COMPOUND 1080

COMPOUND 1080

The case against poisoning Canada's wildlife.

Numerous jurisdictions around the world have banned Compound 1080 due to the potential threats of this highly toxic substance.

Compound 1080 and all its derivatives should be banned from Canada, with an immediate moratorium placed on its use and handling until this is achieved.

TABLE OF CONTENTS

Wolf Awareness
Research • Education • Conservation

wolfawareness.org wehowl.ca

Photo courtesy of Peter Dettling

Executive Summary

Compound 1080

One teaspoon of Compound 1080 can kill up to 100 adult humans and there is no antidote.

Sodium Monofluoroace, commonly called Sodium fluoroacetate or Compound 1080 is one of the most toxic poisons used in Canadian farming. Regulated under the federal Pest Control Products Act (PCPA) it is currently authorized for use as a predacide in two provinces, Alberta and Saskatchewan, to kill wolves and coyotes which are suspected of livestock depredation. The poison is available in two forms: i) 5 mg tablets which are placed in meat baits set out to attract the predator(s) or, ii) in liquid bladders that fill collars worn by livestock. These devices, known as Livestock Protection Collars or LPCs, are worn around the neck of sheep or goats and contain liquid packets of 1080 intended to kill canids should a neck bite occur. Compound 1080 has also been intentionally used to poison rodents and rabbits and does not discriminate among its animal victims.

Compound 1080 poses a threat to species at risk and biodiversity

While Compound 1080 is mainly used to target wild canids in Canada, many other animals have been unintentionally killed by it including endangered species, livestock and pets. In a study done shortly before 1080 use was abandoned in the province of B.C., 20-28% of wolf baits were taken by non-target species (BCMOELP 1999). Prior to the 1972 ban on predator toxicant use on federal lands in the U.S., Dick Randall - a US federal predator control supervisor - found Compound 1080 in the carcasses of golden eagles, bobcats, black bears, pine martens, badgers, dogs and Canada Jays (Defenders, 1981). The poison is believed to be at least partly responsible for the decline of several species at risk in North America, including a drastic 71% decline of a breeding colony of Burrowing Owls over a two-year period, and declines in Swift fox, California Condor and Black-footed ferrets in the U.S.

The use of this poison is of great concern as several species at risk inhabit rural areas across Alberta and Saskatchewan where Compound 1080 is permitted including Swift fox, American badger, Grizzly bear, Burrowing owl and Short-eared owl.

Compound 1080 poses a serious and unacceptable threat to the health and safety of Canadians

One teaspoon of Compound 1080 can kill up to 100 adult humans and there is no antidote. Labelled as a Class 1a poison (the most toxic category) by the World Health Organization (WHO) and considered a super poison by the U.S. Environmental Protection Agency, Compound 1080 is a colourless, odourless salt that is highly soluble in water. The FBI includes Compound 1080 on its list of highly toxic pesticides considered likely to be used by terrorists. Compound 1080 has resulted in human fatalities in North America (CCWHC 1999).

The federal government has devolved the responsibility of administering and monitoring Compound 1080 to provincial governments each time a 5-year use permit is issued. In some cases, the responsibility to handle and record the product is delegated to the municipal level of government, whom have been known to distribute tablets of Compound 1080 to land-owners. Our research suggests that this dangerous product is not regulated well enough in Canada to ensure the public's safety, nor to ensure protection from environmental harm through other non-target deaths.

Furthermore, the Agency has stated that un-degraded Compound 1080 is considered mobile and therefore may move downward in the soil and reach ground water (PDI 2002). Published and unpublished data indicate that for terrestrial uses small quantities of the chemical can potentially reach and contaminate groundwater (EPA 1995) which could have dire consequences.

Poisoning with Compound 1080 is an inhumane killing method

Compound 1080 poisoning is widely acknowledged as an inhumane method of killing animals due to the intensity and duration of the suffering it causes (Sherley 2007, CVMA 2014). Animals that ingest it can suffer excruciating pain for several hours; even days before finally losing consciousness.

In her review of literature, Sherley (2007) cites several painful or distressing symptoms of 1080 poisoning, stating that most animals that have been poisoned by 1080 present a variety of signs including: lethargy, retching and vomiting, trembling, fecal and urinary incontinence, unusual vocalizations, hyperactivity, excessive salivation, muscular weakness, uncoordination, hypersensitivity to nervous stimuli and respiratory distress.

The use of Compound 1080 and other poisons to kill wildlife is in violation of several standards for animal welfare set by experts. Use of 1080 goes against Canadian Council on Animal Care (CCAC) Guidelines and the International Union for the Conservation of Nature (IUCN) Wolf Manifesto. The Canadian Veterinary Medical Association denounced the use of Compound 1080 (and strychnine) in a position paper published in 2014 due to the severe pain and convulsions these poisons cause.

Compound 1080 has been banned in several jurisdictions

Numerous jurisdictions around the world have banned Compound 1080 due to the potential threats of this highly toxic substance.

For the above reasons, Compound 1080 and all its derivatives should be banned from Canada, with an immediate moratorium placed on its use and handling until this is achieved.

The following is a list of 22 jurisdictions that have banned compound 1080 or a derivative of it, showing year of ban.

Fluoroacetimide (1081) Bans	
Brazil	2002
Bulgaria	2004
China	1982*
Cyprus	1991*
Gambia	1997*
Guyana	2006
Korea	1991*
Kuwait	1975*
Mexico	1982*
Nigeria	1998**
Pakistan	Never registered*
Panama	2002*
Philippines	1981*
Russian Fed'n	1988*
Thailand	1985*

Fluoroacetic acid Bans	
Austria	1992*
Germany	1986*
Panama	1987*
Slovenia	1997*

Sodium fluoroacetate (1080) Bans	
Belize	1985*
Caper Verde	1990***
Columbia	1969*
Cuba	1990*
Germany	1985*
Mexico	1982*
Philippines*	
Slovenia	1991*
Thailand	1995*

* Consolidated List of Products - Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments, Eleventh Issue - Pharmaceuticals. United Nations - New York.

** Consolidated List of Products - Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments, Thirteenth Issue - Pharmaceuticals. United Nations - New York, 2009

*** Consolidated List of Products - Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments, Fifteenth Issue - Pharmaceuticals. United Nations - New York, 2009.

2.0 BACKGROUND

Sodium Monofluoroace, commonly called Sodium fluoroacetate or Compound 1080 is a highly toxic substance, historically used as to kill vertebrate species considered undesirable ("pests") by humans. In Canada, it is still used to intentionally kill wolves and coyotes. The use of this slow-acting compound is highly controversial as it presents great physical dangers to wildlife, domestic animals and humans. Moreover, the ecological impacts of this compound are long-lasting and-far reaching due to several of its properties, including that it is water-soluble, colourless, tasteless, odorless and toxic in extremely low doses.

There is no antidote to 1080. It is highly toxic to mammals and birds and has varying potential toxicity levels on fish and invertebrates. Because of its non-selectivity (PMRA 2014), Compound 1080 has killed humans, pets, eagles, badgers, bobcats, raccoons, bears, wolves, coyotes and various other wildlife species (Defenders 1982). The residual poison left in the tissues of 1080 victims is toxic to scavengers (Defenders 1982). Animals that ingest non-lethal doses of the poison have reduced survival after being weakened, as individuals depend upon alertness, agility, and coordination to survive.
As a water-soluble salt, Compound 1080 has the potential to form significant peak downstream concentrations if released in a water supply (Field 2002). 1080 decomposes slowly in soil in low temperatures (King et al. 1994) and it can take several weeks to months to break down (Eason 1997).

Through petitioning the EPA, this poison has been fully banned in several US states (California and Washington State). Where it remains in use, 1080 cannot be placed in baits but must be worn around the neck of a sheep or goat as a Livestock Protection Collar (LPC). Numerous other member countries of The Organization for Economic Co-operation and Development (OECD) have fully banned Compound 1080 or its derivatives, which should trigger Canada to do the same.

Compound 1080 acts on the central nervous and cardiovascular systems, debilitating animals for many hours before they die from lung or heart failure following the shut-down of cellular metabolism. A scientific literature review assessing the humaneness of 1080 as a vertebrate pest control concluded that 1080 should not be considered a humane poison (Sherley 2007).

Photos courtesy of: Lynx and Black Bear - Kerri Martin; Grizzly Bear and Wolf - Wendy Chambers

3.0 HISTORY AND USE

Sodium fluoroacetate was first synthesized in Belgium in 1896 by a man named Swartz. It was not used as a rodenticide until the early 1940s (Proudfoot et al. 2006, Fagerstone et al. 1994, Cluff and Murray 1992, Randall 1981). 1080 has since been used around the world as an agricultural pest control method principally for rodents, rabbits, and some carnivores (BCME 1991).

During World War II, a shortage of strychnine and red squill in England and the United States created a need for development of other rodenticides (Fagerstone et al. 1994). In 1944, a sample of sodium fluoroacetate was among the test chemicals, with attached catalog number of 1080 which hence become its common name. During the late 1940s and 1950s killing efficacy tests were conducted using this poison on predatory mammals, furbearers, and birds of prey (Fagerstone et al. 1994, Randall 1981). The U.S. Fish and Wildlife's Denver Research Centre demonstrated that canids had a low sodium fluoroacetate tolerance level and that most wildlife required more poison per unit of body weight than canid species to be lethal (Randall 1981). Accordingly, researchers theorized that "when a measured amount of 1080 is injected into a bait, it becomes a selective poison" (Randall 1981). Thereafter, 1080 was used as a predacide to control problem coyotes (Canis latrans) throughout the United States (Fagerstone et al. 1994).

In Canada, provinces with important agricultural areas are generally concerned with the management of wolf and coyote predation on livestock, with concerns around other carnivores too. Ontario, Saskatchewan, Manitoba, Alberta, and BC offer financial compensation to ranchers who lose livestock to natural predators (Sadie Parr, pers. comm 2018).

in 2018, the Tull Chemical Company, based in Oxford, Alabama, finally closed its doors to manufacturing 1080 after decades of production. It was the only legal manufacturer of 1080 and holder of the technical product worldwide for decades. It is unknown where the product will be manufactured in the future.

Photo courtesy of Kerri Martin

3.1.0 1080 IN CANADA

Health Canada's Pest Management Regulatory Agency (PMRA) regulates the use of sodium fluoroacetate as an animal toxicant used to "control" (ie. kill) problem wolves and coyotes (PMRA 2014). In Canada, sodium fluoroacetate is classified as a restricted-class product (PMRA 2015) regulated under the federal Pest Control Products Act (S.C. 2002 C.28). This Act in its preamble sets out the need to protect human health and safety and the environment by regulating these products.
Five-year permits for use of 1080 are issued by the Agency to provinces and territories that apply. Permits come with a list of conditions for use, referred to as 'the label'. For a list of approved registration and use of 1080 in Canada, see Appendix 1.

