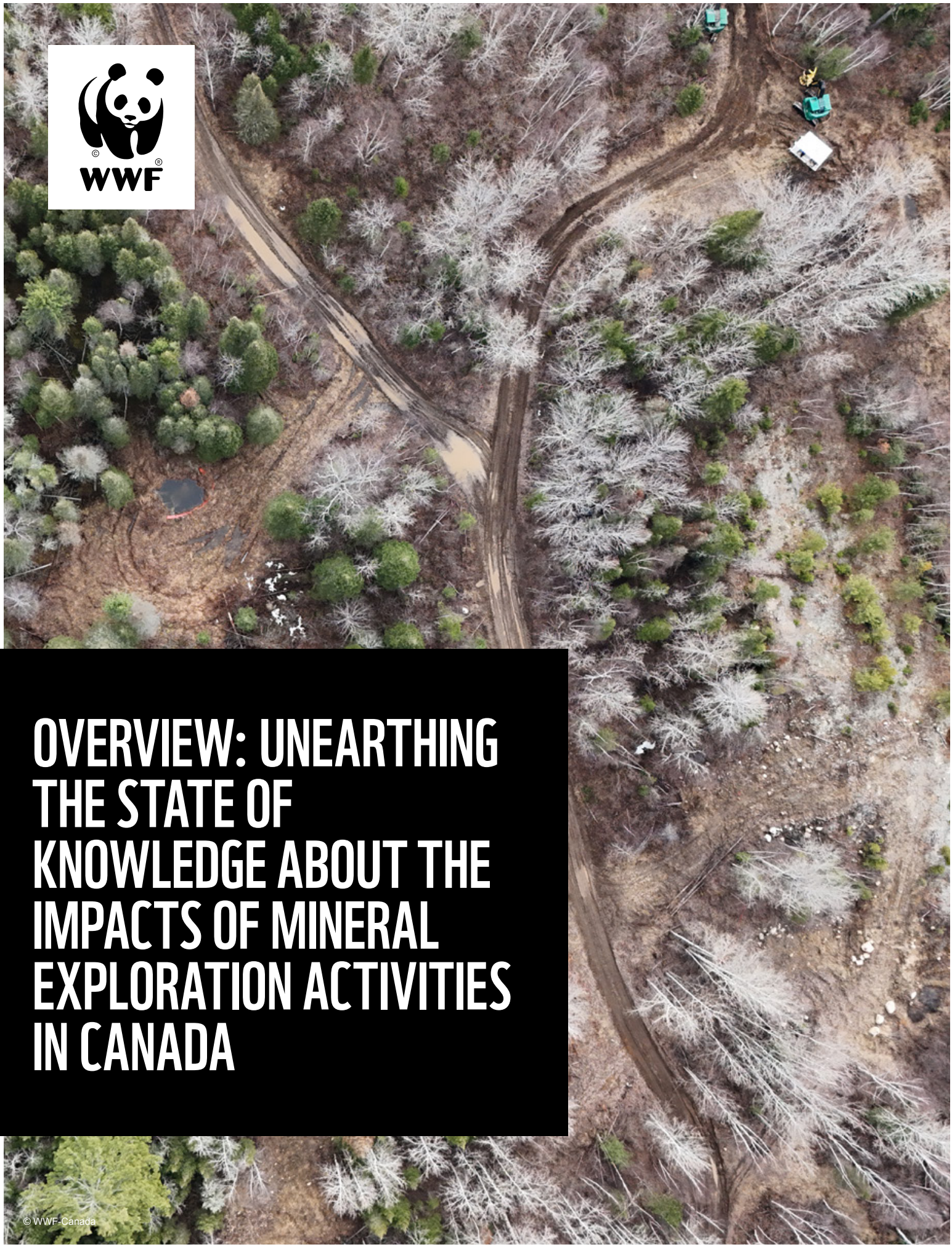

OVERVIEW: UNEARTHING THE STATE OF KNOWLEDGE ABOUT THE IMPACTS OF MINERAL EXPLORATION ACTIVITIES IN CANADA

INTRODUCTION

Industrial scale mining is a significant driver of economic development across Canada, providing key commodities for national and global economies. Alongside its economic benefits, mining operations are known to have significant ecological and social impacts. Land use change, habitat loss and fragmentation, pollution and a range of social impacts, are generally well studied. However, much of this research focuses on the impacts of mines that are operating and producing mineral and metal commodities. This focus neglects to consider the impacts from earlier stages of the mining development sequence: mineral claim staking and exploration activities.

