Appendix 4-NN

Terrestrial Effects Assessment Meeting - October 2020

NWP Coal Canada Ltd

Crown Mountain Coking Coal Project Effects Assessment Overview for Feedback

October 21, 2020

Purpose

To provide an overview of the approach for the assessment of wildlife Valued Components (excluding residual effects) for discussion and feedback.

Presentation Overview

- Project Overview
- Assessment Boundaries
- Measurement Indicators
- Assessment Cases
- Base Case Assessment Approach
- Application Case Assessment Approach
- Questions/Comments

Project Overview

- Proposed open pit metallurgical coal mine in the Elk Valley
- 10 tenured coal exploration licenses (approx. 5,630 ha)
- Footprint approximately 1,300 ha
- Other nearby mines in Elk Valley include Teck's Elkview (8 km southwest) and Line Creek mines (12 km north)
- After all permits received, anticipated production capacity up to 4.0 million run-of-mine tonnes (M ROMt) per annum for 15 years (not including site decommissioning)
- Construction estimated to be 1.5 years

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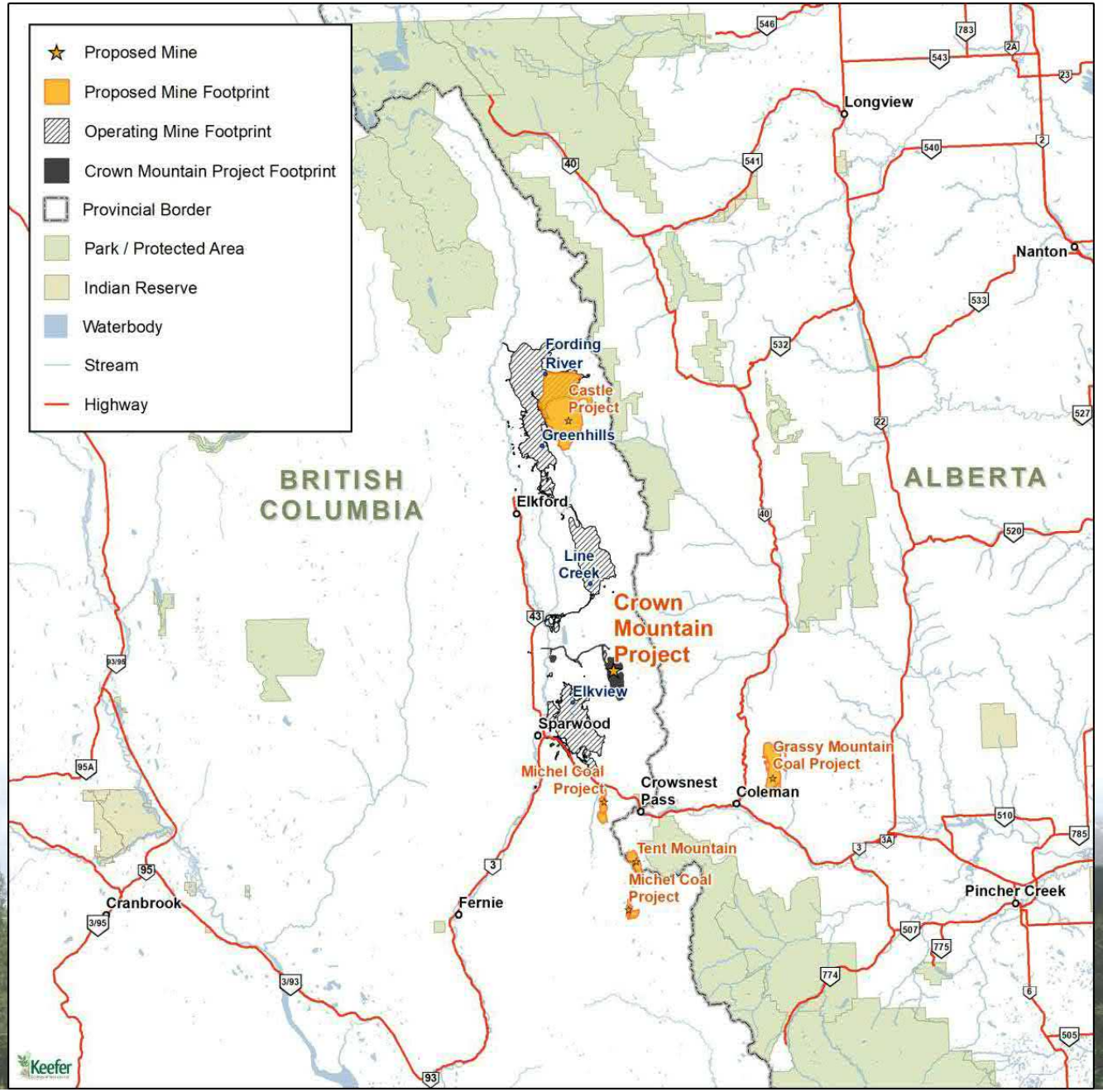
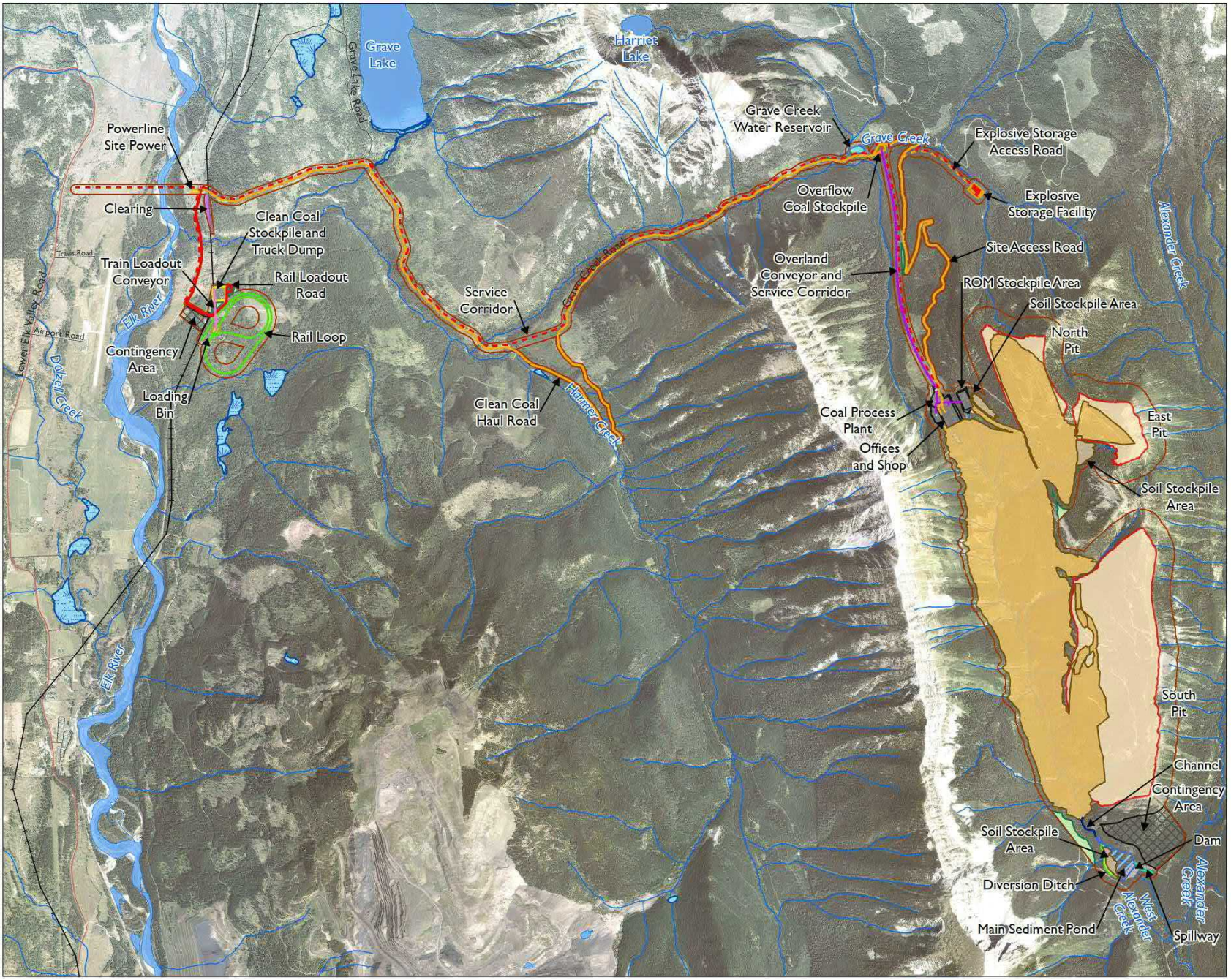
Project Location



Project Overview

- Key project components include:
  - Surface extraction areas (three pits - north pit, east pit, and south pit)
  - Mine rock management areas
  - Plant area (includes raw coal stockpile, processing plant, site support facilities)
  - Clean coal transportation route (overland conveyor and haul road)
  - Rail load out facility and rail siding
  - Power and natural gas supply
  - Explosives and fuel storage
  - Sewage treatment
  - Water supply

Project Footprint



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Crown Mountain Coking Coal Project

FIGURE 1.
Proposed Project Layout

LEGEND

- Project Footprint

Project Footprint Infrastructure

- Channel to Ultimate Pond
- Clean Coal Haul Road\Site Access
- Explosive Storage Access\Facility Road
- Rail Loadout Road
- Rail Loop
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Train Loadout Conveyor
- Waste Dump
- Mined Area
- Clean Coal Stockpile and Truck Dump
- Overflow Coal Stockpile
- Soil Stockpile Area
- Explosive Storage Facility\Pad
- Loading Bin
- Plant Site\ROM Stockpile Area
- Powerline-Site Power
- Water Reservoir
- Main Sediment Pond
- Dam
- Spillway
- Diversion Ditch
- Clearing
- Additional Area
- Contingency Area

Base Data

- Arterial Roads
- Local/Resource Roads
- Railway (Canadian Pacific)
- Watercourse
- Waterbody
- Wetland
- BC/Alberta Border

0 1 2 Kilometers

SCALE 1:40,000

Map Drawing Information: Data Provided by Province of British Columbia, NWP Coal Canada Ltd., Dillon Consulting Limited

Map Created By: JFC/RBB
Map Checked By: LKD
Map Projection: NAD 1983 UTM Zone 11N

PROJECT: 12-6231
STATUS: FINAL
DATE: 2020-10-08

Data and Information Sources

A review of available data and information was conducted to support the wildlife effects assessments:

- Literature in published peer-reviewed scientific journals
- Technical reports and academic research
- Information from wildlife specialists
- Wildlife Baseline Reports (Mammals, Birds, Amphibians, Checkerspot)
- Terrestrial Ecosystem Mapping (TEM)
- Predictive Ecosystem Mapping (PEM)
- Vegetation Baseline Report
- Vegetation Assessment
- Reclamation and Closure Plan
- Terrain and Soils Assessment
- Hydrology Assessment
- Hydrogeology Assessment
- Water Quality Assessment
- Air Quality Assessment
- Noise and Vibration Assessment

Effects Assessment

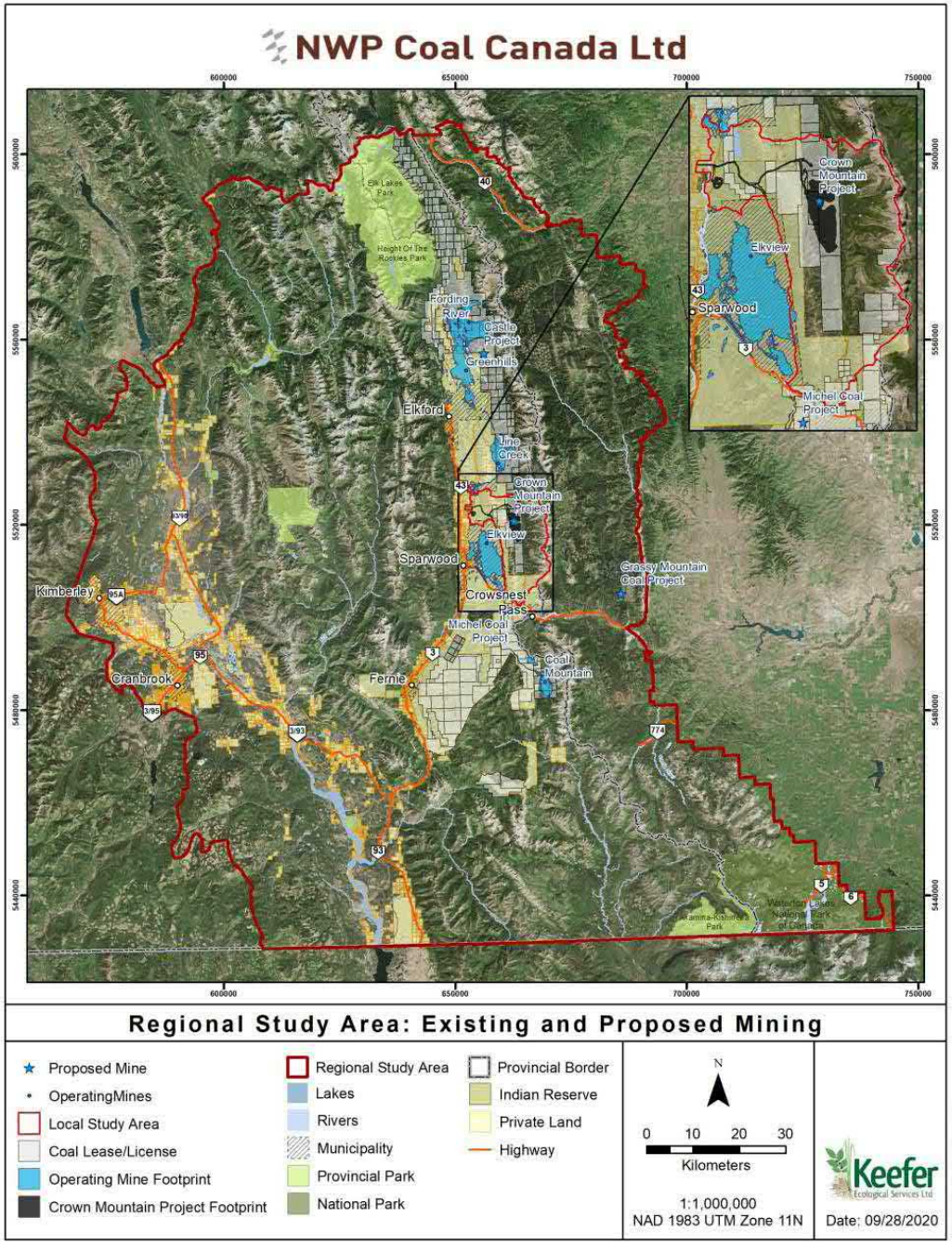
Biodiversity is influenced by past, current and future changes to species, ecosystems and landscapes that can interact with the Project to result in cumulative effects (Hooper et al., 2005).

