

Crown Mountain Coking Coal Project

Figure 15.5-8
Columbia Ground Squirrel and Northern Pocket Gopher Observations within the Terrestrial LSA (2014-2019)

- Columbian Ground Squirrel**
- 2014
 - 2018
 - 2019

- Pocket**
- 2014
 - 2018
 - Terrestrial Local Study Area
 - Project Footprint

- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- - - Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area

- British Columbia/Alberta Border

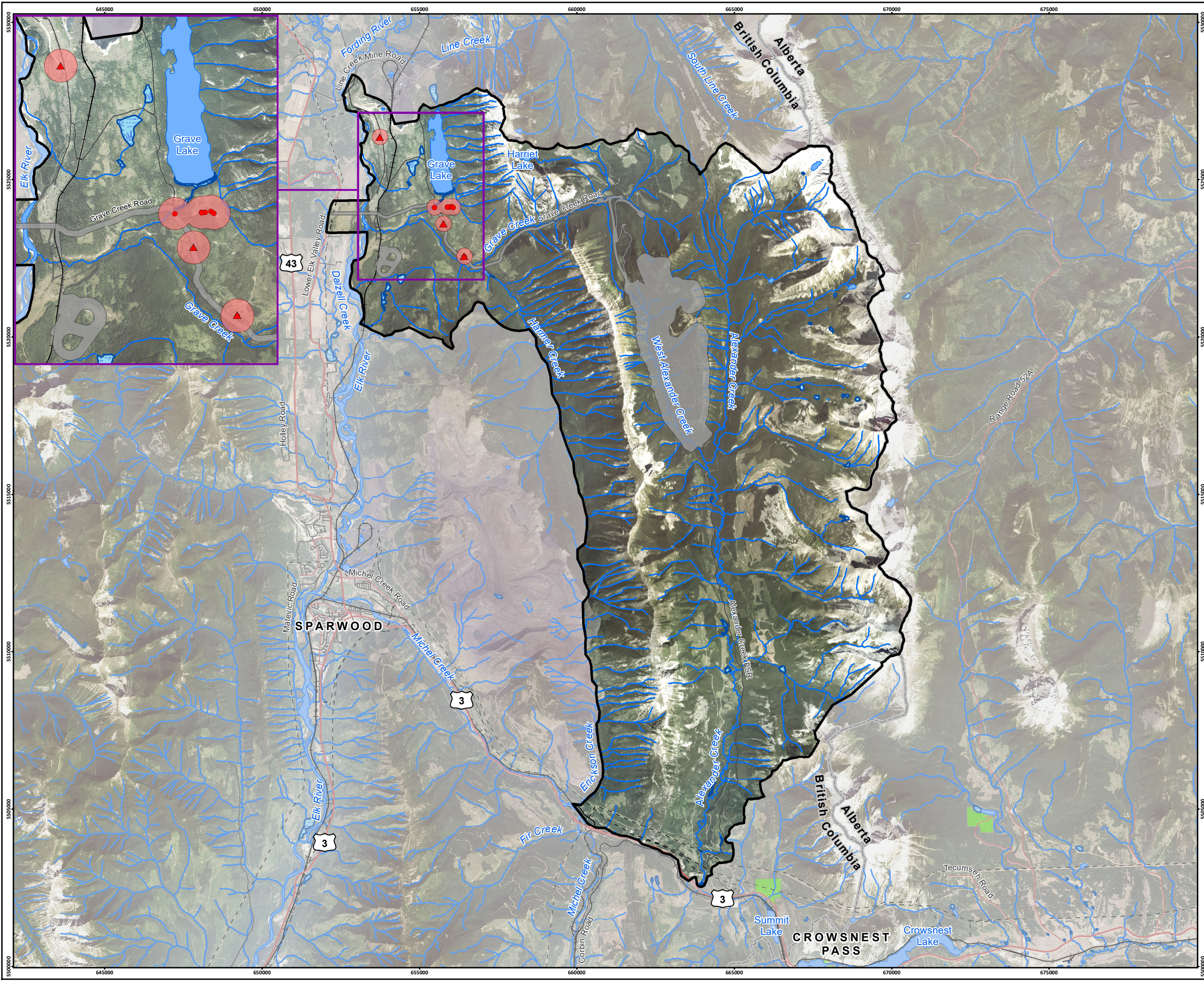
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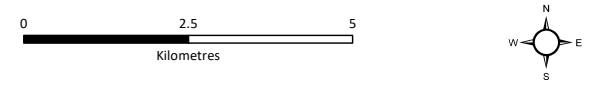


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Figure 15.5-9
Locations of Actively or Recently Used American Badger Burrows in the Terrestrial LSA

LEGEND

- Active Dens**
- 2014
 - ▲ 2018
 - 250 m Buffer
 - ▭ Terrestrial Local Study Area
 - Project Footprint
 - Highway
 - Arterial/Collector Road
 - Local/Resource Road
 - +— Railway
 - - - Transmission Line
 - Watercourse
 - Waterbody
 - Wetland
 - Provincial Park/Protected Area
 - ▭ British Columbia/Alberta Border



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Table 15.5-15: Detections of American Badger and their Prey (Columbian Ground Squirrel and Northern Pocket Gopher) within the Terrestrial LSA

Survey Year	Distance Surveyed	American Badger Burrows	Columbian Ground Squirrel	Northern Pocket Gopher
2014	135	57	274	28
2018	41	16	152	2
2019	74	0	13	0
Total	250	73	439	30

There were no active or recently used burrows, or burrows indicative of maternal denning found within the Project footprint. Based on known American badger social structure and home ranges (Weir et al., 2003), it is reasonable to assume that the Terrestrial LSA provides habitat for a minimum of one female and one male American badger.

American Marten

Baseline surveys showed that American martens were broadly distributed in the Terrestrial LSA, occurring along Alexander, Grave, and Harmer Creek drainages and transboundary mountain passes (Figure 15.5-10). American marten detections were found in relative equal proportions across the BGC zones (Table 15.5-16).

Table 15.5-16: American Marten Detections in BGC Zones within the Terrestrial LSA

