Canadian Institute of Forestry
Institut forestier du Canada

HERBICIDES
AS A FOREST MANAGEMENT TOOL

Topic: Herbicides are sometimes used in Canadian forest management to assist in the rapid recovery of reclaimed forest lands, (afforestation of lands that were previously converted to non-forest use), or to reduce competing vegetation to aid the establishment and growth of new forests of a desired composition. Undesirable vegetation could include grasses, shrubs, and tree species that are not consistent with the desired future forest. Undesirable species could also include non-native or invasive species. Herbicide use on public lands is controversial.

Background: Natural Resources Canada (NRCan) has defined vegetation management as: "the methods and tools used to selectively remove and/or add plant species (e.g., trees, shrubs, herbaceous and graminoid species) within a site or area".[1] In Canada, glyphosate-based herbicide (GBH) is the single most popular herbicide,[2] used in agriculture, forestry, industrial/commercial operations, as well as in residential environments.[3] GBH is sold under brand names including Round-Up, Vision, Rodeo, Xtreme, and Wipe Out.[4,5]

GBH is a broad-spectrum, non-selective herbicide.[6] It is an effective tool for control of many invasive weed species or toxic plants, such as poison ivy."[7] There are a number of forms of GBH including solutions, pastes, and tablets. There are several methods of applying GBH to trees including ground or aerial equipment, wiper and wick applicators, and cut stump or stem injection treatment.[8] In Canada, rotary or fixed wing aircrafts,[9] are the primary method for applying GBH on forests.

Nationally, GBH is used significantly more in agricultural than in forestry, with 90% of national usage in the agricultural sector, where it is applied to 70 different types of crops, including canola, soybeans, field corn, and wheat.[10,11] Additionally, GBH is one of a select number of herbicides used in fruit orchards.[12]

Compared to agriculture, where GBH is sprayed frequently, in the forest sector, GBH may be applied just once or twice per rotation.[13]

Before the application of GBH, stands are typically assessed and spraying occurs only in a targeted area instead of the entire stand.[14]

The need for re-treatment, high cost, safety risks, and shortage of labour associated with manual treatments have made GBH a desirable option for vegetation control.[15] However, opponents of GBH argue its application has a negative impact on human health and ecosystems.[16]

A 50 year old "sterile" Scots pine plantation with a developing hardwood understory.

Current Status: Across Canada, 66% of forest land harvested in the average year is regenerated with no herbicide use. The other 34% of land is generally home to the most productive forest sites and is where replanting occurs.[17] Once the seedlings are planted, after 1-3 years, herbicide (most notably GBH) is applied to control rival vegetation.

Following intense public pressure and a number of public consultations, the Québec government banned the use of glyphosate on Crown land in 2001.[18] Following the ban, "forest regeneration efforts focused on early planting of tall stock and extensive manual brushing.[19]

While Nova Scotia has enacted a similar ban, if issued government approval, GBH based Vision Max and Timberline[20] may continue to be applied on forested land.[21]

In order for the approval to be issued, a number of terms and conditions must be fulfilled, including alerting the public when the spraying will occur, spraying only within certain wind speeds, and maintaining a certain distance from water.[22]

Herbicide use in forest regenerating after harvest is usually prescribed by managers to meet regeneration standards of a specific province, (i.e., density of desired trees, size and growth rate of these trees, and measures of their competition, such as 'free-to-grow' status). GBHs are chosen by forest managers because they are the most effective tool to meet these provincial policies.

Key Considerations: There is much debate about GBH and its impact on humans. In March 2015, the World Health Organization's International Agency for Research on Cancer (IARC) concluded that GBH is "probably carcinogenic to humans". Additionally, the IARC stated: "that there was strong evidence for genotoxicity, both for pure glyphosate and for glyphosate formulations." [23]

However, in 2016, experts from the United Nations' Food and Agriculture Organization (FAO) and the World Health Organization (WHO) stated glyphosate when exposed through food is "unlikely to pose a carcinogenic risk to humans."[24] Additionally, the United States Environmental Protection Agency (EPA) has stated "glyphosate products used according to label directions do not result in risks to children or adults." [25]