Assessment Boundaries

Terrestrial RSA includes:

- WMU 4-1; 4-2; 4-3; 4-21,4-22; 4-23
- Transboundary considerations
- All existing and proposed mines
- Private lands
- Sufficient size to evaluate cumulative impacts to populations (meta-populations):

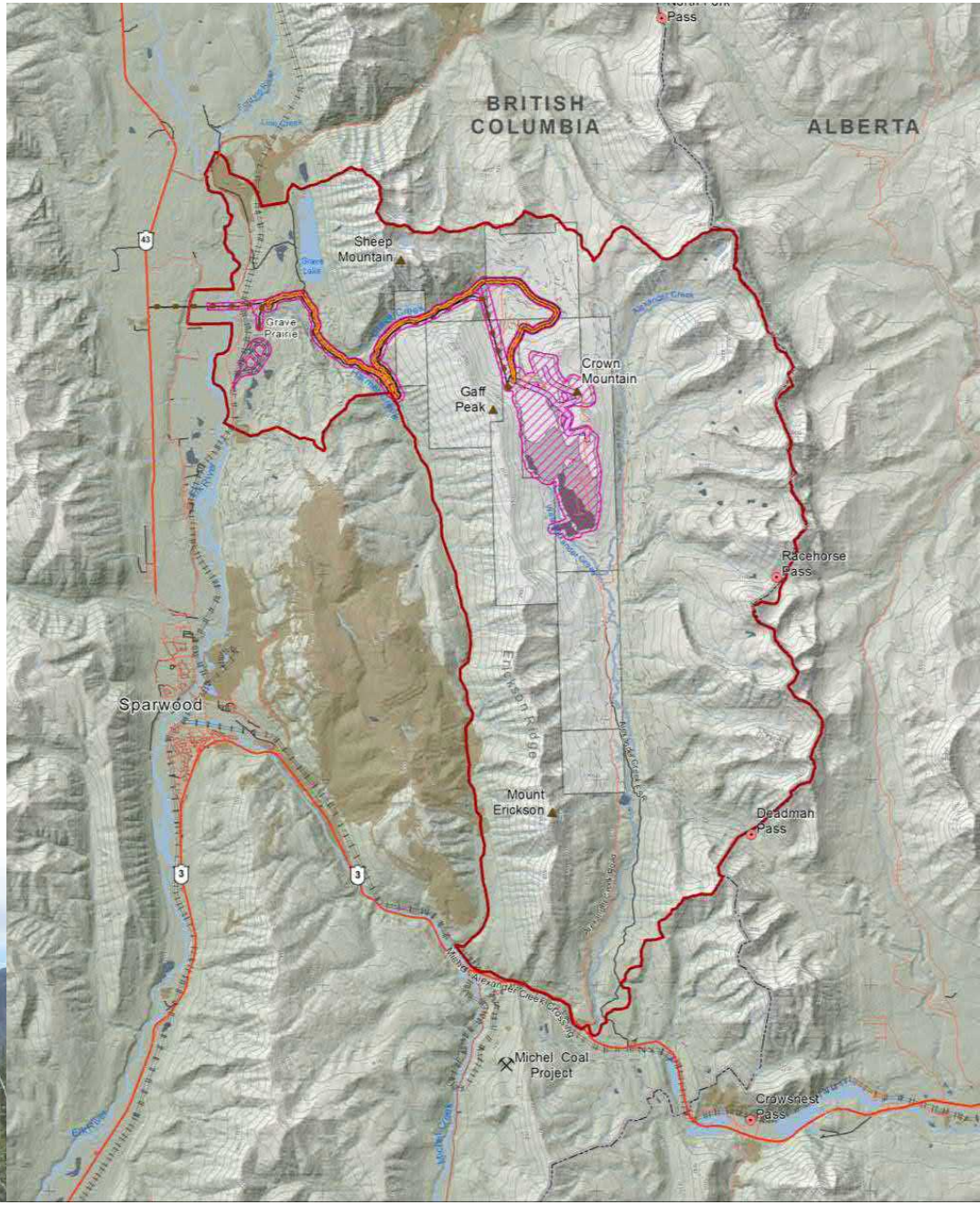
1. Landscape connectivity
2. Habitat availability



Assessment Boundaries

Terrestrial LSA includes:

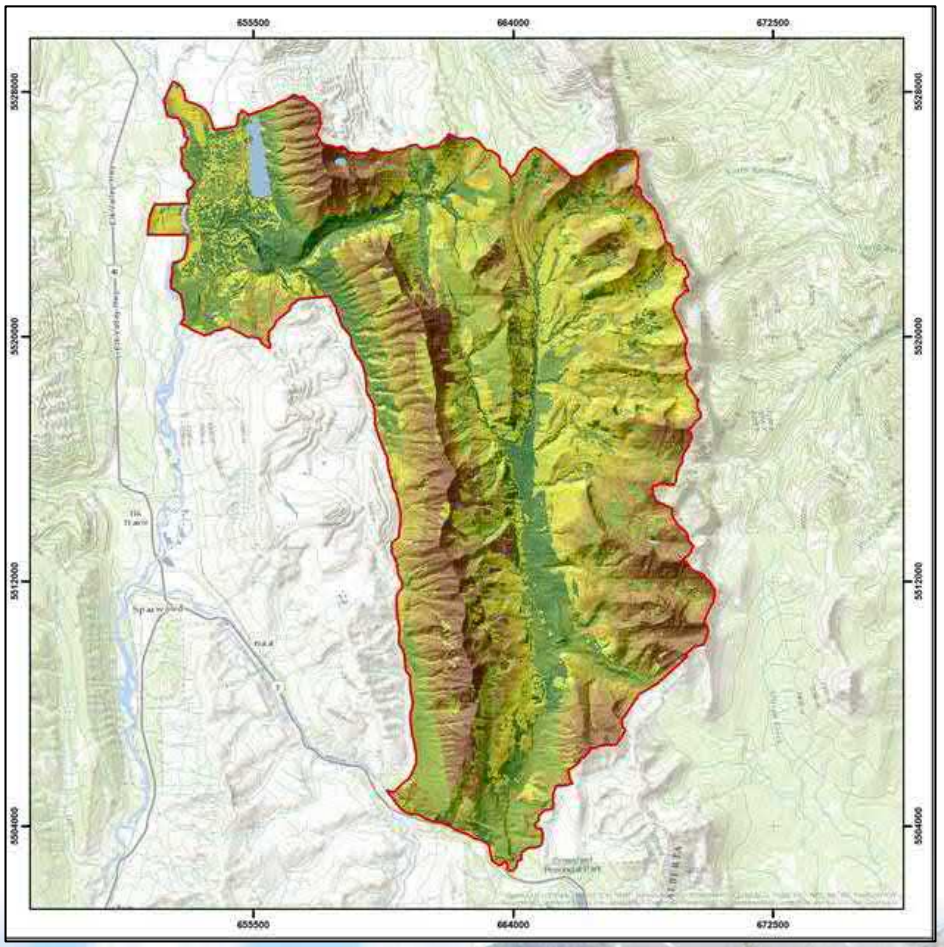
- Maximum Project footprint buffered by ~1-6km
- All watersheds overlapping the Project footprint
- Existing diversity of riparian, forest, grassland, wetland and alpine ecosystems
- All known and anticipated wildlife movement corridors overlapping the Project footprint



Effects Assessment

For each project phase, an evaluation is completed in each assessment chapter that answers the following key questions:

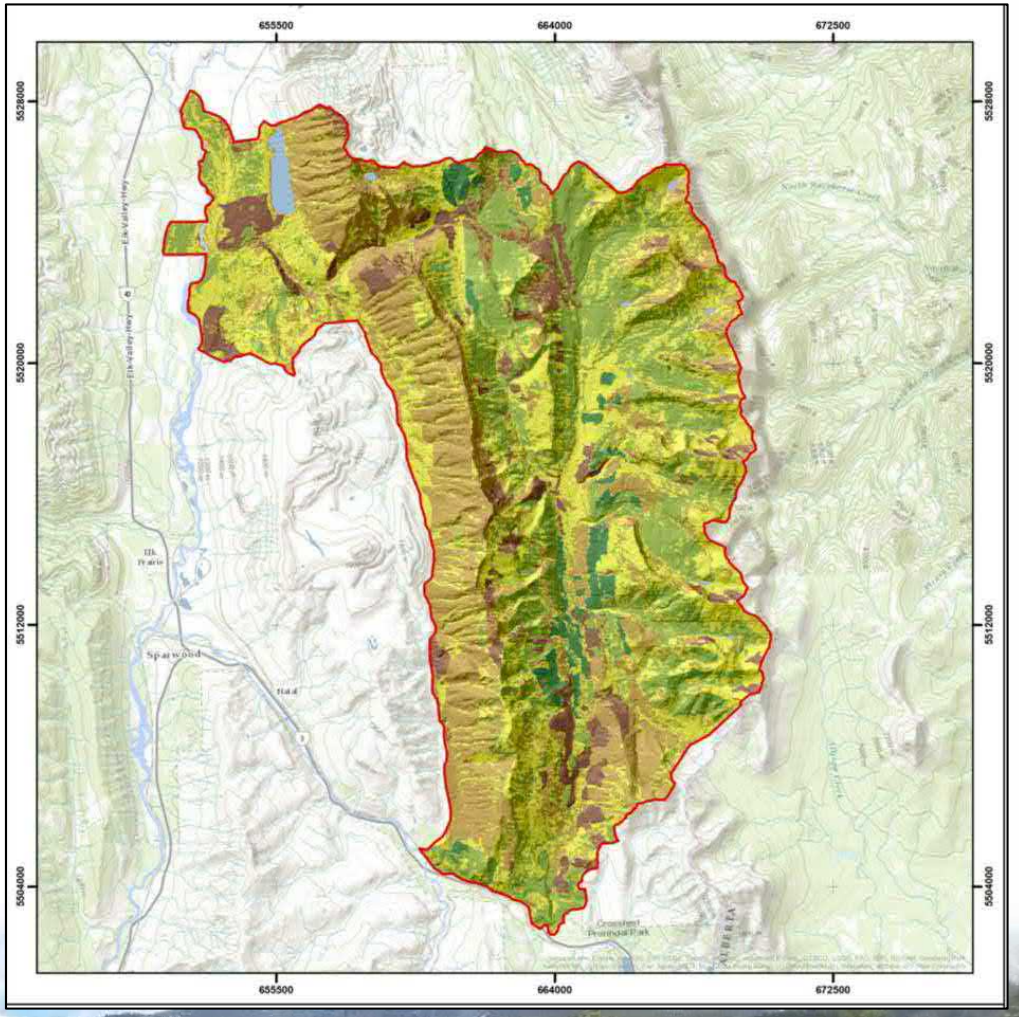
- What are the set of effects on wildlife VCs that result from the interaction with the Project's components and activities?
- Over what spatial and temporal boundaries are potential effects expected to occur?



Moose Fall-Winter Habitat Availability

Assessment Cases

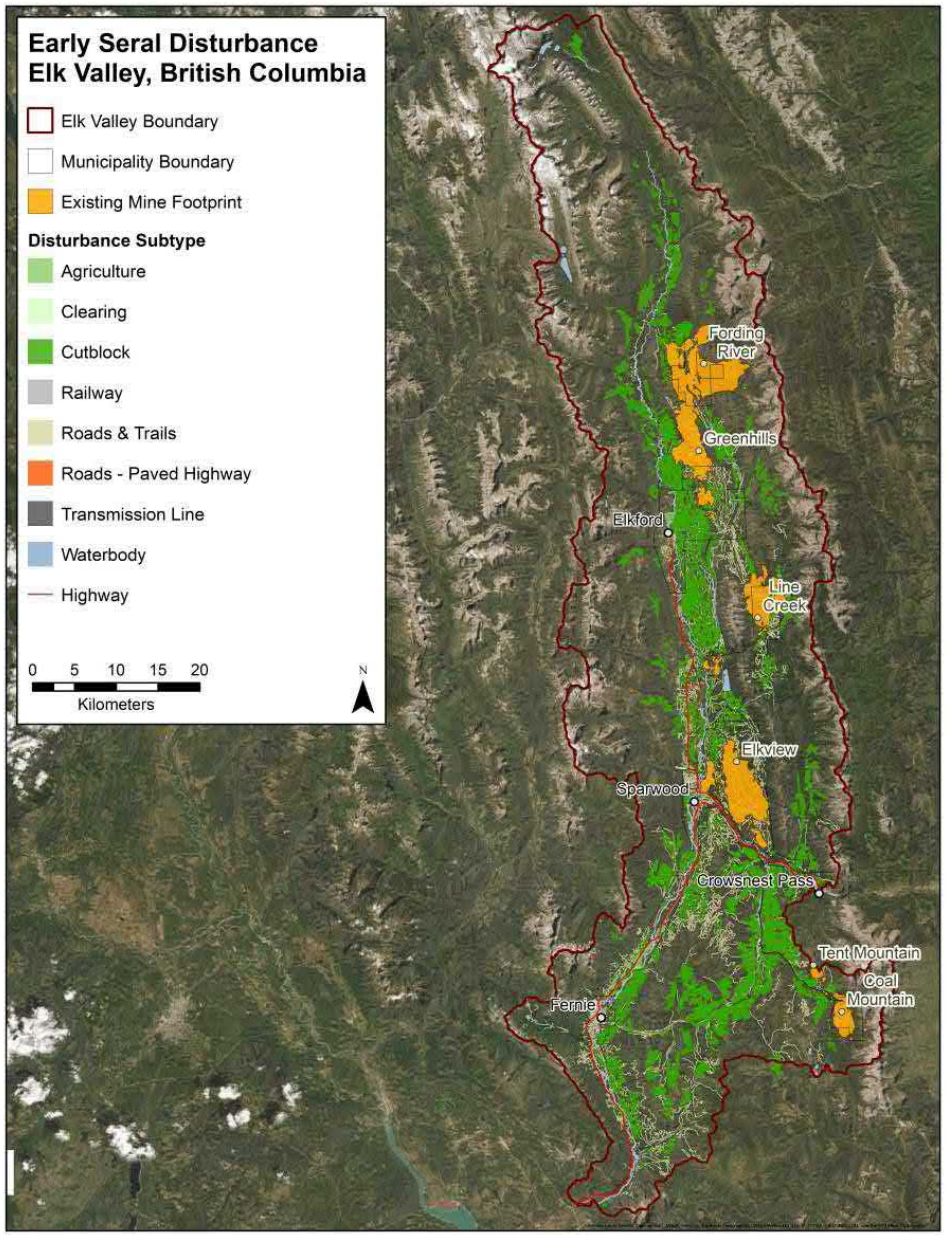
- Base Case
- Application Case
- Reasonably Foreseeable Development Case