BGC Zone	American Marten
MSdw	56
ESSFdkw	61
ESSFdk1	47

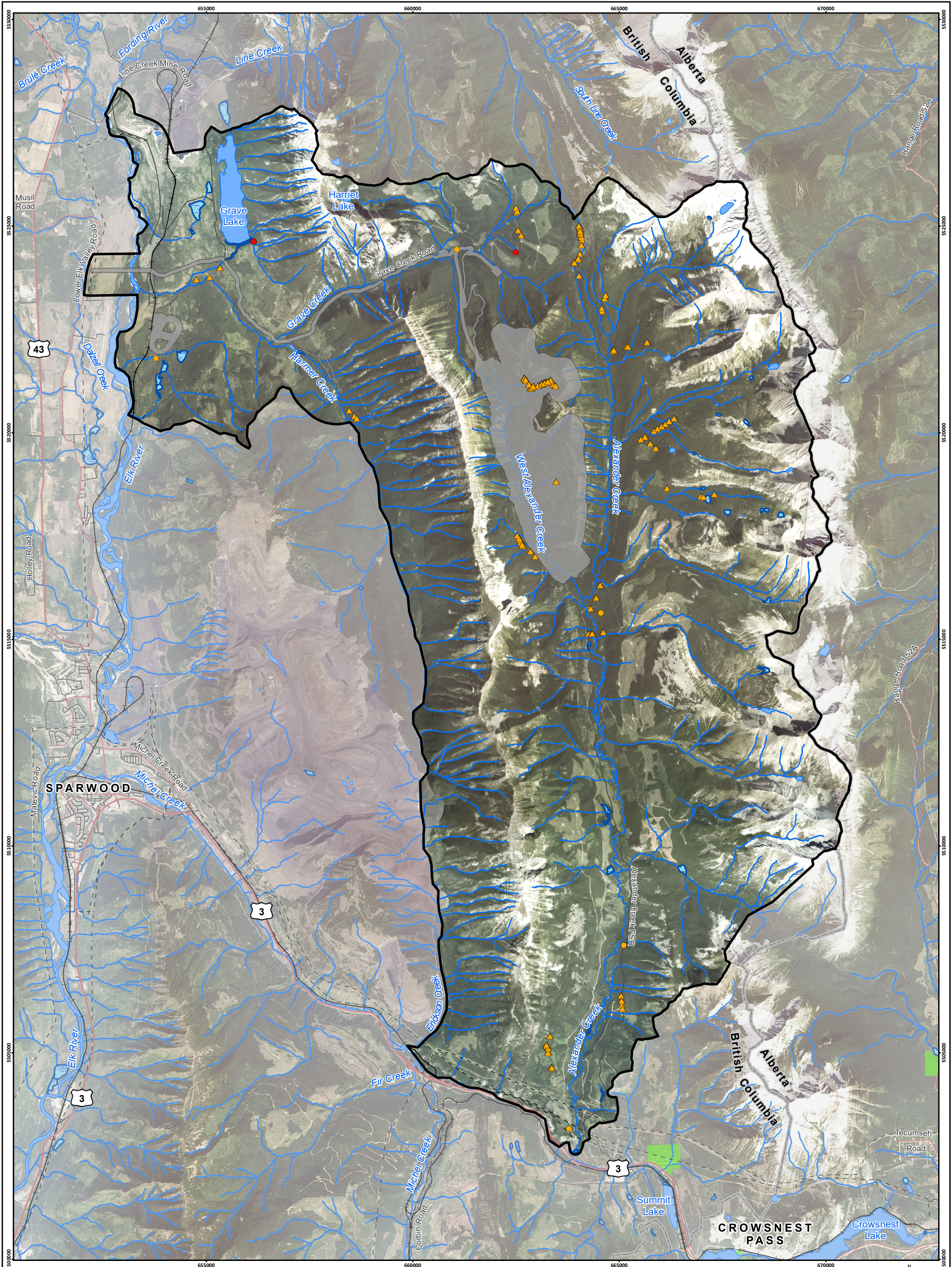
Remote camera survey efforts resulted in a total of 45 unique detections/locations of American marten in the Terrestrial LSA (Table 15.5-17). Remote camera detections found a total American marten relative abundance estimate of 0.006 detections per sampling night. American martens were recorded on 133 occasions during ground transects in the Terrestrial LSA (Table 15.5-17). The relative abundance estimates for American marten during 2014 and 2015 ground transect surveys was 0.236 tracks/km-day and 0.453 tracks/km-day, respectively (Table 15.5-17).

Table 15.5-17: American Marten Detections within the Terrestrial LSA

Survey Method	American Marten
Remote Cameras	45
Ground Transects	133

Canada Lynx

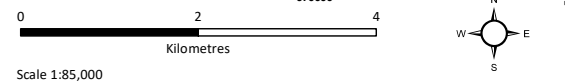
Baseline surveys showed that Canada lynx and snowshoe hares were broadly distributed in the Terrestrial LSA along the Alexander, Grave, and Harmer Creek drainages and transboundary mountain passes (Figure 15.5-11 and Figure 15.5-12). The majority of Canada lynx detections were located within the ESSFdk1, with relatively fewer detections in the MSdw and ESSFdkw (Table 15.5-18).



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LEGEND

- ▲ Winter Transect
- Winter Camera
- Summer Camera
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- +— Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

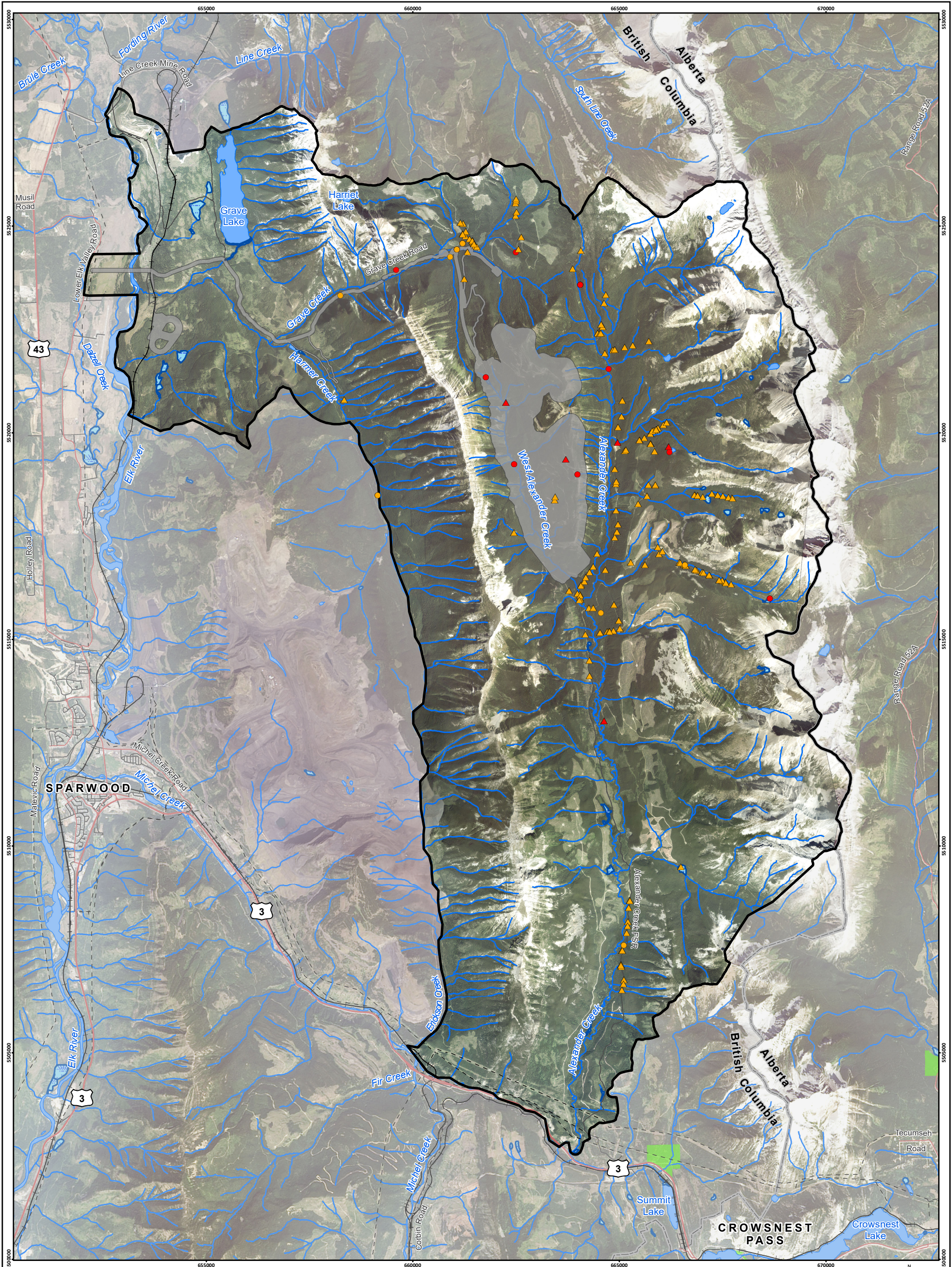


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Figure 15.5-10
 American Marten Observations within the Terrestrial LSA (2014-2019)



