COALITION FOR ALTERNATIVES TO PESTICIDES NEWFOUNDLAND AND LABRADOR (CAP-NL)

POSITION PAPER

ON

PESTICIDES AND OTHER TOXIC SUBSTANCES

JUNE 2014

TABLE OF CONTENTS

About CAP-NL

The Coalition for Alternatives to Pesticides – Newfoundland and Labrador (CAP-NL) is a provincial alliance of professionals, organizations and citizens who are seriously concerned about the adverse effects of cosmetic pesticide use and toxic substances of concern that threaten the health of children, adults, animals and the environment.

CAP-NL formed in 2010 to defend the basic rights of the people of this province to good health and a safe environment by actively campaigning for the replacement of unnecessary cosmetic pesticides with ecologically sound alternatives. Measures must be taken to reduce additional exposure from the unnecessary use of cosmetic pesticides. Less toxic alternatives are available in which to create beautiful gardens and control pests. CAP-NL also advocates restricting or eliminating the use of other toxic substances (see page 15 this document).

Mission

The elimination of the cosmetic use of pesticides through a provincial pesticide ban enacted and enforced by legislation; a ban similar in restriction and enforcement to that of Ontario's ***2008*** C***osmetic Pesticide Ban Act*** and the ***Nova Scotia Non-Essential Pesticide Control Act*** but expanded to include toxic substances of concern and a classification system in which to assess them in a transparent manner.

Focus

- A provincial ban on cosmetic pesticide use like bans enacted in Ontario and Nova Scotia.
- A provincial ban to include green spaces particularly sports and recreation areas, golf courses.
- Restrictions on the use of other toxic substances used for purposes other than cosmetic.
- The power of Municipalities to enact pesticide bylaws, when provincial legislation is of lower standard in both law and enforcement.
- A provincial public awareness program that lays out the (well-documented) adverse effects of cosmetic pesticide use and toxic substances of concern, the steps people can take to avoid exposure and the existence of less harmful alternatives and what they are.
- Strong leadership from our Premier, the Department of Environment and Conservation, and the Department of Health and Community Services to address this critical issue in an effective and expeditious manner.

This document is a revised, updated version of the position paper produced by CAP-NL in 2012. The present document was prepared by Janice Flynn, M.Sc. (biology). Information related to the *Introduction* and *Cosmetic Pesticide Bans in Canada* was compiled in part from the 2012 position paper. Paragraphs relating to specific classes of toxic substances under *Other Toxic Substances of Concern* were written by Frank R. Smith, B.Sc., Ph.D. (London), FCIC, MRSC and Cora J. Young, B.Sc.(Hon.) Chemistry, Ph.D. (Toronto). The document was also edited in full by Frank Smith and Cora Young for content and by Janice Flynn for presentation and grammar. CAP-NL thanks its members for all contributions made in the production and distribution of this document. For readers accessing this document in paper format, references listed as footnotes and image sources may be accessed on-line at http://pesticidealternativesnl.wordpress.com/.

LIST OF TABLES AND APPENDICES

Page

INTRODUCTION[1]

Cosmetic Pesticides

The Business Dictionary[2] defines the term pesticide as: "chemical or biological substance designed to kill or retard the growth of pests that damage or interfere with the growth of crops, shrubs, trees, timber and other vegetation desired by humans". Pesticide is a broad term under which there are three general types: *herbicides*, which destroy vegetation; *insecticides*, which destroy insects; and *fungicides*, which prevent the growth of mold and mildew[3]. Pesticides can kill life forms (including endangered species) that are harmless or useful because most are non-specific[4]. Cosmetic pesticides are non-essential chemical substances used to improve the aesthetic value of green spaces[5]. Most chemical pesticides (including those used for cosmetic purposes) are poisons that have the ability to persist in nature and body tissue, a cumulative feature making them dangerous in the long-term to humans and the environment[6, 7].

Pesticide-Related Health Problems

In 2004, the Ontario College of Family Physicians conducted the most comprehensive literature review of pesticides and human health ever carried out in Canada (Appendix A). Studies showed pesticides are associated with prostate cancer, brain cancer, kidney cancer, pancreatic cancer, non-Hodgkin's lymphoma, ovarian cancer and leukemia[8, 9]. Children exposed to herbicides and insecticides used on lawns, fruit trees and gardens have a greater risk of leukemia[10]. Pesticide exposure is also associated with birth defects, fetal mortality and neurological disorders such as Parkinson's disease[11, 12]. Inuit women have higher levels of pesticide in their breast milk than women in southern Canada[13]. Childhood exposure to cosmetic pesticides has been linked to changes in the brain structure of children; autism, asthma, reduced intelligence and Attention Deficit Disorder[14].

Pesticide-Related Environmental Problems

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[1] Source of toxic hazard image
[2] Business Dictionary
[3] National Institute of Environmental Health Sciences
[4] Business Dictionary
[5] NL Public Health Association, Position Paper, June 2011 (Appendix A)
[6] Business Dictionary
[7] NL Public Health Association, Position Paper, June 2011 (Appendix A)
[8] NL Public Health Association, Position Paper, June 2011 (Appendix A)
[9] Environmental Law Center, University of Victoria, Submission on Restricting Cosmetic Pesticide Use in British Columbia, February 2010
[10] NL Public Health Association, Position Paper, June 2011 (Appendix A)
[11] Environmental Law Center, University of Victoria, Submission on Restricting Cosmetic Pesticide Use in British Columbia, February 2010
[12] NL Public Health Association, Position Paper, June 2011 (Appendix A)
[13] Canadian Association of Physicians for the Environment
[14] Ibid.

Pesticides are found in pristine ecosystems far from point sources of application[15]. Water, wind and prey animals are universal vectors for pesticide dispersal and have contaminated polar bear fat, and whale blubber in all oceans of the world. Pesticides not only affect target and non-target species (including species at risk) but harm human food supplies and sources of medical compounds. In Salmon, changes in their reproductive and sexual characteristics, immune system and survival behaviours have been linked to pesticides[16]. In the last few years, concentrations of pesticides in the honeycomb of bee hives have led to a decrease in bee populations by one third. This impacts human food production, as one third of our food supplies depend on pollination by bees[17].

Jumping Salmon

NL shares in an estimated $255 million in salmon-related activities in eastern Canada (Atlantic Salmon Federation 2011)

COSMETIC PESTICIDE BANS IN CANADA

Eighty percent of Canadians now enjoy the health and environmental benefits derived from the protection of municipal and provincial pesticide legislation. To date, over 170 municipalities across Canada and 6 provinces have enacted bans. Quebec was the first province, in 2003, to introduce a ban on lawn pesticides. Ontario's Cosmetic Pesticide Ban Act that prohibits the sale and use of cosmetic pesticides came into force in 2009. New Brunswick, Prince Edward Island, and Nova Scotia enacted pesticide bans in 2010[18]. The Newfoundland and Labrador ban on the sale and use of cosmetic pesticides came into effect in 2011[19].

Ontario and Nova Scotia Pesticide Bans

Ontario and Nova Scotia have the most comprehensive cosmetic pesticide bans in Canada[20]. This is due to easy access to a credible list (i.e. white list) of less harmful products (Appendix B), its application to all aspects of landscapes, and a large number of pesticides covered by the ban[21] (Appendix C). The Newfoundland and Labrador Cosmetic Pesticide Ban falls significantly short by comparison in a number of key areas (Table 1). In addition to an insufficient number of banned pesticides, the province of Newfoundland and Labrador has no credible list of less harmful alternatives, limited land coverage, no mechanism for classifying new pesticides, no public awareness program and an inadequate number of enforcement officers.

Table 1. A Comparison of key characteristics of cosmetic pesticide bans in Ontario, Nova Scotia, Newfoundland and Labrador

[15] Canadian Association of Physicians for the Environment
[16] Ibid
[17] Environmental Law Center, University of Victoria, Submission on Restricting Cosmetic Pesticide Use in British Columbia, February 2010
[18] Ibid.
[19] News Release - Government of NL
[20] David Suzuki Foundation
[21] Ibid.

ITEM	ONTARIO	NOVA SCOTIA	NEWFOUNDLAND LABRADOR
Number of Pesticides Banned	30; 96 (active)	All but the White List	5
White List	Yes	Yes	No
Lawns, Shrubs, Plants	Yes	Yes	Lawns only
Classifying System (new pesticides)	Yes	Yes	No
Municipal by-law power*	No	Halifax	No
Education	24-7 hotline	Limited	No
Enforcement	Defined(a)	Defined(b)	Inadequate(c)

*This option is available in NB, PEI, QC, AB
(a) Ontario 250 (1,076,395 km^2, population 12,851,821); per inspector: land mass 4,306 km^2, population 51,407
(b) Nova Scotia 75 (55,283 km^2, population 921,727); per inspector: land mass 737 km^2, population 1,2290
(c) Newfoundland 3 (405,212 km^2, population 514,536); per inspector: land mass 135,071 km^2, population 171,512

Key Differences in Cosmetic Pesticide Bans

Ontario has banned 32, Class-8 pesticide products[22]. The ban also restricts the use of 115 active ingredients on public and private lawns and gardens; as well as banning the sale of 172 products containing these chemicals[23]. Another 103 "mixed use" products are subject to retail restrictions[24]. Nova Scotia has a simple and easy-to-understand method for banning pesticides which is based on their white list of credible alternatives[25]. All pesticides not found on the white list have been banned from use or sale in Nova Scotia[26]. In this province, 5 active ingredients have been banned for use as a cosmetic pesticide.
The cosmetic pesticide ban in Newfoundland and Labrador is restricted to lawns[27]. In Ontario, the ban extends beyond lawns to include vegetable and ornamental gardens, patios, driveways, cemeteries, parks and school yards. Because of the existence of low-risk bio-pesticides, the ban is without exception[28]. The ban in Nova Scotia, while less extensive in coverage, does prohibit the use of high risk pesticides on landscaped areas with trees and shrubs, in addition to lawns[29].

[22] Ontario List of Banned Pesticide Products
[23] Ontario List of Banned Pesticides
[24] David Suzuki Foundation
[25] Nova Scotia Non-Essential Pesticides Control Act
[26] Nova Scotia White List of Pesticide Alternatives
[27] NL Pesticides Control Regulations, 2012
[28] Ontario Pesticides Act
[29] Nova Scotia Non-Essential Pesticides Control Act

In Newfoundland and Labrador, there is no pesticide classification system in which to evaluate existing or new pesticides for restriction under the pesticide ban or alternatively as a white-list item. In Ontario, the province maintains guidelines for classifying pesticides under the Cosmetic Pesticides Ban Act. Those substances meeting proposed low-risk criteria and those identified as reduced-risk bio-pesticides are allowed for cosmetic use; otherwise new pesticides are added to the list of banned active ingredients[30]. In Nova Scotia, the minister can update their white list with advance public notice; and municipalities retain the power to further restrict pesticide use[31].

Successful pesticide bans are supported by public awareness programs. Pesticide bans supported by education were more successful in reducing the use of pesticides by a high degree (51-90%)[32]. Enforcement by a sufficient number of inspectors is key to upholding and maintaining a good pesticide ban. Nova Scotia leads the way with clearly defined enforcement: "*An inspector, in carrying out duties pursuant to this Act, has and may exercise in any part of the Province all the powers, authorities and immunities of a peace officer as defined in the Criminal Code (Canada)*[33]. Enforcement in this province is, by comparison, inadequate. The province has yet to develop a public awareness program regarding the health hazards related to toxic substances, particularly cosmetic pesticides.

