

# The sustainable annual take of Canada lynx in the Okanagan Region of British Columbia



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## **Executive summary**

The Okanagan Region of British Columbia has been identified as the preferred source of Canada lynx (*Lynx canadensis*) in a translocation proposal to recover the lynx population in the Kettle Range in Washington. Lynx populations are not directly monitored in the Okanagan Region, thus it is unknown whether the Okanagan population can sustainably provide individuals for translocation. Although lynx in the Okanagan are commercially and recreationally trapped and hunted, it is also unknown whether current harvest rates are sustainable. I estimated the sustainable annual take (i.e., removal through harvest or translocation) of lynx in each Management Unit (MU) in the Okanagan using a habitat capability model and compared that take with current harvest levels. There are estimated to be 454 lynx in the Okanagan with a sustainable annual take of 68 individuals based on a 15% harvest rate. In recent years the combined trapping and hunting harvest across the entire Okanagan has averaged 75 lynx annually (projected 16% harvest rate), but rates vary at the MU scale; lynx harvest is considered sustainable in 12 MUs and unsustainable in 9 MUs. These findings suggest that the Okanagan lynx population could support the proposed translocation if done strategically and if the total number of translocated and harvested individuals does not exceed the sustainable take within a MU. I recommend targeting MUs 8-14 and 8-15 as the sources because these MUs are thought to have relatively high sustainable takes, and actual harvest has been far lower in these MUs in recent years. I also recommend provincial wildlife managers develop a strategy to lower harvest in MUs where harvest rates are thought to be currently unsustainable and make compulsory inspection of lynx mandatory across the Okanagan to monitor lynx harvest more accurately.

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## **Introduction**

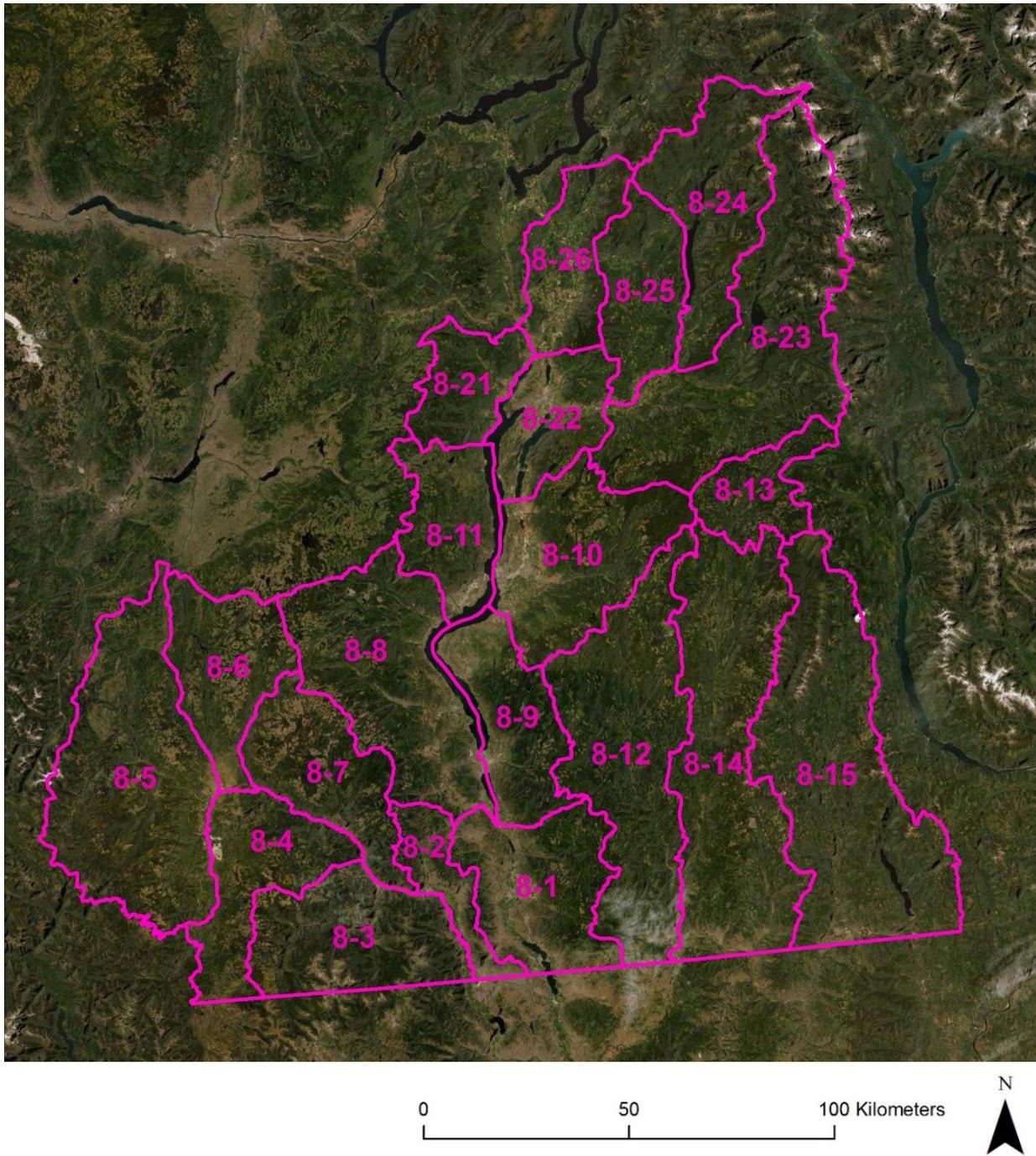
Canada lynx (*Lynx canadensis*; hereafter lynx) are found throughout most of the boreal forest in Canada and Alaska, extending south into some parts of the northern US (McKelvey et al. 2000, Mowat et al. 2000). There is also an isolated, reintroduced population of lynx in Colorado. Lynx are listed as Not at Risk in Canada but are federally listed as Threatened in the contiguous US under the Endangered Species Act (US Fish and Wildlife Service 2000). While lynx occur across most of the British Columbia (BC)-US border (Gooliaff et al. 2018), BC is largely the southern extent of lynx distribution as only a few fingers of lynx habitat extend south into Washington, Idaho, and Montana (McKelvey et al. 2000, Lewis 2016). Although elusive and rarely seen, lynx are considered relatively common in southern BC but their distribution is limited to high-elevation, coniferous forests where snowshoe hares (*Lepus americanus*), their primary prey, are found (Hodges 2000).