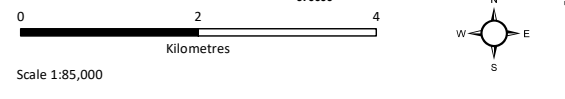
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LEGEND

- ▲ Winter Transect
- Winter Camera
- ▲ Summer Transect
- Summer Camera
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
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- Provincial Park/Protected Area
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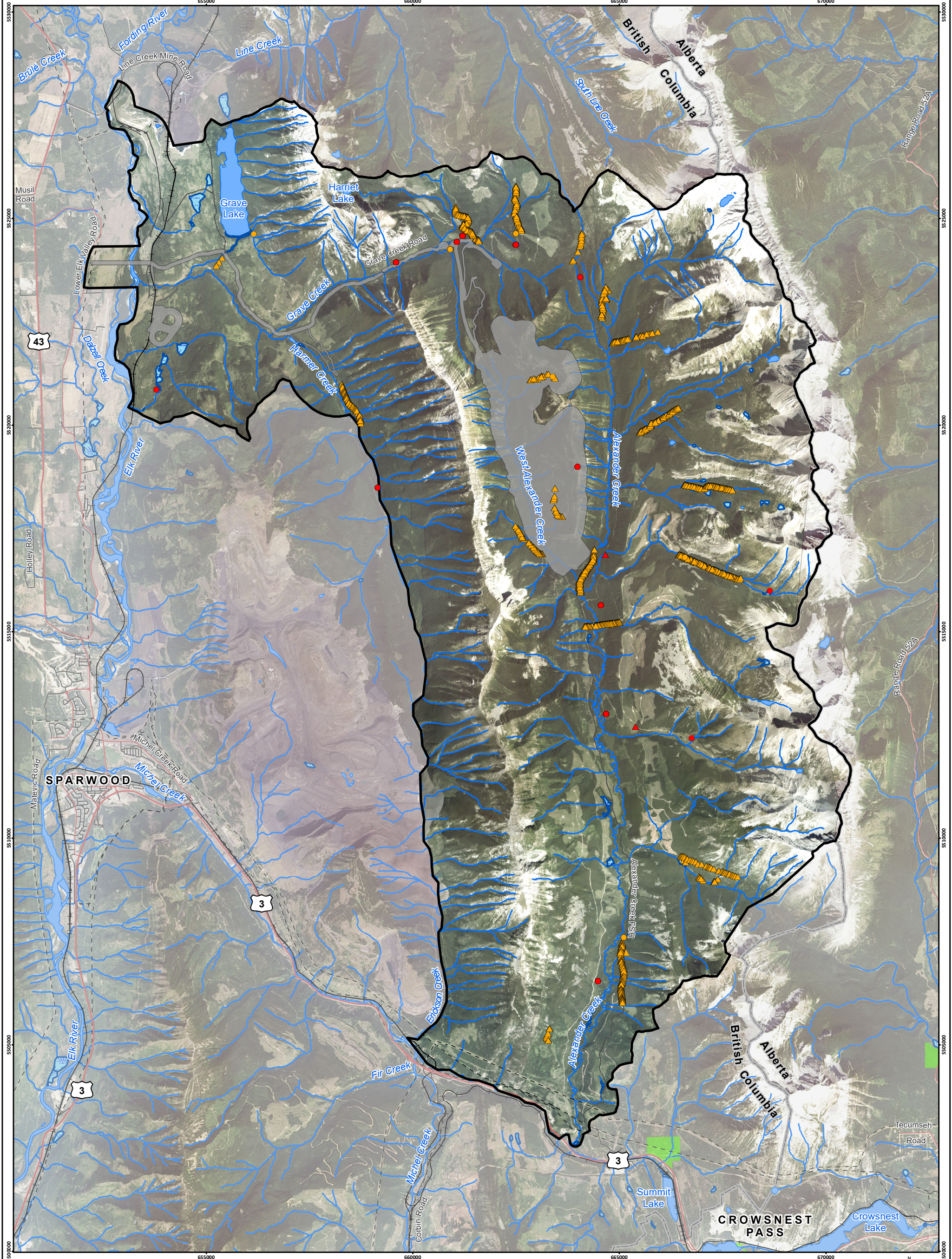
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Figure 15.5-11
 Canada Lynx Observations within the Terrestrial LSA (2014-2019)

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LEGEND

- ▲ Winter Transect
- Winter Camera
- ▲ Summer Transect
- Summer Camera
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
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- Waterbody
- Wetland
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Figure 15.5-12
Snowshoe Hare Detections within the Terrestrial LSA (2014-2019)

0 2 4
Kilometres

Scale 1:85,000

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Table 15.5-18: Canada Lynx Detections in BGC Zones within the Terrestrial LSA

BGC Zone	Canada Lynx
MSdw	57
ESSFdkw	37
ESSFdk1	111

Remote camera survey efforts resulted in a total of 55 unique detections/locations of Canada lynx and 198 unique detections/locations of snowshoe hare across the Terrestrial LSA (Table 15.5-19; Figure 15.5-11; Figure 15.5-12). During ground transects, Canada lynx were recorded on 161 occasions and snowshoe hares recorded on 1,612 occasions in the Terrestrial LSA (Table 15.5-19). The relative abundance estimates for Canada lynx was 0.251 tracks/km-day in 2014 and 0.276 tracks/km-day in 2015.

Table 15.5-19: Canada Lynx and Snowshoe Hare Detections within the Terrestrial LSA

Survey Method	Canada Lynx	Snowshoe Hare
LSA Remote Cameras	55	198
Ground Transects	161	1612

15.5.2.3 Modelling

15.5.2.3.1 Methods

Habitat availability and distribution was quantified using habitat suitability models. Habitat suitability for the carnivore VCs was predicted from using field observations and 40 to 60 environmental predictor variables. Variables selected for modelling were chosen based on *a priori* knowledge of habitat characteristics influencing carnivore VC species survival and reproduction. Variables seek to account for variation of food resources, prey capture, reproduction and denning habitat, movement, security and thermal habitat, and human disturbance. Full-season (annual) occupancy models were developed for wolverine, American badger (spring/summer only), American marten and Canada lynx, using the data collected and summarized in Table 15.5-8 and Section 15.5.2.2. Four single-season resource selection function (RSF) models were developed for grizzly bear (spring, summer, fall, winter) based on the data summarized in Section 15.5.2.2.2. To quantify primary prey availability for Canada lynx, an occupancy model was developed for snowshoe hare. To quantify primary prey availability for American badger, an occupancy model was developed for Columbian ground squirrel. An index of large mammal prey (moose, elk, deer species, bighorn sheep and mountain goat) based on aerial survey data (Section 15.4.2.2) was used to quantify prey/carcass availability for wolverine. Details of habitat variables and modelling methods are provided in Appendix 15-C.

The grizzly bear RSF model and the occupancy models for the remaining carnivore VCs were used to predict the probability of occurrence of each species across the Terrestrial LSA, Terrestrial RSA, and Grizzly Bear RSA using the model coefficients and the mapped environmental variables. The resulting map data are interpreted as a measure of habitat suitability. Values (from 0 to 1) were grouped in to six classes (very high, high, moderate, moderately low, low and nil/unclassified) for summary purposes.

15.5.2.3.2 Results

Grizzly Bear

Habitat Use.

Grizzly bears selected for open, herbaceous and shrub-dominated conditions, and tended to avoid landscapes of exposed rock and forest, with scale- and season-dependent differences. In addition, grizzly bears were not typically associated with forest-dominated landscapes, and human and/or natural disturbance may have attributed to mild association with deciduous conditions. During berry season, grizzly bears selected for shrub-dominated landscapes. Grizzly bears selection was positively associated with vegetation indices across seasons.