NL Cosmetic Pesticide Ban

Since 2004, CAP-NL has been lobbying for changes to the Newfoundland and Labrador pesticide legislation that would protect the people of this province from the unnecessary health risk associated with non-essential cosmetic pesticide use. On July 14, 2011 the Department of Environment and Conservation announced "a ban on the sale and use of pesticides for cosmetic lawn care purposes throughout the province" and that "the following pesticides will no longer be permitted for application on lawns" [34]:

- Carbaryl
- 2,4-D (2,4-dichlorophenoxyacetic acid)
- Mecoprop
- Dicamba
- MCPA (2-methyl-4-chlorophenoxyacetic acid)

This is a step in the right direction. Restricting cosmetic pesticide use in this province is essential to the health of the people that live here. However, restricting only five ingredients falls significantly short of the 115 ingredients banned in Ontario, leaving the citizens of Newfoundland and Labrador by comparison vulnerable to 110 remaining toxic substances (Appendix B[35]).

Additional Restrictions

CAP-NL seeks legislation that will extend the provincial pesticide ban to include the remaining 110 pesticide ingredients banned for cosmetic use in Ontario, and to extend coverage beyond

[30] Ontario Pesticides Act
[31] Nova Scotia Non-Essential Pesticides Control Act
[32] Best Practices for Pesticide Reduction
[33] Nova Scotia Non-Essential Pesticides Control Act
[34] News Release - Government of NL
[35] From the list of pesticides banned for cosmetic use in Ontario: 1. 2, 4-D (2, 4-dichlorophenoxyacetic acid), 18. carbaryl, 35. Dicamba, 71-72. MCPA, 73-75. Mecoprop

lawns to include sports fields, recreational areas, golf courses, roadsides, railway sidings, under power lines and corridors, motor way verges and other unused open land.

In the short-term, there are 13 pesticide ingredients identified as a priority for immediate action[36]; seven of them are already banned in Ontario, for cosmetic use (Appendix B[37]).


Apple Blossom Pollinated by a Honey Bee

INSECTICIDE **Acetamiprid** (neonicotinoid)

INSECTICIDE **Clothianidin** (neonicotinoid)

INSECTICIDE **Imidacloprid** (neonicotinoid)

INSECTICIDE **Nitenpyram*** (neonicotinoid)

INSECTICIDE **Nithiazine*** (neonicotinoid)

INSECTICIDE **Thiacloprid*** (neonicotinoid)

INSECTICIDE **Thiamethoxam** (neonicotinoid)

INSECTICIDE **Parathion*** (diethyl p-nitrophenyl phosphorothionate)

INSECTICIDE **Malathion** (O,O-dimethyl S-1,2-di[ethoxycarbonyl] ethyl phosphorodithionate)

INSECTICIDE **Diazinon** (diethyl 2-isopropyl-4-methylpyrimid-6-yl phosphorothionate)

HERBICIDE **Glyphosate** N-phosphonomethylglycine

HERBICIDE **Picloram*** (2-carboxy-4-amino-3,5,6-trichloropyridine (syn 4-amino-3,5,6 trichloropicolinic acid) triispropoanolamine salt)

HERBICIDE **Tordon 101 Mixture (includes Picloram*)**

*not found on the list of pesticides banned for cosmetic use in Ontario

Insecticides

Among the chemicals listed above for restriction, seven are **neonicotinoids**. These are known to persist in plant tissue and because they are found in flower nectar and pollen, they have been implicated in beehive colony collapse[38, 39]. Colony collapse disorder (CCD) refers to the sudden loss of adult bees from the hive[40]. A 2012 study conducted in Europe showed that even with very low levels of pesticide in the bee's diet, more than one third of bees suffered from orientation disorder and were unable to return to the hive[41]. The chemicals interfere with bee nervous systems and prevent them from flying, navigating and feeding properly[42]. The European

[36] Frank R. Smith, B.Sc., Ph.D.(London) FCIC, MRSC, retired professor of chemistry, Memorial University, St. John's, NL (Personal Communication)
[37] From the list of pesticides banned for cosmetic use in Ontario: 7. Acetamiprid (neonicotinoid), 27. Clothianidin (neonicotinoid), 34 Diazinon, 61-62. Glyphosate, 65. Imidacloprid (neonicotinoid), 69. Malathion, 106. Thiamethoxam (neonicotinoid)
[38] 30 Million Bees Dead in Elmwood, Canada
[39] Bumble Bee Poisoning in Oregon
[40] Colony Collapse Disorder
[41] Ibid.
[42] The Star

Union has now restricted the use of three **neonicotinoids**: **thiamethoxam**, **clothianidin**, and **imidacloprid**[43].

In 2012, 37 million bees were found dead in Elmwood, Ontario. Representatives from the Ministry of Environment (MOE), Pest Management Regulatory Agency (PMRA), the Ministry of Agriculture and Food (OMAF) and the Ministry of Rural Affairs (MRA) investigated affected bee hives and collected bee samples for residue analysis[44]. Eighty-percent of the dead bees sampled contained **neonicotinoids**[45]**.** PMRA's initial lab results indicate that "pesticides used on treated corn seeds may have contributed to at least some of the 2012 spring bee losses that occurred in Ontario, however, there is still additional information being collected"[46]. A similar study conducted on the death of millions of pollinators in Europe showed bees exhibited neurotoxic symptoms and traces of **thiamethoxam** and **clothianidin** (neonicotinoids) were found in dead bees[47]. The source was traced to **neonicotinoid** treatments and air seeders used to coat corn seed. Pesticide dust is blown into the air and onto nearby flowers, when planting corn seeds[48].

Honey Bee on Dandelion

Cornell University estimated that "honeybees pollinate $14 billion worth of seeds and crops in the U.S[49]. If honeybees disappear, they could take most of our insect-pollinated plants with them"[50]. Despite the overwhelming evidence linking **neoincotinoids** to beehive colony collapse, the insecticide has a current market share of 40% and in 2011, grossed almost 3 billion in sales[51]. In addition, PMRA has said actions recommended in their March 2013 InfoSheet[52] is not guaranteed to prevent bee kills, and transferred the onus of responsibility onto the growers; as they are the persons applying pesticide when planting treated seed. A new report released to CBC news in June 2014 has scientist calling for a world-wide ban on **neonicotinoids**, which they say pose an environmental threat similar to that of DDT during the 1960s[53]. **Neonicotinoids** are also known to affect memory, learning and motor problems in developing children[54].

The remaining three insecticides - **parathion**, **malathion** and **diazinon**.- are from the organophosphate family and are from the same chemical class as the nerve gases developed in World War II[55]. The extremely toxic characteristic of these ingredients allows it to bind irreversibly to an essential nervous system enzyme which interrupts normal nerve impulse transmission in humans[56]. Of the three insecticides, **Parathion** is the most toxic[57]. One

[43] Colony Collapse Disorder
[44] Taking Steps Toward Reducing Risks to Pollinators
[45] The Cord
[46] Ibid.
[47] 30 Million Bees Dead in Elmwood, Canada
[48] Bumble Bee Poisoning in Oregon
[49] Bee Benefit to Agriculture
[50] The Importance of Bees
[51] World-Wide Ban on Neonicotinoids
[52] Taking Steps Toward Reducing Risks to Pollinators
[53] World-Wide Ban on Neonicotinoids
[54] The Star
[55] G.S. Hartley and T.F. West. 1969. Chemicals for Pest Control. Pergamon Press, New York (page 65).
[56] Ibid.

teaspoon per 150 pound person is lethal. It is easily and quickly absorbed through the skin and remains on the surface of plants, fruit, clothing and mechanical equipment for days[58]. **Parathion** is used to control a wide variety of insects and mites in agriculture, forestry and aquaculture. Application methods are restricted to certified applicators, because of its high toxicity[59]. **Parathion** is also extremely toxic to fish, aquatic invertebrates (such as scallops), birds, bees and mammals; although the sensitivity in birds such as songbirds, waterfowl and raptors is more acute than in mammals[60].

Like **parathion**, **malathion** is a nerve poison[61]. It is widely used in forestry, agriculture and indoor environments like schools, hospitals, food processing plants and dog kennels[62]. A study conducted by the American Medical Association showed "pesticide exposure at schools produce acute illnesses among school employees and students"[63]. **Malathion** is also easily absorbed through the skin, by ingestion and inhalation and becomes increasingly toxic as it breaks down within an organism.[64] A 5 ounce dose is fatal to a chemically-sensitive human weighing about 155 pounds[65]. **Malathion** is mutagenic, carcinogenic and has been implicated in vision loss. It causes kidney damage, lung damage, is known to cause DNA abnormalities and has been linked to leukemia[66]. It kills non-target species and is extremely toxic to bees[67]. It is also extremely toxic to birds and aquatic invertebrates[68].

Diazinon is another nerve poison that is widely used on lawns and in gardens[69]. It is a mutagen that is easily absorbed through the skin. Long-term exposure may damage the fetus or cause birth defects, nerve and/or liver damage. **Diazinon** is extremely toxic to bees and grazing waterfowl such as ducks and geese are particularly susceptible to poisoning from **diazinon**[70]**.** **Diazinon** has been linked to the deaths of 700 Atlantic brant and 85 American widgeon due to the application of this pesticide on golf courses in New York State[71]. The EPA stated past efforts to mitigate risks to birds from **diazinon** poisoning, "are not adequate to prevent mortality"[72]. **Diazinon** is the most commonly found insecticide in surface water in the US, and according the US Geological Survey, **diazinon** is able to concentrate in fog droplets[73]. In addition, cattle can store **diazinon** in their fat cells for more than two weeks and trace amounts were found in their milk 24 hours after skin contact[74].

Diazinon is a common ingredient in flea collars and studies on both cats and dogs showed a disruption in the nervous system for the length of time the collar was

[57] Chemical Fact Sheet-Parathion
[58] Ibid.
[59] Chemical Fact Sheet-Parathion
[60] Ibid.
[61] Chemical Fact Sheet - Malathion(1)
[62] Ibid.
[63] Acute Illness in Schools Linked to Pesticide Use
[64] Chemical Fact Sheet - Malathion(2)
[65] Sierra Club Canada - Malathion
[66] Sierra Club Canada - Malathion
[67] Ibid.
[68] Beyond Pesticides - Malathion
[69] Chemical Fact Sheet - Diazinon
[70] Ibid.
[71] Chemical Fact Sheet - Diazinon
[72] Sierra Club Canada - Diazinon
[73] Chemical Fact Sheet - Diazinon
[74] Ibid.

worn[75]. Earthworms are extremely sensitive to **diazinon** and when applied on turfs and laws**,** can kill more than 60% of the population. In 2000, PMRA phased out all indoor and non-agricultural uses of **diazinon.** However, wildlife species are still at risk because restrictions do not apply to agricultural use[76].

Male American Widgeon

Herbicides[77]

Recent studies have demonstrated the true toxicity of **Glyphosate,** which is the primary ingredient in Monsanto's herbicide Roundup[78]. Scientists say overuse of the Roundup Ready line of engineered seeds has produced "weed immunity such that these weeds now infest an area equal to the state of Michigan"[79.] A study published in the Journal Ecotoxicology showed that even though regulators promote glyphosate as nontoxic to aquatic invertebrates, glyphosate was found to be toxic to water fleas in dose levels expected to occur in the environment. This is alarming given water fleas are the indicator for toxicity in the environment[80.] Another study published in the Journal Archives of Toxicity in 2012 showed Roundup is toxic to human DNA "even when diluted to concentrations 450-fold lower than concentrations used in agricultural applications"[81]. The toxicity levels of glyphosate are significantly magnified by polyoxyethyleneamine, a surfactant compound within Roundup that dramatically enhances the absorption of glyphosate into human cells and tissue[82]. A supporting study showed residual levels found on roundup-treated crops, lawns and gardens damage cells and cause cell death. Researchers also suspect that "Roundup might cause pregnancy problems by interfering with hormone production, possibly leading to abnormal fetal development, low birth weights or miscarriages"[83]. Genetically modified corn contains 13 ppm (parts-per-million) of glyphosate. Organ damage from glyphosate occurs at 0.1 ppm in animals. Given that Americans consume 193 pounds of genetically engineered foods annually, the implications are staggering[84].

