

CROSSING PATHS

Impacts of Transportation on Canadian Wildlife



Contents

Purpose

The goal of this publication is to examine five transportation themes in Canada and their impacts on wildlife.

- Roads and highways
- Railway Transit
- Ocean transportation
- Air traffic
- Human activity on lakes and rivers

Each topic is examined within its own section and accompanied by relevant images, information, and quotes from authorities in the field. We encourage readers to learn about the subjects covered in this document and follow the links contained within it to learn more. The publication can be shared with friends, family, and colleagues that would appreciate the content and benefit from the Knowledge provided.

-The CCPC Team



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Cover photo by Shane Kalyn, CCPC



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Back cover photo by Agathe Bernard, CCPC



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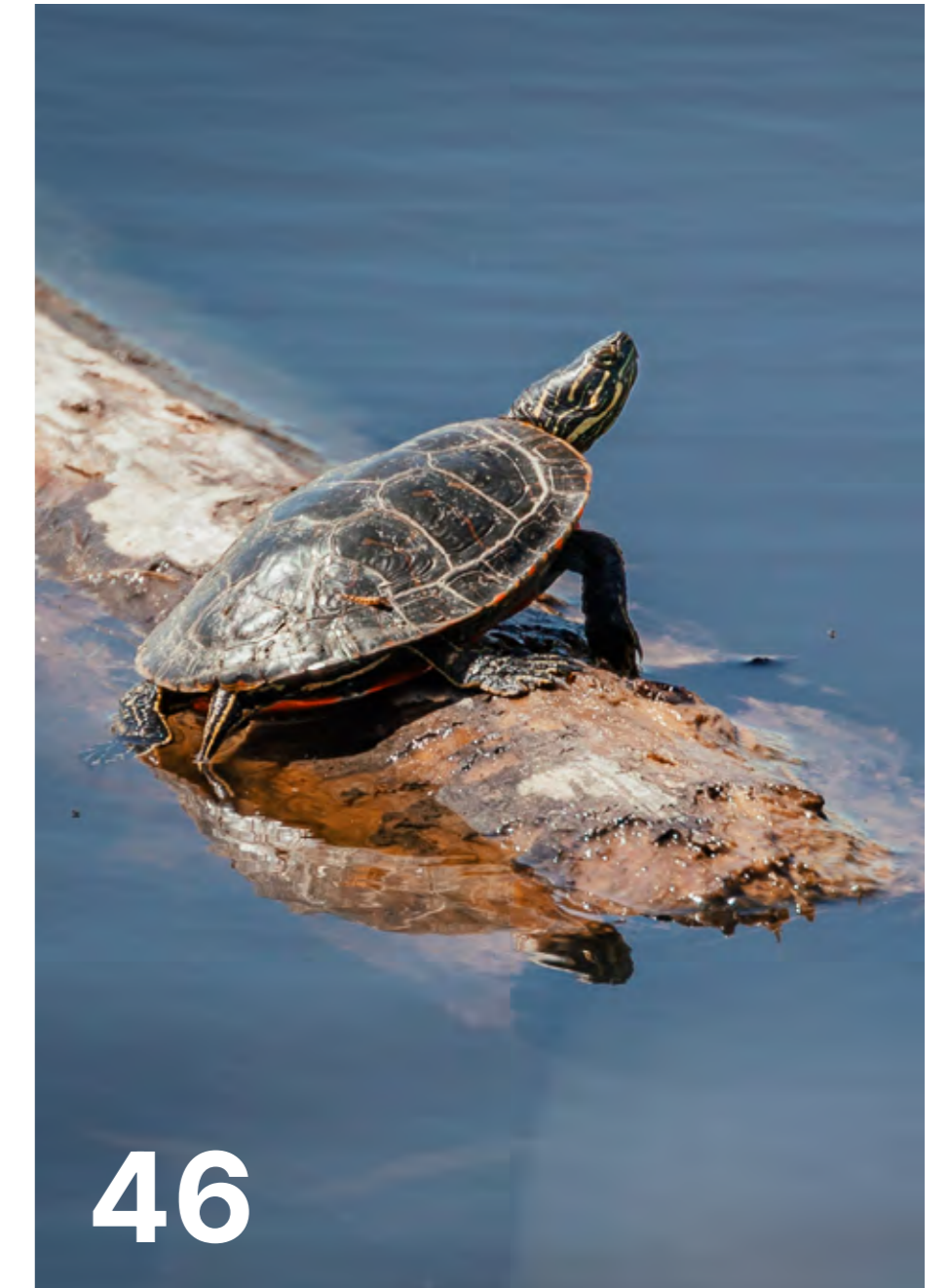
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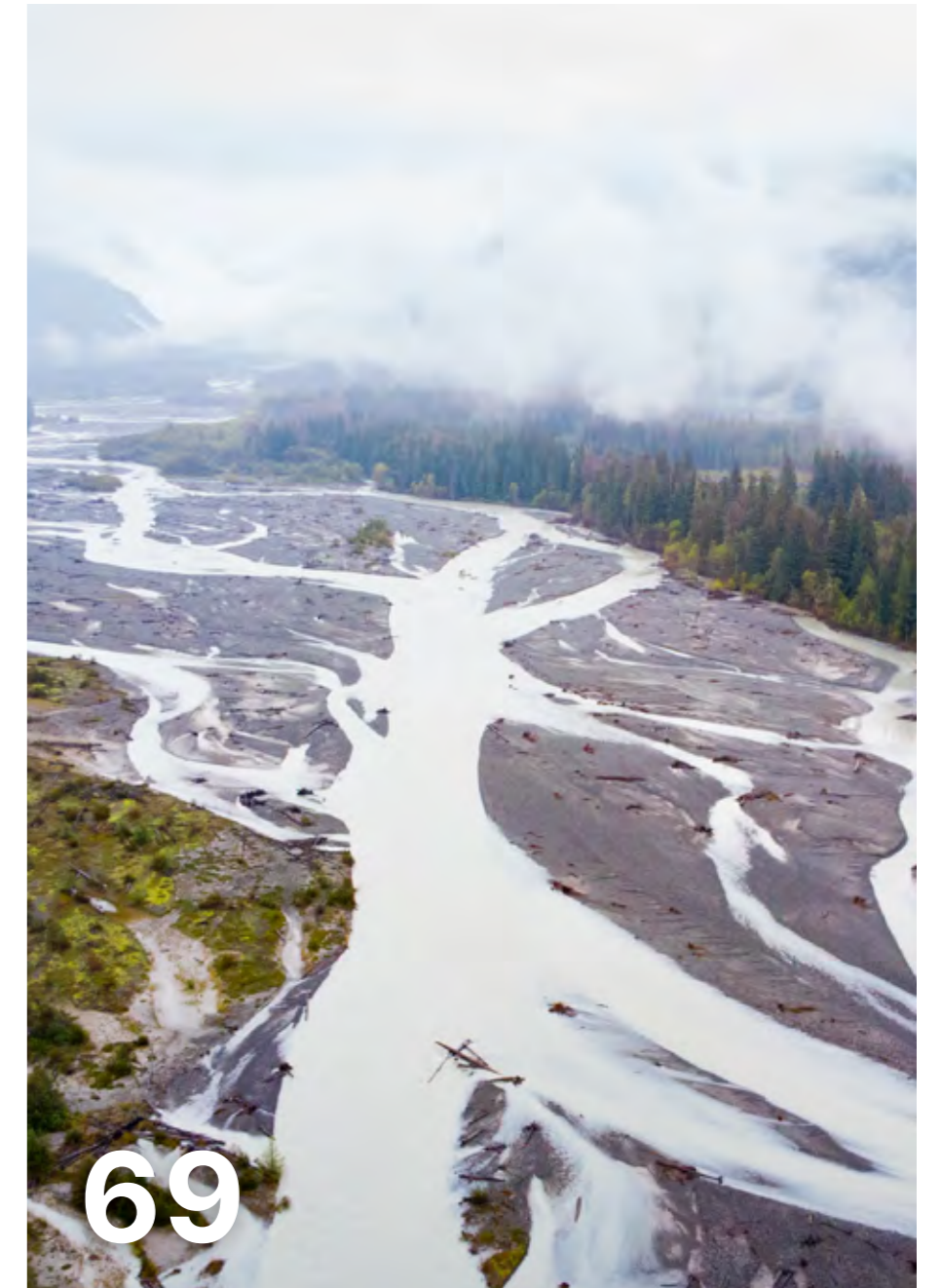
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Canadian Conservation Photographers Collective

About Us

The Canadian Conservation Photography Collective (CCPC) was formed in 2021 with the objective of promoting conservation and science education through the production of strong, thought-provoking visual content.

The collective is composed of freelance photographers from across the country and from a wide variety of occupational training backgrounds including biology, education, journalism, social work and business. We firmly believe that networking as a team and combining our strengths and experience dramatically furthers our ability to shed light on pressing conservation issues and to reach, inform, and engage a much wider audience.

In addition to regularly publishing content on its social media platforms and through established media channels, the CCPC plans to expand its outreach activities to include conferences, presentations, and in-house print publications. We recognize the importance and effectiveness of a collaborative hands-on approach and therefore also plan to offer workshops, mentorship sessions, and guided expeditions aimed at a variety of skill levels and age groups.

To effectively and accurately document and relate often complex and time-sensitive conservation issues throughout the entirety of the country, we work in concert with other collectives, non-governmental organizations, non-profits, research organizations, governments, and communities.

The CCPC strongly believes in photography as a tool to educate, inspire, and engage and our goal is to produce content that will open dialogues, stimulate conversations, and ultimately bring about change.

What Does 'Crossing Paths' Mean to Us

The Crossing Paths campaign highlights the impacts of public and commercial transportation on wildlife in Canada. Through personal and professional experience as photographers, our members have witnessed innumerable tragedies suffered by wild animals across the country as a result of activity along transportation corridors. In line with the goals of the CCPC, we have selected this topic to both raise awareness of the hazards that wildlife face from transportation and draw attention to the solutions that exist to mitigate those risks.

