help. Even a spill that appears to be minor can endanger you, other people, and the environment if not handled correctly. Never leave a spill unattended. When in doubt, get help.

The faster you can contain, absorb, and dispose of a spill, the less chance it will cause harm. Clean up spills immediately. Even minor dribbles or spills should be cleaned up as soon as possible to keep unprotected persons or animals from being exposed.

A good way to remember the steps for a spill emergency is the “three C’s”: Control, Contain, Clean up.

1. *Control* the spill situation: Protect yourself, stop the leak, protect others, and stay at the site.
2. *Contain* the spill: Confine the spill, protect water sources, absorb liquids, and cover dry materials.
3. *Clean up* the spill, decontaminate the spill site, neutralize spill site, decontaminate equipment, and decontaminate your PPE.

Reporting Spills

Report pesticide spills as well as pesticide-related fires and poisonings first to 9-1-1 for immediate response. Then report to the appropriate number below.

Idaho Report all spills, fires, and poisonings to the EMS dispatcher: 800-632-8000 (in Idaho only).

Oregon Report spills to the Oregon Emergency Response System: 800-452-0311 (in Oregon) 503-378-6377 (Salem area)

Washington Report all spills, fires, and poisonings to the Department of Emergency Management: 800-258-5990.

Report spills or discharges from containment areas to the nearest regional office of the Department of Ecology; find locations online at <http://www.ecy.wa.gov>

Additional help with chemical emergencies, including pesticide emergencies involving spills, leaks, fires, or exposures, can be obtained from the Chemical Transportation Emergency Center:

CHEMTREC, 800-424-9300

Cleaning, Recycling, and Disposing of Agricultural Pesticide Containers

Unrinsed or contaminated empty pesticide containers are considered hazardous waste, unless a pesticide distributor or manufacturer will accept them for refilling. Hazardous waste is more difficult and more expensive to dispose of than solid waste.

Clean, dry containers are considered solid waste and can be disposed of in a state-permitted solid waste site. Clean, dry containers may be recycled and it is recommended that the containers are recycled through the state pesticide container recycling program. Only dry, properly rinsed containers are accepted at collection sites, so thoroughly rinse all residues from the containers immediately after use. Properly rinsing and handling empty pesticide containers is very important, because it:

- Protects humans by removing hazardous materials
- Prevents sources of environmental contamination
- Saves money by putting all product into the spray tank

How to Properly Clean Pesticide Containers

A website with helpful container-rinsing information:

- Ag Container Recycling Council <http://www.acrecycle.org>

Think Safety!

Unrinsed pesticide containers still can hold enough material to harm people and the environment. The person cleaning the containers should observe these precautions:

- Read and understand all safety and environmental precautions on the pesticide label.
- Wear eye protection such as goggles or a face shield.
- Wear chemical-resistant gloves that will neither absorb pesticide or rinse water nor let the material contact the skin.
- Wear chemical-resistant apron, gloves, and footwear or chemical-resistant covers over shoes or boots.

The best way to dispose of rinsate is to add it in the spray mixture and apply it according to the label directions. Rinsate also can be collected for later use in a spray mix or for disposal. Do not mix different pesticide rinsates. Label each storage container clearly. Do not dump rinsate on the ground or into storm drains.

Triple/Multiple Rinsing

Plastic and metal containers (jugs)

- Empty the container's contents into a spray tank, turning the container so that any product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds.
- Immediately begin rinsing. Do not wait, or the product may become difficult to remove.
- Fill the empty container one-quarter full of clean water.
- Replace the cap on the container. With the container opening facing to your left, shake the container about 6 inches left to right. Shake the container about twice per second for 30 seconds.
- Drain rinse water into spray tank as described above.
- Fill the empty container one-quarter full of clean water a second time.
- Recap the container. With the opening of the container pointed toward the ground, shake the container about 6 inches up and down. Then drain the rinse water into the spray tank.
- Finally, fill the empty container one-quarter full for a third time with clean water. Recap the container. With the container in the normal upright position, shake the container about 6 inches up and down. Pour the rinse water into the spray tank.
- Carefully rinse residue from the outside of the container into the spray tank.
- Carefully rinse cap over spray tank opening.
- Look closely at the container inside and out to make sure that all pesticide has been removed.
- Allow the containers to dry.
- Store cleaned jugs and caps where they will be protected from rain until they can be recycled or disposed of properly.
- Oregon requires that 1- and 5-gallon metal containers be punctured at least three times with 1-inch holes and then crushed.
- Oregon law requires rinsing the containers as many times as is necessary with an appropriate diluent (solvent) to get the container clean.