Picloram is a persistent herbicide used largely on rights-of-way to control broad-leaf weeds and woody plants[85]. This chemical is very effective in killing trees when applied to the bark at the base of the tree particularly when the heartwood has been exposed[86]. The pesticide has been linked to a number of human poisonings particularly in combination with other pesticides such as 2, 4-D (Tordon 101). The EPA has designated the chemical a "restricted use" pesticide because it can lead to extensive groundwater contamination, as **Picloram** does not adhere to soil particles[87]. Furthermore evidence suggests that Picloram may be contaminated by

[75] Sierra Club Canada - Diazinon
[76] Ibid.
[77] Source of Roundup image
[78] Glyphosate Toxicity
[79] Union of Concerned Scientists
[80] Glyphosate Toxicity
[81] Ibid.
[82] Glyphosate Toxicity.
[83] Ibid.
[84] Glyphosate Toxicity
[85] Chemical Fact Sheet - Picloram
[86] G.S. Hartley and T.F. West. 1969. Chemicals for Pest Control. Pergamon Press, New York
[87] Ibid.

hexachlorobenzene, a known carcinogen[88]. Tordon 101 originated as a defoliant, Agent White in Vietnam, consisting of 4 parts 2,4-D and one part Picloram. Only 1 ppm in water was sufficient to permanently damage plants[89]. **Picloram** can contaminate surface and subsurface water within 100 m of transmission-line rights-of-way after aerial and ground applications. This is because **Picloram** can enter the atmosphere through spray drift during application. **Picloram** in spray drift can also damage non target plants[90].

Tordon 101 (Mixture) is used to kill brush and small plants by hydroelectric companies, and by government to clear roadsides and rights-of-way. It consists of two herbicides: 2, 4-D and Picloram. 2, 4-D is already on the list of restricted pesticides in NL, but not restricted for the uses mentioned[91]. Due to the characteristics of the ingredients found in **Tordon 101**, its use should be restricted as it can to lead to the contamination of local water supplies by **picloram**[92]. **Tordon 101** is promoted as a seemingly harmless, cost effective product. However, it is banned for sale, distribution and use in Nassau and Suffolk Counties in New York State because the pesticide is toxic to some plant species at very low concentrations[93]. Non-target plants are adversely affected if the pesticide is allowed to drift from areas of application. The product should not be applied directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas[94]. **Picloram** in combination with **2, 4-D** (a.k.a. Tordon 101) causes birth defects in laboratory mice, embryo loss in pregnant laboratory rabbits and testicular atrophy in male laboratory rats[95]. Ammonium sulfamate is a safer chemical alternative to Tordon 101 and has a lesser lifetime in the environment[96].

OTHER TOXIC SUBSTANCES OF CONCERN

Toxic substances (poisons) kill or are harmful to human and environmental health. Environment Canada and Health Canada are obligated to determine whether chemical substances are "toxic" or "capable of becoming toxic" as defined by the Canadian Environmental Protection Act (CEPA), Section 64[97, 98].

Under the Act, a substance is "toxic" if it is entering or may enter the environment in a quantity or concentration or under conditions that[99]:

- have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
- constitute or may constitute a danger to the environment on which life depends; or
- constitute or may constitute a danger in Canada to human life or health.

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[88] Chemical Fact Sheet - Picloram (2)
[89] Chemical Fact Sheet - Picloram
[90] Canadian Water Quality Guidelines for the Protection of Aquatic Life, Canadian Council of Ministers of the Environment 1999.
[91] Dow AgroSciences
[92] Ibid
[93] Dow AgroSciences
[94] Ibid
[95] Picloram Fact Sheet
[96] G.S. Hartley and T.F. West. 1969. Chemicals for Pest Control. Pergamon Press, New York
[97] Ibid.
[98] Determining What is Toxic
[99] Dow AgroSciences

The substances under discussion are of concern because they fall into one or more of the following classes:

- carcinogens
- reproductive toxins
- endocrine disrupting chemicals

Carcinogens play a role in the development of cancer. Preventing cancer means eliminating or reducing exposure to carcinogens, whether in tobacco smoke, pesticides or household products or in the environment[100]. Reproductive toxins are often also carcinogens and cause changes in the developing fetus that may lead to cancer later in life[101]. Endocrine disrupting chemicals (EDCs) affect hormones that control growth and development in both humans and animals. Because of their mode of action, EDCs can cause adverse effects at extremely low levels. New research shows EDCs may also play a role in the development of cancer[102].

Priority Substances - What should be done?

There is increasing public concern in this province over the health and environmental risks posed by a number of *classes* of toxic substances, other than pesticides. These include:

- plasticizers (e.g. bisphenol A (BPA), phthalates)
- flame retardants (e.g. polybrominated diphenylethers (PBDEs))
- non-stick chemicals (e.g. perfluorooctanoic acid (PFOA))
- chemicals used in hydraulic fracturing
- polychlorinated biphenyls (PCBs)
- chlorinated solvents
- polyaromatic hydrocarbons (PAHs)
- dioxins
- pharmaceuticals

Environment Canada has a registry in accordance with the Canadian Environmental Protection Act which contains lists of substances that are or might be considered toxic. Two versions exist of a list of toxic substances, one originating in 1988 and updated in 2010 (Appendix D). A second more comprehensive list was published November 6th 2013 (Appendix E). This list includes those substances considered harmful to the environment including the ozone layer, global warming and ground level air pollution and smog. Two further lists are of First Priority Substances, 1989 (Appendix F) and of Second Priority Substances 2005 (Appendix G). Flame retardants, non-stick chemicals and phthalates are on the 2013 List (Appendix E) but BPA is absent, although in 2012 the Minister of the Environment issued an order regarding its safe disposal as waste[103].

The goal of CAP-NL is to see the toxic substances of concern listed above identified and their use restricted or eliminated. As a first objective, CAP-NL seeks the development of a province-

[100] Toxic Free Canada
[101] Ibid.
[102] Toxic Free Canada
[103] Bisphenol A in industrial effluents

wide public awareness program outlining the well-documented adverse effects of these toxins, the steps to take to avoid exposure and an itemized list of less harmful alternatives. Each class of toxic chemicals listed for action are described below.

Bisphenol-A (BPA): bis-phenol A is used to make polycarbonate plastics and epoxy resins. Polycarbonate is used for CDs and DVDs and containers; epoxy resins are used for coating the insides of metal cans, and as dental sealants. In 2006, an alarmed panel of experts met to examine a series of studies that showed a relationship between **Bisphenol-A (BPA)** and negative trends in certain aspects of human health. These studies led to restrictions on the use of **BPA** in baby bottles:

- abnormal penile/urethral development in males
- early sexual maturation in females
- an increase in attention deficit hyperactivity disorder (ADHD)
- autism
- an increase in childhood and adult obesity
- type 2 diabetes in children
- an increase in prostate and breast cancers.

Published studies also reported the above adverse health effects occurred in animal experiments treated with "low doses" of **BPA** and that the "low doses" are within the range of exposure experienced by humans living in developed countries. In fact, people living in developed countries have measurable levels of **BPA** in their blood, tissue and urine samples that already exceed the "low doses" applied to animals in laboratory experiments. Evidence also showed adverse affects may be delayed until long after initial exposure to **BPA** during development. **BPA** may not be detected when the damage or disease is expressed and these developmental effects are irreversible[104]. Yet, Health Canada's Food Directorate continues to conclude "that current dietary exposure to **BPA** through food packaging uses is not expected to pose a health risk to the general population, including newborns and young children"[105].

Phthalates are industrial chemicals used to soften PVC plastic[106]. As solvents in cosmetics and other consumer products, phthalates can damage the liver, kidneys, lungs, and particularly the developing testes. **Phthalate** DEHP can leach from IV bags and tubing (made of flexible PVC) into patients, causing them to be exposed to high levels of this toxic chemical. Some government agencies have admitted that exposure to unsafe amounts of phthalates is likely to occur in some patients receiving medical care and that sick infants treated in neonatal intensive care units have high exposure levels to this reproductive toxicant. Outside the health care setting, people are exposed to **phthalates** from beauty products, vinyl shower curtains, car seats, wallpaper, and many other consumer products[107]. Health Canada does regulate the amount of **phthalates** in medical PVC tubing but does not intend to ban the sale of medical devices containing **phthalates**[108].

Flame Retardants: **Polybrominated diphenyl** ethers or **PBDEs**, are organobromine compounds that are used in products to lower the likelihood of ignition when exposed to fire.

[104] National Center for Biotechnology Information
[105] Health Canada
[106] Health Care Without Harm
[107] Ibid.
[108] Health Canada (2)

Like other brominated flame retardants, **PBDEs** have been used in building materials, electronics, furnishings, motor vehicles, airplanes, plastics, polyurethane foams, and textiles. These chemicals reduce fertility in humans at levels found in households. The finding of **PBDE** in the blubber of grey seals in the North Sea was associated with disruption of thyroid function[109]. The industrial production of some **PBDEs** is restricted under the Stockholm Convention because of their toxicity and persistence in the environment[110]. Other flame retardants, such as organophosphate, have been introduced as replacements and may also be toxic substances.

Non-stick Chemicals: The most widely known compound in this class is **Perfluorooctanoic acid (PFOA)**, also known as C8 and perfluorooctanoate. This chemical is used in the manufacture of Teflon and Gore-Tex consumer goods. **PFOA** has been manufactured in industrial quantities since the 1940s, persists indefinitely in the environment and is toxic and carcinogenic in animals. **PFOA** has been detected in the blood of more than 98% of Americans and levels are higher in chemical plant employees and surrounding subpopulations. Exposure leads to increased cholesterol and uric acid levels and increased risk of chronic kidney disease[111]. The C8 Science Panel reported a link between **PFOA** exposure and pregnancy-induced hypertension, hypercholesterolemia, testicular cancer and kidney cancer, thyroid disease and ulcerative colitis. Studies have also found **PFOA** in umbilical cord blood indicating these chemicals cross the placenta[112]. Recent studies suggest that **PFOA** may alter steroid hormone production or act indirectly, via ovarian effects, as a novel means of endocrine disruption[113]. **PFOA** has been detected in industrial waste, stain resistant carpets, carpet cleaning liquids, house dust, microwave popcorn bags, water, food, some cookware and Teflon products. Teflon (polytetrafluoroethylene) itself is not a suspected carcinogen[114].

Hydraulic Fracturing (Fracking): Hydraulic fracturing is a relatively new and under-researched method of extracting oil and natural gas from "tight formations" in the earth. It involves the use of large quantities of water and sand together with a wide variety of chemicals detailed in a report by the U.S. House of Representatives Energy & Commerce Committee[115].

According to engineering professor Dr. Anthony Ingraffea of Cornell University, as reported by Andrew Nikiforuk in 2013 [116, 117], hydraulic fracturing in its current form is only possible because of the simultaneous availability of four new technologies: directional drilling (wells going down vertically 2 km and then horizontally for 1 km); the use of millions of litres of fracturing fluids (water, sand and chemicals); slick water (use of gels and fluid flows typically 100 barrels/minute); and multi-well pads and cluster drilling (say 9 wells in different directions per industrial platform). Whereas horizontal drilling began in 1991, clusters were first introduced only in 2007.

The speed at which hydraulic fracturing has been introduced has left insufficient time for the technology to be evaluated for its health or environmental impacts. In New Brunswick, the

[109] Environmental Pollution, 126 (2003) 29-37
[110] Flame Retardants
[111] Perfluorooctanoic Acid
[112] Agency for Toxic Substances and Disease Registry
[113] Perfluorooctanoic acid (PFOA) in endocrine disruption
[114] Perfluorooctanoic Acid
[115] Hydraulic Fracturing
[116] Fracking Myths and Realities
[117] Environmental Impacts of Shale Gas Extraction in Canada

Chief Medical Officer of Health in a comprehensive report has suggested guidelines[118] for that province. In the U.S, hydraulic fracturing was given the go-ahead during the G.W. Bush Administration's term by virtue of exemptions to the EPA's Clean Water and Clean Air Acts. This action led the House Democrats[119] to investigate the chemicals being used. Nevertheless, there has been a great expansion of fracking exploration and production of shale oil and gas in states such as Pennsylvania, Texas, North Dakota and others, but a moratorium exists in New York State. In Canada, similar activity has occurred principally in British Columbia, Alberta and Saskatchewan[120]. The Ontario government was warned by the Council of Canadians that fracking could have serious impacts on the Great Lakes[121]. In eastern Canada, small operations have occurred in Nova Scotia and Newfoundland, which currently have moratoria; fracking continues in New Brunswick[122].