Beyond education, we are working with NGOs to identify projects that our audience can contribute to, whether by donation to specific projects, petitions for change, or opportunities to volunteer. This document and the other materials produced for the campaign contain links to our partner organizations and details about their activities.

Supplementary information was provided by experts from within the CCPC, academic researchers, and our partners organizations with in-depth knowledge of the relevant themes. By combining powerful imagery from our photographers and guest contributors with research, statistics, and advice from experts, we seek to make a meaningful contribution to addressing the issues that we have illustrated.





ROADS AND HIGHWAYS

Contributor/Shelby Huff

The Problem

Roads are everywhere in Canada. They connect communities and are integral to the daily function of Canadian society. Canada has over a million kilometers of roads and their impacts on the natural environment are considerable. For the average Canadian, many road-related impacts may go largely unnoticed. Road ecology is the study of the impact of roads on the natural world.

Despite a myriad of road related impacts, there are three major ways in which animals are negatively impacted by roads:

- a. Animals are killed or injured in vehicle collisions
- b. Habitat is degraded or lost when roads are constructed
- c. Roads can create a barrier, preventing animals from moving across the landscape





CCPC/Zach Baranowski



CCPC/Liron Gertsman



CCPC/Geoffrey Reynaud



Mortality

Every year, more than a million large mammals are killed on North American roads. In Canada, an estimated 14 million birds die from roadway collisions every year. In Southeastern Ontario, scientists have estimated that a 37 km section of highway kills an average of 75 vertebrates (birds, mammals, reptiles, and amphibians) daily and over 16,000 animals annually.

Across Canada, a variety of species are especially vulnerable to road mortalities. In particular, animals that reproduce slowly and require large habitats are most at risk. In southeastern B.C., for example, roads are a major source of mortality for grizzly bears. Grizzly bears generally only raise one or two cubs a year so only a handful of deaths each year can have significant impacts on the population. Smaller animals such as amphibians and reptiles are often unafraid of vehicles or the roadway, and as a result they

are among the most commonly killed animals on Canadian roadways. Road mortality is especially concerning for those species that are currently at risk of extinction in Canada. For example, the Blanding's turtle is a medium-sized, long-lived turtle found in the Great Lakes region and Nova Scotia. Roads and their associated mortality present a major threat to the continued persistence of this species in Canada.

Degradation

Roads destroy and degrade habitat in a variety of ways. Light, noise, and chemical pollution associated with roads impact numerous species of Canadian wildlife. For example, a widespread chemical preservative in the rubber of car tires was responsible for the death of thousands of coho salmon in Washington State, just south of British Columbia. A vast mix of chemicals are continually introduced into our environment as a result of roads and vehicles. Similarly,

roads contribute significant light and noise pollution which potentially interferes with the behaviors and survival of countless Canadian wildlife species. In Newfoundland, researchers have documented hundreds of stranded young Atlantic Puffins on roadways. These young birds become disoriented by the light pollution of the road and without the help of wildlife volunteers, they may not successfully return to the ocean.





CCPC/Geoffrey Reynaud



CCPC/Geoffrey Reynaud

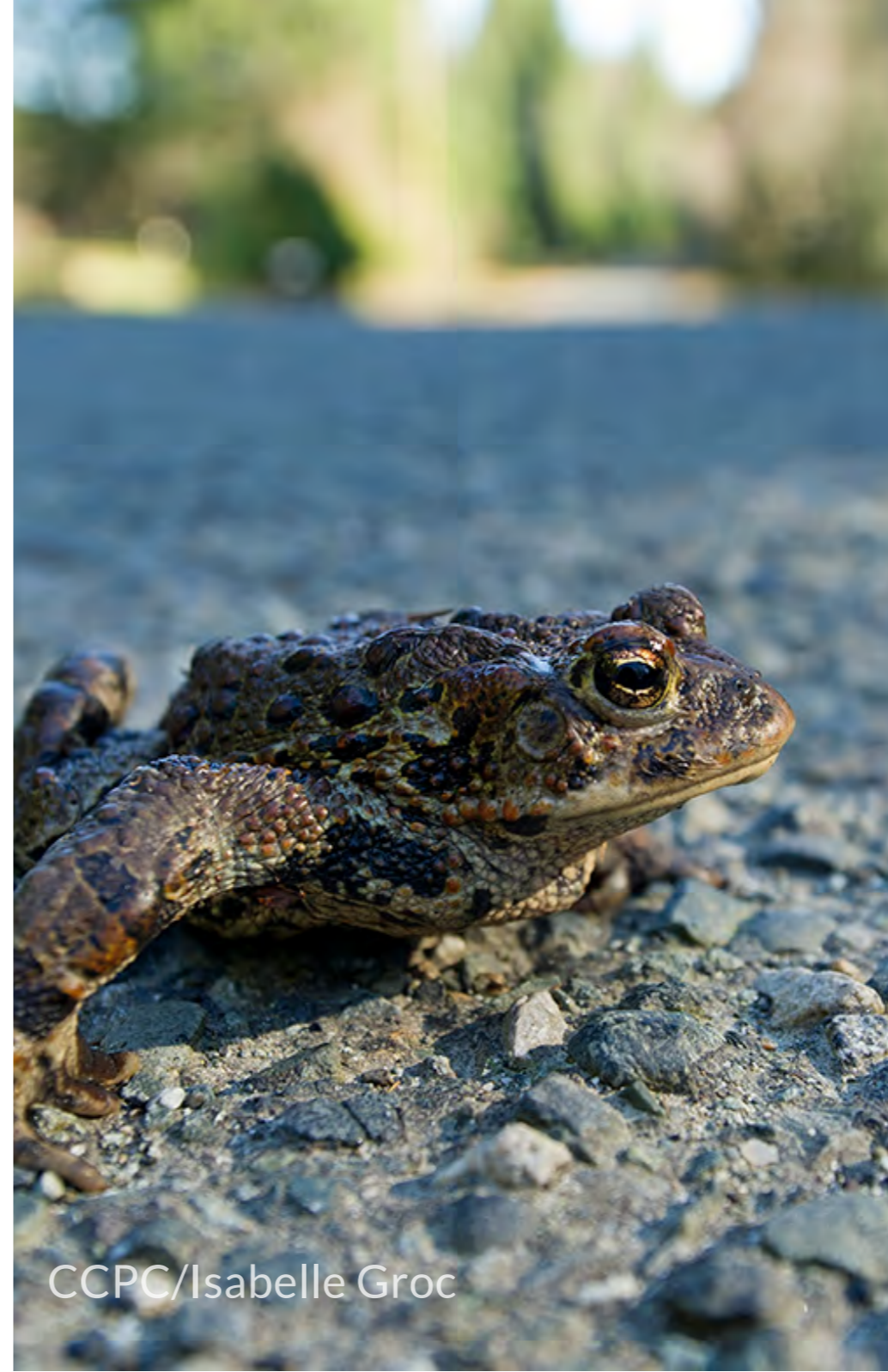
Disruption of Connectivity

Across the nation, roads and especially high traffic highways present major obstacles to animal movement. When traffic volumes rise, certain species of large mammals cannot cross the highway. For wide ranging carnivores such as wolverines in Western Canada, researchers have even discovered genetic differences in animals on either side of a major highway.

Without movement across highways, wildlife populations can become isolated, inbred, and more likely to go extinct. Similarly, migratory animals must access a variety of habitats across the landscape. If roads prevent them from accessing important feeding or breeding areas, their populations may not persist.



CCPC/Adam Skalzub



CCPC/Isabelle Groc



CCPC/Adam Skalzub



Contributor/Shelby Huff



CCPC/Adam Skalzub



CCPC/Jillian Brown



The Solution

To minimize the negative impacts of roadway, transportation and government agencies have introduced a variety of wildlife-friendly infrastructure projects. The most basic projects involve roadside signage that warns drivers of the possible presence of wildlife, encouraging them to slow down. While this form of wildlife signage is common across Canada, studies have shown that signage is unlikely to decrease the occurrence of wildlife vehicle collisions.

To significantly reduce the occurrence of wildlife vehicle collisions, transportation agencies can install wildlife fencing that prevents animals from accessing the road. For example, research shows that wildlife fencing successfully prevents between 85 to 95 vehicle and wildlife collisions for large mammals. Wildlife underpasses and overpasses are pieces of green infrastructure that allow animals to safely pass under and over the roadway. When taken all together, wildlife fencing, underpasses and overpasses significantly mitigate wildlife mortality while also creating successful movement corridors so animals can access important habitats. Compared to the immense cost of building and maintaining roadways in Canada, the cost of wildlife infrastructure is relatively low. In fact, studies have shown that strategically placed wildlife infrastructure can save governments money in the long run. By preventing wildlife vehicle collisions, the real economic costs of vehicle, human and wildlife damage can offset the price of the infrastructure in only a couple of decades.





Wildlife Collision Prevention Partnership

The Wildlife Collision Prevention Program (WCPP) is an organization that strives to reduce wildlife vehicle collisions through public outreach and education.

To reduce the risk of collisions, the WCPP provides extensive education material on their website and in public outreach. For example, the WCCP suggests that motorists reduce their vehicle speed when they see a wildlife warning sign. The decrease of speed increases drivers' ability to steer, reduces their stopping distance, and decreases the force of impact in the event of collision.

By learning about the wildlife in the area and their activities patterns (e.g., more active at dawn and dusk), motorists can drive defensively, and plan to travel during less risky times of the day.



“roads really constrain our lives and have significant noise and air pollution impacts on humans too. Just as roads are destroying the lives of wild creatures, they’re destroying our own lives as well.”

“It’s important to think about the ways in which roads impact on wildlife, really run parallel to roads impacts on human beings (...) try getting around rural areas without a car, right?”

