



Red Lake Wolverine Project Field Report 2022



Authors:

Dr. Matthew Scrafford

Jacob Seguin, M.Sc.

Laura McCaw, M.Sc.

BACKGROUND

Wildlife Conservation Society (WCS) Canada began the Red Lake wolverine project in spring 2018. This report provides a summary of data we collected through five field seasons and highlights from our 2022 field season. Our reports from previous field seasons are available on the WCS Canada website (<https://www.wcscanada.org/Publications/Conservation-Reports.aspx>).

The Ontario government listed wolverines as threatened under the *Endangered Species Act, 2007*. Scientists drafted a Wolverine Recovery Strategy (2013) in response to their listing and the Ministry of Natural Resources and Forestry (MNRF) created a Government Response Statement (2016) that prioritized research and conservation actions for wolverines. We designed our field project to address six action items in the Government Response Statement:

- Produce data that quantifies wolverine abundance in Red Lake and across the Ontario shield (Action #1).
- Determine wolverine habitat use and den-site selection in response to industrial disturbance (Actions #2 and #4).
- Develop best-management practices for human activities in wolverine habitats (Actions #7 and #13).
- Promote public awareness of wolverines through targeted communication products (Action #14).

The focus of our fieldwork has been deploying GPS collars on wolverines and tracking them to document den-site use, habitat use, foraging, and mortality sources. We used a grid of live traps and run poles to estimate wolverine abundance. For additional detail on our methods, please see our [2020-2021 report](#).

Project funders include the W. Garfield Weston Foundation, the Ontario Species at Risk Stewardship Fund administered by the MECP, Evolution Mining, Domtar, The Donner Foundation, The Fitzhenry Foundation, R. Howard Webster Foundation, The Wolf Foundation, Oak Island Films, and The Schad Foundation.

2018-2022 SUMMARY

Below we highlight our main accomplishments from five years of fieldwork in Red Lake:

- Deployed 30 live traps and 10 run poles across a 5,470 km² study area (Fig. 1, Fig. 2).
- Live trapped over 9,895 trap nights (Table 1A).
- Responded to over 520 triggered live traps, of which 253 were wolverines.
- Monitored 53 wolverines (18 females and 35 males) with GPS collars and confirmed an additional 14 individuals on camera (so far) that we were not able to live trap, bringing the total to 67 known wolverines in our study area (Fig. 3).
- Collected over 65,000 GPS locations from 47 wolverines (16 females and 31 males) between March 2018 and May 2022 (Fig. 4). The median (minimum, maximum) number of GPS locations collected from males ($n = 31$) was 1,009 (60, 3,866) and from females

($n = 16$) was 1,455 (91, 4,860). About 2/3 of our GPS locations have been from the summer relative to the winter.

- Documented 11 wolverine mortalities: 9 human-caused and 2 from predation.
- Documented 7 male and 3 female dispersal or exploratory movements.
- Visited 108 “clusters” of GPS points to investigate wolverine activities. We found prey remains at 63 clusters, with moose and beaver as the primary wolverine food source.
- Located 12 reproductive dens in slash piles ($n = 4$), rocks or boulders ($n = 2$), and down trees or root balls ($n = 6$). The 12 dens were from 5 different females.
- Wrote and published a forestry management guide with recommendations for forestry activities around known wolverine denning sites.
- Collected 392 wolverine biological samples: 197 scat samples, 97 hair samples, 46 blood samples, and 52 tissue samples.
- Provided the Cascades Carnivore Project with 132 wildlife tracks to help understand the accuracy of wolverine track identification by citizen scientists and professionals.
- Deployed motion sensor cameras on all our traps and run poles to identify wolverines in our study area resulting in over 500,000 pictures over 5 years.
- Deployed 167 motion sensor cameras on current and retired forestry roads to determine the use of roads by wildlife, vehicles, and humans.
- Worked with local trappers to monitor live traps and run poles.
- Worked with grade 12 students at Red Lake District High School to develop and write scientific reports using field data we have collected.
- Contributed to a number of interviews and news articles on our research on wolverines in Ontario.
- Participated in the filming of the TVO documentary series *Great Lakes Untamed*, which features our wolverine research in Episode 2 *The Big Freeze*, and Episode 4 *Wolverine Walker of the Great Lakes*, both released September 27th, 2022.

2022 FIELD WORK

Our 2022 field season (season 5) was shorter than previous years and went from February 4th to April 30th. We had a team of 3-4 researchers operating live traps and tracking wolverines with additional support from local trappers. Below we primarily provide a summary of data collected in the 2022 field season, along with relevant information from previous field seasons.

Wolverine captures/detections

We operated 21 live traps over the field season, including one new live trap north of the Dixie Road (Dixie North in Fig. 2). We did not operate any run poles. Our live traps were open for 1,274 trap nights (cumulative number of nights that each trap was open) (Table 1A). During that time, we caught 4 males (M32-M35) and 4 females (F14-F17) new to the project, along with wolverines from previous years including 5 males (M16, M18, M22, M24, M26, M28) and 6 females (F01, F05, F07, F10, F11, F13,). We averaged 4.47 wolverine captures/100 trap nights, much higher than during previous field seasons (Table 1A).

We continued to capture non-target wildlife at live traps (Table 1B). However, our low capture numbers for marten was an anomaly relative to earlier field seasons. Local trappers reported that their marten harvest was low in 2022. We also put greater effort into securing bait in the back of the live trap so that only wolverines could dislodge the bait and trigger the trap.