While there are many problems with the technology, two principal concerns are the escape of methane gas and the leakage of fracking fluids and wastewater into the water table and hence into drinking water supplies. Objections to the technology have focused on the water usage, the contamination of the wastewater that may be difficult to purify and the fact that much of the contaminated water remains behind in the rocks, perhaps for decades or longer. Furthermore, evidence indicates that 6-7 % of new wells leak and that eventually the majority are found leaky[123, 124]. This is expected when two materials such as cement and steel with dissimilar "coefficients of thermal expansion"[125] are bonded together in the well bore. Sloppy handling of wastewater has also been alleged[126].

According to Frac Focus[127, 128, 129, 130], the industry attempts to convince the public of the safety of hydraulic fracturing. Up to 13 different chemical types may be used: Acid, Corrosion Inhibitor, Iron Control, Anti-bacterial Agent, Scale Inhibitor, Clay Stabilizer, Friction Reducer, Surfactant, Gelling Agent, Breaker, Cross linker, pH Adjusting Agent, Oxygen Scavenger. Some of these are used only when gels are to be employed[131]. To a chemically trained observer, some of the chemicals are likely to react with each other: it is not clear that the choices are being made with full understanding of the consequences. The industry appears to believe that because the percentage of additives (other than sand) is small (typically below 2%) that the nature of the additives, their toxicity or carcinogenicity etc., is of little consequence. But the water quantities are so great that the quantities of poisons are also large[132].

Within each chemical type up to 10 different individual substances may be involved. In the U.S. the controversial practice of non-disclosure of the nature of a chemical or mixture of chemicals

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[118] Suggested Fracking Guidelines for NB by Chief Medical Examiner of Health
[119] Chemicals used in Hydraulic Fracturing
[120] Fracking Across Canada
[121] Ontario not Ready to Allow Fracking
[122] Financial Post - Gas Industry Tackles Issues on Fracking
[123] Fracking Myths and Realities
[124] Environmental Impacts of Shale Gas Extraction in Canada
[125] The **coefficient of thermal expansion** describes how the size of an object changes with a change in temperature; specifically, it measures the fractional change in size per degree change in temperature at a constant pressure.
[126] Hydraulic Fracturing Chemicals
[127] Water Protection and Drilling Usage
[128] Why Chemicals are Used
[129] What Chemicals are Used
[130] Hydraulic Fracturing Chemicals and Public Disclosure
[131] Chemical Types used in Hydraulic Fracturing
[132] Chemicals used in Hydraulic Fracturing

has been permitted for proprietary reasons. This practice may or may not occur in Canada. The Council of Canadian Academies[133] has advocated application of the precautionary principle in this matter: they have told the federal government to move slowly on hydraulic fracturing. CAP-NL strongly supports that statement. If hydraulic fracturing were to be permitted in this province (and we do not think it should be), strict adherence to the Louisville Charter should be required. This charter was agreed to by the U.S. chemical companies with the effect that where alternative chemicals are available for a given task, the least toxic material be employed[134]. Appendix H details hydraulic fracturing chemicals and why they are selected for use.

Polychlorinated biphenyls (PCBs) are a group of 209 different chemicals sharing a common structure[135] and are known carcinogens in animals[136]. They are widely used as insulating material in electrical transformers and residue can be found in the environment where these transformers have been discarded[137]. Studies have found increased rates of melanomas, liver cancer, gall bladder cancer, biliary tract cancer, gastrointestinal tract cancer, brain cancer and an association to breast cancer. For this reason, the international treaty on Persistent Organic Pollutants targeted **PCBs** as one of the `dirty dozen´ chemicals to be phased out worldwide[138]. Although **PCBs** were banned in Canada in 1977 and release into the environment was prohibited in 1985, Canadian legislation has allowed owners to use PCB equipment until the end of its service life. In order to "speed up" the pace of **PCB** phase-out, specific dates have been set by Environment Canada for the destruction of **PCBs** in service and in storage[139]. However, handling, transport and destruction of PCBs are under provincial regulations[140].

Chlorinated solvents are a large family of chlorine-containing compounds that have a particular chemical structure useful in dissolving fats and greases[141]. **Chlorinated-solvents** also serve as a raw material in the production of other chemicals and are widely used in cleaning solutions, paint thinners, pesticides, resins, glues, and a host of other mixing and thinning solutions[142]. As solvents the two most frequently used are PERC and TRIKE, the former in dry-cleaning and the latter in de-greasing of metallic parts. PERC, perchloroethylene is tetrachloroethene C_2Cl_4. It is a non-flammable liquid. TRIKE, 1,1,2-trichloroethene C_2HCl_3, is an industrial solvent formerly used as an anaesthetic. Other chlorinated solvents of concern are:

- Chloroform, trichloromethane, $CHCl_3$ formerly used as an anaesthetic and as a refrigerant. Chloroform in the environment is probably natural in origin. It is a 2nd priority substance (Appendix G).

- 1,2,2-tetrachloroethane, $C_2H_2Cl_4$ formerly used as a solvent but may still be in use as a refrigerant.

- 1,1,1-trichloroethane, CH_3CCl_3, methyl chloroform, formerly a solvent, has been phased out as part of the Montreal Protocol as it interferes with the ozone layer.

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[133] Environmental Impacts of Shale Gas Extraction in Canada
[134] Louisville Charter
[135] Clearwater
[136] Ibid.
[137] Environment Canada
[138] Clearwater
[139] Environment Canada
[140] Ibid.
[141] Worker Health Protection Program
[142] Ibid

- Dichloromethane, CH_2Cl_2, is used as a solvent for a wide range of purposes. Although regarded as the least toxic of the chlorohydrocarbons, it has its health problems partly owing to its high volatility (boiling point 39°C).

- Halothane, $C_2HBrClF_3$ or 2-bromo 2-chloro-1,1,1-trifluoroethane replaced trichloroethene as an anaesthetic but it too has health drawbacks and is replaced by newer agents in developed countries.
- Carbon tetrachloride, CCl_4, tetrachloromethane formerly a solvent, refrigerant and ingredient in fire extinguishers has been phased out of major use. It is hepatoxic.

The above are chlorinated paraffins or olefins and all but Chloroform and Halothane are on Environment Canada's list of 1st priority substances (Appendix F).

Chlorinated solvents evaporate easily and are therefore absorbed through inhalation, which is the most common form of workplace exposure. Skin contact is another important route of exposure in the workplace[143]. Exposures can lead to chronic skin problems and/or damage the nervous system, kidneys, or liver and are also known to cause cancer in humans and animals[144].

The National Institute of Occupational Health and Safety (NIOSH) conducted a 30 year study on people who worked at dry cleaning shops that used percholorethylene (Perc). The purpose of the study was to confirm reports that showed an increased risk of bladder cancer among workers in the dry-cleaning business and to examine other related diseases and health problems. The results of their study are indicated in Table 2[145].

Table 2. Diseases Among Workers in Dry-Cleaning Shops Exposed to Perc and Other Solvents

Cause of Death	Observed	Expected	O/E	Notes and Comments
All Cancers Combined	271	216.5	1.25	-
Bladder Cancer	10	4.5	2.22	Smoking is a risk factor
Cervical Cancer	12	6.2	1.95	Socioeconomic factors contributed
Esophageal Cancer	14	5.7	2.47	Smoking and alcohol are risk factors
Intestine	32	21.6	1.48	-
Tongue Cancer	5	1.0	5.00	Other tobacco products are risk factors
Lung Cancer	65	47.9	1.36	-
Pneumonia	43	28.1	1.53	All over 65 years old
Duodenum Disease	11	4.7	2.33	Not related to length of employment
Urinary Stones	2	0.4	4.85	Found in perc-only group

The figure in column 4 (O/E) represents the study group mortality for each disease compared to others not exposed to PERC or other dry cleaning solvents[146]. For the "overall" category,

[143] Worker Health Protection Program
[144] Centers for Disease Control and Prevention
[145] Ibid.
[146] Centers for Disease Control and Prevention

workers employed for five years or more at a dry-cleaning shop using PERC had a higher risk of bladder, esophageal, and cervical cancer, than others not exposed under the same conditions.

Polyaromatic Hydrocarbons (PAHs): The Agency for Toxic Substances and Disease Registry indicates the universal presence of **polyaromatic hydrocarbons (PAHs)** in the environment is due to the combustion of fossil fuels and organic waste. Studies have shown that "certain **PAH** metabolites interact with DNA and are genotoxic, causing malignancies and heritable genetic damage in humans." In addition, heavy occupational exposure to mixtures of **PAHs** leads to a substantial risk of lung, skin, or bladder cancer in humans[147].

Dioxins and dioxin-like compounds (DLCs): **(DLCs)** are highly toxic by-products that are formed during combustion processes such as waste incineration, forest fires and backyard trash burning, as well as paper pulp bleaching and herbicide manufacturing. **Dioxins** are also persistent organic pollutants with the highest environmental concentrations of **dioxin** found in the soil and sediment[148]: The most toxic in the class is 2,3,7,8-tetrachlorodibenzo-para-dioxin.

Human exposure to **dioxin** occurs primarily through ingesting chemically contaminated food. **Dioxin** accumulates and persists in mammal fatty tissue for months or years. People develop chloracne, a skin disease marked by severe acne-like pimples, when exposed to high doses of **dioxin**. Studies have shown that workers exposed to high levels of dioxins have an increased risk of cancer, reproductive and developmental problems and an increased risk of heart disease and diabetes[149].

Pharmaceuticals: **Pharmaceuticals** are prescription medicines, over-the-counter therapeutic drugs and veterinary drugs that contain active synthetic or natural chemicals designed to benefit society. Pharmaceuticals are introduced into water sources through sewage, from discarding drugs into toilets and from agricultural runoff in the form of livestock manure[150]. Recent studies have found alarming effects on human cells and wildlife due to persistent exposure to random combinations of low levels of pharmaceuticals over time[151]. Because of their potential to reach drinking-water, they are of increasing concern to the public[152]. Because of this, the following provinces have formal disposal programs: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, Prince Edward Island, **and Newfoundland and Labrador**[153]**.** However, in Newfoundland the program is not regulated[154].

CONCLUSION

For many years, environmentalists and health advocates have encouraged the use of the "precautionary principle" in the regulation of chemicals, including cosmetic pesticides. This principle states that if there is a weight of evidence that indicates, for example, a chemical is carcinogenic or toxic to reproduction, then regulations restricting its use or even banning it should be implemented - even if conclusive proof of cause and effect has not yet been

[147] Agency for Toxic Substances and Disease Registry
[148] National Institute of Environmental Health Sciences
[149] Ibid.
[150] World Health Organization
[151] NBC News - Pharmaceuticals in drinking water
[152] World Health Organization
[153] Water Canada
[154] Pharmaceutical Disposal Programs for the Public - A Canadian Perspective

established. CAP-NL strongly advocates this position by virtue of this document and through a series of recommendations related to cosmetic pesticide use and toxic substances of concern, which are presented below.

Cosmetic Pesticide Ban

A review of the legislation in Ontario and Nova Scotia showed the pesticide bans in these provinces are the best in Canada for protecting public health and the environment from cosmetic pesticide use. The legislation bans a large number of pesticides; its scope extends beyond lawns; it includes a white list of allowable bio-pesticides (low risk pesticides); and it covers the possible use of new pesticide products. However, regulations around exemptions are weak and a strong public awareness program is needed to support the success of cosmetic pesticide bans.

