

# **Making an Informed Decision:**



## **Potential Impacts of Local Quarry Development**

December 2020

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Slide Presentation highlighting activities and impacts.

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Impacts of Uranium Mining on Serpent River First Nation Territory, 1953-88 – Dr. Lianne Leddy of Wilfrid Laurier University

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a) Globe and Mail Article (front-page) Nov. 4, 2019.

b) Scientific Research Article “*Global Ecology and Conservation – Vol 20, 2019*) Turtle Habitat and Site of Proposed Quarry – Endangered species protection and evidence-based decision-making: Case study of a quarry proposal in endangered turtle habitat – G. Zagorski, D. Boreham, and J. Litzgus

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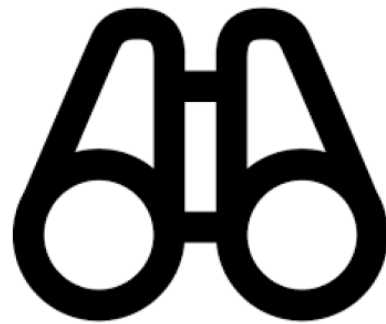
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## 8. **Supplementary Readings**

# 1. Overview



# Information Overview

## Serpent River Watershed and a Proposed Quarry

Proposed Quarry Location



# Serpent River Watershed

Proposed Quarry Boundary  
115 Ha = 284 acres  
OR  
215 Football Fields



Diagram showing the location of proposed quarry off highway 17 between Algoma Mills and Spragge. Quarry boundary (blue line) and access road (red line)

# Environmental Impact

- Quarry project involves 5 species at risk- Blanding's Turtle, Snapping Turtle, Painted Turtle, Whip-poor-will, Myotis Bat, provincially significant wetlands, with other wetlands in proximity.





Long Lake – Water levels and Quality Impacts



## Quarry Operations

- Complex water management issues.
- 251 years for natural filling of East Pit
- 218 years for natural filling of West Pit
- Pumping water for entire life of quarry operations
- Water taken from watershed from Hastie Lake, Long Lake, Lake Lauzon, Lake Huron to artificially fill pits lasting over 75 years
- Unprecedented large scale water management with 7 different site discharge locations to manage over an extremely long period of time

## Overview



Unnamed Lake A



- Disruption of significant moose aquatic feeding areas (yellow circles) with no 120m MNR recommended set back (Tulloch Environmental NEL 2, 2018)
- Noise from operations will frighten wildlife from natural habitats (blasting, crushing, washing, trucking)
- Wetlands may become degraded (dried up or flooded) due to changes in surface water flow.



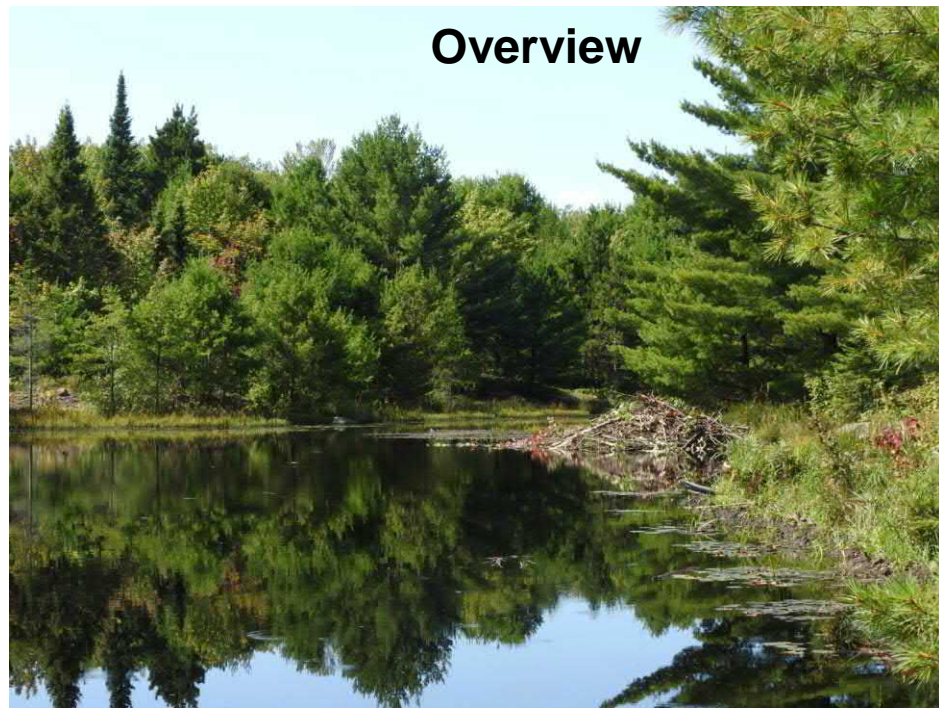
## Overview



Unnamed Lake B



- Extraction time period of proposed quarry is 121 years, after an access road is built
- Rehabilitation results in 2 man-made lakes (if the project is not abandoned)
- Estimated time to fill the lakes is an additional 350-400 years if left to mother nature
- Estimated water volume to fill the pits is 27.5 million m<sup>3</sup> (27 billion, 500 million liters of water)
- Diesel powered water pumps using nearby waterbodies operating at 100 gallon per minute will take over 75 years to fill.



## Overview

Wetland A



- Water levels impact on significant wetlands
- Contaminated water from residual explosives
- Spillage or incomplete detonation of explosives causes seepage into fragmented rock and into ground or surface water



Wetland Meadow (flows into Unnamed Lake B)



## Overview



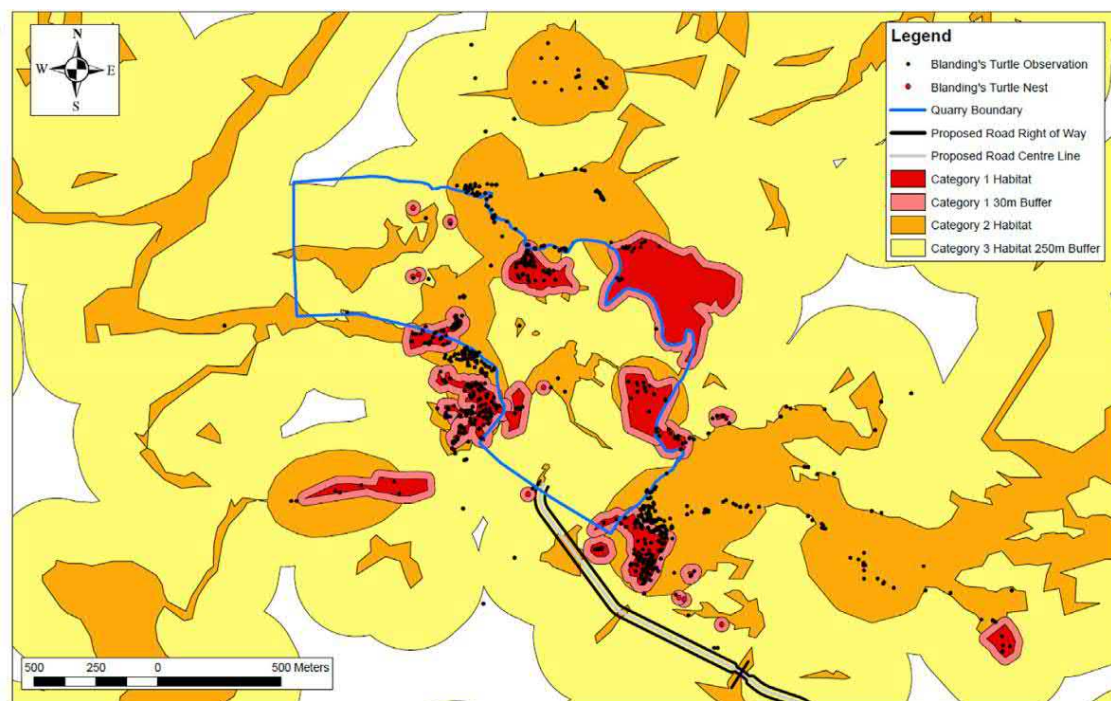
- Dust will contaminate watersheds with particulate matter, sulphur dioxide, carbon monoxide, nitrogen dioxide, metals (Al, Cr, Fe, Mg, Mn), radioisotopes (Radium and Uranium), and respirable crystalline silica (quartz) (PM10).
- Crystalline silica dust is an airborne carcinogen
- Sediment in settling ponds containing metals and isotopes are dispersed onto the land
- Spills of fuels and contaminants
- Water treatment of settling ponds required before discharge to environment
- Unclear long term regulatory oversight

## Turtle Research



Graduate student Gabriella Zagorski conducting the turtle research

- Wetlands are significant habitat for threaten Blanding's Turtles
- Over 56 mature turtles have been discovered so far
- Quarry boundary is almost completely turtle habitat (see figure below)

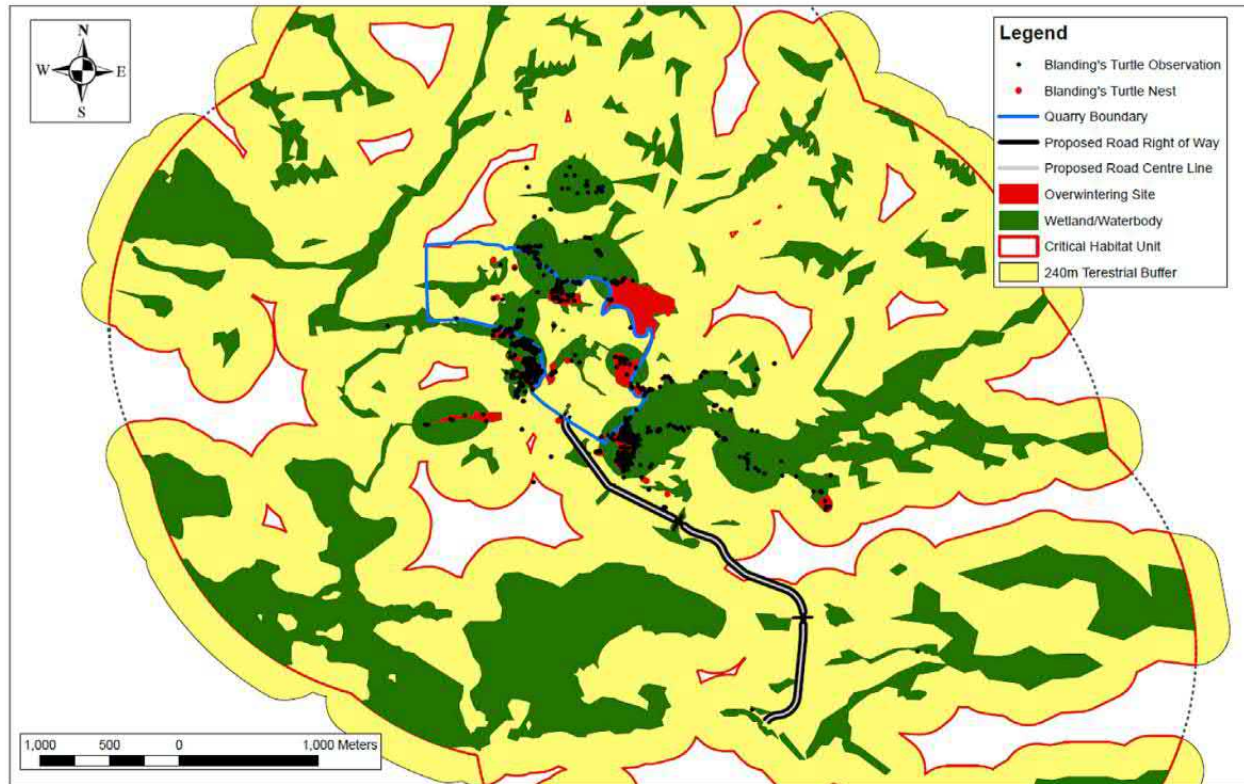


Habitat categorization map using provincial maximum 250 m terrestrial habitat buffer showing 100% habitat in quarry zone (Taken from scientific publication Global Ecology and Conservation Vol 20, 2019)

Critical Habitat of Wetlands and Lakes affected by Quarry.  
 Based on federal Blanding's Turtle recovery strategy guidelines. The blue outline of the quarry footprint covers 100% critical habitat.

G.M. Zagorski et al. / Global Ecology and Conservation 20 (2019) e00751

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**Fig. 3.** Blanding's turtle (*Emydoidea blandingii*) critical habitat unit map as per the federal recovery strategy. Nesting sites are given a 150 m terrestrial buffer, and wetland complexes within the 2 km radial distance of an observation have a 240 m terrestrial buffer (ECCC, 2018). All areas surrounded by the terrestrial buffer that fall inside the 2 km radial distance from a turtle observation are defined as critical habitat units (ECCC, 2018). The proposed quarry location is outlined in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

## The problem with turtles is reproductive potential.

Turtles reproduce at a very slow rate and displacing or destroying small numbers of turtles will critically impact the population. After 17 years, 25 bears, 681 moose, and 912 deer will be produced but there will still be only 1 turtle.

General comparison of reproductive potential among big-game species in Ontario

Year	Snapping Turtle	Black Bear	Moose	White-tailed Deer
0				
1				
2				
3				
4				
5				
6				
17		x7  x18 = <b>25</b>	x303  x151  x227 = <b>681</b>	x629  x283 = <b>912</b>

Note this chart does not take mortality into consideration.

This chart was developed by the OMNR Black Bear Technical Team in 2005 based on an original idea by George Kolenosky.

Snapping Turtle column was added by the Ontario Multi-Species Turtle Recovery Team in 2008.

Please note that up to 1400 eggs need to be laid by a snapping turtle before one offspring reaches maturity. This may not occur until year 50.

= young of the year

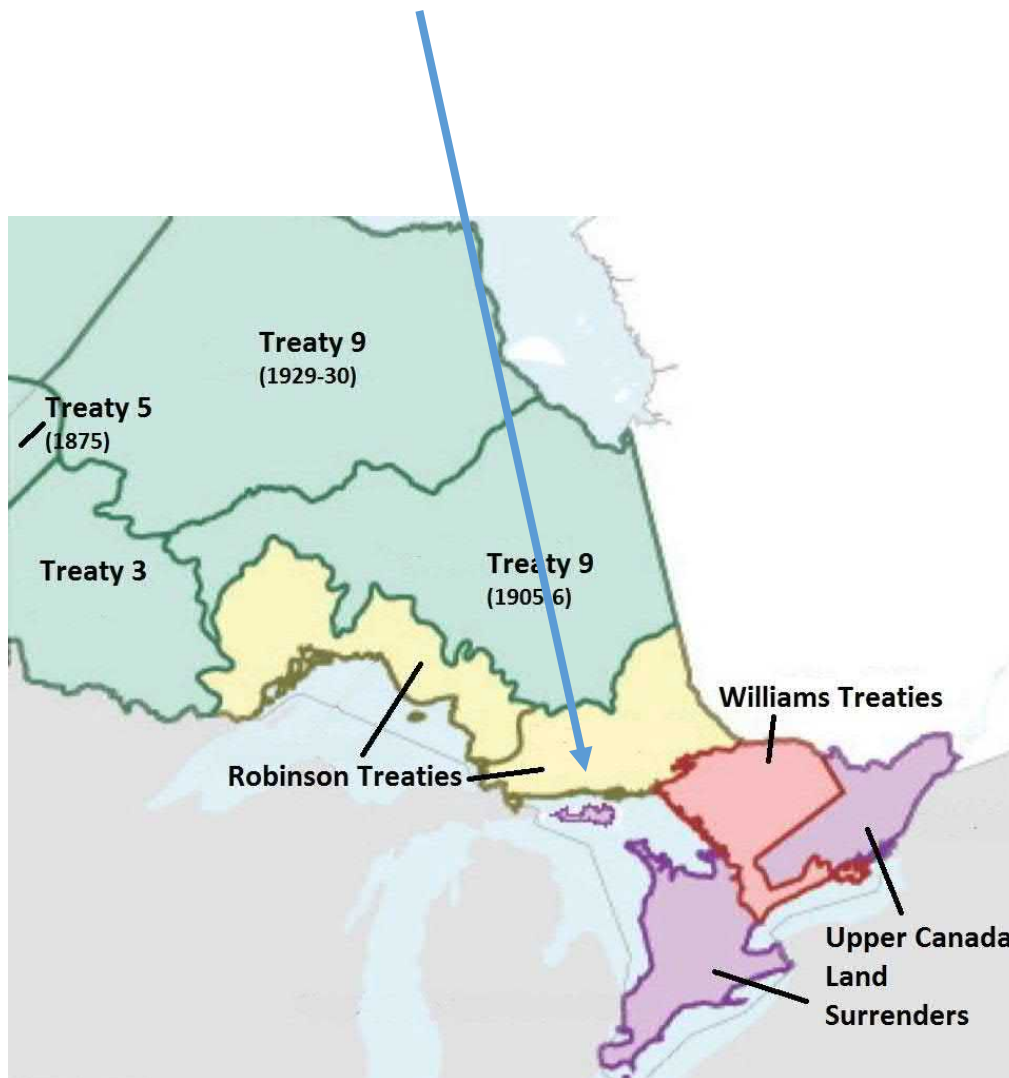
= sexually immature

= sexually mature

## The proposed quarry is on Robinson Huron Treaty lands

### List of Robinson Huron Treaty First Nations

- Atikameksheng Anishnawbek First Nation (Robinson Huron)
- Batchewana First Nation of Ojibways (Robinson Huron, Pennefather)
- Dokis First Nation (Robinson Huron)
- Garden River First Nation (Robinson Huron)
- Henvey Inlet First Nation (Robinson Huron)
- Magnetawan First Nation (Robinson Huron)
- Mississauga First Nation (Robinson Huron)Nipissing First Nation (Robinson Huron)
- Sagamok Anishnawbek First Nation (Robinson Huron)
- Serpent River First Nation (Robinson Huron)
- Shawanaga First Nation (Robinson Huron)
- Sheshegwaning First Nation (Robinson Huron)
- Temagami First Nation (Robinson Huron)
- Thessalon First Nation (Robinson Huron)
- Wahnapiatae First Nation (Robinson Huron)
- Wasauksing First Nation (Robinson Huron)
- Whitefish River First Nation (Robinson Huron)



# Project involves provincially significant wetlands on Robinson-Huron Treaty lands.



Wetlands on project site impacted by the project



Turtle Island Center Research Station on proposed quarry site.