As governments continue to promote the expansion of the mining economy, an improved understanding of the impacts of claim staking and exploration activities is needed. Industry and governments, including those in Canada, continue to characterize exploration activities as having limited negative ecological and social impacts. As a result, regulatory frameworks fall short in effectively managing them. This includes how the impacts of exploration intersect with other anthropogenic activities on the land (i.e. cumulative effects) and how they affect traditional land use practices and Indigenous rights.

In 2025, WWF-Canada commissioned a review of the scientific and grey literature describing the ecological and social impacts of mineral claim staking and exploration activities across Canada. The *State of Knowledge Review: Mineral Exploration Impacts in Canada* documents the current knowledge of claim staking and exploration impacts, describes the current approach to mitigate impacts, and identifies areas for further study that could catalyze an improved understanding of the impacts from these expanding industrial activities. This overview highlights key findings and provides a brief snapshot of *the review* augmented with new information and the latest research. It concludes with a series of recommendations for governments and industry to consider as they look to expand mineral development across Canada.

Recommended Citations

For this overview document:
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https://wwf.ca/impacts-of-mineral-exploration-activities

For the original report:
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https://wwf.ca/wp-content/uploads/2026/08/WWF-Final-Review-Exploration-Impacts-Northwinds.pdf

KEY FINDINGS

The *State of Knowledge review* has two primary findings. First, **claim staking and mineral exploration activities have potential ecological and social impacts, including cumulative effects**. Activities like claim staking, drilling and the development of associated infrastructure all have a range of potential impacts on water, land, wildlife and people.

Second, *the review* reveals that **these impacts have not been adequately studied**, with limited evidence found in peer-reviewed scientific sources. Exploration and related activities, from drilling to road construction, rarely undergo impact assessments and are often exempt from government regulations.[19, 36] Governments and industry justify these exemptions by describing the impacts as "limited and temporary" despite sparse evidence.[15, 28] As a result, activities are poorly tracked and there is minimal publicly available information on their location, extent and duration. The lack of oversight compounds research gaps and makes it difficult to understand, monitor and anticipate exploration impacts, including how they might interact with other human activities or natural processes.

Regulatory exemptions and the understatement of impacts also impede meaningful consultation and participation in decision-making for Indigenous Nations and local communities. When weak environmental and social safeguards are combined with a free entry mineral tenure system that privileges mining over other land uses, tension and conflict often arise.[4]

Despite inadequate research, *the review* documents evidence of the potential ecological and social impacts of mineral exploration activities. With mineral exploration primed for expansion across Canada, the potential impacts to water, land, wildlife and people should be more deeply investigated, addressed, monitored and regulated. Ensuring adequate environmental and social safeguards are in place and upholding the rights of Indigenous Peoples across the mining development sequence, including during claim staking and exploration, will have the added benefit of reducing the likelihood of conflict and providing more certainty for industry looking to invest in mineral projects across Canada.

