Herbicides and Noxious Weeds:
Answers to Frequently Asked Questions

MONTANA STATE UNIVERSITY | EXTENSION

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leafy spurge - Clinton Shock, Oregon State University

The widespread use of pesticides to control pests on crops for agricultural productivity has raised concern about chronic effects to the environment and human health. Because pesticides are a concern to the public, noxious weed crews may receive questions about herbicides and how they affect us and our environment.

This brochure presents an overview of commonly asked questions posed by the public. Questions focus on the use of herbicides to control noxious weeds on non-crop sites, such as rangelands and pastures, forests and roadway rights-of-way, and the potential risks that may be associated with their use. Herbicide risk is not always a straightforward issue to which simple 'yes' or 'no' outcomes are provided. The answers given in this brochure are not exhaustive but are intended as an overview.

saltcedar - Bonnie Milliam, bugwood.org

For more publications available on noxious weed management and herbicides, please visit your local county weed district or Extension office, or online at store.msuextension.org, and the Center for Invasive Species Management, www.weedcenter.org/store.

front cover photos, from left to right:
perennial pepperweed - Mel Harte, forestryimages.org
blueweed - Stevens County, Washington Weed Control Board
oxeye daisy - courtesy of Tiiu Roiser - www.freetiiupix.cwahi.com
Dyer's woad - Wikimedia Commons
back cover:
tall buttercup - Thomas H. Kent

Why are you killing those pretty flowers?

The Montana County Weed Control Act requires landowners to control noxious weeds, including those with attractive flowers. Many of these plants were originally brought to the U.S. from Eurasia for ornamental and landscape use. They escaped cultivation and invaded native habitats where they now cause serious environmental problems. Noxious weeds with showy flowers include Dalmatian toadflax, saltcedar, oxeye daisy and others.

What are noxious weeds?

The Montana County Weed Control Act designates noxious weeds as priority plants for control by landowners by rule of the Montana Department of Agriculture or a county weed district. A noxious weed is a plant that meets the following criteria:

- Is non-native or exotic to Montana, and
- When introduced, may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses, or may harm native plant communities.

Certain noxious weeds are invasive. They invade native habitats and then spread, outcompeting and displacing native plants, causing significant losses of grazing land and wildlife habitat.

What weeds are labeled as noxious in Montana?

Thirty two plants are labeled as noxious weeds in Montana. The Montana noxious weed list is available at the Montana Department of Agriculture noxious weeds program website. See the MSU Extension Bulletin, *Montana's Noxious Weeds* (EB0159), or visit the Montana Weed Control Association website for noxious weed identification. Counties may have additional weeds labeled as noxious. Contact your county weed district for noxious weed lists, useful information and expert advice.

What noxious weeds are common in Montana?

The most widespread noxious weeds in Montana are Canada thistle, spotted knapweed and leafy spurge. Other weeds abundant in Montana and widespread in many counties include:

- Common tansy
- Dalmatian toadflax
- Diffuse knapweed
- Field bindweed
- Houndstongue
- Oxeye daisy
- Russian knapweed
- Saltcedar
- St. Johnswort
- Sulfur cinquefoil
- Whitetop
- Yellow toadflax

What are herbicides?

Herbicides are chemicals used to kill weeds by interfering with the normal biological processes of plants, usually through an interaction with a crucial enzyme. Herbicides are a class of pesticides. Other common pesticide classes include insecticides and fungicides.

Why are herbicides used on noxious weeds?

Herbicides offer the most effective means of weed control when used in combination with other practices. Weed crews practice integrated weed management by combining the selective use of herbicides with cultural practices, including sheep grazing and revegetation, and mechanical and biological techniques, such as hand tools and exotic herbivorous insects and fungi. Mapping and monitoring is another typical practice. Encouraging the growth and reproduction of native plants is emphasized to suppress the growth and spread of weeds.

How are herbicides applied?

Herbicides are sprayed on the foliage or soil using different methods tailored to the site conditions. Ground-based methods use sprayers on backpacks, trucks, all-terrain vehicles or even horses. Aerial application involves spraying herbicides from aircraft, usually a helicopter.

How do herbicides work?

Herbicides are absorbed by foliage or roots. Herbicides can be either selective or non-selective to certain types of plants. Some herbicides are systemic and move to other areas of the plant, while others are contact herbicides that affect only the tissue on which they land.

How do herbicides kill plants?

There are many ways herbicides can kill or injure plants. Most herbicides used on noxious weeds fall into two groups classified by the effect a herbicide has on a plant, or the mode of action (Table 1).

- Plant growth regulators are selective, killing broadleaf plants but not grasses by deregulating cell growth.
- Amino acid inhibitors are non-selective, killing broadleaf plants and grasses by preventing protein synthesis.

What herbicides are commonly used on weeds?