In BC, lynx are managed as both a furbearer, meaning they are commercially trapped for their fur, and as a game species, meaning they are hunted by resident and non-resident hunters. Trappers own spatially defined traplines within which they have the exclusive right to trap furbearing animals for which trapping seasons exist. Most of the province is divided into traplines that vary significantly in size and configuration. Resident hunters can hunt anywhere in the province for which there is a hunting season for lynx, whereas non-resident hunters are restricted to hiring a guide outfitter (hereafter outfitter); outfitters own spatially defined territories within which they have the exclusive right to guide non-resident hunters. Most of the province is divided into outfitter territories that also vary significantly in size and configuration. The licensed harvest regime for lynx (e.g., season dates, bag limits) is set within Wildlife Management Units (MUs) in each of BC's 9 larger Wildlife Management Regions. First Nations can harvest lynx through trapping and hunting for food, social, and ceremonial purposes unregulated by the provincial government.

The Okanagan Wildlife Management Region (hereafter Okanagan) extends along the BC-Washington border from approximately Manning Park in the west, Christina Lake in the east, and Malakwa in the north. The Okanagan is divided into 21 MUs (**Figure 1**) and contains 69 traplines and 11 outfitter territories. In all 21 MUs, trapping for lynx occurs in an open season from November 15<sup>th</sup> to February 15<sup>th</sup>, and hunting also occurs in an open season from November 15<sup>th</sup> to February 28<sup>th</sup> (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2020). While there is no bag limit for trappers, hunters can harvest only 1 lynx per year. Each individual client of an outfitter can harvest only 1 lynx per year, but there is no limit to how many clients an outfitter can guide each year.

The Okanagan has been identified as the preferred source of lynx in a translocation proposal to recover lynx populations in the Kettle Range in Washington. The Okanagan lies just north of the Kettle Range and lynx here are likely to be genetically and behaviourally most like those in the Kettle Range. There is also desire from the First Nations that are leading this project on both sides of the border, Colville Confederated Tribe in Washington and the Okanagan Nation Alliance in BC, for this translocation to occur Nation-to-Nation.

The purpose of this analysis is to determine whether the lynx population in the Okanagan could support this proposed translocation. Lynx populations are not directly monitored in the Okanagan, thus it is unknown whether there is a surplus of lynx available, or even whether current harvest rates here are sustainable. Specifically, the objective of this report is to estimate the sustainable annual “take” (i.e., removal through harvest or translocation) of lynx in each MU in the Okanagan. This report is intended to inform the translocation plan as to the number and location of lynx available to be translocated from the Okanagan. This report is also intended to help trappers and outfitters in the Okanagan manage local lynx populations by identifying which MUs currently have sustainable and unsustainable harvest rates.



**Figure 1.** Wildlife Management Units in the Okanagan Region.

## **Methods**

I calculated the sustainable annual take of lynx in the Okanagan by first estimating the population size of lynx by applying lynx density estimates reported in the literature to a habitat capability model for lynx developed by Apps (2002). Then I applied a harvest rate of 15% (Stephenson and Karczmarczyk 1989), which is thought to be sustainable in the literature, to the estimated population size of lynx to estimate the sustainable annual take of lynx from the population. I compiled trapping and hunting harvest records during 2009-2018, the latest 10-year-period that these data were available, to estimate the actual annual harvest rate of lynx over that time to determine if the sustainable annual take is being exceeded. I conducted this analysis at the MU scale because lynx are classified as a Class 2 furbearer under BC's Fur Management Program, meaning that they are sensitive to harvest and are a wide-ranging species that cannot be managed on individual traplines (Hatler and Beal 2003).