Recommendations[155]

CAP-NL makes the following recommendations regarding the Cosmetic Pesticide Ban in Newfoundland and Labrador:

1. Widen the Newfoundland and Labrador ban to include a larger number of pesticides beyond the 5 mentioned in the July 2011 news release. We recommend a simple approach by structuring the ban around a "White List" of lower risk alternatives to harmful pesticides, a ban that prohibits the sale and use of all pesticides not on that list.

2. Extend the ban beyond lawns to all aspects of landscaping i.e. trees, shrubs and flowers, and gardens, in public and private areas including sports fields, recreational areas, golf courses, roadsides, railway sidings, under power lines and corridors, motor way verges and other unused open land.

3. Develop a mechanism for classifying new pesticides that appear on the market for use, to prevent the provincial ban from becoming obsolete.

4. Implement mandatory permit requirements for all exemptions related to the use of banned pesticides, where exemptions are only permitted for public health and safety reasons. Implement mandatory requirements for retailers and wholesalers to maintain a record of pesticide sales for exempted uses, in order to monitor and address possible abuse. For all operators using a pesticide under exemptions, implement mandatory certification requirements in integrated pest management, the use of PPE as outlined by OSH and the submission of public reports disclosing the type and amount of each pesticide used, along with plans to minimize pesticide use. Implement mandatory notification requirements for all pesticide usage

[155] Source of child in grass image

applied under exemptions with bold poison/warning signs (skull & cross bone), detailed product information, date and time of use, along with 24 hour - 50 meter neighbourhood notification.

5. Implement a mandatory Green Signage Policy for commercial applicators using "White List" pesticides (lower risk pesticides). Standard green signage posted on lawns will make it clear to the public that the applicator is not using an illegal pesticide and will satisfy the public's right to know about the use of a pesticide.

6. Expand legislation to support municipalities wishing to further restrict pesticide use beyond the requirements of the provincial ban.

7. Develop an effective monitoring and adequate enforcement program, one which includes unscheduled inspections, increased enforcement abilities and number of control personnel, and a hotline available to the public for reporting violations.

8. Develop a public information and education component to promote greater awareness of the ban and alternatives to toxic pesticides, with a hotline available to the public for questions.

Toxic Substances of Concern

CAP-NL endorses provincial legislation that restricts or eliminates the use of toxic substances of concern presented herein and supports public awareness programs to educate people on reducing exposure to them. CAP-NL is willing to assist with public campaigns related to this endeavour.

Recommendations

CAP-NL makes the following recommendations regarding toxic substances of concern other than pesticides:

1. Develop a mechanism for classifying, and restricting or eliminating toxic substances to reduce unnecessary exposure of people and the environment to them.

2. Develop a system of approval where new chemicals must undergo rigorous, independent tests for toxicity to humans, animals or fishes; as well as their fate in the environment prior to use.

3. Establish provincial mandatory requirements for improved labeling of commercial products containing toxic substances based on a classification system (recommendation 1) and tests for toxicity (recommendation 2) so that consumers may be properly informed of their contents.

4. Develop a provincial public awareness program detailing the adverse effects of targeted toxic substances, what to do to avoid exposure, with an itemized list of less harmful alternatives; a program that will increase the ability of consumers to make informed choices when they purchase items that may contain toxic substances.

5. Develop a provincial public awareness program that will educate specific people in the workplace likely to be exposed to the toxic substances detailed in this document.

6. Maintain the provincial moratorium on hydraulic fracturing until the technology has been thoroughly vetted by independent sources for human and environmental impacts, particularly related to our fresh water supply, and endorsed by such bodies as the Council of Canadian Academies.

7. Require mandatory segregation in garbage of materials such as bis-phenol A and materials likely to revert to it through new legislation.

CAP-NL has presented its position on the cosmetic pesticides as well as certain classes of toxic substances with regard to their continued and unregulated use in Newfoundland and Labrador. There is an overwhelming body of evidence contained in this document to strongly support the very serious long-term risk to human and environmental health that the people of this province are exposed to – this cannot be disputed. Now is the time for our government to adopt the precautionary principle and seriously pursue steps, like those taken in Ontario and Nova Scotia, to extend the pesticide ban to fully protect the people of this province and our environment from harmful pesticides; and to identify through a rigorous classification system other toxic substances for restriction or elimination.

SUPPORTING RESOURCES

Atlantic Salmon Federation, Economic Value of Wild Salmon, September 2011

Jeff Arp. June 2012. Personal Communication. Ontario Ministry of the Environment (Supervisor Corporate Correspondence Unit)

George Ingram. June 2012. Personal Communication. NL Dept of Environment (Pesticide Enforcement & Licensing Specialist)

Brad Skinner. May 2012. Personal Communication. NS Dept of Environment (Amherst District Manager)

Appendix A. Newfoundland & Labrador Public Health Association, Position Paper, June 2011

The Newfoundland and Labrador Public Health Association (NLPHA) supports legislation for a provincial ban on the use and sale of cosmetic pesticides. These pesticides are used for non-essential, aesthetic purposes for example, to improve the appearance of green spaces. In April 2004 the Ontario College of Family Physicians released a systematic literature review of pesticides and human health. This was the most comprehensive study of its kind in Canada. It showed that pesticide exposure is associated: with brain cancer, prostate cancer, kidney cancer and pancreatic cancer; with adverse reproductive effects including birth defects and even the death of the fetus: and that children exposed to pesticides, especially insecticides and herbicides used on lawns, fruit trees and gardens -- have an increased risk of leukemia. The Journal of Canadian Paediatric Society 2006 found that the common weed killer 2,4-D can be "persuasively linked to cancers, neurological impairment and reproductive problems."

With the strong evidence of the negative health impacts of pesticides especially to our most vulnerable (our children), many provinces across Canada developed bans on cosmetic use. The **Ontario's *Cosmetic Pesticide Ban Act, 2008*** which came in effect April 22, 2009 remains the most health-protective in North America and actually took 250 toxic lawn chemicals off store shelves by stopping the sale of these products. There are safer alternatives to lawn care. In

addition organic lawn care is more labour-intensive; this Act actually increased the number employed in the lawn care industry.1

A poll commissioned by the Newfoundland and Labrador Medical Association (NLMA) and the Canadian Association of Physicians for the Environment (CAPE) in 2009 asked residents of Newfoundland and Labrador about the use of cosmetic pesticides. The majority of people (68 percent) either mostly or completely supported a ban of cosmetic pesticides. The majority (72 percent) of those surveyed also felt that lawn pesticides used in their communities threaten the environment. While the greatest majority (76 percent) of those surveyed believed that lawn pesticides used in their community threaten children's health. On another positive note, when compared to the 2006 Statistics Canada survey, it appeared that pesticide use was declining.
Children are our most valuable resource. They are our future and as such deserve our protection. They deserve the right to a healthy safe environment. It is essential that the Province of Newfoundland and Labrador protect its children so they can grow into healthy productive citizens.

Based on the overwhelming evidence of the potential for negative health impacts of pesticides, especially on our children, NLPHA supports legislation for a provincial ban on the use and sale of cosmetic pesticides similar to the Ontario's ***Cosmetic Pesticide Ban Act, 2008.***

Supporting Resource Links

Pesticides Literature Review - Ontario College of Family Physicians

Paediatricians and the Environment: Bringing our expertise to the support of Canadian children's health - Canadian Paediatric Society

Poll reveals support for cosmetic pesticide ban - News release: Newfoundland and Labrador Medical Association

Pesticides - Canadian Association of Physicians for the Environment

Date Approved: Jun 28 2011

1 In the Halifax Regional Municipality, since the enactment of a cosmetic pesticide by-law, the number of landscaping companies has increased by more than 50 percent, as has the number of employees per company. The lawn care industry is booming wherever cosmetic pesticide use has been banned. For instance, Statistics Canada reports that the number of landscaping companies in Toronto has increased each year since that city implemented a cosmetic pesticide ban. Please see Statistics Canada, Business Register, Canadian Business Patterns. 2006. (1998-2005); and Statistics Canada. 2006. Business Register, Canadian Business Patterns (2001-2006).

Appendix B. List of credible less harmful alternatives to cosmetic pesticides for Ontario, Nova Scotia and Newfoundland & Labrador

ONTARIO	**NOVA SCOTIA**	**NEWFOUNDLAND AND LABRADOR**
ACETIC ACID	ACETIC ACID	N/A
AMMONIUM SOAPS OF FATTY ACIDS	AMMONIUM SOAPS OF FATTY ACIDS	N/A
AMMONIUM SOAPS OF HIGHER FATTY ACIDS	N/A	N/A
AZADIRACHTIN	N/A	N/A
BACILLUS SUBTILIS MBI 600	BACILLUS SUBTILIS MBI 600	N/A
BACILLUS SUBTILIS QST 713	BACILLUS SUBTILIS QST 713	N/A
BACILLUS THURINGIENSIS KURSTAKI	BACILLUS THURINGIENSIS KURSTAKI	N/A
BACILLUS THURINGIENSIS TENEBRIONIS	BACILLUS THURINGIENSIS TENEBRIONIS	N/A
BORACIC ACID (BORIC ACID)	BORACIC ACID (BORIC ACID)	N/A
BORAX	BORAX	N/A
BRASSICA HIRTA WHITE MUSTARD SEED POWDER	N/A	N/A
CAPSAICIN	CAPSAICIN	N/A
CASTOR OIL	N/A	N/A

CHONDROSTEREUM PURPUREUM STRAIN PFC2139	N/A	N/A
CITRIC ACID*	CITRIC ACID *	N/A
CODLING MOTH AND LEAF ROLLER PHEROMONE	N/A	N/A
COPPER, AS TRIBASIC COPPER SULPHATE	COPPER, AS TRIBASIC COPPER SULPHATE	N/A
COPPER, AS COPPER OXYCHLORIDE	COPPER, AS COPPER OXYCHLORIDE	N/A
CORN GLUTEN MEAL	CORN GLUTEN MEAL	N/A
DIALLYL DISULFIDE AND RELATED SULFIDES	N/A	N/A
DRIED BLOOD	DRIED BLOOD	N/A
DRIED WHOLE EGGS	N/A	N/A
FATTY ACID	FATTY ACID	N/A
FISH MEAL MIXTURE	N/A	N/A
FISH OIL MIXTURE	N/A	N/A
GARLIC	N/A	N/A
HYDROGEN PEROXIDE	HYDROGEN PEROXIDE	N/A
IRON, AS FEHEDTA	IRON, AS FEHEDTA	N/A
IRON (FERROUS OR FERRIC) PHOSPHATE	IRON (FERROUS OR FERRIC) PHOSPHATE	N/A
IRON (FERROUS OR FERRIC) SODIUM	IRON (FERROUS OR FERRIC) SODIUM	N/A
KAOLIN	N/A	N/A
LACTIC ACID	LACTIC ACID	N/A
LIME SULPHUR OR CALCIUM POLYSULPHIDE	LIME SULPHUR OR CALCIUM POLYSULPHIDE	N/A
MEAT MEAL MIXTURE	N/A	N/A
METARHIZIUM ANISOPLIAE STRAIN F-52	N/A	N/A
MINERAL OIL	MINERAL OIL	N/A
NUCLEAR POLYHEDROSIS VIRUS OF DOUGLAS FIR TUSSOCK	NUCLEAR POLYHEDROSIS VIRUS OF DOUGLAS FIR TUSSOCK	N/A
NUCLEAR POLYHEDROSIS VIRUS OF THE GYPSY MOTH	N/A	N/A
NUCLEAR POLYHEDROSIS VIRUS OF RED-HEADED PINE SAWFLY	N/A	N/A
OIL OF BLACK PEPPER	OIL OF BLACK PEPPER	N/A
PANTOEA AGGLOMERANS STRAIN C9-1	N/A	N/A