Drums

- Empty the drum as much as possible.
- Fill the drum one-quarter full with water. Replace and tighten bungs.
- Tip the drum on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds.
- Stand the drum on its end and tip it back and forth several times to rinse the corners.
- Turn the drum over on its other end and repeat this procedure.
- Carefully empty the rinsate into the spray tank.
- Repeat this procedure until the rinse water runs clear.
- Carefully rinse cap over spray tank opening and then dispose of appropriately as regular solid waste.
- Look closely at the containers inside and out to make sure all pesticide has been removed.
- Puncture the base of the drum with a drill so that it cannot be reused.

- Allow drums to dry.
- Store drums where they will be protected from rain until they can be recycled or disposed of properly.
- Oregon requires that the tops and bottoms of 30- and 55-gallon containers be removed and the container flattened after it has dried.
- Oregon law requires persons cleaning pesticide containers to rinse the containers as many times as is necessary with an appropriate diluent (solvent) to get the container clean.

Pressure Rinsing

This method continuously washes the inside of the container and drains into the spray tank. A pressure nozzle punctures and rinses the container in one step. It is easier and more effective than triple/multiple rinsing.

Containers (jugs)

- Empty contents of container into a spray tank, turning the container so that any product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds.
- Immediately begin rinsing. Do not wait, or the product may become difficult to remove.
- Hold the container so the opening can drain into the spray tank.
- Force the tip of the pressure nozzle through the lower portion of the side closest to the handle.
- Connect nozzle to a clean water source of at least 40 psi. Rotate the nozzle inside the container to assure good coverage of all sides, including the handle.
- Rinse at least 30 seconds.
- Rinse cap under water coming out of the jug and into the spray tank and then dispose of cap appropriately as regular solid waste.
- Drain all rinse water into the spray tank.
- Look closely at the containers inside and out to make sure that all pesticide has been removed.
- Allow containers to dry.
- Store cleaned jugs and caps where they will be protected from rain until they can be recycled or disposed of properly.
- Oregon requires that an appropriate solvent be used for rinsing and that 1- and 5-gallon metal containers be punctured at least three times with 1-inch holes and then crushed.

Drums

- Be sure the drum is completely empty.
- Drill a pilot hole in the bottom of the drum and then position the drum mouth over the spray tank so that rinse water will empty directly into the tank.
- With the water turned off, use the pressure rinse nozzle to widen the hole in the bottom.
- Turn water on and rotate the nozzle inside the drum to rinse all sides.
- Rinse drum at least 30 seconds or until rinse water runs completely clear.

- Rinse cap under water coming out of the drum and into the spray can and then dispose of appropriately as regular solid waste.
- Turn water off and replace the tip guard on the nozzle.
- Look closely at the containers inside and out to make sure all pesticide has been removed.
- Allow containers to dry.
- Store drums where they will be protected from rain until they can be recycled or disposed of properly.
- Oregon requires an appropriate solvent be used for rinsing and that the tops and bottoms of 30- and 55-gallon drums be removed and the container flattened after it has dried.

Cleaning Paper or Plastic Sacks and Fiber Containers

- Empty the contents completely into the application equipment. You may need to cut open the container to clean out all the material in the seams. Never rip the container; use scissors or a knife but not a personal pocketknife. Do not let material blow around.
- Wear appropriate personal protective equipment, including breathing protection if necessary.
- If possible, rinse the container. Some containers have plastic or foil liners that can be rinsed. Use the rinsate in the spray mixture or collect it for disposal.
- Once the containers are clean, dispose of them as regular solid waste. Do not burn the containers. Burning can release poisonous fumes and is illegal.

Recycling Procedures for Plastic Containers

Disposal and Recycling

Proper disposal or recycling of pesticide containers helps to protect the environment and helps promote a positive image of agricultural users. Recycling also saves money for the pesticide user and for local landfills.

Landfill Procedures

Landfills accept only containers that have been cleaned. Some landfills inspect containers and/or require written verification of their cleanliness. Disposal site locations are listed below.

Idaho, Oregon, and Washington have programs to collect and recycle clean plastic pesticide containers. The following steps will help in the recycling process. For times and places of recycling events, see the appropriate state contact listed below.

- Only clean, dry plastic containers can be accepted.
- Remove slip-on labels and label booklets. Glued labels may stay.
- Remove hard plastic lids and place them in a separate container for recycling.
- Remove most of the foil seal from around the opening of the container. A small amount of foil is acceptable.
- Remove lids and metal bails from 5-gallon buckets. Lids from buckets are accepted if metal rings and rubber gaskets are removed. Containers of 5 gal and smaller are accepted whole.
- Do not put plastic lids back on empty containers. This inhibits container inspections.

Disposing of Unusable Pesticides and Agricultural, Household and Residential Pesticide Products

Unusable pesticide is regulated as a hazardous waste and needs to be disposed of according to Resource Conservation and Recovery Act (RCRA) regulations. Be sure to check the pesticide label for instructions on disposing of pesticides — this includes both agricultural, household and residential pesticides. The EPA advises consumers to call local authorities for specific disposal instructions. This is to provide state and local government greater latitude in carrying out their responsibilities for product disposal and waste management. Specific instructions will be provided for products based on formulation.