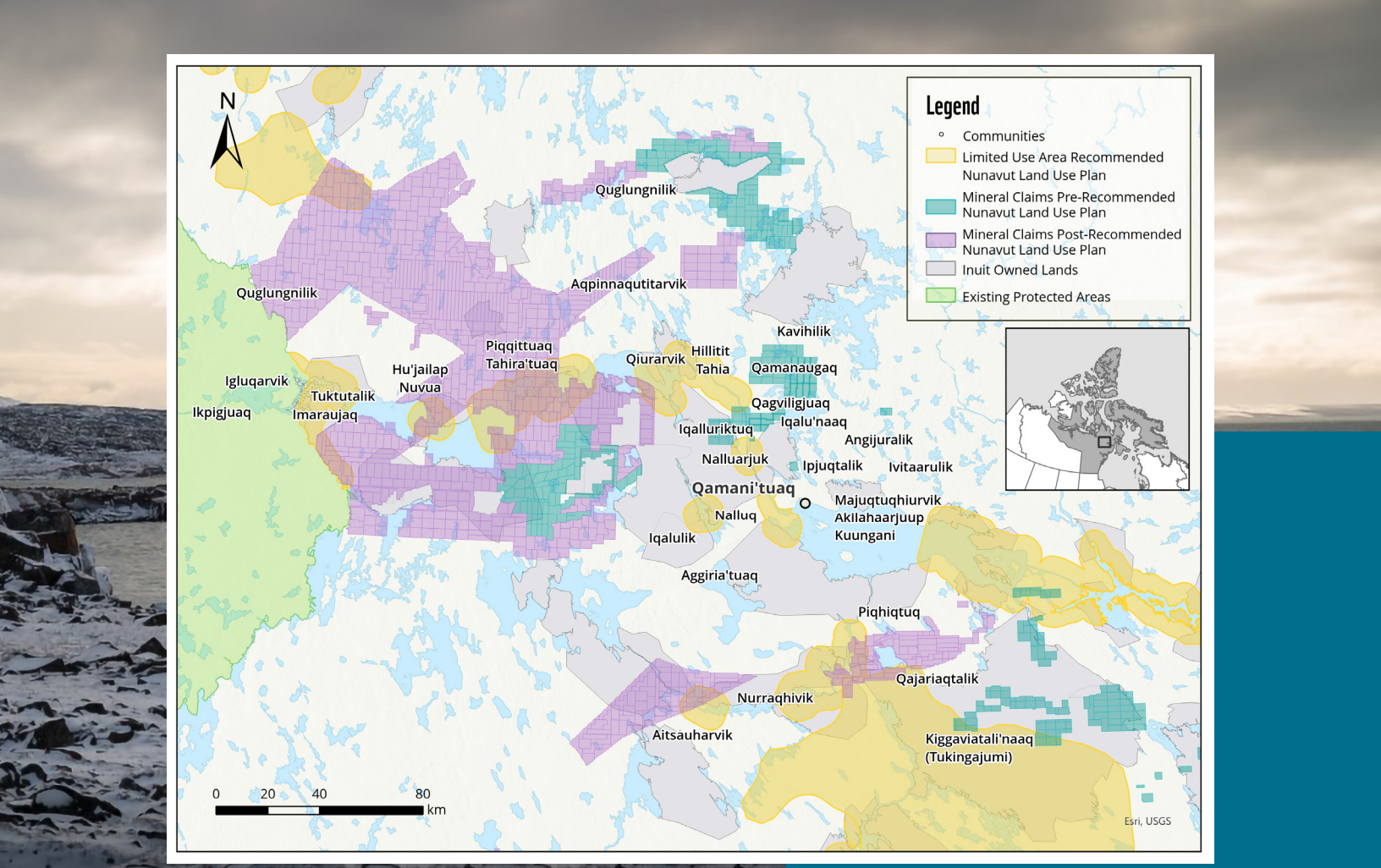
MINERAL CLAIM STAKING

When a proponent is interested in exploring an area of land to assess its mineral potential, they need to first acquire the mineral rights by staking a mineral claim. Each province and territory has its own mining legislation and process for staking claims. In Canada, there are two methods to acquire mineral rights: the "ministerial discretion" system and the "free entry" system. Ministerial discretion gives governments the authority to approve or deny mining claims based on various factors, including environmental impacts, specific local concerns or Indigenous rights. Alberta, Nova Scotia and Prince Edward Island all use this system. On the other hand, the free entry system is based on the principles of the right to free access to public lands to search for minerals, the right to stake a mineral claim and obtain title to the minerals, and the right to develop or mine the minerals. B.C., Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Newfoundland and Labrador, Yukon, Northwest Territories and Nunavut have all adopted some form of modified free entry system.[24]

Historically, claim staking required a prospector to consult a map of existing claims and land designations to verify that an area of interest was available to be staked, travel to the area of interest and drive physical stakes in the ground to mark the claimed area. Today, most mining regions in Canada have replaced the ground-staking model with electronic registries where people with appropriate permissions (normally some version of a prospector license) can log in from anywhere in the world and pay a small fee to claim the mineral rights for an area.