Table 2 provides a list of the years that we detected individual wolverines. F01 was the only wolverine documented in all five years. M02 (Gullrock Lake area), M16 (Chukuni Road area), and M18 (Pine Ridge Road area) were monitored for three years but all other males were two or less. In general, it was more reliable to catch the same female each year than it was to catch the same male, potentially because females are less likely to disperse from the study area (Table 2).

Table 3 includes updated morphometric measurements from wolverines.

We are going to use wolverine detection data to estimate wolverine abundance and density in Red Lake. Before we can complete that, we need to finish entering or marking thousands of photos from our live traps and run poles. Our aim is to have these data compiled and ready for analyses by spring 2023.

GPS collar status

We deployed 90 GPS collars on 53 wolverines over 5 winters. Ten individuals might still be wearing GPS collars, but we can't know definitively because these collars do not transmit GPS data anymore. Based on our past experience, we suspect that many of the remaining ten collars have slipped off the wolverines.

We used rot-away patches on the collar bands in 2022 because mechanical drop-offs worked poorly in prior field seasons. The rot-away section is made of cotton and intended to naturally wear-out and allow the collar to fall off. We finished the 2022 field season with nine wolverines wearing GPS collars with rot-off sections. We can confirm that eight of the nine collars have since fallen off the wolverines. On average, rot-offs dropped off female wolverines after 140 days and off male wolverines after 81 days.

Home range size

Scientists in 2003/2004 used VHF telemetry collars to estimate wolverine home range size in Red Lake. They found the average home range size for male wolverines was 2,563 km² ($n = 3$) and for females was 428 km² ($n = 4$) (Dawson et al. 2010). These were calculated as 95% Minimum Convex Polygons (MCP), which is a 2-dimensional polygon drawn around 95% of all the known locations from an individual. Using this method with GPS data from our current study, we found the average home range size for males was 1,409 km² ($n = 25$) and for females was 713 km² ($n = 14$) (Table 4).

Foraging sites

We visited 20 foraging sites in 2022. Over five field seasons, 63 of 108 foraging sites had evidence of prey including black bear, caribou, whitetail deer, lynx, and grouse. Below we describe two interesting foraging sites from winter 2022.

Moose calf

M32 was spending time in a concentrated area between Madsen and Red Lake beginning on February 26, 2022 (Fig. 5). He remained in the area through March 1st, and we snowshoed in from Hwy 618 on March 2nd. The cluster was located at the edge of a burned area from two summers ago and on a hillside leading down to a creek. The hillside didn't burn and was thick with young balsam trees. It appeared that the wind would carry snow over the burned area and drop it into the balsam stand, resulting in deep snow drifts (6' deep in places). We found a moose calf buried in the snowdrift, and M32 had a network of caves under the tree-bowls that he used to rest, establish latrines, and stash pieces of the moose. There were no tracks of any other animals at the site (Fig. 6).

Whitetail deer

M32 had a cluster off the Longlegged Road on April 27th and we walked in on April 29th. We were surprised to find evidence of a dead whitetail deer because we don't often see their tracks in this area. Since this site was fresh and there was still snow, we backtracked to try and understand what might have happened. It appeared that M32 was walking and opportunistically crossed paths with two deer. He chased one deer and was able to stay on the surface of the snow while the deer fell ~2' into rotten snow. We suspect that M32 took down the deer during a 50-meter chase. All that remained of the carcass were guts and a bit of meat, but there were no signs of any other animal tracks but his (Fig. 7).

Wolverine reproductive dens

We use a few pieces of evidence to justify searching for a wolverine reproductive den site: a female expressing milk through her teats during handling, localization of female movement during the reproductive period, and missed GPS locations from a female collar during the reproductive period. The missed GPS locations or fixes generally occur because a female is in a den and the collar cannot acquire satellites for an accurate GPS fix. To find the den, we sometimes backtrack wolverines from nearby GPS locations when she was not in the den site. We also might use an antenna to track the VHF signal from the wolverine GPS collar on foot or during a flight – however the signal generally only carries 1-2 km in the bush – making this task difficult at times! Ideally, the female is in the den when we track her and shows us the exact structure and location she is using.

We located seven reproductive den sites in 2022, for a total of 12 den sites since the project began. Below we discuss in more detail the seven den sites from 2022.

F01

We live trapped F01 on March 21st and noticed she was lactating. On March 25th, we heard her VHF signal while snowmobiling a forest road but did not walk in because it was getting dark. We returned on March 26th and heard her VHF signal from the same location and walked in. We likely flushed her from the den site as we approached although her VHF signal indicated she was circling us. We backtracked her to a den site that was only 400m from the den site she used in the winter of 2021. The forest at the den site was open spruce with thick moss. The den structure was a fallen tree covered in snow, with two snow holes on either end of the tree trunk (Fig. 8). It appears that she moved under the tree trunk and exited and entered through the snow holes. We suspect this den site would be unsuitable in a year when there was poor snow depth, as the den site was highly reliant on deep snow to provide structure and cover (Fig. 8).

F05 Den Site #1

We caught F05 on February 9th and we noticed she had teats and we felt a fetus. Her first den site was not apparent to us until after she uploaded backlogged GPS data, and after we had found her second den site (discussed below). Once her collar uploaded a batch of GPS data, on April 12th we visited a cluster of 47 points concentrated in a very small area. At the center of the cluster was a tangle of fallen spruce trees, and under the branches and tree trunks were beds, latrines, and trails. We could see these features because most of the snow that formed the structure had melted. We suspect she used this location from March 2nd to March 13th and abandoned the site because of warm weather and snowmelt.

