Attributes and ecological impacts of herbicides used for invasives control in native habitats: explanations.

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The herbicides on the reverse side are used to control noxious and invasive weed species but note their problematic attributes! Use chemicals sparingly and by hand only. Devise non-chemical alternatives to interrupt invasive species' life cycles. Plant in competitive native species.

What problems might the product of choice cause the applicator and nearby people? Check the **signal word** in the table on the reverse page. DANGER indicates acute toxicity, be it through oral, dermal, or eye contact, or inhalation. DANGER is of most concern, followed by WARNING, then CAUTION which signifies the least toxic. Follow the pesticide label for protective use. The term "pesticides" includes herbicides, insecticides, fungicides, etc.

How long will the herbicide remain in its toxic state in the environment? The longer the **half-life** of the product, the more time it has to move off-site, affect non-target organisms, or reach groundwater. The break-down products may also be toxic to species or affect the environment.

How mobile is the pesticide? Check **vapor pressure** for drift potential, **solubility/soil sorption** for **leach potential**.
Most of the given products have relatively low vapor pressures but drift can also be caused by wind, high temperature, and by the application pressure. Higher pressures produce smaller droplets which are more likely to drift. For protection from drift, follow label instructions, make applications only under favorable wind direction and speed, and provide non-chemical buffer zones.
Products with high solubility and low soil sorption are more likely to leach i.e. move through the soil or offsite and end up in non-target areas on non-target organisms, particularly if the pesticide has a long half-life. Note that soil erosion can also move chemicals which are tightly bound to the soil. EPA suggests protecting sites from leaching by reducing the pesticide volume and/or using alternate products, biological control, or cultivation methods.

What is the **toxicity to terrestrial vertebrates**? Quail, mallard, rat, mouse and rabbit are the usual test species. How might wild and rare species and their predators be affected?

What is the **toxicity to terrestrial invertebrates**? Honeybees serve as a model for pollinating insects. What effects are likely for other insect groups, other invertebrates and the food web?

How **selective** is the product for the pest you wish to control? Nonselective herbicides are likely to affect many species they contact while selective products spare at least some of the non-target organisms. Check pest control manuals and labels for more information.

What is the **toxicity to aquatic species**? Aquatic species including vertebrates such as amphibians and fish, invertebrates, and wetland species, may differ substantially from terrestrial organisms in their sensitivity to a pesticide. If aquatic toxicity is the case, protective actions may already be prescribed on the label. Follow these carefully to prevent negative impacts during and after application. Also consider larger buffer zones and alternative types of pest control.

Websites: www.ace.ace.orst.edu/info.extoxnet; www.pesticide.org/factsheets.html; members.aol.com/rccouncil/ourpage/conf98.html
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Attributes and ecological impacts of herbicides used in native habitat management

Herbicide/ active ingredient	**Signal Word**	**1/2 life in environment**	**Vapor pressure**	**Solubility; soil sorption**	**Leach potential**	**Toxicity to terrest-rial vertebrates**	**Toxicity to terrestrial invertebrates**	**Selective control of plants**	**Toxicity to aquatic spp**
Garlon 3a triclopyr	DANGER Eyes!	10 - 46 days	low	high low	large	quail, mallard none; **eye irritation**!	bees none	broadleaf and woody	practically none
Garlon 4,Pathfinder triclopyr	CAUTION	10 - 46 days	low	low high	small	quail, mallard none; rat, rabbit low	?	broadleaf and woody	**very toxic to fish and Daphnia**
Crossbow	WARNING	see triclopyr	and	2,4-D					
Roundup glyphosate	CAUTION Eyes!	3 - 47 days	low	high high	small	**rat: inhalation; eye irritation**	earthworm, bee none; **toxic to fruit insects**	no	**fish, Daphnia, oyster toxic;** crayfish, shrimp, crab none
Rodeo glyphosate (aquatic)	CAUTION Inhalation!	3 - 47 days	low	high high	small	**inhalation**!	see Roundup	no	fish and Daphnia none
Krenite fosamine ammonium	WARNING Eyes! inhalation!	8 - 10 days	low	high low	medium	none quail; **rat: inhalation some**	bee none	no	none to trout, minnow
Tordon* picloram	WARNING, RUP Eyes, inhal., skin!!	20-300 days	low	high low	large	quail, mallard none; **rat: inhalation high**	bee low	no	**some trout, bluegill, catfish, Daphnia toxic**
Tordon RTU	WARNING	see also	picloram	and	2,4-D				
Banvel dicamba	WARNING	14 - 100 days	low	high low	large	slightly toxic	bee none	no	fish and Daphnia some
2,4-D (many products)	DANGER - CAUTION eyes!	7 - 28 days	low to high	varies low	varies	slight	bee some dosages toxic	broadleaf and sedges	**bluegill, trout, crab, shrimp toxic**
Landmaster BW	DANGER	see 2,4-D	and	glyphosate					
Velpar hexazinone	DANGER Eyes!	60 - 120 days	low	high low	large	quail, mallard none	none bee	no	fish and Daphnia low
Liberty nc glufos-inate ammonium	WARNING	7 days	low	high low	large	quail none	honeybee nontoxic	no	trout slight
Basagran bentazon	CAUTION	14 - 20 days	low	high low	large	slightly toxic	not to bees	broadleaf, sedges	slight to aquatics
Transline clopyralid	CAUTION Eyes, skin!	12 - 170 days	low	high low	large	non-toxic	toxic to bees	legumes, composites, smartweeds	slightly toxic to fish
Stinger clopyralid	CAUTION	30 - 170 days	low	high low	large	non-toxic	toxic to bees	legumes, composites, smartweeds	slightly toxic to fish
Dalapon 2,2-dichloroprop	WARNING	2 – 16 weeks	?	medium low	medium	can depress reproduction in birds	insects, soil organisms low	monocots	toxic to aquati c invertebrates
Surflan oryzalin	CAUTION	28 - 180 days	low	low low	small	non-toxic	non-toxic to bees	non-woody	moderately toxic
Oust sulfometuron methyl	CAUTION	20-28 days	low	high low	large?	practically non-toxic in quail, mallard	?	no	**high to some minnow embryos, fish, crayfish**
Plateau* imazameth	CAUTION Eyes, skin, inhal.!	30-200 days	?	?	large?	don't use in grazing area; rat inhalation	low bee and earthworm	no	slight in bluegill, trout, Daphnia
Poast, Vantage sethoxydim	WARNING Inhal., Skin,Eyes!	4 - 10 days	low	high/ low-med.	medium?	low mallard, quail	none to bees	grasses	some in Daphnia

Information sources:(1) Farm Chemicals Handbook '97; (2) Herbicide Handbook 1994; (3) EXTOXNET 1997; (4) Montgomery, J.H. 1993. Agrochemicals Desk Reference. **Shaded cells and bolded font indicate concern** (see reverse) Compilation: Ursula C. Petersen, Bureau of Agrichemical Management, Wisconsin Dept of Agriculture, Trade and Consumer Protection 1997. Rev. 1/99; 2/01.