The common herbicides used on noxious weeds are listed in Table 1. These herbicides are often applied in combinations as either prepackaged mixtures or tank mixes.

- Aminocyclopyrachlor + chlorsulfuron (Perspective)
- Aminopyralid + 2,4-D (Forefront R&P)
- Aminopyralid + metsulfuron (Chaparral)
- Aminopyralid + triclopyr (Capstone)
- Clopyralid + 2,4-D (Curtail)
- Clopyralid + triclopyr (Redeem R&P)
- Dicamba + 2,4-D (Weedmaster)
- Metsulfuron + chlorsulfuron (Cimarron)
- Metsulfuron + dicamba + 2,4-D (Cimarron Max)
- Picloram + 2,4-D or metsulfuron or chlorsulfuron (tank mix)
- Triclopyr + 2,4-D (Crossbow)

What herbicides should I use on which weeds?

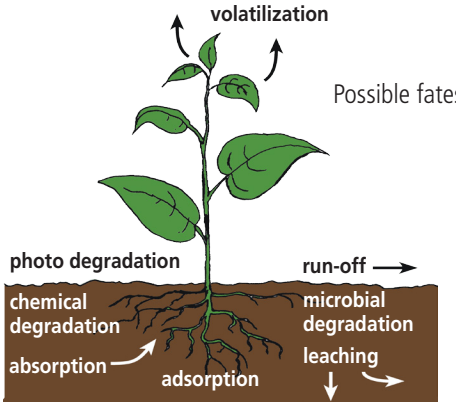
This depends. Selecting the right herbicide and application rate and method is based on the weed species and site conditions, such as weed density, the presence of desirable vegetation and proximity to water. Consult your county weed district or Extension office to determine the best practices to use in your situation.

Will herbicides hurt my lawn?

Yes, if the herbicide is non-selective. Non-selective herbicides like glyphosate are often sold as "weed killers" with lawn and garden care products. Consumers should carefully read the label both before buying and using a product to avoid damage to desired plants.

What happens to herbicides after application?

Typically, herbicides applied to a site degrade by plant metabolism or soil microbes, and chemical reactions with sunlight, water and oxygen. They can disperse into the air by volatilization or water by runoff and leaching. Some herbicides adsorb to the soil and degrade over a period of time. Long-lived herbicides may persist in compost and hay and can affect desired plants when these materials are applied to soil. For information on herbicide carryover refer to the MSU Extension Montguide, *Minimizing Pesticide Contaminated Soil around the Home and Garden* (MT201008AG).



Possible fates of applied herbicides.

Image courtesy of University of Missouri Extension.

TABLE 1. Herbicides commonly used to control noxious weeds in Montana.

Mode of action	Site of action[1]	Selectivity	Chemical family	Active ingredient	Selected trade name(s)	Relative persistence in soils[2]
Growth regulators	unknown	Broadleaf plants	phenoxy acid	2,4-D	various	Low
				MCPA		Low
			benzoic acid	dicamba	Banvel, Clarity, Vanquish	Low
			pyridine	aminocyclopyrachlor	Method 505G	High
				aminopyralid	Milestone	High
				clopyralid	Transline, Stinger	High
				triclopyr	Garlon, Remedy	High
				picloram	Tordon	High
Amino acid synthesis inhibitors	Inhibition of ALS enzyme	Broadleaf plants and grasses	imidazolinone	imazapic	Plateau	Moderate
				imazapyr	Arsenal, Habitat	Moderate
			sulfonylurea	chlorsulfuron	Telar	Moderate
				metsulfuron	Escort	Moderate
	Inhibition of EPSPS enzyme	All types of plants[3]	glycine	glyphosate	Roundup, Touchdown, Rodeo, many others	Moderate

[1] biochemical site affected by the herbicide; [2] under ideal conditions; [3] ferns, mosses, broadleaf plants, grasses and conifers

Dalmatian toadflax - Patrick Standish

What is a residual herbicide?

Residual herbicides have persistence in soils, providing season-long weed control. Herbicides with a residual decompose slowly, remaining in the soil to kill weed seedlings as they emerge. Herbicides that are short-lived show low persistence in soils.

What is herbicide drift?

Drift is typically the movement of herbicide droplets away from the target area during application. Droplet drift is influenced by weather, application method and droplet size. Drift may occur when herbicides are carried by wind or temperature inversion layers to non-target areas, potentially affecting susceptible plants or aquatic habitats.

How do you minimize herbicide drift?

Weed crews reduce drift potential by spraying in the morning when relative humidity is high and wind velocity and temperatures are low. They also use low spray pressures and specially-designed nozzles, and employ ground-based methods that spray as close to the weeds as possible.

Will herbicides kill my flowers or garden next to the right-of-way?