Household and Residential Unusable Pesticide Products and Containers

Labels on aerosol products will state: “Do Not Puncture or Incinerate! If empty, place in trash or offer for recycling if available. If partly filled, call your local solid waste agency or 800-CLEANUP (253-2687) or other qualified number for disposal instructions.”

Labels on all other types of products will state: “If empty: Do not reuse this container. Place in trash or offer for recycling if available. If partly filled: Call your local solid waste agency or 800-CLEANUP (253-2687) or other qualified number for disposal instructions.” This includes liquids, tablets, dusts, gels, pet products, etc., in other types of containers such as bags, bottles, bait stations, etc.

Pesticide Recycling and Disposal Contacts (Agricultural and Household Products)

Idaho

Recycling

Northwest Ag Plastics, Inc.
509-457-3850
<http://www.nwagplastics.com/>

Disposal

Contact Vic Mason, Idaho State Department of Agriculture
208-332-8628
Email: vic.mason@agri.idaho.gov

Oregon

Household Waste

A toll free number (1-800-732-9253) is available to residents statewide to find out information about household hazardous waste collection programs. Information on state and local government sponsored household hazardous waste collection events can be found in the following links.

Household Hazardous Waste Program:
<http://www.deq.state.or.us/lq/sw/hhw/index.htm>

Oregon Household Hazardous Waste Collection Event Schedule:
<http://www.deq.state.or.us/lq/sw/hhw/events.htm>

Locally Sponsored Collection Programs:
<http://www.deq.state.or.us/lq/sw/hhw/collection.htm>

Recycling

Oregon Agricultural Chemicals and Fertilizers Assn.
503-370-7024
Agri-Plas, Inc. 503-390-2381
<http://www.agriplasinc.com/>

Disposal

Oregon Department of Environmental Quality
800-452-4011 (in Oregon only)
<http://www.deq.state.or.us/lq/hw/pesticide.htm>
Bend 541-633-2014
Portland 503-229-5336
Salem 503-378-5071
Pendleton 541-278-4613

Washington

Recycling

Northwest Ag Plastics, Inc.
509-457-3850 ; <http://www.nwagplastics.com/>

Disposal

Washington State Department of Agriculture:
<http://agr.wa.gov/PestFert/Pesticides/WastePesticide.aspx>

You may call toll free at 1-877-301-4555 or email
WastePesticide@agr.wa.gov

Hazardous Waste

Washington State Dept of Ecology 360-407-6000
<http://www.ecy.wa.gov/programs/hwtr/>
Northwest Regional Office (Bellevue) 425-649-7000
Southwest Regional Office (Lacey) 360-407-6300
Central Regional Office (Yakima) 509-575-2490
Eastern Regional Office (Spokane) 509-329-3400

Pesticides and Water Quality

Proper handling, use, and disposal of pesticides are critical for preventing adverse impacts on water resources. Environmental pollution can occur when pesticides enter surface and ground water systems through misapplication, movement of treated soils, irrigation return flows, runoff from urban and agricultural land, storm water runoff, and leaching through soils. It is important to know the pesticide and soil properties to help avoid water contamination. Your local NRCS Soil Conservationist can provide you with more site specific pesticide and soil properties information. For additional information and links to publications on this topic, visit:

National Water Quality Program <http://www.usawaterquality.org/themes/npm/default.html>

- Idaho State Department of Agriculture <https://agri.idaho.gov/main/water-quality-program/>
- Oregon Department of Agriculture <https://www.oregon.gov/ODA/programs/Pesticides/Water/Pages/AboutWaterPesticides.aspx>
- Washington Department of Agriculture <http://agr.wa.gov/PestFert/natresources/WaterResourcesProtection.aspx>

Water Quality Related Databases

State and county offices of the USDA-Natural Resources Conservation Service will provide decision aids and risk assessment tools to predict groundwater and surface water vulnerability to pesticide contamination. The decision aids utilize pesticide properties and soil types to help predict site-specific vulnerabilities. <http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

Clean Water Permits for Certain Pesticide Applications

A permit is required for certain pesticide applications in, over, or near waters of the State and/or United States. A National Pollutant Discharge Elimination System (NPDES) pesticide general permit and a Notice of Intent (NOI) may be required before an aquatic

application or pesticide application near waterways. Be sure to check the state and federal regulations.