Significant wildlife habitat. Camera surveillance regularly detects moose (pictured above), deer, raccoons and other wildlife.



# Research on Robinson-Huron Treaty Lands through Turtle Island Center

Mike Newnham (President)

Ken Meawasige(CEO)

Darrel Manitowabi (NOSM Researcher)



The Turtle Island Center for Excellence in Environmental Research and Education (TIC) is an academic research and development centre in Northern Ontario. It brings the teachings of the Ojibwa peoples combined with western science to help restore earth, water and air to their natural form.



## 2. Water



# Impacts of Uranium Mining on SRFN Territory, 1953-88

Prepared for ANSWER and TEK Elders

Prepared by Dr. Lianne C. Leddy  
SRFN Member  
Associate Professor, Indigenous Studies, Wilfrid Laurier University

January 2021

## Report Background

In November 2020, Rhonda Kirby of ANSWER approached me to prepare a short report for her organization and TEK Elders based on my dissertation, “Cold War Colonialism: The Serpent River First Nation and Uranium Mining, 1953-1988.” Rhonda and other members of ANSWER thought that it would be helpful to write a brief historical report about mining and industrial activity on our territory, and that is the spirit in which I humbly share my results once again. I should also note from the outset that there are community Elders who can speak to this history and I hope they have the opportunity to do so.

## Contents

This report includes:

- a timeline of uranium mining on SRFN territory
- a summary of the impacts of mining on the Serpent River
- a summary of pollution as a result of the acid plant
- relevant maps

## Uranium Mining Timeline

1948 – Aimé Breton and Karl Gunterman stake mining claims near Lake Lauzon  
1953 – “Backdoor Staking Bee” results in more mining claims staked in the area  
1955 – mines established, as well as what would become the town of Elliot Lake  
1956 – Lease of SRFN land finalized between the federal government and Noranda; acid plant opens  
1957 – Contracts with the Atomic Energy Commission (USA) for more than \$1.5 billion worth of uranium  
Early 1960s – “Bust” period after the contracts are not extended  
1963 – Cutler Acid Plant Closes  
1969 – Exercise Powder Serpent blows up the acid plant buildings  
1970s – Increased SRFN involvement in discussions surrounding the health of the river and potential expansion of mining operations at Elliot Lake  
1980s – Attempts to reach agreement to clean-up the acid plant site  
1988 – Cutler Acid Site clean-up (again)  
Today – several tailings management areas in and near the watershed.

## Overview of Mining at Elliot Lake and its Impacts on the River

The town (now City) of Elliot Lake, located on Anishinaabek traditional territory, was established as a planned mining community. Local history and the Elders I interviewed make it clear that the Anishinaabek had long used the area for hunting and trapping.

When the Cold War brought a demand for uranium for nuclear weapons development, Canada entered into a contract with the United States to meet their demand for uranium.

Mines were established in the Elliot Lake and North Shore area, in accordance with the stakes that were claimed in the early 1950s. The *Leader-Spectator*, even as early as 1957, said that the 35,000 tonnes of uranium mining capacity of the mines in operation near Elliot and Quirke Lakes “indicated a tremendous waste disposal problem.”<sup>1</sup> Concerns about water quality are evident in government documents, as well as in coverage in the *Globe and Mail* in the 1960s.

The impacts that tailings leakage had on the watershed were significant for the river itself, and also the beings that relied on it. Elders spoke about the impacts on fishing as well as beaver quality. Importantly, some community members still drew drinking water from the river and hunted and trapped animals that did so as well, but I have not found evidence that the SRFN community was directly told about these dangers before the mid-1970s, twenty years after mining began.

### Overview of the Cutler Acid Plant

In 1955-56, Noranda Mines built the acid plant in the SRFN community. Sulphuric acid was used in the leaching process to extract the uranium from the rock, and its production was dangerous: sulphuric acid is a highly corrosive substance and inhaling its fumes can lead to irritation and damage to the mucous membranes of the lungs, throat, and nose. The Centers for Disease Control and Prevention lists the following symptoms of exposure: “irritation of eyes, skin, nose, throat; pulmonary edema, bronchitis, emphysema; conjunctivitis; stomatitis; dental erosion; eye, skin burns; dermatitis.”<sup>2</sup> The acid was produced by burning sulphur in a roaster.<sup>3</sup>

The plant promised jobs for community members, and the site was chosen in part because it was close to transportation infrastructure. Another reason was that the federal government could use an old lease for a timber mill that had never been fully returned to the community years before as a rationale for entering into the lease agreement with Noranda. Furthermore, some community members had wanted their own legal representation at the time of the lease, but Elders who were interviewed about this said the request was denied by Indian Affairs.

Elders I interviewed talked about the harsh working conditions in the plant as well as the damage it did to the air for the surrounding area, resulting in deforestation and damage to houses. Some also mentioned having to fish further out because of the pollution, in addition to their children developing skin rashes after swimming in the area.<sup>4</sup>

When the acid plant closed, the company left a mess. The clean-up phase took place in two parts. The first was during a training operation called Exercise Powder Serpent in the summer of 1969, several years after the plant closed. It succeeded in blowing dangerous materials over a large surface area. The subsequent clean-up in 1988 came after long negotiations on the part of SRFN leadership, which included Chief Earl Commanda, Keith Lewis, and other active community members. When I wrote my dissertation in 2006-2011, the rocks near Aird Bay were still stained orange and the smell of sulphur was still evident.

## Conclusion

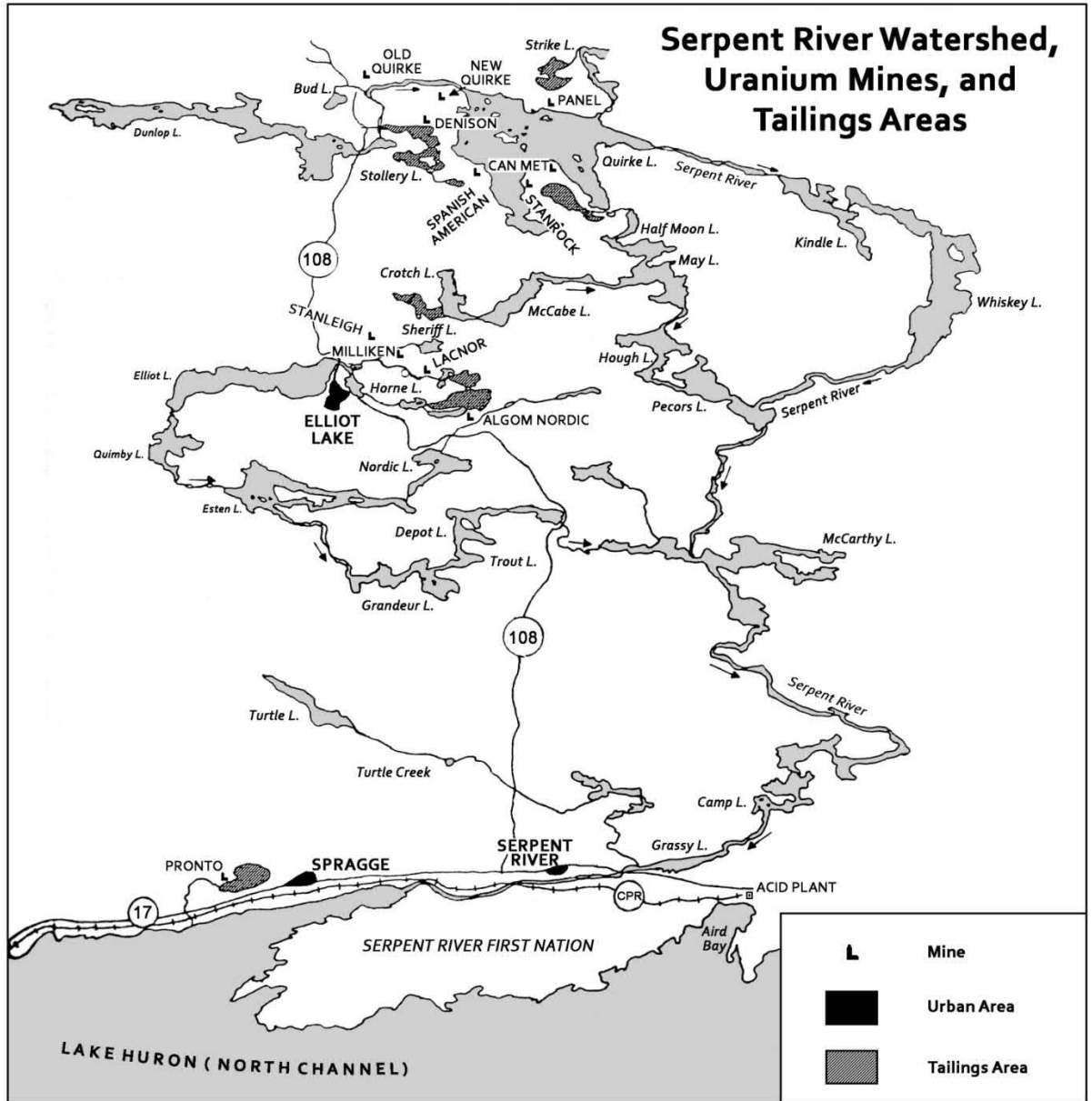
In conclusion, this report summarizes uranium mining activities in the area from the 1950s to the 1980s, highlighting the effects these processes had on our territory and on the reserve. Mining operations at Elliot Lake had environmental consequences for the watershed and SRFN. Additionally, the acid plant brought environmental damage, and while it did provide employment opportunities, those jobs lasted for less than a decade.

## Contact Information and Further Reading

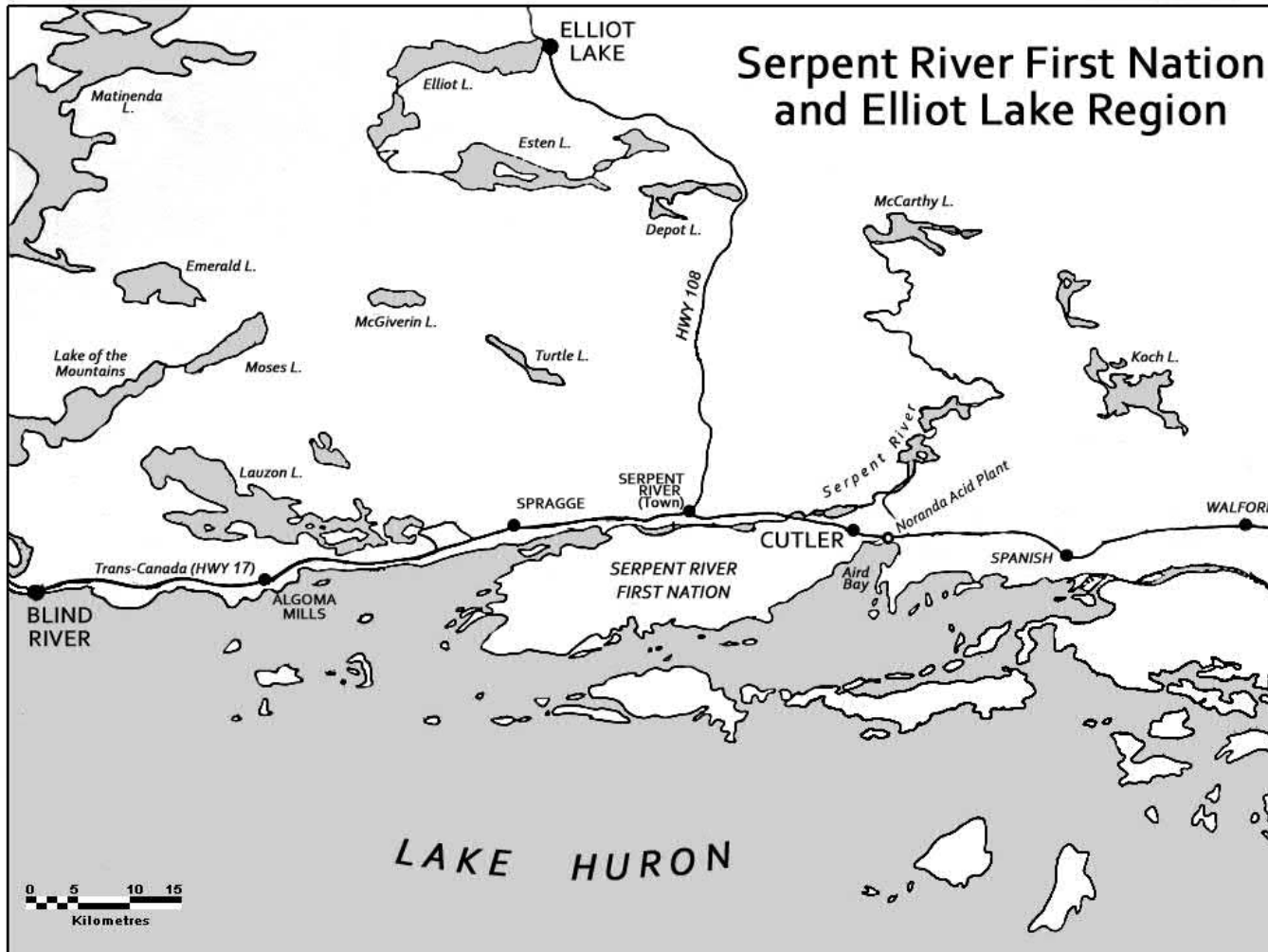
If there are further questions related to my research, I can be reached at any time at [lleddy@wlu.ca](mailto:lleddy@wlu.ca). I would also be happy to speak virtually or by phone as well.

Readers will note that I have concentrated on mining-related dates and activities. I have not included other dates that the community may also find important, such as the Robinson-Huron Treaty (1850) and dates related to community establishment and timber (late 19th and early 20th centuries).

I have reduced the citations for readability, but I am happy to provide more information where necessary. My research blended interviews with Elders as well as the inclusion of archival, newspaper, and secondary sources. You may also find the following helpful: my dissertation, which is available digitally upon request from me or in paper form at the SRFN library; Elder Tea's *Connected to the Land*; SRFN's *This is My Homeland*, edited by Lorraine Rekmans, Keith Lewis, and Anabel Dwyer; and Anna Stanley's dissertation was, at the time I was writing my own work, also available at the SRFN library.

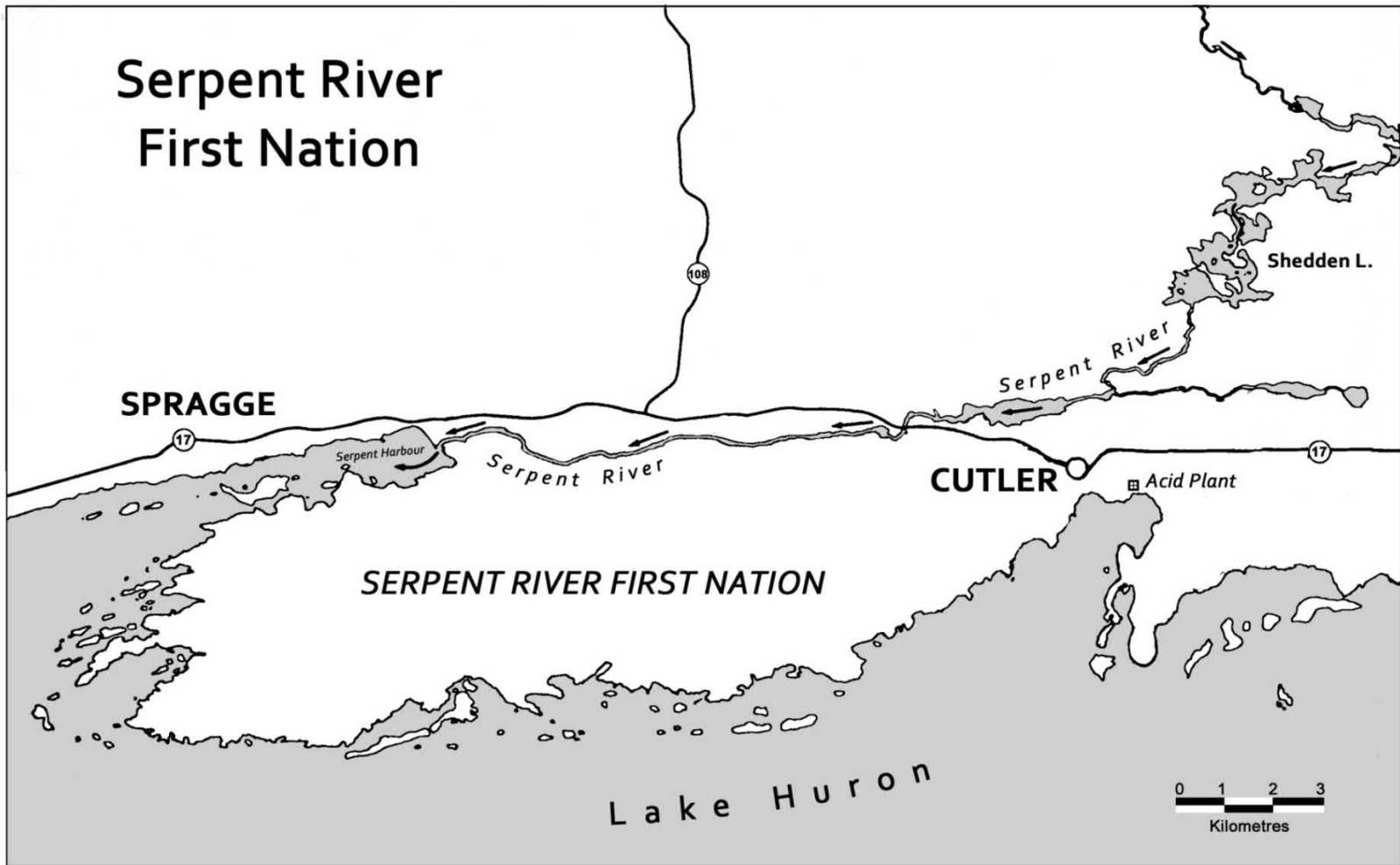


Map 1: Serpent River Watershed, Uranium Mines, and Tailings Area



Map 2: Serpent River First Nation and Elliot Lake Region





Map 3: Serpent River First Nation

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<sup>1</sup> “Study Uranium Mine Area Water Disposal Problems” *Leader Spectator*, 30 May 1957, 7.