Photo courtesy of Ann Brokelman

Judith Samson-French, DVM, MSc.
Banded Peak Veterinary Hospital
Bragg Creek, Alberta

As humans, it is our shared responsibility to ensure that whenever an animal's life is taken, it is done with as little fear, pain, and distress as possible.

To achieve this, there must be a rapid loss of consciousness followed by cardiac and respiratory arrest, and thus brain function. Unconsciousness, i.e. a loss of awareness, happens when the brain is so disrupted that it can no longer integrate information.
Pain can be perceived while not yet unconscious.

Thus, the use of the toxicants strychnine, Compound 1080 (sodium fluoroacetate), and sodium cyanide, is extremely problematic and unacceptable as a killing method because each fail to induce rapid loss of consciousness and each produces a great amount of fear, pain, and distress.

It is equally distressing to know that the kill may not always come from a high enough dose of the poison itself. Instead, causative physiological impairments affecting hunting, predator evasion and ambulatory behaviours become compromised, lasting for days, and further contributing to animals' misery and demise.

As a veterinarian committed to animal health and welfare and a former Alberta Fish & Wildlife biologist, I vehemently oppose the use of these toxicants as a method of responsible wildlife management since poison has not been scientifically proven to achieve sustainable population control, its use is not socially acceptable, and the fact remains that under ANY circumstances the use of these poisons cannot be justified as humane.

3.1.1 HANDLING AND DISTRIBUTION

When a province or territory obtains the required permit through the federal Pest Management Regulatory Agency, such as Alberta and Saskatchewan presently have, Compound 1080 can be legally applied as meat baits containing tablets or as a collar device on livestock, referred to as a Livestock Protection Collar or LPC (PMRA 2014). These collars have been known to leak poison, become lost, be chewed through by livestock, and/or become punctured by barbed wire, thorns, etc. (Randall 1981, Defenders 1982, Animal Welfare Institute et al. 2017), causing great risk to sheep and goat handlers (G. Connolly et al. 1978) as well as myriad other non-target animals.

'The label' allows for the use of the restricted substance with general limitations on bait size by species, and "general operating conditions" (BCME 1991 and PMRA 2015). Additionally, the provincial permit dictates the number and deployment of coyote and wolf baits permitted as well as required methods for disposal (BCME1991 and PMRA 2015).

Currently, Canadian public and wildlife are subject to the use of Compound 1080 in two provinces; Alberta and Saskatchewan (PMRA 2014). These provinces have been authorized by the Government of Canada to use this highly toxic substance as a pest control product. The application of use ranges from 1 - 12 tablets (5 mg/tablet of Compound 1080) in meat baits or one 60 mL collar device per livestock animal (10 mg/mL) (PMRA 2014).

In 2014, PMRA removed the following limitation (pg. 7),

> "remove and destroy poison bait within 30 days of placement between April and October 31st and within 90 days of placement between November and March 31st."

These use restrictions are now lacking in Canada and there is no clear time-frame for removal of baits or of poisoned victims.

The federal government has devolved the application of this highly toxic substance down to the provincial governments.

These use restrictions are now lacking in Canada and there is no clear time-frame for removal of baits or of poisoned victims.

Saskatchewan requires Compound 1080 to be handled by trained predation control officers. However, Alberta further transfers this significant responsibility to municipal governments and then beyond to members of the farming community.

The province of Alberta has done this pursuant to Section 45 of the Pest Control Products Act. In Alberta's own comprehensive Coyote Predation Control Manual and Study Guide, (revised 2016), and subject to Alberta's Agricultural Pests Act, the province has stepped aside from the responsibility of monitoring and inspecting 1080, and assumes this upon local municipal governments, who are also given to training the end-users (ie. landowners). In many cases, the actual distributor of 1080 is the landowner.

Photo courtesy of Paula Longshore

Photo courtesy of Ann Brokelman

Non-applicators, especially children, could come into contact with Compound 1080

This is in contravention to more strict regulations ensure that only certified Commercial Applicators can handle 1080, such as in the U.S. The Environmental Protection Agency (EPA) has noted that "Non-applicators, especially children, could come into contact with Compound 1080 if the pesticide were stored, transported, or applied negligently" (pg. 11, USA EPA, Special Pesticide Division 1980).

In Alberta, researchers or other personnel can also be contracted out as authorized by the Government of Canada Pest Management Regulatory Agency following specific provisions outlined in Alberta Fish and Wildlife Division's "Standards and Procedures Manual 1999".

Photo courtesy of Kerri Martin

3.1.2 MONITORING AND REPORTING

The delegation of Alberta's 1080 use and administration to municipal officials who are responsible for their own inspection and recordkeeping of 1080 distribution, brings great trepidation.

A brief investigation we undertook showed that Canada's standards for monitoring and reporting of 1080 use are lax and inadequate. Records obtained through the Freedom of Information Process for the period between January 1, 2011 through December 31, 2016 reveal data collection is inadequate and indicate that record-keeping is not up to the required standards, yet this is not being enforced.

Our findings show that 1080 products are not used to ensure the public's safety nor the protection of wild and domesticated animals that are not the intended targets, nor is 1080 being adequately monitored. During our efforts to gather records, we determined that between 2011 and 2016, eight cases were reported in Alberta where 1080 baits had been set and consumed but no carcasses were recovered (E17-G-0418). Records from Saskatchewan (ENV 209/17G) also showed that baits were consumed without any carcasses recovered and lack required information regarding the disposition of baits, collars, or carcasses.

Other records provided no information after 1080 bait was set. We also established that records are missing from several jurisdictions in Alberta (AF 2017-G-0010 - see Appendix 3). Further disconcerting to read in reports provided were descriptions of tablets "melting", "crumbling", or "dissolving" which indicate improper storage of the tablets, and is inconsistent with label requirements (AF 2017-G-0010). During the same time period in Saskatchewan there are discrepancies between provincial and local records that were provided (Saskatchewan Freedom of Information Request: 2017- 558-16G).

A similar scrutiny of BC's historical daily use records for a previous 1080 use permit (1996 - 1998) indicates that monitoring and enforcement of the terms of use were lacking and contraventions occurred, see Section 3.1.4. Likewise, several audits by the USDA Office of the Inspector General found the USDA Wildlife Services' maintained sloppy inventory control and could not properly account for stockpiles. In Nov. 2007, USDA Wildlife Services' admitted it had endured a "wake of incidents" that involved Compound 1080 (G. Allan pers.comm.).

Although provinces (and municipalities) play a role in regulating the sale, use, storage, and disposal of Compound 1080, these products are registered for use in Canada by the federal government, who thus has the responsibility to amend concerns raised.

Photo courtesy of Peter Dettling

3.1.3 PEST MANAGEMENT
REGULATORY AGENCY'S DECISION TO RENEW 1080

In 2004 (PMRA 2004), and again on May 27, 2014, the Pest Management Regulatory Agency reapproved the use of 1080 following a re-evaluation and special review (PMRA 2014).

In 2014, new label requirements for products containing 1080 were set forward by Health Canada's PMRA as additional key risk-reduction measures for death of non-target species. These included:

- Burying of multi-dose baits for the control of coyotes;
- Placement of tablets deep into cuts made in carcasses to reduce exposure to scavenging birds;
- Destruction and disposal of poisoned carcasses;
- Disposal of vials or unused Compound 1080 product; and
- Addition of a statement prohibiting use of Compound 1080 in designated areas where species at risk exist.

The update label requirements have not addressed our concerns for the following reasons:

- Tablets placed deep into cuts, as well as the poisoned tissues surrounding these, will eventually become more exposed to scavenging birds (and other animals) as a carcass is consumed.
- Even if poisoned carcasses are disposed of or destroyed, there are likely to be animals that wander off before dying which are not collected and therefore remain on the landscape as a threat to others though secondary poisoning.
- Labels and warning signs cannot prevent public safety or environmental damage incidents if they are not being heeded. In addition, human error, accidents and mistakes occur and are highly possible when handling this highly toxic substance, not to mention intentional misuse.
- Given the high toxicity of this poison, even sporadic non-compliance with Health Canada's conditions for use should indicate that the risks outweigh any perceived benefit.


Photo courtesy of Ann Brokelman

An additional concern is the inconsistency of regulations. For instance, the very first key risk-reduction measure listed under the amendments from PMRA's review on page 4 (2014) is negated on page 5 by stating that in certain circumstances, carcasses killed by coyotes that are left out as "poisoned baits are not required to be buried".

LPC's were not re-evaluated during PMRA's review of 1080 in 2014, which is disconcerting given they provide serious threats.

See Appendix 2 to view a copy of the current labels for 1080.

Photo courtesy of Peter Dettling

3.1.4 CASE STUDY: CARNAGE & MISUSE LEADS BC TO DISCONTINUE 1080 USE

The province of British Columbia's last federal permit to use 1080 expired in December 2002 (PMRA 2002). Prior to that, BC had a valid permit to use 1080 to kill coyotes and wolves conflicting with livestock (PMRA 2002).

Pesticide use and Pest Management Plans for the use of pesticides were issued through the province's former Ministry of Water, Land, and Air Protection (D. Cronin pers. comm.). Before its use ended, Compound 1080 was used in BC only by licensed and trained conservation officers (M. Badry pers. comm.).

The province of British Columbia began using Compound 1080 in 1949 and the poison was distributed in most of central and northern B.C. throughout the 1950s as part of a 'long-term indiscriminate wolf reduction program' (Cluff and Murray 1992).

Poison baits were dropped by aircraft onto frozen lakes and rivers and left unchecked (Cluff and Murray 1992). In 1961, this method of extensive poisoning ceased but localized wolf removal using 1080 continued in grazing areas where livestock was considered heavily hunted (Cluff and Murray 1992).

By the end of 1978, a moratorium on poisons was declared across the province. Until that time, wolves and coyotes were killed with strychnine, Compound 1080, cyanide pill baits, as well as shooting and trapping (Pettigrew 1990).

The moratorium was ineffective in reducing poisoning by outfitters and guides however, (Cluff and Murray 1992) leading to additional constraints being put forward in 1980. Accordingly, the total number of wolf baits used across the province of BC was restricted to 250/year. In addition, the very first Pesticide Use Permit for Compound 1080 was issued (Pettigrew 1990) and new regulations included that no more than 12 individual baits could be set at a single confirmed depredation site (Tompa 1983a,b, PMRA 2002).

