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AMERICAN BADGER BURROW SURVEY; BRISCO MINERAL CLAIM #1042750

American Badger Burrow Survey; Brisco Mineral Claim #1042750

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12 September 2018

Scott Allan
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Regarding: American Badger Burrow Survey; Brisco Mineral Claim #1042750

Dear Mr. Allan,

Grassroots Environmental Services is pleased to deliver the enclosed copy of our American Badger Species Inventory report. As a representative of Fireside Minerals and the project QEP, Grassroots conducted a burrow search within the proposed project footprint. Based on the information collected at the site site west of Brisco BC, a summary of findings is presented herein.

This document has been prepared at the request of Fireside Minerals, and all contents remain the property of and are for the sole discretionary use of Fireside and their clientele. If you have any questions, concerns or comments, please contact the undersigned at your convenience.

Sincerely,
Grassroots Environmental Services

Scott Wilson
Senior Biologist
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Encl.

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by Grassroots Environmental Services Limited ("Consultant") for the benefit of Fireside Minerals ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

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This Statement of Qualifications and Limitations is attached to and forms part of the Report, and any use of the Report is subject to the terms herein.

Executive Summary

An American badger (*Taxidea taxis*) burrow search was completed on behalf of Fireside Minerals, at a mineral claim (#1042750) near Brisco, in the Columbia Valley of BC. The client wishes to develop this mineral claim, and a badger survey is required by the BC Ministry of Environment prior to undertaking work. Grassroots Environmental Services was contracted to conduct the biological survey, and completed the fieldwork August 23, 2018. Standardized RISC sampling protocols were employed.

As per Fireside's request, Grassroots also searched for signs of olive-sided flycatcher (*Contopus cooperi*) and raptors. One raptor call was heard outside the study area. One olive-sided flycatcher was observed inside the study area. No American badger burrows or signs of badgers were observed within the study area. One abandoned mammal burrow was noted next to the access road, outside the study area. Results are indicative of the low badger density in BC and this valley in particular, which supports approximately 100 – 160 adult badgers. The population of ground squirrels and other prey species in the immediate area seemed low to support an adult badger.

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Introduction

Fireside Minerals (Fireside) has subsurface rights to mineral claim #1042750, west of Brisco BC. Fireside is seeking barite for their industrial operations and plan to explore this claim starting September 2018. American badger (*Taxidea taxis*) are known to inhabit the drier, west-facing slopes of the Southern Rocky Mountain Trench where the claim resides. This geographic area is thought to have as few as 100 adult badgers. The Government of British Columbia requires a badger den survey prior to disturbing the area, and stipulates that any wildlife surveys must adhere to the protocols set forth by the Resource Inventory Standards Committee (RISC) (Ministry of Environment, Land and Parks (MOELP) 1998). Fireside contracted Grassroots Environmental Services (Grassroots) to identify potential badger dens, olive-sided flycatcher (*Contopus cooperi*) and raptor observances, and to ensure that the regulatory requirements of the Ministry of Environment (MOE) are satisfied.

As a Qualified Environment Professional (QEP), Grassroots conducted a badger den search and subsequent desktop review for available habitat information. Documents reviewed include:

- *Recovery plan for American Badger (Taxidea taxus) in British Columbia*. (BC Badger Recovery Team 2016)
- *An Introduction to the Ecoregions of British Columbia*. (Demarchi, D.A. 2011)
- *The Ecology of the Interior Douglas-fir Zone*. (Egan, B. 1997)
- *The Ecological Framework of Canada*. (Environment Canada 2018)
- *The Ecology of the Montane Spruce Zone*. (McDowell, J.A. and D. Lloyd. 1999)
- *Inventory Methods for Medium-sized Territorial Carnivores: Badgers.* (MOE 2007)
- *Species Inventory Fundamentals.* (MOELP 1998)

This resulting Assessment Report includes a discussion of the habitat requirements and local distribution of American badger, study approach, results and implications of this survey.