The habitat capability model (Apps 2002) assigns a lynx habitat quality rating of 1-4 to 0.25 km<sup>2</sup> cells across BC based on the Broad Ecosystem Inventory ecological classification (Resource Inventory Standards Committee 2000; **Figure 2**). I calculated the number of cells of each rating within each Okanagan MU; cells were assigned to the MU that contained most of each cell. I grouped ratings into discrete values of 1, 2, 3, or 4 by rounding intermediate values  $\leq 0.5$  to the lower rating and values  $>0.5$  to the higher rating. Then I calculated the total area (km<sup>2</sup>) of each habitat rating within each MU. I considered habitat ratings of 1, 2, 3, and 4 to represent low-quality, moderate-quality, high-quality, and very high-quality lynx habitat, respectively.

To estimate the population size of lynx I extrapolated lynx density reported in previous studies in similar areas. Lynx densities vary significantly across their distribution and in different phases of the snowshoe hare cycle (Poole 2003), but Koehler (1990) and Aubrey et al. (2000) report lynx densities of 2-3 per 100 km<sup>2</sup> in southern boreal forests, and southern lynx populations are thought to not cycle (Koehler and Aubry 1994). Because lynx densities in southern BC are unknown, I estimated lynx density for each habitat rating based on the benchmark of 2-3 lynx per 100 km<sup>2</sup>. I applied lynx densities of 0, 1.75, 2.5, and 3.0 lynx per 100 km<sup>2</sup> to habitat ratings 1, 2, 3, and 4, respectively. To provide a range of the population estimate, I also considered lynx densities of 20% lower and 20% higher than these estimates providing 3 different scenarios of varying lynx density: low, moderate, and high (**Table 1**).

**Table 1.** Estimated densities of lynx (lynx per 100 km<sup>2</sup>) applied to habitat ratings 1-4 under 3 different lynx density scenarios: low, moderate, and high.

Scenario	Density (lynx per 100 km <sup>2</sup> )			
	1	2	3	4
Low density	0	1.4	1.75	2.1
Moderate density	0	2.0	2.5	3.0
High density	0	2.4	3.0	3.6

To calculate the sustainable annual take of lynx I applied the harvest rate thought to be sustainable in the literature to the population estimate. In northern boreal populations, lynx fecundity is tied to the snowshoe hare cycle and changes drastically between high and low phases (Poole 2003). Lynx are relatively resilient to harvest and during high phases of the snowshoe hare cycle can sustain harvest rates of up to 40-50% (Stephenson and Karczmarczyk 1989, Hatler and Beal 2003). Southern boreal lynx populations have a lower, more stable reproductive output similar to that of northern lynx populations during low phases of the snowshoe hare cycle (Aubrey et al. 2000). While the sustainable harvest rate of lynx in southern BC is unknown because local demographic data required for population modelling do not exist, modelling by Stephenson and Karczmarczyk (1989) in Alaska suggests that lynx in areas of low snowshoe hare density can sustain harvest rates closer to 20%. Because southern BC is at the range limit for lynx and generally contains poorer-quality lynx habitat compared to Alaska, I assumed that a more conservative harvest rate of 15% is the sustainable limit here, but also present the estimated sustainable annual takes based on harvest rates of 10% and 20%.

To estimate the actual harvest rate of lynx I compiled all available harvest records and tallied total harvest annually. All lynx harvested in the Okanagan by trappers, resident hunters, and non-resident hunters are legally required to be reported to the provincial government annually through the compulsory reporting (CR) system (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2020). Additionally, trappers must report their unique trapline number whenever they sell lynx pelts, and outfitters must submit a guide declaration reporting their client’s lynx harvest after each guided hunt.

The two data sources for trapper harvest are fur sales records and CR records. The fur sales records reflect only the number of pelts sold by each trapper each year rather than actual harvest because i) trappers occasionally sell pelts years after they were harvested, ii) trappers can trap on other people’s traplines with permission and report their own trapline number when selling pelts, and iii) nonmerchantable pelts that are not sold are not reported. In comparison, CR records should be an accurate measure of annual harvest because trappers must report all harvested lynx whether they are sold or not and include the specific location

and date of harvest. However, comparing the CR records with the fur sales records suggests there is a high rate of noncompliance with trappers compulsory reporting lynx; during 2009-2018, a total of 322 lynx were reported in the fur sales records and only 227 lynx were compulsory reported by trappers in the Okanagan.