Idaho: Idaho Department of Environmental Quality issues NPDES permits under the Idaho Pollutant Discharge Elimination System. <https://www.deq.idaho.gov/permitting/water-quality-permitting/npdes/>

Oregon: <https://www.oregon.gov/ODA/programs/Pesticides/Water/Pages/AboutWaterPesticides.aspx>

Washington: <http://www.ecy.wa.gov/programs/wq/pesticides/index.html>

Pesticides, Endangered Species, and Mandatory No-spray Buffer Zones

No-spray buffers have been established for some pesticides in some areas of Washington and Oregon. Buffers extend 60 ft by ground and 300 ft by air from affected water bodies. For a list of pesticides and buffer requirement: <http://www2.epa.gov/endangered-species/salmon-mapper>

The EPA reviews pesticides for their effects on endangered species. The list of affected pesticides can change frequently; therefore, consult the list each time before applying pesticides in affected areas. EPA publishes Endangered Species Protection Bulletins that set forth geographically specific pesticide use limitations for species protection. The pesticide label will direct you to the Bulletins Live! Website (<http://www.epa.gov/oppfeed1/endanger/bulletins.htm>) and you are required to follow the pesticide use limitations. Direct any questions to your state department of agriculture.

Pollinator Protection

In an effort to protect pollinators from certain types of insecticide applications, EPA has revised the labels of neonicotinoid insecticides (imidacloprid, dinotefuran, clothianidin, thiamethoxam) to include pollinator protection instructions. These special instructions are included in the “Directions for Use” section of the label. A bee advisory box and icon appear on the label and contain information on routes of exposure and spray drift precautions. EPA is continuing to review the toxicity of certain pesticides as a result of direct treatment and their extended residual toxicity.



The bee hazard icon on EPA's new, strengthened labels for neonicotinoid pesticides helps signal the pesticide's potential hazard to bees. Image courtesy of EPA.

Special Pesticide Registration Options

Pesticides are federally registered by the U.S. Environmental Protection Agency (EPA) under Section 3 of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) as amended. This law also contains two provisions for states to obtain certain pesticide uses to address local pest management needs:

- Emergency exemptions from registration under Section 18
- Special local needs registrations under Section 24(c)

Emergency Exemptions Under Section 18

Section 18 of FIFRA provides that the Administrator of EPA may exempt certain federal and state agencies from any provision of the Act if it is determined that emergency conditions exist. Section 18 authorizes EPA to allow states to use an unregistered use of a

pesticide, or a pesticide that does not have a tolerance for the food or feed crop to be treated, for a limited time.

EPA regulations for Section 18 provide four types of emergency exemptions: specific, public health, quarantine, and crisis.

Special Local Needs Registrations - Section 24(c)

In each state the department of agriculture is the designated lead agency responsible for registering pesticides to meet special local needs under section 24(c) of the FIFRA. A special local need (SLN) is defined as, “an existing or imminent pest problem within a State for which the State lead agency, based upon satisfactory supporting information, has determined that an appropriate federally registered pesticide is not sufficiently available.”

Each state is authorized to register a new end use product for any use, or an additional use of a federally registered pesticide product, under the following conditions:

- There is a special local need for the use within the state.
- The use is covered by necessary tolerances, exemptions or other clearances under the Federal Food, Drug and Cosmetic Act, if the use is a food or feed use.

SLN registrations have been useful particularly to growers of minor crops, who often have limited access to pest management options. Types of SLN registration requests considered include: adding a crop or site; incorporating an alternate application method, such as chemigation or dip (e.g., for bulbs); changing application timing; encouraging the use of reduced-risk pesticides or pesticides that facilitate resistance management; or modifying the application rate.

Contact the local State Department of Agriculture for specific instructions on Section 18 and 24c registrations:

Idaho: <http://www.agri.idaho.gov/AGRI/Categories/Pesticides/registration/indexregistrationmain.php>

Oregon: http://www.oregon.gov/ODA/PEST/Pages/contact_us.aspx

Washington: <http://agr.wa.gov/PestFert/Pesticides/ProductRegistration.aspx>

Regulatory Authorities

The specific laws and regulations governing use, storage, disposal, and transportation of pesticides differ slightly in each northwestern state. Before you use pesticides, obtain a copy of the detailed pesticide use laws and rules for the state(s) in which you are operating. The state-specific pesticide laws and rules can be found at each state department of agriculture website.

Idaho

<http://www.agri.idaho.gov/AGRI/Categories/Pesticides/indexPesticides.php>

For regulations on hazardous waste

Department of Environmental Quality
1410 North Hilton
Boise, ID 83706-1255
208-373-0502; <http://www.deq.state.id.us/>

Oregon

<http://egov.oregon.gov/ODA/PEST>

Washington

<http://agr.wa.gov/PestFert/Pesticides/>

Additional Pesticide Information

Note: The table below is not a complete listing of websites containing additional information on pesticide use and safety. The presence or absence of a given website below does not constitute an endorsement of one website over another.