As of 1983, Pesticide Use Permits for 1080 became issued for five-year terms which were reviewed annually. The maximum quantity of poison bait allowed for individual use annually was 6.5 grams (1/5 oz.) (Pettigrew 1990). 13 mg baits were initially used to kill wolves in BC but dosage was increased to 20 mg in 1991 (BCME 1991).

For several years in the 1990's, the BC Ministry of Environment's use of Compound 1080 was opposed on behalf of the Thompson Watershed Coalition in a campaign led by Browen Boulton, who was Media Coordinator for the Public Relations Department at The University College of the Cariboo. In 1992, Boulton was the petitioner (Thompson Watershed Coalition) in an

unsuccessful appeal of the BC Government's 1080 permit. In 1993, Boulton challenged ministry records before the environmental appeal board highlighting that of 1,198 wolf baits set from 1988 to 1992, 28% of poisoned baits were taken by non-target animals (B. Boulton pers. comm.).

Boulton argued that it is impossible to accurately estimate or record the number of non-target animals taken by 1080.

In 1998, the BC government reapplied for a 1080 use permit but several First Nation communities within the region, as well as other concerned residents wrote protest letters to the government (B. Boulton. pers. comm.). When the next permit period approached Boulton and other residents lobbied the government to stop the use of 1080 and other poisons used for "wildlife control".

The NPD's Environment Minister, Cathy McGregor, ordered a review on the effects of Compound 1080 to determine whether BC's poisoning program was humane. Meanwhile a moratorium was placed on the use of 1080 owing to the outcry against poisoning. After major lobbying from the BC Cattleman's Association, McGregor considered reinstating 1080 use. At that time, Boulton informed the deputy administrator of the permit process in Prince George that she intended to appeal because she had discovered from daily use records during the permit period 1996-1998 that certain required conditions were not followed (B. Boulton. pers. comm.). For example, the time between bait placement and checking bait stations exceeded the 14-day window at times. In addition, 1080 baits were placed repeatedly during summer months when the province of BC restricted–use pesticide requirements include the removal of baits before spring thaw (B. Boulton pers. comm.). Pesticide use contrary to label directions is illegal according to the Pesticide Management Act. The proposal from the Minister of the Environment to reinstate the 1080 permit was dropped thereafter (B. Boulton pers. comm.).

Data collected over the last three years of BC's final 1080 usage permit (January 1996 to December 1998) show that a total of 484 known wolf baits were placed, (315 baits/year were permitted) along with 107 known coyote baits (150 baits/year permitted) (BCMLP 1999.). An average of 118 wolves (73%) and 33 coyotes (93%) took their respective baits annually during this period (BCMLP 1999). The annual average of wolves that took 1080 baits during this period had increased significantly from the previous permit, during which an average of only 57% of wolves were reported to have taken the poisoned baits annually (BCME 1993).

Photo courtesy of Mike McKinley

Following the expiration of BC's federal permit to use 1080 as a predacide in 2002 it has not since been renewed. To date there has not been an official permit application for the use of 1080 made by the BC ministry of agriculture (D. Cronin, pers. comm. and Gary Allan pers. comm).

3.2 1080 IN THE UNITED STATES OF AMERICA

Photo courtesy of Peter Dettling

February of 1972 U.S. President Nixon signed an Executive Order which prohibited the use of chemical toxicants as predacides and prohibited toxicants that caused secondary poisoning on federal lands or by federal agencies (Fagerstone et al. 1994, Defenders 1982). In March 1972, the U.S. Environmental Protection Agency (EPA) ordered cancellation and suspension of Compound 1080 as a predacide. The banning of the poison was due to its high toxicity and protests by scientists and conservation organizations (Defenders 1982, Randall 1981). The ban also followed the release of the Cain Report (1971), a federal study on managing predators which rated the overall use of Compound 1080 as poor as a control technique. In the U.S., the Cain Report is considered a landmark when questioning the humaneness of methods surrounding predator control (Defenders 1982). Pesticides in the U.S. are registered by the EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

The US Environmental Protection Agency determined the following risks were met or exceeded by Compound 1080

i) lack of emergency treatment

ii) acute toxicity to mammalian and avian species

iii) significant reductions of non-target organisms and fatalities to members of endangered species.

Since the predacide ban in 1972, Compound 1080 has not been used in the USA federally for general predator control (Gary Allan pers. comm. 2014 and Fargerstone et al. 1994). However, 1080 was once again legalized by the EPA in 1986 for limited use following intense lobbying by the livestock industry. The U.S. Department of Agriculture's Animal Damage Control (ADC) approved the use of Compound 1080 to be used only in Livestock Protection Collars (LPCs), which are currently permitted for selectively killing problem coyotes, foxes or wolves preying on domestic sheep and goats (Burns and Connolly

1995), and must be handled only by trained, certified applicators (EPA 1995).

The decision to allow the use of LPCs was controversial and appealed unsuccessfully by fourteen conservation groups (Sibbison 1984). LPCs can be registered for use by Wildlife Service's personnel (API 2002). Their use remains controversial. Voters in California and Washington states voted to ban the use of 1080 livestock collars in 1998 and 2000 respectively. In 1998, the Governor of Oregon discontinued the use of the collars (API 2002), where they have not been used since. In 2009 the EPA was forced to reinitiate consultation with the Fish and Wildlife Service in response to a petition filed by Sinapu and ten other groups (EPA Web Archive). The petition was in response to public concern that threatened and endangered species were being harmed by Compound 1080 (in LPC's) as well as M-44 sodium cyanide ejectors. The Agency, however, denied the petitioners' request to cancel and suspend the registrations of these pesticides. (EPA Web Archive).

In March 2017, United States Congressman Rep. Peter DeFazio introduced legislation to ban Compound 1080 and sodium cyanide in bill H.R. 1817, called the Chemical Poisons Reduction Act (Defazio 2017). The bill is supported by the national wildlife advocacy group Predator Defense, as well as the Humane Society. The Congressman's bill introduction came shortly after five animal welfare and conservation organizations submitted a petition to the EPA seeking cancellation of the Nation's registration for Compound 1080, on the grounds that its use is in violation of FIFRA. According to the petition (Animal Welfare Institute et al. 2017), because coyotes have never been declared a pest or found to be "injurious to health or the environment," as defined under FIFRA, pesticides (including Compound 1080) cannot lawfully be used to kill the animals.

Photo courtesy of Peter Dettling

4.0 CONTROVERSY SURROUNDING COMPOUND 1080

4.1 TOXICITY OF COMPOUND 1080

Compound 1080 is a highly toxic chemical belonging to the "Fluoroacetic Acid" chemical family (EPA 1995). The poison is labeled a "super poison" by the US Environmental Protection Agency (EPA 1995). It is a Category 1a "Extremely Hazardous" poison (the most toxic category) according to the World Health Organization (2009). Compound 1080 is highly toxic to all warm blooded animals when ingested (EPA 1995).

Compound 1080 can be absorbed through respiratory and gastrointestinal tracts or open wounds and can also be absorbed slowly through intact skin (EPA 1995, WHO 2009).

Photo courtesy of Ann Brokelman

Photo courtesy of Ann Brokelman

4.2 SELECTIVITY OF COMPOUND 1080

Among all poisons used to kill wildlife, Starlicide, a chemical avicide (poison targeting birds), is the only poison known that is toxic to just one taxon, in this case, avian species (Cain et al. 1972). No other poisons are selective in this manner.

Compound 1080 was originally believed to be specific to canids, because canids are up to ten times more susceptible to the poison compared to most other mammals, however, veterinarians of the Canadian Cooperative of Wildlife Health (1999) classified 1080 as "moderately selective for canids". Although variation in toxicity of poisons to various animals exists, this alone does not guarantee selectivity (Cain et al. 1972).

4.2.1. Primary and Secondary

Poisoning

Poison baits are often the subject of vigorous debate over the impact they have on non-target animals

Poison baits are often the subject of vigorous debate over the impact they have on non-target animals, including endangered species, domestic animals, companion animals and humans. There is an agreement in the literature reviewed that Compound 1080 poison used in livestock protection collars or in baits can cause primary and secondary risks of poisoning to non-target animals, (PMRA 2014, Sherley 2007, Hjertass et al. 1995, Defenders 1982 and US EPA 1985 Position document 2).

Compound 1080 is not fully broken down by the body's metabolism and consequently can poison other animals feeding on contaminated carrion or their vomit, a process termed secondary poisoning. Veterinarians have concluded that canids will generally vomit shortly after oral exposure to 1080, thus the amount of toxin in the gastrointestinal tract is reduced. D. Randall observed that canines often travel far distances eafter ingesting 1080, vomiting along the way and subsequently distributing the poison through a vast area before dying (Defenders 1981).

Before death, toxin remaining in the body is distributed broadly via blood flow to many tissues, principally the skeletal muscle (CCWHC 1999). Scavenging animals are then exposed to secondary poisoning by feeding on poisoned carcasses. Scavenging birds will consume toxin remaining in the digestive system and fly away prior to succumbing to death. This secondary and even tertiary poisoning is a risk for non-target animals that scavenge on poisoned carcasses (Cain et al. 1972).

In Australia and New Zealand, secondary poisoning by Compound 1080 has been deliberately and effectively used as a widespread killing agent for animals considered “exotic” species, i.e. not native to the island (Proudfoot et al. 2006), Compound 1080 has been used as a predator killing agent for ferrets, stoats (mustelid family) and feral cats (felid family), proving that the toxin is not selectively poisonous to animals in the canid family (CCWHC 1999).

4.2.2 NON-TARGET WILDLIFE SPECIES AND SPECIES AT RISK

Despite the primary purpose of Compound 1080 to kill coyotes and wolves in North America, it is widely recognized that this poison is a toxic chemical that can affect a wide variety of vertebrates and invertebrates. There are serious valid concerns over the impact 1080 has on non-target animals including rare or endangered species as well as domestic and companion animals (PMRA 2014,Sherley 2007 and United States Prevention, Pesticides EPA 1995).

Photo courtesy of Ann Brokelman

Sodium fluoroacetate is in fact toxic to most mammals, to different levels, and poses a serious and unnecessary risk to non-target wild and domestic species (Burns and Connolly 1995, CCWHC 1999 and PMRA 2014). In addition, since the exact lethal dose is unknown for some species the deployment of 1080 baits, as specified in the Alberta permit for instance, can pose a primary hazard to small felids, mustelids, foxes, and domestic dogs and cats (CCWHC 1999). Endangered species are at risk when near Compound 1080 baits or toxic carrion.