Grizzly bears preferred higher-elevation, steeper, and more rugged terrain during pre-berry and berry seasons, and the opposite during post-berry seasons. Denning sites were associated with broader landscapes that are relatively high and rugged, of moderately steep slope, slightly above treeline but not within barren rock. At the broader scale, den sites were generally negatively associated with human influence (Apps and Lamb, 2019; Appendix 15-C; Appendix 15-D).

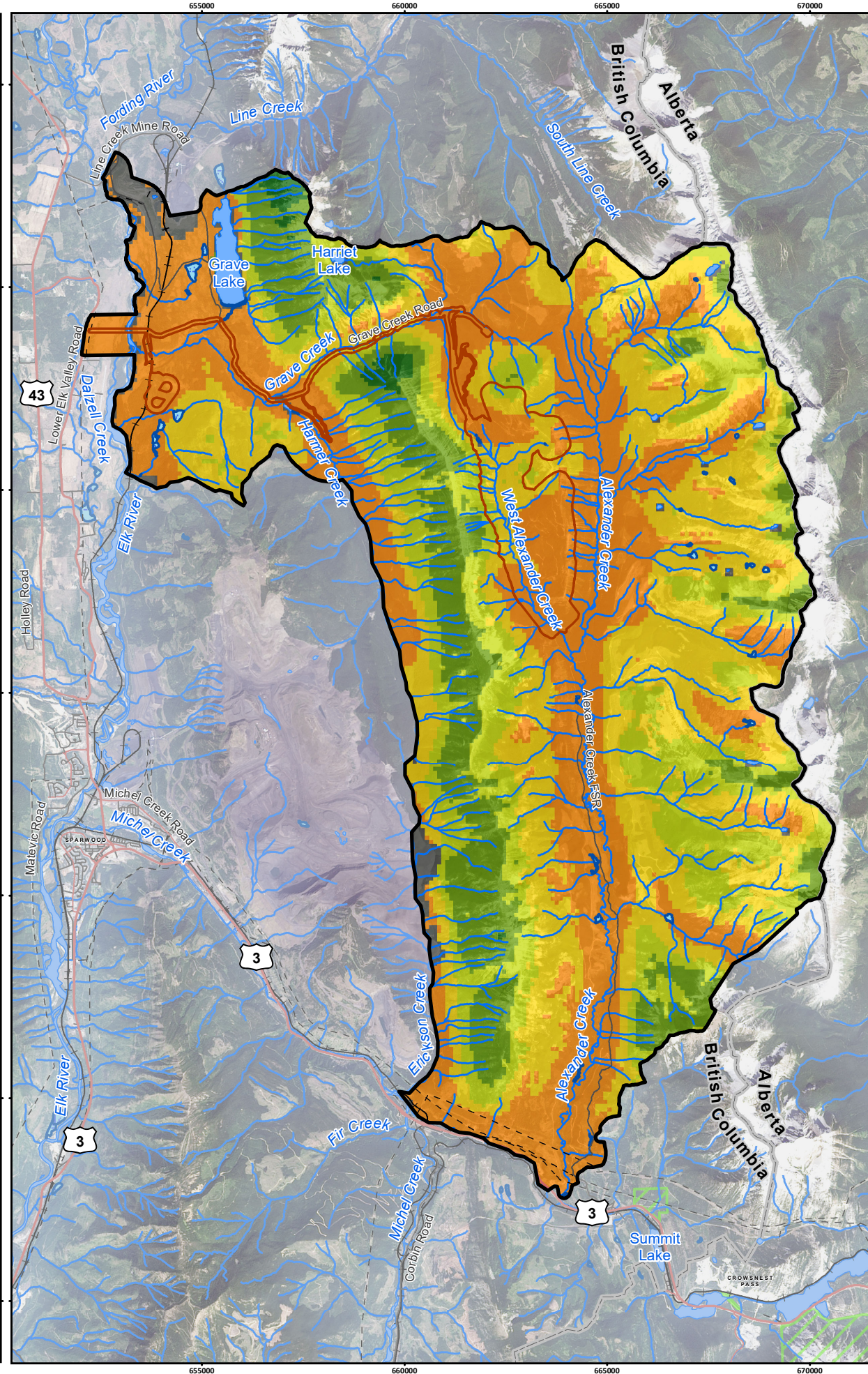
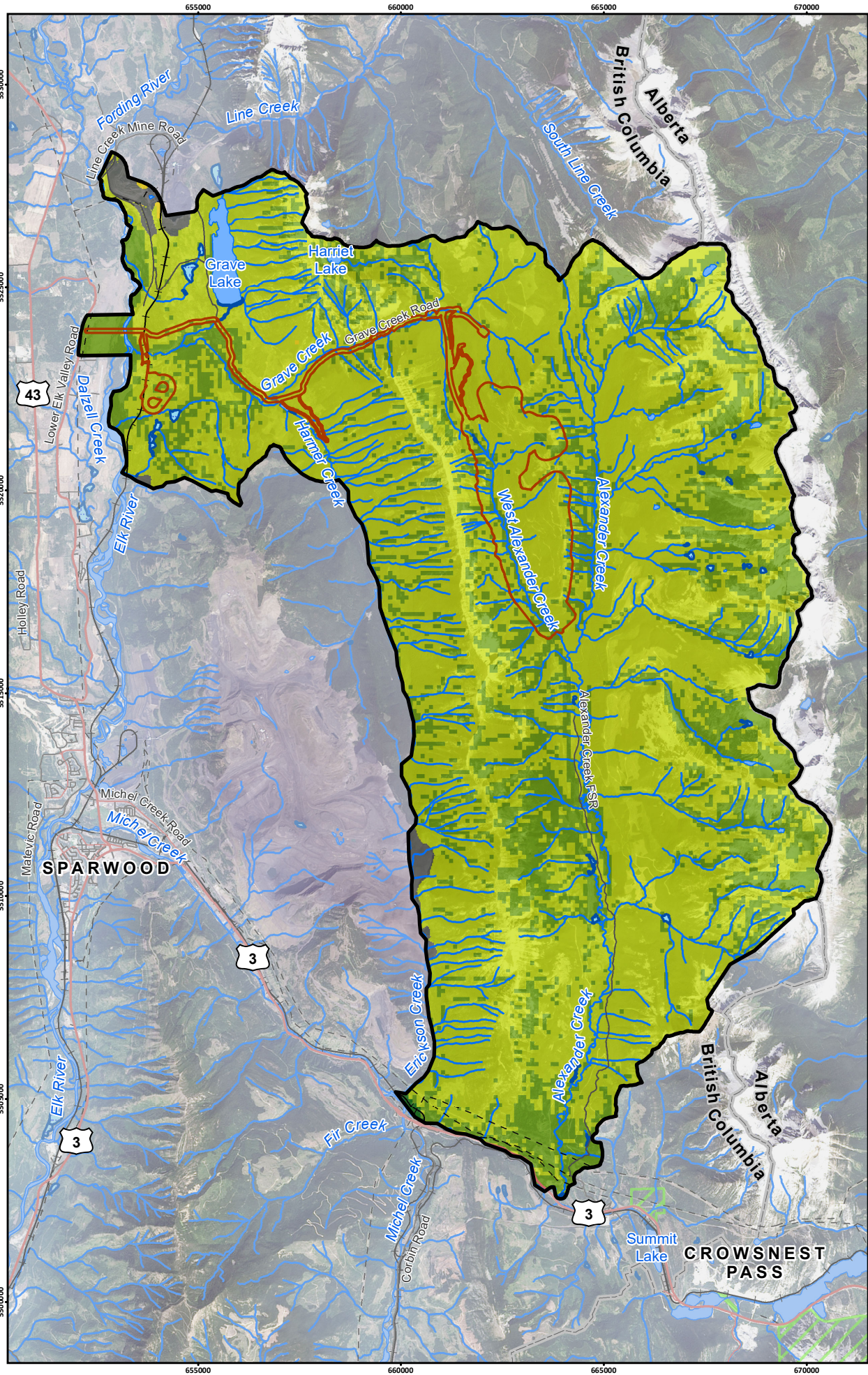
Habitat Suitability