This is the only wolverine den site we found in Red Lake where a cluster of GPS points was on the exact den site location. More often, GPS collars are unable to get GPS fixes when the wolverine is in the den site because the structures block satellite acquisition (e.g., rock, root ball, slash pile). This den site was mostly made of snow and branches that likely enabled the collar to acquire satellites more easily.

F05 Den Site #2

On March 29th, we heard F05's VHF signal on the top of a rocky hill but could not get into the site before dark. The following day, we heard F05 in the same area again but not at the same exact location as the previous night. We found fresh tracks leading from the top of the hill and followed these tracks back to a large boulder field/cliff area. F05 had numerous snow and rock caves she was using and tunnels between them, likely through the open spaces in the boulders. She also had surface trails going between various holes in the boulder/cliff complex. One cave in particular was well used by F05 and we suspected this was her den site (Fig. 10). It was one of the only holes at the base of a tree and was primarily a rock structure with snow providing additional cover (Fig. 10).

F07

We knew F07 was wearing a GPS collar from the previous winter and we wanted to capture her to replace it. We had a hard time catching her, so we decided to put a live trap closer to the center of her range. We ended up catching her at the new trap site on March 30th and noticed she was lactating. She returned to a remote location off the Longlegged road after we released her. We suspected her den site was in this area, but we waited for additional GPS data to warrant a field visit. After getting backlogged GPS data, we noticed that F07 continued to leave and return to this same area off the Longlegged road and so we decided to visit the location on foot on April 5th. We listened for her VHF signal when we got close to the area but she was not there. We hiked to one of the many scattered GPS locations in the larger area and backtracked fresh tracks to what we believe was her den site, best described as a complex of fallen trees with snow caves and tunnels (Fig. 11). However, she also regularly moved in and out of a beaver lodge that was ~90m from the fallen trees (Fig. 12). Subsequent GPS data uploads indicated that she continued to leave and return to this area on an almost daily basis, making us confident she was using one of these structures as a den site.

F10 Den Site #1

F10 was live trapped February 11th and had enlarged teats. Although F10's GPS collar was rarely transmitting GPS data, we were able to locate her using VHF telemetry on March 4th, March 15th, and March 18th in the same general area near the Golden Road. On March 19th, using both a triangulated VHF location and backtracking, we followed her tracks to a slash pile that was buried in snow and had a tunnel leading inside (Fig. 13); she was not in the slash pile at the time, but we suspect this was her den site. The tunnel was well used and there were latrines in the area. The surrounding area was a regenerating cutblock (cut in 2000) and comprised of dispersed spruce trees. The slash pile was on the edge of more mature forest that rose immediately to a hill.

F10 Den Site #2

In April, we noticed that F10's collar was inconsistently uploading GPS data and the few locations we got from her collar were in a specific area close to her first den. On April 29th, we hiked to these GPS points and were able to backtrack her to another den site within a large slash pile (Fig. 14); she was not inside at the time. This slash pile was at the base of a hill at the edge of a regenerating cutblock (also cut in 2000). There were latrines both surrounding and inside the slash pile, and bones cached nearby. This den site was 1.3 km from her first den.

F11

We caught F11 on April 2nd and found she was lactating. After we released her from the live trap, we suspect she ran straight back to her den site because her subsequent GPS data uploads were sparse. We searched for F11's den site on April 6th. We used a few GPS locations to narrow down a search area off Joyce Road, and after some travel along the road, we were able to hear her VHF signal. We followed the VHF signal to a slash pile that she was currently inside. There

were two main trails and tunnels into the slash pile (Fig. 15). The area had many rock features and the proximal cutblock was harvested in 2002.

Reproductive timeline

Females typically begin mating at two-years of age. Wolverines mate during the summer (late-May and June) and females suspend their fertilized eggs until implantation (late-December to mid-January) and have their kits in mid-February (Rausch & Pearson 1972). Lactation and teat engorgement occur after implantation (early-February) and through weaning (mid-May). Therefore, evidence of lactation or teats could indicate a female had kits or is of reproductive age. However, it is possible for a female to develop teats even if she did not have a successful implantation of a fertilized egg (e.g., a pseudo-pregnancy), as there is some evidence that simply the mechanical aspect of mating triggers teat development the following winter (Mead et al. 1993).

As a crude estimate of the number of females potentially with kits or at reproductive age, we report evidence of teats and lactation at each female handling over the course of the five field seasons (Table 5). The earliest date we observed teats or lactation was February 9th (F05 in season 5), although there was only one other female handling between mid-January and February 9th where early teat development would potentially be seen (F10 season 4). F01 showed evidence of teats or lactation in four out of five field seasons, suggesting, at minimum, she was old enough to mate in the summer of 2017. We suspected some females were yearling or sub-adults when we first handled them because of body condition and lack of evidence of past or present reproduction. F06 and F11 were suspected to be sub-adults the first year we handled them but denned the following winter. There were three instances where a female showed evidence of teats or lactation at handling, but we were unable to find a den site, either because the area was inaccessible, the collar malfunctioned, or we just simply could not find it (F01 season 2, F09 season 3, F14 season 4; Table 5).

Wolverine mortalities and injuries

A trapper in Manitoba accidentally killed M25 in a trap set for a different species, which brings the total to 11 documented mortalities (Table 2).