Although claims can be staked on most Crown land, there are some areas where mining-related activities are not permitted and land may be withdrawn from staking. These generally include, but are not limited to: protected areas, Indigenous reserves, municipalities and cemeteries.

Once a claim is staked, the holder has exclusive rights over resources below the ground in that area, and with additional permissions can conduct exploration activities across the claim area.



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Mineral claims staked between June 2023 and September 2025 as the RNLUP was being reviewed.

IMPACTS OF CLAIM STAKING

Although claim staking is now a virtual activity, emerging research, extensive case law, and industry and civil society reports show that claim staking can impact what happens on the ground. It can undermine land use planning and can be a source of conflict even before exploration activities take place (e.g. see Platinex Inc. vs. Kitchenuhmaykoosib Inninuwug).

Once claims have been staked, those areas are unable to be legally designated as protected areas. This restricts governments, communities and Indigenous Nations from being able to make decisions about how land gets used. This includes decisions to establish and designate protected areas, including Indigenous Protected and Conserved Areas (IPCAs), and decisions to limit mining activity to protect values like Indigenous rights and/or cultural activities, biodiversity, wildlife and wilderness tourism. Claim staking can typically continue in areas that have been identified for protection but that have not yet been given legal protected status or been withdrawn from mineral registries. This complicates land use and/or conservation planning activities and often leads to or exacerbates conflict.

THE NUNAVUT LAND USE PLAN

The Nunavut Land Use Plan (NLUP), under development for nearly two decades, outlines where development should be allowed and where environmental protection needs to be prioritized. While the NLUP was under review by the signatory parties, the number of mining claims staked across the territory continued to rise, even in zones proposed as Limited Use Areas, which, upon finalization of the NLUP, would have banned mineral exploration and development. Although the current Recommended NLUP was officially rejected in July 2026, these Limited Use Areas in that version included caribou calving grounds, migratory bird habitats and watersheds that supply communities' drinking water. As the land use planning process evolves, these ecological and culturally important areas remain at risk from expanding mineral exploration and potential future mine development.

MINERAL EXPLORATION ACTIVITIES

Mineral exploration is a process aimed at unearthing information about the geology of a region. It involves a range of activities to search for an economically profitable concentration of mineral resources that could be mined. Exploration activities happen across the country with Ontario, Quebec, and B.C. often considered hotspots.

In Canada, exploration is often categorized into early and advanced stages with each province and territory having its own approach to regulation and environmental considerations. Exploration activities range from grassroots prospecting (e.g. rock pick/hammer) to mechanical drilling and include important ancillary activities, such as the construction of trails and roads to access exploration sites, and development of other types of infrastructure (e.g. drill pads, airstrips, field camps, storage facilities). Although activities may sometimes be temporary, there are instances where exploration is carried out in an area for years or even decades; exploration sites also make up a portion of the 10,000 abandoned and orphaned mine sites found across Canada. The spatial and temporal extent of exploration activities is often poorly understood since many of the activities have few regulatory or policy requirements, and exploration activity tends to ebb and flow with the amount of investment that is secured to fund it.

Permitting requirements for exploration continue to evolve; setbacks in Ontario and improvements in Quebec are recent examples. Still, most provincial, territorial, and federal laws and regulations governing exploration have few provisions to protect the environment or communities. Exploration programs are often screened favourably by regulators who continue to characterize the impacts from exploration activities as *minimal* and *temporary* and many activities are exempt from environmental law, including impact assessments.[19, 36]

Weak permitting requirements and a lack of impact assessment contribute to a limited understanding of the activities undertaken by prospectors and exploration companies, the potential impacts of these activities, and the most effective mitigations. Weak regulations also hinder Indigenous consultation and participation opportunities, which contributes to conflict throughout the mineral development sequence.

EXEMPTIONS FROM LEGISLATION

The political and economic importance of "critical minerals" has led to further exemptions from environmental laws for exploration activities. For example, in 2024, the Government of Canada put forth its Boreal Caribou Emergency Order under the federal *Species at Risk Act (2002)* in response to the declining population of caribou in Quebec. Despite the government attributing caribou population declines to habitat disturbance from roads (a key enabling infrastructure for mineral exploration), the government exempted "projects *at any stage* with primary resources on Canada's critical mineral list" from having to abide by the Order's conditions. Exemptions like this establish a dangerous precedent that undermines the power of federal legislation such as the Species at Risk Act in the name of critical mineral development.