PANTOEA AGGLOMERANS STRAIN E325	N/A	N/A
PHOMA MACROSTOMA STRAIN 94-44B	PHOMA MACROSTOMA STRAIN 94-44B	N/A
CAT PIPERINE	PIPERINE	N/A
PUTRESCENT WHOLE EGG SOLID	PUTRESCENT WHOLE EGG SOLID	N/A
SCLEROTINIA MINOR	SCLEROTINIA MINOR	N/A
N/A	PYRETHRINS; NO PIPERONYL BUTOXIDE	N/A
SILICON DIOXIDE -PRESENT AS DIATOMACEOUS EARTH - SALT WATER FOSSILS	SILICON DIOXIDE (DIATOMACEOUS EARTH)	N/A
SOAP (ALKANOLAMINE SALTS OF FATTY ACID)	SOAP (ALKANOLAMINE SALTS OF FATTY ACID)	N/A
SOAP (POTASSIUM SALTS OF FATTY ACID)	SOAP (POTASSIUM SALTS OF FATTY ACID)	N/A
SODIUM CHLORIDE	SODIUM CHLORIDE	N/A
SODIUM ALPHA-OLEFIN SULFONATE	N/A	N/A
N/A	SPINOSAD	N/A
SULPHUR	SULPHUR	N/A
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG255. TYP	N/A	N/A
TYPHULA PHACORRHIZA STRAIN 94671	TYPHULA PHACORRHIZA STRAIN 94671	N/A
VERTICILLIUM ALBO-ATRUM STRAIN WCS850	VERTICILLIUM ALBO-ATRUM STRAIN WCS850	N/A
WINTERGREEN OIL	N/A	N/A

*Present as fermentation products of Lactobacillus rhamnosus Strain R-11, Lactobacillus casei Strain R215, Lactococcus lactis ssp. cremoris Strain M11/CSL, Lactococcus lactis ssp. lactis Strain LL102/CSL, and Lactococcus lactis ssp. lactis Strain LL64/CSL

Appendix C – Banned Pesticides in Ontario

COMPENDIUM REPORT- CLASS 9 PESTICIDES - March 31, 2014

Pesticide ingredients that are banned for cosmetic use. Products containing these ingredients may still be used for exceptions to the ban. See Pesticide Classification Guideline for Ontario for more details.

No.	A.I. code(s)	ACTIVE INGREDIENT NAME
1.	DXA	2,4-D PRESENT AS ACID
2.	DXB	2,4-D PRESENT AS AMINE SALTS (DIMETHYLAMINE SALT, DIETHANOLAMINE SALT, OR OTHER AMINE SALTS)
3.	DXF	2,4-D PRESENT AS LOW VOLATILE ESTERS
4.	CPA	4-CPA
5.	ABM	ABAMECTIN
6.	ACP	ACEPHATE
7.	NXI	ACETAMIPRID
8.	AMD	AMINOPYRALID
9.	AMI	AMITROLE
10.	ATR	ATRAZINE PLUS RELATED ACTIVE TRIAZINES
11.	AZY	AZOXYSTROBIN
12.	BET	BENSULIDE
13.	BZN	BENTAZON (PRESENT AS THE SODIUM SALT)
14.	BIA	BISPYRIBAC-SODIUM
15.	CHH	BOSCALID
16.	BBU	BROMACIL PRESENT IN FREE FORM, AS DIMETHYLAMINE SALT, OR AS LITHIUM SALT
17.	CAP	CAPTAN
18.	CAB	CARBARYL
19.	VIT	CARBATHIIN
20.	CAE	CARFENTRAZONE-ETHYL
21.	DUB	CHLORPYRIFOS
22.	JIY	CHLORANTRANILIPROLE
23.	TET	CHLOROTHALONIL
24.	CSL	CHLORSULFURON
25.	CHL	CHLORTHAL PRESENT AS ACID OR AS DIMETHYL ESTER
26.	DPI	CLOPYRALID
27.	COD	CLOTHIANIDIN
28.	CYM	CYPERMETHRIN
29.	CYT	CYANTRANILIPROLE
30.	CYP	CYPRODINIL

31.	ALF	D-CIS, TRANS ALLETHRIN
32.	DAZ	DAZOMET
33.	DBR	DELTAMETHRIN
34.	DIA	DIAZINON
35.	DIC	DICAMBA PRESENT AS ACID, AS DIETHANOLAMINE SALT, AS DIMETHYLAMINE SALT, OR AS BUTOXYETHYL ESTER
36.	DCB	DICHLOBENIL
37.	DIK	DICHLORAN
38.	DCF	DICOFOL
39.	DIM	DIMETHOATE

Note: Under Section 4(1) of Regulation 63/09 under the Pesticides Act the Director has the authority to add or remove pesticides to maintain an updated list.

COMPENDIUM REPORT- CLASS 9 PESTICIDES

No.	A.I. code(s)	ACTIVE INGREDIENT NAME
40.	DIQ	DIQUAT
41.	DIR	DITHIOPYR
42.	DIH	DICHLORPROP
43.	DPZ	DICHLORPROP-P ISOMER (PRESENT AS 2-ETHYLHEXYL ESTER)
44.	DUR	DIURON
45.	PHG	D-PHENOTHRIN
46.	ALM	D-TRANS ALLETHRIN
47.	ESF	ENDOSULFAN
48.	TRB	ETRIDIAZOLE
49.	FBT	FENBUTATIN OXIDE
50.	FPF	FENOXAPROP-P-ETHYL (ISOMER)
51.	FER	FERBAM (FERRIC DIMETHYLDITHIOCARBAMATE)
52.	FLD	FLUDIOXONIL
53.	FOX	FLUMIOXAZIN
54.	FLC	FLUOPICOLIDE
55.	FXA	FLUOXASTROBIN
56.	FLR	FLUROXYPYR 1-METHYLHEPTYL ESTER
57.	FOL	FOLPET
58.	KRE	FOSAMINE AMMONIUM
59.	FAL	FOSETYL-AL
60.	GLG	GLUFOSINATE AMMONIUM
61.	GPS	GLYPHOSATE
62.	GPX	GLYPHOSATE, PRESENT AS DIMETHYLAMINE SALT
63.	VPR	HEXAZINONE
64.	ARS	IMAZYPYR
65.	IMI	IMIDACLOPRID
66.	GPI	ISOPROPYLAMINE SALT OF GLYPHOSATE
67.	IPD	IPRODIONE
68.	CYH	LAMBDA-CYHALOTHRIN
69.	MAL	MALATHION
70.	MAH	MALEIC HYDRAZIDE
71.	MAB	MCPA PRESENT AS AMINE SALTS (DIETHANOLAMINE, DIMETHYLAMINE, OR MIXED AMINES)
72.	MAE	MCPA (PRESENT AS ESTERS)
73.	MEA	MECOPROP (D-ISOMER) PRESENT AS POTASSIUM SALT
74.	MEC	MECOPROP (D-ISOMER) PRESENT AS AMINE SALTS
75.	MEP	MECOPROP (D-ISOMER)
76.	MER	MESOTRIONE
77.	MFN	METALAXYL-M AND S-ISOMER
78.	MHY	METALDEHYDE
79.	MTM	METAM
80.	GHA	METCONAZOLE
81.	MTR	METIRAM
82.	MEM	METSULFURON METHYL
83.	MYC	MYCLOBUTANIL
84.	NAL	NALED
85.	NBP	NAPROPAMIDE

COMPENDIUM REPORT- CLASS 9 PESTICIDES

No.	A.I. code(s)	ACTIVE INGREDIENT NAME
86.	HQB	OXINE BENZOATE
87.	PTX	OXYCARBOXIN
88.	PAQ	PARAQUAT
89.	PNT	PENTHIOPYRAD
90.	PFL	PERMETHRIN
91.	PHS	PHOSALONE
92.	PHY	PROPAMOCARB HYDROCLORIDE
93.	PON	PROPICONAZOLE
94.	BAY	PROPOXUR
95.	KRB	PROPYZAMIDE
96.	PYA	PYRACLOSTROBIN
97.	PYR	PYRETHRINS
98.	QTZ	QUINTOZENE
99.	REZ	RESMETHRIN
100.	ROT	ROTENONE
101.	AME	S-METOLACHLOR
102.	SMZ	SIMAZINE PLUS RELATED ACTIVE TRIAZINES
103.	SPI	SPINOSAD
104.	NEO	TETRAMETHRIN PLUS RELATED ACTIVE COMPOUNDS
105.	TZL	THIABENDAZOLE
106.	THE	THIAMETHOXAM
107.	THI	THIRAM
108.	TPM	THIOPHANATE-METHYL
109.	TPR	TRICLOPYR
110.	TFY	TRIFLOXYSTROBIN
111.	TRF	TRIFLURALIN
112.	TRR	TRIFORINE
113.	TXP	TRINEXAPAC-ETHYL
114.	TRT	TRITICONAZOLE
115.	ZIN	ZINEB

Appendix D

TOXIC SUBSTANCES LIST (CEPA 1988)

1.	Asbestos	2
2.	1,1,1-Trichloroethane	3
3.	Benzene	3
4.	Bis(chloromethyl) ether	3
5.	Bromochlorodifluoromethane	3
6.	Bromofluorocarbons	3
7.	Bromotrifluoromethane	3
8.	Chlorobiphenyls	1
9.	Chlorofluorocarbon	1
10.	Chloromethyl methyl ether	3
11.	Dibenzo-para-dioxin	3
12.	Dibenzofuran	3
13.	Dibromotetrafluoroethane	3
14.	Dodecachloropentacyclo [5.3.0.02,6.03,9.04,8] decane (Mirex)	1
15.	Fuel containing toxic substances that are dangerous goods within the meaning of section 2 of the *Transportation of Dangerous Goods Act, 1992*	3
16.	Hydrobromofluorocarbons	3
17.	Hydrochlorofluorocarbons	3
18.	Lead	2
19.	Mercury	2
20.	Methyl Bromide	3
21.	Polybrominated Biphenyls	1
22.	Polychlorinated dibenzo-para-dioxins	3
23.	Polychlorinated dibenzofurans	3
24.	Polychlorinated Terphenyls	1
25.	Tetrachloromethane, Carbon Tetrachloride	3
26.	Vinyl Chloride	

Appendix E

Toxic Substances List - Schedule 1. Updated by Environment Canada November 6, 2013

1. Chlorobiphenyls that have the molecular formula $C_{12}H_{(10-n)}Cl_n$ in which "n" is greater than 2
2. Dodecachloropentacyclo [5.3.0.$0^{2,6}$.$0^{3,9}$.$0^{4,8}$] decane (Mirex)
3. Polybrominated Biphenyls that have the molecular formula $C_{12}H_{(10-n)}Br_n$ in which "n" is greater than 2
4. Chlorofluorocarbon: totally halogenated chlorofluorocarbons that have the molecular formula $C_nCl_xF_{(2n+2-x)}$
5. Polychlorinated Terphenyls that have a molecular formula $C_{18}H_{(14-n)}Cl_n$ in which "n" is greater than 2
6. Asbestos
7. Lead
8. Mercury and its compounds
9. Vinyl Chloride
10. Bromochlorodifluoromethane that has the molecular formula CF_2BrCl
11. Bromotrifluoromethane that has the molecular formula CF_3Br
12. Dibromotetrafluoroethane that has the molecular formula $C_2F_4Br_2$
13. Fuel containing toxic substances that are dangerous goods within the meaning of section 2 of the Transportation of Dangerous Goods Act, 1992 and that
    a. are neither normal components of the fuel nor additives designed to improve the characteristics or the performance of the fuel; or
    b. are normal components of the fuel or additives designed to improve the characteristics or performance of the fuels, but are present in quantities or concentrations greater than those generally accepted by industry standards
14. Dibenzo-para-dioxin that has the molecular formula of $C_{12}H_8O_2$
15. Dibenzofuran that has the molecular formula $C_{12}H_8O$
16. Polychlorinated dibenzo-para-dioxins that have the molecular formula $C_{12}H_{(8-n)}O_2Cl_n$in which "n" is greater than 2
17. Polychlorinated dibenzofurans that have the molecular formula $C_{12}H_{(8-n)}OCl_n$ in which "n" is greater than 2
18. Tetrachloromethane (carbon tetrachloride) CCl_4
19. 1,1,1-trichloroethane (methyl chloroform) CCl_3-CH_3
20. Bromofluorocarbons other than those set out in items 10 to 12
21. Hydrobromofluorocarbons that have the molecular formula $C_nH_xF_yBr_{(2n+2-x-y)}$ in which 0
22. Methyl Bromide
23. Bis(Chloromethyl) ether that has the molecular formula $C_2H_4Cl_2O$
24. Chloromethyl methyl ether that has the molecular formula C_2H_5ClO
25. Hydrochlorofluorocarbons that have the molecular formula $C_nH_xF_yCl_{(2n+2-x-y)}$ in which $0<n<3$
26. Benzene that has the molecular formula C_6H_6
27. (4-Chlorophenyl)cyclopropylmethanone,O-[(4-nitrophenyl)methyl]oxime that has the molecular formula $C_{17}H_{15}ClN_2O_3$
28. Inorganic arsenic compounds
29. Benzidine and benzidine dihydrochloride, that have the molecular formula $C_{12}H_{12}N_2$ and $C_{12}H_{12}N_2 \cdot 2HCl$, respectively
30. Bis(2-ethylhexyl)phthalate
31. Inorganic cadmium compounds