Base Case: Elk Fall-Winter Habitat Availability

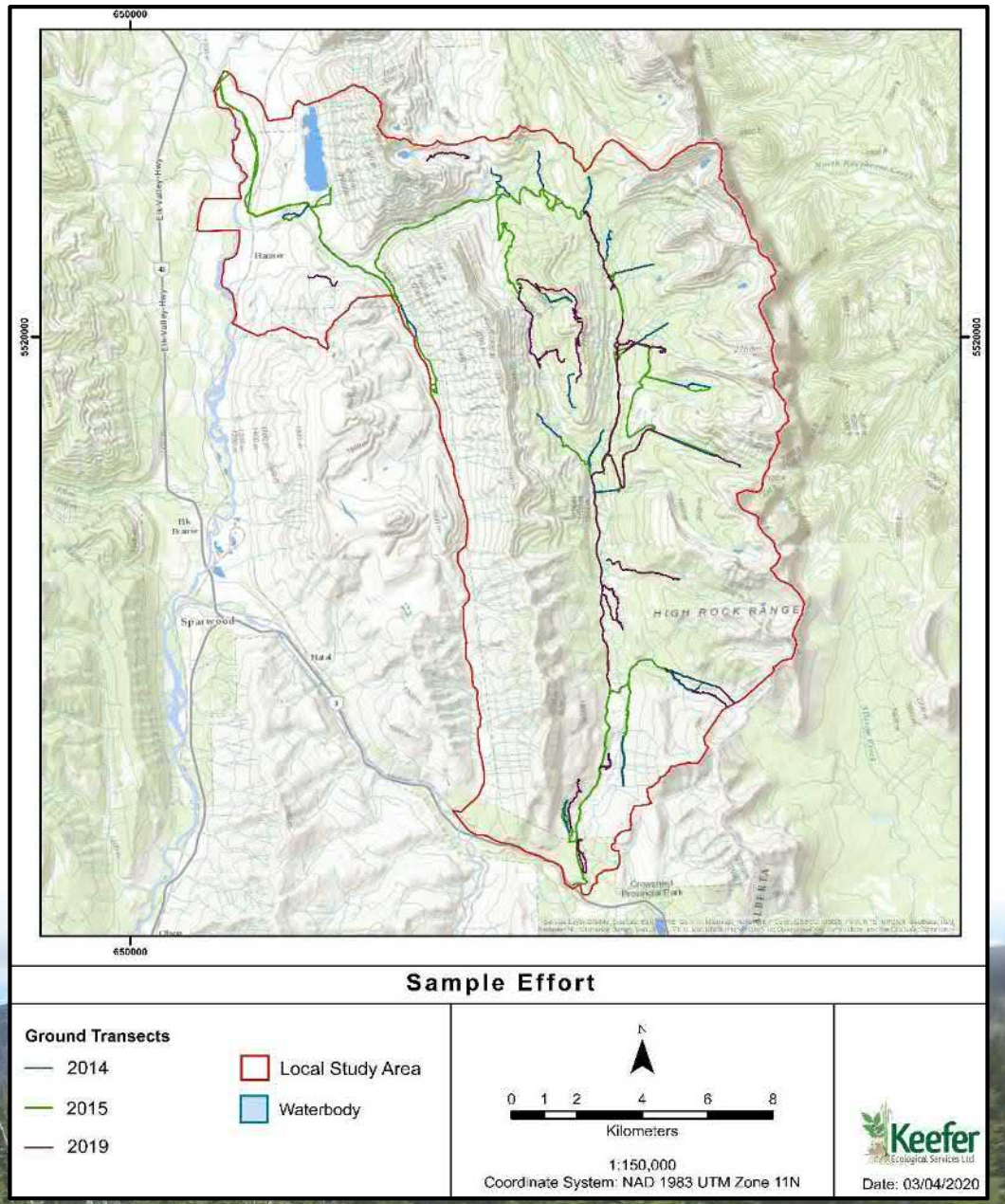
Base Case/Existing Conditions

- **Cumulative outcome of previous and existing developments and activities**
- Assessment of habitat availability, connectivity, demographic and mortality factors
- Scientific evidence obtained from the Base Case assessment, published literature and technical reports are used to provide an informed prediction of potential effects for wildlife VCs in the RSA and LSA



Existing Conditions

- Baseline Surveys
  - Aerial transect surveys (n=874.08 km)
  - Ground transect surveys (n=557.21 km)
  - Badger burrow surveys (n=250.46 km)
  - Remote camera surveys (8, 918 sampling nights)
  - Hair-snag surveys (n=65 hair samples)
  - GPS collar surveys (n=75 grizzly bears collared)
  - Acoustic and live-capture bat surveys
  - Amphibian surveys
  - Migratory, breeding bird and wetland surveys
- Modelling Results
- Existing Regional and Local Data



Measurement Indicators

Measurement Indicator:
An effect on an ecological component that can be measured and described quantitatively (CCME, 1996)

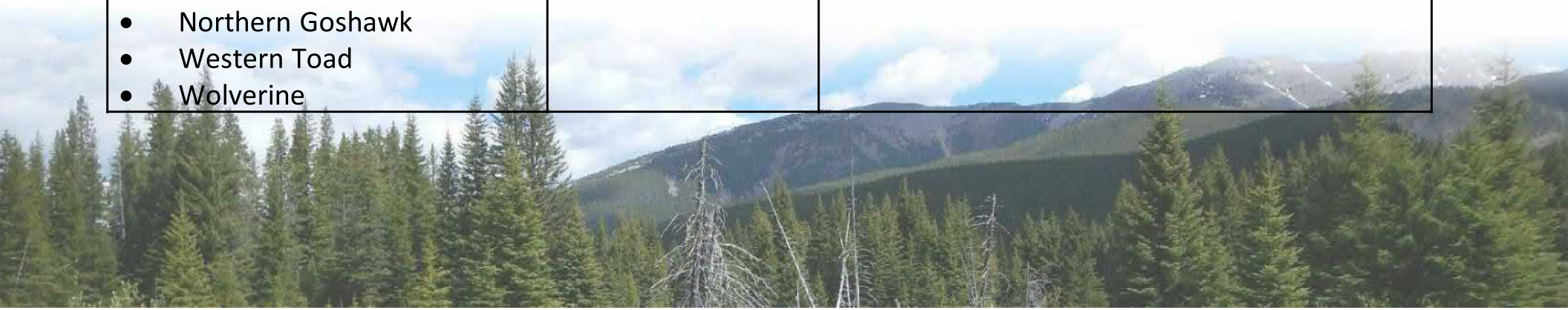
- Habitat Availability
- Habitat Connectivity
- Abundance

Measurement Indicators

Valued Component	Assessment Endpoint	Measurement Indicators
• Avalanche chutes • Grassland Ecosystems • Wetland Ecosystems • Riparian habitat • Old growth and mature forests	Maintenance of viable and ecologically effective ecosystems	**Ecosystem abundance and distribution-** amount of ecosystem present, connectivity of ecosystem, patch size, coarse woody debris, wildlife trees **Compositional and structural changes of the ecosystem** **Changes in wetland function** as it relates to migratory birds and species at risk

Measurement Indicators

Valued Component	Assessment Endpoint	Measurement Indicators
• American Badger • American Marten • American Dipper • Bats (Little Brown Bat, Northern Myotis, Eastern Red Bat) • Bighorn Sheep • Canada Lynx • Elk • Gillette's Checkerspot • Grizzly Bear • Migratory Birds (Barn Swallow, Olive-sided Flycatcher, Woodpeckers) • Moose • Northern Goshawk • Western Toad • Wolverine	Maintenance of viable and ecologically effective wildlife populations	**Habitat Availability**- changes in resource selection (probability of selection) and animal use (rate of resource use) **Habitat Connectivity-** changes to animal movement (a condition that reduces or impedes animal use) **Abundance-** changes to mortality, recruitment and habitat **Wildlife Health-**changes in water, soil and air quality



Assessment of Wildlife VCs

Species distribution modelling provides quantitative measures of species

- Occurrence
- Habitat availability (quality and quantity)
- Distribution

- Baselines that future change can be measured against
- Identification of quality habitats (e.g., forage, security, reproduction, movement)
- Information necessary for informed land-use planning and identification of feasible species/area specific mitigation strategies

Wildlife VCs
American Badger
American Marten
Bats
Bighorn Sheep
Canada Lynx
Elk
Moose
Western Toad
Wolverine
Grizzly Bear
American Dipper
Gillette's Checkerspot
Migratory Birds
Northern Goshawk

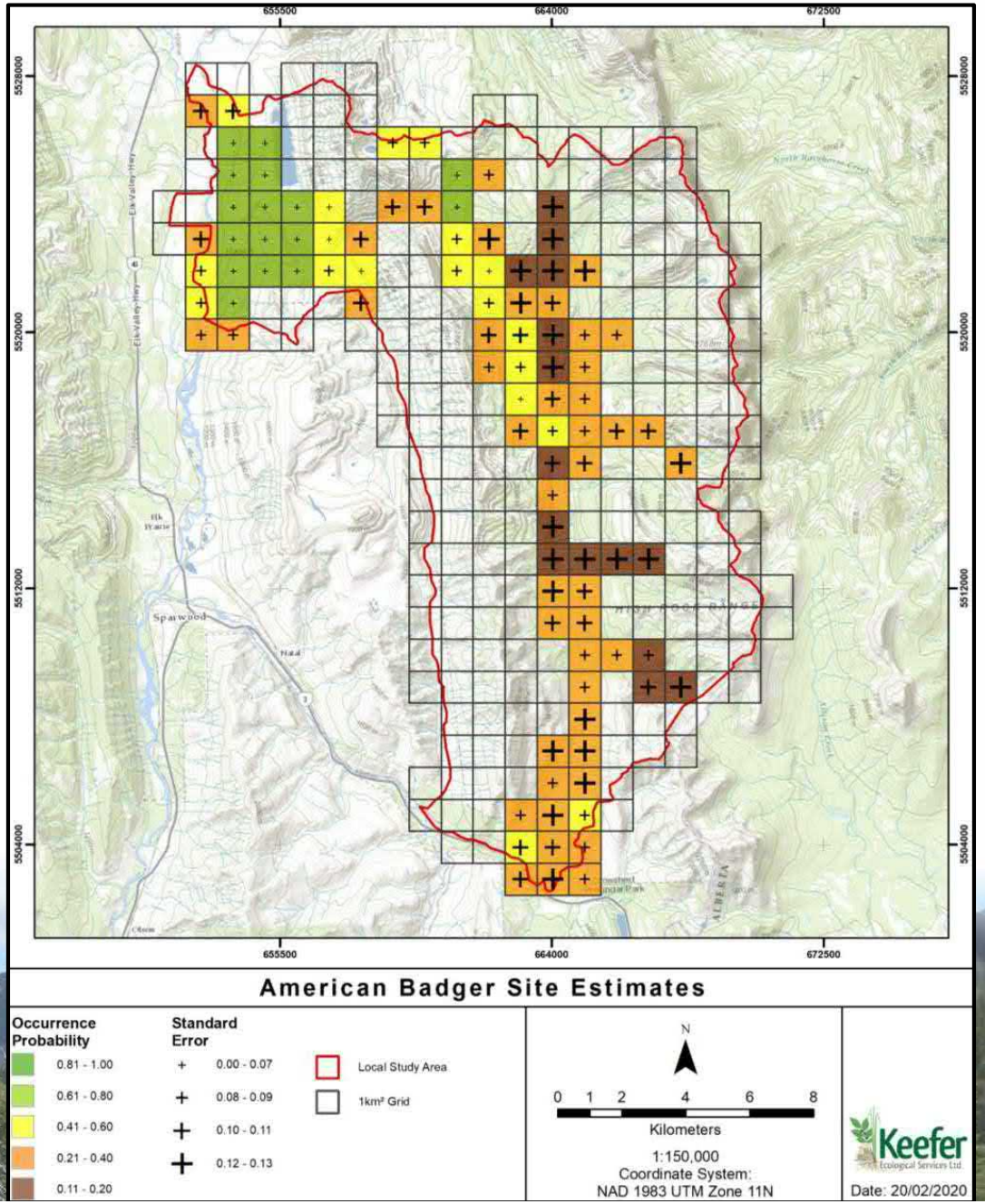
Occupancy Model

Resource Selection Function Model

Habitat Suitability Index Model

Assessment of Wildlife VCs

Accurate baseline information permits more reliable predictions regarding how a proposed Project may affect Wildlife VCs and how ecosystems and species can be expected to respond to changes.

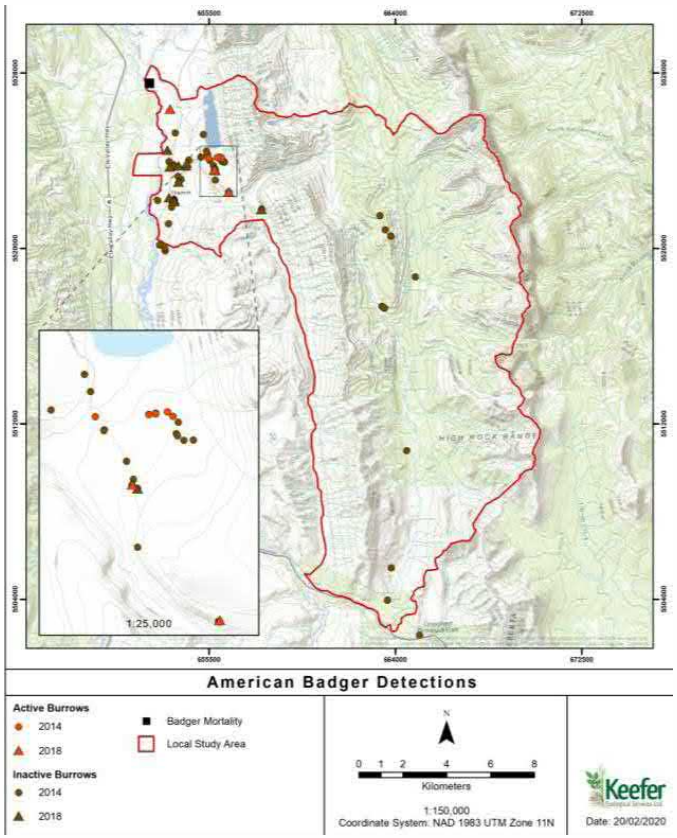


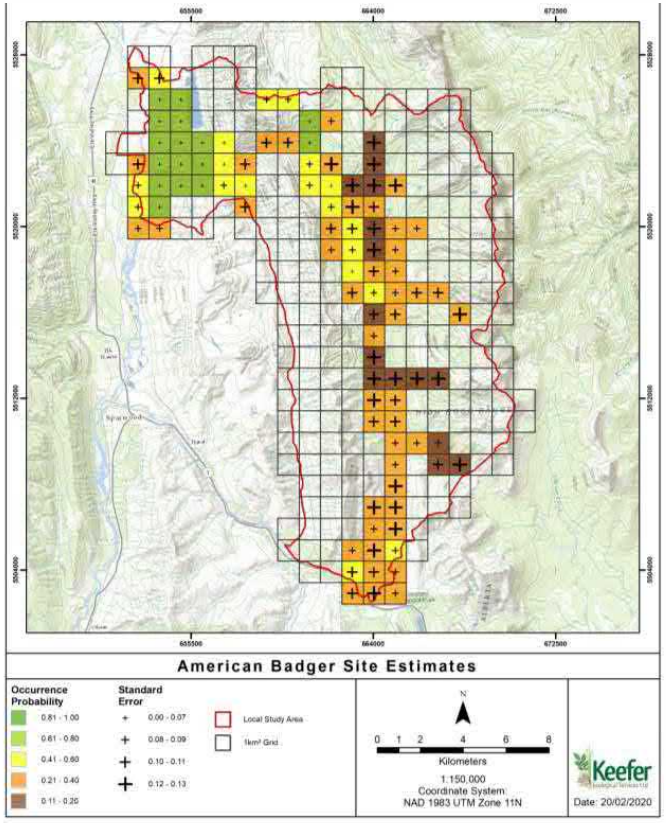
Assessment of Wildlife VCs

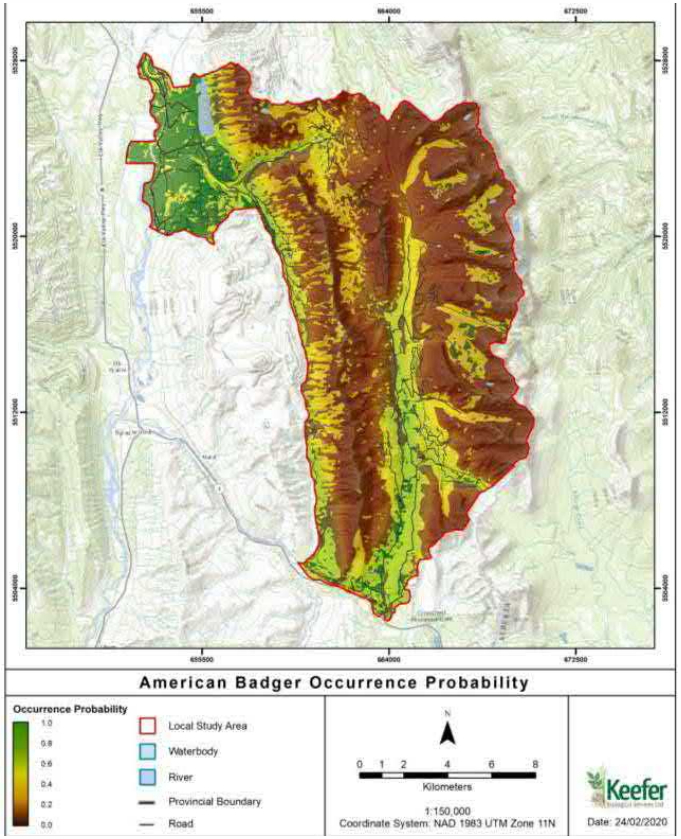
Habitat availability

- Habitat availability (habitat suitability, resource selection and habitat use) assessed from occupancy and habitat modelling
  - Type of model(s) used depended on the data available
- Effects evaluated (where feasible) from empirical data using:
  - **occupancy models** and **resource selection** regression coefficients or proportions of resource use to habitat and development conditions
- Where data were insufficient to develop empirical models:
  - professional judgement, scientific literature, and collaboration were used to build **habitat suitability index models**