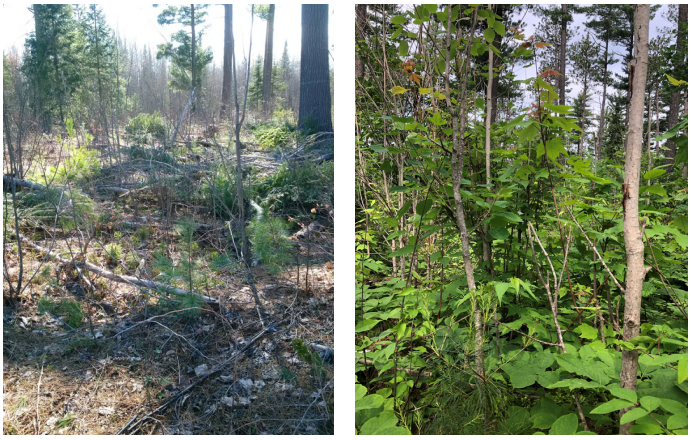
Their stance is similar to other international experts and regulatory authorities including the Canadian Pest Management Regulatory Agency.[26] In 2019, Health Canada issued a statement on GBH in response to their 2017 re-evaluation decision on glyphosate. This statement summarized that "no pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed."[27]

A number of groups opposing the usage of glyphosate have stated that since GBH was re-evaluated in 2017, new scientific research has emerged showing its potential risks, which must be considered by Health Canada. It is argued that these risks include: "impacts on microbiome, neurodegenerative and reproductive toxicity, adverse impacts to monarch butterflies and ecological harm to freshwater ecosystems."[28]

As well, some Indigenous communities have raised concerns with GBH being used in Canadian forests. These concerns are linked to various plants either grown for food (berries, nuts) or grown for medicine either being killed by GBH or being viewed as contaminated. A notable example is the McLeod Lake Indian Band who in July 2019 passed a Band Council resolution "that reaffirms the Band's zero tolerance for herbicide, pesticide, insecticide, and chemical fertilizer use within the traditional territory." Furthermore, the resolution states that GBH is carcinogenic and has a direct effect on wildlife, ecosystems, and water sources.[29]

Options: Biological control (i.e., when a living organism is used to reduce or eliminate the population of a problem species),"[30] can sometimes be used to inhibit unwanted vegetation. As an example, in Ontario, the defoliating moth (*Hypena*) is being tested as a biological control for dog-strangling vine, which is invading the province's ravines and watersheds.[31]

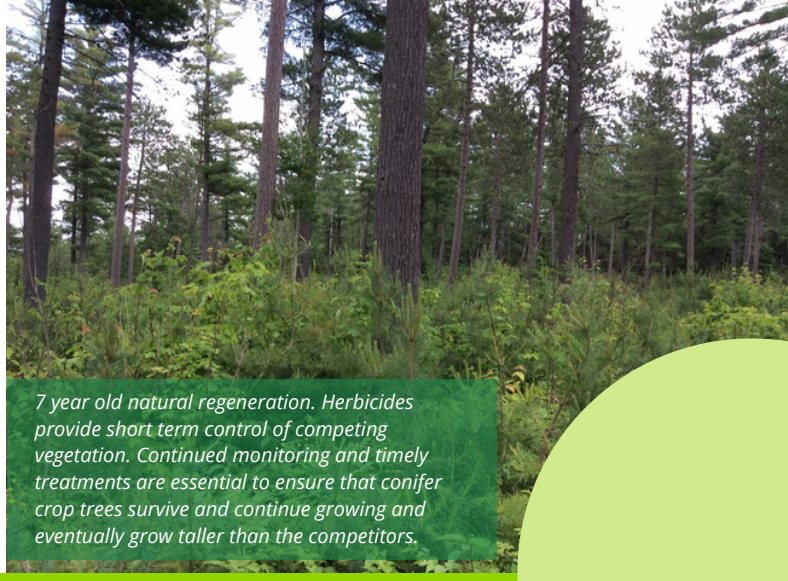
Targeted grazing is also another alternative to GBH usage. For instance, in the City of Calgary, goats are used to control weeds in parks. Through the goats grazing on targeted invasive species, the growth of native vegetation and biodiversity occurs, improving land management in an environmentally friendly manner.[32]



White pine uniform shelterwood, regeneration cut, natural regeneration site. Left: post-spray - effective control of competing vegetation, white pine regeneration is able to access adequate light levels to survive and grow. Right: 4 years after a chemical site preparation treatment using glyphosate.

To formulate land use agreements and address the concerns put forward by environmentalists and Indigenous communities, two-way education, communication, collaboration, and joint problem-solving amongst all stakeholders is critical.[33] Relationship building and pro-active communication can also address concerns and misinformation around GBH.