Project & Study Area

The project occurs in the Southern Rocky Mountain Trench ecoregion of the Montane Cordillera ecozone (Environment Canada 2018). This ecoregion is a long, narrow complex of ecosystems that occupy the valley of this major geological fault that runs between the Columbia Mountains and the Rocky Mountains. The Southern Rocky Mountain Trench is a linear, steep-walled, faulted valley about 480 km long. The valley floor is relatively level and can vary in width from less than 1 km to 20 km. Valley bottom vegetation ranges from bunchgrass, ponderosa pine, and Douglas-fir in the south, to western red cedar and western hemlock in the central portion, and to white and black spruce and lodgepole pine in the northern portions of the ecoregion. Characteristic wildlife includes elk, moose, mule and white-tailed deer, bighorn sheep, grizzly and black bear, cougar, coyote, grouse, and waterfowl.

The study area is within the Upper Columbia Valley ecosection (Demarchi 2011). This ecosection is a broad intermountain plain, that is widest in the southern portion and becomes much narrower in the northern portion past Parson. Most of the sedimentary bedrock outcrops are of Purcell Mountain volcanic origin that were laid down in a shallow sea on the western margin of the North American Craton before the mountain building episodes of about 200 million years ago. The dry, silty and sandy sites on the benchlands have dry Interior Douglas-fir forests; these forests become moister further north from Brisco to Golden. Montane Spruce forests occur on the higher benches on the western side against the Purcell

Mountains and in the Spillimacheen/Francis valley. Moist Interior Cedar – Hemlock forests on the higher benches against the Dogtooth Ranges in the northwest and the Brisco Range in the northeast. This area has been logged, farmed, and more recently it has seen the impact of recreational development. The three largest communities in this ecosection are: Invermere, Radium Hot Springs and Golden.

The Interior Douglas-fir biogeoclimatic zone spreads across low- to mid-elevations in the east Kootenays, while the Montane Spruce biogeoclimatic zone is slightly higher in elevation (Egan, B. 1997; McDowell, J.A. and D. Lloyd. 1999). The ecology, temperature regime and vegetation of the Montane Spruce zone represent the study area more closely.

The study area lies approximately 4 km west of Brisco, BC (Figure 1), approximately 75 km south of Golden and 29 km north of Radium. A previously clear-cut area (yellow boundary) surrounds a work zone (shaded white) approximately 10 ha in size (Figure 2), center at 547121 E, 5630585 N, Zone 11, Nad83 or 5-32-21-17 W5M. The green shaded area is still forested. Transect lines (blue) were followed in the field (orange). Waypoints and photographs of note are included on the figure.

Figure 1: Area Overview Map in relation to Brisco, BC.
(Adapted from Google Earth Pro 2018)