Ben Goldfarb, Author and Journalist





Contributor/Rey Monfared

Kelly Zekewich Yukon to Yellowstone Initiative

“Our mission is to connect and protect habitat from Yellowstone to Yukon. So people in nature thrive, and that means creating space for a wide range of species to roam, feed, and reproduce”

“The sad story is that we’re not actually sure how big of an impact that is we have an idea, but because a lot of those collisions go unreported and a lot of the roadkill go off to the bushes and aren’t seen by people, we’re not a hundred percent”

“There was one picture I can remember of some parks employees carrying a small grizzly cub who had died because they had gotten through a hole in the fence and went to the highway, putting them in the back of a truck. These are really hard things to talk about and hard things to hear about and hard things to see, but they’re part of that bigger story. That moment of, ‘That’s not right. What can we do about it?’”

“At the Yukon to Yellowstone Initiative, we are connecting people so that there’s connections for wildlife. Science is obviously an important piece but it’s not the only piece.”



CCPC/Cari Siebrits



Contributor/Jamie Bussey



Contributor/Liam Brennan



RAILWAYS



CCPC/Chris McEvoy

The Problem

Mortality

Railways pose several threats and obstacles to wildlife all over Canada. Animals often fall victim to collisions with trains, but also experience habitat degradation and loss due to rail tracks, become barred from reaching certain areas and other members of their species, and can even be endangered by the introduction of exotic species by trains.

It is hard to establish the frequency and complete impact of train collisions with wildlife as such deaths are less visible and less studied than roadkill. Roadkill does more damage to vehicles than railway deaths do to trains, so roads have attracted more attention and study. However, we know that the impact of trains is severe for both large mammals and smaller animals attempting to cross the tracks. Tracks

constitute an attractive area to large mammals looking for food, such as bears, which have been found through isotope hair analyses to feed on carcasses of run-over animals or eating plants that grow on the railway verges. Trains can also spill grain as they pass through forests at high speeds, turning tracks into an inviting buffet. Overall, elk and deer are some of the most common victims of Canadian trains. The black bear is the carnivore with the highest mortality due to railway traffic, with an estimated higher number of collisions than with cars on highways. In British Columbia, 13 black bears were killed on a 15 km railway section between 1994 and 1996. Another study in British Columbia has found that the annual loss of moose alone to train collisions in the winters between 1969 and 1982 ranged from several hundred to more than a thousand animals. Smaller mammals, amphibians, and reptiles collide with

trains while resting or crossing tracks. Birds such as owls often become disoriented by train lights and are hit. They are also commonly killed by electrocution, wire strikes, and rail entrapment, which may lead to slow death due to dehydration or hunger.

“animals... experience habitat degradation and loss due to rail tracks, become barred from reaching certain areas and other members of their species.”



Disruption of Connectivity

Animals with low agility that struggle to overcome obstacles or that are susceptible to stress, such as box turtles, frogs, and toads, commonly become trapped in rail tracks. In addition to directly killing animals through collisions and electrocution, railways contribute to barrier effects for wildlife: The tracks may become obstacles to small animals' migration, while "traffic noise, vibrations, chemical pollution, and human presence can impact animal populations living close to railways". The construction of a railway may cut a habitat in half, leading to habitat fragmentation, or degrade and even destroy parts of a habitat through soil and water pollution and soil erosion.

Lastly, pest species such as rats, mice, and even ants can become invasive when transported over long distances by human activity, including by trains.



CCPC/Adam Skalzub



CCPC/Donna Feledichuk

The Solution

Overall, researchers agree that more study is needed into both the harmful effects of railways to wildlife and possible mitigation measures. There are some common solutions that help curtail wildlife deaths and mitigate barrier effects, as well as habitat loss and fragmentation:

- Natural passes such as culverts and tunnels, underpasses and overpasses, as well as barriers (trees, poles, etc.) and fencing near high-mortality spots.
- Sound-signaling and warning systems similar to those in place to warn human travellers. Through associative learning, sharp sounds and flashing before trains approach can teach animals to connect the emergence of those signals with imminent danger.
- Habitat management such as pruning to remove fruiting plants that can be attractive to wildlife; such measures, however, require regular maintenance.
- Supplemental feeding stations that can be placed far from railways to influence animal movement in the opposite direction.
- Targeted reduction of train speed at mortality hotspots and during migration periods.
- Rail fastenings, rail dampers, under-sleeper pads, and noise barriers.



“We have high mortality of grizzly bears here in southeastern B.C. Basically there are three ways a bear will die: the road, railway, and conflict with people. The road and rail account for about 50% of the mortality.”

Dr. Clayton Lamb, Research Scientist Biodiversity Pathways

“Road ecology projects like fencing and crossing structures are one of those win-win solutions. They can save governments money in the long run while keeping both motorists and wildlife safe. Everybody can thrive with these sorts of investments.”

“When we think of rail and roadways, we think of them as relatively small, but their impacts are broad. Through isolation and fragmentation, these roads chop up the landscape such that animals can’t access important habitat, and become inbred and susceptible to random events.”

“The bears are drawn to the railways as a travel corridor, potentially feeding on road-killed ungulates or grain spillage.”





Photos CCPC/Donna Feledichuk



CROSSING PATHS 2023





OCEANS

CCPC/Mark Williams
Humpback Whale, Identity Unknown

The Problem

Canada is bordered by the Atlantic, Arctic, and Pacific Oceans, through which large volumes of marine traffic migrate daily. Commercial shipping vessels, cruise ships, fishing fleets, and personal watercraft among others navigate the coastal waters, frequently coming in contact with both resident and migratory wildlife. Oceanic vessels present a number of risks to wildlife, including collisions, deliberate and accidental contamination, and noise pollution. Marine mammals such as whales, dolphins, sea lions, seals, walruses, and sea otters are particularly vulnerable to the dangers presented by ocean traffic. As the number of ships increases, so too do the hazards that they present to aquatic life.

The North Atlantic right whales are among the most endangered species of large whales on the planet and exist within high volume shipping lanes along the east coast of Canada, often resulting in their deaths or injuries. Baleen whales such as grey and humpback whales off the coast of British Columbia are at risk of ship strikes and many found dead along the coastline were determined to have been struck by vessels resulting in their deaths. The reduction in sea ice in the Arctic Ocean has resulted in increased shipping traffic, further increasing the hazards posed to marine mammals in the region.





CCPC/Josh DeLeenheer

The primary risks to wildlife associated with vessels underway are ship and propeller strikes. Wildlife at sea are difficult to detect and avoid by captains, made more challenging by lighting and weather conditions. Marine mammals in particular often feed at or near the surface of the water and return to the surface to replenish their air supply. Additionally, many whale species rest at the surface of the ocean and are virtually impossible to see. Vessel operators often assume that whales will use echolocation to observe the presence of boats and navigate away from them safely. However, only toothed whales such as orcas and sperm whales have that ability. Baleen whales such as humpback and grey whales do not have bio sonar and may be entirely unaware of approaching ships. The combination of typical vessel and animal behaviours results in frequent injury and loss of life to wildlife.

Statistics related to wildlife vessel strikes are collected but not publicly distributed in Canada. Gaining an accurate

picture of the scale of the problem is extremely difficult without data to validate the anecdotal reports.

The primary sources of contamination by vessels in Canadian coastal waters are greywater, bilge water, sewage, and scrubber wastewater. While the government of Canada has implemented mandatory regulations under an interim order on the discharge of greywater and sewage by cruise ships, they have not yet addressed the primary source of contamination, which is the dumping of scrubber wastewater into the oceans surrounding the country. Many large ships include scrubber systems that use water to wash contaminants such as sulfur dioxide, carcinogens, and heavy metals from the exhaust systems. The resulting slurry is then emptied into the sea, increasing ocean acidification that inhibits the ability of crustaceans to form shells in their early development. Shipping vessels operating in Canadian coastal waters are not yet subject to any regulations relating to the discharge of toxic substances.

The following statistics identified by World Wildlife Fund Canada relate to the generation of contaminants by ships in Canadian coastal waters:

- Bilge water - 77.5 million litres
- Sewage - 549.8 million litres
- Grey water - 3.6 billion litres
- Scrubber wastewater - 143 billion litres

Shipping vessels operating in Canadian coastal waters are not yet subject to any regulations relating to the discharge of toxic substances.

Vessel noise has been widely identified as another hazard faced by marine wildlife. The noise created by vessels can also impair the ability of marine mammals to navigate and successfully avoid collisions with vessels. It also increases stress levels in marine wildlife, reducing immunity and

adversely affecting reproduction. Communication is essential to some marine mammals, such as the Southern Resident orca population, which traverses between western Canadian and U.S. coastal waters in the path of shipping and recreational vessels. The noise created by

ocean vessels interferes with the orca's echolocation, which they rely on to successfully hunt salmon. Combined with the impacts of the rapidly diminishing chinook salmon population, Southern Resident orcas are now listed as an endangered species and number only 73 as of August 2023.





CCPC/Jacquie Matechuk



CCPC/Jillian Brown



CCPC/Cari Siebrits

The Solution

There are several solutions to address the issues of vessel strikes, pollution, and noise.

With regards to vessel strikes, there are a range of potential solutions that could help to mitigate the dangers to marine wildlife:

- Regulate and enforce lower vessel speeds, particularly in areas with higher populations of marine mammals and threatened species.
- Use technology such as [acoustic and thermal sensors](#) to alert vessels to the presence of whales.
- Establish shipping routes that avoid areas frequented by marine mammals and threatened species.
- Provide educational resources to vessel operators to improve awareness of the risks of ship strikes such as knowledge about marine mammal behaviour, areas of known density, and signs of presence.
- Investigate incidents of ship-strikes to better understand patterns and behaviours of wildlife at sea.

Contamination of ocean waters can be controlled through government regulations that prohibit vessels from dumping hazardous materials into the ocean. Existing laws can be strengthened to cover materials not currently included in the established regulations and expanded to include all waters under the jurisdiction of Canada.

Vessel noise can be reduced by regulating speed in protected areas and regions with high numbers of marine animals. Technological advancements can also be employed in the design of marine vessels and watercraft to reduce noise.