The habitat model indicates that the best fall (i.e., post-berry season) grizzly bear habitats are broadly distributed along Erickson Ridge, the east side of Crown Mountain, Sheep Mountain, and are generally associated with the Alexander Creek and Grave Creek drainages and transboundary mountain passes in the Rocky Mountain Range. The habitat model indicates that the best winter (i.e., denning) habitats are located along the east side of Erickson Ridge. The spring (i.e., pre-berry season) habitat model indicates that the best habitats are located along Erickson Ridge, eastern portions of Crown Mountain, and transboundary mountain passes. Finally, the summer (i.e., berry season) grizzly bear habitat model indicates that bears utilize habitats at lower elevations during this season, and are generally associated with Alexander Creek, Grave Creek Canyon, and portions of Grave Prairie in addition to transboundary mountain passes. Grizzly habitat suitability in the Terrestrial LSA is shown in Figure 15.5-13 and Figure 15.5-14 and summarized in Table 15.5-20.

Approximately 228 ha of the Project footprint (18%) was predicted as very high or high suitability fall habitat for grizzly bears. Quality fall habitats for grizzly bears within the Project footprint are located along the lower slopes of Erickson Ridge and within West Alexander Creek in addition to portions of Grave Prairie and areas adjacent to the Elk River near the rail loadout and the powerline (Figure 15.5-13). Approximately 6,195 ha of the Terrestrial LSA (26%) was predicted as very high or high suitability fall habitat for grizzly bears. Quality fall habitats in the Terrestrial LSA in proximity to the Project footprint are located on avalanche chutes along the eastern portion of Crown Mountain and Erickson Ridge. Approximately 27% of the Grizzly Bear RSA was predicted as very high or high habitat suitability for grizzly bear in fall.

FALL

WINTER



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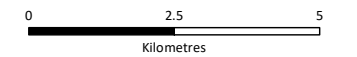
Figure 15.5-13
Grizzly Bear Fall and Winter Habitat Suitability in the Terrestrial LSA

LEGEND

Habitat Suitability

- Very High
- High
- Moderate
- Low
- Very Low

- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
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Scale 1:130,000

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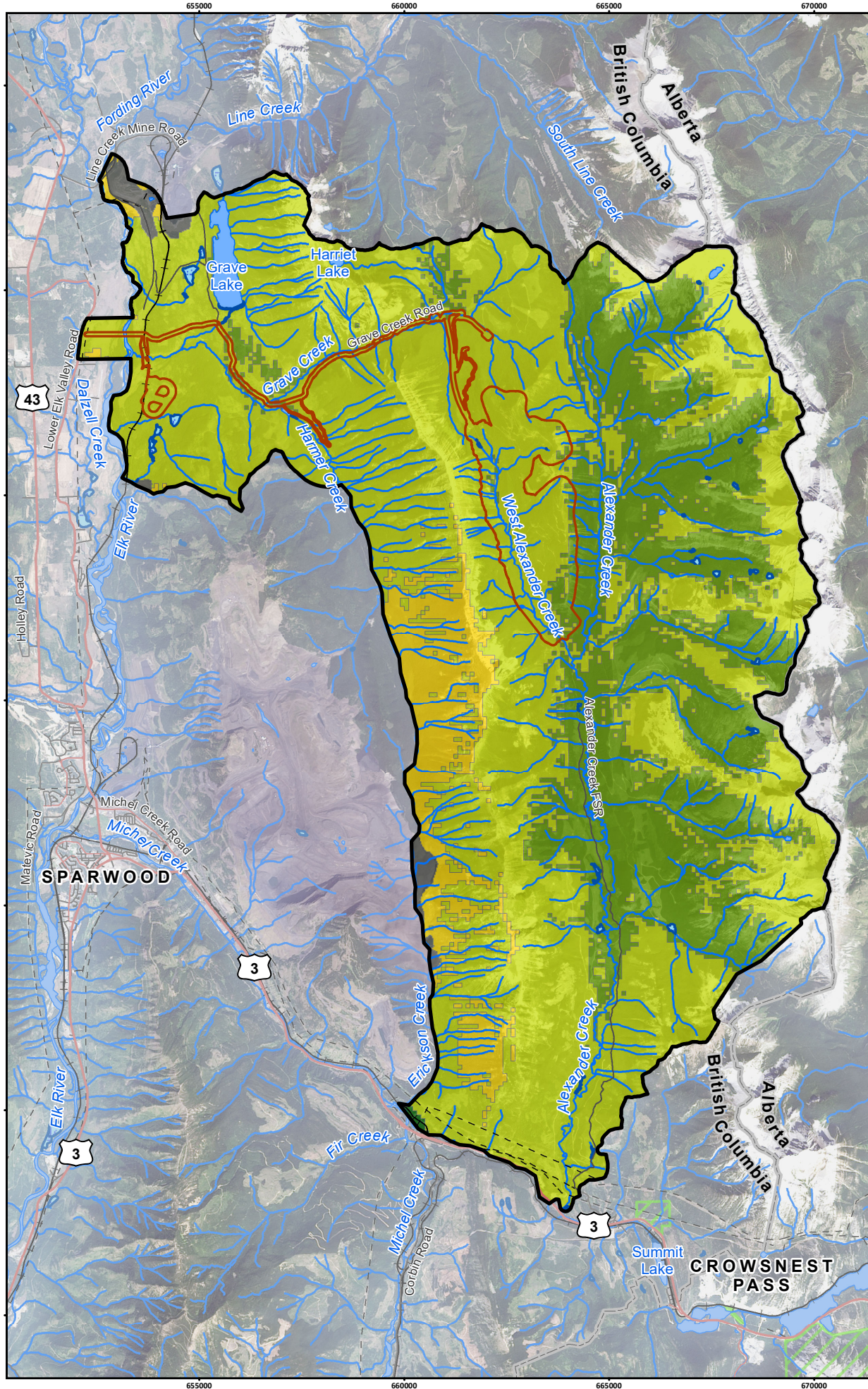
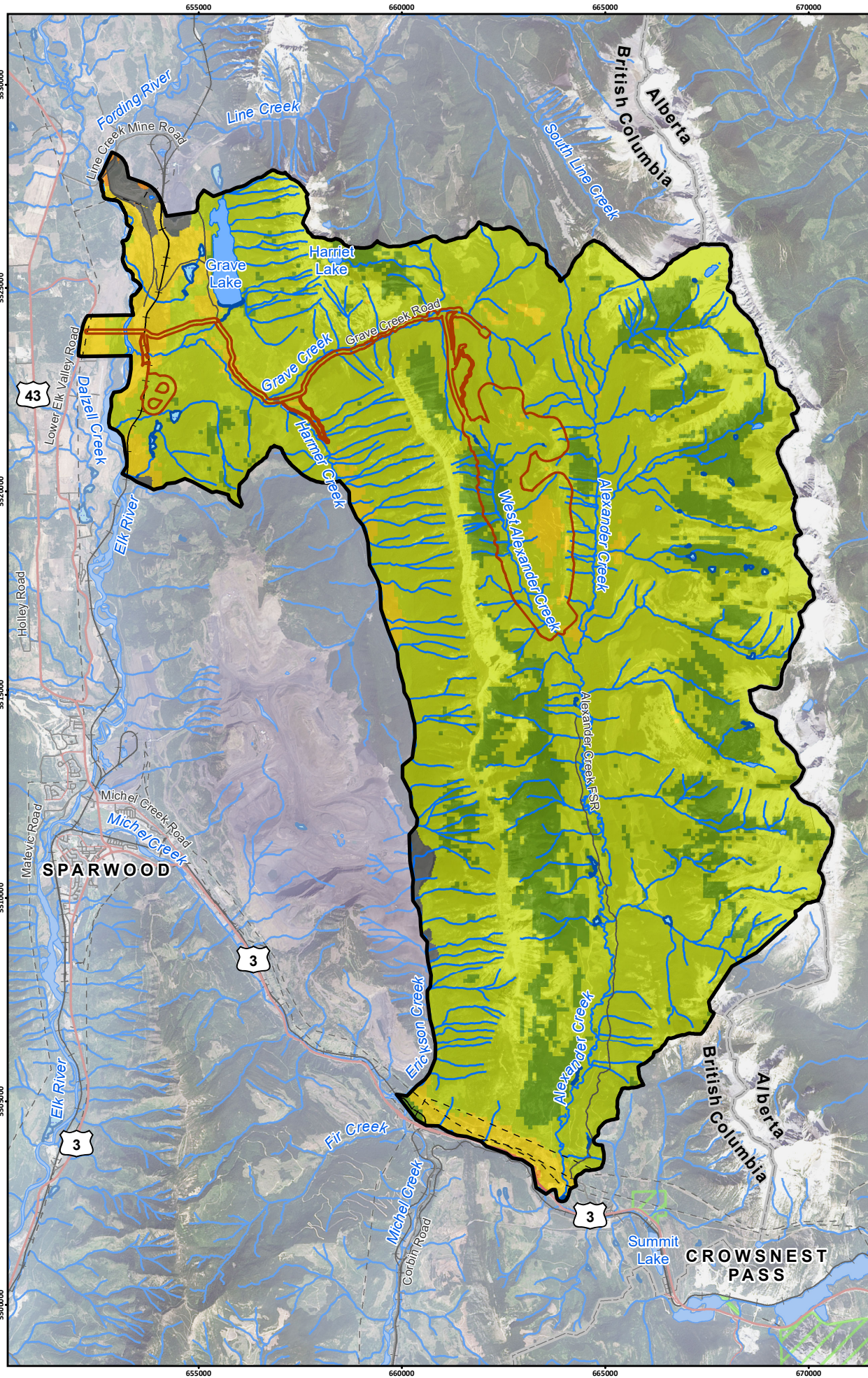
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SPRING