<sup>2</sup> Centers for Disease Control and Prevention, “NIOSH [National Institute for Occupational Safety and Health] Pocket Guide to Chemical Hazards—Sulfuric Acid,”  
<http://www.cdc.gov/niosh/npg/npgd0577.html> (accessed 2 December 2020).

<sup>3</sup> “New Acid Plant Cost \$3,000,000” *The Standard*, 13 December 1956, 1.

<sup>4</sup> Chi miigwetch to the Elders who shared their knowledge and experiences with me for my dissertation in 2008-2009 (in alphabetical order): Valerie Commanda, Arnelda Jacobs, Terry Jacobs, Betty Jacobs, Peter Johnston, and my grandmother, Gertrude Lewis. Frank Lewis also shared his experiences with me for a subsequent project in 2014. I am grateful for the time they took to share their expertise with me.

## Water Issues

Re: Proposed Quarry and Access Road

- **Tree clearance** for the proposed access road and quarry will create **surplus water runoff** to nearby ponds, lakes, and streams. Who will monitor this activity?
  
- Once extraction begins, **Water Balance** will be maintained by pumps so that there is less of an effect on nearby Provincially Significant Wetlands (**PSWs**).
  - **Who** will monitor these pumps and water levels: a qualified, independent third party?
  - **How soon** will these pumps be up and running?
  - **How often** will they be monitored? Who will ensure this discharge of water will not contain pollutants (i.e., spills from diesel fuel, oil from machinery, etc.) that will run off into the surrounding water bodies?
  - Too many uncertainties; a “Water Management Plan” is to be detailed at a later date (once an application is made for a Permit to Take Water).
  
- **Wetlands** inside the extraction area **will be consumed**. Others may become degraded (dried up or flooded) due to changes in surface water flow.
  - **How does** this consumption affect the adjacent **PSWs**?
  - How will this impact **moose aquatic feeding areas**?
  
- **Dust** from crushing the aggregate and truck traffic will settle in the **nearby water bodies**. **Noise** will deter moose from their aquatic feeding areas.
  - What will be the long-term effects on **fish populations** and other **wildlife** (i.e., moose) dependent on the nearby wetlands?
  - Will the dust contain **Uranium? Sulphur dioxide**, a respiratory irritant on wildlife?
  
- **Shipping** - Will traffic increase on Lake Huron? Will it affect **Whitefish** populations?
  
- **Projected life** of proposed quarry is 121 years, after an access road is built.
  - **Rehabilitation** results in 2 man-made lakes (if the project is not abandoned).
    - Estimated time to **fill the lakes** is an additional 400 years if left to mother nature.
    - If water is pumped from another source it will take less time. But where will this **water be sourced**? How will this drawing of water affect the **lake habitat** from which it is drawn?

## 3. Environment

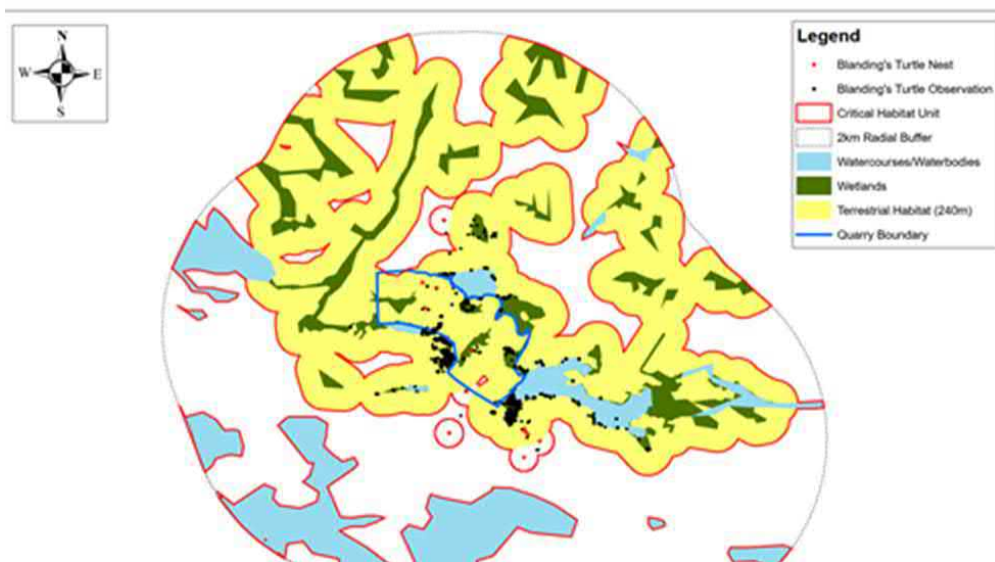


## Turtle Habitat and Site of Proposed Quarry

The proposed site is a pristine wetland complex (provincially significant wetlands have been identified) combined with mixed coniferous forest stands, clear lakes and abundant rock outcrops. The flora and fauna species present are diverse. Most importantly, at least five species at risk (Blanding's turtle, snapping turtle, painted turtle, myotis bat, eastern whippoorwill) have been identified in the area.

A recent research study conducted in 2017-2018 by researchers from Laurentian University and the Northern Ontario School of Medicine found a significant population of federally endangered Blanding's turtles. The researchers captured Blanding's turtles and estimated the population size to be 80 +/- 18 turtles, and density to be 1.84 turtles/ha, which is among the highest reported densities for the species in North America. The data also show that unlike other Blanding's turtle populations in Ontario that travel longer distances to find suitable habitat, this population does not travel as far to acquire necessary resources. This suggests that habitat quality is unusually high in the proposed quarry area. The scientists identified 15 nesting sites and 12 wetlands that housed overwintering turtles, both considered to be critical habitats with the lowest tolerance to destruction. A map generated using the federal protection document (Environment and Climate Change Canada 2018) demonstrated that 100% of the proposed quarry area is categorized as endangered species habitat. This research was successfully defended in a Master's thesis at Laurentian University and has been published in a peer reviewed scientific journal.

*Please see attached Scientific Publication*



**Critical Habitat of Wetlands and Lakes affected by Quarry.**

Based on federal Blanding's Turtle recovery strategy guidelines. The of the quarry footprint (blue outline) covers 100% turtle critical habitat (red lines, yellow and green areas).

## Northern Ontario's turtle tussle pits scientists against quarry builders Threatened species caught in the middle of conflict that is testing province's new policy on endangered wildlife protection



'Turtle whisperer' Gabriella Zagorski, left, and field technician Shannon Millar wade through the wetlands of Northern Ontario with a Blanding's turtle. GINO DONATO/THE GLOBE AND MAIL

**IVAN SEMENIUK** SCIENCE REPORTER

**T**o her colleagues, Gabriella Zagorski is the "turtle whisperer." In the wetlands of Northern Ontario, she can approach a turtle with such stealth that it won't see her coming. "If you move really slowly, then they think you're a tree or something," said the 24-year-old field biologist. "It can take up to an hour sometimes."

Ms. Zagorski's patience paid off two years ago when she was working on her master's degree at Laurentian University in Sudbury and began looking for Blanding's turtles – a rare and globally endangered species – in a soggy pocket of provincial Crown land about 150 kilometres west of the city. Over two summers, she and her teammates found 56 Blanding's turtles concentrated

in an area that measures about three kilometres across. The unexpected find makes the site one of the richest and most densely populated refuges for the species ever found in Canada.

Now, Ms. Zagorski's turtles are caught in a showdown between a company that is seeking to turn the site into a quarry and local residents who oppose the project. The dispute has divided the township of North Shore, a picturesque stretch of rocky inlets and forested wetlands along the northern rim of Lake Huron where Ms. Zagorski's study site is located.

This week, North Shore's municipal council is expected to ratify a 3-2 vote to rezone the area for mineral extraction. If the rezoning is approved, it will be up to the province to say whether the quarry can go forward.

# Turtles: Tulloch Engineering accused biologists of falsifying data at site



**Master's student Gabriella Zagorski along with field technicians Shannon Millar, centre, and Heather Van Den Diepstraten search for Blanding's turtles in Northern Ontario. They found 56 of the globally endangered species over two years in a densely populated three-kilometre stretch that is now a proposed quarry site.**  
PHOTOS BY GINO DONATO/ THE GLOBE AND MAIL

The decision will become an early test of how species protection in Ontario is likely to be conducted under new legislation passed by Ontario Premier Doug Ford's government last June. In the meantime, the brewing controversy has already taken some strange turns, including one last year when Ms. Zagorski and her supervisor, biologist and professor Jacqueline Litzgus, found themselves accused of falsifying their data about turtles at the site. Those charges were levelled by a consulting firm that was hired to conduct an environmental assessment of the site on behalf of the quarry company. In a letter to Laurentian's vice-president of research, the company wrote that the scientists had committed research misconduct and asked the university to investigate. The letter was copied to municipal and provincial officials connected to the approval process for the quarry. The university determined the complaint to be without merit and did not launch a misconduct investigation. Dr. Litzgus, a long-time faculty member who is known for her work in turtle

ecology, saw the broadside as an attempt to undercut the scientists' credibility with decision makers. "It's mind-boggling to me that this could have happened," she said. "Researchers shouldn't be attacked for collecting data that might protect a species at risk in accordance with the law." Without naming their accusers, the scientists included mention of a "defaming attack" when they published their findings in October's edition of research journal *Global Ecology and Conservation*. They noted that "after several exchanges between lawyers, a letter of apology and a retraction of the accusations was received from the consultant." Public documents obtained by *The Globe and Mail* show that Tulloch Engineering was the consulting firm that made the allegations in March, 2018, on behalf of the quarry company, Darien Aggregates, and its majority owner, Rankin Construction Inc. of St. Catharines, Ont. The matter is playing out against a shifting landscape of provincial regulations. Under Ontario's Endangered Species Act, proponents of a project that



**Ms. Zagorski, left, Ms. Van Den Diepstraten, centre, and Ms. Millar, prepare to search a wetland area in Northern Ontario for turtles. Ms. Zagorski says the wetlands are poised to become even more important for Blanding's turtles as their range is affected by climate change.**

could negatively affect a listed species can apply for an “overall benefit permit.” To obtain such a permit, the proponent must take specific actions that helps the species elsewhere to an extent that outweighs any negative effects the project might cause.

This year, the Ford government amended the act to provide another way for a project to get a green light. In principle, the change would allow the quarry to proceed as long as the company contributes money to a provincial conservation fund – an approach that critics have dubbed “pay as you slay.” Conservation groups say the change has dangerously weakened Ontario’s species laws. “We are concerned that it will make the act nothing more than a paper exercise that doesn’t actually protect species,” said Josh Ginsberg, director of the Ecojustice environmental law clinic at the University of Ottawa. Rhonda Kirby, a North Shore resident who op-poses the quarry, said she is among those preparing to challenge the council’s intentions to re-zone the site. She has launched an advocacy group, the North Shore Environment Resource Advocates, and a GoFundMe campaign to raise money for legal costs. Ms. Kirby and her husband were named in Tulloch’s letter of complaint

in part because their property became a staging area for the scientists, which the consulting firm argued was a conflict of interest. Ms. Kirby said the support they provided had no bearing on the scientists’ results and that Tulloch’s complaint was all about silencing independent information about the site. “It was a schoolyard-bullying tactic to get the re-searchers to back off,” she said. Tulloch has since referred questions about the letter to Rankin Construction. Tom Rankin, the company’s chief executive of-ficer, who was also a signatory to the letter of complaint, dismissed the Laurentian study, which he said offered no new information. He added that the placement of the quarry would not affect the turtles. “There’s enough land that we don’t have to touch their habitat,” he said. In an interview with The Globe, Mr. Rankin reiterated one of the letter’s claims that the Laurentian study was biased because one its co-authors, Douglas Boreham of the Northern Ontario School of Medicine, is also a North Shore resident who opposes the project. Dr. Litzgus countered that the study data were collected using well-established protocols – the same that she has applied for years at study sites across the province.



**Blanding's turtles once ranged widely across the Great Lakes region and U.S. Midwest, but increasing agriculture and urbanization have caused their numbers to decline.**



In their study, the scientists noted that Tulloch's relationship to its client puts it in a perceived conflict of interest that may pre-vent it from presenting an accurate portrayal of endangered species at the site. That dynamic is a familiar one in Canada, where companies seeking approval for projects are typically the ones who underwrite assessments, forcing consultants to walk a fine line between their clients' interests and environmental regulators. Dr. Litzgus said her group's study was conducted with far more rigour and transparency than Tulloch's assessment, which yielded a handful of Blanding's turtles. And, contrary to the company's claim, it demonstrates there is an abundant population at the site that overlaps with and would be adversely affected by the quarry, she said.

Known for their boxy shells and bright yellow chins, Blanding's turtles once ranged widely across the Great Lakes region and U.S. Midwest. As agriculture and urbanization have steadily reduced their habitat, their numbers have declined. Although they can live more than 75 years, they are slow to mature and their eggs, which females deposit and bury in loose soil, are frequently devoured by predators. The species relies on females surviving over many years to maintain a stable population. Studies suggest that road kills have played a particularly devastating role in reducing that population over the years. Ms. Zagorski, who returned to the

site in September to retrieve transmitters she had placed on some of the turtles to track their movements, said the discovery of so many members of the species in one location underscores the importance of the habitat, even though it lies on the northern fringe of the turtles' traditional range. "This population is a good indicator of what an untouched area along the Canadian Shield would look like, because it's never faced difficulties like roads and habitat destruction," Ms. Zagorski said. She added that northern wetlands are poised to become even more important for the threatened species as its range is affected by climate change. Dr. Litzgus said she first learned of the site in the fall of 2016, when Ms. Kirby's son contacted her to ask questions about the turtles there. A few months later, Dr. Boreham ran into Dr. Litzgus at an academic meeting and asked if she would be interested in investigating the site. The suggestion turned into a project for Ms. Zagorski, which Dr. Litzgus saw as an opportunity to inform plans for mitigating the quarry's impact on local turtles and test their effectiveness. She offered to partner with Tulloch, writing in an e-mail that the project would help Darien satisfy requirements for an overall benefit permit while ensuring the best protection for the turtles and their habitats. The consulting firm was receptive at first, but that was before anyone realized just how many Blanding's turtles Ms. Zagorski would find.



**Ms. Zagorski had originally offered to partner with consulting firm Tulloch Engineering to help quarry company Darien Aggregates satisfy requirements for an overall benefit permit while ensuring the protection of the turtles and their habitats.**

The revelation came as Darien was working to persuade the township to support the development of a quarry for trap rock, a finegrained stone that is used in building roads. The effort included flying everyone on the five-member municipal council to the Niagara region to visit a quarry Darien operates there. The company has said a new quarry in North Shore could bring 20 to 25 jobs to the community when it is operating at full capacity. Gary Gamble, a councillor who voted against rezoning, said he was not persuaded by the company's case because he said most new revenue in the community is now tied to retirees who are building homes on the waterfront. "Economically, I think a quarry would be detrimental to that," he said.

Ms. Kirby said she is concerned that the council is underplaying the environmental

consequences the project would have, adding that Tulloch's responses to questions about how they would reduce that impact have been taken at face value. "Council seems to think that [the consultants] have answered all the questions but they're not taking all the research into account," she said. And while the Laurentian study is now published and available to decision makers, it's not clear how that evidence will be weighed at the provincial level. Ms. Zagorski, who is now based at the Royal Botanical Gardens in Hamilton, recalled that when Dr. Litzgus first approached her about the project, her initial reaction was to say: "You mean I'm going to spend two years studying these turtles and then they're all going to die?" Now, she sighs, "I just hope my data will help people make an informed decision."



## Original Research Article

# Endangered species protection and evidence-based decision-making: Case study of a quarry proposal in endangered turtle habitat



Gabriella M. Zagorski<sup>a</sup>, Douglas R. Boreham<sup>b</sup>, Jacqueline D. Litzgus<sup>a,\*</sup>

<sup>a</sup> Department of Biology, Laurentian University, 935 Ramsey Lake Road, Sudbury, Ontario, Canada

<sup>b</sup> Northern Ontario School of Medicine, 935 Ramsey Lake Road, Sudbury, Ontario, Canada

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## ABSTRACT

Surface mining practices can negatively impact turtles through degradation of wetlands and surrounding upland habitat, alteration of movement corridors, increased risk of nest and turtle predation, and direct mortality. These impacts, in turn, can cause changes in sex ratios and population demography, which may ultimately lead to population declines and extirpation. Using radio-telemetry, GPS data loggers, and capture-mark-recapture surveys over two field seasons, we described the demography of, and identified critical habitat for, a population of endangered Blanding's turtles (*Emydoidea blandingii*) inhabiting an area of interest for development of a trap rock quarry in Ontario, Canada. We captured 56 turtles and estimated population size to be  $80 \pm 18$  turtles, and density to be 1.84 turtles/ha, which is among the highest reported densities for the species. Daily distances moved and home range sizes were generally smaller than conspecific values reported in the literature, suggesting that habitat quality was high as turtles did not need to move much to acquire necessary resources. We identified 15 nesting sites and 12 wetlands that housed overwintering turtles, both considered by government to be critical habitats with lowest tolerance to destruction. We mapped our spatial data based on the application of legislated provincial and federal recovery guidelines, and the results indicate that the quarry proposal should be rejected if the spirit of the law is upheld given that at least 63% and at most 100% of the proposed quarry area is categorized as endangered species habitat.

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## 1. Introduction

An estimated 61% of turtle species are threatened with extinction or are already extinct (Gibbons et al., 2000; Lovich et al., 2018; Rhodin et al., 2018). Turtle life history characteristics limit the ability of populations to recover from anthropogenic threats as most species are long-lived with delayed sexual maturity and long generation times (Ernst and Lovich, 2009). Turtle populations are especially vulnerable because of their low fecundity and low recruitment, and even a small loss of adults can lead to population declines and extirpation (Congdon et al., 1993; Innes et al., 2008; Keevil et al., 2018). Adult survivorship, especially of females, is arguably one of the most important factors contributing to population persistence (Congdon et al., 1993; Heppell, 1998; Enneson and Litzgus, 2008). Habitat loss is the primary threat to turtles (Gibbons et al., 2000;

\* Corresponding author.