Website Information	Website
Crop Data Management Systems (CDMS): A searchable database of print-on-demand pesticide labels including many SLN 24(c)	http://www.cdms.net/manuf/default.asp
A searchable database of pesticides registered with the Idaho Dept. of Agriculture	http://www.kellysolutions.com/id
NPIC (National Pesticide Information Center): A source of scientific, unbiased information	http://npic.orst.edu
Pesticide Information Center On-Line (PICOL): A searchable database of Washington and Oregon registered pesticides	http://cru66.cahe.wsu.edu/LabelTolerance.html
Pesticide toxicology information at EXTOKNET	http://extoknet.orst.edu/
Northwest Coalition for Alternatives to Pesticides	http://www.pesticide.org/
A searchable database of pesticides registered with the Oregon Dept. of Agriculture	http://oda.state.or.us/dbs/pest_productsL2K/search.lasso
Idaho State Dept. of Agriculture	http://www.agri.idaho.gov
Washington State Dept. of Agriculture	http://agr.wa.gov/
Oregon State Dept. of Agriculture	http://oregon.gov/ODA/

Worker Protection Standard (WPS) for Agricultural Pesticides

Key Features

The U.S. Environmental Protection Agency (EPA) revised the Worker Protection Standard for Agricultural Pesticides (WPS), on November 2, 2015. The WPS revisions are intended to decrease the pesticide exposure incidents among farmworkers and their family members. The WPS is designed to protect employees of farms, forests, nurseries, and greenhouses from occupational exposure to agricultural pesticides.

The WPS contains requirements for notifying employees of applications, the use of personal protective equipment, and restrictions on entry to treated areas. Additionally, the WPS also requires certain actions by employers to ensure worker safety. The WPS requires the registrants of pesticides to add label references to the WPS and to list specific application restrictions and other requirements.

Most of the revised WPS requirements became effective on January 2, 2017. Three requirements go into effect on January 2, 2019: <https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps>

4. Pesticide safety training must cover the expanded content;
5. Pesticide safety information (posters) must meet the revised standards;
6. Handlers must suspend applications if workers or other people are in the application exclusion zone.

WPS provisions are directed toward two types of employees:

Pesticide handlers—Those who mix, load, or apply agricultural pesticides; clean or repair pesticide application equipment; or assist with the application of pesticides.

Agricultural workers—Those who perform tasks related to growing and harvesting plants on farms or in greenhouses, nurseries, or forests for any type of compensation.

Pesticide Products Covered by the WPS

The WPS covers nearly all pesticide products used to produce plants commercially, including pesticides used on soil and potting media. It also covers restricted-use and general-use products. WPS provisions are intended to:

7. Minimize worker exposure to pesticides
8. Mitigate any exposures
9. Inform employees about the hazards of pesticides

The new revisions of the Worker Protection Standard are very extensive and detailed. An EPA funded “Pesticide Educational Resources Collaborative” PERC has all of the information on the new Standard. It is recommended that everyone visit the PERC website to obtain training materials and WPS Handouts, such as the Quick Reference Guide, Checklists for Employers, and Compliance Requirement Schedule. <http://pesticideresources.org//index.html>

Idaho

Luis Urias
Idaho State Department of Agriculture
Division of Agricultural Resources, Boise
208-332-8663
luis.urias@agri.idaho.gov

Oregon

Oregon Department of Agriculture
Pesticides Division
503-986-4652
http://www.oregon.gov/ODA/pages/pub_regs_safety.aspx

Washington

Washington Department of Agriculture
Pest Management Division
PO Box 42589
Olympia, WA 98504
360-902-2015
<http://agr.wa.gov/PestFert/Pesticides/WorkerProtection.aspx>

Information is also available from your local Extension educator.

QUICK REFERENCE GUIDE TO THE WORKER PROTECTION (WPS) AS STANDARD (WPS) AS REVISED IN 2015

The WPS is a federal regulation designed to protect agricultural workers (people employed in the production of agricultural plans) and pesticide handlers (people mixing, loading, or applying pesticides or doing certain tasks involving direct contact with pesticides). Each section links to the Code of Federal Regulations ([40 CFR, Part 170](#)) for more information on the revised WPS. (www.ecfr.gov)

The guide summarizes the maximum requirements under the revised WPS. It does not include exemptions and exceptions that may allow you to do less. See the referenced sections below.

Exemptions (general) [170.303.\(b\)](#) and [170.601](#)
 Exceptions for workers [170.401.\(b\)](#) and [170.409.\(a\)\(2\)](#)

Exceptions for early-entry workers during a restricted-entry interval [170.603](#)

Exceptions for handlers [170.501.\(b\)](#)
 Exceptions to PPE required on pesticide labels [170.602](#)

Employer Responsibilities for Supervisors and Labor Contractors

Employers must provide sufficient information to supervisors and/or labor contractors to ensure compliance with the revised WPS. Specify:

- The tasks supervisors/labor contractors must do, and
- The information they must provide to workers/handlers.