Yes, herbicide drift can damage desired plants. Damage to sensitive plants can occur at low concentrations, so weed crews take care to minimize drift and avoid sensitive areas adjacent to a targeted right-of-way.

Will herbicides injure my trees or shrubs?

Herbicides may injure or kill trees and bushes by drift or root absorption. Care should be taken when applying soil sterilant herbicides and herbicides with a long residual, such as picloram and aminopyralid, to areas where tree roots may extend. This is usually two to three times beyond the widest-reaching branches.

How do I find out what an applicator was spraying next to my property?

Ask the applicator or landowner directly. You can learn about the herbicide by reading the product label and material safety data sheet (MSDS) available from the Crop Data Management Systems website. If you still have questions or concerns, call the National Pesticide Information Center at 1-800-858-7378.

How do I stop herbicide spraying in the right-of-way next to my property?

Contact your county weed district and request permission to control weeds adjacent to your land. Once approved, you can post WEEDS CONTROLLED BY LANDOWNER signs. You will be responsible for noxious weed control in the right-of-way; otherwise the weed crew will spray the area as part of their weed management program.

What is herbicide toxicity?

Toxicity is the degree of injury posed by a substance on a life form in terms of dose and exposure. Acute toxicity results when a substance causes an immediate effect from a single exposure. Chronic toxicity results from repeated exposures over time. The same substance can show low acute toxicity with high chronic toxicity and vice versa. For more information refer to the MSU Extension Montguide, *Assessing Pesticide Toxicity* (MT200810AG), or visit the National Pesticide Information Center website.

Where is herbicide toxicity reported?

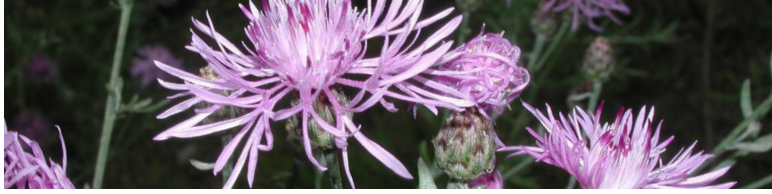
Toxicity is reported on the label and the material safety data sheet (MSDS). The label classifies acute human toxicity of the herbicide formulation (active and inert ingredients) by a signal word as CAUTION - least toxic; WARNING - mildly to moderately toxic; DANGER - very toxic; or DANGER/POISON - highly toxic and potentially fatal at low doses. For chronic human toxicity of the active ingredient, a statement identifying the chronic health concern is reported on the label if genotoxic tests indicate mutagenic effects. Ecotoxicity, or the effects on certain wildlife, can sometimes be found on the MSDS or under the environmental hazard section of the label. Sublethal effects at low doses are rarely measured and therefore not reported on the label or MSDS.

Does EPA registration mean a herbicide is safe?

Any pesticide legally used in the U.S. must be registered with the Environmental Protection Agency. Registration does not constitute an approval rating or safety claim. Registration means the pesticide will not pose unreasonable risk to humans or environment relative to the benefits gained from its use when the user explicitly follows the directions and restrictions on the label.

Is the toxicity of herbicide additives reported?

Acute human toxicity of inert or "other" ingredients, for instance carriers, surfactants and other adjuvants, is reported by the signal word on the herbicide label. Because most tests for chronic toxicity and ecotoxicity assess only the active ingredient rather than the formulation, the potential for inert ingredients to cause chronic and



spotted knapweed - Leslie Mehroff, bugwood.org

sublethal effects may not be reported. Some inert chemicals may exert biological activity and toxicity. Most glyphosate-based herbicides (Roundup and many others) contain the surfactant POEA, which is more toxic to aquatic life than glyphosate alone. Extensive studies document sublethal effects to fish and amphibians on endocrine and immune function, suspected of contributing to population declines. The aquatic glyphosate formulation Rodeo omits POEA.

Is it safe to spray herbicides into water?

Only herbicides with an aquatic label can be safely applied to water. Aquatic herbicides are used to control aquatic noxious weeds: curlyleaf pondweed, Eurasian watermilfoil, flowering rush, purple loosestrife and yellowflag iris. Before applying aquatic pesticides to water, even if the waters are privately owned, applicators must be licensed by the Montana Department of Agriculture and obtain a Montana Pollutant Discharge Elimination System (MPDES) permit from the Montana Department of Environmental Quality.

How do herbicides get into water?

Herbicides applied to terrestrial sites may enter water directly through drift or overspray, or indirectly by runoff and leaching. Herbicide leaching may cause groundwater pollution when herbicides are carried by water through the soil. Groundwater pollution is usually associated with heavily farmed areas where chemical use is intensive. Drift or overspray of terrestrial herbicides into water is a violation under the Federal Insecticide, Fungicide and Rodenticide Act. Anyone can file a complaint, which is subject to review by the Montana Department of Agriculture.