E-mail address: [jlitzgus@laurentian.ca](mailto:jlitzgus@laurentian.ca) (J.D. Litzgus).

Rhodin et al., 2018), therefore description and quantification of home ranges, and nesting and overwintering sites (i.e., critical habitats; SARA, 2002) are essential to habitat and species protection. Because individual populations occur in different habitats, population-specific spatial data cannot always be effectively extrapolated among populations, necessitating local data collection to effectively inform decision making.

Quarrying is a type of surface mining that destroys turtle habitat (COSEWIC, 2016). Wetlands may become degraded from water discharge, changes in surface or groundwater flow, and chemical or sediment contamination (Azous and Horner, 2001; Tulloch Environmental, 2017). Terrestrial habitat may be destroyed by blasting, and turtles may be directly killed by excavation equipment or vehicles entering and exiting construction and operation zones (Azous and Horner, 2001; Steen et al., 2006; COSEWIC, 2016). The creation of quarry access roads and areas of finely crushed gravel may attract nesting females, increasing the risks of turtle and nest mortality and predation (Steen et al., 2006; ECCC, 2018). Many biological and legislative factors need to be considered when constructing and operating quarries in areas containing Species At Risk (SAR) turtles. Political factors should be excluded if endangered species laws are upheld for their intended purposes, which are to protect SAR and their habitats, and to facilitate their recovery (SARA, 2002; ESA, 2007).

The purpose of our study was to apply endangered species legislation to ecological data to inform decision-making about resource extraction. We examined a population of the endangered Blanding's turtle (*Emydoidea blandingii*; van Dijk and Rhodin, 2011) inhabiting Crown (i.e., public) Land in Algoma District, Ontario where a trap rock quarry is proposed. The objectives of our study were to (1) collect population demography data to quantify abundance, (2) collect spatial ecology data to quantify home range size and movements, and (3) use the spatial data to delineate critical habitats under provincial (Ontario) and federal (Canada) endangered species legislation, to provide a quantitative data-driven approach to decision-making about the quarry permit. We also discuss the challenges associated with data that may or may not support development in SAR habitat.

## 2. Methods

### 2.1. Habitat characterization and critical habitat

Under the Endangered Species Act (ESA) in Ontario, general habitat descriptions are created for species likely to be affected by human activities, and are intended to provide scientific evidence-based habitat protection (OMNRF, 2013). The general habitat description for Blanding's turtles divides used habitats into categories in order of least to most tolerant of alteration (OMNRF, 2013). Category 1 includes nesting and overwintering sites, plus a 30-m buffer, and is considered least tolerant of alteration. Category 2 is the used wetland complex and any waterbodies within 500 m of a species' occurrence, and is considered moderately tolerant to alteration. Category 3 is an area between 30 and 250 m from an occurrence buffering the suitable wetlands and waterbodies, and is considered most tolerant to alteration. The Ontario ESA is enforced on both public and private lands (ESA, 2007).

At the federal level in Canada, protection of critical habitat falls under the Species At Risk Act (SARA) which applies on federal lands, including military bases and First Nations lands (SARA, 2002). Critical habitat for Blanding's turtles was defined in a recent recovery strategy (ECCC, 2018). Nesting sites are given a 150 m terrestrial buffer, and wetland complexes in the 2 km radial distance of an observation receive a 240 m terrestrial buffer (ECCC, 2018). All areas surrounded by the terrestrial buffer that fall inside the 2 km radial distance from a turtle observation are defined as critical habitat units which should be protected from development (ECCC, 2018).

### 2.2. Study site

The study site (46°N, 82°W) is located on relatively pristine Crown Land in Algoma District, Ontario to which provincial legislation applies (ESA, 2007), and also sits within the Robinson-Huron Treaty Lands (1850) of Canada's First Nation peoples to which federal legislation applies (SARA, 2002). Human disturbance at the site includes wells placed to monitor ground water levels, ATV trails and a few small areas where test blasting for the quarry has occurred. The proposed quarry licensed area is 115 ha with an extraction area of 68.3 ha (Tulloch Environmental, 2017). The habitat includes a combination of rocky outcrops, mixed forest and wetlands. Common wetland types include open marshes, wet meadows, fens, vernal pools and treed swamps.

### 2.3. Population demography

Mark-recapture data were collected from June 2017 to November 2018. During the turtle active season (late April to September), surveys for Blanding's turtles were conducted 5 times per week by a minimum of 2 and up to 6 researchers. Sites were accessed using canoes, by walking around the edges or through wetlands, to hand capture individuals. Individual-specific data (body size, sex, and age category) were collected. All turtles were marked using marginal scute notching (Cagle, 1939), sexed using secondary sex characteristics (Ernst and Lovich, 2009), measured with calipers ( $\pm 0.1$  cm, Haglof Model CF59729), weighed using Pesola spring scales ( $\pm 10$  g), photographed, and any deformities recorded. Turtle capture locations (latitude, longitude) were recorded with a handheld GPS unit (Garmin GPSMap 64s), converted to UTM coordinates, and inputted into ArcGIS 9.2 (ESRI, 2006). Population size was estimated using the Lincoln-Peterson model calculated by hand. We opted to use the Lincoln-Peterson model, recognizing it assumes a closed population, because of the short duration

of our mark-recapture surveys relative to the great longevity of Blanding's turtles (Congdon et al., 1993). Population density was calculated by dividing population size by area of wetlands where turtles were found. We did not include deep water (i.e., centers of lakes with water depth > approx. 5 m), terrestrial habitat or nesting sites in this calculation, as Blanding's turtles prefer shallow water and are mostly found in wetlands (COSEWIC, 2016).

#### 2.4. Spatial ecology

Spatial data were collected from June 2017 to November 2018 using radio telemetry and miniature GPS data loggers placed on a subset of captured male and female Blanding's turtles. A total of 29 different Blanding's turtles were monitored with VHF radios (Advanced Telemetry Systems Inc., Isanti, MN; models R1655, R1650 and A2850) across the 2017–2018 and 2018–2019 field seasons. Gravid females ( $N = 11$ ) were outfitted with GPS loggers (Lotek PinPoint Beacon Tag-240) to identify nesting sites. Each turtle was radio-located approximately 2 times per week throughout the active season, once per week in the fall, and once per month during the winter to confirm overwintering sites. Data collected included GPS coordinates (latitude, longitude) and behaviour (e.g., nesting, hibernating).

##### 2.4.1. Home ranges and daily distances moved

We calculated home range size using 100% Minimum Convex Polygons (MCPs; ha), and then calculated 95% kernel density estimates (Rowe et al., 2009; Edge et al., 2009, 2010; Laverty et al., 2016) with a smoothing factor ( $h$ ) that resulted in kernel home range sizes being equal to the 100% MCP (Row and Blouin-Demers, 2006) for each turtle's annual home range size using functions created in RStudio (R Core Team, 2017). Home ranges were calculated only for turtles that were tracked every 2–3 days for 3 months or more during the active season (April–October). We tested for differences in mean home range sizes between the sexes using a Mann-Whitney  $U$  test. We also compared our calculated home range sizes to those published for other Blanding's turtle populations.

Daily distance moved (DDM; m/day) was calculated in RStudio for turtles that were tracked every 2–3 days for a minimum of one field season (May–October) with some individuals being tracked continuously for up to 23 months. DDM was calculated as the distance moved between consecutive radio-locations divided by the number of days between these consecutive tracking events. We compared mean DDM between the sexes using a  $t$ -test. We also compared our calculated DDM to those published for other Blanding's turtle populations.

##### 2.4.2. Nesting and overwintering sites

We gathered nest site data over two nesting seasons (2017 and 2018). GPS data loggers were deployed on female turtles when they were gravid with shelled eggs (as indicated by inguinal palpation), and retrieved and offloaded once eggs were no longer detectable by palpation (with the exception of 2 loggers that could not be retrieved until 14 August and 12 October). If a female was gravid for more than 7 days (expected battery life of programmed GPS loggers), the logger was replaced with a freshly-charged logger. Data from the GPS loggers were downloaded and tabulated in Excel. Nesting sites were confirmed by ground-truthing and visual inspection. If nesting sites were not found, GPS logger data were used to make the best estimate using GPS points in combination with habitat type (rocky outcrops) and VHF telemetry data. Distance travelled from water to nest site (m) was measured in ArcGIS. To quantify how far females travelled to nest, the distance from the wetland of origin was measured. If wetland of origin was known, the straight-line distance was measured from the nest to the wetland of origin. When the wetland of origin was unknown, the straight-line distance from the nest to the nearest waterbody was measured.

Overwintering areas were identified using VHF telemetry data collected from 24 different Blanding's turtles from September to December of 2017 and September 2018 to May 2019. Turtle location points were loaded into ArcGIS and the entire wetland where one or more hibernating turtles were identified was labelled as an overwintering area.

#### 2.5. Provincial and federal mapping

Maps were created to delineate critical habitat using both the provincial and federal habitat protection documents (OMNRF, 2013; ECCC, 2018). All nesting sites found with GPS loggers, VHF transmitters, or by opportunistic nesting observations were recorded, and UTM coordinates for these locations were mapped in ArcGIS. The buffer tool was used to create a 30 m minimum buffer and a 250 m maximum buffer around each nest location as per the general habitat description for Blanding's turtles (Category 1 habitat; OMNRF, 2013). A buffer of 240 m was delineated around nesting sites to define federal critical habitat (ECCC, 2018). The ArcGIS polygon tool was used to create a polygon around overwintering wetlands and the buffer tool was applied to create a 30 m buffer around these wetlands as per the general habitat description for Blanding's turtles (OMNRF, 2013).

### 3. Results

#### 3.1. Population demography

Blanding's turtles were found in almost every wetland, waterbody and creek surveyed (21 aquatic habitats had turtles/23 habitats surveyed). Male to female sex ratios were approximately equal ( $\chi^2 = 1$ ,  $df = 1$ ,  $p = 0.4$ ; Table 1), and we captured one juvenile. A total of 56 Blanding's turtles were captured at the proposed quarry site, with 31 recaptured at least once. If a turtle

**Table 1**  
Population ecology and mean  $\pm$  standard deviation morphometric data for Blanding's turtles (*Emydoidea blandingii*) captured at a proposed trap rock quarry site in Algoma District, Ontario.

Population metric	Value
Turtles captured (recaptures)	56 (31)
Estimated population size	80
Body mass (g)	
Males	1574.89 $\pm$ 143.51
Females	1432.68 $\pm$ 167.93
Midline carapace length (cm)	
Males	22.71 $\pm$ 0.80
Females	21.62 $\pm$ 0.61
Midline plastron length (cm)	
Males	20.18 $\pm$ 0.68
Females	20.33 $\pm$ 0.78
Male: Female	27:28 (+1 juvenile)

was recaptured at any point in either of the 2017–2018 or 2018–2019 field seasons, not using radio telemetry, it was counted as a recapture. Estimated population size was 80 (95% CI  $\pm$  18) turtles. The area of wetlands used by turtles was approximately 43.0 ha, yielding a population density of 1.8 turtles/ha.

### 3.2. Spatial ecology

#### 3.2.1. Home ranges and daily distances moved

Home range sizes did not differ significantly between the sexes ( $U = 45$ ,  $df = 2$ ,  $p = 0.2$ ; Fig. 1A). The turtle with the largest home range was a male (69.1 ha). Daily distances moved also did not differ significantly between sexes ( $t = 0.73$ ,  $df = 16$ ,  $p = 0.47$ ; Fig. 1B). The turtle with the greatest DDM was an adult female (61.5 m/day).

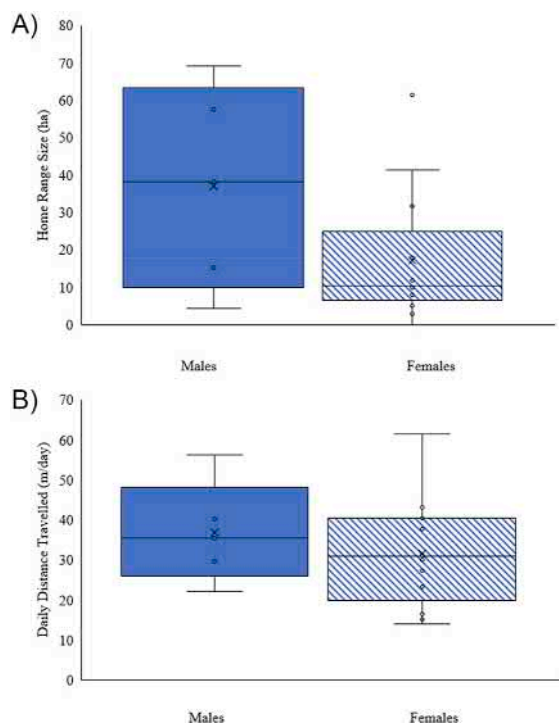
#### 3.2.2. Nesting and overwintering sites

In the 2017 field season, we found 1 gravid female on 2 June 2017 and she nested on 11 June 2017. In the 2018 field season, the first gravid female was found on 2 June 2018 and the first female nested between 12 and 15 June 2018. Of the 12 GPS loggers deployed, 2 did not produce data due to researcher error. A total of 15 nesting sites were identified using GPS loggers, radio telemetry and nesting surveys; all of which were on rocky outcrops, which is common nesting habitat for freshwater turtles in the geographic region (Litzgus and Brooks, 1998; Litzgus and Mousseau, 2006; Markle and Chow-Fraser, 2014). Each nest site showed multiple signs of nesting activity including test-pitting and depredated nests, and one site had 4 different Blanding's turtle nests in an area approximately 1 m  $\times$  0.3 m. All nests were laid in rock crevasses where soil depth was approximately 10–30 cm. Turtles moved an average of 278.2  $\pm$  132.7 m from their home wetland to nest. Of the 10 turtles with retrievable GPS logger data, nesting migrations took between 2 and 14 days with an average of 6  $\pm$  4 days.

We identified 12 wetlands that housed overwintering turtles. A total of 47 individual turtles were observed in overwintering sites in the 2017/2018 and 2018/2019 winters. Of the 39 turtles whose overwintering sites were confirmed in the 2017/2018 season, 22 individual's overwintering sites were also found in the 2018/2019 season, and 13/22 (59%) returned to the same wetlands to overwinter in both winters. Of the individuals that did not overwinter in the same sites in both winters, distances between overwintering sites ranged from approximately 90 to 640 m. In 7 of the 47 (15%) overwintering observations, turtles were overwintering in areas where no other turtle was found overwintering. We cannot know with certainty that these sites were used by individual turtles as other turtles may have been present but just not detected. We found that 40 of the 47 (85%) overwintering observations were in wetlands where other turtles were also found hibernating. Water depth in overwintering sites ranged from 30 to 150 cm before ice formation. All turtles used overwintering sites within their active season wetlands or within 240 m of their active season wetlands.

### 3.3. Provincial and federal mapping

Habitat maps were created using the provincial legislation's 30 m minimum and 250 m maximum buffers (Fig. 2). Total categorized habitat using the 30 m buffer was 66.6 ha (62.6% of the 115 ha of land in the proposed quarry). Of the total categorized habitat, 14.8 ha (12.9% of the 115 ha quarry) was Category 1 habitat, 26.2 ha (22.8% of the 115 ha) was Category 2 habitat, and 25.6 ha (22.3% of the 115 ha) was Category 3 habitat when the minimum buffer was applied. Using the 250 m maximum provincial buffer, 114.8 ha (100% of the 115 ha) was categorized habitat, and Category 3 habitat increased to 73.8 ha (64.2% of the proposed 115 ha). A map was also created using the federal legislation's 240 m buffer around turtle occurrences (Fig. 3) which showed that 113.9 ha (99.9% of the 115 ha quarry) was categorized as critical habitat for Blanding's turtles.



**Fig. 1.** **A)** Home range sizes and **B)** daily distances moved by male ( $N=5$ ) and female ( $N=13$ ) Blanding's turtles (*Emydoidea blandingii*) in Algoma District, Ontario. Home range sizes ( $p=0.20$ ) and daily movements ( $p=0.47$ ) did not differ between the sexes. X indicates the mean, horizontal line indicates the median, filled box indicates inter-quartile range, and whiskers indicate the highest and lowest observations.