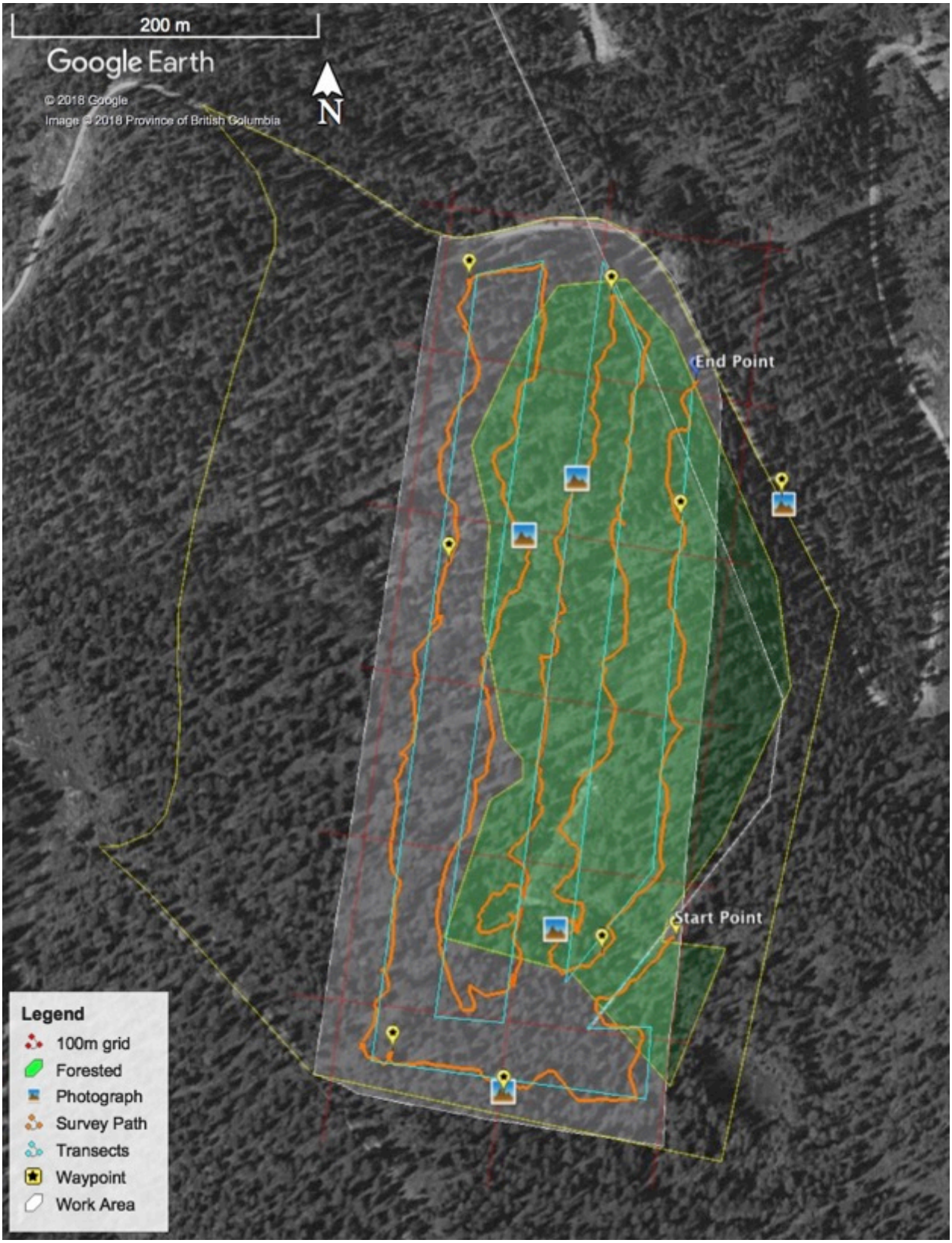

Figure 2: American Badger Burrow Search Map, 23 August 2018.
(Adapted from Google Earth Pro 2018)

Summary of Existing Information

The American badger (*Taxidea taxis*) has an extensive range; from the western and central United States, northern Mexico, and south-central Canada to certain areas of southwestern British Columbia (BC). Three subspecies of badgers occur in Canada, where it is distributed from BC's Interior to southwestern Ontario. Within BC, all American Badgers are considered to be the *jeffersonii* subspecies, within which two distinct populations are recognized: Western Population and Eastern Population (COSEWIC 2012). Individuals in the Rocky Mountain Trench show distinct genetic differences from other badgers due to geographic barriers (BC Badger Recovery Team 2016).

In BC, American badgers are a listed species at risk (Table 1), requiring special management consideration. The majority of the Eastern Population occurs in the Rocky Mountain Trench EO in the East Kootenay region of southeastern BC. Their range here extends from the United States border at Grasmere, B.C., north to Golden, B.C. The Elk Valley between the Rocky Mountain Trench and the Alberta border also supports American Badgers, as does the Creston/Yahk area of the Central Kootenay region (BC Badger Recovery Team 2016). Between 100 and 160 mature individuals are estimated to occur in the Eastern Population.

Table 1: American Badger (*Taxidea taxis jeffersonii*) Status Information (adapted from BC Badger Recovery Team 2016).

Agency / Legislation	Status or Designation	Comments / Details
FRPA	Species at Risk	Species at Risk = a listed species that requires special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* and/or the impacts of oil and gas activities on Crown land under the *Oil and Gas Activities Act* as described in the Identified Wildlife Management Strategy.
OGAA	Species at Risk	
BC Wildlife Act	Schedule A	Schedule A = designated as wildlife under the *Wildlife Act,* which offers it protection from direct persecution and mortality.
SARA	Schedule 1 Endangered (2003)	Schedule 1 = found on the List of Wildlife Species at Risk under the *Species at Risk Act.*
BC List	Red	Red: Includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia.
BC Rank	S2 (2015)	S = subnational; N = national; G = global; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure.
National Rank[1]	N4 (2012)	
Global Rank	G5 (2012)	

Notes: [1] All badger subspecies are collectively ranked nationally at the species level, Taxidea taxus.