When handling M16, we noticed a bump on the left-front sternum, and when we felt along his side, it seemed that two ribs had broken. M35 had a round-soft lump on the left side of his sternum the size of a ping-pong ball. We couldn't find any punctures or wounds associated with the lump.

Insights and future plans

We had a very high wolverine capture rate that allowed us to catch nearly as many wolverines during this shortened field season (~ three months) as during prior field seasons that were longer (~ six months). Part of this success was likely that the shortened field season occurred in the spring when wolverines are often moving around more, because of dispersal and reproduction,

which increases capture success. This field season did not include some of the slower capture periods in mid-winter. Whatever the reason, it does suggest that live trapping over a shorter duration can be effective.

We had issues with our mechanical GPS collar drop-offs malfunctioning in the field, leaving the status of the collar on the wolverine unknown after the collar stops transmitting GPS data. The drop-offs also contributed to the collars fitting poorly on certain individuals – mostly because the drop-off is not flexible along the bands. As a result, we tried different brands of drop-offs, but none worked as we wanted them to. This field season we switched to rot-offs or cotton spacers on the collar band. For the most part, these rot-offs degraded and caused the GPS collar to fall off the wolverine while still staying on long enough to collect GPS data. Collars with rot-offs also fit the wolverines much better.

A major success was finding seven reproductive den sites, more than the total number of den sites found in the previous four winters. An advantage of starting the field season later is that we placed GPS collars on females right before or during the reproductive period, which better ensures that they still work when the female is at her den site. Prior field seasons, when females might have been collared in November or December, their collars often stopped transmitting by the time the reproductive period began (either running out of battery or just malfunctioning).

The 12 den sites we have found have been in a variety of natural and forestry structures including fallen trees and root balls ($n = 6$), rocks or boulders ($n = 2$), and slash piles ($n = 4$). Most of these sites glean structure from snow, suggesting that poor snow years could affect den site quality or availability.

This field season we learned more about female fidelity to denning areas. F01 continues to den year-after-year within the same small area in the center of her range. Likewise, F05's den sites have all been within 1-2 km of each other. These types of data are hard to obtain without knowledge of the distribution of females and long-term monitoring. Future analyses will look at what habitats might be attractive to denning females.

We are reducing fieldwork this winter so we can focus on analyzing and writing-up our data. We plan to continue to monitor female reproductive areas with cameras, but we will not operate live traps this winter. We recently published a report detailing recommendations on protecting female denning areas titled "[Wolverine Denning Ecology and Ontario's Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales](#)" and are working with the data to produce articles and reports that summarize wolverine abundance, density, foraging, mortality, physiology, and habitat use within the Red Lake area.

Wolverines in the media

[Wildlife Conservation Society Canada: Wolverine story map.](#)

[Red Lake Wolverine Project Field Report 2020-2021.](#)

[The Walleye Magazine: Wolverines Under Threat article \(page 100\).](#)

[CBC Thunder Bay - Superior Morning: Wolverines and climate change, May 2022.](#)

[Cabin Radio: The wolverine, a recluse, becomes more of an open book to scientists.](#)

[TVO: Great Lakes Untamed. Episode 2 – The Big Freeze \(35:55 - 41:52\).](#)

[TVO: Great Lakes Untamed, Episode 4 – Wolverine Walker of the Great Lakes.](#)

[CBC Thunder Bay - Superior Morning: Matt Scrafford Wolverine Genome Sequence interview, September 2022.](#)

[CBC Edmonton AM: Matt Scrafford discusses wolverine genome, September 2022.](#)

[Wildlife Conservation Society Canada: On the track of wolverines, from Ontario to Washington State.](#)

[Wildlife Conservation Society Canada: Building a trap.](#)

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Figure 1. Wolverine F08 at a live trap in Red Lake, Ontario. Wolverines are attracted to the beaver bait inside the traps. When the wolverine pulls on the bait, the trap door closes and the satellite transmitter (attached to the plywood on the crossbeam) notifies field staff through email that the trap is sprung.