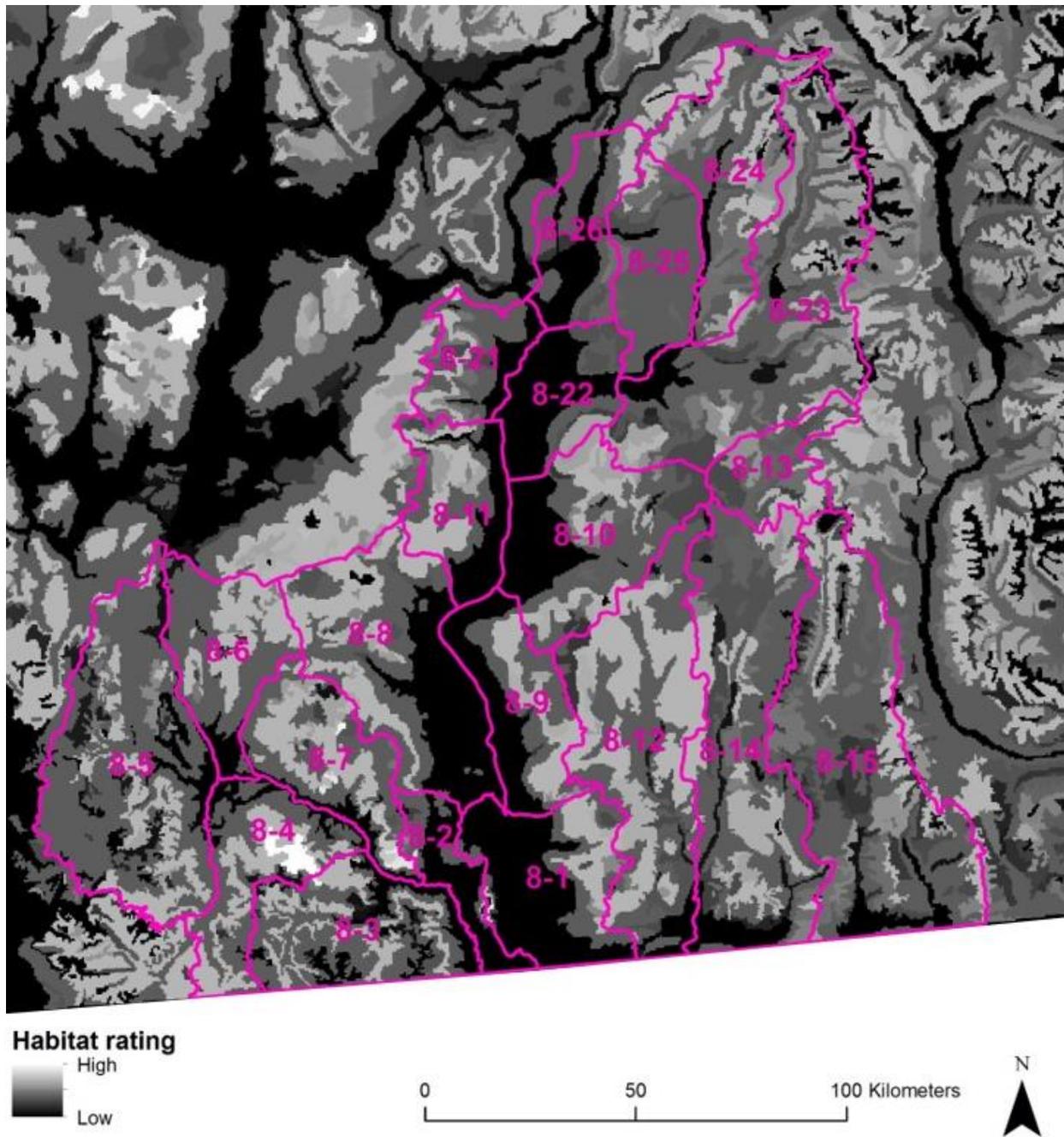
To estimate trapper harvest I used both the fur sales records and the CR records because many lynx are reported in one data source but not the other. I first cross-referenced the fur sales records and the CR records to identify duplicate data points (i.e., the same lynx being reported in both data sources). I assumed that lynx reported in both data sources were the same animal if those reports were from the same trapline number in the same year. Of all lynx reported in the fur sales records or the CR records as being trapped during 2009-2018, an estimated 48% were only reported in the fur sales records, 23% were only reported in the CR records, and 29% were reported in both data sources. I then tallied total trapper harvest for each MU by counting lynx that were reported in both data sources only once.

The only data source for resident hunter harvest is the CR records. Like trappers, there appears to be a high rate of noncompliance with resident hunters compulsory reporting lynx. For example, during 2009-2018 only 10 lynx were compulsory reported by resident hunters in the Okanagan. By comparison, in the Kootenay Region, which neighbours the Okanagan to the east, lynx were switched from compulsory reporting to compulsory inspection in 2012; compulsory inspection has a far higher compliance rate and means that all harvested lynx must be brought in to have their carcass physically inspected (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2020). As a result of this change, the annual resident hunter harvest reported in the Kootenay Region increased by 580% over that reported prior to 2012, indicating that CR records are likely a significant underestimate of lynx harvest in other areas including the Okanagan.