Generally, studies reviewing 1080 conclude that non-target species of birds and mammals, including endangered species, can be and often are exposed to primary and secondary hazards of 1080 poisoning. To illustrate the extent of secondary poisoning, consider that between 2011-2016 there were eight records from Alberta's Ministry of environment and Parks showing that 1080 baits were consumed but no carcasses were recovered (E17-G-0418).

During the tenure of a previous permit held by British Columbia, an average of 28% of wolf baits were taken by non-target species between 1988 and 1992 (i.e. 328 baits were taken by non-target species out of 1,128 baits placed for wolves) (BCMOELP 1999). Between 1996 and 1998, 20% of a total of 484 Compound 1080 baits laid for wolves were taken by non-target animals (BCMOELP 1999).

US Federal predator control supervisor Dick Randall provided an account of his government work with 1080 which illustrates its impacts on non-target animals

(Randall 1981 and Defenders 1982). Prior to the 1972 predator toxicant ban placed by President Nixon, Randall collected extensive wildlife kills scattered from 1080 bait stations between 1969 and 1972. Using tracer material (Zinc and Cadmium sulfide combined with 1080 poison) to identify 1080 victims, Randall reported the following recovered species containing tracer material: coyote, dog, black bear, badger, bobcat, pine marten, mink, weasel, golden eagle, red-tailed hawk, magpie, prairie falcon, sharp shinned hawk, Canada Jay and rough-legged hawk (Randall 1981, Defenders 1982).

In Alberta and Saskatchewan, the two provinces with active permits for 1080, use of the poison overlaps with the home ranges of several scavenging animals considered sensitive species and/or species listed under the Federal Species at Risk Act.

It is appropriate that the welfare and distress levels of both target and non-target animals be considered when assessing the humaneness of Compound 1080 (Sherley 2007).

Photo courtesy of Gustav

Persistence of 1080 in the environment in baits, and in the carcasses of poisoned carnivores, causes secondary poisoning in unintended animals. Even for those animals not directly consuming the bait, other predators and scavengers can be intoxicated by feeding on the poisoned carcass. Non-target animals that may have consumed some of the bait will not behave normally, making themselves more susceptible to predation, and thus provide yet another route for poisoning non-target animals. Affected, non-target species have included native small mammals, owls, hawks, other birds of prey, scavengers including endangered species of vulture, ravens, magpies, foxes, seed eating birds, insectivorous birds, bobcats, plus domestic dogs.

Judit Smits,
DVM, MVetSc, PhD
Professor Eco-toxicology & Wildlife Health
Faculty of Veterinary Medicine,
University of Calgary

a.) Mammals

Among non-target species susceptible to Compound 1080 poisoning, foxes are thought to be the most at risk. As canids and scavengers, they are likely to be attracted to 1080 baits placed for wolves or coyotes (CCWHC 1999).

In 2005, PMRA indicated concern around "the use of 1080 collars in areas in and nearby Swift fox habitat" (PMRA 2005, pg. 9) also noting "unknowns surrounding the use of liquid strychnine by farmers in Swift fox range".

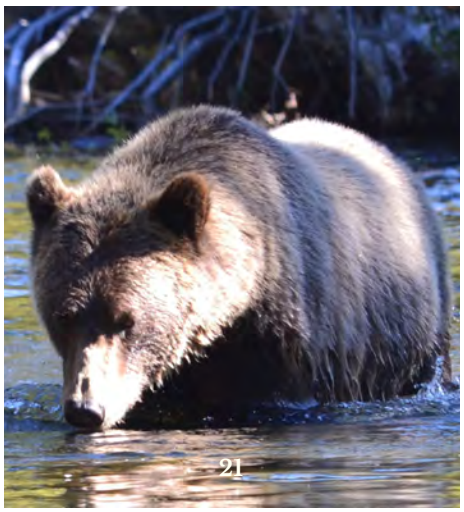
The use of 1080 as a predacide against coyotes is believed to be responsible for the decline of Swift fox (Vulpes velox) populations in California, although fortunately Swift foxes have re-colonized many of their populations since the substance has been banned on US federal lands (Ginsberg and MacDonald 1990).

One of North America's rare mammals, the black-footed ferret, is believed to have been adversely affected by 1080 in the past. It has been shown that populations suffered a great decline during the years of broadest 1080 application in the United States (Defenders 1982).

The U.S. Fish and Wildlife Service (USFWS) addressed the issue of incidental mortality of species-at-risk in 1993 by identifying restricted areas where Livestock Protection Collars (LPC) containing 1080 were not to be used, so as not to result in the incidental deaths of the federally Endangered Gray wolf or Grizzly bear (EPA 1995).

Although Saskatchewan has determined zones of restricted use for 1080 that coincide with federally threatened Swift fox habitat, these zones allow the use of Livestock Protection Collars. Swift foxes remain vulnerable to secondary poisoning from unrecovered carcasses in areas that allow 1080 in any form.

Photos courtesy of: Wolf - Peter Dettling; Grizzly - Sadie Parr; Swift Fox - Cochrane Ecological Institute



These maps have been put together to demonstrate that compound 1080 is currently being used in areas close to and within Swift Fox range occurrences. We are not able to show where liquid strychnine is being used, but this use also causes great concern.

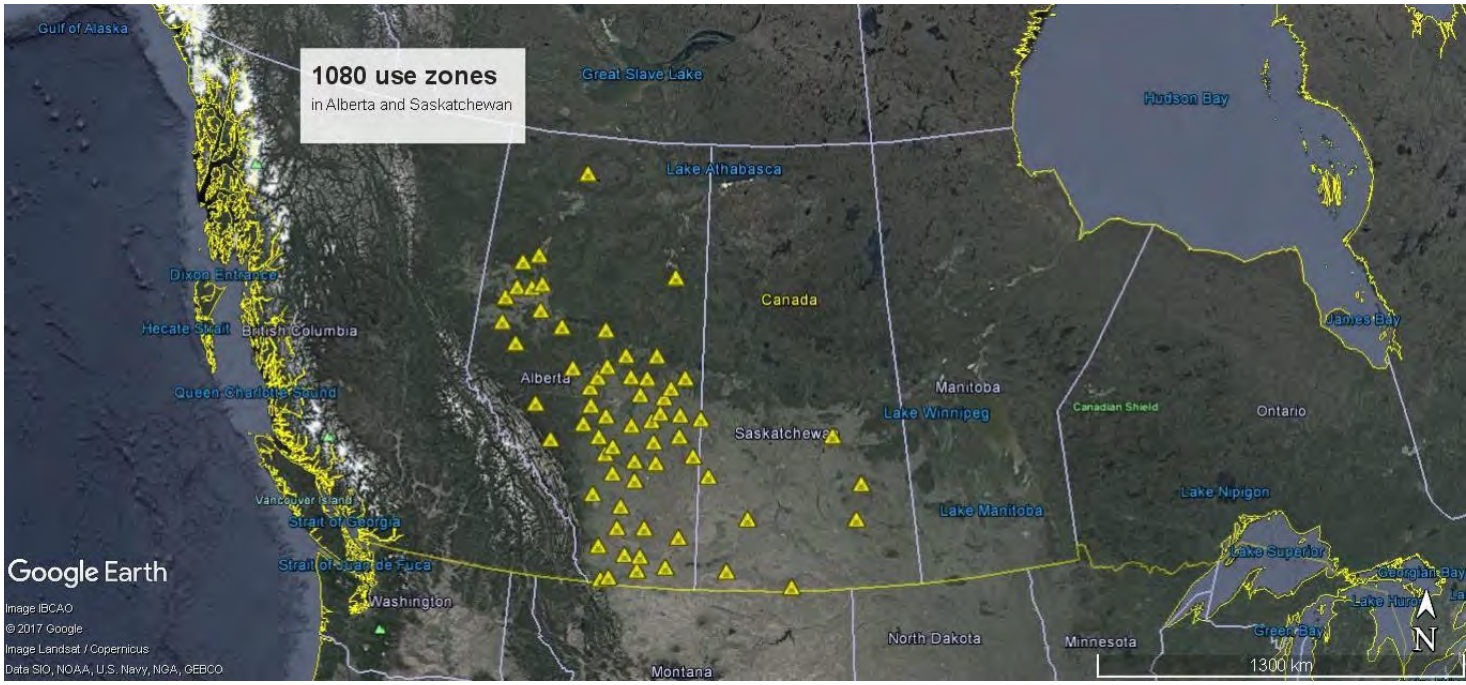


FIGURE 1 MAP SHOWING USE-LOCATIONS FOR COMPOUND 1080 IN AB AND SK 2011 – 2016. SOURCE: WOLF AWARENESS INC 2017

Swift fox – Vulpes velox
Federal Status: THREATENED in Canada (COSEWIC 2009)
Provincial Status: ENDANGERED in Alberta and Saskatchewan

Other Canadian Species at Risk in 1080 poison use zones include:
American Badger – Taxidea taxus –
Federal Status: SPECIAL CONCERN; (COSEWIC 2012).

Wolverine – Gulo
Federal status: –Special Concern (COSEWIC 2014)

Grizzly Bear – Ursus Arctos
Federal status: –Special Concern (COSEWIC 2012)
Provincial Status: THREATENED in Alberta

Long-Tailed weasel – Mustela frenata
Provincial Status: Alberta: SENSITIVE (GoA 2017, 2015)
Saskatchewan: N/A

Canada Lynx– Lynx canadensis
Provincial Status: Alberta: SENSITIVE (GoA 2017, 2015)
Saskatchewan: No evaluation

b). Birds

Tests for toxicity to avian species conducted in 1995 for the US Environmental Protection Agency's (EPA) reassessment of 1080 show that the poison is highly toxic on “an acute oral basis” (1995). The Agency (1995) reviewed toxicity data, which indicate that scavenging birds, mainly raptors, appear to have a lower sensitivity to sodium fluoroacetate than mammals in general. Other avian species may be more susceptible to the poison.

The Canadian Wildlife Service (CWS) and Environment and Climate Change Canada reported in their National Recovery Plan for Burrowing Owls that data from a study illustrated that the presence of sodium fluoroacetate “laced grain on the ground surface of a prairie dog town”, may have been at least partly responsible for the drastic 71% decline of a breeding colony of Burrowing Owls for two consecutive years (Hjertass et al. 1995). Burrowing owls and Peregrine Falcons, both federally listed as Species at Risk through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), range within areas where Compound 1080 is used, in addition to other sensitive raptors.