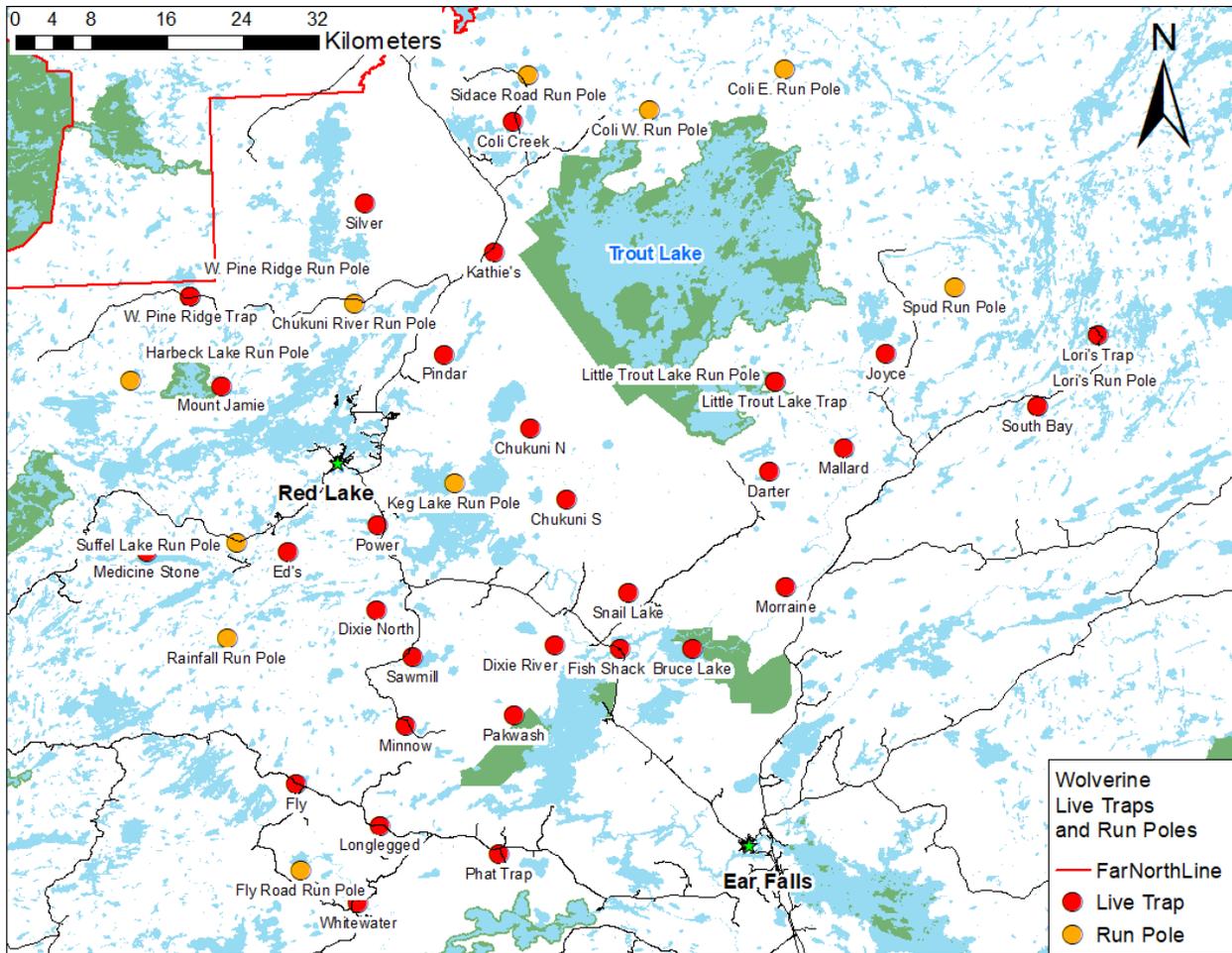


Figure 2. The distribution of live traps and run poles in Red Lake, Ontario.