Through engagement with Indigenous communities, accommodations can be successfully implemented including: establishing no-spray areas, increasing buffer zones, setting aside untreated areas of land, and scheduling treatments around the activities of local communities.[34] As well, replacing aerial GBH application with manual treatments or backpack application is another suggested method to increase engagement with Indigenous communities, which would also create economic opportunities.



7 year old natural regeneration. Herbicides provide short term control of competing vegetation. Continued monitoring and timely treatments are essential to ensure that conifer crop trees survive and continue growing and eventually grow taller than the competitors.

Conclusions: Herbicides, most notably GBH, are used in the Canadian forest sector due to their affordability and effectiveness at reducing unwanted vegetation, including invasive species. However, there are increasing concerns and mounting opposition about its usage, as it relates to human health and the environment, as well as on plants used for food and medicinal purposes in Indigenous communities. The use of GBH ties into a number of Canadian forest policies on plantation management that may need re-assessment. There are many groups impacted by GBH and debate on its usage will continue to grow in prominence.

Footnotes

1. https://cfs.nrcan.gc.ca/publications?id=39511
2. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/fact-sheets-other-resources/glyphosate.html
3. https://www.carexcanada.ca/profile/glyphosate/
4. https://www.carexcanada.ca/profile/glyphosate/
5. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/fact-sheets-other-resources/request-special-review-glyphosate-herbicides-containing-polyethoxylated-tallowamine/frequently-asked-questions.html
6. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/glyphosate-rvd-2017-01.html#a4
7. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/glyphosate-rvd-2017-01.html
8. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/glyphosate-rvd-2017-01.html
9. https://cfs.nrcan.gc.ca/publications?id=38286
10. https://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/ForestsCrownLands/health-canada-statement-glyphosate-e.pdf
11. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/glyphosate-rvd-2017-01.html
12. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/glyphosate-rvd-2017-01.html
13. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
14. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
15. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
16. https://environmentaldefence.ca/2023/01/24/environmental-and-food-groups-take-health-canada-to-court-over-glyphosate-product-renewal/#:~:text=There%20are%20many%20emerging%20potential,Canada%20has%20not%20previously%20considered.
17. https://www.mdpi.com/1999-4907/8/6/208
18. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
19. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
20. https://novascotia.ca/news/release/?id=20220812002
21. https://www.cbc.ca/news/canada/nova-scotia/new-research-glyphosate-harmful-freshwater-ecosystems-1.6186992#:~:text=Glyphosate%20is%20used%20in%20the,in%20forests%20around%20the%20province.
22. https://novascotia.ca/news/release/?id=20220812002
23. https://www.iarc.who.int/featured-news/media-centre-iarc-news-glyphosate/#:~:text=In%20March%202015%2C%20IARC%20classified,of%20%E2%80%9Cpure%E2%80%9D%20glyphosate).
24. https://www.reuters.com/article/us-health-who-glyphosate-idUSKCN0Y71HR
25. https://www.epa.gov/ingredients-used-pesticide-products/glyphosate#:~:text=EPA%20scientists%20performed%20an%20independent,risks%20to%20children%20or%20adults.
26. https://www.epa.gov/ingredients-used-pesticide-products/glyphosate
27. https://www.canada.ca/en/health-canada/news/2019/01/statement-from-health-canada-on-glyphosate.html
28. https://ecojustice.ca/news/environmental-and-food-groups-take-health-canada-to-court-over-glyphosate-product-renewal/
29. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
30. https://www.invasivespeciescentre.ca/forest-invasives/response-and-control/
31. https://www.invasivespeciescentre.ca/about-us/investing/
32. https://www.calgary.ca/our-services/goats-targeted-grazing.html
33. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF
34. https://library.fpinnovations.ca/media/FOP/TR2019N21.PDF

References:

- Forest Professionals British Columbia. 2022. Does the Use of Glyphosate Herbicide Meet the Silvicultural Goals of Today? BC Forest Professional, Summer 2022: 16-18.
- FPInnovations. 2019. Review of glyphosate use in British Columbia forestry.
- Government of Canada. 2017. Re-evaluation Decision RVD2017-01, Glyphosate.
- Rolando, C.A.; Baillie, B.R.; Thompson, D.G.; Little, K.M. 2017. The risks associated with glyphosate-based herbicide use in planted forests. Forests 8(6): 208-233.

- Photo 1 (page 1) provided by: Mike Rosen, CIF-IFC Ottawa Valley Section
- Photos 2, 3, 4 (pages 2 & 3) provided by: Andree Morneault, CIF-IFC Algonquin Section