To estimate resident hunter harvest I first applied a correction factor of 5.8 to the total number of lynx compulsory reported in the Okanagan by resident hunters during 2009-2018. Then I distributed that resulting harvest across all MUs based on the distribution of trapper harvest; I calculated the percentage of total trapper harvest within each MU and applied that percentage to the estimated total amount of resident hunter harvest. I did not simply apply the correction factor to the resident hunter CR records for each MU because most ( $n = 15$  of 21) MUs contained no records, and I did not combine trapper harvest and non-resident hunter harvest to estimate harvest distribution because not all MUs overlap with outfitter territories, thus there would have been a bias in those overlapping areas. I discussed the resulting estimate of resident hunter harvest with local people who use dogs to hunt cougars (*Puma concolor*), bobcats (*Lynx rufus*), and lynx who agreed the estimate was reasonable.

The two data sources for non-resident hunter harvest are guide declarations and CR records. Guide declarations and CR records should match exactly because all lynx harvested by non-resident hunters must be reported through both systems. However, there is an extremely high rate of noncompliance with non-resident hunters compulsory reporting lynx. During 2009-2018, 269 lynx were reported in guide declarations and only 43 lynx were compulsory reported by non-resident hunters in the Okanagan.

In the same way that I estimated trapping harvest, I first cross-referenced the guide declarations and the CR records to identify duplicate data points. I assumed that lynx reported in both data sources were the same animal if those reports were from the same MU in the same year. Of all lynx reported in the guide declarations or the CR records as being harvested by non-resident hunters during 2009-2018, an estimated 84% were only reported in the guide declarations, 1% were only reported in the CR records, and 15% were reported in both data sources. I then tallied total non-resident hunter harvest for each MU by counting lynx that were reported in both data sources only once.



**Figure 2.** Lynx habitat quality in the Okanagan Region based on the habitat capability model created by Apps (2002). Ratings are based on the Broad Ecosystem Inventory ecological classification (Resource Inventory Standards Committee 2000). Also shown are the 21 Management Units in the Okanagan.

## Results

Most of the Okanagan contains suitable lynx habitat; 79% of the Region is classified as moderate to very high-quality lynx habitat (i.e., habitat ratings 2-4; **Table 2**). In total, 21% of the Region is classified as low-quality habitat (rating 1), 54% as moderate quality (rating 2), 25% as high quality (rating 3), and <1% as very high quality (rating 4). Almost all of the low-quality habitat is contained within the main Okanagan Valley, whereas the largest areas of moderate and high-quality habitat are found on the Pennask Summit (MUs 8-6, 8-7, 8-8, and 8-11) and Okanagan Highlands (MUs 8-1, 8-9, and 8-12; **Figure 2**). The only sizeable tract of very high-quality habitat is found in MU 8-4.

The total population estimate for lynx in the Okanagan is 454 based on the moderate lynx density scenario but ranges from 364-545 between the low and high lynx density scenarios (**Table 3**). Under the moderate lynx density scenario, population estimates vary between MUs from 3 to 47 lynx due to differences in habitat quality and MU size. In total, 60% of the estimated lynx population ( $n = 271$  lynx) occurs in moderate-quality habitat, 40% ( $n = 181$ ) occurs in high-quality habitat, and <1% ( $n = 2$ ) occurs in very high-quality habitat.

Under the moderate lynx density scenario with a 15% harvest rate, the sustainable annual take for lynx across the entire Okanagan is estimated to be 68 individuals and varies from 0 to 7 lynx between MUs (**Table 4**). The estimated sustainable annual take ranges from 36-55 between the low and high lynx density scenarios with a 10% harvest rate, from 55-82 with a 15% harvest rate, and from 73-109 with a 20% harvest rate.

During 2009-2018, an estimated total of 749 lynx were harvested: 419 (56%) by trappers, 58 (8%) by resident hunters, and 272 (36%) by non-resident hunters (**Table 5**). The average annual harvest was 75 lynx during this time and varied from 0 to 10 between MUs. Using the estimated population size of 454 lynx, the average annual harvest rate was estimated to be 16% across the entire Okanagan and varied between MUs from 0 to 71%. The average annual harvest was at or below the estimated sustainable take of 15% in 12 MUs and exceeded the sustainable take in 9 MUs (**Figure 3**). MUs where the sustainable take was exceeded generally occurred closest to the human population centres in the Okanagan.

**Table 2.** The area of lynx habitat ratings 1-4 in each Management Unit (MU) in the Okanagan. Habitat ratings were obtained from a habitat capability model for lynx (Apps 2002). I considered habitat ratings of 1, 2, 3, and 4 to represent low-quality, moderate-quality, high-quality, and very high-quality lynx habitat, respectively.