CCPC/Shane Kalyn



CCPC/Mark Williams
Bigg's Killer Whales, Identity Unknown

The Marine Education and Research Society

“The Marine Education and Research Society ([MERS](#)) is a registered Canadian charity dedicated to promoting conservation and understanding of marine ecosystems through scientific research, environmental education, and marine wildlife response.”

Based in Port McNeill on Vancouver Island, British Columbia, the organization was incorporated in 2010 and has concentrated its humpback research in the areas of central Vancouver Island north to the coastal community of Bella Bella as well as the northwest region of Vancouver Island. MERS is composed of scientists and educators focussed on marine conservation, applying their knowledge of marine ecosystems to develop and disseminate a greater understanding of the complexity of the coastal environment.



CCPC/Mark Williams
Orca, Identity Unknown

Their educational outreach has helped to inform boaters of the hazards of wildlife strikes by vessels and entanglement in fishing gear and reduce the volume of debris contaminating coastal waters. Research conducted by MERS has included studies of local marine mammals to better understand the hazards that they currently face, coordinating the provincial documentation of the humpbacks in BC waters through the Canadian Pacific Humpback Collaboration, and the monitoring of Mola sightings in contribution to an international research project.



MERS also provides coordination and communication as a regional hub for marine mammal incident response.

You can help MERS to further their objectives in the following ways:

- Make a charitable contribution on their [website](#).
- [Submit](#) humpback images and information to further the knowledge of the species.
- [Sponsor a humpback whale](#).
- Purchase sustainable and educational materials from [the Ocean Store](#).
- Participate in their [auction](#) and [fundraising trips](#).
- And [more!](#)



CCPC/Josh DeLeenheer
Bigg's Killer Whale, T251 (Mature Male)



CCPC/Agathe Bernard



Contributor/Liam Brennan
Bigg's Killer Whale, T101 Family, Identity Unknown



CCPC/Jacque Matechuk
Humpback Whale, Identity Unknown

“Marine mammals are living in a world of sound. The ocean is a sound trap and we’re injecting this noise in there.”

Jackie Hilderling, Education and Communication Director,
Marine Education and Research Society

“Sound is magnified in water. It travels up to five times faster and further. This is why there are distance limits and speed limits around marine wildlife.”

“They rely on [sounds] for everything from socializing, mate selection (depending on the species), to finding prey through echolocation, to communicating and navigating.”



Contributor/Mollie Cameron
Bigg's Killer Whale T041 "Lawrie"



CCPC/Cari Siebrits



Contributor/Ana Olteanu

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CCPC/Kristian Gillies
Humpback Whales BCY0996 "Chinook" and BCX1602 "Lorax"



CCPC/Josh DeLeenheer



Contributor/Mollie Cameron
Bigg's Killer Whale T011A "Rainy"



CCPC/Agathe Bernard



CCPC/Ray Maichin
Humpback Whale BCX1412 "Cosmo"



AVIATION

The Problem

CCPC/Donna Feledichuk

Air transport has become essential to the movement of goods and people throughout the world. As with other forms of travel though it comes with a cost to wildlife. The primary risk to animals from air traffic in Canada is wildlife strikes. Wildlife strikes can happen on land, water, and in the air with most incidents occurring at or near airports. The majority of collisions with aircraft involve birds but can also include mammals and any other species in the flight path.

Wildlife strikes related to aviation in Canada are tracked by Transport Canada, the federal department responsible for regulating the transportation industries operating in the country. Airlines and airports are required to monitor and act to minimize wildlife strikes, to reduce the risks to people, and the significant costs that are incurred from collisions. Not surprisingly, the frequency of wildlife strikes coincides with the busiest airports and the areas with the greatest number of birds. The 2021 Annual Strike Report produced by Transport Canada shows that most strikes

occur during the takeoff and landing phases of flight. Bird and mammal strikes have increased nearly every year since 2005, peaking in 2019 at 2043 bird strikes and 108 mammal strikes in Canada. Wildlife strikes declined significantly at the height of the pandemic but records show they are increasing as air travel returns to normal.

Birds often congregate in the grassy fields surrounding airports, where they feed, rest, and sometimes nest. The number and species of birds reflects seasonal behaviours and weather conditions. Migratory birds may be present in the spring and fall as they stop along their journeys to rest and eat. Residential populations return to airfields as food and water sources become available. Birds may also choose airports as safe alternatives if they have been harassed or driven away from nearby properties such as farms or parks.

While not as common, other species such as moose, deer, coyotes, rabbits, bats, and frogs are also susceptible to

aviation collisions in Canada. Although high fencing is common surrounding major airports, smaller airfields may not have the resources to fully enclose runways. In spite of the mitigation strategies employed by airports, many resourceful animals continue to access restricted areas, putting themselves at risk.

Most strikes occur during the takeoff and landing phases of flight. Bird and mammal strikes have increased nearly every year since 2005.



Photos CCPC/Donna Feledichuk



Float and bush planes are common in the rural regions of Canada. They often takeoff and land in remote areas where few to no measures are available to protect the aircraft and wildlife. Even in urban harbours with active airports, wildlife have unrestricted access and may stray in the path of moving aircraft. Although they account for a relatively small percentage of aircraft that traverse Canadian airspace, float and bush planes travel to areas of the country with the greatest concentrations of wildlife.

To give context to the issue of wildlife strikes, here are some statistics from the Wildlife Strikes at Canadian Airports for 2021, the most recent data currently available:

- 1363 bird strikes were reported, including 1231 involving civilian aircraft and 132 military.
- 66 mammal strikes were reported, including 65 involving civilian aircraft and 1 military.
- In 2019 at the height of air travel in Canada, 2043 bird strikes and 108 mammal strikes were reported.
- Peak months were from May to October, occurring primarily in the hours of 07:00 to 15:00.
- The top five airports reporting wildlife strikes in Canada in 2021 were:
 - Toronto Pearson International Airport (156)
 - Vancouver International Airport (142)
 - Calgary International Airport (YYC) (79)
 - Montréal-Pierre Elliott Trudeau International Airport (61)
 - Victoria International Airport (48)





The Solution

Wildlife management for the aviation industry is regulated by the federal government in Canada and managed by airports. Their primary concerns are for the safety of passengers and crew and reducing expenses associated with wildlife strikes. While those objectives most often align with the protection of wildlife, their priorities supersede the wellbeing of animals and sometimes conflict with it.

There are a variety of methods currently being utilized to minimize the hazards to wildlife and people. Research and knowledge sharing throughout the industry can help to improve strategies and further mitigate the risks associated with flights. Understanding wildlife patterns, changing conditions, and external factors influencing wildlife behaviours will provide the airline industry with additional tools to respond appropriately. Organizations like the [Bird Strike Association of Canada](#) actively coordinate with members of the aviation community to share information and promote best practices.

[Transport Canada](#) requires that airports “implement wildlife control measures to discourage wildlife from seeking food, water, and shelter on or near airport property”. Airport authorities employ a range of techniques to harass and discourage wildlife with the goal of creating an inhospitable environment. The methods are categorized as passive and active management. Examples of passive management include removing food sources and attractants as well as habitat alteration. Modifying habitat such as removing water sources, shelter sites, and perches disincentive wildlife from gathering on airport property. Active management refers to harassing, dispersing, and removing wildlife that access airport grounds. Transport Canada lists a range of methods in its publication titled [“Sharing the Skies: An Aviation Industry Guide to the Management of Wildlife Hazards”](#), which range from “not recommended”, “limited recommendation”, and “highly recommended”.



Photos CCPC/Donna Feledichuk



Photos CCPC/Donna Feledichuk

It's important to note that killing wildlife is accepted practice by both the government and airport authorities, although other methods are typically attempted first. Wildlife are generally killed on airport properties [“where specific individual birds or mammals cause persistent problems”](#). Animals that are selected for death are most often shot or poisoned. Poisoning wildlife can have unintended consequences though, sometimes leading to the deaths of species not targeted by the poison. Alternatively, animals may be live-trapped and released in other locations.

Aviation accounts for a relatively small percentage of the overall impacts of transportation to wildlife in Canada. The number of wildlife strikes and overall contribution to greenhouse gas (GHG) emissions are low compared to road transportation; however, that is also reflective of the number of flights in relation to the number of vehicles in operation. The GHG emissions per flight are considerably higher than other modes of transport and the overall trend is an increase in air traffic. The electrification of aircraft can help to reduce the impacts on climate change but currently only for shorter flights. Improvements in alternative fuels may also help to mitigate climate risks providing that there is adequate investment in production and the costs to the aviation industry are comparable.







LAKES AND RIVERS



The Problem

Studies in freshwater reservoirs in Canada have found that over a tenth of all plant and animal species are ‘at risk’, namely labelled as “Threatened”, “Endangered”, or “Extirpated”, while more than 17% are identified as “Special Concern”. One of the major causes of habitat and wildlife endangerment in rivers, lakes, ponds, wetlands, and reservoirs, comes in the form of boating. Both directly and indirectly, boats used for transportation, movement of goods, and leisure cause significant dangers to wildlife and affect the quality of water. Specifically, boating results in two categories of damages:

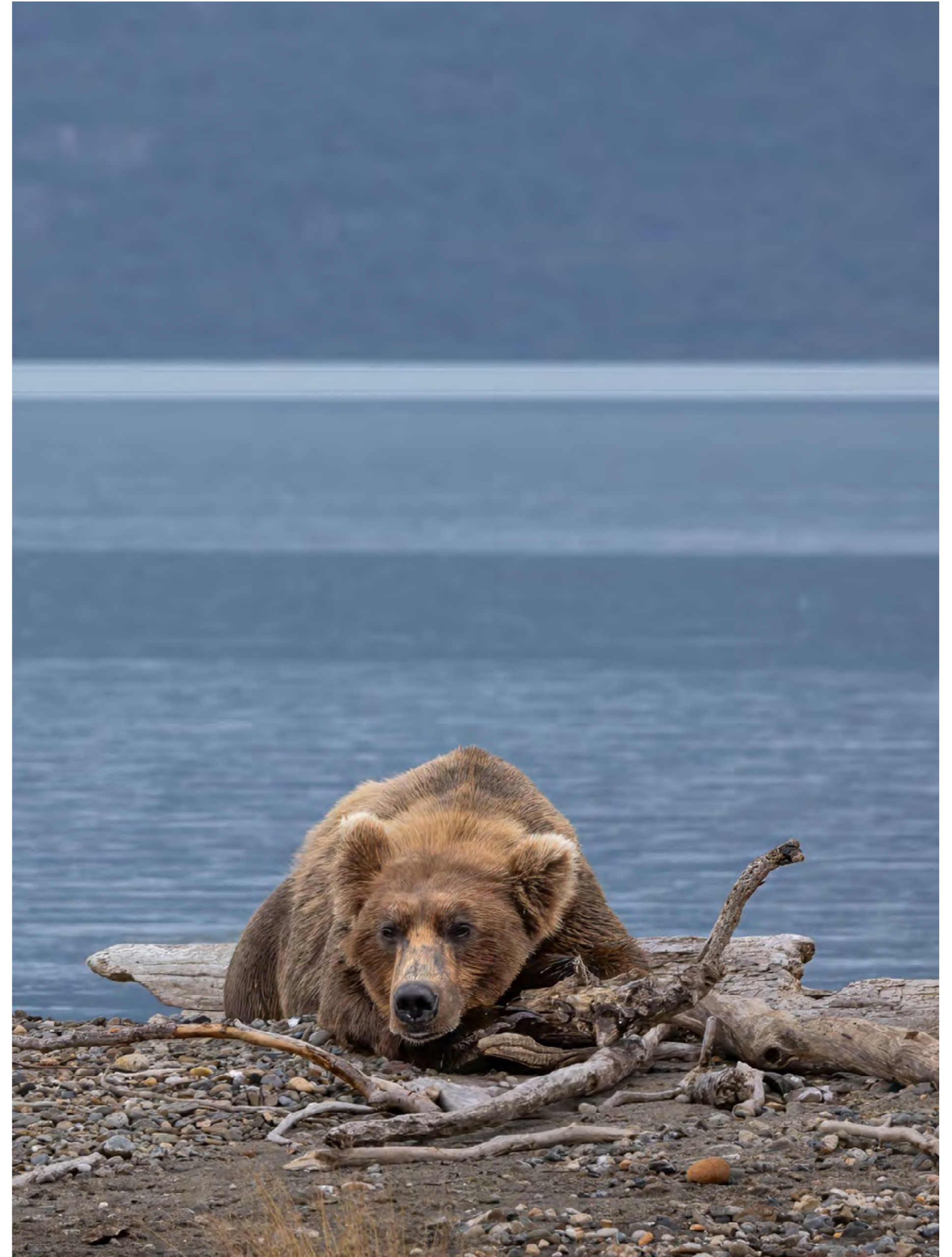
- Physical damages during movement and mooring to species and their habitats
- Pollution, contamination, and toxification of freshwater habitats.

Motor propellers further damage aquatic fauna by cutting and uprooting submerged vegetation, and studies have found them consistently wounding fish

In the first category, we commonly think of direct collisions with slow-moving animals, especially injuries caused by propellers. Motor propellers further damage aquatic fauna by cutting and uprooting submerged vegetation, and studies have found them consistently wounding fish.



Photos CCPC/Jacquie Matechuk





CCPC/Donna Feledichuk

The physical impacts extend far beyond wildlife contact with the boat itself: moving boats create surface disturbance in the form of a wake, accelerating erosion along nearby shorelines, and turbulence in the surrounding waters which upends the waterbed sediments and causes turbidity, decreasing water clarity and quality, thus affecting the underwater plants' ability to photosynthesize and clogging fish gills.

“Anchoring takes place indiscriminately, physically damaging the waterbed, while shading from the boat or piers may alter the hydrodynamics beneath”

Both effects are magnified in lakes and rivers as opposed to the open ocean, due to the shallowness of the water and the small distance to the coastline. Faster boats, such as those used for recreational activities, exacerbate those effects (Mosisch & Arthington 1998). In the summer months especially, power boating can be so intense that the carrying capacity for safe boating is likely exceeded for a given lake. In a study of Lake Windermere, BC, the effects of power boating included a deterioration of water quality, habitat values, and drinking water intakes. Specifically, the examination of sediment samples indicated “elevated arsenic, copper and lead exceeding the 80% of maximum allowable concentration warning threshold”.

Noise and visual disturbance is found to affect the psychological well-being of birds and their breeding.

Even while mooring, boats still adversely affect freshwater environments: anchoring takes place indiscriminately,

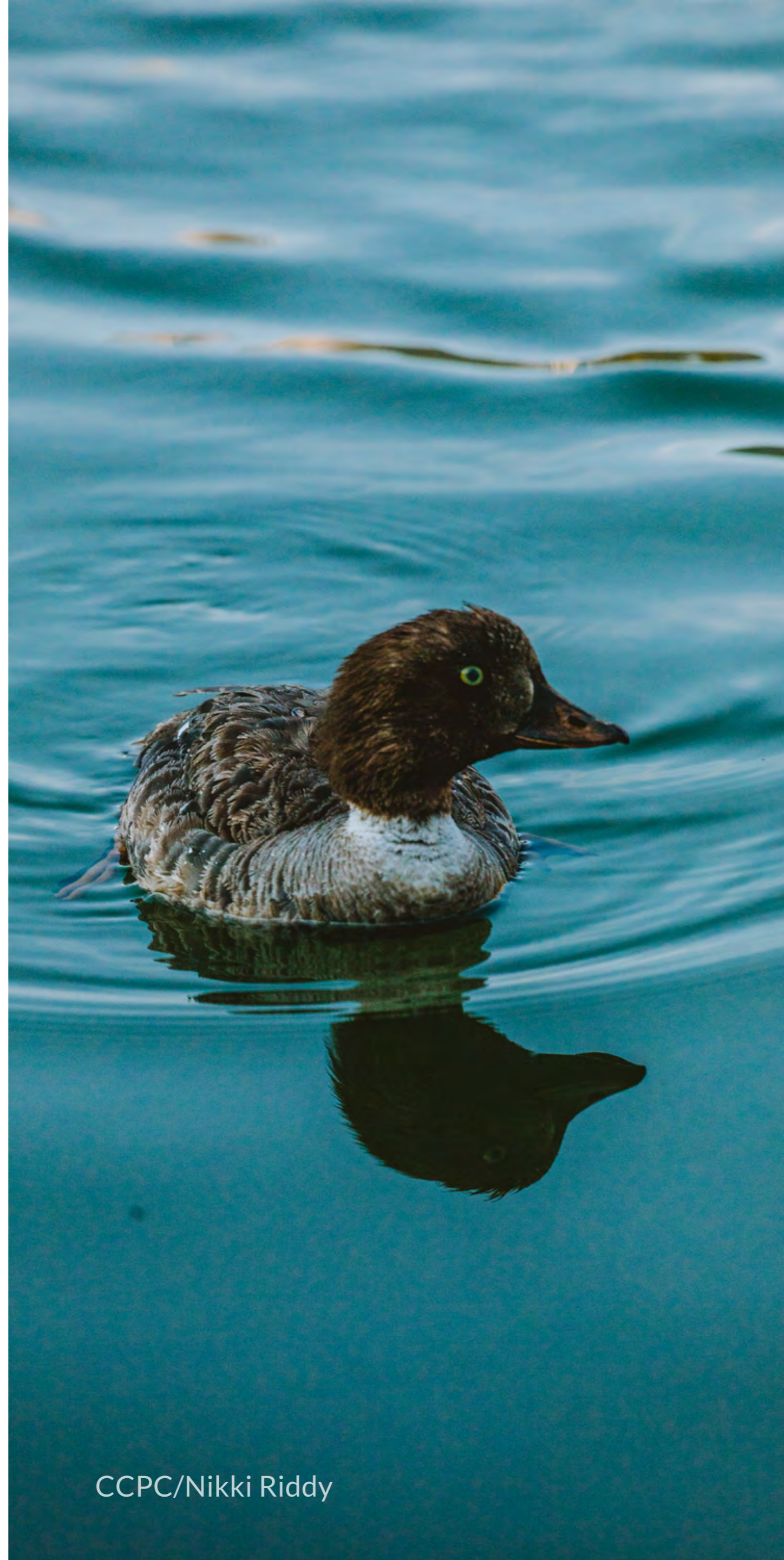
physically damaging the waterbed, while shading from the boat or piers may alter the hydrodynamics beneath.

In the second category of impacts, we have all sorts of toxic chemicals that leak into the water from boats, including untreated or insufficiently treated waste, fuel spills, motor and exhaust fumes, heavy metals such as lead, anti-fouling paint applied on the hull of the boat, and other pollution. Such contaminants affect the health of fish, inhibit algal growth, and enter into food chains eventually reaching larger animals. Also, boats used in multiple freshwater environments may carry with them plants and organisms from one to the next, which can significantly alter the ecosystems in which they are introduced. Overall, the polluting effects of boating cause long-term, cumulative damage that upsets aquatic wildlife that has specific needs for water temperature, light, pH, and cleanliness.





CCPC/Mark Bernards



CCPC/Nikki Riddy



CCPC/Nikki Riddy



The Solution

Some of the effects of transportation in freshwater environments can be mitigated by responsible boating use. Boat owners are encouraged to adopt the following practices:

- Retire older boats that are prone to leakage and old motors that still rely on fuel containing lead.
- Use caution and responsible speeds while driving a boat.
- Carefully clean up propellers and hull before switching the boat from one waterway to another to avoid transfer of non-native species.
- Have a supply of rags on board to clean up oil and fuel spills as soon as they occur.
- Dispose of used oil and filters through the proper channels. Boaters can find the [closest facilities online](#) or by calling 1-800-CLEANUP.
- Be careful with portable fuel tanks. Boaters should fill them on shore, never overfill them, and secure and close them when not in use.
- Wax often. Wax on fiberglass prevents surface dirt from building up and reduces the need for harsh detergents when washing.
- Avoid abrasive cleaning tools. Soft sponges and freshwater applied to topsides should sufficiently clean the vessel.
- Use natural and non-toxic cleaning solutions.
- Choose alternatives to anti-fouling paint. Regular paint and wax or storing the vessel on land are viable options.
- Avoid wake boat use during spawning and nesting seasons.
- Use your depth finder, limit water recreation to designated areas or the deepest parts of the lake and maintain a minimum distance of 200 ft from the shoreline when using a recreational watercraft.
- Become a local lake steward, a citizen-scientist: find out how you can help in your own area to protect the local ecosystems.