Photo courtesy of: Golden Eagle, Burrowing Owl -- Ann Brokelman;
Peregrine Falcone - Podargus01

Peregrine Falcon - Falco Peregrinus Anatum
Federal Status: Special Concern in Canada
(COSEWIC 2007)

Burrowing Owl – Athene cunicularia
Federal Status: ENDANGERED in Canada
(COSEWIC 2006)

c). Fish and Invertebrates

There is very limited information about the effects of Compound 1080 on fish species but based on the results of tests conducted on rainbow trout (Oncorhynchus mykiss) and bluegill sunfish (Lepomis macrochirus), sodium fluoroacetate is classified in the EPA's review (1995) as "slightly toxic to cold-water fish species and practically non-toxic to warm water fish species".

According to an acute static toxicity test conducted on Daphnids (Daphniidae spp.), a common aquatic zooplankton, Compound 1080 appears to be practically non-toxic to freshwater invertebrates (EPA 1995). However, other studies indicate that when deployed in warm weather when insects are more active, Compound 1080 becomes a potential risk to invertebrates. Furthermore, insects containing residues of the chemical when consumed by insectivores can result in secondary poisoning (CCWHC 1999).

Photo courtesy of: Rainbow Trout - Norm

4.2.3 HUMAN HEALTH AND PUBLIC SAFETY

Compound 1080 has been evaluated in the past as a chemical warfare agent (Defenders 1982, Field 2002, PDI 2015) because it can and has killed humans (CCWHC 1999). Due to its extreme toxicity in small amounts and its highly water-soluble nature, the U.S. Federal Bureau of Investigation (FBI) includes sodium fluoroacetate on its list of "highly toxic pesticides" considered likely to be used by terrorists or "for malicious intent" (FBI 2001 and CIA 2004).

According to Dr. Rumack, former director of the Rocky Mountain Poison Center (Denver, CO) who has treated hundreds of patients affected by 1080, the toxicity of Compound 1080 is so extreme that a single teaspoon (5 mL) contains enough lethal doses to kill between 30 - 100 adults weighing 150lbs (Defenders 1982, PDI 2002 and API 2002). He states that it is very difficult to detect or treat 1080 poisoned patients. Human and primate symptoms of 1080 poisoning include abdominal pain, agitation, muscle spasms, vomiting, anxiety, irritability, verbosity, agitation, confusion, nausea, faecal incontinence, tetanic spasms, cardiac irregularity, gradual loss of alertness, epileptiform convulsions and partial paralysis (PMRA 2002, Sherley 2007). There is no known antidote, and symptomatic treatment of poisoning cases is only effective in approximately 50% of human cases (PMRA 2015). Dr. Rumack remarked that access to Compound 1080 poses a threat to children, wildlife, unsuspecting adults, and even trained users (Defenders 1982).

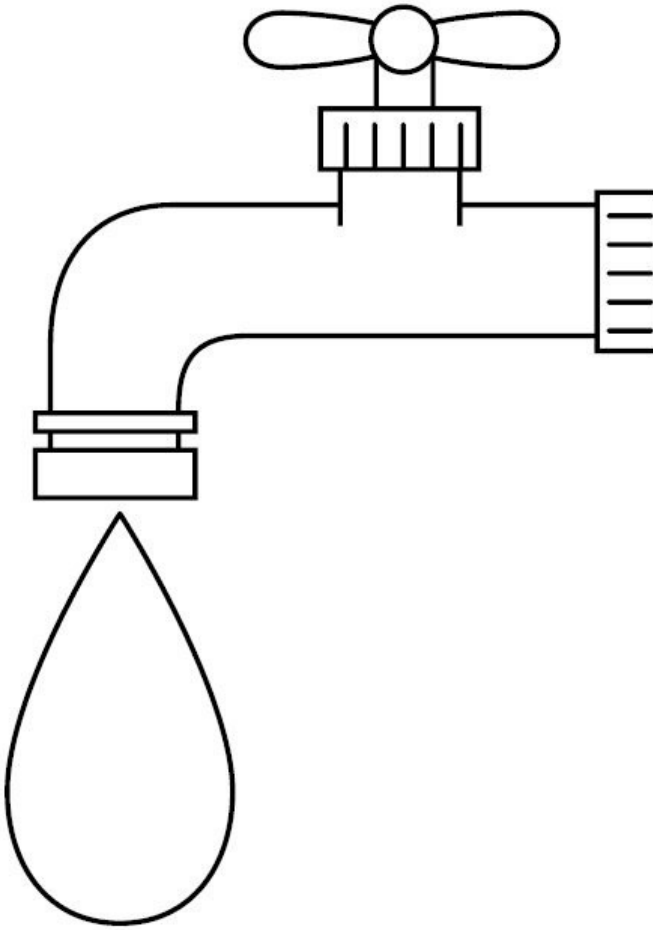
The United States EPA included the listing of 13 cases of confirmed fatalities and 5 suspected cases as a documented reason for banning the use of Compound 1080 in 1972 (Ryden 1981). A Predacide Training Manual for Compound 1080 by Saskatchewan's Ministry of Environment (2015) indicates (pg. 5) that during the 25 years that 1080 was licensed as a predacide and rodenticide in the U.S., there were 16 human deaths, 12 of which were accidental (Saskatchewan MOE FOIP 2017-558-16G, pg. 140 of 225).

To further illustrate the high probability of risk, note that between 2011 – 2016, Alberta handles and distributed a minimum of 7,325 tablets (5 mg/tab) of Compound 1080 (FOIP AF 2017-G-001). In 2012 alone, a minimum of 2200 tablets of 1080 were handled in Alberta.

" Alberta Environment and Parks (AEP) always puts public safety and the well-being of animals as our top priorities..."

Rob Simieritsch of Alberta Environment and Parks in a response letter to concerns raised about the rehabilitation of bears in Alberta, including the potential for a rehabilitated bear to be killed by Compound 1080 or other predacides on Alberta's landscape

In an article to the National Center for Environmental Assessment, US Environmental Protection Agency (2002), Malcolm S. Field, a Senior Research Hydrogeologist with the US EPA described serious concern surrounding the toxicity and lethal effects of sodium fluoroacetate in a human drinking water system. Field states that if 1 kg of sodium fluoroacetate was released in a water supply, it would produce a significant downstream peak concentration and could have significant human casualties (2002).



1080 End User	2012	2013	2014	2015	2016	5-yr min
Inspector	98	96	100	163	154	611
Land Owner	2102	1161	1153	1472	826	6714
TOTALS - Alberta	2200	1257	1253	1635	980	7325

5.0 CONCLUSION

Compound 1080 causes excruciating pain and suffering to wolves, coyotes and unintended victims, and poses a serious safety risk to Canadians.

Compound 1080

A national ban on Compound 1080 and all of its derivatives is warranted in Canada.

The capacity to kill both target species and other animals through secondary poisoning, combined with the violent symptoms prior to death, render the use of 1080 in violation of the IUCN Wolf Manifesto, Canadian Council on Animal Care Guidelines, and the Canadian Veterinary Medical Association Guidelines (CCAC 2010, CCAC 2003, CVMA 2014).

A national ban on Compound 1080 and all of its derivatives is warranted in Canada. It is one of the most toxic poisons still used in farming. Compound 1080 causes excruciating pain and suffering to wolves, coyotes and unintended victims, and poses a serious safety risk to Canadians. It is past due time to ban this product in entirety and support farmers in adopting humane and sustainable farming practices that are more effective at preventing and reducing livestock depredations through ethical and evidence-based practices.

REFERENCES

AEP (Alberta Environment and Parks). 2018. Freedom of Information and Protection of Privacy Act Request E17-G-0418

AF (Alberta Agriculture and Forestry). 2017. Freedom of Information and Protection of Privacy Act Request AF 2017-G-001.

Animal Welfare Institute, Legal Defense Fund, Centre for Biological Diversity, Project Coyote, Predator Defense. 2017. Petition to issue a notice of intent to the U.S. Environmental Protection Agency to cancel the registration of Compound 1080 (Sodium flouroacetate). Available on-line at: https://awionline.org/sites/default/files/uploads/documents/AWI-Compound-1080-Petition-and-References-01122017.pdf Accessed Aug. 30, 2018.

ASRD (Alberta Sustainable Resource Development). (2008) Advice to Minister April 17. FOIP pp 000023 - 000024.

ASRD (2008) Use of strychnine for wildlife management. June 9 report. FOIP pp 000107 - 000115.

API (Animal Protection Institute). (1999) API Position Statement on the Use of Livestock Protection Collars Containing Compound 1080. Available online at: www.api4animals.org/doc.asp?ID=676. Accessed: August 7, 2002.

BCME (British Columbia Ministry of Environment) (1991) Efficacy of Compound 1080 in Controlling Coyotes and Wolves in British Columbia. Prepared by BC Wildlife Branch, Victoria. 6 pages.

BCME (British Columbia Ministry of Environment) (1993) Final Pesticide Use Report for Permit # 139-041-88/92.

BCMOELP. (British Columbia Ministry of Environment, Lands and Parks) (1999) Final Pesticide Use Report for Permit #139-061-96/98.

Burns R.J. and G.E. Connolly. (1995) Assessment of Potential Toxicity of Compound 1080 from Livestock Protection Collars to Canines and Scavenging Birds. International Journal of Biodegradation and Biodeterioration 32:161-167.

Cain, S.A., J.A. Kadlec, D.L. Allen, R.A. Cooley, M.G. Hornocker, A.A. Leopold, and F.H. Wagner. (1972) Predator Control 1971. Report by the Advisory Committee on Predator Control to the Council on Environmental Quality and U.S. Dep. Inter. 207 pages.

CCAC (Canadian Council on Animal Care). (2010)

CCAC guidelines on euthanasia of animals used in science. ISBN: 978-0-919087-52-1

Photo courtesy of Peter Dettling

CCAC (Canadian Council on Animal Care). (2003)

CCAC guidelines on the care and use of wildlife. ISBN: 0-919087-39-6.

CCWHC (Canadian Cooperative Wildlife Health Center). (1999) 1080 Review. Unpublished report prepared for the Wildlife Branch BC Ministry of Environment, Lands and Parks, Victoria. 8 pages.

Cluff D.H. and D.L. Murray. (1992) Review of Wolf Control Methods in North America. Pp.491-504. in L. Carbyn, , S.H. Fritts, and D.R. Seip eds. Ecology and Conservation of Wolves in a Changing World.

Connolly, G. E.; Griffiths, R. E. Jr.; and Savarie, P.J. 1978. 'Toxic Collar for Control of Sheep-killing Coyotes: a Progress Report', Proceedings of the 8th Vertebrate Pest Conference, 1978.

COSEWIC 2006. COSEWIC assessment and update status report on the Burrowing Owl Athene cunicularia in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 31 pp.

COSEWIC 2007. COSEWIC assessment and update status report on the Peregrine Falcon Falco peregrinus (pealei subspecies - Falco peregrinus and pealei anatum/tundrius - Falco peregrinus anatum/tundrius) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 45 pp.