IMPACTS OF MINERAL EXPLORATION

The review commissioned by WWF-Canada consolidates and summarizes information from academic and grey literature about the ecological and social impacts of claim staking and exploration activities, including from sectors with similar activities. *The review* highlights the need for more research to move beyond the current narrative that mineral exploration is "minimally invasive" and "temporary" in nature. Although *the review* highlights how limited the body of knowledge is, it also identifies evidence describing the impacts of exploration activities (Table 1, page 10).

Many of these impacts can be harmful to important habitat, including for species at risk and wildlife of cultural significance to Indigenous Peoples. For example, **access development**, which includes the construction of trails, roads, corridors, airstrips and other infrastructure can disturb and fragment habitat;[7, 18] compact wetlands, soil and riverbeds;[39] introduce contaminants and invasive species;[37] and create conditions that make predation easier for some wildlife,[9] while also potentially increasing hunting pressure.[15, 37]

Line cutting to create a grid for further surveying and sampling disturbs the landscape and can accelerate the erosion of unstable soils.[25, 27] **Trenching, pitting, stripping** and **drilling** are all activities that seek to expose rock at and below the earth's surface. These activities can exacerbate the above disturbances and can scar the landscape if not restored. Rehabilitation is not always required and when it is, challenges exist, especially in certain habitats, such as peatlands.[7,8] Acid rock drainage can happen when chemical reactions occur after water and air mix with bedrock that is exposed during trenching or pitting, producing contaminants that impact aquatic habitats.[27, 36] These activities and the associated use of vehicles (e.g.: helicopters, planes) also create noise emissions that have been shown to disturb wildlife, leading to a range of impacts.[11, 14, 16, 23, 26, 33]

Mineral exploration activities and associated infrastructure can also impact watersheds and the species and communities they support. **Access development** and the poor installation of water crossings and culverts can alter the flow of water, change local hydrology and create barriers to species movement.[29, 37, 39] Construction activities can also affect water quality when soil erodes and mixes with water.[22, 40] **Drilling** can contaminate groundwater if fluids are spilled,[12, 21] and the underground flow and quality of water can be altered if drilling creates a connection between previously separate water tables.[39]

The review also details a range of social impacts associated with exploration activities that often go undocumented through regulatory processes, like the impacts to the health and well-being of local communities and Indigenous Peoples. Exploration has historically proceeded without proper consultation or consent from Indigenous Nations and has created social tension and land use conflicts across Canada. For example, Indigenous Peoples have long expressed concerns about the impacts of mineral exploration activities on constitutionally protected rights such as fishing, hunting, trapping and other cultural practices.[26, 33] Research on the Maymayquayshwak moose hunt that was released after the completion of *the review* offers further insights into this longstanding dynamic (page 8).

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CUMULATIVE EFFECTS

In many areas, mineral exploration is not the only thing taking place on the land. Exploration activities often overlap and interact with other disturbances including those caused by humans and by natural processes. Potential cumulative effects are often examined as part of environmental impact assessments for large projects, such as mines and related infrastructure (e.g. all-weather roads). Mineral exploration projects are rarely required to carry out impact assessments, in part because their impacts are thought to be minor. This means that the cumulative effects of exploration activities are often overlooked even though the impacts of many small projects — including the thousands of mineral exploration activities taking place across the country — can add up to being more significant than the impacts of larger projects.[20]

THE MAYMAYQUAYSHWAK MOOSE HUNT

In Northwestern Ontario, Indigenous harvesters have identified connections between declines in their food sources and the presence of mineral exploration activities for lithium. Ongoing exploration activities, including exploration drilling, the use of float planes, helicopters and boats to transport employees and materials to the exploration site, are seen to be altering wildlife movement patterns and affecting harvest success, especially the availability of moose, a key source of food for the community.[10] Concerns about exploration activities impacting wildlife behavior and harvesting rights are echoed elsewhere in the research literature.[26, 33]


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MITIGATION AND CERTIFICATION

There are many sources of information suggesting best practices for mitigating the impacts of exploration activities. Although most advice has been reviewed and endorsed by the experts who put the guidelines together (Canada's Code of Practice, PDAC eToolkit),[15, 27] the advice is rarely linked to specific evidence of impacts and/or the effectiveness of mitigation efforts, whether it be scientific studies or Indigenous knowledge. Multiple third-party certification standards in the mining sector include advice for exploration activities and set expectations for environmental, social and governance practices. Unfortunately, few exploration companies voluntarily subscribe to these standards, and effectiveness monitoring of these standards remains limited.