## 4. Discussion

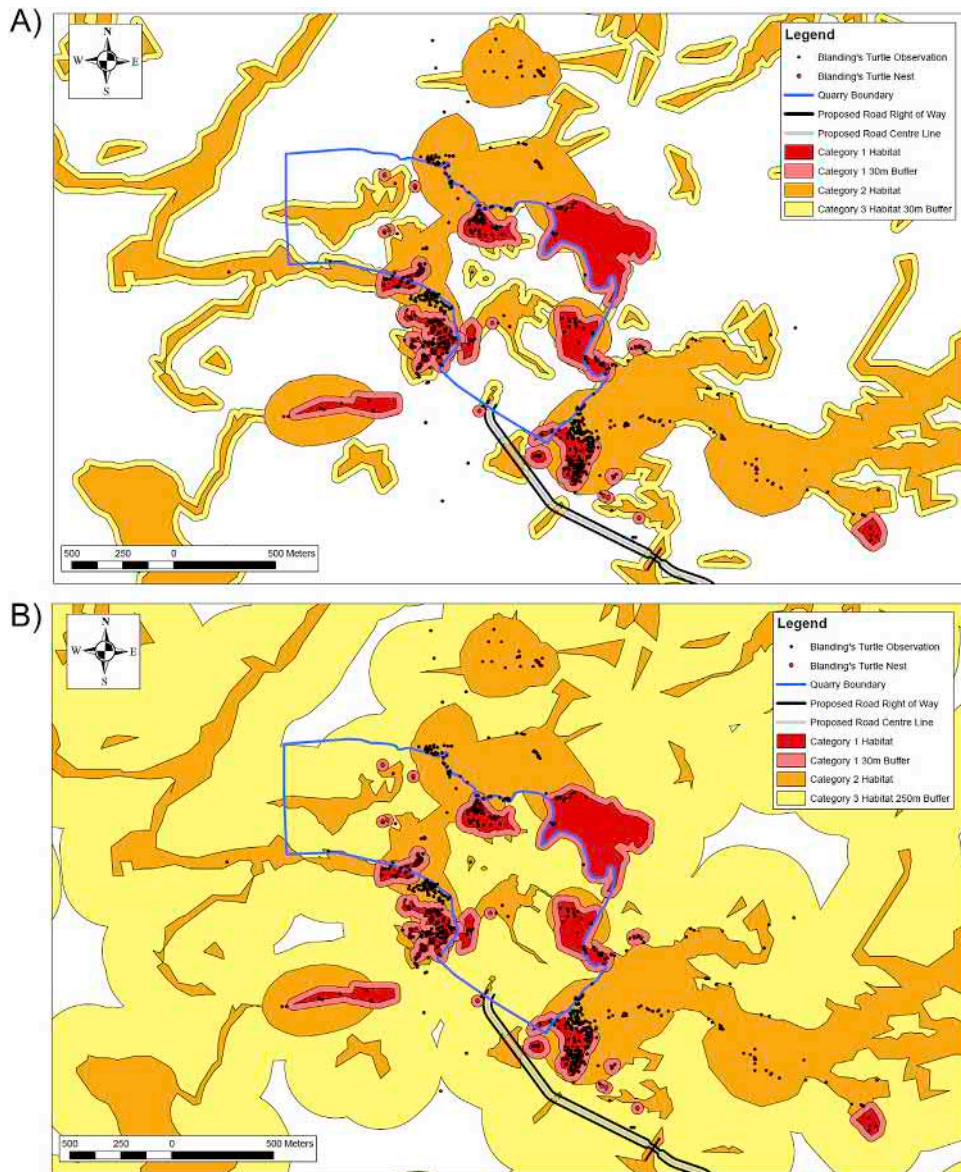
### 4.1. Population demography

We found a large number of Blanding's turtles at our study site. Our calculated population density (1.8 turtles/ha) is the highest reported for Blanding's turtles in Ontario, followed by a population in Southern Ontario with a density of 1.4 turtles/ha (COSEWIC, 2016). Of the other 19 populations listed in the COSEWIC (2016) report for which density was calculated, 14 reported densities ranging from only 0.05 to 0.6 turtles/ha with an average of  $0.2 \pm 0.08$  turtles/ha (COSEWIC, 2016). That abundance was greater at our site relative to other locations in the country likely reflects the relatively pristine nature of our study area, indicating it may not be the best location for a trap rock quarry if Blanding's turtle protection is prioritized as per the ESA and habitat description (OMNRF, 2013).

### 4.2. Spatial ecology

Blanding's turtles in our study generally had smaller home range sizes and daily movements than turtles in other studies. Blanding's turtles in our study did not move more than 240 m from their active season wetlands, other than to nest. These data are important because they support current federal and provincial legislation requiring a terrestrial buffer to protect Blanding's turtle habitat (OMNRF, 2013; COSEWIC, 2016; ECCO, 2018). Edge et al. (2010) reported annual home range sizes of turtles in Algonquin Provincial Park almost twice the size of those of our turtles, yet both populations are at northern latitudes where habitat productivity is presumably relatively low. In contrast, Millar and Blouin-Demers (2011) reported smaller home range sizes but daily movements over 4 times the distances travelled by turtles in our study, even though they tracked turtles over a shorter time period on Grenadier Island, a more southern location in Ontario in a heavily developed area. Daily movements of Blanding's turtles in Algonquin Provincial Park (Edge et al., 2010) were approximately double the size of those in our study. The study site in Algonquin Park, where logging takes place and where human recreational use is high, was adjacent to human development, and therefore not as pristine as our study site. We presume our turtles may be moving less because habitat quality is high such that turtles did not need to move much to acquire necessary resources, but we did not quantify habitat quality.

We identified multiple nesting and overwintering sites, both considered Category 1 critical habitats least tolerant to destruction (OMNRF, 2013). A total of 15 nest sites were identified, 10 of which were found using GPS loggers. Rowe and Moll (1991) and Millar and Blouin-Demers (2011) found gravid females making average movements of approximately 900 m from their wetland of origin to nest. Our turtles moved 3 times less (approx. 278 m) to reach nesting sites, again suggesting that



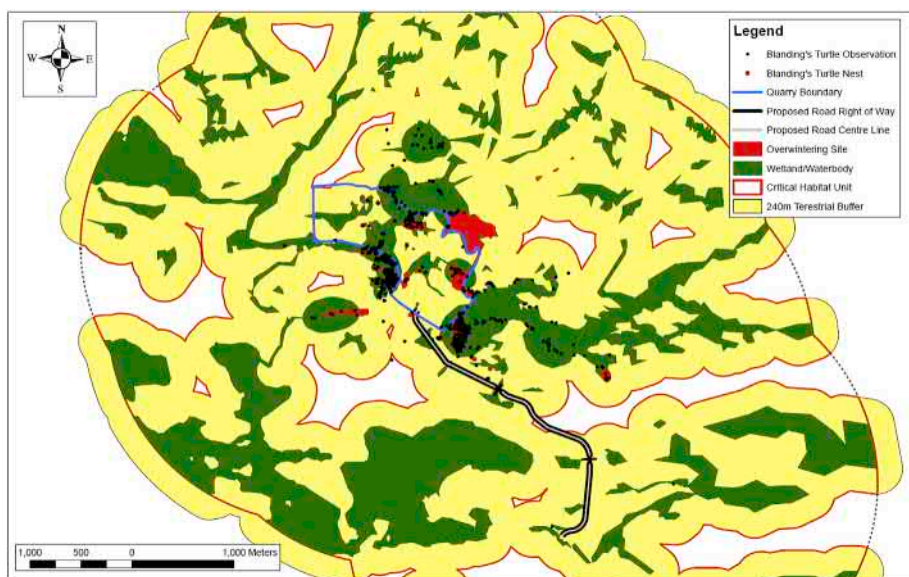
**Fig. 2.** A) Blanding's turtle (*Emydoidea blandingii*) habitat categorization map with a 30 m terrestrial habitat buffer as per provincial habitat description minimum, and B) 250 m terrestrial habitat buffer as per provincial habitat description maximum (OMNRF, 2013). The proposed quarry location is outlined in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

habitat resources are in close proximity, likely because the habitat matrix is relatively pristine. Many of the Blanding's turtles in our study exhibited communal hibernation and fidelity to overwintering sites. Newton and Herman (2009) suggested that Blanding's turtles return to the same overwintering sites each year to increase mating opportunities; they found at least 46 turtles overwintering in 7 sites, a number similar to our observations. We also observed mating aggregations at overwintering sites (Zagorski, 2019). Edge et al. (2010) found turtles overwintering in bogs, fens and marshes while we found turtles overwintering in marshes and swamps. Seburn (2010) suggested that turtles will sometimes use active season habitat as overwintering habitat, as we observed in some cases; however, only protecting areas where turtles have been observed basking can result in a lack of protection for overwintering sites.

#### 4.3. Conservation implications

At the time of submitting this manuscript, the quarry application was still pending approval from the provincial government regulator (OMNRF). In the interest of transparency and evidence-based decision-making, we willingly shared our





**Fig. 3.** Blanding's turtle (*Emydoidea blandingii*) critical habitat unit map as per the federal recovery strategy. Nesting sites are given a 150 m terrestrial buffer, and wetland complexes within the 2 km radial distance of an observation have a 240 m terrestrial buffer (ECCC, 2018). All areas surrounded by the terrestrial buffer that fall inside the 2 km radial distance from a turtle observation are defined as critical habitat units (ECCC, 2018). The proposed quarry location is outlined in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

data with the regulator, the quarry company, and their retained environmental consultant; we also extended an invitation to collaborate on field data collection. Upon seeing our data, the quarry company and their consultant launched a defaming attack on our careers by widely disseminating, in writing, accusations of academic misconduct, conflict of interest, and data fabrication. After several exchanges between lawyers, a letter of apology and retraction of the accusations was received from the consultant (but not the quarry company). It is our understanding that the process to apply for development permits in Ontario involves the developer hiring an environmental consultant to collect SAR data (and other data) at the proposed development site. This could be perceived as a conflict of interest and could be avoided by collaboration with academic researchers who collect focused data at arms-length from the regulator and developer. Our mapping results, based on both the provincial or federal legislation (Figs. 2 and 3), indicate that the quarry proposal should be rejected if the spirit of the ESA and SARA are upheld, given that at least 63% and at most 100% of proposed quarry area is categorized as endangered species habitat with low tolerance to disturbance, but it remains to be seen whether science, politics, or money will prevail in the quarry permit decision.

If the quarry is permitted, our study could serve as the “before” period of a Before-After-Control-Impact (BACI) study as we also collected demographic and spatial data at a control site (Zagorski, 2019). Long term BACI studies are recommended to examine effects of environmental change (Lesbarrères and Fahrig, 2012; Smokorowski and Randall, 2017). Without this experimental approach, changes in abundance and movement patterns would be missed during development (Price et al., 2011). BACI designs have been conducted in a road ecology context (e.g., Baxter-Gilbert et al., 2015; Colley et al., 2017; Markle et al., 2017), but few if any studies have been conducted for surface mining impacts. Overall Benefit Permits (OBP) allow for development in SAR habitat if the provincial Minister has the opinion that an overall benefit to the species will be achieved in a reasonable amount of time, that other alternatives have been considered, and that steps have been taken to minimize the impact on members of the species (ESA, 2007; OMNRF, 2012). Oftentimes, projects are approved before enough prior research has been done on habitats where SAR are present, resulting in poorly-informed mitigation and little to no overall benefit for the species. OBPs present an opportunity for scientists to conduct BACI studies to assess the effectiveness of mitigation measures and suggest improvements before, as well as after, the development is complete. BACI studies also can be used to influence current and future legislation regarding development in SAR habitats.

Our case study does not solely apply to Blanding's turtles in Canada. We are advocating a data-driven evidence-based approach that can be used in any area where development is proposed in SAR habitat, and where mitigation measures are required. Delineating critical habitat is essential for the protection of any SAR, especially those that use numerous habitat types across different life stages. Once critical habitat is identified, areas that are intolerant of development can be avoided and areas where the species will not be affected, or will be minimally affected, can be selected for development. Enforcing legislation during development projects is critical for the conservation of SAR, as is the use of scientific evidence to make decisions about development.

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## Appendix A. Supplementary data

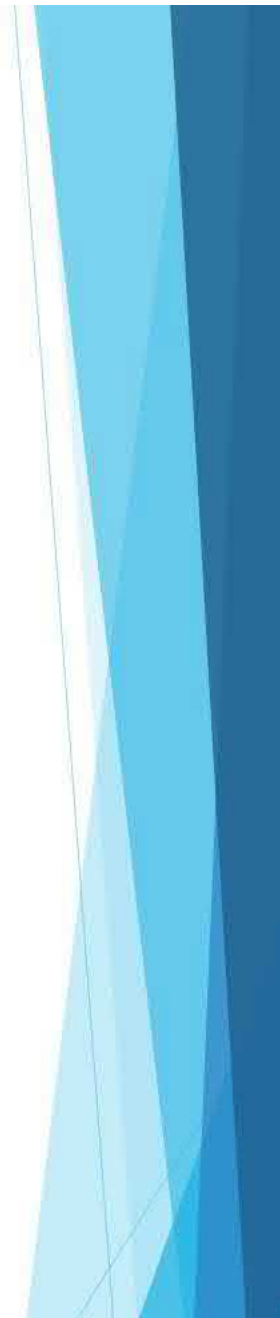
Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gecco.2019.e00751>.

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## 4. Health



# Health Impacts of Quarry Operations

Dr. Christine Kennedy, M.Sc. MS. DPhil. MD. CCFP. FCFP. FRCP (C).  
CCBOM. PGCEBP.

December 16, 2020



## Dr. Christine Kennedy

I practice family medicine, public health and preventive medicine and occupational and environmental medicine. I have worked for Public Health Agency of Canada, Primary Health Care Authority - First Nations and Inuit Health Branch, and Health Canada. I am currently the Zone Medical Officer of Health for Calgary Zone Alberta Health Services. I was the Chief Medical Officer (Occupational Medicine Physician) in Fort McMurray and Medical Officer of Health for the Grey Bruce Health Unit.

### Overview

As an expert in the health effects of occupational and environmental pollutant exposures, I was asked to prepare a synopsis of the potential health impacts of activities associated with a trap rock aggregate extraction (Quarrying). The purpose of my overview is to provide information to the local politicians, regulators, the general public, and local First Nations communities about the potential impacts on air and water quality from quarry dust emissions, and dust and fumes from trucking, . Emissions from the proposed quarry will include but are not limited to **respirable crystalline silica (RCS), carbon monoxide, sulphur dioxide, nitrogen oxides, and particulate matter (including nanoparticles)**. There is no doubt that these emissions will have impacts on workers, nearby residents, and wildlife.

### Health Consequences

A significant threat to health and safety is respirable crystalline silica (RCS). Depending on the type of aggregate or rock, levels of RCS will vary. The traprock and granite from this quarry will create dust particles of ranging size from over 100 microns to less than a micron (nanoparticles) which are not visible to the naked eye). Exposure to RCS causes lung damage eventually causing silicosis (hardening and scarring lung tissue, shortness breath) and silicosis is irreversible. Individuals with silicosis are at risk for other diseases such as arthritis and kidney inflammation. Exposure to nanoparticles from quarry dust and can cause cancer but because of their size, they can directly enter living cells in organs throughout the body leading to serious other diseases.

The other airborne chemical emissions such as carbon monoxide can result in headaches, dizziness, and nausea. Sulphur dioxide and nitrogen oxides affects lung and respiratory tract function and can irritate the eyes. The diesel particulates created by quarry machinery and trucking are known to cause cancer.

### Impacts on First Nations

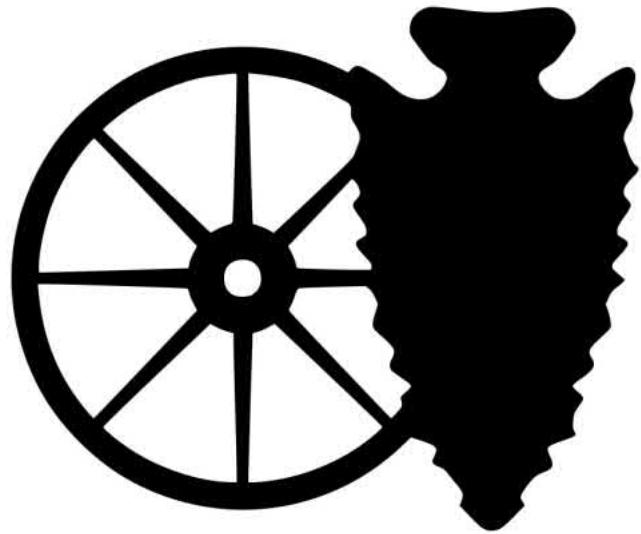
The proposed quarry is located on Robinson Huron Treaty lands on the Serpent River Watershed. There are three nearby First Nations communities and they rely on the Serpent River Watershed for food and water. In the past, the watershed was contaminated from uranium mining activities. It is slowly recovering but quarry emissions would re-contaminate the system. The impact on the health of First Nations, that have already been impacted, will worsen.

I am happy to share experience and expertise should anyone require my assistance.

Sincerely,

Dr. Christine Kennedy

## 5. Archeology



## Four Considerations Regarding Amick Consultants' Archaeology



1. Long and Spragge Townships are rich in pre-Confederation archaeology, including registered sites. This Logging Sleigh Runner (circa 1860-1920) was found “hiding in plain sight” **within** the proposed Lauzon quarry site. Ruins of trapping shacks (archaeology) dot the area north of Lake Lauzon. There may be more archaeological resources relating to First Nation transportation routes/economic activity as well as pre-Confederation



logging activities within the site, especially near potential camp sites on Trudel Creek and Long Lake/Spragge Creek. These two creeks are important historically.

2. Stage 1 (Background): Amick Consultants' Archaeological Assessment was incomplete because no local historians, museums, libraries, historic maps or community groups such as Elder Tea were consulted for important background information when the company did its research.
3. Stage 2 (Test Pits): Only 5 out of 30 test pit sites had potential for revealing archaeology within the proposed quarry site. The other 25 test pit sites were chosen for their low potential:
  - a) 10 sites were located on the path to the site, not within the site.
  - b) 6 sites were located on bedrock.
  - c) 4 sites were located in swamps.
  - d) 5 sites were located on steep slopes.

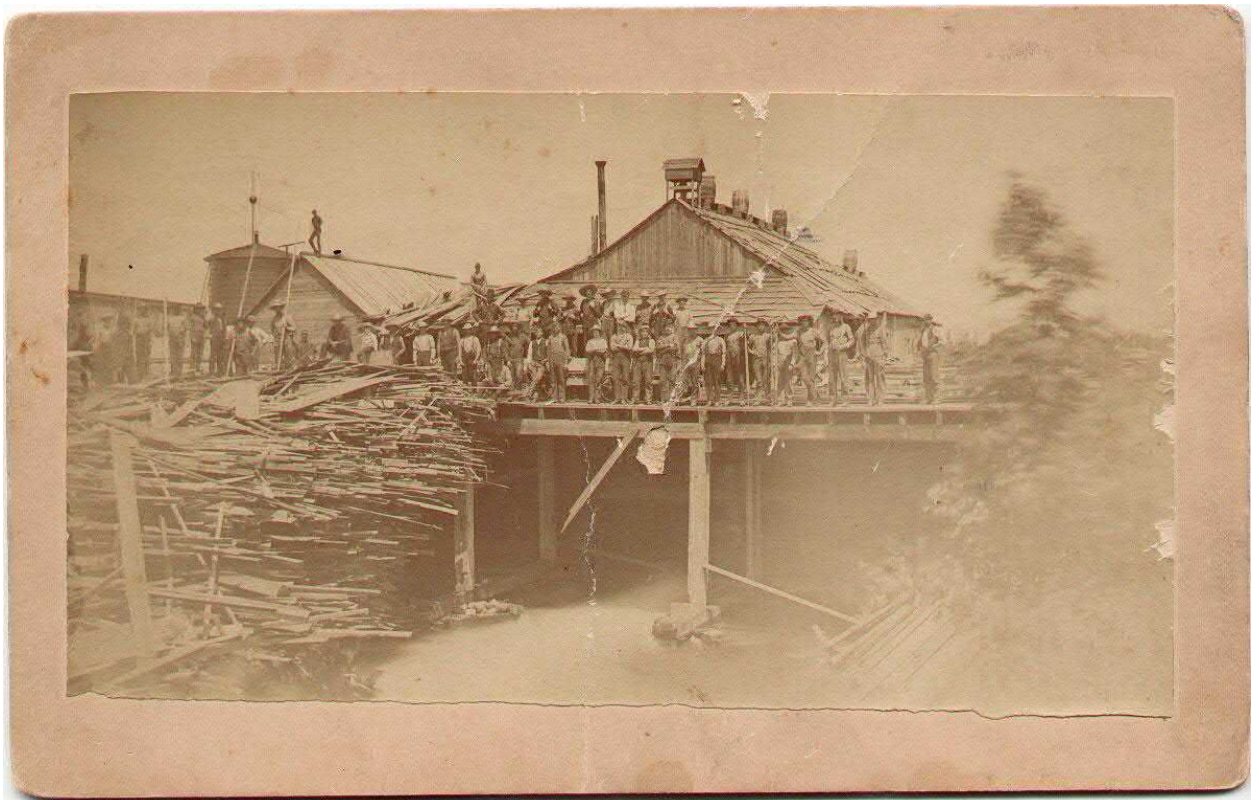
Amick's assessment concluded that there is no significant archaeology at the site.