32. Chlorinated wastewater effluents
33. Hexavalent chromium compounds
34. Creosote-impregnated waste materials from creosote-contaminated sites
35. 3,3'-Dichlorobenzidine
36. 1,2-Dichloroethane
37. Dichloromethane
38. Effluents from pulp mills using bleaching
39. Hexachlorobenzene
40. Inorganic fluorides
41. Refractory ceramic fibre
42. Oxidic, sulphidic and soluble inorganic nickel compounds
43. Polycyclic aromatic hydrocarbons
44. Tetrachloroethylene
45. Trichloroethylene
46. Tributyltetradecylphosphonium chloride that has the molecular formula $C_{26}H_{56}P{\cdot}Cl$
47. Bromochloromethane, that has the molecular formula CH_2BrCl
48. Acetaldehyde, which has the molecular formula C_2H_4O
49. 1,3-Butadiene, which has the molecular formula C_4H_6
50. Acrylonitrile, which has the molecular formula C_3H_3N
51. Respirable particulate matter less than or equal to 10 microns
52. Acrolein, which has the molecular formula C_3H_4O
53. Ammonia dissolved in water
54. Nonylphenol and its ethoxylates
55. Effluents from textile mills that use wet processing
56. Inorganic Chloramines, which have the molecular formula $NH_nCl_{(3-n)}$, where n = 0, 1 or 2
57. Ethylene oxide, which has the molecular formula H_2COCH_2
58. Formaldehyde, which has the molecular formula CH_2O
59. *N*-Nitrosodimethylamine, which has the molecular formula $C_2H_6N_2O$
60. Gaseous Ammonia, which has the molecular formula $NH_3(g)$
61. Ozone, which has the molecular formula O_3
62. Nitric oxide, which has the molecular formula NO
63. Nitrogen dioxide, which has the molecular formula NO_2
64. Sulphur dioxide, which has the molecular formula SO_2
65. Volatile organic compounds that participate in atmospheric photochemical reactions, excluding the following:
    a. methane;
    b. ethane;
    c. methylene chloride (dichloromethane);
    d. 1,1,1-trichloroethane (methyl chloroform);
    e. 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113);
    f. trichlorofluoromethane (CFC-11);
    g. dichlorodifluoromethane (CFC-12);
    h. chlorodifluoromethane (HCFC-22);
    i. trifluoromethane (HFC-23);
    j. 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114);
    k. chloropentafluoroethane (CFC-115);
    l. 1,1,1-trifluoro-2,2-dichloroethane (HCFC-123);
    m. 1,1,1,2-tetrafluoroethane (HFC-134a);
    n. 1,1-dichloro-1-fluoroethane (HCFC-141b);
    o. 1-chloro-1,1-difluoroethane (HCFC-142b);
    p. 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);

q. pentafluoroethane (HFC-125);
r. 1,1,2,2-tetrafluoroethane (HFC-134);
s. 1,1,1-trifluoroethane (HFC-143a);
t. 1,1-difluoroethane (HFC-152a);
u. parachlorobenzotrifluoride (PCBTF);
v. cyclic, branched or linear completely methylated siloxanes;
w. acetone;
x. perchloroethylene (tetrachloroethylene);
y. 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca);
z. 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb);
(z.1) 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee);
(z.2) difluoromethane (HFC-32);
(z.3) ethylfluoride (HFC-161);
(z.4) 1,1,1,3,3,3-hexafluoropropane (HFC-236fa);
(z.5) 1,1,2,2,3-pentafluoropropane (HFC-245ca);
(z.6) 1,1,2,3,3-pentafluoropropane (HFC-245ea);
(z.7) 1,1,1,2,3-pentafluoropropane (HFC-245eb);
(z.8) 1,1,1,3,3-pentafluoropropane (HFC-245fa);
(z.9) 1,1,1,2,3,3-hexafluoropropane (HFC-236ea);
(z.10) 1,1,1,3,3-pentafluorobutane (HFC-365mfc);
(z.11) chlorofluoromethane (HCFC-31);
(z.12) 1-chloro-1-fluoroethane (HCFC-151a);
(z.13) 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a);
(z.14) 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane ($C_4F_9OCH_3$);
(z.15) 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OCH_3$);
(z.16) 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane ($C_4F_9OC_2H_5$);
(z.17) 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OC_2H_5$); and
(z.18) methyl acetate and perfluorocarbon compounds that fall into the following classes, namely,
i. cyclic, branched or linear completely fluorinated alkanes,
ii. cyclic, branched, or linear completely fluorinated ethers with no unsaturations,
iii. cyclic, branched or linear completely fluorinated tertiary amines with no unsaturations, or
iv. sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

66. Hexachlorobutadiene, which has the molecular formula C_4Cl_6
67. Particulate matter containing metals that is released in emissions from copper smelters or refineries, or from both
68. Particulate matter containing metals that is released in emissions from zinc plants
69. Dichlorodiphenyltrichloroethane (DDT), which has the molecular formula $C_{14}H_9Cl_5$
70. 2-butoxyethanol, which has the molecular formula $C_6H_{14}O_2$
71. 2-methoxyethanol, which has the molecular formula $C_3H_8O_2$
72. Tetrachlorobenzenes, which have the molecular formula $C_6H_2Cl_4$
73. Pentachlorobenzene, which has the molecular formula C_6HCl_5
74. Carbon dioxide, which has the molecular formula CO_2
75. Methane, which has the molecular formula CH_4
76. Nitrous oxide, which has the molecular formula N_2O
77. Hydrofluorocarbons that have the molecular formula $C_nH_xF_{(2n+2-x)}$ in which $0<n<6$

78. The following perfluorocarbons:
    a. those that have the molecular formula C_nF_{2n+2} in which $0<n<7$
    b. octafluorocyclobutane, which has the molecular formula C_4F_8.
79. Sulphur hexafluoride, which has the molecular formula SF_6
80. Methanone, bis[4-(dimethylamino)phenyl]-, which has the molecular formula $C_{17}H_{20}N_2O$
81. 2-Butanone, oxime, which has the molecular formula C_4H_9NO
82. *n*-Butyl glycidyl ether, which has the molecular formula $C_7H_{14}O_2$
83. Polybrominated diphenyl ethers that have the molecular formula $C_{12}H_{(10-n)}Br_nO$ in which $4 \leq n \leq 10$
84. Perfluorooctane sulfonate and its salts
85. Compounds that contain one of the following groups: $C_8F_{17}SO_2$, $C_8F_{17}SO_3$ or $C_8F_{17}SO_2N$
86. Methyloxirane, which has the molecular formula C_3H_6O
87. Ethyloxirane, which has the molecular formula C_4H_8O
88. Naphthalene, which has the molecular formula $C_{10}H_8$
89. Toluene diisocyanates, which have the molecular formula $C_9H_6N_2O_2$
90. 1,2-Benzenediol, which has the molecular formula $C_6H_6O_2$
91. 1,4-Benzenediol, which has the molecular formula $C_6H_6O_2$
92. Hexane, 1,6-diisocyanato-, homopolymer, reaction products with alpha-fluoro-omega-2-hydroxyethyl-poly(difluoro- methylene), C16-20-branched alcohols and 1-octadecanol
93. 2-propenoic acid, 2-methyl-, hexadecyl ester, polymers with 2-hydroxyethyl methacrylate, gamma-omega-perfluoro-C10-16-alkyl acrylate and stearyl methacrylate
94. 2-propenoic acid, 2-methyl-, 2-methylpropyl ester, polymer with butyl 2-propenoate and 2,5-furandione, gamma-omega-perfluoro-C8-14-alkyl esters, tert-Bu benzenecarboperoxoate-initiated
95. 2-propen-1-ol reaction products with pentafluoroiodoethane tetrafluoroethylene telomer, dehydroiodinated, reaction products with epichlorohydrin and triethylenetetramine
96. Phenol, 4,4′ -(1-methylethylidene)bis-, which has the molecular formula $C_{15}H_{16}O_2$
97. Thiourea, which has the molecular formula CH_4N_2S
98. 1,3-Butadiene, 2-methyl-, which has the molecular formula C_5H_8
99. Oxirane, (chloromethyl)-, which has the molecular formula C_3H_5ClO
100. Colour Index Pigment Yellow 34
101. Colour Index Pigment Red 104
102. Cyclotetrasiloxane, octamethyl-, which has the molecular formula $C_8H_{24}O_4Si_4$
103. Phenol, 2,4,6-tris(1,1-dimethylethyl)-, which has the molecular formula $C_{18}H_{30}O$
104. Ethanol, 2-methoxy-, acetate, which has the molecular formula $C_5H_{10}O_3$
105. 1-Propanol, 2-methoxy-, which has the molecular formula $C_4H_{10}O_2$
106. 2-Naphthalenol, 1-[(4-methyl-2-nitrophenyl)azo]-, which has the molecular formula $C_{17}H_{13}N_3O_3$
107. Ethanol, 2-(2-methoxyethoxy)-, which has the molecular formula $C_5H_{12}O_3$
108. Sulfuric acid, diethyl ester, which has the molecular formula $C_4H_{10}O_4S$
109. Sulfuric acid, dimethyl ester, which has the molecular formula $C_2H_6O_4S$
110. Benzenamine, *N*-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene
111. 2-Propenamide, which has the molecular formula C_3H_5NO
112. Ethanol, 2-chloro-, phosphate (3:1), which has the molecular formula $C_6H_{12}Cl_3O_4P$
113. Tributyltins, which contain the grouping $(C_4H_9)_3Sn$
114. Tetrabutyltins, which have the molecular formula $(C_4H_9)_4Sn$
115. Benzene, (chloromethyl)-, which has the molecular formula C_7H_7Cl
116. Propane, 2-nitro-, which has the molecular formula $C_3H_7NO_2$
117. Benzene, 1-methyl-2-nitro-, which has the molecular formula $C_7H_7NO_2$
118. Phenol, 2,6-bis(1,1-dimethylethyl)-4-(1-methylpropyl)-, which has the molecular formula $C_{18}H_{30}O$