TABLE I: MINERAL EXPLORATION ACTIVITIES AND POTENTIAL IMPACTS

ACTIVITY		POTENTIAL IMPACTS
Line Cutting Cutting narrow strips of forest in a grid pattern to allow access for ground surveys and drilling.	Water	**Soil erosion:** Erosion of unstable soils can impact water quality.[27]
	Land	**Land clearing:** Can change forest composition and fragment habitat, changing how wildlife use the area.[25] **Access creation (line openings):** Can increase human hunting pressure.[27] **Corridor creation:** Can change wildlife movement, increasing predator efficiency.[25] **Stringing of survey wires (grid lines):** Wildlife can be caught in wires.[27]
Drilling Use of mechanized drill rigs to collect subsurface rock samples for testing of mineral content.	Water	**Groundwater disruption:** Drilling can alter water flow and bring underground water sources to the surface.[39] **Reduced water availability:** Taking water from lakes, rivers and wetlands for drilling can stress vegetation.[27, 40] **Contamination (drilling waste discharge):** Drill fluids and sludge can pollute soil and water.[12, 21, 41] **Artesian flow:** Upward movement of groundwater can make it difficult to close drill holes resulting in mineral-rich water flowing across the landscape.[41]
	Land	**Drilling waste:** Waste rock can generate acid when exposed to air/water.[6] **Land clearing (drill pad construction):** Removing vegetation can fragment habitat, causing wildlife to avoid the area.[3, 36] **Soil compaction (drill pads):** Can limit revegetation and change the way water moves through the ecosystem.[8]
	Air	**Noise (drilling equipment and vehicles):** • Can increase movement, energy use, alertness, and flight behaviour in caribou *(Rangifer tarandus)*.[14] • Can cause avoidance and alter wildlife migration routes.[14, 33] • Can reduce reproductive success in white tailed deer *(Odocoileus virginianus)*.[11] • Can impact predator–prey dynamics in birds.[16, 23]
Trenching, Pitting, Stripping Manual or mechanical excavation to expose bedrock and minerals for further analysis.	Water	**Surface water disruption (excavation):** Can change paths of water flow.[39] **Contamination (exposed rock, drainage):** Can pollute surface or groundwater.[39] **Sediment runoff (soil disturbance):** Can degrade surface water.[15] **Acid rock drainage (exposed minerals reacting with air/water):** Can pollute aquatic habitat.[27, 36]
	Land	**Soil compaction (heavy machinery):** Can limit revegetation and change the way water moves through the ecosystem.[8] **Removal of topsoil (stripping):** Can remove soil communities (e.g., bacteria, nematodes, and fungi).[38] **Open excavations (pits/trenches):** Can cause wildlife injury or death.[1,5] **Habitat fragmentation (disturbed ground):** Can reduce gene flow and disrupt wildlife movement.[17,18]
	Air	**Noise (equipment and vehicles):** Can disturb wildlife (see "Drilling" above).

[1] This table does not represent a comprehensive review of the impacts of mineral exploration activities. Rather, it aims to recognize a range of ecological impacts as detailed in available evidence, including from proxy industries with similar activities. The table speaks to the specifics of key activities, while noting that many activities have potential overlapping impacts to air, land and water.