CCPC/Cari Siebrits



CCPC/Agathe Bernard



CCPC/Chris McEvoy



CCPC/Jacquie Matechuk

Living Lakes Canada

Living Lakes Canada is an award-winning NGO that facilitates collaboration in monitoring, restoration, and policy development initiatives for the long-term protection of Canada's lakes, rivers, wetlands and watersheds. As a partner organization for this campaign, Living Lakes helps empower people across the country to protect threatened freshwater sources and biodiversity.

A leader in community-based water monitoring initiatives for almost two decades, Living Lakes delivers a range of science-driven water monitoring and assessment programs, from hydroclimatic, groundwater and high elevation monitoring, to shoreline mapping, biomonitoring trainings and water data storage and management. The [Foresore Integrated Management Planning](#) program maps shoreline habitats along lakes to help inform lake management and protect lake foreshore and species at risk. In collaboration with Indigenous partners, the program aims to [interweave Indigenous Knowledge and Western science](#) to support resilient lake management. Through their [National Lake Blitz](#) citizen science initiative, Living Lakes equips volunteers across the country with basic monitoring tools to encourage widespread lake monitoring and help create a 'snapshot' of lake health across Canada.

You can visit [Living Lakes Canada](#) to learn more about their water stewardship work, and discover volunteer opportunities and other ways to get involved. Stay in the flow of all things freshwater by [subscribing](#) to the Living Lakes Newsletter, and following them on social media ([Instagram](#), [Facebook](#), [X](#), [LinkedIn](#) and [Threads](#)). You can also support Living Lakes Canada's water stewardship work through a [donation](#).





Photos CCPC/Agathe Bernard

Over 84% of freshwater species have been lost since the 1970s

Georgia Peck, Lakes Program Manager

As Living Lakes Canada's Lakes Program Manager, Georgia Peck oversees the training of volunteers to become local lake stewards, supports and builds capacity for existing stewardship programs across Canada, and leads the organization's Foreshore Integrated Management Planning program. Here is what Georgia told the campaign:

"Freshwater biodiversity is showing some of the steepest decline amongst any other biodiversity. Over 84% of freshwater species have been lost since the 1970s; this is more than both terrestrial and marine species."

"There are three major risks to lake biodiversity, all of which can become exacerbated in the summer months: habitat loss and disturbance, invasive species, and climate change. All of these risks are further compounded by human influence and activity."



“Due to climate change, we see that snowpacks and glaciers are in decline, leading to considerably less snow and glacial melt. This can contribute to significantly lower lake levels and warmer water temperatures. The consequences can include harmful algal blooms, increased sediment suspended in water, increased erosion along shorelines and increased health risk for cold water fish, such as salmon and trout.”

“Invasive species is one of the greatest threats to biodiversity in Canada. Travelling humans can bring with them travelling non-native species. Given warmer temperatures due to climate change, invasive species are doing better than ever before and outcompeting our native species.”

“Human recreation on lakes can contribute to habitat loss and disturbance. Wake boat studies are showing how

severe and far-reaching wake boat impacts are on lakes. It is said that wake boats travelling within 300 metres of shorelines can have a negative impact.”

“The depth of disturbance from wake boats is extreme: anywhere from 6 to 8 metres below the water is getting stirred up by wake boats. When we take salmon-bearing streams and rivers into account, many of which do have wake boat activity, are typically less than 600 metres across and less than 6 metres deep. So in areas that provide habitat to critical species such as salmon and trout, wake boats are having a harmful impact.”

“Some of the species most impacted by boats are fish, migratory waterfowl, and macroinvertebrates in streams and river bottoms that are getting carried with sediment disturbance.” “As recreational boating and skiing stir up sediment along the bottom, it causes increased erosion

along the shoreline, and can disturb floating nests on the lake and critical spawning areas for fish. Many spawning grounds are located on shallow cobblestone near the shoreline, and are typically some of the most at-risk areas.”

“It’s easy to focus on the large animals that we can see with our own eyes, such as bald eagles, beavers, or moose, but equal to the impacts on them are those on incredibly small animals. This includes macroinvertebrates which form the foundation for aquatic food webs and are an important water quality indicator.”

“We all have a role to play in minimizing impacts to freshwater rivers and lakes and the wildlife and communities that call these places home. Responsible and sustainable recreation is the key to enjoying these natural spaces for generations to come. Educate yourself, your friends, and your family!”







CCPC/Donna Feledichuk



CCPC/Ray Maichin



CCPC/Ray Maichin





CLIMATE CHANGE



Transportation's Impact on Climate Change

Transport accounts for approximately one quarter of greenhouse gas emissions in Canada, second only to the oil and gas industry. According to the [Government of Canada GHG inventory](#), "Between 1990 and 2021, GHG emissions from the transport sector grew by 27%. The growth in emissions was mostly driven by increases from freight heavy-duty trucks and passenger light trucks."

Based on the [National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada](#), the following is a breakdown of the transportation sectors in 2021 tracked by the government

expressed as percentages of the total GHG emitted by the transport sector:

- Aviation - 3%
- Roads and Transportation - 61.7%
- Railways - 3.6%
- Marine - 2.3%
- Other Transportation - 29.4%



Photos CCPC/Jillian Brown



Climate change is increasingly responsible for the extreme weather events affecting wildlife and their natural habitats. 2023 was the worst year for wildfires in Canada with 6451 fires recorded, burning a total of 17,577,396 hectares as of Sept 26, 2023. Flooding and the resulting slides from more frequent and intense storms destroys habitat, creates barriers to migration, and may kill wildlife directly. Extreme drought conditions conversely reduce and remove water sources, devastate wild crops, and create impossible conditions for salmon migrations.