Assessment of Wildlife VCs: Modelling







Detection/non-detection data → Site estimates of occurrence → Spatially explicit prediction maps

Assessment of Wildlife VCs: Modelling

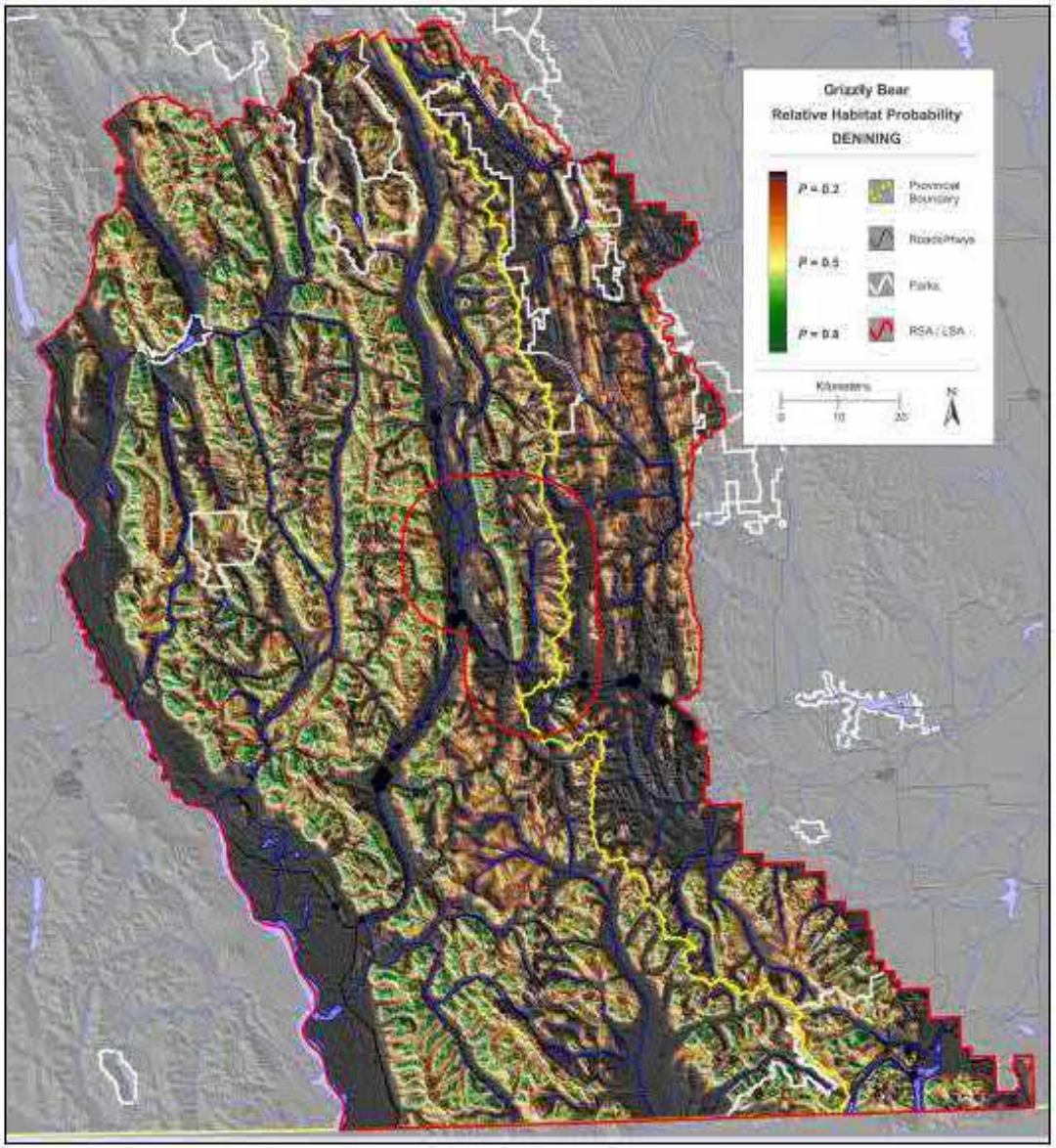
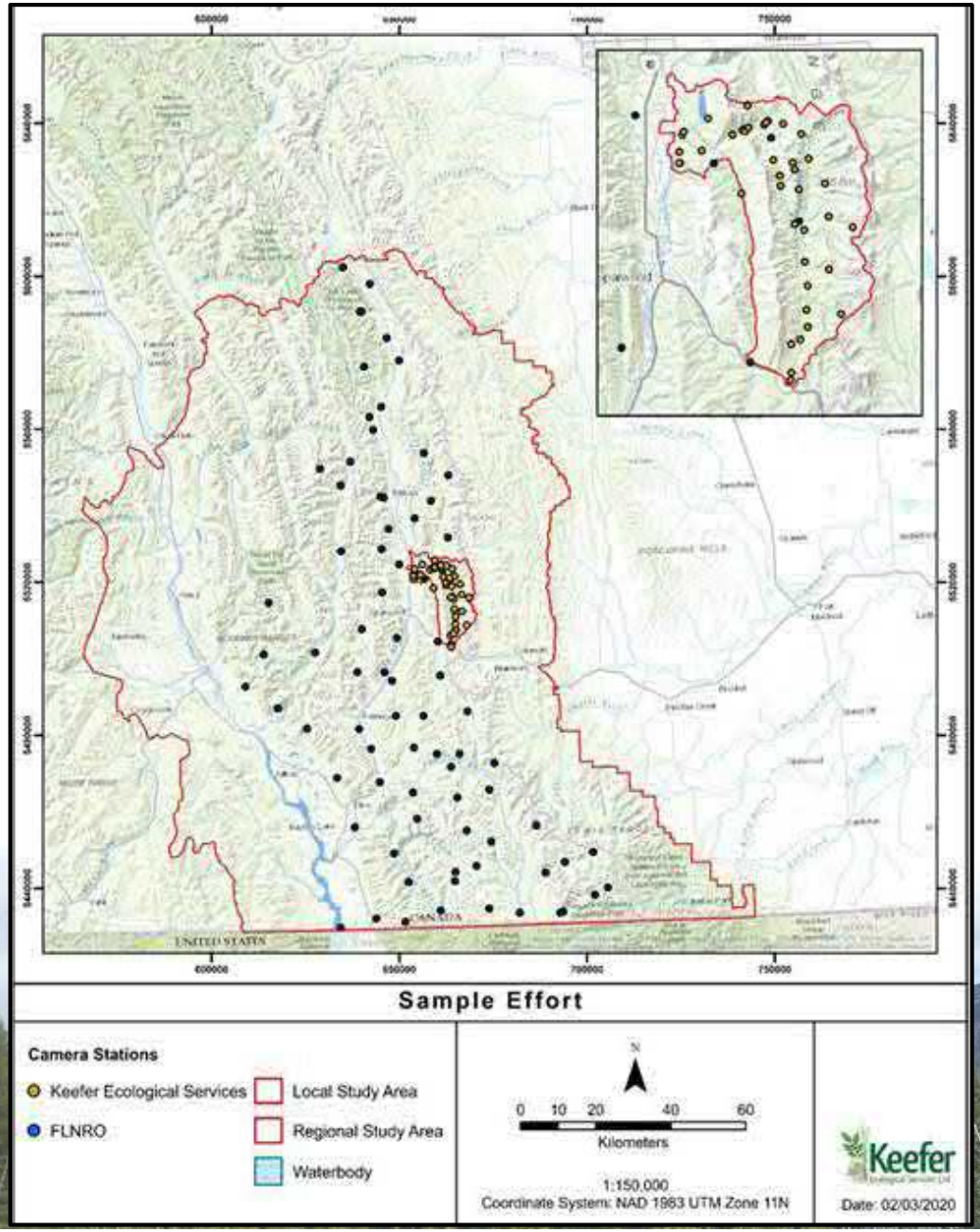
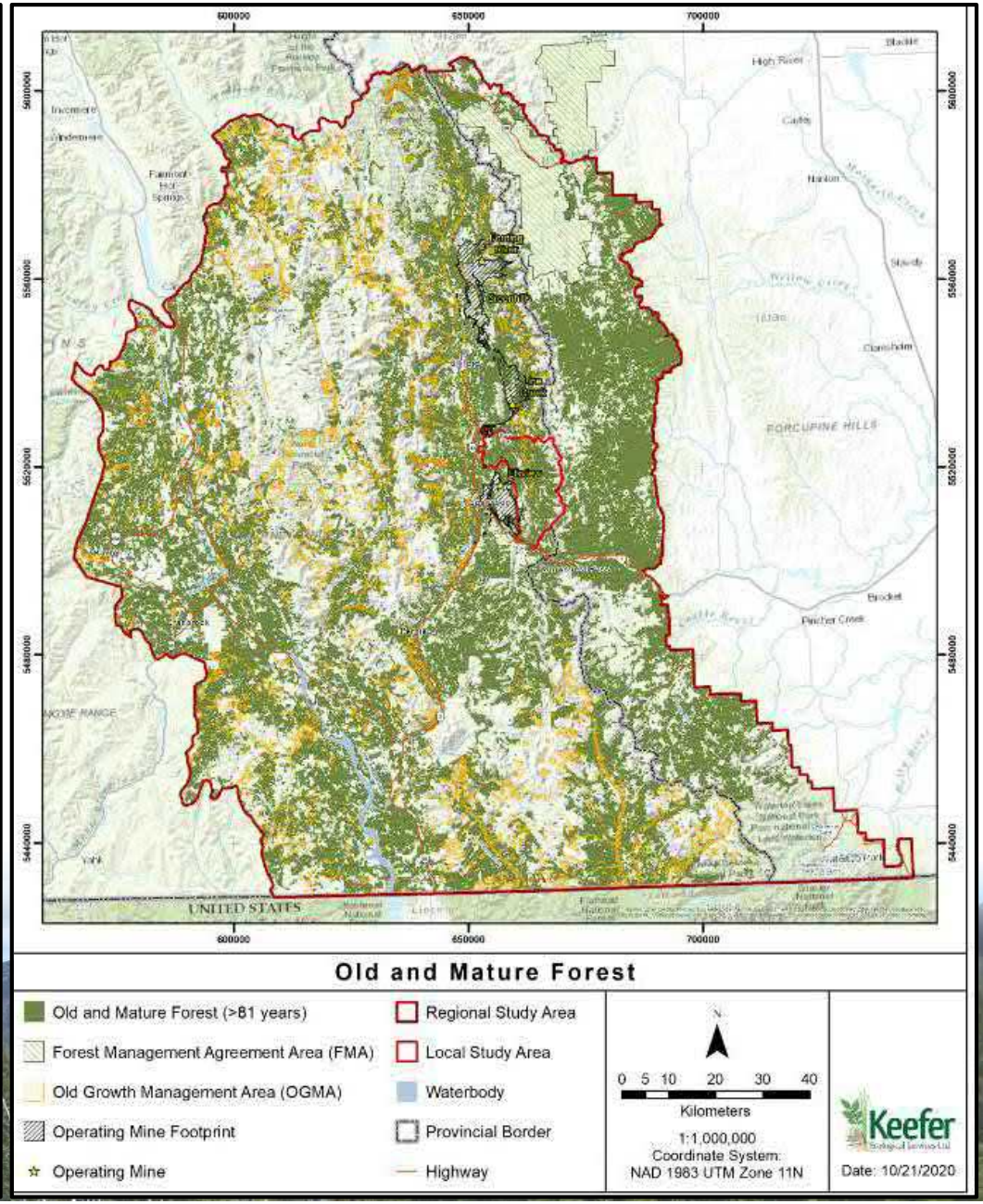


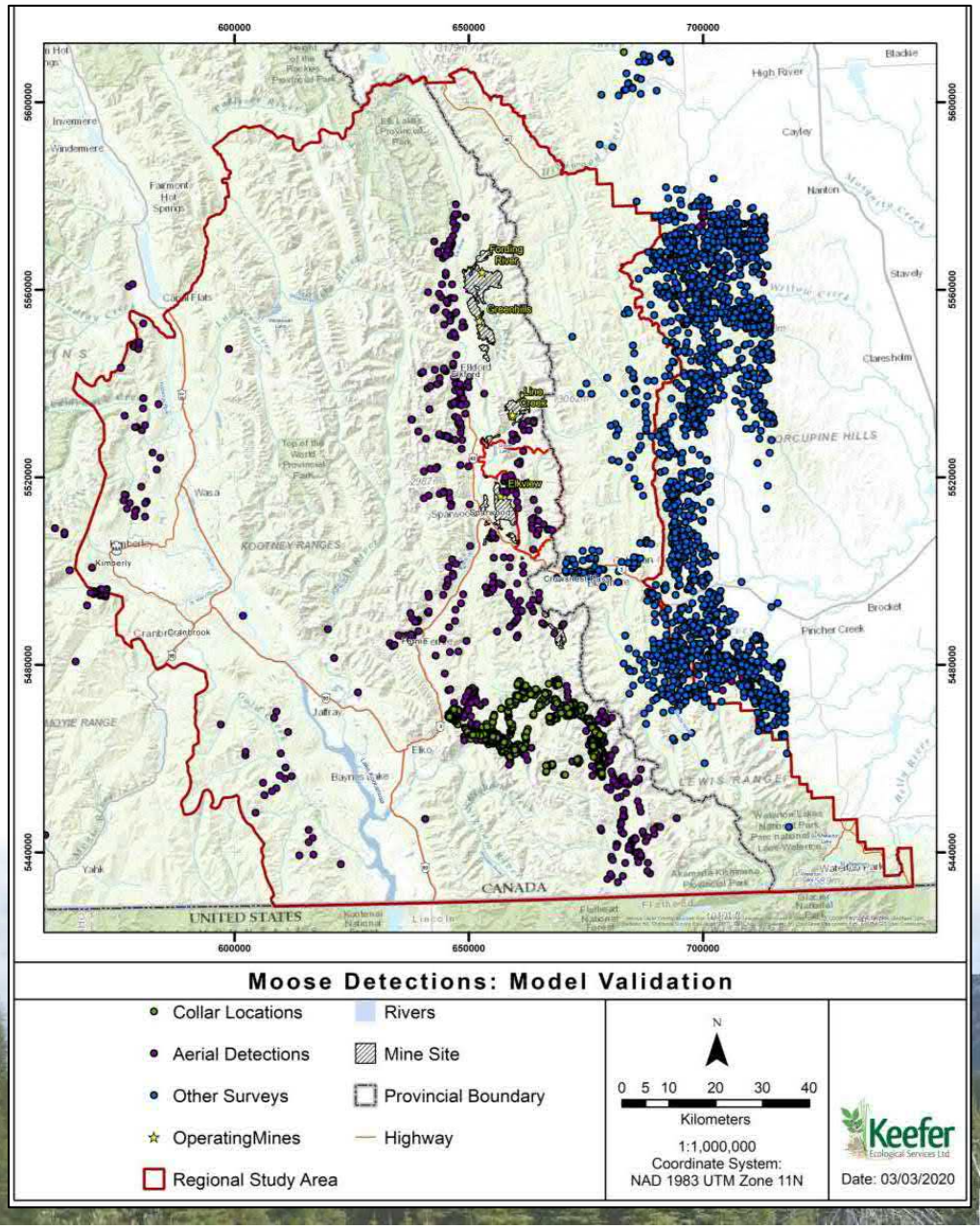
Figure 6-9. Spatial output of DENNING relative habitat probability for grizzly bears across the regional and local study areas to inform environmental assessment for NWP Coal's Crown Mountain Project within the southern Canadian Rocky Mountains.