119. Methylium, [4-(dimethylamino)phenyl]bis[4-(ethylamino)3-methylphenyl]-, acetate, which has the molecular formula $C_{27}H_{34}N_3.C_2H_3O_2$
120. Chlorinated alkanes that have the molecular formula $C_nH_xCl_{(2n+2-x)}$ in which $10 \leq n \leq 20$
121. Benzene, 1,2-dimethoxy-4-(2-propenyl)-, which has the molecular formula $C_{11}H_{14}O_2$
122. Vanadium pentoxide, which has the molecular formula V_2O_5
123. Oxirane, 2,2′,2″,2‴-[1,2-ethanediylidenetetrakis (4,1-phenyleneoxymethylene)]tetrakis-, which has the molecular formula $C_{38}H_{38}O_8$
124. Bromic acid, potassium salt, which has the molecular formula $KBrO_3$
125. Polychlorinated naphthalenes, which have the molecular formula $C_{10}H_{8-n}Cl_n$ in which "n" is greater than 1
126. Hydrazine, which has the molecular formula N_2H_4
127. Hexabromocyclododecane, which has the molecular formula $C_{12}H_{18}Br_6$
128. Quinoline, which has the molecular formula C_9H_7N
129. Perfluorooctanoic acid, which has the molecular formula $C_7F_{15}CO_2H$, and its salts
130. Compounds that consist of a perfluorinated alkyl group that has the molecular formula C_nF_{2n+1} in which n = 7 or 8 and that is directly bonded to any chemical moiety other than a fluorine, chlorine or bromine atom
131. Perfluorocarboxylic acids that have the molecular formula $C_nF_{2n+1}CO_2H$ in which $8 \leq n \leq 20$ and their salts
132. Compounds that consist of a perfluorinated alkyl group that has the molecular formula C_nF_{2n+1} in which $8 \leq n \leq 20$ and that is directly bonded to any chemical moiety other than a fluorine, chlorine or bromine atom

First Priority Substances List (PSL1)

The first Priority Substances List (PSL1) was published in 1989 and included 44 substances or groups of substances. Environmental assessments and human health assessments were completed under the Priority Substances Assessment Program by early 1994. Assessment Reports for each of these PSL1 substances were completed and published following a critical review of relevant identified data. Conclusions of whether the substances were considered toxic under the *Canadian Environmental Protection Act* were published.

In some cases, there were substances for which a conclusion could not be reached. Follow-up to the orignal assessment report has been undertaken following a review of new information.

For substances on which the final decisions have been made, please click the following links below to obtain the related assessment information.

- 1,1,1-Trichloroethane
- 1,1,2,2-Tetrachloroethane
- 1,2-Dichlorobenzene
- 1,2-Dichloroethane
- 1,4-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- 3,5-Dimethylaniline
- Benzene
- Benzidine
- Bis (2-chloroethyl) ether
- Bis (2-ethylhexyl) phthalate
- Bis (chloromethyl) ether
- Chlorinated paraffins
- Chlorinated wastewater effluents
- Chlorobenzene
- Chloromethyl methyl ether
- Creosote-contaminated sites
- Dibutyl phthalate
- Dichloromethane
- Di-n-octyl phthalate
- Effluents from pulp mills using bleaching
- Hexachlorobenzene
- Hexavalent chromium compounds
- Inorganic arsenic compounds
- Inorganic cadmium compounds
- Inorganic fluorides
- Methyl methacrylate
- Methyl tertiary-butyl ether
- Organotin compounds
- Oxidic, sulphidic and soluble, inorganic nickel compounds
- Pentachlorobenzene
- Polychlorinated Dibenzodioxins
- Polychlorinated Dibenzofurans
- Polycyclic aromatic hydrocarbons
- Refractory ceramic fibre
- Styrene
- Tetrachlorobenzenes
- Tetrachloroethylene
- Toluene
- Trichlorobenzenes
- Trichloroethylene
- Used crankcase oils
- Xylenes

Following considerations of comments received, the Draft Follow-Up Reports listed below will be revised as appropriate and published with final conclusions as to whether or not the substances are considered to be "toxic" as defined in CEPA 1999.

- Aniline

APPENDIX G - Second Priority Substances List (PSL-2)

The second Priority Substances List (PSL2) of the Canadian Environmental Protection Act (CEPA) was published in December, 1995. The list, recommended by a Ministers' Expert Advisory Panel drawn from major stakeholder groups, contains 25 substances, including single chemicals as well as mixtures and effluents.

Environment Canada and Health Canada have completed ecological and human health risk assessments for the substances listed on PSL2. The Draft PSL2 Assessment Reports were made available for a 60-day public comment period. Following consideration of comments received, the Assessment Reports were revised as appropriate and published with final conclusions as to whether or not the substances are considered to be "toxic" as defined in CEPA 1999. Summaries of the public comments and their responses are available from the website for each substance.

Because of the considerable limitations of the available data on effects of two of the PSL2 substances (aluminum salts and ethylene glycol), a definitive conclusion of toxic or not toxic with respect to human health could not be reached. Therefore, assessments of these two substances have been suspended in order for Health Canada to collect data on toxicity to human health. State of the Science Reports for these substances have been completed.

- 1,3-Butadiene
- 2-Methoxy Ethanol, 2-Ethoxy Ethanol, 2-Butoxy Ethanol
- Acetaldehyde
- Acrolein
- Acrylonitrile
- Aluminum Chloride, Aluminum Nitrate, Aluminum Sulphate
- Ammonia in the Aquatic Environment
- Butylbenzylphthalate (BBP)
- Carbon Disulfide
- Chloroform
- Ethylene Glycol
- Ethylene Oxide
- Formaldehyde
- Hexachlorobutadiene (HBCD)
- Inorganic Chloramines
- N,N-Dimethylformamide (DMF)
- N-Nitrosodimethylamine (NDMA)
- Nonylphenol and its Ethoxylates (NPE)
- Phenol
- Releases from Primary and Secondary Copper Smelters and Copper Refineries
- Releases from Rrimary and Secondary Zinc Smelters and Zinc Refineries
- Releases of Radionuclides from Nuclear Facilities (Effects on Non-human Species)
- Respirable Particulate Matter Less than or Equal to 10 Microns (PM-10)
- Road Salts
- Textile Mill Effluents

Appendix H. List of Chemicals used in Hydraulic Fracturing and their Purpose			
Product Function	Chemical Name	CAS	Chemical Purpose
Acid	Hydrochloric Acid	00764 7-01-0	Helps dissolve minerals and initiate cracks in the rock
Biocide	Glutaraldehyde	00011 1-30-8	Eliminates bacteria in the water that produces corrosive by-products
	Ammonium Chloride	01212 5-02-9	Eliminates bacteria in the water that produces corrosive by-products
	Quaternary Ammonium Chloride	06178 9-71-1	Eliminates bacteria in the water that produces corrosive by-products
	Tetrakis Hydroxymethyl-Phosphonium Sulphate	05556 6-30-8	Eliminates bacteria in the water that produces corrosive by-products
Breaker	Ammonium Persulphate	00772 7-54-0	Allows a delayed break down of the gel
	Sodium Chloride	00764 7-14-5	Product Stabilizer
	Magnesium Peroxide	01445 2-57-4	Allows a delayed break down of the gel
	Magnesium Oxide	00130 9-48-4	Allows a delayed break down of the gel
	Calcium Chloride	01004 3-52-4	Product Stabilizer
Clay Stabilizer	Choline Chloride	00006 7-48-1	Prevents clays from swelling or shifting
	Tetramethyl ammonium chloride	00007 5-57-0	Prevents clays from swelling or shifting
	Sodium Chloride	00764 7-14-5	Prevents clays from swelling or shifting
Corrosion Inhibitor	Isopropanol	00006 7-63-0	Product stabilizer and / or winterizing agent
	Methanol	00006 7-56-1	Product stabilizer and / or winterizing agent
	Formic Acid	00006 4-18-6	Prevents the corrosion of the pipe
	Acetaldehyde	00007 5-07-0	Prevents the corrosion of the pipe
Crosslinker	Petroleum Distillate	06474 1-85-1	Carrier fluid for borate or zirconate crosslinker
	Hydrotreated Light Petroleum	06474 2-47-8	Carrier fluid for borate or zirconate crosslinker

	Distillate		
	Potassium Metaborate	01370 9-94-9	Maintains fluid viscosity as temperature increases
	Triethanolamine Zirconate	10103 3-44-7	Maintains fluid viscosity as temperature increases
	Sodium Tetraborate	00130 3-96-4	Maintains fluid viscosity as temperature increases
	Boric Acid	00133 3-73-9	Maintains fluid viscosity as temperature increases
	Zirconium Complex	11318 4-20-6	Maintains fluid viscosity as temperature increases
	Borate Salts	N/A	Maintains fluid viscosity as temperature increases
	Ethylene Glycol	00010 7-21-1	Product stabilizer and / or winterizing agent.
	Methanol	00006 7-56-1	Product stabilizer and / or winterizing agent.
Friction Reducer	Polyacrylamide	00900 3-05-8	“Slicks” the water to minimize friction
	Petroleum Distillate	06474 1-85-1	Carrier fluid for polyacrylamide friction reducer
	Hydrotreated Light Petroleum Distillate	06474 2-47-8	Carrier fluid for polyacrylamide friction reducer
	Methanol	00006 7-56-1	Product stabilizer and / or winterizing agent.
	Ethylene Glycol	00010 7-21-1	Product stabilizer and / or winterizing agent.
Gelling Agent	Guar Gum	00900 0-30-0	Thickens the water in order to suspend the sand
	Petroleum Distillate	06474 1-85-1	Carrier fluid for guar gum in liquid gels
	Hydrotreated Light Petroleum Distillate	06474 2-47-8	Carrier fluid for guar gum in liquid gels
	Methanol	00006 7-56-1	Product stabilizer and / or winterizing agent.
	Polysaccharide Blend	06813 0-15-4	Thickens the water in order to suspend the sand
	Ethylene Glycol	00010 7-21-1	Product stabilizer and / or winterizing agent.
Iron Control	Citric Acid	00007 7-92-9	Prevents precipitation of metal oxides
	Acetic Acid	00006 4-19-7	Prevents precipitation of metal oxides

	Thioglycolic Acid	00006 8-11-1	Prevents precipitation of metal oxides
	Sodium Erythorbate	00638 1-77-7	Prevents precipitation of metal oxides
Non-Emulsifier	Lauryl Sulphate	00015 1-21-3	Used to prevent the formation of emulsions in the fracture fluid
	Isopropanol	00006 7-63-0	Product stabilizer and / or winterizing agent.
	Ethylene Glycol	00010 7-21-1	Product stabilizer and / or winterizing agent.
pH Adjusting Agent	Sodium Hydroxide	00131 0-73-2	Adjusts the pH of fluid to maintains the effectiveness of other components, such as crosslinkers
	Potassium Hydroxide	00131 0-58-3	Adjusts the pH of fluid to maintains the effectiveness of other components, such as crosslinkers
	Acetic Acid	00006 4-19-7	Adjusts the pH of fluid to maintains the effectiveness of other components, such as crosslinkers
	Sodium Carbonate	00049 7-19-8	Adjusts the pH of fluid to maintains the effectiveness of other components, such as crosslinkers
	Potassium Carbonate	00058 4-08-7	Adjusts the pH of fluid to maintains the effectiveness of other components, such as crosslinkers
Scale Inhibitor	Copolymer of Acrylamide and Sodium Acrylate	02598 7-30-8	Prevents scale deposits in the pipe
	Sodium Polycarboxylate	N/A	Prevents scale deposits in the pipe
	Phosphonic Acid Salt	N/A	Prevents scale deposits in the pipe
Surfactant	Lauryl Sulphate	00015 1-21-3	Used to increase the viscosity of the fracture fluid
	Ethanol	00006 4-17-5	Product stabilizer and / or winterizing agent.
	Naphthalene	00009 1-20-3	Carrier fluid for the active surfactant ingredients
	Methanol	00006 7-56-1	Product stabilizer and / or winterizing agent.
	Isopropyl Alcohol	00006 7-63-0	Product stabilizer and / or winterizing agent.
	2-Butoxyethanol	00011 1-76-2	Product stabilizer

Source: http://fracfocus.ca/chemical-use/what-chemicals-are-used