Township of the North Shore Council and SRFN can ask MNRF and Paige Campbell, who registered Amick's Stage 1 and 2 for the Ministry of Tourism, Culture and Sport, to request a complete archaeological assessment Stage 1-4 by an impartial, reputable archaeologist recommended by the Professional Archaeologists of Ontario. (Laurentian's Alicia Hawkins is President of the PAO.) Area First Nations can supervise test pit supervision.

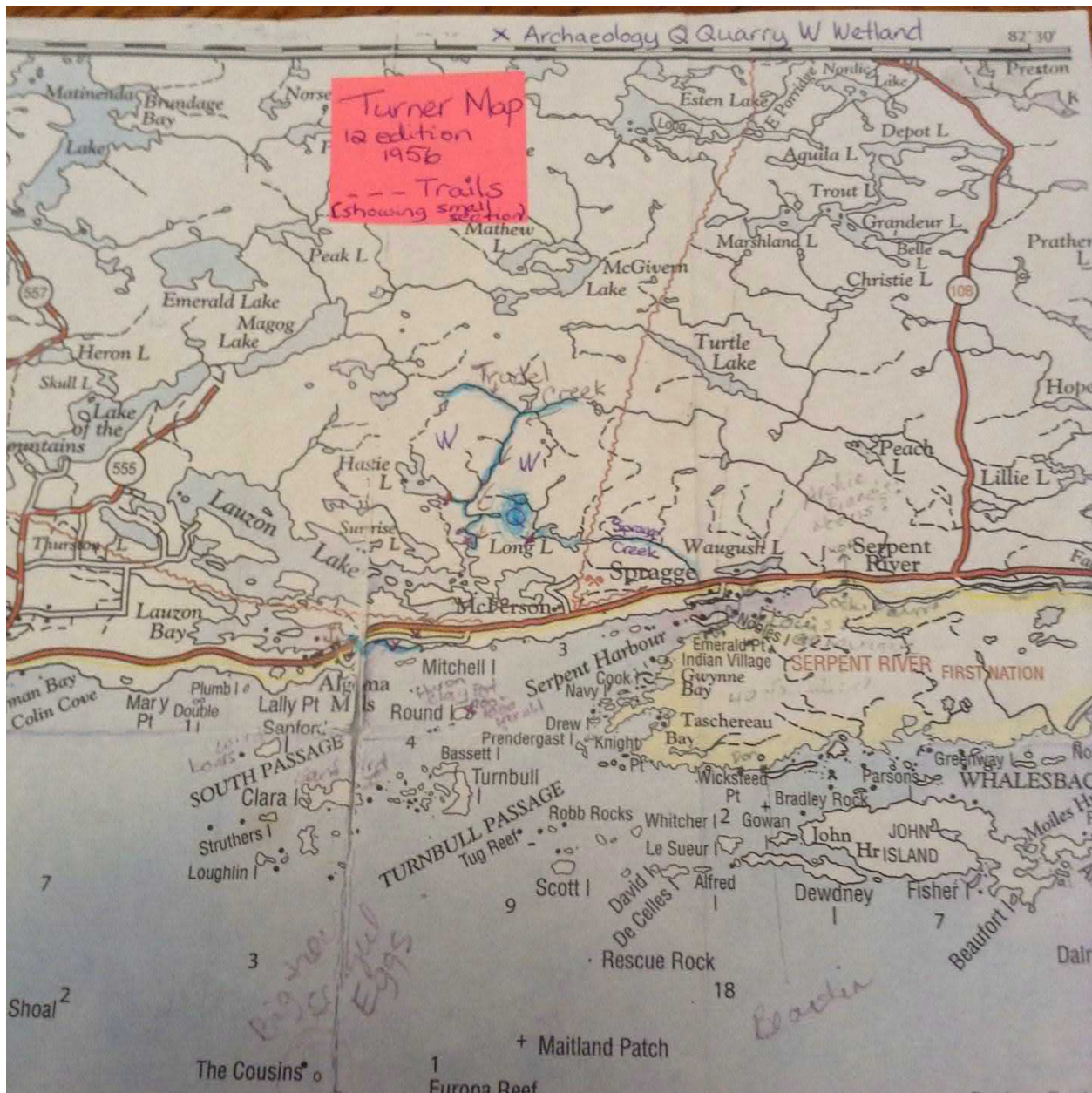
4. Reconciliation from the Past:

Before young Alfred Lauzon came to Algoma in 1860, he worked for Christie's Mill at Port Severn as a manager. The Indigenous people there honoured him by renaming Sawmill Island to Lauzon's Island. When he

moved north, he would have met the Mississaugas camped at today's Bootlegger Bay, as very few non-Native people lived in Algoma at the time. (Reference 1861 Census) Lauzon paid his Indigenous workers \$40.00/month (twice the going rate) and they helped him build a mill where today's Lauzon Creek enters Lake Huron, six dwellings for his men, a commodious pier and a log slide into Betiwaaginan (Lake Between the Lakes). Lauzon tried to get his permits to take lumber, but was ousted by Alfred Gunn in 1870, childhood friend of Sir John A. Macdonald. By 1870, the Mississaugas had renamed Betiwaaginan to Lozo's Lake, in honour of Alfred Lauzon.



Lauzon's Mill



Section of the historic Turner Map (1956) Showing Trapper Trails, the Lauzon Quarry, Wetlands, Trudel and Spragge Creek. 2/3 of the site is drained by Trudel Creek into Lake Lauzon and North Channel; 1/3 of the site is drained by Spragge Creek into Serpent Harbour.

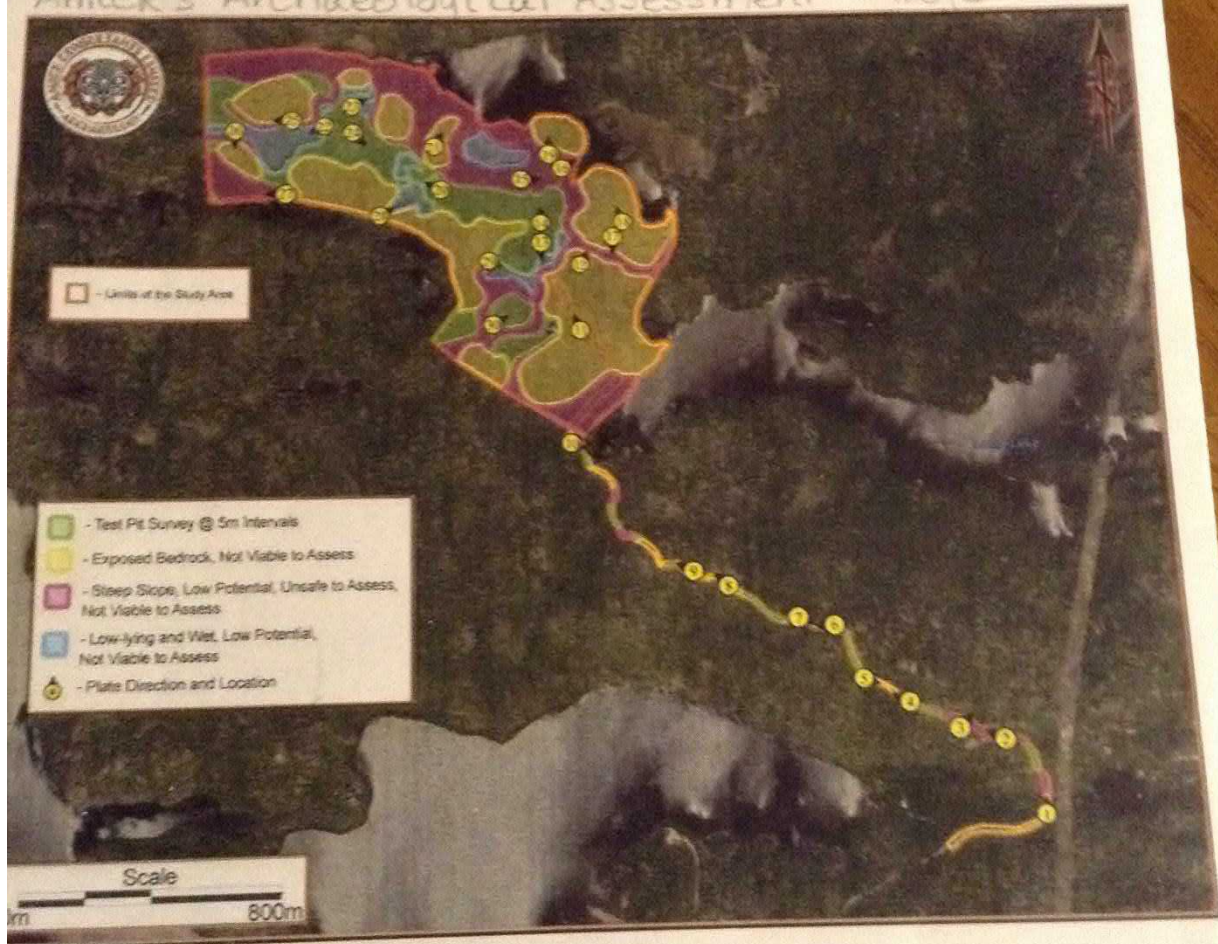


Log Slide near McKerrow (Lauzon's Log Slide on Trudel Creek would have looked similar to this.)



Trudel Creek 1905 where it enters into Lake Lauzon. Trudel creek drops 90 feet just beyond this photo.

# Amick's Archaeological Assessment Stage 2



Test Pits 2015/16

## 6. Tourism



Ministry of Environment, Conservation and Parks  
Species at Risk Branch  
Mary Hennessy, Director  
300 Water Street  
Peterborough, ON K9J 3C7  
mary.hennessy@ontario.ca

October 23, 2019

Dear Ms. Hennessy,

On behalf of the Algoma Kinniwabi Travel Association, it is with grave concern that I write to you with regards to the potential development of the Darien Quarry Site# 625990 that is being considered in the Municipality of the Township of the North Shore.

Since 1974, the Algoma Kinniwabi Travel Association has been representing our 28,000-square mile catchment area in the promotion and development of tourism product. Tourism product in Northern Ontario is built predominately on small businesses and small communities that welcome tourists throughout the entire calendar year. The businesses situated in Algoma, and around the North, who offer tourism product are built on the deepest respect for Ontario's natural resources. Whether it be the forest, the water, the wildlife, or the fisheries, ensuring healthy resources lies within all of us; they are our greatest assets. And not just for tourism, but for our quality of life and to ensure these natural assets are here for future generations.

Did you know that Northern Ontario anglers contribute nearly \$300 million towards Ontario's gross domestic product resulting in over 5,000 jobs? Did you know the Northern Ontario is the number one fishing destination in Canada and that 40% of the workforce in the North is employed in the tourism industry? Tourism is also the largest employer of young workers in the province of Ontario. Over the course of the past three years, we have seen a steady growth in fixed roof accommodation revenue from 2015 to 2018. Tourism in Algoma is enjoying a return of American consumers in numbers that have not been seen in over a decade. Domestic travel is rising in the North and are we now looking at marketing our natural assets to international consumers in both Germany and the U.K. We offer the iconic Canadian tourism product: green forests, crystal clear waters, fresh air and opportunities to see wildlife in their natural environment.

Northern Ontario makes up 78% of the land mass of our beautiful province. Much of this land is untouched and is the reason for consumers to come here for their vacation. The North Shore is no exception. Dubbed a "Vacationer's Paradise", the beauty of this area is truly one that we at Algoma promote with pride.

Most recently, it has been brought to the Association's attention that an environmental assessment was completed and findings determined that the proposed 82-hectare quarry is a pristine wetland, moose aquatic feeding areas and home to at least five species at risk (Blanding's turtle, snapping turtle, painted turtle, myotis bat, and the eastern whippoorwill).



In fact, this study found a significant population of Blanding's turtles which are federally endangered. It is our understanding that under federal guidelines, 100% of the proposed quarry area is categorized as an endangered species habitat. Clearly, this is an area that must be protected.

The development of this 82-hectare quarry along the North Channel of Lake Huron both above and below the water-table and the staking of the mountains around Hastie and Lauzon Lakes -- despite the findings of the environment study -- and without the consideration for the tourism product so close to this development, and to those communities and businesses in the region, will change the face of tourism in this region forever. This development is based on the wants and the needs of Southern Ontario. We will pay a very high price both environmentally and through the devastation of tourism as we know it today to service the needs of the South.

Tourism in Northern Ontario is built predominately on small businesses that are dotted across the landscapes. A somewhat invisible industry as the businesses work as one with the natural environment. This industry doesn't have big parking lots, or around the clock shifts for workers, but rather small family run businesses, many of whom are now being run by second or third generations of the same family. They employ local people, they purchase their groceries, fuel, building materials, and they live and thrive, in our small communities.

It is our hope that this potential development and decisions that must be made in this regard, will take into consideration what this location can and will do to the tourism industry in this region. It is our hope that our natural assets will be respected, and the needs of the North will be in the forefront rather than an afterthought with the needs of Southern Ontario being the rationale behind the decision.

Respectfully,



Heather Bot  
**Executive Director**  
**ALGOMA KINNIWABI TRAVEL ASSOCIATION**

**CC** Carol Shaughnessy - Administrative Assistant [carol.shaughnessy@ontario.ca](mailto:carol.shaughnessy@ontario.ca)  
Jennifer L. Chang, Executive Coordinator [jennifer.l.chang@ontario.ca](mailto:jennifer.l.chang@ontario.ca)  
Rhonda Kirby, Advocates for the North Shore Water and Environmental Resources [rhondakirby@live.com](mailto:rhondakirby@live.com)



To Mayor and Council, Township of North Shore;

I am writing on behalf of the Sault Naturalist Club of Ontario and Michigan to express our concerns with the rezoning of an area in the Township of North Shore that includes critical habitat for the endangered Blanding's Turtle.

We noted with regret that last evening the Committee on Adjustments voted to rezone an area of critical habitat for Blanding's Turtle to permit construction of a Quarry, which will have a powerful deleterious impact of the Turtle's habitat.

The Sault Naturalists Club is a group of about 100 people from all walks of life. We live in the north and we are well aware of the importance of resource-based industries to the northern economy. Our interest in species-at-risk is not a casual one. Our members have recently been doing field work toward the study and conservation of 4 species of threatened turtles, 2 species of dragonflies, and Chimney Swifts. Two club members will be working on mark/recapture studies of Blanding's Turtles this September.

All Ontario turtle species are threatened, and habitat destruction is a large part of the problem. If developers suggest that they can compensate for destroying wetlands by creating equivalent wetlands elsewhere it would be good to ask how they will duplicate the very narrow temperature and substrate needs of overwintering Blanding's Turtles. It would also be good to consider what penalties (if any) the developer would incur should a healthy population of Blanding's Turtles not be established.

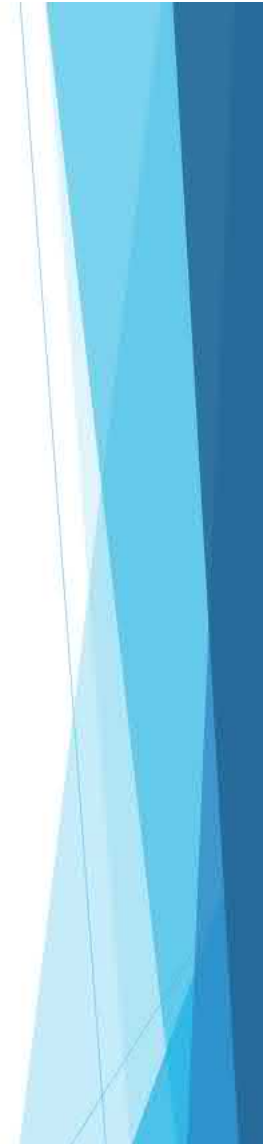
The mayor of the North Shore says "The North Shore is a great place to live and to visit, with fresh air, pristine lakes and open spaces." This is currently true, but will it still be true when our children and grandchildren inherit the land? Only if a thousand small decisions protect the pristine landscape. This is one of those decisions. Some might view it as small, but it is enormous from the point of view of 80 or more endangered turtles.

Very few Blanding's Turtles reach adulthood but those that do could easily live 70 or 80 years, perhaps longer. It is likely that many of the turtles in the wetlands were full-fledged adults when municipal councillors were still babes-in-arms. This decision is not to be taken lightly.

We encourage council to have open and transparent discussions regarding the future of the North Shore, its natural environment and the special living things that share the land. Seven generations from now a quarry will still be a hole in the ground; if a thousand small decisions have favoured holes in the ground, Blanding's Turtles will be found only in quaint museum displays.

