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HERBICIDE USE BY INDUSTRY IN BRITISH COLUMBIA: ISSUES AND PROSPECTS

The use of pesticides and herbicides has become an important public issue in Canada. In its August 2009 Throne Speech, the BC government promised to launch consultations "...on new statutory protections to further safeguard our environment from cosmetic chemical pesticides." As government moves ahead, it is important to recognize that regulatory frameworks already exist to protect human health and the environment in connection with the use of chemical substances. In BC, industry depends on the responsible use of pesticides and herbicides for operational and safety purposes. This issue of the Business Council's Environment and Energy Bulletin discusses industrial use of herbicides in the province. It is based on a commentary by **Gwen Shrimpton**, a board member of the Integrated Vegetation Management Association of BC.

For many industries in BC, safe and reliable operations depend on **Integrated Vegetation Management (IVM)**. An IVM program involves selecting and combining vegetation treatments to target specific plant species that pose a risk to safety or reliability, while minimizing impacts on the environment and the public. Implementing IVM is a common practice on utility rights-of-way, railways, roadways, oil and gas pipelines, forestry plantations, and at electrical and industrial facilities in BC.

IVM programs use a combination of physical and chemical techniques to provide effective control of unwanted weeds and plants. Herbicides¹ are rarely the only IVM method used, and generally are deployed in conjunction with other methods, including manual or mechanical removal, as well as biological methods (such as sheep grazing, specialized fungi-based compounds, or insect releases). For example, trees under power-lines are removed mechanically, and herbicides are applied to cut stumps to prevent re-growth. Herbicides generally are not used when other methods will do the job more effectively, or where herbicides may pose an environmental problem, such as near bodies of water, culturally sensitive areas, critical wildlife habitat, agricultural land, or residential areas.

¹ A herbicide is a substance used to kill and control unwanted plants. A pesticide is a substance or mix of substances used to kill a pest.



Agricultural versus Other Industrial Uses

In Canada, the vast majority of herbicides are used by the agricultural industry for crop protection. Agricultural use is mostly exempt from BC’s *Integrated Pest Management Act and Regulation*, and is not discussed further in this article. Herbicide use by industrial sectors for vegetation management purposes constitutes only 1.2% of all pesticide use in Canada.

Sector	% Pesticide Use (Canada)
Crop protection	95%
Industrial IVM (railways, utility rights-of-way, oil and gas pipelines, etc.)	1.2%
Forestry IVM	0.6%
Cosmetic (lawn care, golf course turf, etc.)	2%
Structural (wood structure protection from fungi and insects)	1.2%

Source: AgroSciences Canada

Rationales for Herbicide Use

In some industry sectors, effective control of vegetation with herbicides is necessary to ensure safety and operational reliability. IVM programs protect workers by preventing electrocutions, fires, visibility obstructions, and tripping hazards caused by vegetation. IVM ensures reliability of equipment and operations, including minimizing power outages on power-line rights-of-way and preventing train derailments on railway lines. It also provides visibility for inspection purposes and access for the maintenance of industrial operations. Finally, herbicides are often the most environmentally sound solution for controlling the spread of invasive and noxious weeds onto public or private land.

Vegetation management is also crucial for some sectors to maintain economic viability. For example, the forest industry relies on herbicides to reduce the time and costs of establishing crop trees, an activity required by provincial legislation. The herbicides used by industry are approved by Health Canada’s Pest Management Regulatory Agency (PMRA), and many contain the same active ingredients found in agricultural formulations. IVM uses selective herbicides that target only undesirable and competing vegetation, such as Canada thistle. These types of products allow desirable vegetation to flourish, such as grasses, forbs, legumes, and low-growing native shrubs. IVM products may also be non-selective to target all species of vegetation in cases where bare ground is the desired result.

The active ingredients of the most common industrial herbicides are of low or extremely low toxicity to people, fish, and wildlife (mammals). For example, two of the most commonly used herbicides—triclopyr (Garlon Ultra) and glyphosate (Roundup)—break down quickly in soil and have virtually no proven toxic effects on life. Glyphosate is registered for use in food crops and triclopyr is registered for use on ranges, pastures and sites where cattle have been grazed. These herbicides are not “known, probable, possible or reasonably anticipated to be carcinogenic” as determined by the US National Toxicology Program.