MU	Area (km <sup>2</sup> )				Total
	1	2	3	4	
8-1	747	304	188	5	1,244
8-2	315	145	5	1	466
8-3	328	669	317	3	1,317
8-4	153	480	341	64	1,038
8-5	394	1,536	461	0	2,390
8-6	133	538	329	0	1,000
8-7	121	495	436	7	1,058
8-8	696	682	539	0	1,916
8-9	388	342	254	0	984
8-10	404	725	370	0	1,499
8-11	289	279	285	0	853
8-12	134	1,069	1,025	0	2,228
8-13	1	363	203	0	568
8-14	316	1,622	591	0	2,528
8-15	315	2,007	494	0	2,815
8-21	130	397	95	0	622
8-22	501	239	53	0	793
8-23	314	1,557	738	0	2,608
8-24	110	778	433	0	1,320
8-25	50	765	39	0	853
8-26	273	484	57	0	813
<b>Total</b>	<b>6,111</b>	<b>15,473</b>	<b>7,251</b>	<b>79</b>	<b>28,913</b>

**Table 3.** The estimated population size of lynx within each habitat rating in each Management Unit (MU) in the Okanagan. Population sizes were estimated by applying densities of 0, 1.75, 2.5, and 3 lynx per 100 km<sup>2</sup> (i.e., moderate lynx density scenario) to habitat ratings 1, 2, 3, and 4, respectively. The values in brackets are the estimated ranges based on applying 20% lower and higher densities; the lower estimate was generated by applying densities of 0, 1.4, 2.0, and 2.4 lynx per 100 km<sup>2</sup> (i.e., low lynx density scenario), and the upper estimate was generated by applying densities of 0, 2.1, 3.0, and 3.5 lynx per 100 km<sup>2</sup> (i.e., high lynx density scenario) to habitat ratings 1, 2, 3, and 4, respectively.

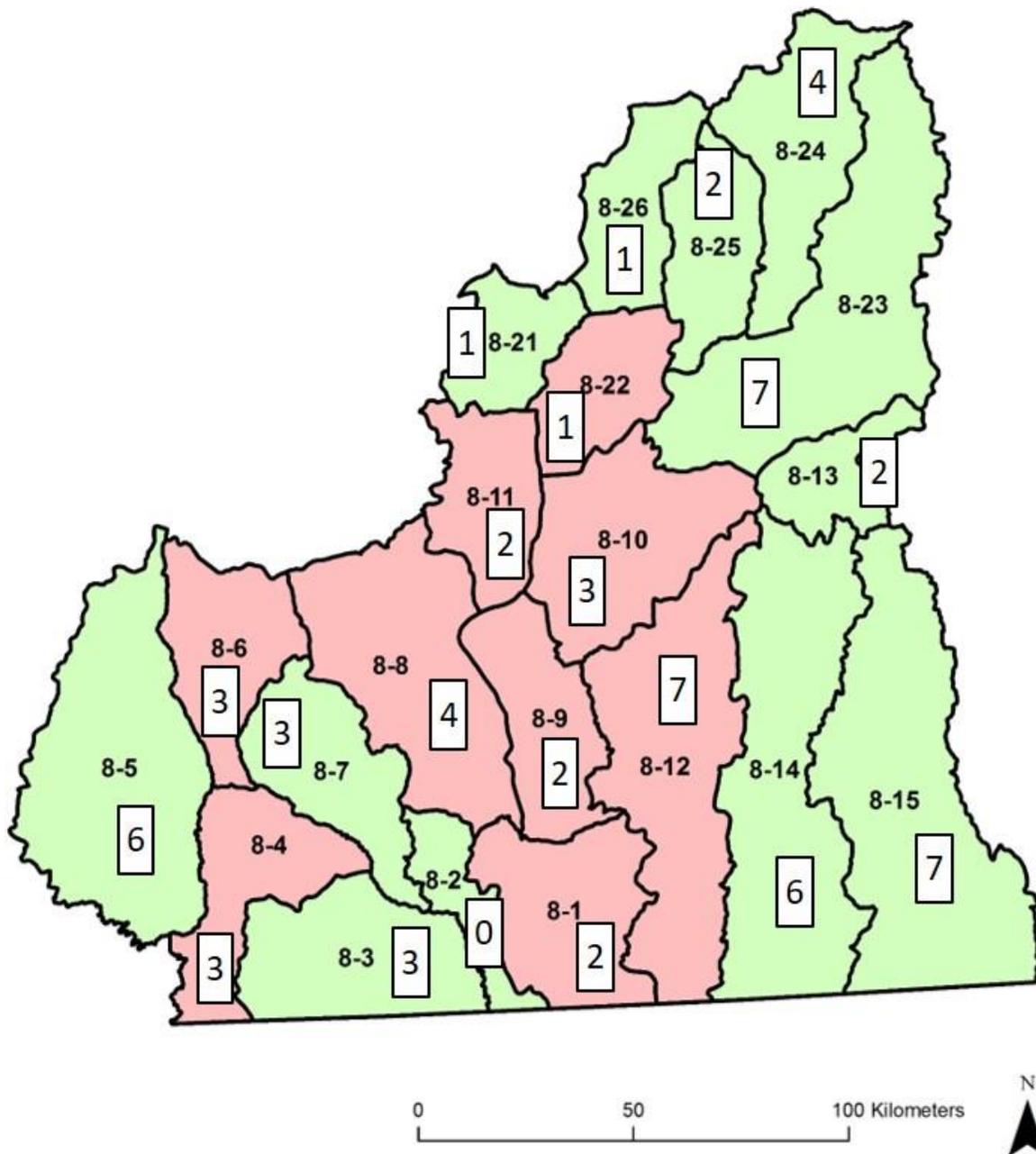
MU	Estimated population size				Total
	1	2	3	4	
8-1	0	5 (4-6)	5 (4-6)	0 (0-0)	10 (8-12)
8-2	0	3 (2-3)	0 (0-0)	0 (0-0)	3 (2-3)
8-3	0	12 (9-14)	8 (6-9)	0 (0-0)	20 (16-24)
8-4	0	8 (7-10)	9 (7-10)	2 (2-2)	19 (15-23)
8-5	0	27 (21-32)	12 (9-14)	0 (0-0)	38 (31-46)
8-6	0	9 (8-11)	8 (7-10)	0 (0-0)	18 (14-21)
8-7	0	9 (7-10)	11 (9-13)	0 (0-0)	20 (16-24)
8-8	0	12 (10-14)	13 (11-16)	0 (0-0)	25 (20-30)
8-9	0	6 (5-7)	6 (5-8)	0 (0-0)	12 (10-15)
8-10	0	13 (10-15)	9 (7-11)	0 (0-0)	22 (18-26)
8-11	0	5 (4-6)	7 (6-9)	0 (0-0)	12 (10-14)
8-12	0	19 (15-22)	26 (20-31)	0 (0-0)	44 (35-53)
8-13	0	6 (5-8)	5 (4-6)	0 (0-0)	11 (9-14)
8-14	0	28 (23-34)	15 (12-18)	0 (0-0)	43 (35-52)
8-15	0	35 (28-42)	12 (10-15)	0 (0-0)	47 (38-57)
8-21	0	7 (6-8)	2 (2-3)	0 (0-0)	9 (7-11)
8-22	0	4 (3-5)	1 (1-2)	0 (0-0)	6 (4-7)
8-23	0	27 (22-33)	18 (15-22)	0 (0-0)	46 (37-55)
8-24	0	14 (11-16)	11 (9-13)	0 (0-0)	24 (20-29)
8-25	0	13 (11-16)	1 (1-1)	0 (0-0)	14 (11-17)
8-26	0	8 (7-10)	1 (1-2)	0 (0-0)	10 (8-12)
<b>Total</b>	<b>0</b>	<b>271 (217-325)</b>	<b>181 (145-218)</b>	<b>2 (2-3)</b>	<b>454 (364-545)</b>