COSEWIC. 2009. COSEWIC assessment and status report on the Swift Fox Vulpes velox in Canada.Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

COSEWIC. 2012. COSEWIC assessment and status report on the American Badger Taxidea taxus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. iv + 63 pp.

COSEWIC. 2012. COSEWIC assessment and status report on the Grizzly Bear Ursus arctos in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 84 pp

COSEWIC. 2014. COSEWIC assessment and status report on the Wolverine Gulo gulo in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa xl + 76 pp

CVMA (Canadian Veterinary Medical Association). 2014. Pest Control - Position Statement. Online https://www.canadianveterinarians.net/documents/pest-control. Accessed August 9, 2018.

Defazio. P. (U.S. Congressman for the district of Oregon) media relations. 2017. Media Release: Rep. Peter Defazio introduces legislation to ban lethal poisons Compound 1080, Sodium Cyanide for predator control, March 30, 2017. Available at: https://defazio.house.gov/media-center/press-releases/rep-peter-defazio-introduces-legislation-to-ban-lethal-poisons-compound Accessed August 30, 2018

Defenders of Wildlife. (1982). 1080, the case against poisoning our wildlife. Washington, D.C., special report.

Duckworth, Barbara. Posted May 28, 2015 in the Western Producer Newspaper. Livestock Losses to wolves rising in BC. Available online at http://www.producer.com/2015/05/livestock-losses-to-wolves-rising-in-b-c/. Accessed June 10, 2015.

Eason, C.T., 1997. Sodium monofluoroacetate toxicology in relation to its use in New Zealand. Australasian Journal of Ecotoxicology, 3(1), pp.57-64.

Photo courtesy of Peter Dettling

Eason, C.T., Ross, J. and Miller, A., 2013. Secondary poisoning risks from 1080-poisoned carcasses and risk of trophic transfer—a review. New Zealand Journal of Zoology, 40(3), pp.217-225.

EPA (Environmental Protection Agency) 1995. Reregistration Eligibility Decision (RED)Sodium Fluoroacetate. United States Prevention, Pesticides EPA 738-R-95-025 Environmental Protection And Toxic Substances. 72 pages

EPA (Environmental Protection Agency) (1995) (RED FACTS)_Sodium Flouroacetate. United States Prevention, Pesticides EPA-738-F-95-022 Environmental Protection And Toxic Substances.

EPA Web Archive. Pesticides: Regulation. http://www.epa.gov/pesticides/reregistration/sodium_fluoroacetate/index.html. Accessed June 10, 2015.

Field, Malcolm S. 2002. Development of a Counterterroism Preparedness Tool for Evaluating Risks to Karst Spring Water. US Environmental Protection Agency, National Centre for Environmental Assessment (86230), Washington, DC 20460. Paper presented at U.S. Geological Survey Karst Interest Group Proceedings, Sheperdstown, West Virginia, Aug. 20-22.

Fagerstone K.A., P.J. Savarie, D.J. Elias and E.W. Schafer Jr. (1994) Recent Regulatory Requirements for Pesticide Registration and the Status of Compound 1080 Studies Conducted to Meet EPA Requirements. Pp 33-38 in A.A. Seawright and C.T. Eason, eds. Proceedings of the Science Workshop on 1080.

FBI. (Federal Bureau of Investigation) (2001). FBI contacts for suspicious pesticides / OP nerve gas incidents. Available on line at: www.comunityipm.org/docs/FBI_alert.doc Accessed: August 10, 2002.

Ginsberg, J.R. and D.W. MacDonald. (1990) Canid Action Plan with updated references: from Foxes, Wolves, Jackals, and Dogs, an action plan for the conservation of canids the IUCN/SSC Canid Specialist Group's 1990 Action Plan IUCN/SSC Canid Specialist Group IUCN Wolf Specialist Group (L.D. Mech, Chair) . IUCN Publications. 116 pages. Available online at: https://portals.iucn.org/library/sites/library/files/documents/1990-008.pdf Accessed August 26, 2018.

Photo courtesy of Peter Dettling

Government of Alberta. 2017. Alberta Wild Species General Status Listing - 2015. 24pp. Available at: http://aep.alberta.ca/fish-wildlife/species-at-risk/albertas-species-at-risk-strategy/general-status-of-alberta-wild-species/documents/SAR-2015WildSpeciesGeneralStatusList-Mar2017.pdf Accessed January 5, 2018.

Hayes R.D. and J.R. Gunson. (1992) Status and Management of Wolves in Canada. Pp21-33. in L. Carbyn, , S.H. Fritts, and D.R. Seip eds. Ecology and Conservation of Wolves in a Changing World.

Harper, E., William, P.J. Mech, L.D. and Weisberg. (2008) Effectiveness of Lethal, Directed Wolf Depredation Control in Minnesota. The Journal of Wildlife Management. 72(3), 778-783.

Hjertaas, D., S. Brechtel K. De Smet, O. Dyer, E. Haug, G. Holyroyd, P. James, and J. Schmutz. (1995) National Recovery Plan for the Burrowing Owl. Report No. 13. Ottawa: Recovery of Nationally Endangered Wildlife Committee, 33 pp, at 17, 26.

International Programme on Chemical Safety (IPC, 2007). Sodium Fluoroacetate. Available at http://www.inchem.org/documents/icsc/icsc/eics0484.htm. Accessed April 4 2017. IPC and European Commission.

International Union for the Conservation of Nature -IUCN. (2000) Manifesto- Declaration of Principles for Wolf Conservation. Wolf Specialist Group, of the Species Survival Commission, of the World Conservation Union (IUCN)

Photo courtesy of Peter Dettling

Kalmbach, E.R. Report: OBSERVATIONS ON NEW RODENTICIDES. Wildlife Research Laboratory, Fish and Wildlife Service, U. S. Department of the Interior. Available at http://hist.library.paho.org/Spanish/BOL/v27n12p1138.pdf. (Accessed August 21, 2018).

Karp, G. (1996) Cell and molecular biology: concepts and experiments. Canada: John Wiley and Sons Inc..

King, D.R.; Kirkpatrick, W.E.; Wong, D.H.; Kinnear, J.E. (1994) Degradation of 1080 in Australian soils. pg. 45-49 in Seawright, A.A.; Eason, C.T. (eds): Proceedings of the science workshop on 1080. The Royal Society of New Zealand Miscellaneous Series 28.

Muhly, T., and Musiani, M. (2009). Livestock depredation by wolves and the ranching economy in the Northwestern US. Ecological Economics. 68 pp.2439–2450

Musiani, M., Boitani, L. and Paquet, P. (Eds.) (2009). A New Ear for Wolfves and People. Wolf Recovery, Human Attitudes and Policy. Calgary: University of Calgary Press.

Pettigrew, S.L. (1990) Livestock, Predators, Humans and Environment. NWPS Focus. Earth Day Special Edition:1-2.

PDI (Predator Defense Institute).(2002) Top Issue: Wolf Poisoning. Available online at www.predatordefense.org/predpress/index.htm. Accessed: August 9, 2002

PDI (Predator Defense Institute). (2015). Help Us Ban Compound 1080: The World's Only Known Manufacturer of Compound 1080. Available online at www.predatordefense.org/1080.htm. Accessed May 10, 2015.

PMRA (Pesticide Management Regulation Agency), Health Canada (2001). Regulation Directive-Dir2001-03. Submission Management and Information Division and Pesticide Management Regulatory Agency. iii+16 pages.

PMRA (Pesticide Management Regulation Agency), Health Canada. (2002). Label Transcript, Registration # 17664.00. Available online at: www.eddenet.ca/4.0/4.1.asp. Accessed August 25, 2002.

PMRA (Pesticide Management Regulation Agency), Health Canada. (2004) Proposed Acceptability for PACR2004-20 Continuing Registration. Re-evaluation of Sodium Monofluoroacetate Available online at: http://www.fluoridealert.org/wp-content/pesticides/1080.Canada.assess.june.04.pdf (Accessed August 21, 2018).

Photo courtesy of Peter Dettling

PMRA (Pest Management Regulatory Agency), Health Canada. 2005. Re-evaluation of Strychnine. Proposed Acceptability for Continuing Registration: PACR2005-08

PMRA (Pesticide Management Regulation Agency), Heath Canada. 2008. Label Transcript Registration # 20410 Approved label 14-MAR-2008 2007-8667. Attachment 1, STRYCHNINE: Strychnine Wolf, Coyote and Black Bear Predacide. (FOIP 1; pp 6 - 9)

PMRA (Pest Management Regulatory Agency), Health Canada. 2014. Re-evaluation Decision: Special Review Decision for Compound 1080, Ref. no. RVD2014-03. ISSN: 1925-1017 (print) 1925-1025 (online) PDF (PDF version) 10pp.

PMRA (Pest Management Regulatory Agency), Health Canada. (2015). Sodium Monofluoroacetate predacide: Coyote control and wolf control #18300 Approved label 2015-2623. 3pp.

Proudfoot, T., A. & M. Bradberry, S. & V. Allister. (2006). Sodium Fluoroacetate Poisoning. Toxicological reviews. 25. 213-9. 10.2165/00139709-200625040-00002. Available at https://www.researchgate.net/publication/6517312_Sodium_Fluoroacetate_Poisoning. (Accessed August 21, 2018).

Randall, D. (1981)"Bitter Truths About 1080". Defenders of Wildlife, Oct. 96, No. 5pp. 18-21.

Ryden, H. (1981) "Pointless Massacre", pp. 22-24. Defenders of Wildlife Oct. Vol. 96, No. 5
Saskatchewan Government Access Request ENV 558/16G, Ministry of Environment

Saskatchewan Government Access Request, Access Request is ENV 209/17G, Ministry of Environment

Saskatchewan Ministry of Environment Predacide Training Course Manual (2015) from FOIP 558/16G (225 pp)

Sherley, M. (2007) Is Sodium Fluoroacetate (1080) a Humane Poison? Animal Welfare. 16 :449-458.

Sibbison, J. (1984) EPA and the Politics of Poison: The 1080 Story. Defenders of Wildlife (Jan/Feb'84):5-15.

Society of Grassland Naturalists, 2008. April 11th letter to PMRA; (FOIP 1; pp 00040).

Special Pesticide Review Division, Office of Pesticide Programs, U.S. Environmental Protection Agency. (1985) Fluoroacetamide (Compound 1081) Position Document 2. Reference No 024279.

Environment Canada. (2015) Species At Risk Act. Available on line at www.registrelep.gc.ca/species/schedules_e.cfm?id=1. Accessed May 10, 2015.

