NCASI Fact Sheet

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An Overview of Forestry Herbicide Use in the US and Canada

Updated JANUARY 2019 (*originally published April 2016*)

Introduction

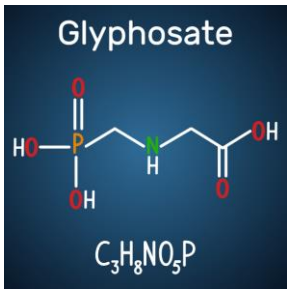
In commercial forestry, herbicides are used to control competing vegetation and improve timber productivity. Wagner et al. (2004) reviewed long-term studies (10–30 years) of increased wood volume yield in response to forest vegetation management (primarily using herbicides) in North America. They reported that most studies indicated 30–300% increases in wood volume yield for major commercial tree species and that gains were relatively consistent for a wide range of site conditions. Herbicides may also be applied in forest ecosystems to control invasive plants and help restore native ecosystems (e.g. native pine-grasslands ecosystems) and early successional and savanna habitats favored by high-priority species such as red-cockaded woodpecker (*Picoides borealis*), northern bobwhite (*Colinus virginianus*), and gopher tortoise (*Gopherus polyphemus*) (e.g., Jones and Chamberlain 2004).

Gopher Tortoise *Photo Credit: Adobe Stock Images*

Are herbicides regulated?

Before herbicides can be applied, they must be approved and registered by the Environmental Protection Agency (EPA) in the United States and by the Pest Management Regulatory Agency (PMRA) of Health Canada in Canada. The approval process includes extensive study and review of data on chemical composition, mode of action, environmental fate, and toxicity to a range of plant and animal species. Based on these data, a label is developed that specifies, among other things, the approved uses, application concentrations and methods for those uses, and mitigation measures that must be used to protect applicators and bystanders. Herbicides must be applied according to the label directions and when those directions are followed, there is no potential for significant adverse effects on humans or the environment.

What herbicides are used in forestry?



In Canada, there are five herbicide active ingredients registered for use in forestry: glyphosate, triclopyr, hexazinone, 2,4-D, and simazine. However, historically, glyphosate has seen nearly exclusive use. According to Canada's National Forestry Database (http://nfdp.ccfm.org), in 2016, nearly 98% of forest land that was treated with herbicides was treated with glyphosate-based herbicides.

In the United States, in a survey conducted by NCASI (2015), forest landowners and managers reported using 12 different herbicides[1] on managed forest land in 2011. However, imazapyr (applied to 73% of treated acreage[2]) and sulfometuron methyl (applied to 41% of treated acreage) were by far the most commonly applied.

[1] *2,4-D, aminopyralid, atrazine, clethodim, clopyralid, fosamine, glyphosate, hexazinone, imazapyr, metsulfuron methyl, sulfometuron methyl, triclopyr*

[2] *Because some herbicides were used in combination, individual herbicide percentages will sum to greater than 100% of treated acreage.*

Are forest herbicide applications widespread?

In any given year, only a small portion of forest land is treated with herbicides. For example, in Canada, in 2016, about 0.2% of land classified as "forest" by the National Forestry Database (http://nfdp.ccfm.org) was harvested and about 0.04% of land classified as "forest" was treated with herbicides. According to the NCASI (2015) survey, in the US in 2011, herbicides were applied to 4.4% of the total area under management.

Are herbicides harmful to plants and animals in the environment?

In general, when using pesticides of any kind, one of the primary concerns is to minimize movement off-site where non-target organisms could be exposed and potentially harmed. Minimizing risk to non-target organisms is achieved through a combination of practices, some of which relate to application practices and some of which relate to the selection of pesticide formulations that are not persistent in the environment or toxic to non-target organisms.

Herbicide applicators use a variety of techniques to minimize spray drift, thus reducing the risk of movement off-site during application. For example, using large droplet sizes, applying as close to ground level as possible, and making applications when meteorological conditions are favorable (e.g. avoidance of inversions, dew, forecast rain, high ambient temperature, and low relative humidity) help minimize spray drift (NCASI 2015). Movement off-site in runoff water is minimized by scheduled applications when no rain is forecast and by selecting herbicides that are not highly mobile in the environment. Selecting herbicides that degrade rapidly in the environment minimizes the time window during which non-target organisms can come in contact with the herbicide active ingredient. Selecting herbicides that are low in toxicity minimizes the risk of adverse effects if non-target organisms should be exposed.

Tatum (2004) reviewed the environmental transport and fate and toxicity of six of the most commonly used forest herbicides[3] and surfactants that are used with them and concluded:

- These herbicides target biochemical processes unique to plants, such a photosynthesis, and are of low toxicity to animals;
- At concentrations likely to be encountered in the environment, these herbicides are not carcinogenic, are not reproductive or developmental toxicants, and are not endocrine disrupters;
- Mixtures of these herbicides are not likely to be significantly more toxic than the individual compounds;
- Concentrations of herbicides and surfactants in environmental media following forestry applications are typically much lower than the concentrations associated with any adverse effects on non-target organisms;
- Frogs do not appear to have any unusual sensitivity to forest herbicides;
- These herbicides are not toxic to honeybees;
- These herbicides are water soluble and degrade quickly in the environment and thus are neither persistent nor bioaccumulative.

References

Jones, J.D.J. and Chamberlain, M.J. 2004. Efficacy of herbicides and fire to improve vegetative conditions for northern bobwhites in mature pine forests. *Wildlife Society Bulletin* 32:1077-1084.

National Council for Air and Stream Improvement, Inc. (NCASI). 2015. *Herbicide use patterns on corporate forest lands in the United States, 2011*. Technical Bulletin No. 1031. Research Triangle Park, N.C.: National Council for Air and Stream Improvement, Inc.

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Wagner, R.G., Newton, M., Cole, E.C., Miller, J.H., and Shiver, B.D. 2004. The role of herbicides for enhancing forest productivity and conserving land for biodiversity in North America. *Wildlife Society Bulletin* 32:1028-1041.

For More Information Contact

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[3] *Glyphosate, hexazinone, imazapyr, metsulfuron methyl, sulfometuron methyl, triclopyr*