**Table 4.** The estimated sustainable annual take (i.e., removal from harvest or translocation) of lynx for each Management Unit (MU) in the Okanagan under 3 different lynx density scenarios: low (LD), moderate (MD), and high (HD), and 3 different harvest rates: 10%, 15%, and 20%. See Table 2 for the population estimates of lynx used in each scenario.

MU	10% harvest rate			15% harvest rate			20% harvest rate		
	LD	MD	HD	LD	MD	HD	LD	MD	HD
8-1	1	1	1	1	2	2	2	2	2
8-2	0	0	0	0	0	0	0	1	1
8-3	2	2	2	2	3	4	3	4	5
8-4	2	2	2	2	3	3	3	4	5
8-5	3	4	5	5	6	7	6	8	9
8-6	1	2	2	2	3	3	3	4	4
8-7	2	2	2	2	3	4	3	4	5
8-8	2	3	3	3	4	5	4	5	6
8-9	1	1	1	1	2	2	2	2	3
8-10	2	2	3	3	3	4	4	4	5
8-11	1	1	1	1	2	2	2	2	3
8-12	4	4	5	5	7	8	7	9	11
8-13	1	1	1	1	2	2	2	2	3
8-14	3	4	5	5	6	8	7	9	10
8-15	4	5	6	6	7	9	8	9	11
8-21	1	1	1	1	1	2	1	2	2
8-22	0	1	1	1	1	1	1	1	1
8-23	4	5	5	5	7	8	7	9	11
8-24	2	2	3	3	4	4	4	5	6
8-25	1	1	2	2	2	3	2	3	3
8-26	1	1	1	1	1	2	2	2	2
<b>Total</b>	<b>36</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>68</b>	<b>82</b>	<b>73</b>	<b>91</b>	<b>109</b>

**Table 5.** Estimated harvest of lynx from trapping and hunting in each Management Unit (MU) in the Okanagan during 2009-2018. Harvest rates were estimated under the moderate lynx density scenario. The values in brackets are the estimated ranges based on the low and high lynx density scenarios. See Table 2 for the population estimates of lynx used in each scenario.