The American badger's habitat is typified by open grasslands with available prey (such as mice, squirrels, and groundhogs). The species prefers areas such as prairie regions with sandy loam soils where it can dig more easily for its prey (see Table 2 below for a habitat preference). Badger density depends heavily on prey availability.

Table 2: Summary of essential functions, features, and attributes of American Badger habitat in BC (BC Badger Recovery Team 2016).

Life stage	Function[1]	Feature(s)[2]	Attribute(s)[3]
Adults	Feeding/foraging	Suitable prey	Colonial fossorial rodents; primarily Columbian Ground Squirrels (where present). Non-forested to open forest sites with well-developed grass or forb community. Typically in valley bottom locations but also in mid-elevation forest clearings (resulting from forestry) and alpine environments.
	Denning (security, thermal, reproductive cover)	Unconsolidated sediments >1 m deep and suitable for denning	Preferred soil types include: Brunisols and Chernozems on Aeolian, Glacio-lacustrine, Lacustrine and Fluvial parent materials, with low coarse fragments.
			Often adjacent to large rodent burrow complexes, and often (but not always) well-removed from human disturbance.
Juveniles	Dispersal	Continuous habitat and/or corridors that are not unduly impeded by anthropogenic barriers, such as major roadways and large developed areas.	Typically lower relief valley bottom grasslands and open forests in the Bunchgrass, Ponderosa Pine, and Interior Douglas Fir biogeoclimatic zones, but also mid-elevation forest clearings up to and including the Alpine biogeoclimatic zone.
Adult female	Reproduction	Male Badgers	Female Badgers are induced ovulators (multiple breedings required to induce ovulation), so access to multiple males may be necessary. This may be a challenge in low-density populations.
Adult male	Reproduction	Female Badgers	Male Badger occurrence during breeding season (June–July) is a function of search for females. Especially in low-density populations, this can lead to large home ranges and Badger occurrences in atypical habitats.

Notes: [1] Function: a life-cycle process of the species (e.g., include either animal or plant examples: spawning, breeding, denning, nursery, rearing, feeding/foraging and migration; flowering, fruiting, seed dispersing, germinating, seedling development).

[2] Feature: the essential structural components of the habitat required by the species.

[3] Attribute: the building blocks or measurable characteristics of a feature.

Methods

This assessment was undertaken to meet the requirements of RISC sampling protocols. (MOE 2007; MOELP 1998). Scott Wilson of Grassroots Environmental Services completed all phases of this work. Mr. Wilson is a Registered Professional Biologist (R.P.Bio, #2469) and has experience conducting badger surveys in this geographic region; in 2009 he was part of an AECOM biological team conducting baseline surveys for a proposed transmission line in the Columbia Valley. The surveys included bird, wildlife and vegetation inventories to document any sensitive ecosystem components, and ranged from Invermere to Golden among the very same habitat types as this mineral claim.

Desktop

Desktop preparations included an aerial review of the study area using Google Earth Pro, creation of a 100m x 100m survey grid, and creation of survey transects with sufficient density for the study area (25 m parallel spacing. Five main north-south transects, with minor connectors at the ends, were spaced to ensure good coverage within the different vegetation types of the study area.

Field

Once in the field, Mr. Wilson began the survey near the south of the work area, working toward the northeast. Using Map Plus (for iPhone), he followed the transect lines as closely as possible, carefully observing at least 5m width on both sides of the transect center. At the start point, end point, and several intermediate locations Scott stopped and waited 3 minutes to observe and listen for raptors and olive-sided flycatchers. If any of the above creatures or signs were seen or heard, a GPS waypoint, photos and appropriate notes were collected. Waypoints were collected in Universal Transverse Mercator (UTM) system (Zone 11U, Nad83). Photos were captured with an iPhone SE.