Tompa, F.S. (1983a) Status and Management of Wolves in British Columbia. pp.20-24 in L.N. Carbyn, ed. Wolves in Canada and Alaska: Their Status, Biology and Management. Can. Wildl.Serv. Rep. Ser., No 45.

Tompa, F.S. (1983b) Problem Wolf Management in British Columbia: Conflict and Program Evaluation. pp. 112-119 in L.N. Carbyn, ed. Wolves in Canada and Alaska: Their Status, Biology and Management. Can. Wildl.Serv. Rep. Ser., No 45.
Wallach A.D, Euan G. Ritchie, John Read, Adam J. O'Neill. (2009) More than Mere Numbers: The Impact of Lethal Control on the Social Stability of a Top-Order Predator. PLoS ONE 4(9).

Wielgus RB, Peebles KA. (2014) Effects of Wolf Mortality on Livestock Depredations. PLoS ONE 9(12).

World Health Organization (WHO). (2009). The WHO recommended classification of pesticides by hazard and guidelines to classification: 2009. Available at http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf Accessed April 4 2017.

Photos courtesy of Peter Dettling

Personal Communications

Allan, Gary. Former President Wolf Awareness Inc. - Compound 1080 special review and discussions with PMRA 2010

Badry, Mike. September 2002. Furbearer Specialist. Wildlife Branch, British Columbia Ministry of Water, Land, Air and Protection.
Boulton, Bronwen. Media Coordinator, Public Relations Department, The
University College of the Cariboo.

Bruce, Robert K. Problem Wildlife Technician. Wildlife and Ecosystem Protection Branch, Government of Manitoba.

Ferguson, Anna Marie. Wildlife Advocate, Alberta 2015

Havlik, Peter. President, North Peace Branch, BC SPCA

Samson-French, Judith. DVM, MSc. Veterinarian in Alberta 2018

Smits, Judit ,DVM, MVetSc, PhD

APPENDIX 1

Below is the approved registration and use of Sodium Fluoroacetate in Canada:

Province	Agency	Permit No.	Product Name	Permit Expiry
Alberta	Alberta Agriculture and Rural Development	18300	Sodium Monofluoroacetate Predacide	2019-12-31
		24512	Sodium Monofluoroacetate Restricted Toxic Collar Solution	2022-12-31
Saskatchewan	Ministry of Environment	25857	Sodium Monofluoroacetate (Compound 1080) Predacide Tablets	2020-12-31
		28865	Sodium Monofluoroacetate – Toxic Collar Solution	2021-12-31

APPENDIX 2
Permit Conditions

B2014-2605 2014-09-08

SODIUM MONOFLUOROACETATE (Compound 1080)
PREDACIDE TABLET FOR COYOTE AND WOLF CONTROL

READ THE LABEL BEFORE USING

KEEP OUT OF REACH OF CHILDREN AND PREVENT ACCESS BY UNAUTHORIZED PERSONNEL

RESTRICTED GUARANTEE: Sodium Monofluoroacetate... 5 mg/tablet

DANGER – DEADLY POISON

REGISTRATION NUMBER 25857 PEST CONTROL PRODUCTS ACT

NET CONTENTS: 30 DRAM

Saskatchewan Ministry of Environment, Fish and Wildlife Branch, 112 Research Drive, Saskatoon, Saskatchewan S7K 2H6 306-933-5767.

NOTICE TO USER: This pest control product is to be used only in accordance with the directions on the label. It is an offence under the Pest Control Products Act to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

NATURE OF RESTRICTION: For storage, use, and handling only by Saskatchewan Ministry of Environment (MOE) personnel who are designated by MOE for that purpose, or by non-MOE personnel who are authorized by MOE for that purpose, provided that such designated or authorized persons are trained in the use of the product in accordance with the Saskatchewan Occupational Health and Safety Regulations (1996) and hold valid Pesticide Applicators Licenses under the Saskatchewan Pest Control Products Regulations (1995). The product used under this label is the property of MOE.

RESTRICTED USE

RESTRICTED USES: Coyote (Canis latrans) and Wolf (Canis lupus) control

DIRECTIONS FOR USE:

A) COYOTE

Single Dose Bait: Place one tablet into a bait of about 100 g (eg. chicken head). Place up to three of these poisoned baits at a coyote control site. Cover treated baits with 5 - 10 cm of soil, snow, vegetation, or other material to prevent exposure to birds.

Multi-Dose Bait: Place up to six tablets into a carcass at a coyote control site and then cover with 30 cm of snow or 15 cm of loose soil. For targeting specific individual coyotes, place up to three tablets into a coyote killed carcass at the predation site.

B) WOLF

Small Bait: Place three tablets into a bait of about 100 g. Conceal up to six of these baits under approximately 30 cm of snow or 15 cm of loose soil along trails leading to an unpoisoned carcass or in a circle around an unpoisoned carcass. Large Bait: Place up to twelve tablets into a carcass that is securely anchored. Cover the bait with 30 cm of snow or 15 cm of loose soil.

LIMITATIONS:

1. For use only in areas where there is proof satisfactory to Saskatchewan Ministry of Environment (MOE) that kills or harassment of domestic animals by predators have occurred within the past 30 days.

2. For storage, use, and handling only by Saskatchewan Ministry of Environment (MOE) personnel who are designated by MOE for that purpose, or by non-MOE personnel who are authorized by MOE for that purpose, provided that such designated or authorized persons are trained in the use of the product in accordance with the Saskatchewan Occupational Health and Safety Regulations (1996) and hold valid Pesticide Applicators Licenses under the Saskatchewan Pest Control Products Regulations (1995). For use only where predation of domestic animals or other problems occur requiring coyote/wolf removal and where there are no other practical alternative control measures.

3. For use only to control offending animals in areas where proper herd management is practiced to discourage predation.

4. Place baits at least 800 m from any inhabited dwelling (excluding that of the livestock owner) or from the boundary of any hamlet, village, town or city.

5. Warning signs must be immediately posted at all normal entry points to land where sodium monofluoroacetate is in use. (Signs must be removed upon completion of use).

6. The user of this product must provide a copy of this label to the landholder on whose land the product is being used.

7. The user of this product must inspect poisoned baits at least every 7 days and remove and destroy all poisoned baits within 15 days of initial placement.

8. To prevent hazard of secondary poisoning, any baits removed from use or the carcasses of poisoned coyotes or wolves must be burned or buried to a depth of 60 cm (2 ft.). Vials and unused product must be disposed of in accordance with provincial requirements.

9. In recognition of risk to certain endangered species, (swift fox, black-footed ferret), no poison may be placed in the restricted area of southern Saskatchewan, fixed by Saskatchewan Ministry of Environment, Fish and Wildlife Branch.

10. A complete record of the use of this product including the date and land location where baits were placed, the success, impact on non-target species and amount of toxicant used, must be maintained by all users of the product, and the information submitted yearly to the Fish and Wildlife Branch, 112 Research Drive, Saskatoon, Sask. S7K 2H6.

11. Sodium monofluoroacetate must be stored under lock and key in a dry place away from food, feed, domestic animals, and corrosive chemicals.

12. Tablets inserted into a carcass should be placed deep in a horizontal cut to prevent scavenging birds from accessing the tablet.

13. Do not apply this product if species at risk that may feed on Compound 1080 bait or on poisoned carcasses are present in your area. For information on species at risk in your area, contact the Saskatchewan Ministry of Environment, Fish and Wildlife Branch.

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN AND PREVENT ACCESS BY UNAUTHORIZED PERSONNEL. EXTREMELY POISONOUS IF SWALLOWED. Do not get dry material from tablets in eyes, on skin, or on clothing. Wear rubber gloves when handling. After handling, wash hands thoroughly before eating or smoking. Sodium monofluoroacetate is toxic to all warm-blooded animals and may cause secondary poisoning in other animals. Place poisoned baits so as to minimize non-target poisoning of wild and domestic animals, especially dogs. Confine pets and domestic animals away from baited areas. Do not use in any manner that could contaminate feeds or foods.

FIRST AID: Speed is essential. Immediately cause vomiting by inserting a finger down the throat. Repeat until vomit is clear, then give 30 mL of Epsom salts in water. Have victim lie down and keep warm and quiet. CALL A PHYSICIAN OR POISON CONTROL CENTRE IMMEDIATELY. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

TOXICOLOGICAL INFORMATION: Sodium monofluoroacetate poisoning results from fluoroacetate changing into fluorocitrate within cell mitochondria. Poisoning is characterized by a symptom-free period of 0.5 to 2 hours or longer between ingestion and onset of symptoms (nausea, vomiting, diarrhea, and hyperactive behavior leading to convulsions). In monkeys, and presumably in humans, effects on the heart are the primary cause of death. The first symptoms of poisoning are changes of heart sounds and premature, weak contractions. No effective antidote is known, but treating the symptoms is effective in approximately 50% of human cases. Immediately cause the victim to vomit all stomach contents and give Epsom salts (magnesium sulphate). Compounds capable of supplying acetate ions give antidotal effects in animals including monkeys; the choice drugs are acetate and ethanol (2 g/kg of each). A single dose of magnesium sulphate (800 mg/kg) injected into muscle as a 50% solution has saved the life of rats dosed with lethal amounts of sodium monofluoroacetate. Complete quiet and rest are required. Symptoms of non-lethal sodium monofluoroacetate poisoning will usually subside within 12-24 hours.

STORAGE: Keep in locked storage in a dry place away from food, feed, domestic animals, and corrosive chemicals.

DISPOSAL: Dispose of all vials, containers, and unused product in accordance with provincial regulations, which require that they be disposed of by a provincially registered hazardous waste disposal company. Poisoned animal carcasses may be disposed of by burning or burying to a depth of 60 cm (2 ft.).

2015-2623 2015-07-03

SODIUM MONOFLUOROACETATE PREDACIDE

COYOTE CONTROL AND WOLF CONTROL
RESTRICTED

READ THE LABEL BEFORE USING

DANGER POISON

GUARANTEE: Sodium monofluoroacetate 5 mg per tablet REGISTRATION NO. 18300 PEST CONTROL PRODUCTS ACT NET CONTENTS: 5 mg per tablet GOVERNMENT OF THE PROVINCE OF ALBERTA Department of Agriculture and Forestry, 3115 5th Ave. North Lethbridge, Alberta T1J 4C7

NOTICE TO USER:

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the Pest Control Products Act to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

NATURE OF RESTRICTION:

This product is for storage, use and handling only by persons authorized under the Alberta Agricultural Pests Act and by designated Fish and Wildlife Officers of the Government of Alberta.