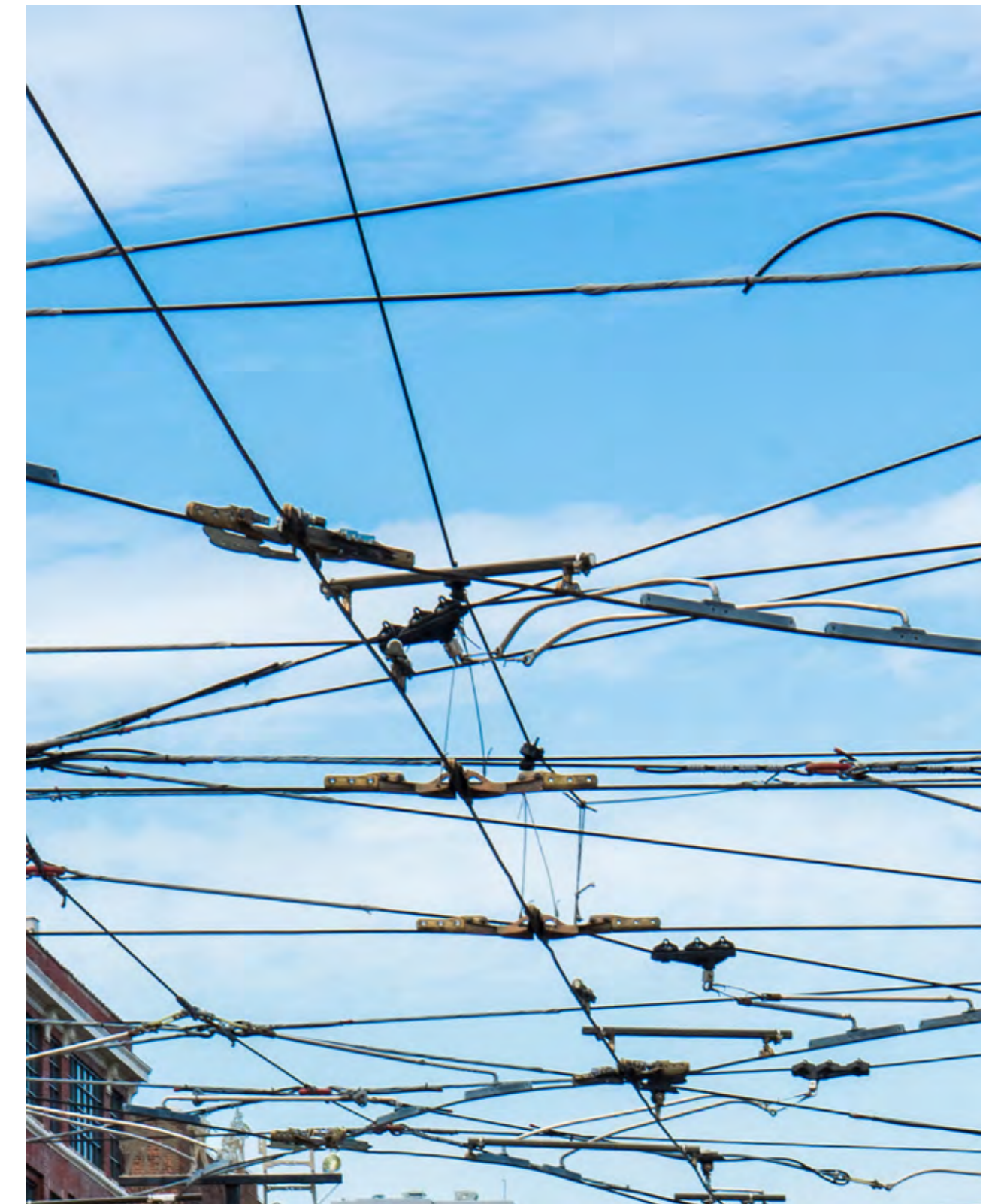
CCPC/Shane Kalyn



CCPC/Ray Maichin



Photos CCPC/Mark Bernards

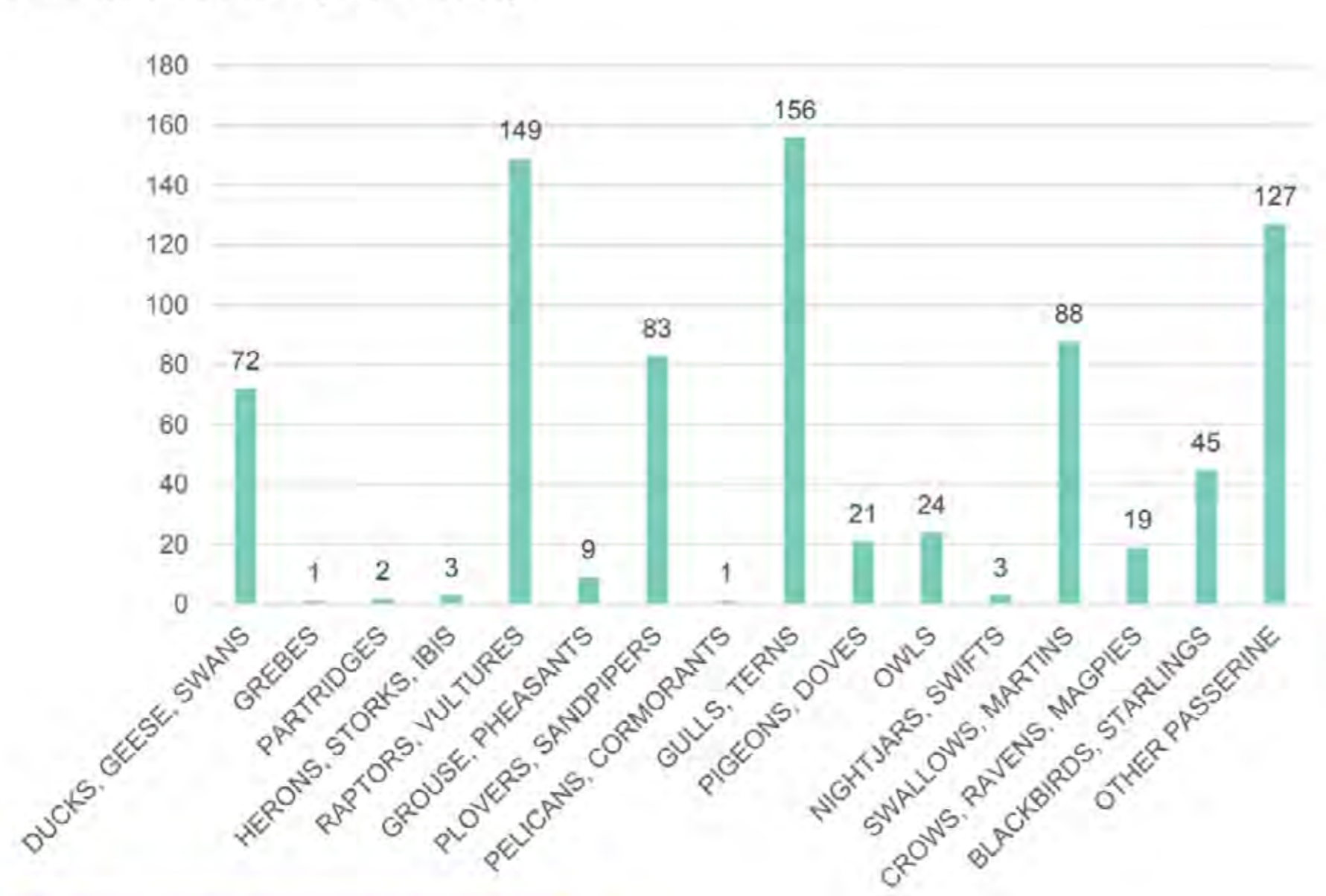


Transportation in Canada is a major contributor to the national GHG emissions, which exacerbates climate change and therefore negatively impacts wildlife in the country. Through education and increased awareness of the environmental costs of transportation, we can make more conscientious choices about how we transit. Reducing travel when possible, taking public transportation, car-sharing, and utilizing low or zero-emission forms of transportation helps to minimize the effects of greenhouse gasses on the environment.



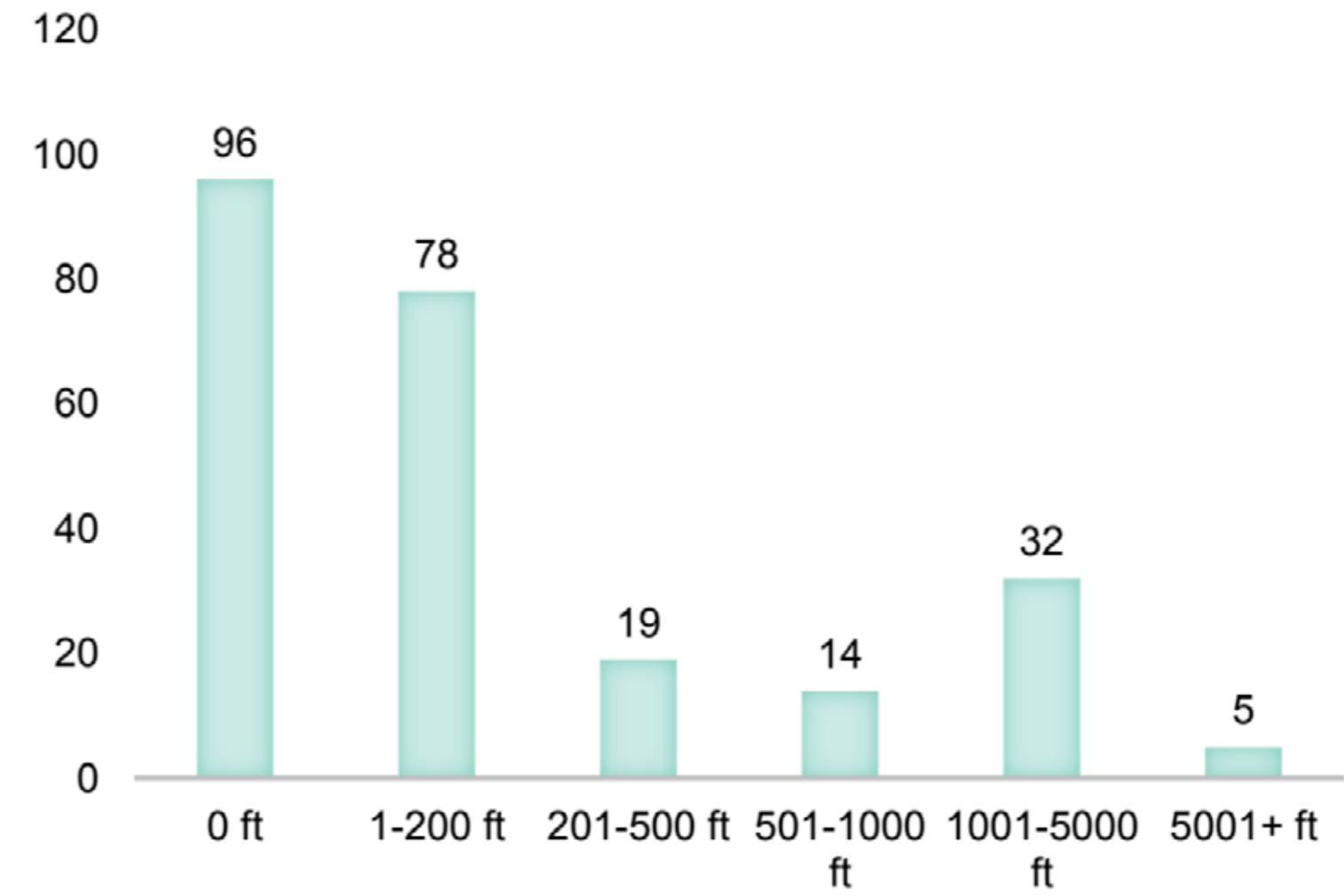
APPENDIX

Appendix Figure A.1



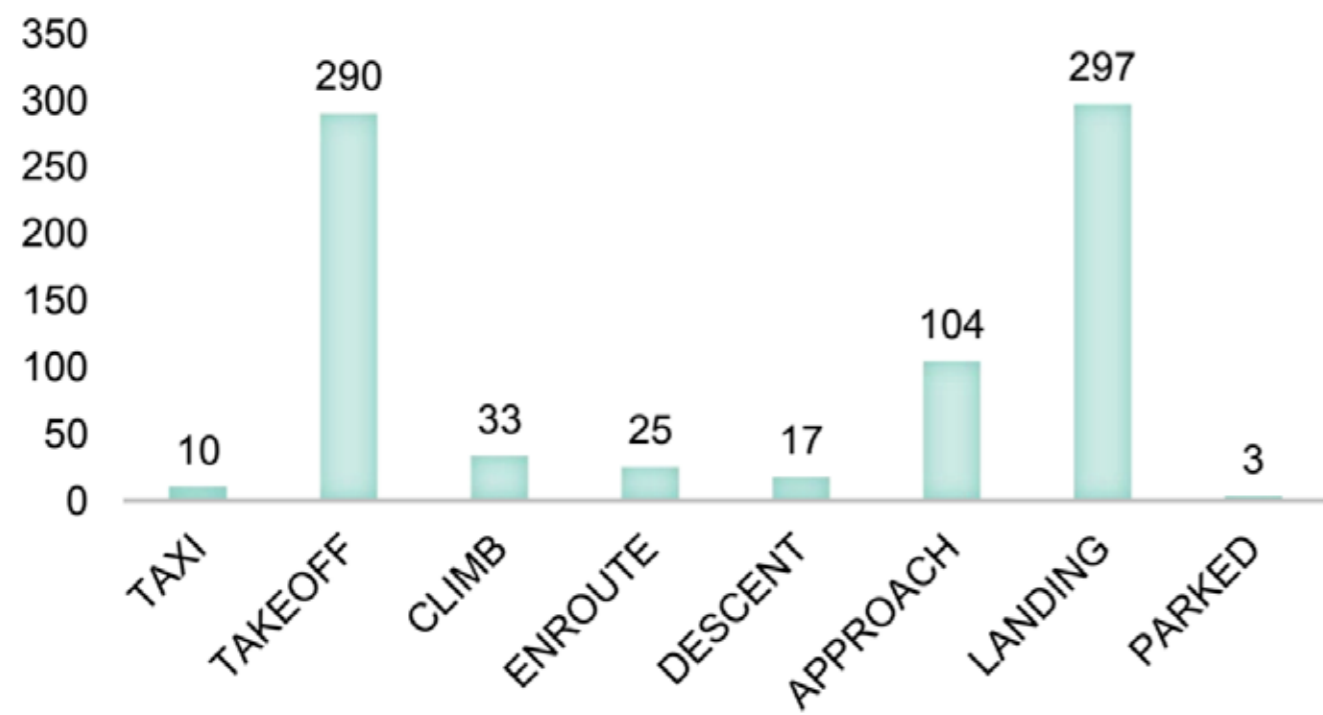
Note: 293 reports did not indicate a species