David Euler  
President, Sault Naturalist Club

## 7. Education/Recreation Opportunities





Northern Ontario  
School of Medicine  
École de médecine  
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December 23, 2020

## Re: Proposed Contributions to Turtle Island Center

To Whom it Concerns:

Aanii/Boozhoo, my name is Darrel Manitowabi, and I am a citizen of Wiikwemkoong Unceded Territory and I currently reside in the Whitefish River First Nation. I have a PhD in anthropology and conduct research in Indigenous health and Anishinaabe ethnohistory and I am an Associate Professor in Human Sciences at the Northern Ontario School of Medicine (NOSM). In this brief letter I outline potential collaborations that I am open to exploring with the Turtle Island Center for Excellence in Environmental Research & Education (Turtle Island Center) in the areas of **teaching and research**.

### Teaching

I have taught Indigenous studies, Indigenous social work, anthropology, human studies and health studies at Laurentian University since 2004. While at Laurentian, significant contributions I have made include co-leading university program name changing initiatives that replaced 'native' with 'Indigenous,' and course and program development. In Indigenous studies, I co-revised the course "Mankind and Nature" to "Living on the Land", an entirely land-based and cultural-immersion course. I was furthermore on the planning committees of the Master of Indigenous Relations (MIR) program and Indigenous Sharing and Learning Centre (ISLC). The MIR program at the time was the second Indigenous graduate program in Ontario and the ISLC is a teaching and community gathering space at Laurentian University and is the centrepiece to Laurentian's new main entrance.

In 2020, I became the inaugural Jason Hannah Chair in the History of Indigenous Health and Traditional Medicine at NOSM, Laurentian Campus. The Hannah Chairs are located at medical schools in Ontario and at McGill University and the University of Calgary and are devoted to research and teaching in the history of medicine. In my Hannah Chair role, I will devote my time to new course content development in the history of Indigenous health and traditional medicine in NOSM's medical doctor program and the Master of Medical Studies program.

It is in this context that I have an interest in, and am able to collaborate with Turtle Island Center. It is possible to consider university teaching land-based courses at Turtle Island Center in collaboration with NOSM and Laurentian University.



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If such an opportunity is explored, it is important to involve community input in design and delivery.

Some thoughts at this moment include a cross-listed course at both NOSM and Laurentian in environmental Indigenous health, or possibly a NOSM land-based experience for medical students. At NOSM, we are currently exploring curriculum revisions and development and it is possible to consider collaboration with Turtle Island Center.

## Research

In my Hannah Chair research role, I propose to conduct research on historical Indigenous healing, and this will begin once COVID 19 travel restrictions are lifted.

One active research project I am involved with NOSM colleagues involves understanding how land and culture-based healing can be integrated in First Nations opioid addictions and recovery programs. Over the last number of years, I have collaborated in research to understand how the Naandwe Miikan (Healing Path) program in Wiikwemkoong is helpful for clients in their recovery journeys. The next step in this research involves working with Elders to understand historical community-based approaches to addressing addiction and proposing community-healing programs. It is anticipated land may continue to figure prominently in these plans. And it may be possible to explore research in understanding how similar initiatives occurring in Serpent River and the region may be included in collaboration with this current research. It is my understanding that Turtle Island Center is open to collaborating through work with Elders of the Robinson Huron Treaty.

A significant aspect of my Hannah Chair research will involve public education initiatives through a web-based Indigenous health and traditional healing teaching institute. The main objective of this institute will be to educate health providers, especially medical doctors, of Indigenous healing concepts, common healing approaches and historical and traditional teachings. Though it will be directed to health professionals, it will be an open access and publicly accessible learning tool and it will be useful for Indigenous communities and schools. Some sample content will include the meaning of holistic healing, the meaning of sacred medicines, and the importance of land and spirituality in healing. This will involve multi-media such as video recordings of Elders and healers providing teachings.

Turtle Island Center's Kindergarten to Grade 12 program called The Learning Fire mirrors many of my objectives and is willing to explore collaboration.

The above is an introduction to some of the teaching and research that I have conducted that are compatible with my understanding of the Turtle Island Center. I have had the privilege of a



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short visit this past November and December to the Center and I look forward to a future conversation about possible collaborations in teaching and/or research.

Chi-miigwetch, Darrel

Darrel Manitowabi, PhD  
Associate Professor, Human Studies  
Jason Hannah Chair in the History of Indigenous Health and Traditional Medicine

## **From the Desk of Mayor Tony Moor of Township of the North Shore**

December 1, 2020

I've done a lot of reading and have spoken to several informed people as to the negative effects a quarry can have on the environment/ratepayers within the quarry umbrella.

I spoke to MPAC and was told that property values, depending upon proximity to the quarry and its road structure would be reassessed, at a minimum, by 5% reduction. I would suggest that that is the very bottom line. I believe that prospective buyers may well be discouraged from purchasing land in proximity to a quarry. I realize the 5% figure is far below the ones expressed by PitSense. The point that I feel is relevant is the need for "full cost accounting" and "financial assurance agreements" from the proponents.

MNRF has to realize that Lake Lauzon is not saturated and that severing and the sale of additional lots is a much more environmentally friendly direction to take. Such sales and related tax dollars would offset any monies promised by Darien.

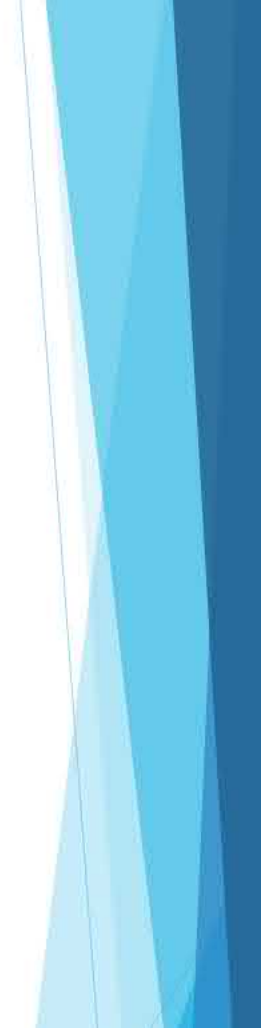
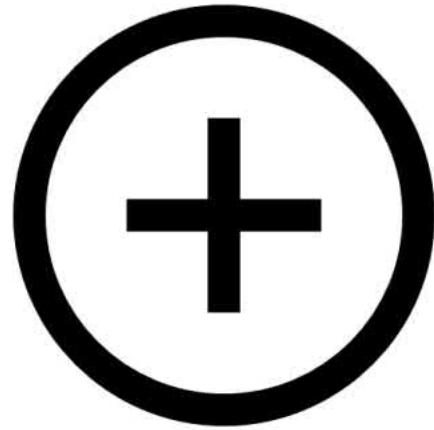
The acquisition of grants has become considerably more difficult due to the emphasis on Covid-19. Having said that, there appears to be an opportunity to hire an intern who would specialize in economic development within the municipality. The development would have to be eco-friendly otherwise what is the point. There is funding that we might be able to access for the improvement of launch facilities throughout the municipality.

When I spoke to a rep. from trap rock, it was explained to me that their maximum employment regime is presently somewhere between 15 and 25. Mostly truckers, mechanics and operators. There is certainly not any clear indication that all those jobs, through the proposed quarry, would be local.

The largest issues for the people of Serpent River First Nation would be I would think, archeological, hydrological, species at risk. No one can deny the devastating impact a quarry will have on an area and its environs.

Hopefully this information will help and I certainly have no problem communicating the minimal advantages as opposed to the maximum disadvantages. Of course, if the quarry is approved, then Darien must be willing to pay up and follow environmental controls to the highest standard.

## 8. Supplementary Readings



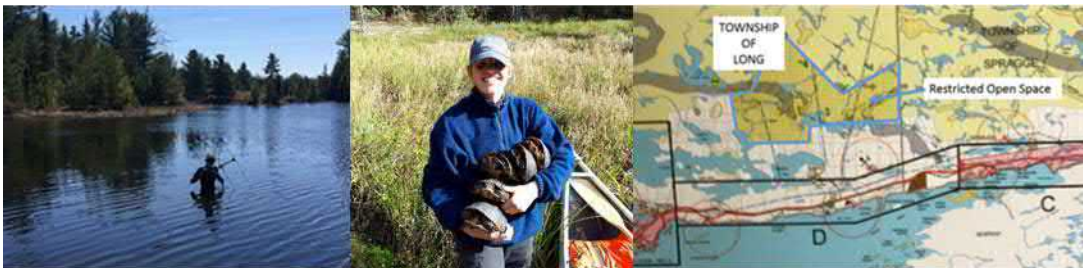


**Blanding's Turtle:** The turtle with the sun under its chin; a teacher and a possessor of great knowledge (First Nation peoples).

Scientifically known as *Emydoidea blandingii*. Note the dome shaped shell and yellow chin.



This turtle is a species at risk for extinction. It is listed as *threatened* in Ontario and *endangered* in Canada. Research conducted within the township of the North Shore has led to the discovery of a large population of Blanding's turtles.



*Pristine Environment*

*Research- Five Blanding's*

*Mature Turtle Population Found in ROS*

The area is a critical habitat for the mating, nesting, basking and overwintering of Blanding's turtles. The temperature of the water bodies permits hibernation over the long, cold winter months and the outcrops provide an ideal nesting substrate. This wetland complex should be part of the Canadian Recovery Strategy in which the Government of Canada is committed to "maintain the presence of known Blanding's turtle local populations where they occur" (<http://www.registrelep-sararegistry.gc.ca> page iv).

Actions we can take: write letters to your local MP Michael Mantha (Email: [mmantha-co@ndp.on.ca](mailto:mmantha-co@ndp.on.ca)), Ministry of Natural Resources and Forestry (MNRF) Steve Acorn ([steve.acorn@ontario.ca](mailto:steve.acorn@ontario.ca)) and local town council ([twpns@ontera.net](mailto:twpns@ontera.net)) to promote the conservancy of this pristine landscape.

*World Turtle Day is observed on May 23rd of each year.*

## **BIODIVERSITY HOTSPOT IN THE TOWNSHIP OF THE NORTH SHORE – BLANDING’S TURTLE SANCTUARY DISCOVERED.**

Research beginning in June 2017 and continuing today has made an exciting discovery. There is a large population of Blanding’s turtles in the Township of North Shore. The true size of this turtle sanctuary is still under investigation and the number of animals found continues to grow with over 50 individuals being identified to date. The natural habitat is a pristine wetland complex and became the subject of a university ecological study examining the population and spatial ecology of Blanding’s turtles. The size and distribution of this rare population was largely unknown at the beginning of the study but could be among one of the largest Blanding’s turtle populations in Canada with numerous critical nesting and overwintering sites scattered across the area. This discovery is important as the Great Lakes population of Blanding’s turtles was recently up-listed to Endangered in Canada due to many threats, including habitat alteration and destruction. Consequently, protecting remaining Blanding’s populations is critical.



*University student researchers conducting Blanding’s turtle research in the Township of the North Shore, Algoma District, Northern Ontario.*

Mark and recapture surveys are a technique used by researchers to estimate the approximate size of a population. Currently 56 turtles have been found and less than half have been recaptured which makes it difficult to calculate the population size with reasonable certainty. A rough estimate based on the current data indicates a population of at least 70-80 turtles and could be larger.

Blanding’s turtles are a long lived species with lifespans greater than 80 years. The turtles do not reach sexual maturity for at least 20 years. A large population of mature adults indicates that this population has existed for centuries and that the ecosystem they inhabit is unique and a special sanctuary. With this recent discovery of a species at risk of extinction comes the obligation to protect this environment and make it a conservation reserve to ensure this irreplaceable natural resource remains healthy. This area and population should become an education and research resource for years to come.

**ANSWER** – Advocates for the North Shore Water and Environmental Resources

*“The North Shore is a great place to live and to visit, with fresh air, pristine lakes and open spaces.”* Mayor of North Shore 2018

***Send your letter to Town Council and show your support to protect this area.***

# Better Decisions for a Healthier North



A picture of NDP MPP Mike Mantha holding five endangered Blanding's Turtles that were tracked by three university researchers (in picture) in the area of the proposed quarry.



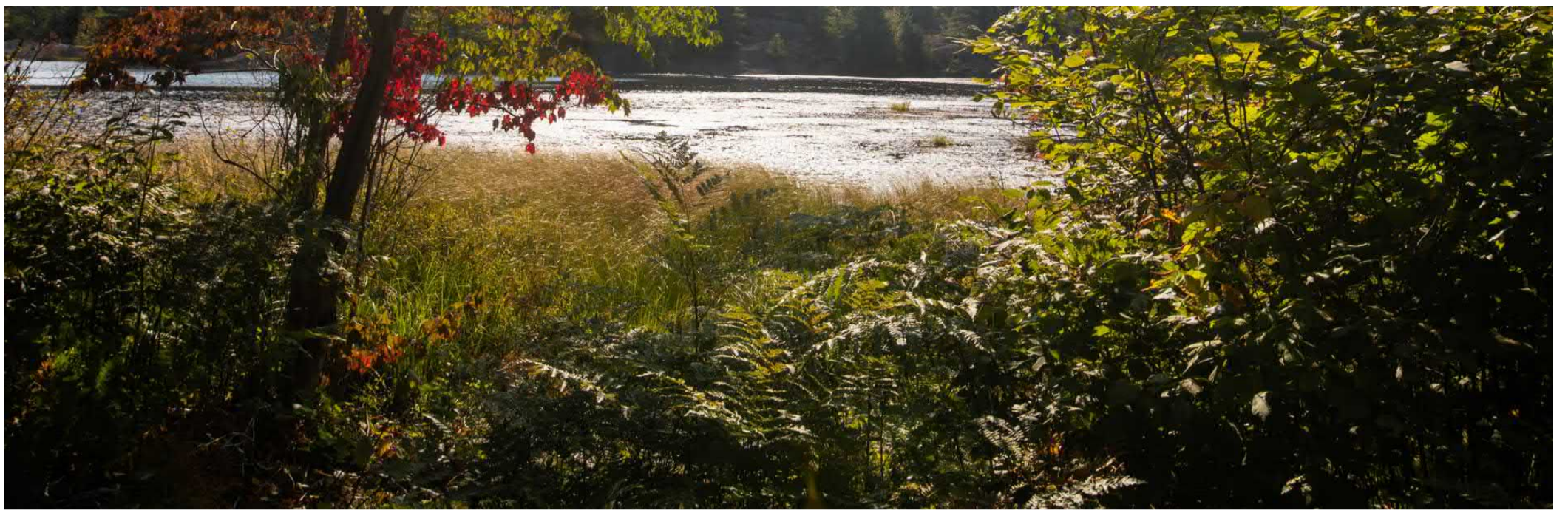
**ANSWER** is a group of local concerned citizens for protection of the water, environment and health.

Website:

<https://answercommunity.ca>

Instagram:

blandings\_of\_the\_north\_shore



ON THE GROUND

## Quarry quarrel: turtle lovers decry Ontario's appetite for construction

A group of self-described 'northern hicks' on Lake Huron is trying to stop a quarry that could harm endangered Blanding's turtles. It's one example of a wider provincial dispute over aggregate extraction

By [Emma McIntosh](#)

Jan. 13, 2023 ⌚ 17 min. read

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This is not how Rhonda Kirby thought she'd be spending her retirement.

The former elementary school teacher was always conservation-minded, sure. And she was always outdoorsy — she and her husband, Tom, love snowshoeing, hiking and riding all-terrain vehicles on a swath of wetlands and forest by their home in The North Shore, Ont., about halfway between Sault Ste. Marie and Sudbury. Then she found out a quarry was proposed to go in on that land, and that it's also home to a rare but thriving population of threatened Blanding's turtles. That just didn't seem right.

Suddenly, she was diving into turtle conservation, trying her best to understand the laws governing quarries and playing host to scientists who used her home as a staging area for wetland research. For over six years now, Kirby has worked to oppose a type of project that almost always receives a green light in Ontario.

"It has been a constant chase," Kirby said, standing at a wetland's edge in early September, blue jays calling from the treetops above. "If the best we can hope for is that we pissed them off, then I guess that's what we have [done]. But that won't be enough."

Kirby and her allies in the grassroots group Advocates For The North Shore Water and Environmental Resources — a coalition of Indigenous and non-Indigenous quarry opponents, who she calls a "bunch of northern hicks" that their opponents greatly underestimated — argue the project isn't necessary. The region is already dotted with pits and quarries that produce aggregate, the rocks and sand used in concrete, they point out.

Darien Aggregates, the company proposing the quarry, and its majority owner, Rankin Construction, contend this site is unique. If approved by the Ontario government, it would produce trap rock, a harder-to-find substance good for highway construction as vehicles are less likely to skid on it than other paving materials. Rankin Construction CEO Tom Rankin declined to answer specific questions from *The Narwhal*, but said in an email the company has worked to be sustainable and improve the environment.

Rankin Construction has also said the project will create up to 25 jobs in the community, which had a population of less than 500 people as of the 2016 census.

“There’s a sense of complacency, I think, in northern Ontario, because there’s so much of this,” Kirby said, gesturing to the foliage that was just beginning to turn red and water glittering in the sunshine.

“They don’t realize that’s what happened in southern Ontario. They started hacking away at it a little bit at a time.”

Tom, her husband, nodded as she spoke. “One bite at a time,” he added. “But eventually, you’re gonna run out.”

Versions of this dispute are playing out all over Ontario, in the many communities where new quarries are proposed.

Tom and Rhonda Kirby were expecting to spend their retirement hiking, riding their all-terrain vehicles and snowshoeing near their home in The North Shore, Ont. Instead, they’re organizing to stop a proposed quarry that could be built on the habitat of threatened Blanding’s turtles. Photo: Ramona Leitao / The Narwhal

The aggregate they produce feeds the growing province’s appetite for concrete to build homes and roads. One kilometre of six-lane highway requires about 2,590 truckloads of aggregate, according to the [Ontario Stone, Sand and Gravel Association](#), a group representing industry. And although some developments spark controversy, others are aimed at improving safety, particularly on remote northern roads.

“How will we welcome and accommodate four million more people in our province in 20 years if we cut off the bottom of the supply chain that builds that infrastructure?” Norm Cheesman, the association’s executive director, [wrote](#) in 2022.