SUMMER

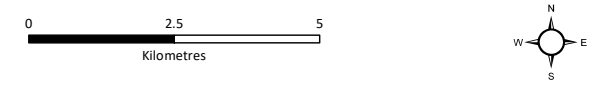


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Figure 15.5-14
Grizzly Bear Spring and Summer Habitat Suitability in the Terrestrial LSA

LEGEND

- Habitat Suitability**
- Very High
 - High
 - Moderate
 - Low
 - Very Low
 - Unclassified
- Terrestrial Local Study Area
 - Project Footprint
 - Highway
 - Arterial/Collector Road
 - Local/Resource Road
 - Railway
 - Transmission Line
 - Watercourse
 - Waterbody
 - Wetland
 - Provincial Park/Protected Area
 - British Columbia/Alberta Border



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Table 15.5-20: Grizzly Bear Habitat Suitability in the Project Footprint, Terrestrial LSA, and Grizzly Bear RSA

Habitat Suitability	Habitat in the Project Footprint		Habitat in the Terrestrial LSA		Habitat in the Grizzly Bear RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Grizzly Bear RSA
Fall Habitat						
Very High (0.8-1)	0	0	15	<1	984	<1
High (0.6-0.8)	228	18	6,180	26	420,894	27
Moderate (0.4-0.6)	1,053	82	17,634	73	1,107,108	70
Low (0.2-0.4)	0	0	11	<1	7,522	<1
Very Low (0-0.2)	0	0	0	0	8,811	1
Unclassified	2	<1	381	2	34,985	2
Winter Habitat						
Very High (0.8-1)	0	0	171	1	22,822	1
High (0.6-0.8)	0	0	3,054	13	178,638	11
Moderate (0.4-0.6)	63	5	4,353	18	328,540	21
Low (0.2-0.4)	396	31	7,500	31	429,139	27
Very Low (0-0.2)	817	64	8,535	35	571,247	36
Unclassified	8	1	608	3	49,270	3
Spring Habitat						
Very High (0.8-1)	0	0	0	0	3,638	<1
High (0.6-0.8)	127	10	3,863	16	319,676	20
Moderate (0.4-0.6)	992	77	18,560	77	1,085,088	69
Low (0.2-0.4)	162	13	1,388	6	1163,47	7
Very Low (0-0.2)	0	0	21	<1	23,535	1
Unclassified	2	<1	389	2	32,018	2
Summer Habitat						
Very High (0.8-0.1)	0	0	16	<1	1,591	<1
High (0.6-0.8)	142	11	6,465	27	598,687	38
Moderate (0.4-0.6)	1,138	89	15,836	65	891,547	56
Low (0.2-0.4)	0	0	1,522	6	45,465	3
Very Low (0-0.2)	0	0	0	0	11,013	1
Unclassified	2	<1	382	2	32,000	2

No habitat in the Project footprint was predicted as very high or high suitability winter (denning) habitat for grizzly bears (Figure 15.5-13). Approximately 3,225 ha of the Terrestrial LSA (13%) was predicted as very high or high suitability denning habitat for grizzly bears. Quality denning habitats in the Terrestrial LSA in proximity to the Project footprint are located along the eastern slopes of the Erickson Ridge and northern portions of Crown Mountain. Approximately 12% of the Grizzly Bear RSA was predicted as very high or high habitat suitability for grizzly bear in winter.

Approximately 127 ha of the Project footprint (10%) was predicted as very high or high suitability spring habitat for grizzly bears. Quality habitats for grizzly bears within the Project footprint are located along the lower slopes of Erickson Ridge and within West Alexander Creek (Figure 15.5-14). Approximately 3,863 ha of the Terrestrial LSA (16%) was predicted as very high or high suitability spring habitat for grizzly bears. Quality spring habitats in the Terrestrial LSA in proximity to the Project footprint are located on avalanche

chutes along the eastern portion of Crown Mountain and Erickson Ridge. Approximately 20% of the Grizzly Bear RSA was predicted as very high or high habitat suitability for grizzly bear in spring.

Approximately 142 ha of the Project footprint (11%) was predicted as very high or high suitability summer habitat for grizzly bears. Quality habitats for grizzly bears within the Project footprint are located along the eastern and southern portions of Crown Mountain and along the Grave Creek Road and within Grave Prairie (Figure 15.5-14). Approximately 6,481 ha of the Terrestrial LSA (27%) was predicted as very high or high suitability summer habitat for grizzly bears. Quality summer habitats in the Terrestrial LSA in proximity to the Project footprint are located on avalanche chutes and lower slopes of the eastern portion of Crown Mountain, Alexander Creek and at the confluence of West Alexander Creek and Alexander Creek. Approximately 38% of the Grizzly Bear RSA was predicted as very high or high habitat suitability for grizzly bear in summer.

Wolverine

Habitat Use

The overall estimate of wolverine occurrence was 0.184 (SE = 0.070), or wolverine potentially use 18% of the Terrestrial LSA. Wolverine showed strong selection for rugged terrain, mid to high elevations, closed-canopied, dense coniferous forest, and landscapes with relatively higher winter snowpack. The greatest determining factors of wolverine occurrence was a negative association with human influence areas. Other strongly determining factors included a negative association with open canopy forest.