Herbicide applications use low rates of chemicals and are usually highly selective. Most applications on rights-of-way or industrial sites are completed with hand-held sprayers that target particular vegetation. Applications for railway ballast and rights-of-way use highly mechanized and computerized technology, which results in targeted, precise applications. Herbicides may also be injected into tree stems and brushed onto the cut surfaces of stumps to prevent re-growth. Current herbicide applications are more selective and focused than in past decades, and industry is continually researching new technologies and alternatives.

All herbicide use must abide by applicable federal and provincial Acts and their regulations, including BC's *Integrated Pest Management Act and Regulation*, and the federal *Pest Control Products Act*. It is illegal to treat pests with products not governed by this legislation or to use a herbicide in a manner inconsistent with its product label. Applications are carefully planned, using federally and provincially registered herbicides formulated for specific application methods. All registered herbicides undergo stringent evaluation and testing by the PMRA to minimize any risks to people and the environment. Herbicides are applied by Certified Pesticide Applicators, who are specially trained and qualified to use herbicides safely, following stringent legislative requirements.

By law, Pesticide-free Zones (PFZ) are set aside to protect environmentally-sensitive areas, such as bodies of water, watersheds, wells, water intakes, etc. A PFZ is a buffer strip (usually 10m) around an area of land that must not be treated with pesticides, and must be protected from pesticides moving onto it. Herbicide applicators in British Columbia do not apply herbicides within PFZs.

An integrated vegetation management program achieves greater success by utilizing the appropriate treatments (both herbicide and non-herbicide methods) to address each aspect of a vegetation problem. It is more cost-effective and less intrusive than a program using mechanical methods alone. A 2006 survey by CN Utility Consulting found that mowing transmission line corridors costs an average of \$400 (US) per acre, while herbicide application costs an average of \$224. This can be reduced even further to \$100-\$150 in a well-developed IVM program (CNUC, 2009). One study (Johnstone, 2008) found a cost savings of \$7.5 million from using selective herbicides instead of continuous mowing for 25 years over 1000 miles of transmission corridors. This is mainly because mechanical treatments like mowing must be repeated each year, at the same or higher cost. In contrast, herbicides need only be applied once, with occasional touch-ups, eliminating the need for further mechanical treatments. Similar cost savings are realized in other sectors besides transmission utilities.

Limitations of Other Methods

The use of non-chemical control methods alone has proven to be ineffective for the long-term management of many weed and brush species. This is especially true in BC, where industry is primarily resource-based and spread over large, inaccessible, geographic areas. Without the complementary use of herbicides, continuous mechanical cutting results in



increased stem density and decreased control and effectiveness over time. Mechanical treatments like mowing and slashing reduce the size of vegetation, but vegetation quickly re-sprouts to reach an even higher density than pre-treatment levels. Follow-up use of herbicides prevents re-sprouting and extends the duration of vegetation control. Moreover, continuous mowing on a right-of-way increases the root mass from cut stumps and root stocks, creating physical hazards for wildlife, people, and equipment, and impedes service vehicle access. It also leaves roots to re-grow vigorously each spring.

Control of noxious weeds is mandated by the BC *Weed Control Act*, including along highway rights-of-way, railway beds, gas lines, and transmission lines. Noxious weeds can potentially displace native vegetation and reduce wildlife habitat and forage. However, physical methods cannot control noxious weeds, and herbicides are the most economic and environmentally sound solution. For example, mowing stimulates the production of species such as orange hawkweed, thereby increasing the weed population. Also, mechanical techniques can spread noxious weed seeds to other locations.

Operations along pipelines and other rights-of-way generally require adequate access by both air and ground. Mechanical methods alone are not practical as a higher number of interventions would be required to maintain vegetation at levels necessary for safety and ease of access. This would increase the costs of IVM and disturb wildlife and the environment due to repeated entries for mechanical treatment.

Industry-Specific Considerations

A number of industries in BC use herbicides to control vegetation, and each industry has specific requirements that necessitate the use of herbicides.