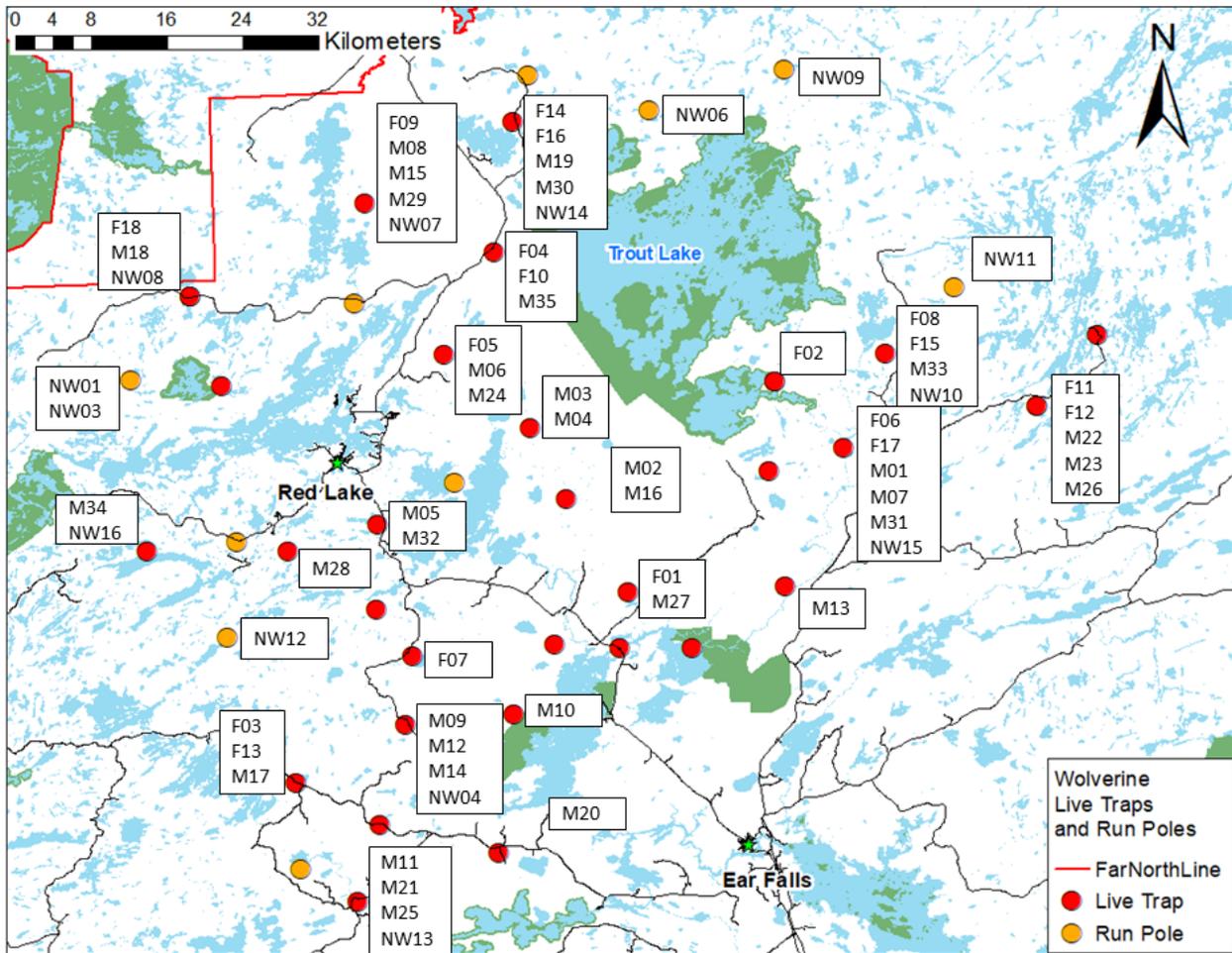


Figure 3. The location where wolverines were first detected in Red Lake, Ontario during field seasons between 2018 and 2022.

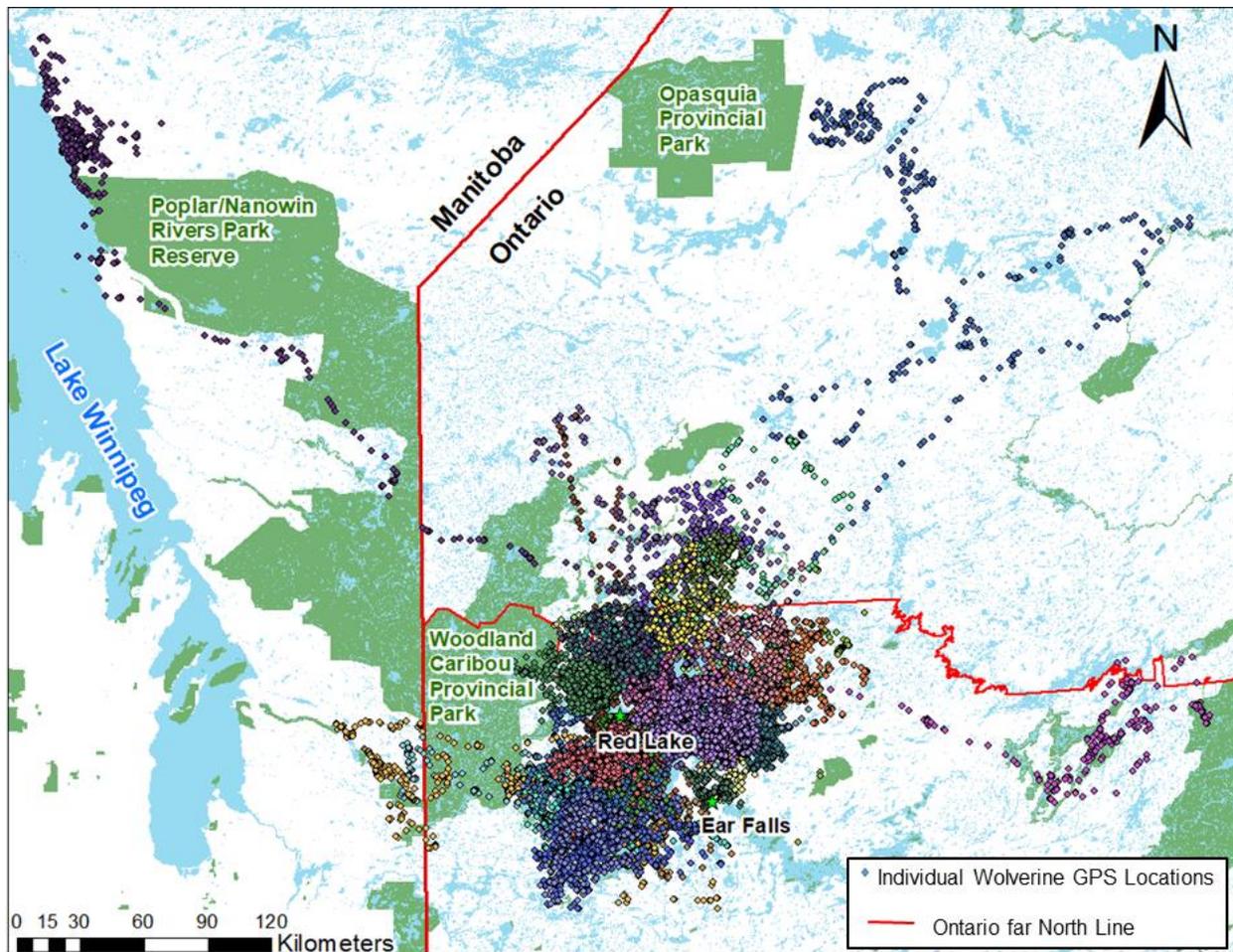


Figure 4. The GPS locations of 47 collared wolverines in Red Lake, Ontario between 2018 and 2022. Different colours represent individual wolverines.