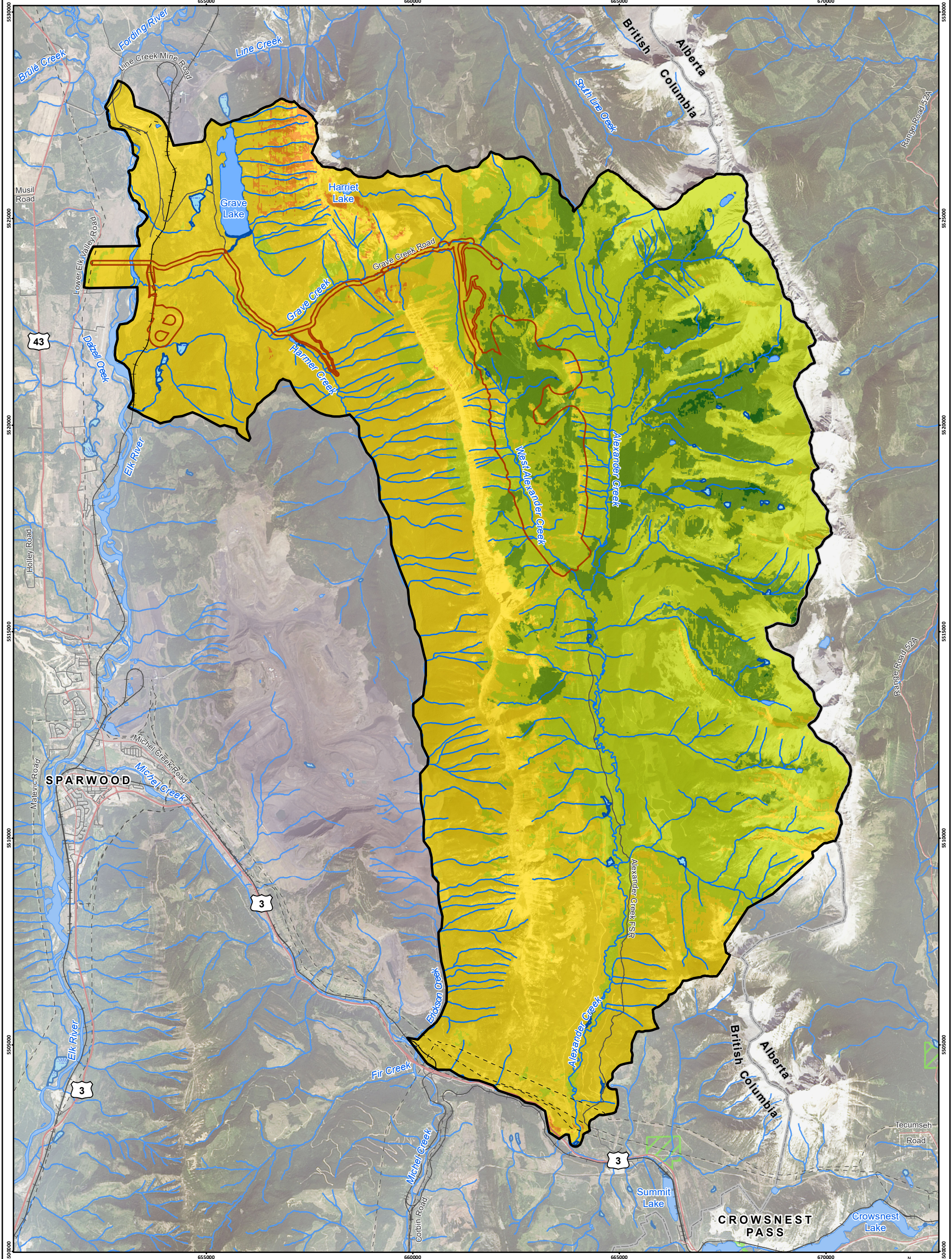
Habitat Suitability

The wolverine habitat model indicates that the best (i.e., very high and high habitat suitability) wolverine habitats are located on Crown Mountain, in the Alexander Creek drainage, and within transboundary mountain passes (Deadman, Racehorse, and North Fork Passes) in the northeastern portion of the Terrestrial LSA. Habitat suitability is shown in Figure 15.5-15 and summarized in Table 15.5-21.

Table 15.5-21: Wolverine Habitat Suitability in the Project Footprint, Terrestrial LSA, and Terrestrial RSA

Habitat Suitability	Habitat in the Project Footprint		Habitat in the LSA		Habitat in the Terrestrial RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Terrestrial RSA
Very High (0.8-0.1)	0	0	101	<1	15,615	1
High (0.6-0.8)	351	27	2,582	11	196,963	10
Moderate (0.4-0.6)	589	46	9,775	40	817,212	44
Low (0.2-0.4)	342	27	11,398	47	810,767	43
Very Low (0-0.2)	0	0	196	1	29,51	<1
Unclassified	1	<1	169	1	32,186	2

Approximately 352 ha of the Project footprint (27%) was predicted as very high or high habitat suitability for wolverine. Quality habitats for wolverine within the Project footprint are located on Crown Mountain and within the West Alexander Creek drainage. Approximately 2,683 ha of the Terrestrial LSA (11%) was predicted as very high or high habitat suitability for wolverine. Areas of quality habitat for wolverine within the Terrestrial LSA are primarily located in the northeastern portion of the Terrestrial LSA, eastern



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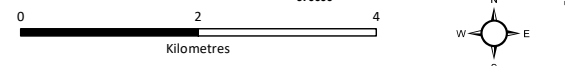
LEGEND

Habitat Suitability

- Very High
- High
- Moderate
- Low
- Very Low
- Unclassified
- Terrestrial Local Study Area
- Project Footprint

- Highway
- Arterial/Collector Road
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Figure 15.5-15
 Wolverine Year-round Habitat Suitability in the Terrestrial LSA

portions of Erickson Ridge, Crown Mountain, upper Alexander Creek, and West Alexander Creek. Approximately 212,578 ha of the Terrestrial RSA (11%) was predicted as very high or high habitat suitability for wolverine.

American Badger

Habitat Use

The overall estimate of American badger occupancy was 0.395 (SE = 0.105), or American badgers potentially use approximately 40% of the Terrestrial LSA. Habitat modelling results indicate that the best American badger habitats are patchily distributed in low elevational grassland, brushland, and open forest habitats with deep friable soils. Habitat use by American badgers in the Terrestrial LSA was most strongly determined by Columbian ground squirrel occurrence, suitable parent material, grassland and brushland habitat and open canopy forest. Other strongly determining factors included a negative association with parent materials classified as unfavourable for excavating burrows (e.g., colluvial, [stony] fluvial, bedrock, and talus).