Forestry

Weed abatement is an essential element of forest management and renewal, and society benefits from healthy vigorous trees that reduce greenhouse gases. Herbicides are the most cost-effective vegetation management tool under various conditions, and often represent the only practical way to meet reforestation obligations. The forest sector is currently experiencing significant financial hardship, but it is legally obligated to reach tree-growing status for logged areas. Loss of herbicides would impose major financial and practical burdens on the forest industry.

Using only non-herbicide methods on forestry stands results in various negative impacts. In general, manual vegetation management is impractical and expensive. A limited work force is available to conduct manual vegetation management, which also prolongs treatments, delays the fulfillment of legislative requirements, increasing the risk of administrative penalties to companies. When undesirable vegetation is poorly controlled, it can limit the growth of crop trees, lead to tree loss, and have other negative impacts on the allowable annual cut (AAC), such as increasing the need to fill-plant (which increases costs).



Despite the often large size of forested areas, an individual site may only be treated with herbicides once or twice over a 30-60 year rotation, except for Christmas tree production (Monaco, 2002). (Rotations in the north are even longer, from 80-100 years.) This makes herbicides a very cost-effective technique.

Railways

Transport Canada's *Railway Safety Act* as well as provincial regulations require all railways to manage vegetation so that it does not become a fire hazard (because trains produce sparks), obstruct visibility of railway signs and signals, interfere with track side duties performed by railway employees, prevent proper functioning of signal and communication lines, or prevent railway employees from visually inspecting moving equipment. Without vegetation management using herbicides, excessive weed growth within railway tracks would affect track geometry, causing track instability and potentially leading to derailment. Poorly controlled vegetation also lessens the effectiveness of safety inspections and impedes drainage. In addition, leaf litter and debris on track rails creates slippery conditions for acceleration and braking (Island Corridor Foundation, nd).

Herbicides are essential in railway vegetation management programs for compliance with safety regulations. It is not possible to ensure safety and reliability using non-chemical control methods alone. For weed control in the ballast section—the rock underlying the track structure—there is no proven alternative to targeted herbicide applications.

Electrical Facilities

Facilities such as BC Hydro's substations have an engineering requirement to be maintained in a totally weed-free condition to protect the safety of workers at the site. Weeds at electrical facilities must be controlled because a surface of clean, crushed rock (similar to gravel) is laid over the electrical ground grid to provide an insulating layer between the grid and the surface of the ground. Crushed rock has features that contribute to electrical and engineering safety - including a high level of electrical resistivity, which means it does not conduct electricity, thereby reducing the risk of electrocution over the ground grid. If weeds become established in the crushed rock, its function as an insulating layer is reduced. Weeds in crushed rock interfere with the ground grid, seriously compromising the safety functions of the grid and posing an electrical hazard to workers.

Weeds must also be controlled at electrical facilities because they can:

- become a fire hazard or contribute to fires as a fuel source
- lead to power outages by interfering with electrical components
- cover or hide fences, increasing the risk of unauthorized entry and theft
- lead to corrosion of steel equipment
- increase risk of tripping and slipping
- interfere with equipment access and safety inspections



- serve as food and shelter for rodents, ants, termites, and other pests
- degrade appearance of sites.

Over the years, numerous non-herbicide techniques have been deployed, but herbicides remain the only effective means of safely maintaining these sites.

Transmission Rights-of-Way

Safe, uninterrupted electrical service is a requirement for transmission rights-of-way, so tall-growing trees must be removed from transmission corridors. An IVM program that combines physical techniques with selective follow-up use of herbicides is often the only feasible way to establish a stable, low-growing, biologically-diverse plant community—the primary objective for transmission rights-of-way. Once this site conversion is complete, it requires minimal maintenance, which reduces disruption to the natural environment over the long term, and helps reduce herbicide use over time.

Reliance solely on non-herbicide methods leads to the build-up of slash on rights-of-way, which increases the “fuel load”, or risk of fire. In addition, mowing and slashing destroy bird nests, while herbicide applications do not.