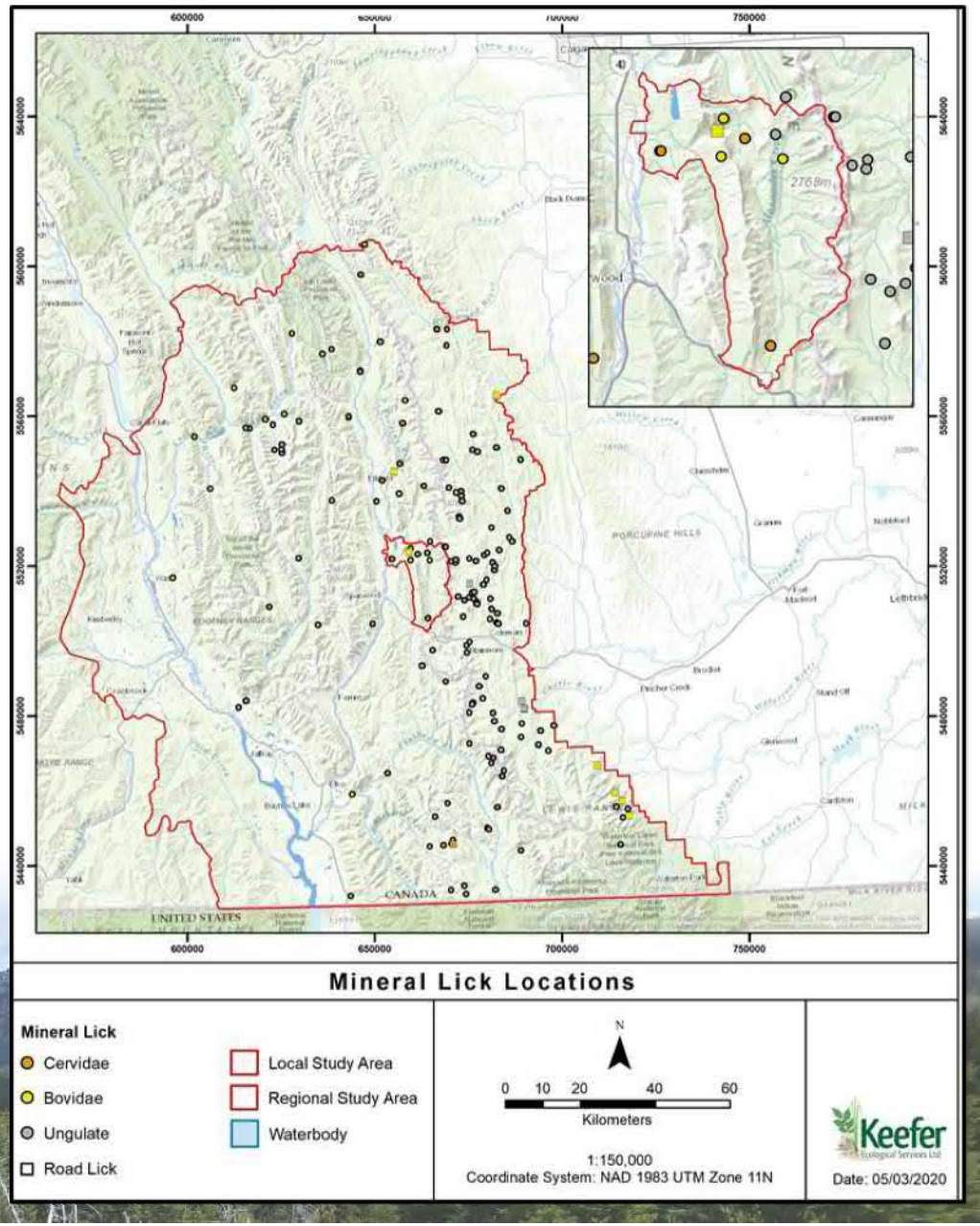
Assessment of Wildlife VCs: Regional and Local Data





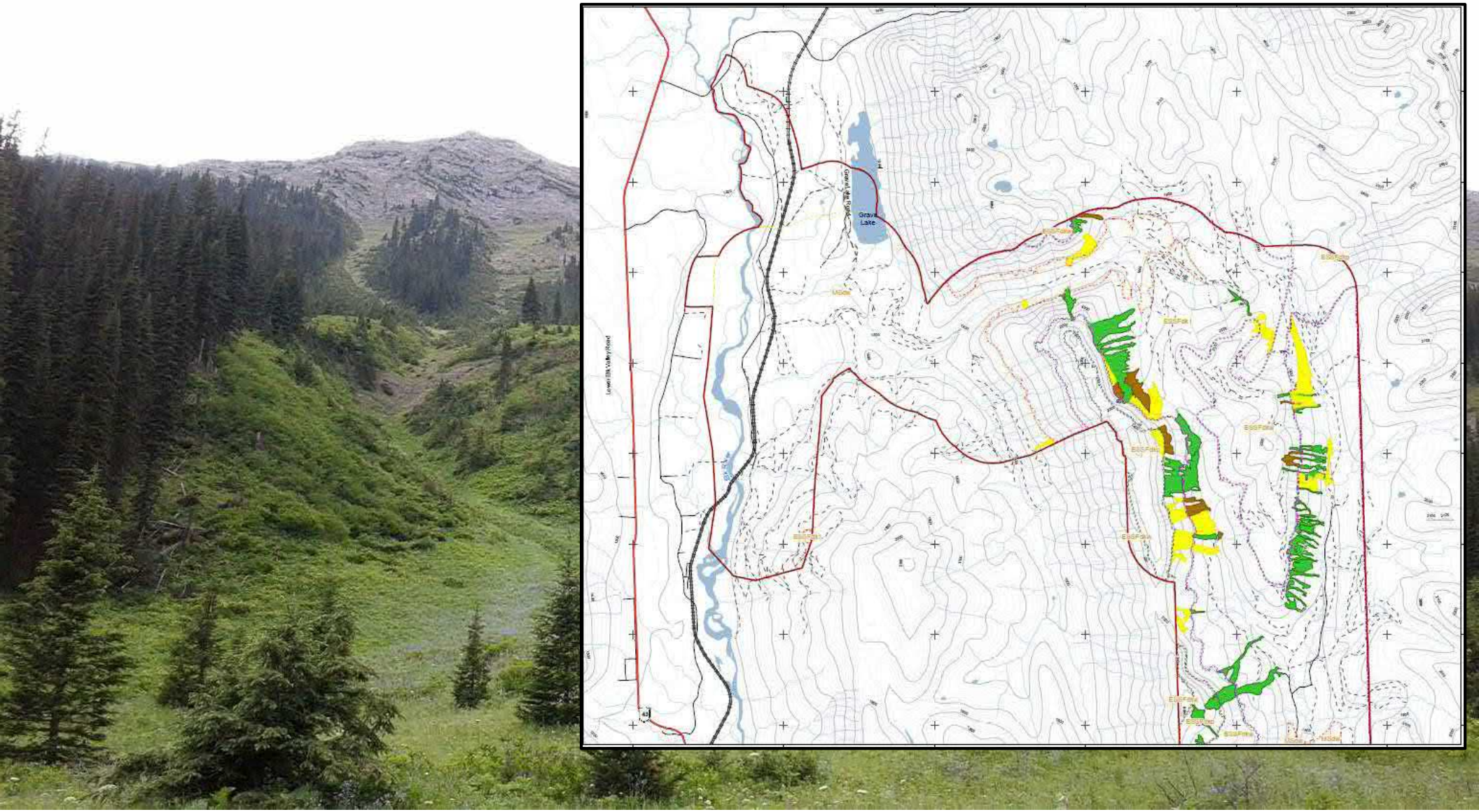
Assessment of Wildlife VCs: Regional and Local Data



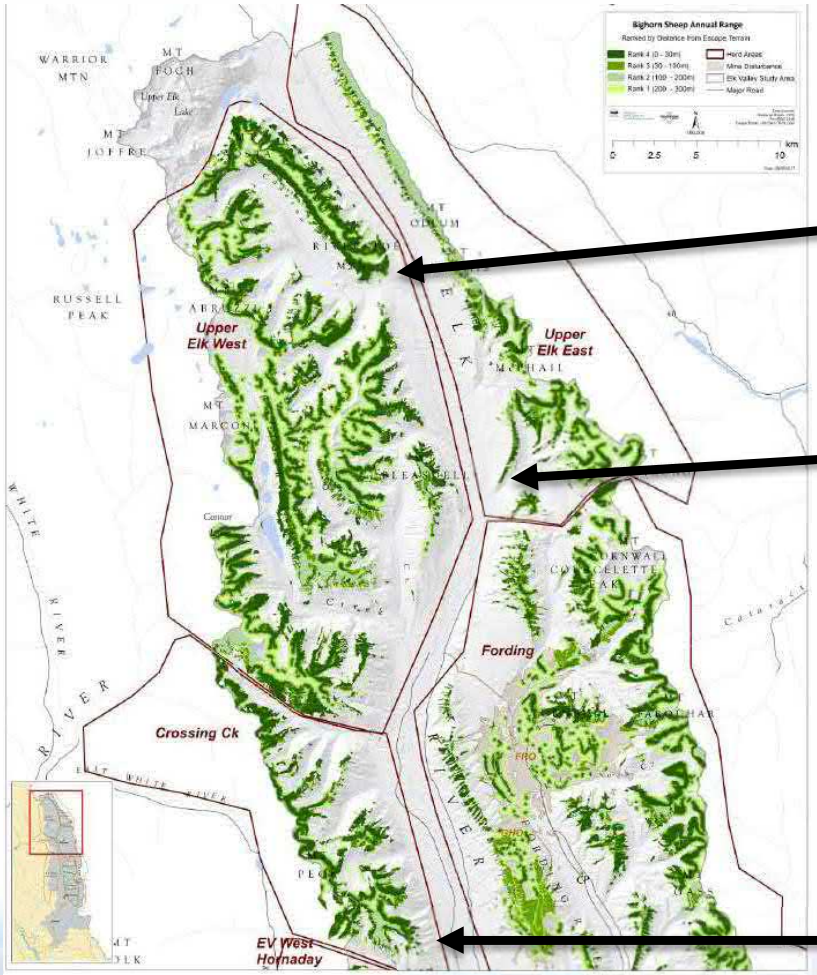


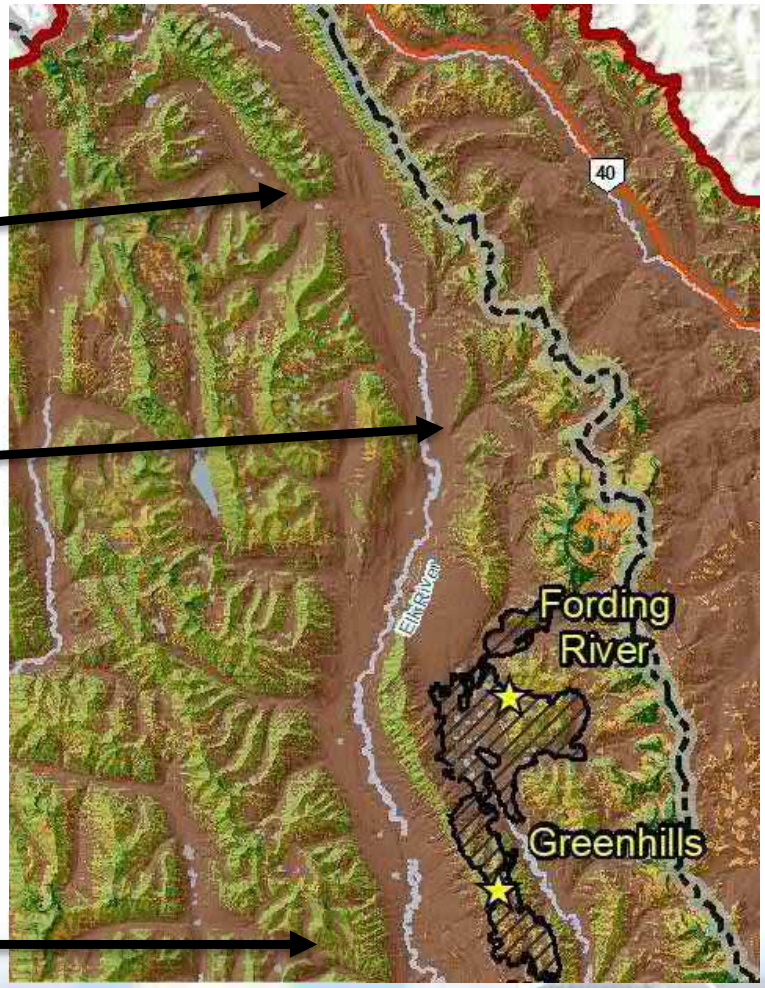
Assessment of Wildlife VCs: Regional and Local Data