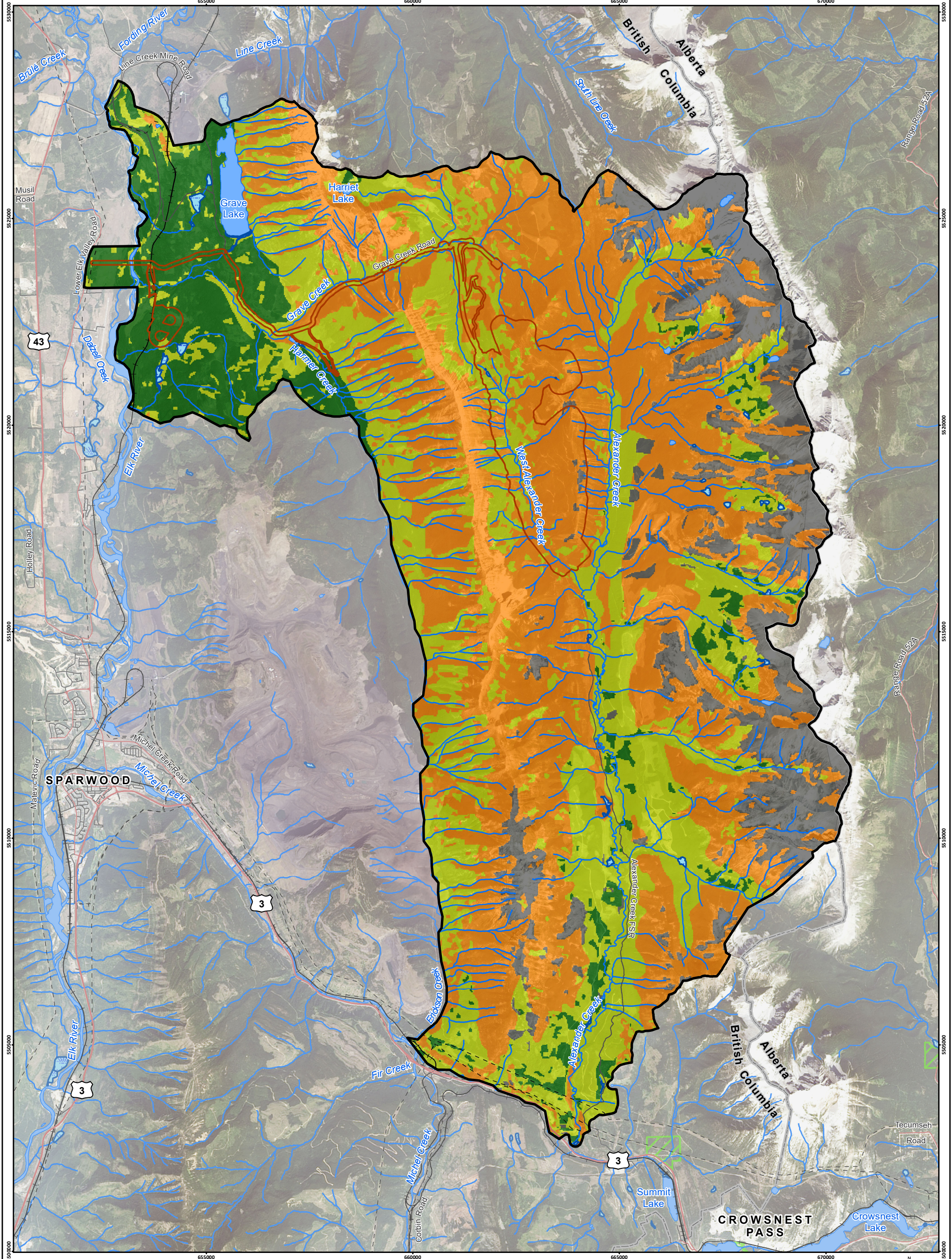
Model results showed that Columbian ground squirrels were negatively correlated with unfavourable parent materials and positively associated with open canopy forests and grasslands, favourable parent material and roads. The most important predictor of Columbian ground squirrel occurrence was parent material (i.e., soil friability). Columbian ground squirrel occurrence was considerably higher in open canopied forests and grassland habitats and in proximity of roads. Areas of high suitability habitat for Columbian ground squirrel were generally associated with reclaimed mining areas and built-up areas (Appendix 15-C).

Habitat Suitability

The American badger habitat model indicates that the best habitats occur at the lowest elevations in the Terrestrial LSA. Habitat suitability is shown in Figure 15.5-16 and summarized in Table 15.5-22.

Table 15.5-22: Habitat Suitability for American Badger in the Project Footprint, Terrestrial LSA, and Terrestrial RSA

Habitat Suitability	Habitat in the Project Footprint		Habitat in the Terrestrial LSA		Habitat in the Terrestrial RSA	
	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Terrestrial RSA
Very High (0.8-1)	98	8	2,526	10	395,613	21
High (0.6-0.8)	0	0	0	0	0	0
Moderate (0.4-0.6)	335	26	7,492	31	647,550	35
Low (0.2-0.4)	0	0	0	0	0	0
Very Low (0-0.2)	833	65	11,176	46	725,992	39
Unclassified	17	1	3,027	12	106,538	6



Crown Mountain Coking Coal Project

LEGEND

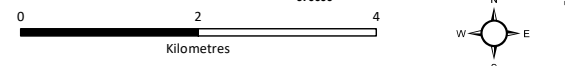
Habitat Suitability

- Very High
- High
- Moderate
- Low
- Very Low
- Unclassified

- Terrestrial Local Study Area
- Project Footprint

- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area

- British Columbia/Alberta Border



Scale 1:85,000

Map Drawing Information:
 Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
 Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).
 Map Created By: RB
 Map Checked By: HEB
 Map Coordinate System: NAD 1983 UTM Zone 11N

Figure 15.5-16
 American Badger Spring-Summer Habitat Suitability in the Terrestrial LSA

NWP Coal Canada Ltd

Project: 12-6231
 Status: FINAL
 Date: 2022-01-11

Approximately 98 ha of the Project footprint (8%) was predicted as very high or high habitat quality for American badger (Figure 15.5-16). Approximately 2,526 ha of the LSA (10%) was predicted as very high- or high-quality habitat for American badger. Areas of quality habitat for American badgers were restricted primarily to the northwest portion of the Terrestrial LSA, in Grave Prairie and the northwest opening of Grave Creek Canyon, the lower Alexander Creek drainage and mountain passes (e.g., Deadman Pass) in the eastern portion of the Terrestrial LSA (Figure 15.5-16). Approximately 395,613 ha of the Terrestrial RSA (21%) was predicted as very high or high habitat quality for American badger (Figure 15.5-16). Habitat modelling results indicated that high quality habitat for American badger is patchily distributed in the Terrestrial RSA, primarily occurring in low elevational valley bottoms.

American Marten

Habitat Use

The overall estimate of American marten occurrence was 0.339 (SE = 0.080), or American marten potentially use approximately 34% of the Terrestrial LSA. Habitat modelling results showed that American marten were strongly associated with old coniferous forests at mid elevations and with low road density. The greatest determining factors of American marten occurrence was a strong selection for canopy closure, coniferous dense forests, old seral stage forests, and high elevations and a strong selection against sites with greater secondary road density and primary and secondary rivers. Other determining factors included a selection against highways, mining areas, agricultural lands, and settlements.

Habitat Suitability

The habitat model indicates that the best American marten habitats are in mid to high elevational areas in upper portions of Grave Creek and its tributaries, the Alexander Creek valley and portions of West Alexander Creek. Model results are presented in Table 15.5-23.

Table 15.5-23: Habitat Suitability for American Marten in the Project Footprint, Terrestrial LSA, and Terrestrial RSA

Habitat Suitability	Habitat in the Project Footprint		Habitat in the Terrestrial LSA		Habitat in the Terrestrial RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Terrestrial RSA
Very High (0.8-1)	112	9	526	2	37,018	2
High (0.6-0.8)	378	29	4,210	17	371,832	20
Moderate (0.4-0.6)	201	16	3,683	15	289,162	15
Low (0.2-0.4)	519	40	11,502	47	984,751	52
Very Low (0-0.2)	40	3	210	1	20,365	1
Unclassified	34	3	4,090	17	172,567	9

Approximately 490 ha of the Project footprint (38%) was predicted as very high or high habitat suitability for American marten. Quality habitats for American marten within the Project footprint are located across the slopes of Crown Mountain and within the West Alexander Creek valley (Figure 15.5-17).