Opponents argue Ontario doesn’t need any more quarries, and the environmental impact of extracting aggregate is too great a cost. Aside from disrupting habitats, aggregate extraction also provides the raw materials for highways and urban sprawl that contribute to climate change. The Reform Gravel Mining Coalition, an alliance of environmental groups that includes the one Kirby leads, has argued for a moratorium on new quarries and pits, saying the province has licensed companies to extract 13 times more than the amount of aggregate it actually uses every year.

In some cases, like the one playing out in The North Shore, quarry applications also impact places important to Indigenous communities.

The Ontario government is currently reviewing the North Shore project, with ministries looking at Darien Aggregate’s application to extract aggregate and mulling whether a permit to damage endangered species habitat might be needed. Meanwhile, the province has [overhauled](#) environmental policy [again and again](#) over the past four years, constantly shifting the playing field for people like Kirby.



The proposed site of the Darien Aggregates quarry is just north of Lauzon Lake, on the rocky Canadian Shield. Video: Katie Krelove / Wilderness Committee

## **Proposed Lake Huron quarry site has among the highest known densities of Blanding's turtles**

The Darien Aggregates quarry, if built, would be just north of Lauzon Lake, a haven of cottages, docks and dense trees. Kirby's home is tucked alongside the lake, at the end of a road leading from the Trans-Canada Highway. Where that road ends, a rugged trail begins, winding up to the proposed quarry site on what the government has designated as Crown land.

Eventually, the thick brush and rocky outcrops of the Canadian Shield along the path give way to a vast series of connected wetlands, with grasses waving and water rippling in the breeze. Though no tiny reptile heads were visible in early September, when nights were beginning to get cold, this particular wetland is a hotspot for slowpokes with shells.

A few types of turtles hang out here, like at-risk [snapping turtles](#) and painted turtles. But endangered Blanding's turtles have captured a lot of the spotlight, because there are an awful lot of them. Conservation biologist Gabriella Zagorski studied the turtles in 2017 and 2018 as she worked on her master's thesis at Laurentian University. She found among the highest known density of Blanding's turtles ever reported — though northern Ontario is speckled with similar wetlands that haven't been studied, and even denser populations could be out there.

The larger point of the research, Zagorski said, was to look at how species at risk legislation is actually working in practice. "When we discover one of the densest sites for Blanding's turtles in Ontario that we know of and nothing is done, how is that legislation working to help us in these situations?"

The site of the proposed Darien Aggregates quarry is close to Lauzon Lake, also known to locals as Lake Lauzon. Map: Shawn Parkinson / The Narwhal

Zagorski's team captured 56 Blanding's turtles in and around the proposed quarry site, using Kirby's house as their basecamp. Turtle catching is easy work in the spring, when animals are still waking up from a winter spent hibernating underwater, but in the summertime, it's an exercise in patience. Zagorski would don hip waders and slip into the wetlands, her chin just dipping underwater as she inched painstakingly towards each specimen. The method earned her the nickname "turtle whisperer."

The team attached radio transmitters to each turtle they caught, to see how each one moved around the wetlands. Some chunks of the quarry footprint are categorized as "critical habitat" for the turtles, meaning it's crucial for the survival or recovery of the species. Other areas are less critical but still important, like travel corridors: turtles retrace the same paths year after year as they move from wetlands to nesting sites to the spots where they spend the winter, and get disoriented if those corridors are disrupted.

A consultant for Darien Aggregates has proposed creating "ecopassages" that could help the turtles pass under quarry roads that would disrupt these travel corridors. That would help, but "reptiles may become stressed when trying to find the entrance to ecopassages, exposing themselves to higher risk of injury or predation," Zagorski's [study](#) noted.

Blanding's turtles are marked by their yellow throats and chins and their slightly upturned mouths, which often look like a grin. They can live to the wizened old age of 75. The turtles can cross large distances, sometimes travelling hundreds of metres or even a few kilometres away from the wetlands they live in.

Gabriella Zagorski studied Blanding's turtles at the proposed quarry site in 2017 and 2018 while she worked on her masters thesis at Laurentian University. Her patient method for catching specimens earned her the nickname "turtle whisperer." Photo: Tom Kirby



Blanding's turtles are known for their bright yellow throats, and for their upturned mouths that often look like a grin. Photo: Shannon Millar

In Ontario, Blanding's turtles mostly live in the Great Lakes basin. One of the biggest threats to their survival is the destruction of their habitat, which the provincial government knows, having said so in its policy statement about protecting the species [in 2020](#).

To Anishinaabe people, or Anishinaabeg, turtles are calendars: markings on their shells correspond to the number of lunar months in a year and the number of days in a lunar month.

“Those turtles are very sacred,” said Nookimis Marly Day, who comes from Serpent River First Nation, a stone's throw from the proposed quarry site, and now lives in Baawating, or Sault Ste. Marie. Day is working with Advocates For The North Shore Water and Environmental Resources to fight the quarry proposal. “The more I heard about these turtles, I had a real concern because animals are equal to humans.”

Other species at risk live around the proposed quarry site, too — like myotis bats, and whip-poor-wills, an elusive bird named after the call it sings on summer nights. Moose also feed at the wetlands. They're not endangered in Ontario, but the species is [on the decline](#).

In Ontario, Blanding's turtles mostly live in the Great Lakes basin. The destruction of their habitat is one of the biggest threats to the survival of the species, the Ontario government has said. Photo: Gabriella Zagorski

## **The north shore of Lake Huron has a long history of resource extraction**

Quarries and the ways they can change a community are nothing new on the north shore of Lake Huron. For a long time, companies have extracted crushed stone and gravel from the rock of the Canadian Shield. People driving by can see a few aggregate operations just off the Trans-Canada Highway, but a [provincial mapping tool](#) shows there are dozens more between Sault Ste. Marie and Sudbury.

There's a long history of resource extraction here, too, one that feeds into why some communities along the north shore are worried.

Beginning in the mid 1800s, Canada claimed authority over the north shores of Lake Superior and Lake Huron — Anishinaabeg territory — and began issuing licences to extract it, without a treaty.

Anishinaabe leaders had asked for years for a treaty, even travelling to Montreal in 1849 to address the governor general. “Can you lay claim to our land?” chiefs [asked](#) the governor general. “If so, by what right? Have you conquered it from us? You have not; for when you first came among us your children were few and weak, and the war cry of the Ojibway struck terror to the heart of the pale face. But you came not as an enemy, you visited us in the character of a friend.”

Later that year, Anishinaabeg [seized](#) and shut down a mine near Lake Superior, forcing the government to come to the table. In the end, two treaties were signed — one covering the north shore of Lake Huron, the 1850 Robinson-Huron Treaty.

The proposed quarry site is a hot spot for Blanding's turtles. It has one of the highest densities of the reptiles ever recorded. Photo: Gabriella Zagorksi

The Canadian Shield in Ontario is speckled with more wetlands that haven't been studied, so there may be even denser populations of Blanding's turtles out there somewhere. Photo: Ramona Leitao / The Narwhal

The Anishinaabeg who signed the treaty didn't surrender their land. They agreed to share it, in exchange for an annual payment that was supposed to increase alongside resource extraction revenues. But the government broke that promise, refusing to raise it beyond \$4 per person since 1874. Ontario courts have sided with 21 First Nations who have filed a lawsuit over the annuity, saying it needs to be re-negotiated. The Ontario government is currently [appealing](#) those decisions to Canada's Supreme Court even as it [negotiates](#) with the First Nations.

In the 172 years since the treaty, settlers continued to build a local economy around resource extraction. Mining, the timber trade and aggregate were the bedrock of many communities that now line the northern edge of Lake Huron.

In the 1950s, during the Cold War, uranium mining began in Elliot Lake, upstream of Serpent River First Nation. Downstream, a plant for sulphuric acid, a corrosive chemical used in uranium production, operated for about a year.

Radiation from uranium tailings leached into the watershed, eventually contaminating Serpent River First Nation's drinking water, and the fish and beaver they'd catch. Fumes from the sulphuric acid plant damaged trees, roofs, community gardens and laundry left out to dry. Rocks nearby [still bore orange stains](#) decades later.

"The environmental cost [of the plant] has been greater than the minor benefits received at the time," Serpent River First Nation Chief Brent Bissaillon told Anishinabek News in 2021. (Bissaillon wasn't available for an interview for this story.)

Ken Meawasige from Serpent River First Nation led an effort to build a turtle research station near the proposed quarry site. "We're going to combine both western science and Traditional Knowledge," he said, with hopes to get youth and elders from his community involved in environmental research. It's not clear how a quarry might affect those plans. Photos: Ramona Leitao / The Narwhal

Serpent River remains beautiful to the eye, lined with granite and white pines. Its water is also still radioactive. Health studies have shown several chronic diseases are more common in the community, as are pregnancies ending in fetal death.

“It is very toxic land,” Myra Southwind, who is from Serpent River First Nation, said at an Advocates For The North Shore Water and Environmental Resources event in September. “And that’s the thing with all the mining. Why would we want to open up more?”

The water from the wetlands that would be affected by the quarry eventually drains into Lake Lauzon, which in turn drains into Lake Huron. Wetlands filter the water that flows downstream, keeping the rest of the system clean. Quarry opponents worry residue from explosives used to blast rock could end up in the watershed, among other problems.

The main hangup so far, however, has been the turtles. For a while, [it got ugly](#): a consultant for Darien Aggregates accused Zagorksi and her supervisor at Laurentian University of falsifying their research. The consultant later retracted the allegation and apologized, and Laurentian found the complaint was without merit. Rankin didn’t answer a question about the incident.

“If we didn’t have the Blanding’s [turtle] research, yeah, there would be shovels in the ground already,” Kirby said. “That’s the only thing that has stalled this, and some determination on the parts of a few people.”

Myra Southwind from Serpent River First Nation said she’s concerned that another quarry may be approved near her community. “It’s not that we can’t use our natural minerals and stuff,” she said. “But we’ve got to learn to use our resources in moderation and respectfully.” Photo: Ramona Leitao / The Narwhal

## ‘They never deny these’

The case of this particular quarry is a microcosm of many current environmental debates in Ontario: along with the specific issue at hand, there’s a larger concern about the rapid-fire pace at which the Doug Ford government has rewritten environmental policies over the last four years.

In 2019, the government [watered down laws](#) protecting species at risk. Among the changes was the creation of a new regime that allows industry to harm the habitats of six species at risk as long as they pay into a provincial fund, which the government plans to use for projects it says will benefit those species in the long run. That list includes Blanding’s

turtles in the Ontario Shield region and the whip-poor-wills around the wetland.

Critics call the system “pay to slay,” a critique the government has [argued is misleading](#), noting companies still have to abide by any conditions attached to their permits. The fund hasn’t been used yet, but the Darien Aggregates quarry could be among the first projects to test it out.

Gary Wheeler, a spokesperson for Ontario’s Environment Ministry, said in an email the government is still reviewing the project to decide whether it will require an endangered species permit and therefore whether a payment to the fund is an option.

And that’s just one way the ground has shifted underneath Kirby’s feet. When she began advocating against the quarry, she was talking to the Ministry of Natural Resources and Forestry. Until oversight of species at risk was shuffled over to the Ministry of the Environment early in the Ford government’s tenure.

Rhonda Kirby has so far spent her retirement opposing an application for a quarry near her home, as part of the grassroots group Advocates For The North Shore Water and Environmental Resources. Photos: Ramona Leitao / The Narwhal

Then, the departments responsible for mining and natural resources merged and separated again. Every time Advocates For The North Shore Water and Environmental Resources found the right person to talk to or started to build a relationship in the government, everything got scrambled and they'd have to start over, Kirby said.

Take a 2019 vote by the Township of The North Shore in favour of rezoning land for the quarry. It's an issue the advocates brought before a provincial tribunal — which was [merged with others](#) in 2021. The Ford government had also tweaked the rules governing aggregate extraction in [2019](#) and [2020](#), and some of those changes made it a moot point. The challenge was dismissed last year.

“We try this, and the door slams in our face,” Kirby said. “We try something else and they change it. It has been unbelievable.”

Ontario's Ministry of Natural Resources and Forestry didn't directly answer when asked if the process has played out fairly. “As part of the application process, members of the public and other agencies have the opportunity to share their concerns with the applicant during the consultation period,” the ministry said in an email.

Late last year, another pivotal change landed: the government locked in a major switch of [wetland policy](#), rewriting the manual that's used to determine whether wetlands are eligible for the “provincially significant” status meant to protect them from development. That manual used to factor in species at risk that live in wetlands, like turtles, and account for the value that interconnected wetland complexes create. Now, neither factor is considered.



A grassroots environment movement has sprung up in The North Shore to oppose the quarry. When Janice Gamble heard about the proposal, she was surprised: "I really didn't know what to do with myself," she said. So she threw herself into researching turtles and the quarry land — and started working on a turtle skirt, with swamp-inspired fabric.

Lesley Chiblow, who lives on Mississauga First Nation, came to an event at Rhonda Kirby's house to learn more about the proposed quarry. Also wearing a special skirt, she said she picked it because it reminded her of the sunrise. "It's about being woke," she said. "Everybody's coming together." Photos: Ramona Leitao / The Narwhal

That makes it a lot harder for wetlands to qualify for protection. Before that, Advocates For The North Shore Water and Environmental Resources had argued the wetlands at the proposed quarry site qualified. But the changes essentially took an eraser to that idea, Kirby said.

"[It's just] a real punch in the gut for us," she said.

There's still time until the quarry plan is finalized. As the natural resources ministry reviews Darien Aggregates' application, the company is working to address concerns that came up in public consultation in spring 2016. It currently has until Feb. 27, 2023 to wrap that up.

In an email, the ministry didn't directly answer whether it would account for the cumulative impact of aggregate operations in the area when it makes its decision.

"Aggregate extraction is driven by market demand," the ministry said. "Some companies have more than one site because the type of aggregate it can produce is different. The supply and demand of the market determines when, how much and what type of aggregate a company can supply from individual sites. These reports are prepared by qualified professionals with experience and expertise to address potential impacts related to mineral aggregate operations."

Tom Kirby pores over a map of the proposed quarry site at the Kirby home by Lake Lauzon. Photo: Ramona Leitao / The Narwhal

Kirby doesn't have much hope her group's concerns will actually be heard, on the aggregate application or the species at risk permit. Ontario has never denied a permit to harm species at risk, even before Ford's tenure, the province's auditor general reported [in 2021](#)." And the province [rarely says no](#) to a new quarry.

"They never deny these permit applications, especially on Crown land," Kirby said.

## **'I know the power of our spirituality, what it can help do'**

In early September, about 30 quarry opponents from all over the north shore sat in Kirby's backyard for a meeting and harvest moon ceremony hosted by KiiGaDoWaak Nookimisuk, a group of Indigenous grandmothers. As afternoon turned to evening, hummingbirds zipped by and the sunset painted pastels across Lake Lauzon.

Before long, a full moon rose over the yard. Elders shared teachings with the group. Then, led by grandmothers Isabelle Meawasige and Nookimis Marly Day, they laid down a medicine bundle and gathered around a sacred fire at the edge of the water, listening as Southwind as others sang, drummed and prayed for the Blanding's turtles, and all of the animals and waters that would be affected by the quarry.

"When I heard about the quarry going in and you know, the damage it could cause, I started thinking about those turtles," Day said. "What's missing through all of this is the spiritual aspect of it, and I know the power of our spirituality, what it can help do."

Items used for a harvest moon ceremony hosted by Advocates For The North Shore Water and Environmental Resources.

Tracie Louttit, left, helped Nookimis Marly Day, right, as Day led the harvest moon ceremony.

Water from the wetlands that would be affected by the Darien Aggregates quarry proposal in would flow into Lauzon Lake, which then drains into Lake Huron. Photos: Ramona Leitao / The Narwhal

Day used to have picnics next to Lake Lauzon before she moved to Baawating. Some members of her family swim there. With so much of their territory now developed and changed forever, she wonders what this area will be like in another 50 years.

Tracie Louttit, who also lives in Baawating and helped Day with the ceremony, said the group is in for the long haul.

“If no one technically gives their notice to say, ‘hey, we’re not good with this,’ then they’ll go through with it,” she said. “Well, we’ll keep doing that. We’ll keep coming here, we’ll keep doing it every 30 days if we have to.”

*Updated Jan. 13, 2023, at 3:01 p.m. ET: This article was updated to include more details about the harvest moon ceremony.*

Banner Photo:

**BANNER:** Darien Aggregates is proposing to build a quarry on a swath of forest and wetlands in The North Shore, Ont. that’s also home to threatened Blanding’s turtles. As a group of locals tries to oppose it, Ontario’s environmental laws keep shifting beneath their feet.

Photo: Ramona Leitao / The Narwhal

# Information Postcard



**QUARRIES AND SPECIES-AT-RISK DON'T MIX!**



**"WHAT HAPPENS TO SHKAAKAMIKWE (MOTHER EARTH),  
HAPPENS TO ANISHINAABEG."**

**--GRANDMOTHER ISABELLE MEAWASIGE, BEAR CLAN WOMAN, SERPENT RIVER  
FIRST NATION**

KiiGaDoWaak Nookimisuk (Grandmother Council) is working with community to raise concerns about a quarry proposed on Robinson-Huron Treaty territory in the Serpent River watershed

- The 115-ha quarry proposed by Darien Aggregates is a Ceremonial site on so-called 'crown land' in the township of North Shore. It would destroy critical habitat for a population of Blanding's turtles and other species-at-risk
- The impacts of the quarry on hunting and harvesting would be devastating on moose habitat, traditional medicinal plants and tree species
- Consultation has been held behind closed doors with little input from communities
- The below water table extraction will have impacts for generations. "Rehabilitation" of the quarry site would take over 75 years to fill two man-made lakes artificially by pumping from neighbouring water sources; up to 400 years to fill naturally
- The Land, Waters and People of this area are still dealing with health challenges from uranium mining and an abandoned Acid Plant. The Darien quarry would add further stress on the ecosystem, drinking water and safety.



**HELP STOP DARIEN QUARRY**

[answercommunity.ca](http://answercommunity.ca)



[@TurtleTableTalks](https://www.facebook.com/TurtleTableTalks)