Assessment of Wildlife VCs: TEM

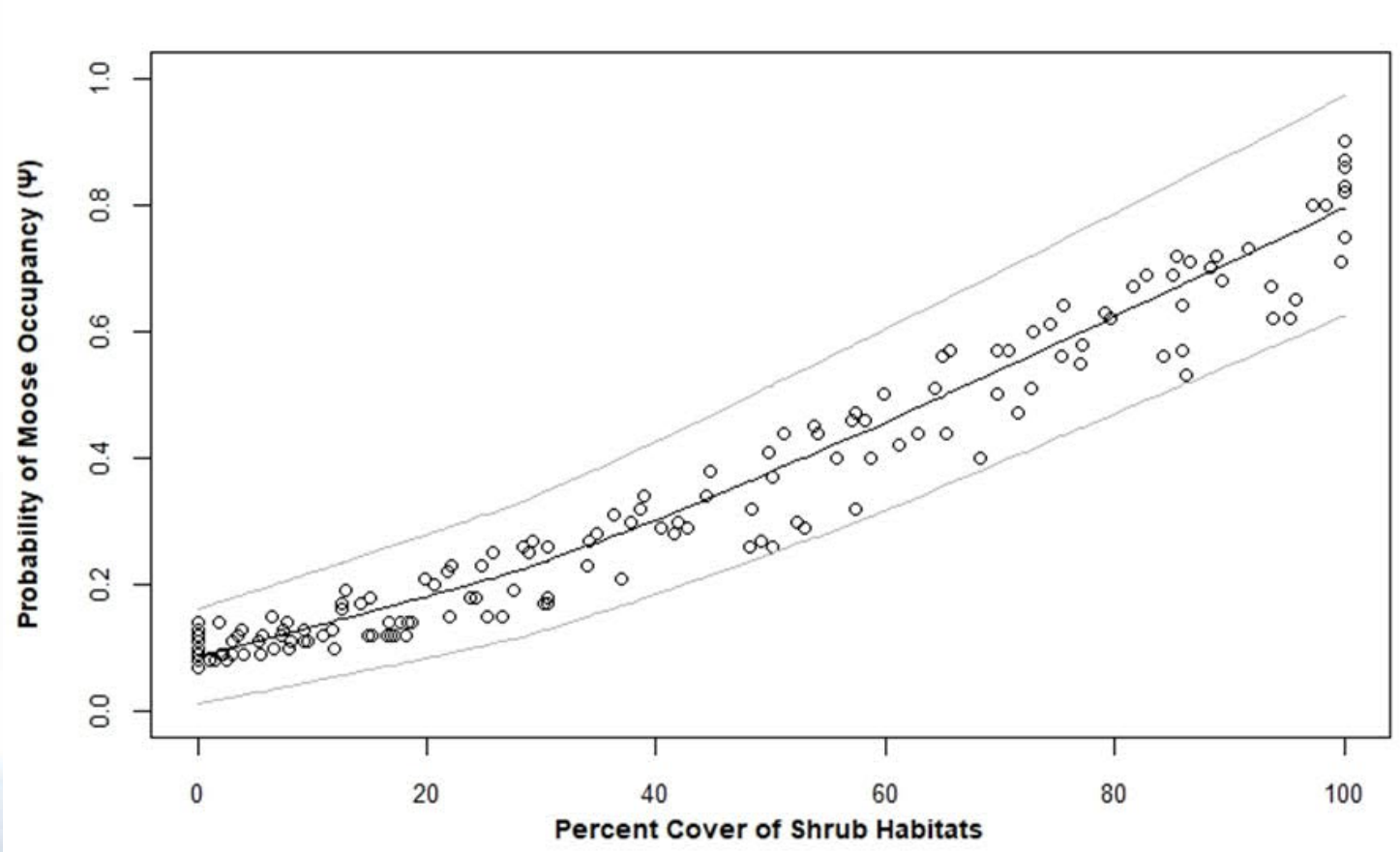


Assessment of Wildlife VCs: Modelling Results

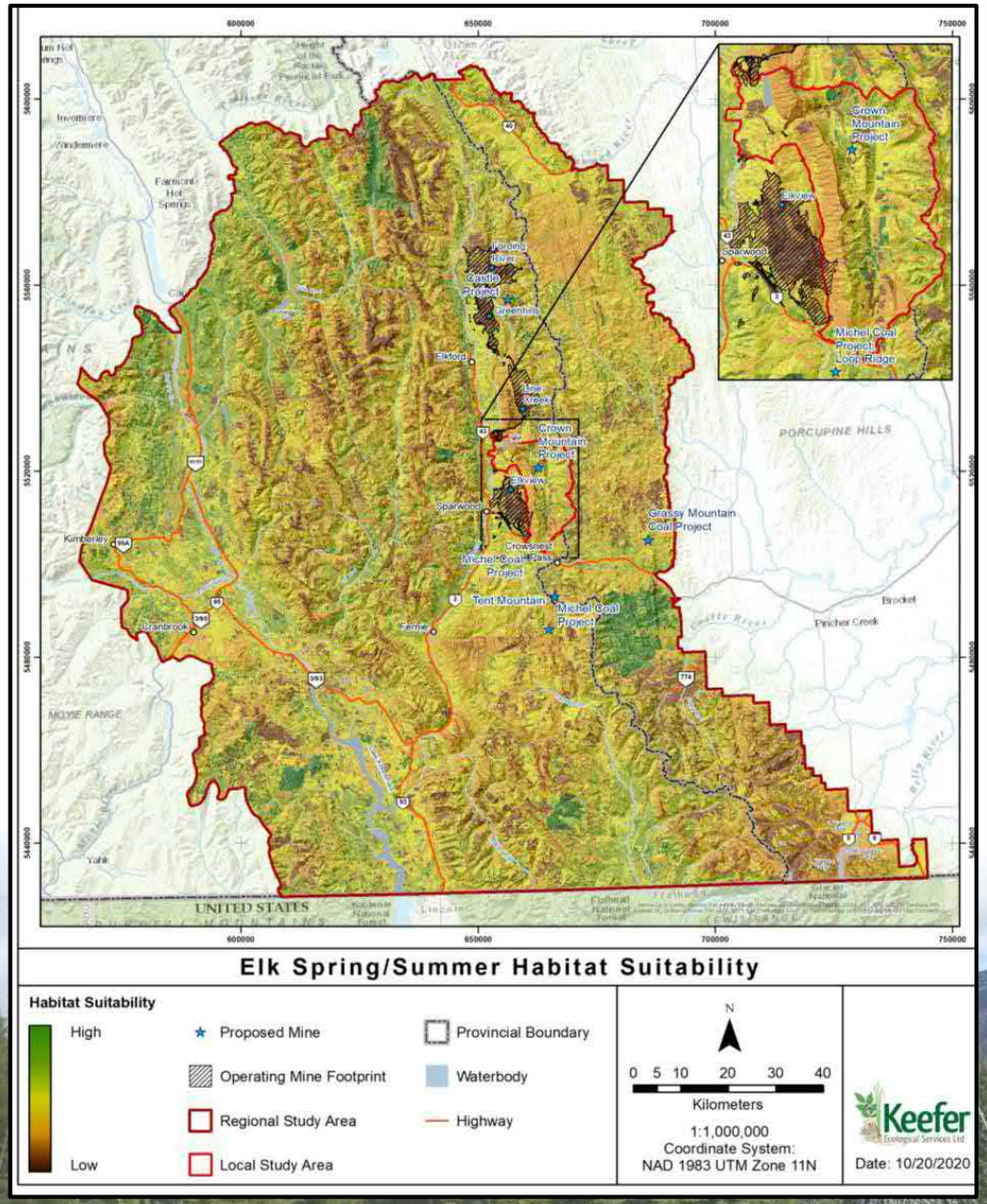


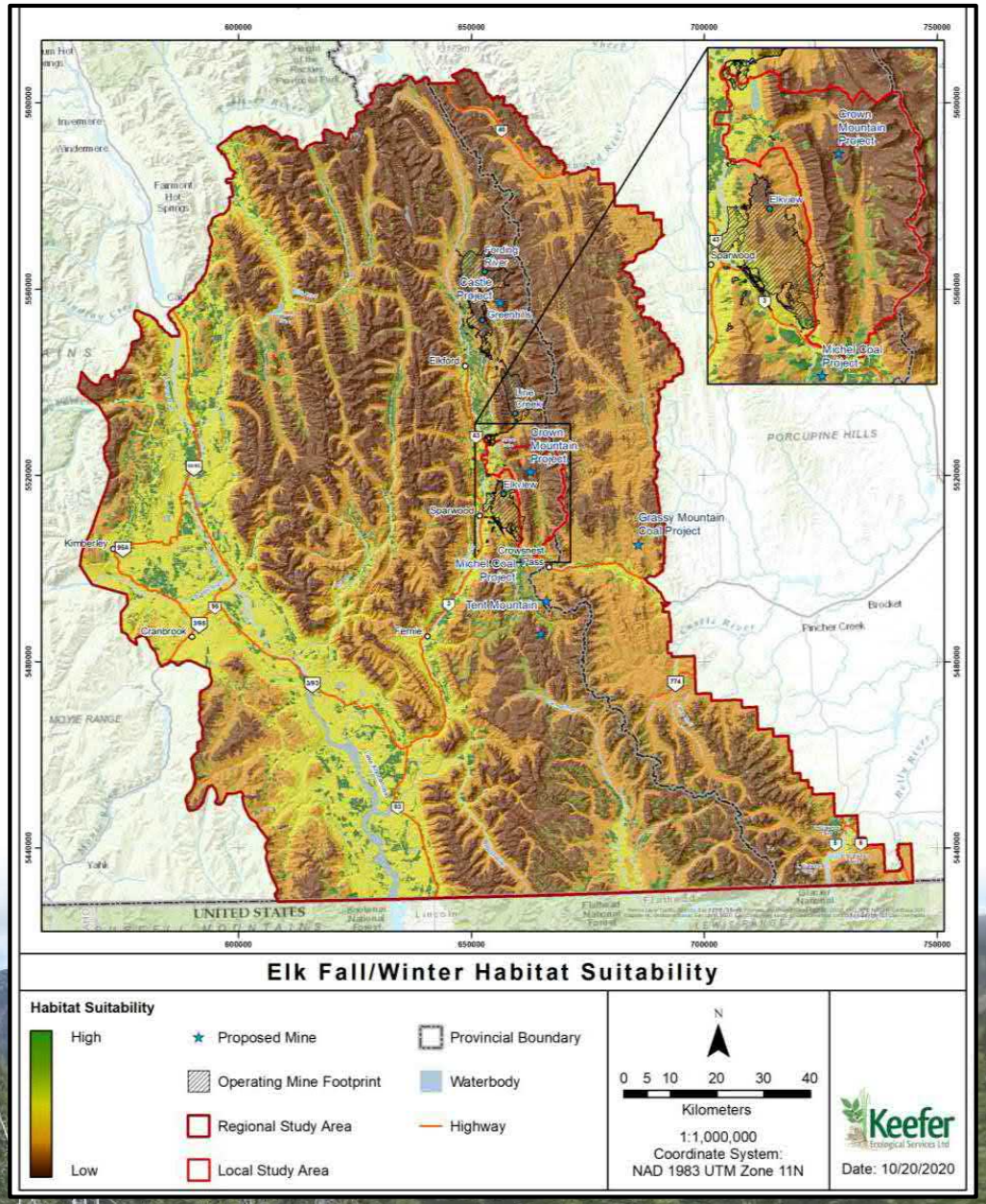


Assessment of Wildlife VCs: Modelling Results

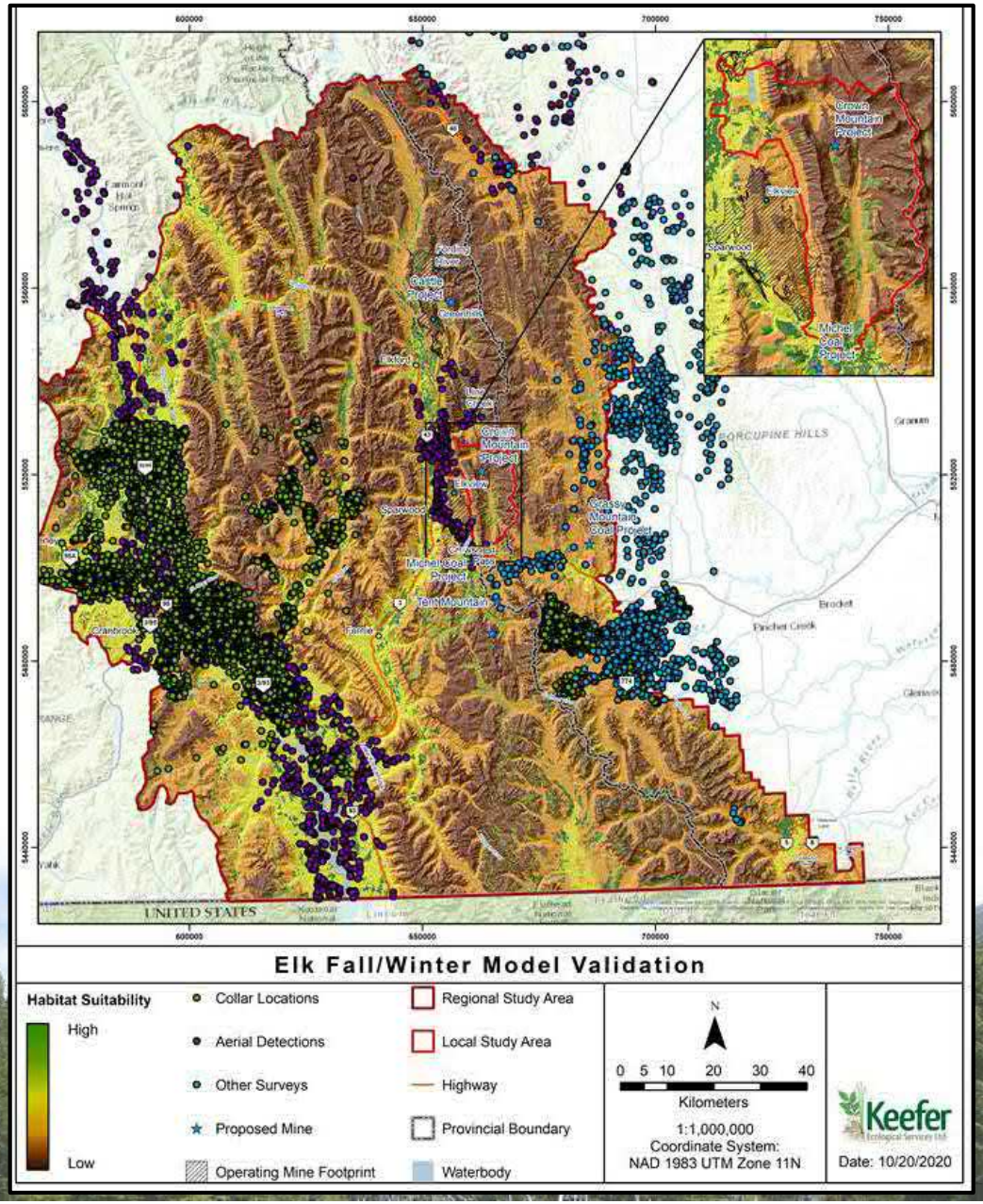


Base Case: Habitat Availability





Base Case: Habitat Availability



Base Case: Habitat Availability

Extent of summer and winter habitat for Elk in the LSA and RSA

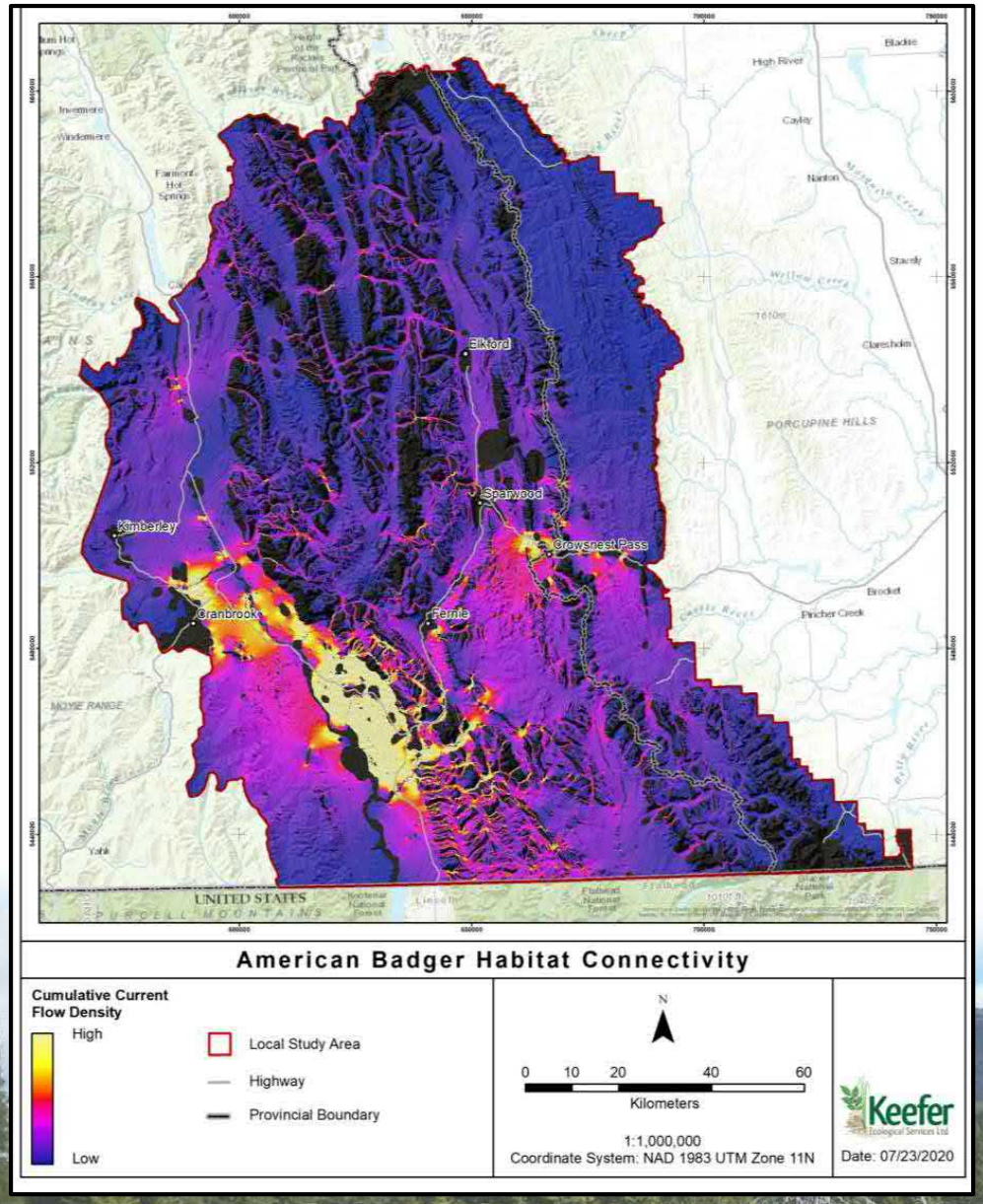
Habitat Quality Rating	Amount of Habitat in the LSA		Amount of Habitat in the RSA	
	Area (ha)	% of LSA	Area (ha)	% of RSA
Summer Requirements				
Very High	275.85	1.14	29328.26	1.56
High	575.51	2.39	103321.03	5.51
Moderate	16166.06	67.03	1127263.03	60.09
Low	6530.71	27.08	533432.19	28.44
Very Low	409.50	1.70	26294.19	1.40
Unclassified	160.98	0.67	31057.57	1.66
Winter Requirements				
Very High	222.57	0.92	6227.39	0.34
High	160.47	0.67	4780.93	0.26
Moderate	47.52	0.20	225078.34	12.16
Low	22307.76	92.49	1367183.59	73.87
Very Low	1220.49	5.06	216662.65	11.71
Unclassified	159.80	0.66	30919.44	1.67

Assessment of Wildlife VCs

<u>Connectivity:</u> The "degree to which landscape facilitates or impedes movement among resource patches" (Taylor et al., 1993)

- **Habitat connectivity** was assessed quantitatively using resistance-surface based modelling techniques (Wade et al., 2015)
- **Effects** were evaluated from empirical data using landscape resistance data from habitat models and circuit theory

Connectivity Modelling

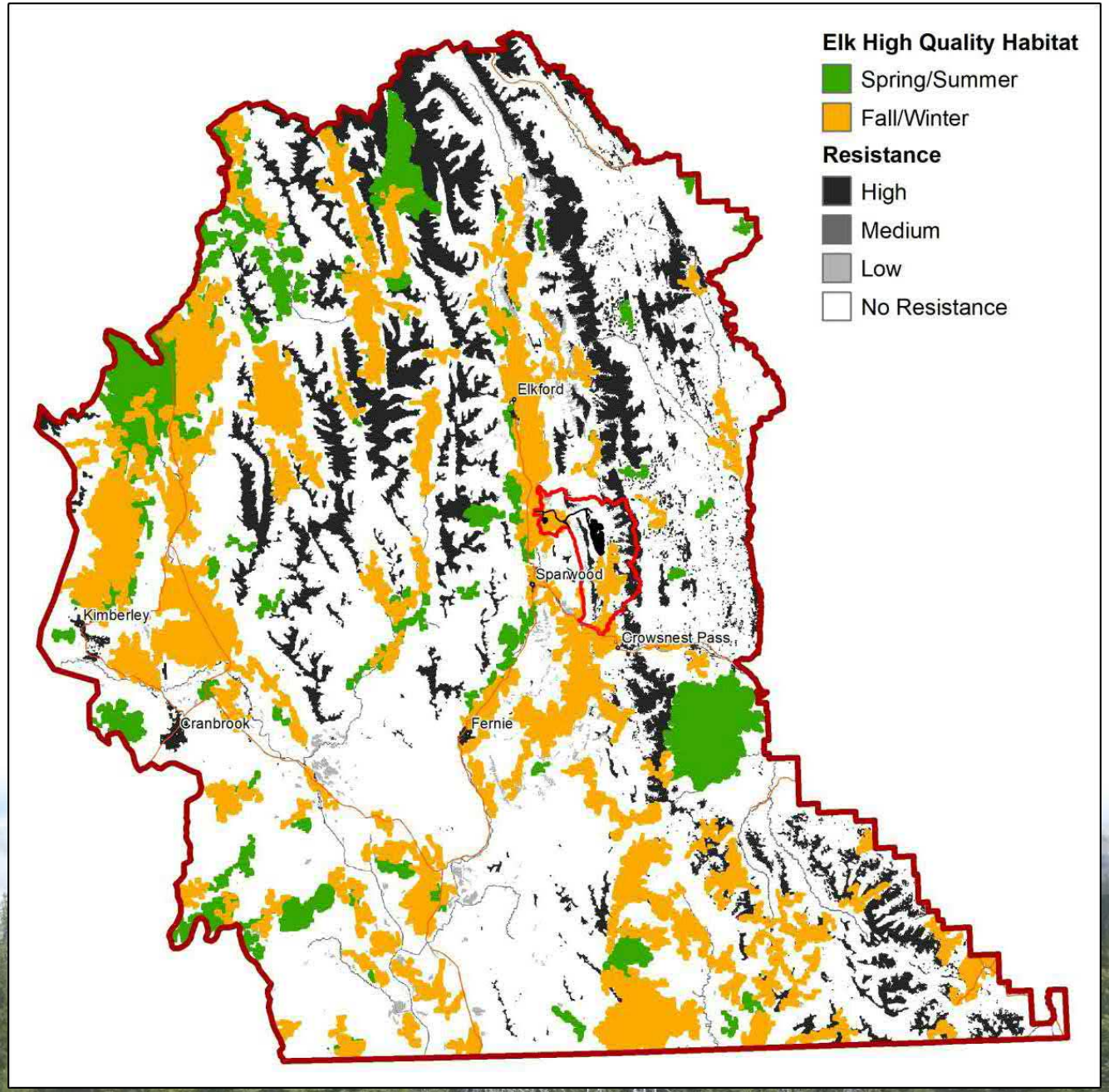


Least Cost Path Analysis