How close to surface water are you allowed to spray terrestrial herbicides?

Many herbicides labeled for terrestrial sites can be applied up to the water's edge unless the label prohibits it, so long as by law applicators follow label directions to restrict entry into water. But this does not imply applications should be made up to the water's edge, particularly in the case of most glyphosate-based herbicides. No-spray buffer zones are recommended to buffer effects of terrestrial herbicides to the aquatic environment, exceeding several feet from the water's edge for ground-based applications. The presence of ground water restrictions on the label (picloram, for example) prohibits application of the product up to the water's edge.

Can herbicides kill the birds and the bees?

This is not likely. While some herbicides are toxic to birds and bees at high concentrations, most are nontoxic under natural conditions. On an acute basis, the herbicides listed in Table 1 are relatively nontoxic to bees and slightly to practically nontoxic to birds. Herbicides should not be confused with insecticides, which usually target nervous systems. For instance, recent population declines in honey bees is generating intensive research on the possible consequences of sublethal effects of newer systemic insecticides on bees that may interact with other stressors and impact honey bee health.

Will herbicide spray harm my children or pets?

This is not likely at low level incidental exposure over the short term. But the effects of repeated and cumulative exposure to certain herbicides or pesticide mixtures are less certain. Minimizing exposure to children is desirable as they are uniquely vulnerable to chemical exposures due to their rapid development and small body size. Pets may experience gastrointestinal problems (or worse) if they drink herbicides or groom their feet or fur wet from spray. The restricted entry interval statement on the label gives the time that must pass before re-entry is allowed into the sprayed area without personal protective equipment (PPE).

Why do weed crews wear so much protective clothing?

Weed crews work with herbicides on a regular basis. They are required to wear PPE to minimize potential exposure. The label states the minimum amount of PPE that must be worn by anyone applying the product and it varies according to the toxicity of the chemical.

When can my animals graze the sprayed area?

This depends on the grazing interval stated on the label. The interval is based on the herbicide, livestock type and application rate and method. For non-lactating horses, for instance, 2,4-D has no waiting period while glyphosate has a 14-day restriction when used as a spot treatment. For more information refer to the MSU Extension Montguide, *Chemicals and Animal Safety* (MT200805AG).

My fruit and vegetables were damaged by right-of-way herbicide spray. Can I still eat them?

Eating fruit or vegetables contaminated by right-of-way herbicides may cause toxicity because these herbicides are not labeled for use on food. Visible damage indicates the herbicides may be present in these foods, so eating them is not recommended.

yellow starthistle - Chris Bersbach

Do herbicides cause cancer and other delayed human health effects?

This is possible, especially for people exposed to certain herbicides on a regular basis or during certain stages of development, such as in pregnancy and childhood. Routine exposure to certain herbicides is associated with different cancers and other delayed conditions in occupational groups such as applicators, farm workers, landscapers and golf course workers. Health effects are often attributed to the lack of PPE when regularly handling and applying pesticides.

Although an association exists between routine exposure to certain herbicides and chronic health effects, this link may not be so simple. For instance, to control multiple pests, occupational groups often use herbicides in mixtures with other pesticides. These mixtures can interact and produce additive or synergistic effects, which may target the immune or endocrine systems and induce chronic conditions. The proper use of PPE is critical to preserve and protect health.

Is herbicide spraying by weed crews safe to the public and environment?

Weed crews typically apply herbicides at relatively low quantity and low intensity on localized sites, often with handgun sprayers. Localized spraying is precise because most of the product reaches the target weed, minimizing off-target damage. There is a risk of contamination of surface water if applicators allow terrestrial herbicides to enter water, for instance by way of drift or overspray. If the herbicide is likely to enter the water, then an aquatic herbicide should be used and an MPDES permit is required.

Great Plains toad – Montana Natural Heritage Program

Carefully avoid contamination of water by terrestrial herbicides to protect aquatic life.

Support your county weed district to protect Montana's environment against noxious weeds

Additional resources:

Montana Department of Agriculture, Noxious Weeds Program
www.agr.mt.gov/agr/producer/weeds

Montana Department of Agriculture, Pesticides Program
www.agr.mt.gov/agr/business/pesticides

Montana Department of Environmental Quality, Water Protection Bureau
www.deq.mt.gov/pcd/wpb

National Pesticide Information Center
www.npic.orst.edu

Pesticide Safety Education Program
www.pesticides.montana.edu

EB0214

Montana noxious weed Education Campaign

This bulletin was produced by the Montana Noxious Weed Education Campaign with suggestions from Dave Burch, Bill Dyer, Jerry Marks, Shelley Mills, Bob Peterson, Steve Shelly, Joe Weigand, and Paul Wick. Funding was provided by the Montana Department of Transportation, USDI-Montana/Dakotas Bureau of Land Management and USDA-Forest Service Region 1.