RESTRICTED USES:

COYOTE

Single Dose Bait

Place one tablet into a bait of about 100g (e.g. chicken head). Place up to three of these poisoned baits at a coyote site. Cover treated baits with 5 - 10 cm of soil, snow, vegetation or other material to prevent exposure to birds. Limitations 1 through 7 inclusive, 12 through 16 inclusive

Multi Dose Bait

Place up to six tablets into a carcass at a coyote control site and then cover with 30 cm of snow or 15 cm of loose soil. For targeting specific individual coyotes, place up to three tablets into a coyote killed carcass at the predation site. Limitations 1 through 7 inclusive, 12 through 16 inclusive.

WOLF

Small Bait

Place three tablets into a bait of about 100g. Conceal up to six of these baits under approximately 30 cm of snow or 15 cm of loose soil along trails leading to an unpoisoned carcass or in a circle around an unpoisoned carcass.
Limitations 8 through 13 inclusive

Large Bait Place up to twelve tablets into a carcass that is securely anchored. Cover the bait with 30 cm of snow or 15 cm of loose soil.

Limitations 8 through 13 inclusive

Use Limitations

1. Tablets inserted into a carcass should be placed deep in a horizontal cut to prevent scavenging birds from accessing the tablet.

2. For use only to control offending animals in areas where proper herd management is practiced to discourage predation.

3. Do not apply this product if species at risk (for example the swift fox) that may feed on Compound 1080 bait or on poisoned carcasses are present in your (local or specific) area. For information on species at risk in your area, contact the Fish and Wildlife Division of Alberta Sustainable Resource Development.

4. For use where verified predation of livestock or game production animals has occurred within the past 30 days.

5. For use by Alberta Fish and Wildlife Services personnel on public land where predation of domestic animals or other problems occur requiring coyote removal.

6. Sodium monofluoroacetate tablets must not be set nearer than 800 metres from the boundary of a hamlet, village, town or city, nor closer than 400 metres to a residence except that of the landholder who has approved the use of the tablets.

7. The user of tablets must remove and destroy all poisoned baits within 15 days of initial placement.

8. For use only by designated Fish and Wildlife Officers of the Alberta Government.

9. For use where verified wolf predation of domestic animals has recently occurred or where a serious threat to human safety exists.

10. For use only under official approval by the Minister responsible for wildlife, where predation has been identified as the primary factor affecting survival of a specific wildlife population.

11. Do not set bait within 800 metres of an inhabited dwelling.

12. To prevent hazard of secondary poisoning, any baits removed from use or the carcasses of poisoned coyotes or wolves must be burned or buried to a depth of 60 cm (2 feet). Vials and unused product must be disposed of in accordance with provincial requirements.

13. The user of tablets must immediately post warning signs at all normal access points to land where poisoned baits are set and remove signs at end of poison use.

14. The user of tablets must provide a copy of this label to the landholder on whose land tablets are being used.

15. The user of tablets must monitor and keep accurate records on the use of each poisoned bait.

16. The user of tablets must inspect poisoned bait at least every 7 days.

PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN AND UNAUTHORIZED PERSONNEL. Sodium monofluoroacetate is toxic to all warm-blooded animals. Store sodium mono- fluoroacetate tablets under lock and key in a dry place away from food, feed, domestic animals, and corrosive chemicals. Do not use in any manner that could contaminate food or feed. Wear gloves when handling tablets. Wash hands thoroughly before eating or smoking. Place poisoned baits to minimize non-target poisoning of wild and domestic animals. Keep dogs and cats on a leash or confined when poisoned baits are set.

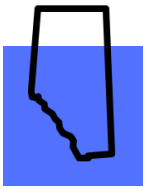
DISPOSAL:

Burn unconsumed poisoned baits, toxicant containers and damaged or unusable tablets at high temperature or bury to a depth of 60 cm. For information on the disposal of unused, unwanted product and the cleanup of spills contact the provincial regulatory agency or the manufacturer.

FIRST AID INSTRUCTIONS: Speed is essential. Immediately cause vomiting by inserting a finger down the throat. Repeat until vomit fluid is clear. Then give 30 ml of Epsom salts in water. Have victim lie down and keep warm and quiet. Call a doctor or the Poison Control Centre (1-800- 3321414) immediately.

TOXICOLOGICAL INFORMATION: Sodium monofluoroacetate poisoning results from fluoroacetate changing into fluoroacetate within cell mitochondria. Poisoning is characterized by a symptom-free period of 0.5 to 2 hours or longer between ingestion and onset of symptoms (nausea, vomiting, diarrhea, and hyperactive behaviour leading to convulsions). In monkeys, and presumably in humans, effects on the heart are the primary cause of death. The first symptoms of poisoning are changes of heart sounds and premature, weak contractions. No effective antidote is known, but treating the symptoms is effective in approximately 50% of human cases. Immediately cause a victim to vomit all stomach contents and give Epsom salts (magnesium sulphate). Compounds capable of supplying acetate ions give antidotal effects in animals including monkeys; the choice drugs are acetate and ethanol (2g/kg of each). A single dose of magnesium sulphate (800 mg/kg) injected into muscle as a 50 % solution has saved the life of rats dosed with lethal amounts of sodium monofluoroacetate. Complete quiet and rest are required. Symptoms of non-lethal sodium monofluoroacetate poisoning will usually subside within 12 - 24 hours.

APPENDIX 3

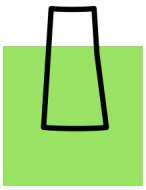


List of Alberta municipalities using 1080 between 2011- 2017 (Ref: AB FOIP 2017-G- 0010). Yellow cells indicate missing information (no data).

		LANDOWNER USE = No. of 1080 tablets						INSPECTOR USE = No. of 1080 tablets					
County	Region	2012	2013	2014	2015	2016	Min 2012-16	2012	2013	2014	2015	2016	Min 2012-16
Athabasca	NW	48	46	16	13	8	131	70	58	40	96	47	311
Barhead #1	NW	36	44	30	60	20	190		15			5	20
Beaver	NE	74	91	96	48	0	309						
Big Horn		0		0	0	0	0						
Big Lakes	Peace	13	12	19	102	45	191						
Birch Hills	Peace				0								
Blood Reserve	South												
Bonnyville	NE	46	18	34	30	6	134						
Brazeau	NW	5		0	6	17	28+						
Camrose	Central	32	29	35	36	35	167						
Cardston	South	9	35	9	0	34	87						
Clearhills	Peace	6	6	12	12	12	48					6	6
Clearwater												26	26
Crowsnest Pass		0						0					
Cypress	South	63	14	30	0	24	131				0		
Fairview	Peace	42	42	38	42	18	182						
Flagstaff	Central	13		0	6	3	22	3					3
Foothills	South	0	0	0	0	0	0						
Fortymile	South	18		0	0	0	18+						
Grand Prairie	Peace	6	4				10+			34	26	10	70
Greenview	Peace	15		0	3	0	18+						
Kneehill	Central	0	5	4	0	0	9				0		
Lac La Biche		12	14	6	21		63+					14	14
Lac St Anne	NW	42	24	25			91+		5		12	3	20
Lacombe	Central	7	3	12	12	4	38						
Lamont	NE	42	36	12	18	6	114						
Leduc	NW	0	0	3	0	0	3						
Less Slave R	NW	24	0	12	28	45	109			8			8
Lethbridge	South	6	0	0	0	0	6						
Mackenzie	Peace			36	66		102+						
Minburn	NE	200	150	20	60	50	480						
Mountainview	Central	19	13	4	2	12	50						
Newel	South	193	105	25	93	18	434						
Northern Light	Peace	108	48	134	71	36	397			6	7	22	35
Northern Sunr	NW	11			0	24	35+						
Paint Earth	Central	5	42	17	0	12	76				0		
Parkland	NW	12	6	6	23	5	52						
Peace #135	Peace	0	0	0	36	17	53						
Pincher Creek	South	0	0	0	0	0	0						
Ponoka	Central	23	16	11	12	0	62			7			7
Provost	NE	90		90	50	10	240+						
Ranchland				0	0		0+						
Red Deer	Central	20	26	8	0	12	66				0		
Rocky View	Central	65	14	31	45	15	170						
Saddle Hills	Peace		0	0	0	0	0+						
Smokey River	Peace	0		0	8	0	8+						
Smoky Lake	NE	147		57	68	39	311+						
SP Areas 2	South	106		27	34	6	173+	12					12
SP Areas 3	South	21	17	7	60	6	111						
SP Areas 4	South	12	31	9	6	6	64						
Spirit River	Peace	0			0	0	0+						
St Paul	NE	108	124	66	78	60	436						
Starland	Central	6	0	6	0	0	12						
Stettler	Central	28	5	0	0		33+						
Strathcona	NW	0	0		0		0+		0				
Sturgeon	NW	0		0	0	0	0+						
Taber	South	30	33		60	20	143+						
Thorhild	NW	0	8	20	43	88	159						
Two Hills	NE	64		10	45	10	129+						
Vermillion	NE	67	52	35	54	19	227		18	5	22	21	66
Vulcan	South	6		0	0	0	6+						
Wainright	NE	9	6	9	4	0	28						
Warner	South	33	0	0	0	0	33	6	0				6
Westlock	NW	51		42	18	12	123+						
Wetaskiw'in	Central	43	36	24	12	36	151	4	0				4
Wheatland	South	30	0	0	0	0	30		0		0		
Willow Creek	South			0	3		3+	3					3
Woodlands	NW	18	6	54	42	0	120						
Yellowhead	NW	18	0	12	42	36	108	0					
TOTAL		2102	1161	1153	1472	826	6714	98	96	100	163	154	611

		2012	2013	2014	2015	2016	5-yr min
Inspector		98	96	100	163	154	611
Landowner		2102	1161	1153	1472	826	6714
TOTALS	Alberta	2200	1257	1253	1635	980	7325

List of Saskatchewan municipalities using 1080 between 2011- 2017
(Ref: Saskatchewan Government Access Request ENV 558/16G and
Saskatchewan Government Access Request, Access Request is ENV 209/17G)



Areas of 1080 use in Saskatchewan as per FOIP map										
County	Collars	Tablets		YEAR						
Lloydminster		x								
Melfort		x								
Major	x									
Foam Lake		x								
Fort Qu'Appelle	x									
Kyle		x								
Eastend	x									
Killdeer	x									
Additional areas from FOIP records_utilization records										
Shaunigan (Swift	X			2016	*field collars were not used, but were available					
Saskatoon		X		2014	8 tablets, all eaten					
Swift Current	X			2013	8 collars					
Swift Current		X		2011	8 tablets					
Yorkton		X		2011	12 tablets					

wolfawareness.org wehowl.ca

COMPOUND 1080

The case against poisoning Canada's wildlife.