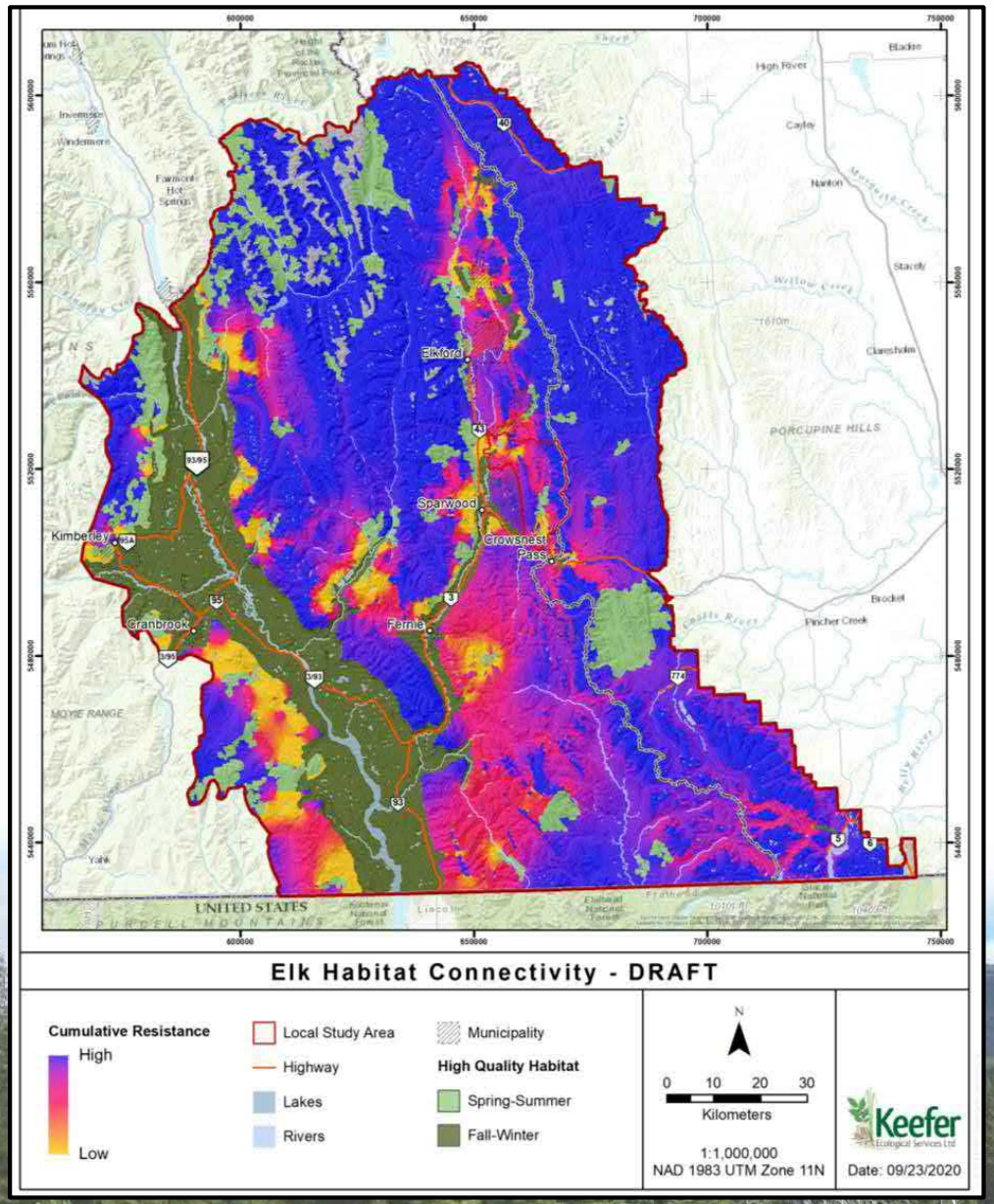
Resistance surfaces based on limiting factors (model parameters)

- Core habitats based on predictive model and known locations (e.g., CDC)

Assessment of Wildlife VCs: Connectivity



Assessment of Wildlife VCs: Connectivity



Quantification:

- Changes in landscape resistance (current flow)
- Species and landscape specific (derived from regional and local data)

Validation

- Mitigation Emphasis Sites (animal collision hotspots)
- Known populations and corridors

Assessment of Wildlife VCs

<u>Abundance</u>

- Demographic data:
  - Group sizes, population structure
  - Species life history traits
  - Published literature/technical reports

Potential effects of relevant developments on mortality risk are discussed for each wildlife VC.

- Mortality factors:
  - **direct mortality** of individuals (e.g., collisions, hunting)
  - **indirect factors** that may cause mortality (e.g., limiting resources, displacement and stress)

Assessment of Wildlife VCs

Seasonal variation in Elk detections using remote cameras

Season	Elk groups detected	Elk individuals detected	Average group size	Females	Males	Unknown	Juveniles
Fall	35	38	1.19	7	8	28	0
Winter	74	91	1.23	33	11	42	5
Spring	114	140	1.23	43	38	47	12
Summer	92	121	1.32	37	43	32	9

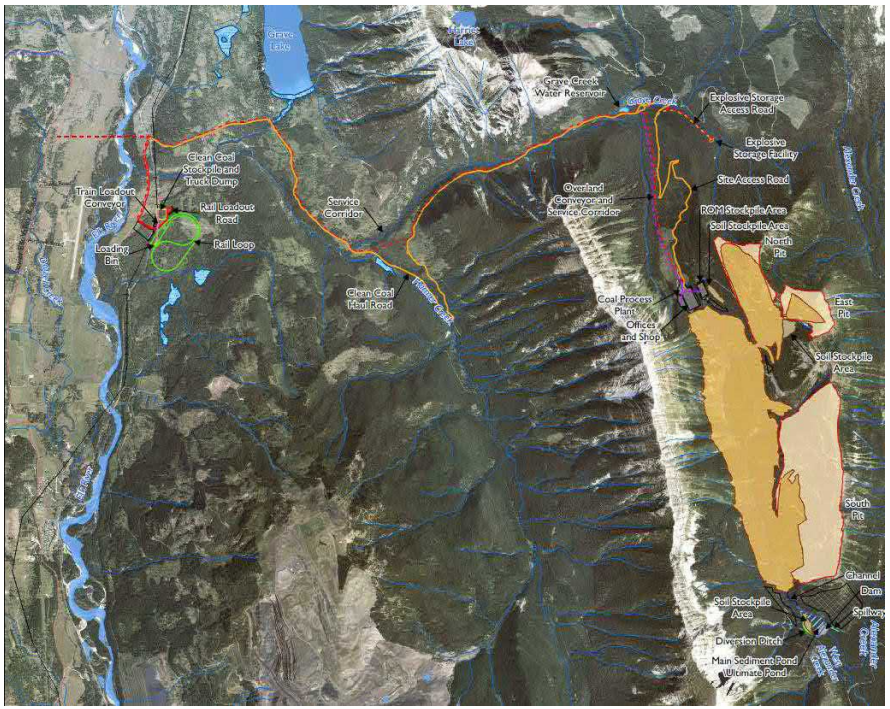
Elk detections during fall, winter and spring aerial transect surveys

Season	Elk Group Sized Detected	Elk Individuals detected	Males	Females	Unclassified	Juveniles
Fall (October, 2014)	1	1	1	-	-	-
Winter (March, 2014)	0	-	-	-	-	-
Spring (June, 2015)	11	27	2	15	6	4
Total	12	28	3	15	6	4