Employers are liable for a penalty under FIFRA if a supervisor or labor contractor acting for them fails to comply with the revised WPS requirements. [170.309.\(d\)](#), [170.313.\(d\)](#), [170.317.\(g\)](#)

This is a summary of the requirements. It does not contain all the information to comply with the revised WPS. Refer to the regulations where indicated for complete details.

Duties for ALL Employers

These requirements apply to agricultural employers and commercial pesticide handler employers except the pesticide safety, application and hazard information requirements apply only to agricultural employers.

Anti-Retaliation

Employers must not retaliate against a worker or handler who attempts to comply with the WPS, files a complaint, or provides information in an investigation of alleged WPS noncompliance. [170.315](#)

Minimum Age Requirements

1. Ensure that early-entry workers and all handlers are at least 18 years old. [170.309.\(g\)](#) and [170.313.\(c\)](#)

Pesticide Safety, Application and Hazard Information

An agricultural employer must display or make certain information available on the establishment. Commercial pesticide handler employers do not have to comply with information display requirements.

1. Display or make available all of the information listed in #2 together in an easily accessible ("central") location on the agricultural establishment. [170.311.\(a\)\(5\)](#) and [170.311.\(b\)\(2\)](#)
2. The information includes:
 - EPA WPS safety poster or equivalent information, which must include some additional information by January 2, 2018, and must be kept current. [170.311.\(a\)](#)
 - o Application information that includes:
 - o Product name, EPA registration number, and active ingredient
 - o Crop or site treated, location and description of the treated area
 - o Date, start and end times of the application, and duration of restricted-entry interval (REI). [170.311.\(b\)\(1\)](#)
 - A copy of the safety data sheet (SDS) for the formulated product for each WPS-labeled pesticide applied. [170.308](#) and [170.311](#)

3. In addition, display the EPA WPS safety poster (or equivalent) where decontamination supplies are located at permanent sites and where decontamination supplies are provided for 11 or more workers. [170.311.\(a\)\(5\)](#)
4. Allow workers and handlers unrestricted access to all of the information and keep all of the displayed information current and legible. [170.311.\(a\)\(6\)-\(7\)](#) and [170.311.\(b\)\(3\)-\(4\)](#)
5. Display the EPA WPS safety poster or equivalent information before an application takes place and for 30 days after the REI expires. [170.309.\(b\)](#)
6. Display the SDS and application information within 24 hours of the application and before workers enter treated areas. This information must be displayed for 30 days after the REI expires and kept in records on the agricultural establishment until 2 years after the REI expires. [170.309.\(b\)\(4\)](#) and [170.311.\(b\)\(5\)-\(6\)](#)
7. Provide the SDS and application information upon request of a worker, handler, designated representative or medical personnel, within 15 days. [170.311.\(b\)\(7\)-\(9\)](#)

Pesticide Safety Training

Ensure that workers are trained before performing tasks in a pesticide treated area (REI in effect within the last 30 days). [170.401.\(a\)](#) Ensure that handlers are trained before performing any handler activity. [170.501.\(a\)](#) There is no grace period for worker or handler training.

1. Train workers and handlers annually. [170.401.\(a\)](#) and [170.501.\(a\)](#)
2. Present training using EPA-approved materials either orally from written materials or audio-visually. After January 2, 2018, the training must cover additional topics. [170.401.\(c\)](#) and [170.501.\(c\)](#)
3. Trainers must be designated by the State or Tribal pesticide enforcement agency. [170.401.\(c\)\(4\)](#) and [170.501.\(c\)\(4\)](#)
4. Training must be delivered in a manner the employees can understand, and the trainer must be present and respond to questions. [170.401.\(c\)\(1\)](#) and [170.501.\(c\)\(1\)](#)
5. Maintain training records on the establishment for two years from the training date for each worker and handler required to be trained on the agricultural establishment. [170.401.\(d\)](#) and [170.501.\(d\)](#)

Continued on next column

Separate from the pesticide safety training, employers must tell workers and handlers where to find the following on the worksite: EPA WPS safety poster (or equivalent), application information, SDS and decontamination supplies. [170.403](#) and [170.503.\(b\)](#)

Decontamination Supplies

1. Establish accessible decontamination supplies located together within 1/4 mile of all workers (when required [170.411.\(c\)](#)) and handlers. [170.411](#) and [170.509](#)

- 1 gallon of water per worker and 3 gallons of water per handler at the beginning of each work period for routine and emergency decontamination,
 - Plenty of soap and single-use towels. Note: hand sanitizers and wet towelettes are insufficient. [170.411.\(b\)\(2\)](#) and [170.509.\(b\)\(2\)](#)
 - A clean coverall (or other clean change of clothes) for handlers
- Provide water that is safe and cool enough for washing, eye-flushing, and drinking. Do not use water that is also used for mixing pesticides unless steps are taken to ensure safety.