ACTIVITY		POTENTIAL IMPACTS
Blasting Use of explosives to blast rock so it can be analyzed.	Water	**Water movement changes (fracturing rock):** Can cause oxidation, acid generation and metal leaching.[27] **Vibrations (blasting shockwaves):** Can harm fish.[27]
	Air	**Creating dust (excavation):** Can deposit pollutants in air and water.[15] **Noise (explosives):** Can disturb wildlife (see "Drilling" above).[13, 15, 26]
Bulk Sampling Excavating or blasting a large pit or small underground operation for testing purposes.	Water	**Exposure of acid-producing rock (excavations):** Can contaminate water.[27] **Dewatering (pit/underground work):** Removing water to operate in dry conditions can disrupt hydrology and reduce water availability.[2]
	Land	**General excavation (large-scale sampling):** Can disturb soil and vegetation and scar the landscape.[15]
	Air	**Noise (heavy equipment and vehicles):** Can disturb wildlife (see "Drilling" above).
Access Development Construction of infrastructure (roads, trails, landings, airstrips) for workers and vehicles (e.g. trucks, drill rigs, aircrafts) to access the exploration site.	Water	**Water crossings (culverts, bridges):** Can impair fish passage.[29] **Surface water disruption (road building):** Can restrict or redirect water.[37] **Wetland disruption:** Can change quantity and flow of water.[39] **Erosion and sedimentation (cleared corridors):** Can reduce water quality and impact aquatic habitat.[22, 40] **Contamination (vehicle operation):** Fluids can pollute water and soil.[22, 37]
	Land	**Land clearing (infrastructure):** Removing vegetation can destabilize soil and fragment habitat reducing gene flow and genetic diversity.[17, 18, 34, 36, 40] **Draining peatlands (road foundations):** Increases wildfire risk.[7] **Soil compaction (road construction and use):** Limits revegetation and changes the way water moves through peat.[8, 39] **Slope undercutting (road construction):** Can cause landslides.[37] **Increased human access:** Can introduce invasive species, increase harassment of wildlife and hunting risk, and cause roadkill.[15, 37] • Can disturb land use and hunting practices.[26, 33] **Predator–prey interactions (linear corridors):** Can make it easier for predators to access prey.[9]
	Air	**Creating dust (road use):** Can deposit dust and pollutants in air and water.[37] **Noise (aircraft and vehicles):** Can disturb wildlife (see above).
Field Camps Accommodation and associated infrastructure (e.g. waste, fuel storage, etc.)	Water	**Water withdrawals (camp operation):** Can impact water supply.[15, 39] **Fuel storage and use (equipment and vehicles):** Can result in spills and contamination of surface, groundwater and/or aquatic ecosystems.[15, 27] **Grey/black water discharge (camp waste):** Can contaminate terrestrial and aquatic ecosystems.[15] **Groundwater contamination (camp waste):** Food waste and landfills can pollute groundwater.[32]
	Land	**Soil compaction (infrastructure):** Can reduce revegetation potential.[8] **Habitat disruption (construction):** Clearing can reduce habitat quality.[15] **Food/waste handling (operations):** may result in human-wildlife conflict.[15] **Fuel storage and use (equipment and vehicles):** Can result in spills and contamination.[15, 26, 27]
	Air	**Noise (camp activity):** Can disturb wildlife (see "Drilling" above).

RECOMMENDATIONS

Despite government and industry claims that mineral exploration activities have minimal and temporary impacts, the *State of Knowledge Review: Mineral Exploration Impacts in Canada* describes a range of potential impacts to habitat, wildlife, water and communities.

Canadian mining jurisdictions need to respect ecological and social well-being while expanding mineral exploration and development activities. To reduce the likelihood of conflict and provide more certainty for industry looking to invest in mineral projects across Canada, the following recommendations should be considered and supported:

- **Improve consultation and participation of Indigenous Nations and communities in decision-making** consistent with the United Nations Declaration on the Rights of Indigenous Peoples.
- **Require companies to collect, and make publicly available, standardized baseline environmental data and location-specific information about exploration activities** for use in research and impact assessment, including regional and cumulative assessments.
- **Investigate and quantify the impacts of claim staking and mineral exploration activities**, including cumulative impacts over the short- and long-term using both western science and Indigenous knowledge.
- **Identify and apply evidence-based and activity-specific mitigation measures** to eliminate or reduce detrimental impacts.
- **Monitor conditions post-exploration** including the effectiveness of mitigation measures over the short and long-term.
- **Apply evidence-based adaptations** to further mitigate detrimental impacts where needed.

Recognizing the potential impacts of claim staking and exploration activities, and filling research and knowledge gaps will help inform improvements to regulatory processes and decision-making across all levels of governments and will allow for the impacts of these activities to be considered.

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