The use of herbicides significantly reduces the costs of BC Transmission Corporation’s vegetation management program, which are borne by ratepayers (all BC citizens). A BCTC study showed that over a 10-year period, using only slashing to control vegetation would cost almost twice as much as combining slashing with herbicides. Slashing results in intensive re-sprouting, while the use of herbicides decreases stem density by 50%. This means that vegetation management cycles can be extended with herbicide use, resulting in significant savings in labour resources over time (BCTC, 2005).

Oil & Gas Pipelines

The federal *Onshore Pipeline Regulation* and the Canadian Standards Association require that vegetation around pipeline rights-of-way be adequately controlled to allow for clear visibility of the ground from the air and ready access for maintenance. The objective is to protect the public and the environment, as the presence of vegetation interferes with the safe and reliable operation and maintenance of pipelines.

Ensuring the safety and integrity of energy infrastructure requires companies to follow rigorous maintenance programs, based on regular inspections and technological modifications. Workers use helicopters and carry out foot patrols to visually inspect the pipeline route or right-of-way corridors. The inspections look for evidence of defects that could cause a failure and activity that could possibly damage pipelines. For example, Spectra Energy maintains over 6,200 km of pipeline within BC, often in remote or inaccessible areas, and conducts aerial inspections as frequently as weekly in many areas.



Where undesirable vegetation is present, herbicides are often used. Herbicide use is necessary to achieve effective vegetation management, because it allows access to the right-of-way and it increases visibility of pipelines, adjacent areas, and access roads. It also maximizes visibility over longer periods of time. With IVM, chemical treatment in the year following initial mechanical cutting will reduce trees around the pipeline right-of-way by 90%-100%. Subsequent treatments for undesirable woody vegetation can then be limited to spot treatments or infrequent mechanical and chemical treatments. This reduces costs and minimizes physical disturbance to the area that would otherwise occur with annual mechanical maintenance. Delivery of herbicides by various means is an important option for IVM on pipelines in remote areas. Aerial delivery requires a separate Pesticide Use Permit and is considered by public regulators on a case-by-case basis.

Oil & Gas Production and Processing Facilities

Areas around oil/gas well sites and within adjacent industrial facilities must be kept bare of vegetation to prevent fires and provide a buffer to reduce damage or catastrophes in the event of wild fires. A vegetation-free work area is required around production and processing equipment to reduce tripping hazards for workers. Visibility of processing and production equipment and components is impeded by vegetation growth. Use of pesticides may also be important for rodent control and to improve aesthetics (Monaco, 2002).

Herbicide applications are less invasive than mechanical interventions, last longer, and are more effective in achieving these operational objectives. It is extremely difficult to manage weeds and grasses using physical means in gravelled areas.

Highways and Roadways

Highway and roadway vegetation control is necessary for public safety and increased visibility, especially for line-of-sight at intersections. Browse-type vegetation left to grow on rights-of-way attracts animals to roadway areas, creating a traffic hazard. Improved road maintenance and aesthetics are also important factors. Total vegetation control is especially critical around guard rails and barriers, and often road shoulders. Highways may be treated with selective herbicides to control broadleaf weeds and woody plants.

Environmental Benefits of Herbicides

Finally, it should be emphasized that there are a number of environmental benefits from using herbicides in the industry sectors mentioned above:

- The success of crop trees is enhanced via selective herbicide use, and crop trees produce more oxygen and sequester more carbon compared to early brush complexes.
- Manual or mechanical treatments require multiple entries into an area, which disturb the environment and wildlife.
- Mechanical techniques often use heavy machinery that is more likely to damage or remove non-target vegetation.



- Mowing and other mechanical methods can destroy ground nests and habitat for burrowing animals. Mowing can lead to soil erosion, which negatively impacts fish-bearing bodies of water.
- Mechanical techniques can spread noxious weed seeds to other locations.
- Mechanized equipment can cause rutting, track marks, or degradation of the ground surface.
- Mechanical equipment has an inherent carbon footprint from fuel consumption and emissions.
- Studies indicate that herbicide-managed sites often have a greater volume of wildlife forage compared to mowed sites.
- Herbicide use reduces fire hazards and aesthetic concerns caused by slash build-up.
- Herbicides are needed to effectively control noxious and invasive weeds, most of which are introduced weeds that crowd out desirable species and wildlife forage.

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