Analysis

This report layout is preferred and determined by RISC (MOELP 1998). The document was written in Microsoft Word on a Mac OS. No statistics were completed on the data results. Spatial data was interpreted and mapped using Google Earth Pro. Shapefiles were handled with QGIS.

Results

During the survey, approximately 3.3 km were covered in 2 hours, at an average speed of 1.5 km/h. No badgers, badger signs or badger dens were observed within the proposed work area. One abandoned mammal burrow (not confirmed as badger) was observed outside the project area, adjacent to an access road. The burrow opening was choked with dry leaf litter, and there were seedlings growing from the earthen mound.

One olive-sided flycatcher was observed atop a snag within the clear-cut area at 547102 E, 5630324 N. While collecting the flycatcher waypoint, one raptor cry (red-tailed hawk) was heard from east of the study area. A downed tree root-wad was inspected for signs of habitation. An abandoned grass ground-nest was noted. An extensive squirrel midden was observed at 547134 E, 5630420 N, just south of the existing rock cut/mineral exploration. Two apparent bear dig sites were noted. A summary of the waypoints collected during the survey is provided in Table 3. Select site photographs are included in **Appendix A**.

Table 3: Waypoints collected on 23 August, 2018.

Waypoint ID	Easting[1]	Northing[1]	Attributes	Photo?[2]
08:32 – Start	547209	5630412	1st listening stop, survey start point	
08:53 – OSFL[3] snag	547102	5630324	Heard hawk cry east of here	Yes
09:02	547036	5630354	2nd listening stop	
09:06	547018	5630359	Downed tree	Yes
09:15	547066	5630642	3rd listening stop	
09:27	547077	5630816	4th listening stop	
09:29	547077	5630813	Old grass bird nest	Yes
09:36	547112	5630658	Bear dig	Yes
10:08	547142	5630693	Bear dig	Yes
10:12	547164	5630807	5th listening stop	
10:32	547134	5630420	Squirrel midden	Yes
10:34	547162	5630404	6th listening stop	
10:42	547206	5630669	7th listening stop	
10:46 – End	547219	5630757	Survey end point	
10:49 – Old burrow	547276	5630688	Abandoned mammal burrow	Yes

Notes: [1] Nad83, Zone 11U
[2] See Appendix A
[3] OSFL = olive-sided flycatcher

Discussion

This small sample area and brief temporal measurement do not add a great deal to the existing American badger knowledge base. Results were as-expected. Special investigations were conducted at chance find locations including squirrel middens, downed-trees and freshly-turned earth, to discover any signs of badger.

Olive sided flycatcher are known to use standing dead trees for perching. One was observed during this study. Several snags have been left in the area after local logging operations and should not be disturbed.

Critique of Inventory Protocols

Conducting the field assessment using 25 m transect spacing allowed the observer to visually assess much more area than the 5m required to either side of the transect center. The small sample area allowed a thorough search of the entire project. This study could have been improved by expanding the size, including additional survey times (winter is preferable), or adding additional passive techniques such as hair-snags or trail cameras.

Management Recommendations

No new management recommendations have arisen from the results of this survey.

Conclusion

No American Badger signs or burrows were found within the study area. A possible abandoned burrow has been noted outside the study area. One olive-sided flycatcher was observed using the clearcut area at the south end of the study area.

This American Badger burrow search has been completed by Grassroots Environmental Services, on behalf of Fireside Minerals. Grassroots has completed these reporting requirements to the best of its ability, using the current information available as of publication. Should you have any concerns or questions concerning the contents of this document, please contact the undersigned at your convenience.

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12 September 2018

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Appendices

Appendix A: Site Photographs

Appendix A: Site Photographs

Photograph 3: OSFL snag near southern edge of Work Area, in clear-cut area.

Photograph 1: Downed tree in clear-cut area, with animal tracks but no dens.

Photograph 2: Remnants of a ground-nest.

Photograph 4: Suspected bear-dig at an old log.

Photograph 5: Another log torn apart; suspected bear dig.

		
Photograph 6: Extensive squirrel midden just south of existing rock-cut area.	**Photograph 7:** Abandoned mammal burrow, outside study area adjacent to access road.	