Appendix Figure A.2



Note: 988 reports did not indicate altitude of flight

Appendix Figure A.3



Note: 456 reports did not indicate phase of flight

Appendix Figure A.4

Family	Species	Strikes
AMPHIBIAN	AMERICAN TOAD	1
BATS	BATS	6
	LITTLE BROWN BAT	2
CANINES	COYOTE	2
	FOX	1
CARNIVORANS	STRIPED SKUNK	9
	RIVER OTTER	1
RABBITS, HARES	RACCOON	2
	HARES	6
	RABBITS	14
RODENTS	ARCTIC GROUND SQUIRREL	3
	GROUND SQUIRREL	1
	GOPHER	7
	MUSKRAT	1
UNKNOWN MAMMALS	RICHARDSON GROUND SQUIRREL	2
	UNKNOWN	3

Appendix Figure A.5

Not Recommended	Limited Recommendation	Highly Recommended
High-intensity sound	Gas cannons	Pyrotechnics
Microwaves	Phoenix Wailer®	Falconry
Lasers	AV-Alarm®	Distress and alarm calls
Ultrasound	Bird Gard AVA®	Shooting
Aircraft hazing	Bird Gard ABC®	Trapping & remote release
Smoke	Scarecrows	
Magnets	Reflecting tape	
Lights	Predator models	
Dyes	Hawk kites and balloons	
Aircraft engine noise	Gull models	
Infrasound	Chemical repellents	
	Foam	
	Predator calls	
	Lure areas	
	Surfactants and water spray	
	Model aircraft	
	Poisons	
	Dogs (Border Collies)	

Appendix Figure A.6

Table 2-5 GHG Emissions from Transport, Selected Years

CRF Code		GHG Emissions Mt CO ₂ eq								Change (%)	
		1990	2005	2014	2015	2016	2017	2018	2019	1990-2019	2005-2019
1.A.3	Transport	145	190	199	201	201	207	215	217	50%	14%
	Aviation	7.5	7.7	7.6	7.6	7.5	7.9	8.7	8.5	14%	11%
1.A.3.a	Domestic Aviation (Civil)	7.3	7.5	7.4	7.4	7.3	7.7	8.4	8.3	14%	11%
1.A.5.b	Military	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.2	3%	-7%
	Road Transportation	84	130	142	143	145	148	152	153	83%	18%
1.A.3.b.i	Light-Duty Gasoline Vehicles	42	41	34	34	35	34	33	32	-22%	-22%
1.A.3.b.ii	Light-Duty Gasoline Trucks	20	38	43	45	48	49	51	53	161%	39%
1.A.3.b.iii	Heavy-Duty Gasoline Vehicles	6.3	12	12	12	13	13	13	14	114%	16%
1.A.3.b.iv	Motorcycles	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	232%	47%
1.A.3.b.i	Light-Duty Diesel Vehicles	0.5	0.6	0.9	0.9	0.8	0.8	0.8	0.8	67%	29%
1.A.3.b.ii	Light-Duty Diesel Trucks	0.2	0.3	0.6	0.8	0.9	1.1	1.2	1.2	686%	251%
1.A.3.b.iii	Heavy-Duty Diesel Vehicles	14	37	50	49	47	49	52	52	280%	41%
1.A.3.b.v	Propane and Natural Gas Vehicles	1.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	-99%	-97%
1.A.3.c	Railways	6.9	6.6	7.5	7.1	6.5	7.5	7.6	7.7	11%	17%
	Marine	3.1	4.0	3.5	3.4	3.5	3.6	3.8	4.4	42%	10%
1.A.3.d	Domestic Navigation	2.2	3.1	3.0	3.1	3.2	3.4	3.6	4.1	87%	32%
1.A.4.c.iii	Fishing	0.9	0.9	0.3	0.2	0.2	0.2	0.2	0.2	-75%	-75%
1.A.5.b	Military Water-Borne Navigation	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1	163%	176%
	Other Transportation	44	42	39	40	39	40	43	43	-1%	3%
1.A.4.c.ii	Off-Road Agriculture and Forestry	9.0	11	10	10	9.7	10	11	11	24%	-1%
1.A.4.a.ii	Off-Road Commercial and Institutional	1.5	2.4	2.8	2.7	2.6	2.8	2.9	3.0	94%	23%
1.A.2.g.vii	Off-Road Manufacturing, Mining and Construction	9.2	10	12	13	12	14	15	14	56%	38%
1.A.4.b.ii	Off-Road Residential	0.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	417%	0%
1.A.3.e.ii	Off-Road Other Transportation	17	6.4	4.5	4.8	4.9	5.1	5.3	5.1	-70%	-21%
1.A.3.e.i	Pipeline Transport	6.9	10	7.9	8.2	8.4	7.4	8.2	8.3	20%	-18%



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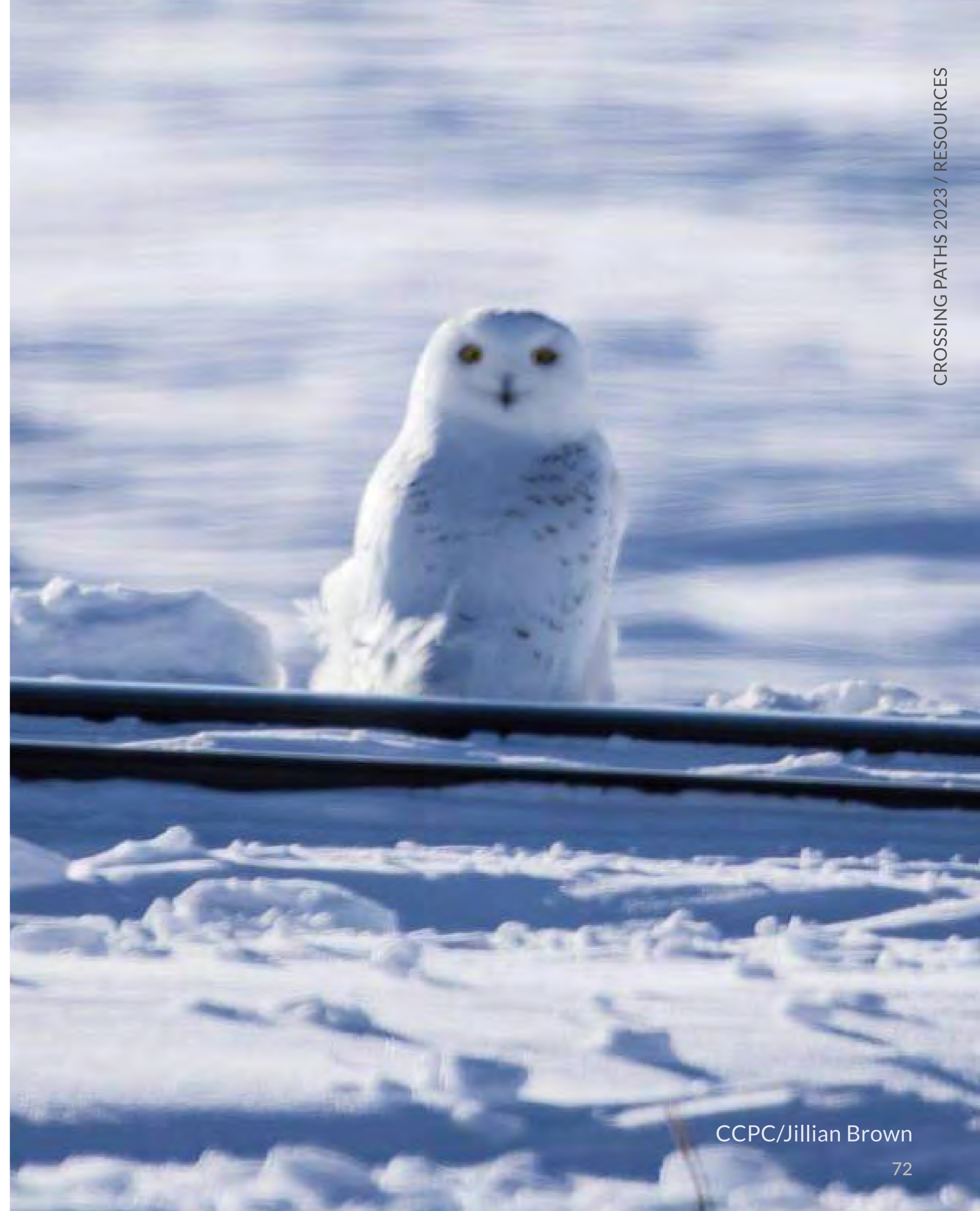
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theccpc.ca

[@theccpc](https://www.instagram.com/theccpc)

info@theccpc.ca