2. Provide hand sanitizers where personal protective equipment (PPE) is removed at the end of a task. [170.509.\(a\)](#)
3. Provide handlers with decontamination supplies at each mixing and loading site. [170.509.\(c\)\(1\)](#)
4. When a product requires protective eyewear for handlers, and/or when using a closed system under pressure, provide the following in mixing and loading areas: a system that can deliver gently running water at 0.4 gallons per minute for at least 15 minutes or 6 gallons of water in containers suitable for providing a gentle eye-flush for about 15 minutes. [170.509.\(d\)\(1\)](#)
5. When applying a product that requires protective eyewear, provide 1 pint of water per handler in portable containers that are immediately available to each handler. [170.509.\(d\)\(2\)](#)
6. Do not put worker decontamination supplies in areas being treated or under an REI. [170.411.\(d\)](#)
7. For handlers, decontamination supplies must be kept outside the treated area, or any area under an REI, unless they are protected from contamination in closed containers. [170.509.\(c\)\(1\)\(A\)\(3\)](#)

Employer Information Exchange

1. Before any application, commercial pesticide handler employers must make sure the owner/operator of an agricultural establishment where a pesticide will be applied, is aware of:
 - Location and description of area to be treated,
 - Date of application, estimated start time and estimated end time of the application,
 - Product name, EPA registration number, active ingredient(s), and REI,
 - Whether the product label requires both oral warnings and treated area posting,
 - All other safety requirements on labeling for workers or other people. [170.313.\(f\)](#)
2. Owners/operators of agricultural establishments must make sure any commercial pesticide handler employer they hire is aware of:
 - Specific location and description of any treated areas where an REI is in effect that the commercial handler may be in or walk within 1/4 mile of, and,
 - Restrictions on entering those areas. [170.309.\(k\)](#)

The commercial pesticide employer must pass this information along to the handler doing the work. [170.313.\(h\)](#)

Emergency Assistance

If there is reason to believe a worker or handler has been exposed to pesticides, during or within 72 hours of employment, and needs emergency medical treatment, employers must do the following:

1. Promptly make transportation available to an appropriate emergency medical facility.
2. Promptly provide to the treating medical personnel, information related to each pesticide product to which the person may have been exposed:
 - Safety Data Sheet
 - Product name, EPA registration number, and active ingredient(s).
 - Description of how the pesticide was used on the agricultural establishment.
 - Circumstances that could have resulted in exposure to the pesticide. [170.309.\(f\)](#)

Additional Duties for Worker Employers

These requirements apply to agricultural employers who employ workers.

Restrictions During Applications [170.405 \(a\)-\(b\)](#)

During pesticide applications, keep workers and everyone other than appropriately trained and equipped handlers out of the treated area (for all types of applications) and out of:

- The application exclusion zone (AEZ) for outdoor production, or
- A specified area that varies by the type of application until the ventilation criteria are met for enclosed space production.

Restricted-Entry Intervals (REIs) [170.309 \(j\)](#) and [170.407](#)

Do not direct or allow any worker to enter or remain in the treated area until the REI has expired and all posted warning signs are removed or covered. Read the exceptions in [170.603](#).

Notice About Applications [170.409 \(a\)](#)

1. Orally warn workers and post treated areas if required by the pesticide labeling.
2. If not, post warning signs if the REI is **greater than**:
 - 48 hours for outdoor production or
 - 4 hours for enclosed space production.
3. For all other applications, **either** orally warn workers or post warning signs.

Posted Warning Signs [170.409 \(b\)](#)

1. Post legible 14" x 16" WPS-design warning signs no more than 24 hours prior to an application; keep posted during REI; remove or cover before workers enter and within 3 days after the end of the REI. [170.409 \(b\)\(1\)-\(3\)](#)
2. Post signs so they can be seen at all reasonably expected entrances to treated areas. [170.409 \(b\)\(3\)\(ii\)](#)
3. Warning signs can be smaller than 14" x 16" under certain conditions. All warning signs must meet specific requirements. [170.409 \(b\)](#)

Oral Warnings [170.409 \(c\)](#)

1. Before each application, tell workers who are on the establishment (in a manner they can understand):
 - Location and description of treated area,
 - Date and times entry is restricted
 - AEZ, REI, and not to enter during REI.
2. Workers who enter the establishment after application starts must receive the same warning at the start of their work period.

Additional Agricultural Employer Duties

Before allowing persons not directly employed by the establishment to clean, repair, or adjust pesticide application equipment, provide the following information:

- The equipment may be contaminated with pesticides.
- The potentially harmful effects of pesticide exposure.
- How to handle equipment to limit exposure to pesticides.
- How to wash themselves and/or their clothes to remove and prevent exposure to pesticide residues. [170.309 \(g\)](#) and [170.313 \(i\)](#)

Additional Duties for Handler Employers

These requirements apply to commercial pesticide handler employers and agricultural employers who employ handlers.