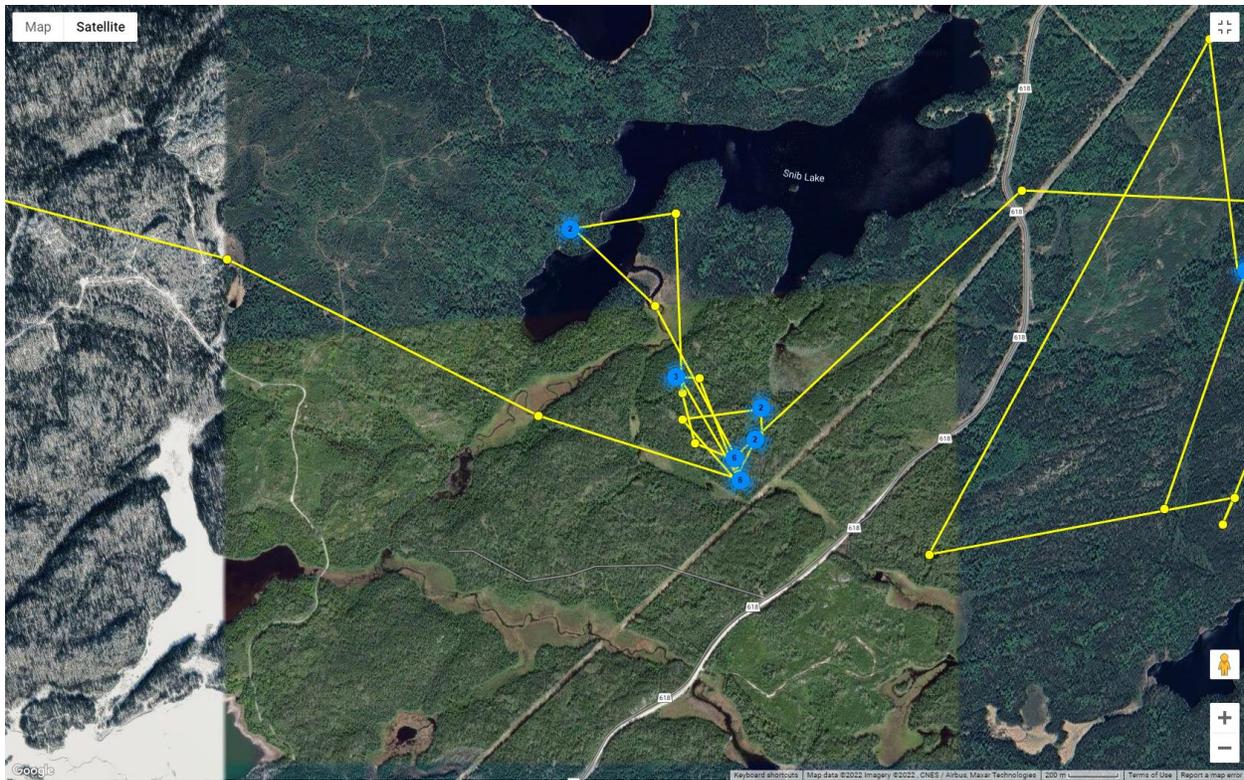


Figure 5. M32 spent most of his time between February 26, 2022 and March 1, 2022 excavating a calf moose out of a snow-drifted hillside. This is what the GPS data from the collars looks like to us when we decide to investigate a cluster of points (Red Lake, Ontario).



Figure 6. The moose carcass that M32 had eaten (Red Lake, Ontario).



Figure 7. A white-tailed deer carcass that M32 was eating (Red Lake, Ontario).



Figure 8. F01's den site entrance and tracks. This was one of two holes on either end of a fallen tree (Photo date: March 26, 2022).



Figure 9. F05's first den site under a complex of fallen spruce trees (left). A bed site F05 used within the den site (right). These pictures were taken on April 12, 2022 although we suspect she used the site from March 2-13, 2022. Therefore, much of the snow had melted that formed the main structure of the den.



Figure 10. F05's second den site was in a rock crack and about 1 km away from her first den site. The top picture shows the rocky face where F10 had caves, trails, and her den site. The bottom picture is a close-up of what we suspect was her den site (Photo date: March 30, 2022).



Figure 11. One of F07's probable den sites. The structure was formed by down trees that were covered in snow (Photo date: April 5, 2022).



Figure 12. Another probable den site for F07 was a beaver lodge. This site was approximately 90m from the structure in Figure 11 (Photo date: April 5, 2022).



Figure 13. F10's first den site in a snow-covered slash pile at the edge of a cutblock. There were tunnels out of the slash pile from the top and side (Photo date: March 19, 2022).



Figure 14. F10's second den site in a slash pile at the edge of a cutblock. This site was 1.3 km from the first den site. This slash pile was considerably larger than the first one she used, with many more latrines and trails (Photo date: April 29, 2022).



Figure 15. F11's den site in a slash pile (Photo date: April 6, 2022).

Table 1A. A summary of our effort and success live trapping wolverines. Season 1 was late winter 2018, season 2 was winter 2018/2019, season 3 was winter 2019/2020, season 4 was winter 2020/2021, and season 5 was late winter 2022. “New individuals” refers to wolverines that had never been captured in previous field seasons. “Recaptures” refers to wolverines that were captured in previous field season.

Season	Trap nights	Total wolverines	Wolverines captured/100 trap nights	New individuals		Recaptures	
				Males	Females	Males	Females
1	259	2	0.77	1	1	0	0
2	2,321	9	1.77	7	1	0	1
3	2,789	26	2.65	13	8	4	1
4	3,252	23	2.43	10	4	4	5
5	1,274	19	4.47	4	4	5	6

Table 1B. A summary of non-wolverine captures. “Triggered traps” refers to the number of times a trap was set-off or triggered by wildlife and visited by field staff. Season 2 was winter 2018/2019, season 3 was winter 2019/2020, season 4 was winter 2020/2021, and season 5 was late winter 2022. Season 1 was not included here as it is missing data on non-target captures.