MU	Estimated total harvest during 2009-2018			Annual average	
	Trapping	Resident hunting	Non-resident hunting	Total	Harvest rate (%)
8-1	11	2	17	30	3 29 (24-36)
8-2	0	0	0	0	0 0 (0-0)
8-3	12	2	0	14	1 7 (6-9)
8-4	8	1	63	72	7 38 (32-48)
8-5	30	4	22	56	6 15 (12-18)
8-6	38	5	8	51	5 29 (24-36)
8-7	11	2	1	14	1 7 (6-9)
8-8	28	4	41	73	7 29 (24-36)
8-9	18	2	39	59	6 48 (40-60)
8-10	30	4	35	69	7 32 (26-39)
8-11	59	8	18	85	9 71 (59-89)
8-12	81	11	11	103	10 23 (19-29)
8-13	5	1	0	6	1 5 (4-6)
8-14	27	4	6	37	4 9 (7-11)
8-15	1	0	0	1	0 0 (0-0)
8-21	0	0	0	0	0 0 (0-0)
8-22	13	2	0	15	1 27 (22-34)
8-23	41	6	11	58	6 13 (11-16)
8-24	5	1	0	6	1 2 (2-3)
8-25	1	0	0	1	0 1 (1-1)
8-26	0	0	0	0	0 0 (0-0)
<b>Total</b>	<b>419</b>	<b>58</b>	<b>272</b>	<b>749</b>	<b>75 16 (14-21)</b>



**Figure 3.** The estimated sustainable take (i.e., removal from harvest or translocation) of lynx for each Management Unit (MU) each year in the Okanagan (indicated by the numbers in white boxes). Values are based on the moderate lynx density scenario and a 15% harvest rate. The average annual harvest rate during 2009-2018 was at or below this sustainable limit in MUs shaded green and exceeded this sustainable limit in MUs shaded red.

## **Discussion and recommendations**

Lynx occur throughout most of the Okanagan with an estimated population of 454 individuals (estimated range = 364-545). If strategically done, this analysis suggests that the Okanagan population can support the proposed lynx translocation to recover the Kettle Range in Washington. To be sustainable, the total number of translocated and harvested animals cannot exceed the sustainable take within a MU. I recommend following the sustainable annual take based on the moderate lynx density scenario and 15% harvest rate (**Figure 3**). The project team must work with local trappers and outfitters in the identified MU(s) to develop an agreement that ensures the sustainable annual take is not exceeded over the entire duration of the project. I recommend targeting MUs 8-14 and 8-15, known as the Boundary area, as the source for the translocation. These MUs have relatively high estimated sustainable takes (6 in 8-14 and 7 in 8-15), and those limits have not been exceeded in recent years; the average annual harvest is 4 lynx in 8-14 and 0 in 8-15 (**Table 5**). The low harvest levels in these MUs suggests that overharvest has probably not occurred here, and there is low risk of translocated individuals causing the sustainable take to be exceeded.

Lynx are harvested primarily by trappers and non-resident hunters in the Okanagan, but relatively little by resident hunters, likely because there are few residents with hunting dogs that target lynx. Trapping accounts for over half (56%) of all lynx harvest while non-resident and resident hunting accounts for approximately 36% and 8% of the remaining harvest, respectively. Overall, the estimated annual harvest rate of lynx is 16%, which exceeds the estimated sustainable take of 15%. There are 9 MUs where lynx harvest has exceeded this limit in recent years and is considered unsustainable (**Figure 3**). I recommend provincial wildlife managers discuss these harvest trends with the trappers and outfitters in those MUs and develop a strategy to lower harvest rates to a sustainable level. I also recommend those local trappers and outfitters work together to ensure that their harvest split is fair. If lynx harvest continues to be unsustainable in parts of the Okanagan then I recommend considering a more conservative harvest regime, such as implementing a bag limit for trappers or a quota for outfitters.

I also recommend switching lynx to compulsory inspection across the Okanagan so that harvest can be more accurately monitored. The compulsory reporting system is clearly not working as those data were largely unusable in this analysis due to non-compliance by all user groups. An estimated 48%, 83%, and 84% of lynx harvested by trappers, resident hunters, and non-resident hunters are not reported, respectively. The only harvest method that can be reliably tracked using a different data source is non-resident hunter harvest through guide declarations. Trapping harvest cannot be reliably tracked using fur sales records because of the limitations

previously described, and resident hunter harvest is not tracked through any other method besides the compulsory reporting system. I recommend provincial wildlife managers reach out to all groups that harvest species requiring compulsory reporting to remind them that compulsory reporting is a legal requirement, and to inform the BC Conservation Officer Service of the current non-compliance rates so that they are aware of the issue and can enforce the regulation. I also recommend provincial wildlife managers work with First Nations to develop a reporting strategy for lynx so that First Nations' utilization of lynx can be included in harvest monitoring and managed for. First Nation harvest was not included in this analysis because it is not tracked.

There are numerous assumptions and limitations with this analysis including how the population size, sustainable harvest rate, and actual harvest rate were calculated. Thus, these estimates should be viewed as a general guide. While referred to as a population estimate in this report, this analysis is an expected carrying capacity of lynx rather than an empirical population assessment, and the actual population could be well below this due to historic overharvesting or other factors. This analysis was conducted with the best available data, and there are multiple ways that it could be improved in the future. First, the habitat capability model could be updated with the most recent Broad Ecosystem Inventory ecological classification data because lynx habitat has likely changed since 2002. Second, surveys could be conducted to better estimate local lynx densities. Lastly, local data on lynx survival and fecundity could be obtained to better estimate the sustainable harvest rate in southern BC.

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