Application Restrictions and Monitoring [170.505](#)

1. Do not allow handlers to apply a pesticide so that it contacts, directly or through drift, anyone other than appropriately trained and equipped handlers.

2. Handlers must suspend applications when anyone other than appropriately trained and equipped handlers enter the application exclusion zone (AEZ). This goes into effect on January 2, 2018. [170.505 \(b\)](#)

3. When anyone is handling a highly toxic pesticide with a skull and crossbones, maintain sight or voice contact every two hours.

4. Make sure a trained handler equipped with labeling-specific PPE maintains constant voice or visual contact with any handler in an enclosed-space production site (e.g., greenhouses, high tunnels, indoor grow houses) while applying a fumigant.

Specific Instructions for Handlers

1. Before handlers do any handling task, inform them, in a manner they can understand, of all pesticide labeling instructions for safe use. [170.503 \(a\)\(1\)](#)
2. Ensure that the handler has access to product labeling during the entire handling task. [170.503 \(a\)\(2\)](#)

Equipment Safety

1. Inspect pesticide handling equipment before each day of use, and repair or replace as needed. [170.309 \(j\)](#) and [170.313 \(g\)](#)
2. Allow only appropriately trained and equipped handlers to repair, clean, or adjust pesticide equipment that contains pesticides or residues, unless they are not employed on the establishment. [170.309 \(g\)](#) and [170.507 \(a\)](#) See Additional Agricultural Employer Duties for information regarding non-employed persons.

Personal Protective Equipment (PPE) Handlers Must Use

1. Provide handlers with the PPE required by the pesticide labeling, and be sure it is: [170.507 \(b\)](#)
 - Clean and in operating condition. [170.507 \(b\)](#)
 - Worn and used according to the manufacturer's instructions. [170.507 \(c\)](#)
 - Inspected before each day of use. [170.507 \(c\)\(2\)](#)
 - Repaired or replaced as needed. [170.507 \(c\)\(2\)](#)
2. When a respirator is required by product labeling, provide handlers with:
 - A medical evaluation to ensure the handler is physically able to safely wear the respirator,
 - Training in respirator use, and
 - A fit test to ensure the respirator fits correctly
- Keep records on the establishment of these items for two years. [170.507 \(b\)\(10\)](#)
3. Take steps to avoid heat-related illness when labeling requires the use of PPE for a handler activity. [170.507 \(e\)](#)
4. Provide handlers a pesticide-free area for:
 - Storing personal clothing not in use,
 - Putting on PPE at start of task,
 - Taking off PPE at end of task. [170.507 \(d\)\(9\)](#)
5. Do not allow used PPE to be taken home. [170.507 \(d\)\(10\)](#)

Care of PPE

1. Store and wash used PPE separately from other clothing and laundry. [170.507 \(d\)\(3\)](#)
2. If PPE will be reused, clean it before each day of reuse, according to the instructions from the PPE manufacturer unless the pesticide labeling specifies other requirements. If there are no other instructions, wash in detergent and hot water. [170.507 \(d\)\(1\)](#)
3. Dry the clean PPE before storing. [170.507 \(d\)\(4\)](#)
4. Store clean PPE away from personal clothing and apart from pesticide-contaminated areas. [170.507 \(d\)\(5\)](#)

Replacing Respirator Purifying Elements

1. Replace particulate filters or filtering facepiece respirators when any following condition is met:
 - When breathing becomes difficult,
 - When the filter is damaged or torn,
 - When the respirator label or pesticide label requires it, After 8 total hours of use, in the absence of any other instructions or indications of service life. [170.507 \(d\)\(6\)](#)
2. Replace vapor-removing cartridges/canisters when any following condition is met:
 - When odor/taste/irritation is noticed,
 - When the respirator label or pesticide label requires it (whichever is shorter),
 - When breathing resistance becomes excessive, After 8 total hours of use, in the absence of any other instructions or indications of service life. [170.507 \(d\)\(7\)](#)

Disposal of PPE

1. Discard, do not clean, coveralls and other absorbent materials that are heavily contaminated with pesticide having a signal word "DANGER" or "WARNING." When discarding PPE, ensure that it is unusable as apparel or made unavailable for further use.
2. Follow federal, state, and local laws when disposing of PPE that cannot be cleaned correctly. [170.507 \(d\)\(2\)](#)

Instructions for People Who Clean PPE

[170.507 \(d\)\(8\)](#)

- The handler employer must inform people who clean or launder PPE:
- That PPE may be contaminated with pesticides,
 - Of the potential for harmful effects of exposure to pesticides,
 - How to protect themselves when handling PPE,
 - How to clean PPE correctly, and
 - Decontamination procedures to follow after handling contaminated PPE.



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