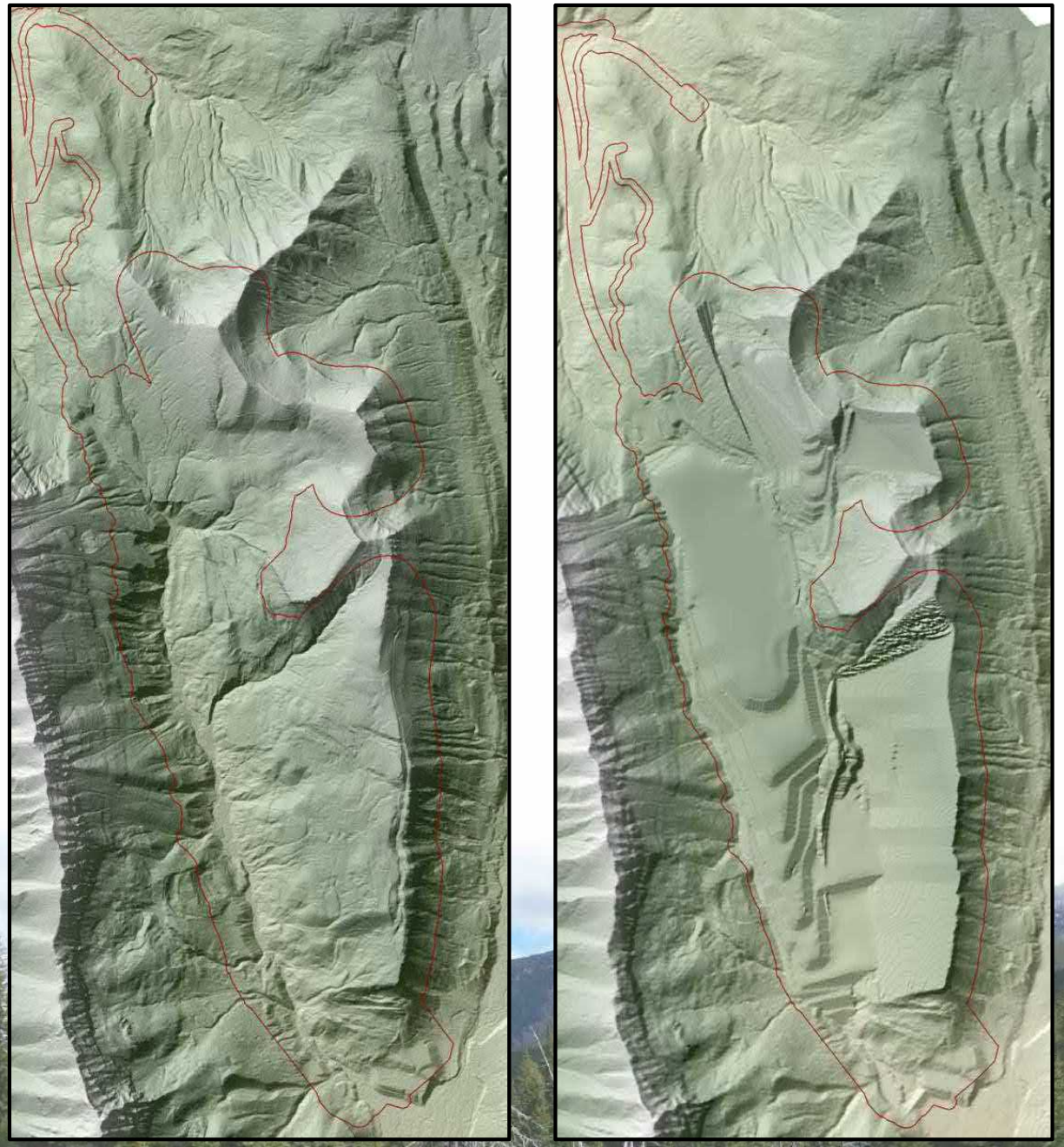
Application Case

- Incremental contributions of residual effects from Project to existing cumulative outcome of previous and existing developments
- Formed by adding the Project to the Base Case
- Base Case wildlife habitat models were updated with the:

1. Project disturbance footprint (Maximum extent)
2. Post-mine DEM/TEM



Application Case: Post-Mine DEM



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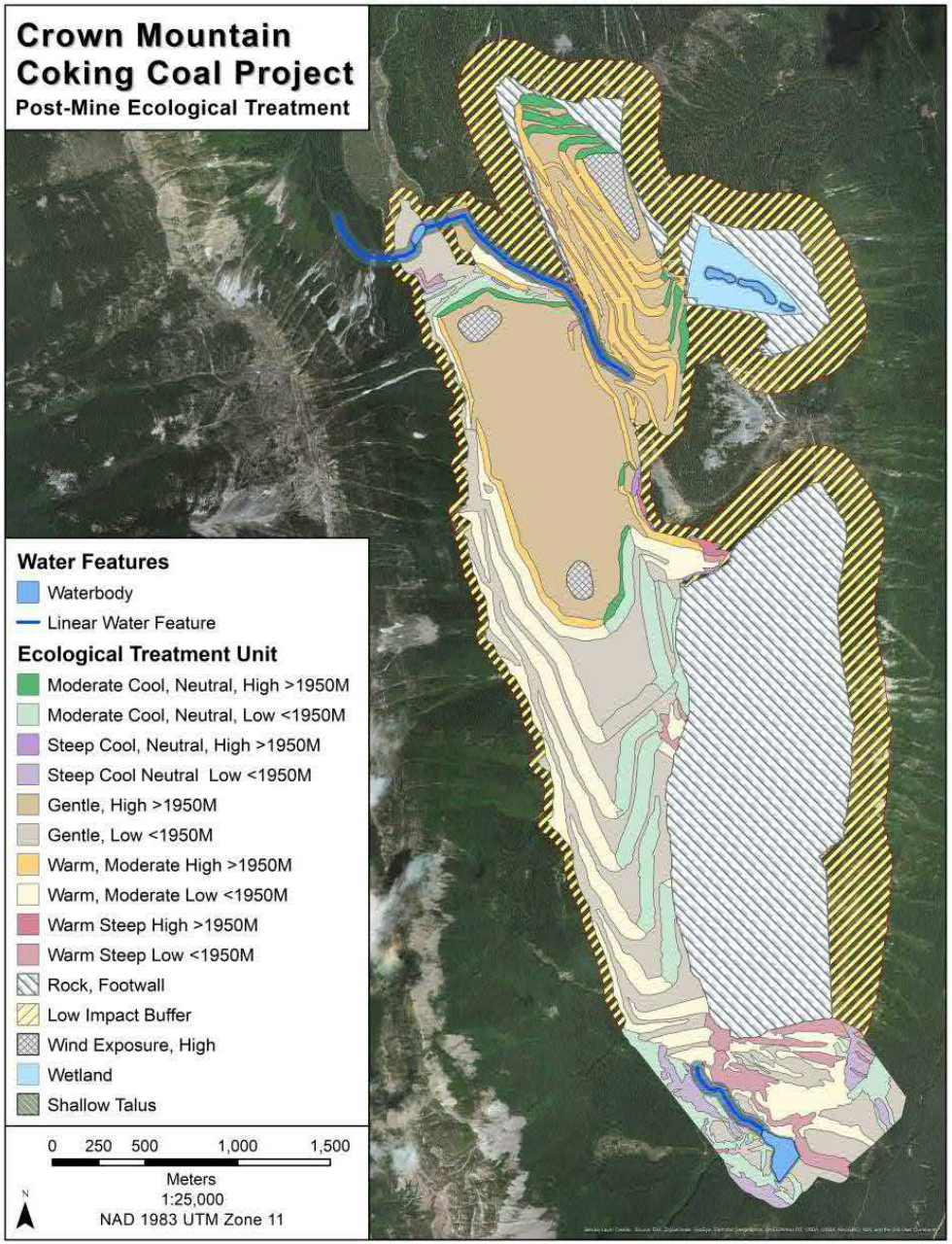
Application Case: Post-mine TEM



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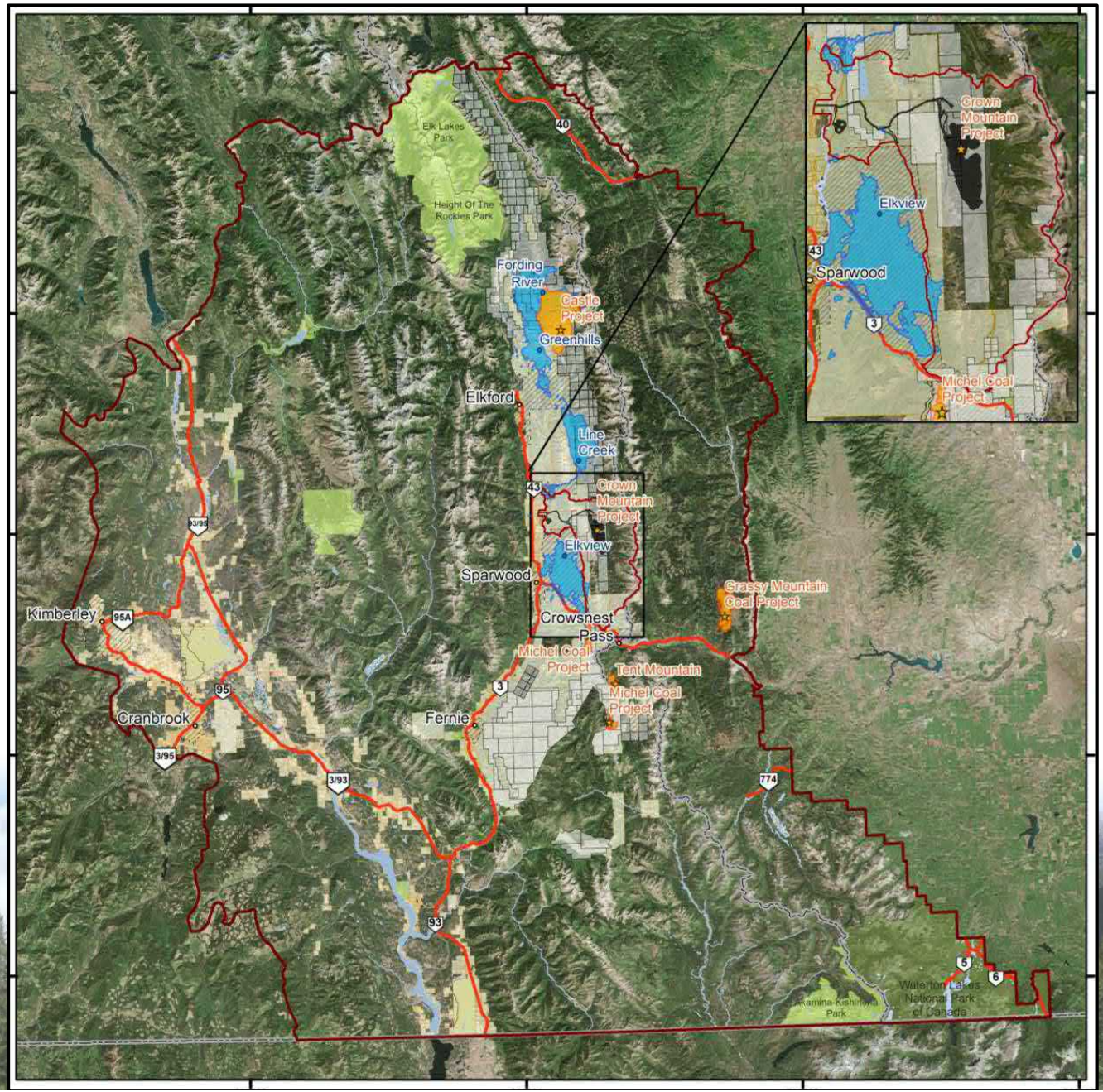
Application Case: Disturbance



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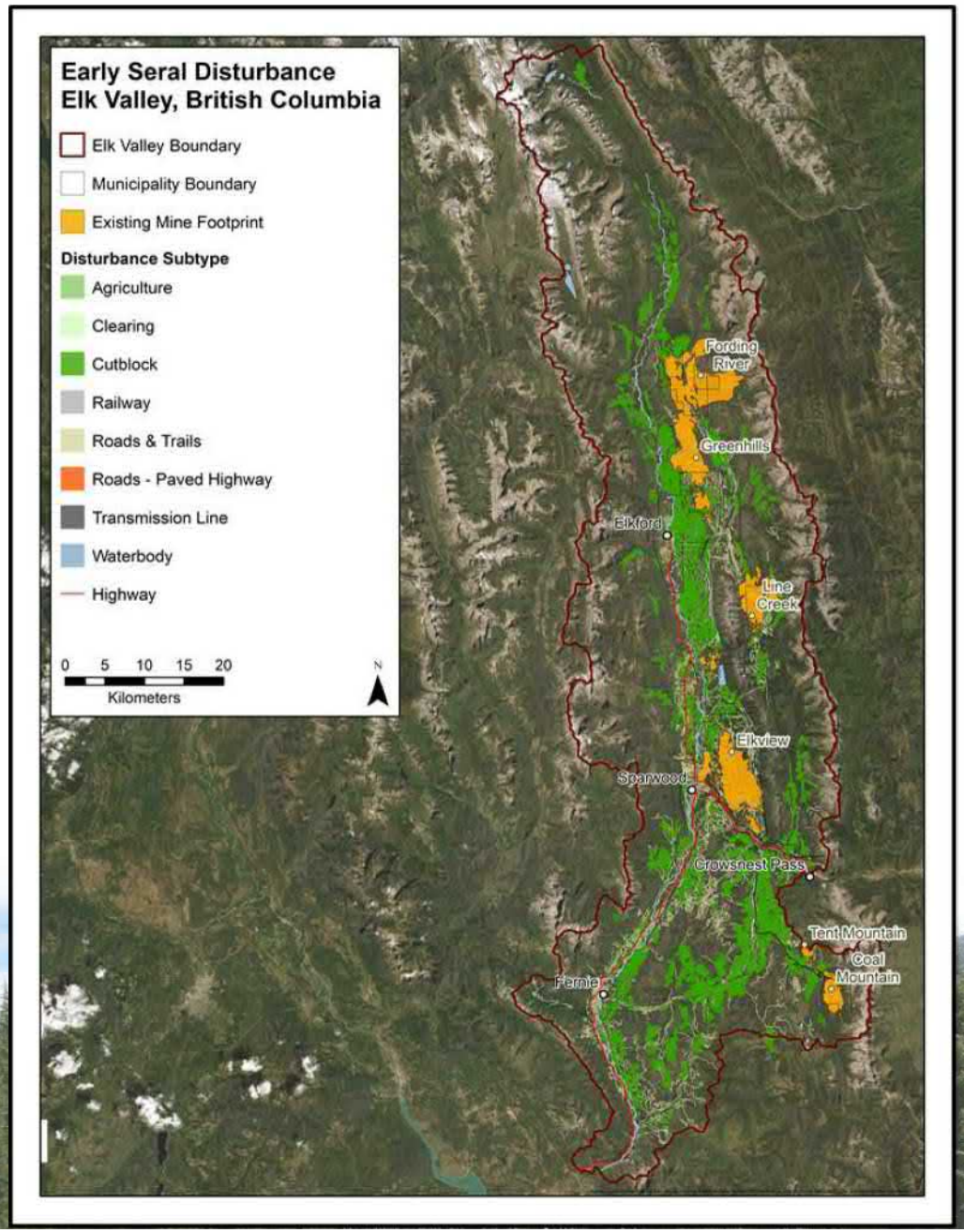
Application Case: Disturbance




Questions and Discussion
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