Season	Triggered traps	Total non-target wildlife trapped	Number of species trapped						
			Lynx	Marten	Fisher	Fox	Wolf	Mink	Raven
2	108	67	16	33	11		5	2	
3	155	81	46	28	5	1			1
4	163	84	34	29	13	7	1		
5	91	34	22	4	8				

Table 2. The field seasons that individual marked wolverines were detected (either by camera or capture) at live traps and run poles in Red Lake, Ontario. An “F” before the number indicates a female wolverine, an “M” indicates a male wolverine. Red font indicates a known mortality.

Wolverine ID	Season 1 (2018)	Season 2 (2018/19)	Season 3 (2019/20)	Season 4 (2020/21)	Season 5 (2022)
F01	x	x	x	x	x
F02		x			
F03			x		
F04			x		
F05			x	x	x
F06	x		x	x	
F07			x	x	x
F08			x	x	
F09			x	x	
F10			x	x	x
F11				x	x
F12				x	
F13				x	x
F14				x	
F15					x
F16					x
F17					x
F18					x
M01	x				
M02		x	x	x	
M03		x	x		
M04		x	x		
M05		x	x		
M06		x	x		
M07		x		x	
M08		x			
M09			x		
M10			x		
M11			x		
M12			x		
M13			x		
M14			x		
M15			x		
M16			x	x	x
M17			x	x	
M18			x	x	x
M19			x		
M20			x		
M21			x	x	
M22				x	x
M23				x	
M24				x	x
M25				x	
M26				x	x
M27				x	
M28				x	x

M29	x	
M30	x	
M31	x	
M32		x
M33		x
M34		x
M35		x

Table 3. Average physical measurements from wolverines in Red Lake, Ontario, taken during chemical immobilizations.

Measurement	Female wolverine (n = 18)	Male wolverine (n = 34*)
Weight (kg)	9.42	13.59
Neck circumference (cm)	28.93	35.52
Head circumference (cm)	33.83	38.01
Body length (cm)	81.85	88.23
Tail length (cm)	16.47	18.62
Chest circumference (cm)	41.18	46.97
Forearm length (cm)	15.31	16.40
Paw length (cm)	10.08	11.33

*We were not able to obtain measurements from one male in our study.

Table 4. Number of relocations we have collected for 47 collared wolverines since spring 2018, and the size of the area they each use, calculated as a 95% Minimum Convex Polygons (MCP). Wolverine are only included if they have at least 60 GPS relocations.

Wolverine	Number of relocations	95% MCP (km ²)
F01	4860	1052.8
F03	1554	43189.7
F04	1356	667.2
F05	2417	112.5
F06	2238	639.1
F07	1725	796.1
F08	2555	554.7
F09	455	801.1
F10	2377	805
F11	943	545.9
F12	283	3048.7
F13	1641	1402
F14	1229	1458.1
F15	475	859.9
F16	91	196.5
F17	151	92
M01	1643	7310.7
M02	3866	1082.5
M03	2563	8450
M04	998	1022.3
M05	2274	1971.3
M06	678	191
M07	771	197.9
M08	552	6129.3
M10	322	243.6
M11	65	226.6
M12	1431	9248.4
M13	663	1418.7
M14	1009	2054.9
M15	1162	13258
M16	3118	1855.5
M17	1717	1680.7
M18	2421	999.9
M19	301	2373.9
M21	2629	3626.9
M22	60	132.4

M24	1142	314.2
M25	1284	2307.6
M26	1125	2711.1
M27	308	83
M28	862	2235.8
M29	1783	1061.3
M30	411	964.6
M31	1424	18799.2
M32	641	823.6
M33	671	1189.3
M35	122	693.1

Table 5. Female reproductive status when handled in Red Lake, Ontario. An “x” indicates either engorged teats or evidence of lactation. A shaded box around the field season indicates we found a reproductive den site associated with that female at that time.

Wolverine ID	Date handled	Field season	Appeared to be a juvenile or sub-adult	Teats	Lactation
F01	April 14, 2018	1		x	x
F01	November 22, 2018	2			
F01	March 23, 2019	2		x	x
F01	November 20, 2019	3			
F01	December 27, 2020	4			
F01	March 10, 2021	4		x	x
F01	April 1, 2021	4		x	x
F01	March 21, 2022	5		x	x
F02	April 4, 2019	2	x		
F03	December 8, 2019	3	x		
F04	December 13, 2019	3	x		
F05	February 16, 2020	3			
F05	December 21, 2020	4			
F05	March 17, 2021	4			
F05	February 9, 2022	5		x	
F06	March 14, 2020	3	x		
F06	January 12, 2021	4			
F07	March 22, 2020	3		x	x
F07	March 30, 2022	5		x	x
F07	April 25, 2022	5		x	x
F08	March 23, 2020	3			
F08	December 1, 2020	4			
F08	March 6, 2021	4			
F09	April 1, 2020	3		x	x
F10	April 2, 2020	3			
F10	January 30, 2021	4			
F10	April 12, 2021	4			
F10	February 15, 2022	5		x	
F11	February 26, 2021	4	x		
F11	April 2, 2022	5		x	x
F12	February 27, 2021	4			

F12	February 28, 2021	4		
F13	February 28, 2021	4	x	
F13	March 4, 2022	5		
F13	March 20, 2022	5		
F14	March 20, 2021	4		x x
F15	March 21, 2022	5	x	
F16	March 25, 2022	5	x	
F17	March 31, 2022	5	x	
F18	April 20, 2022	5	x	