

DIVERSIFIED ENVIRONMENTAL SERVICES

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BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY BOREAL CARIBOU TELEMETRY PROGRAM

FIXED-WING TELEMETRY MONITORING FLIGHT – MAY 25-26, 2017

Date: May 31, 2017

Attention: Brian Thomson
BC Oil and Gas Research and Innovation Society
Victoria, BC

Executive Summary

On May 25-26, 2017, 108 boreal caribou collar frequencies and 14 wolf collar frequencies were scanned during a scheduled fixed-wing telemetry monitoring flight. Thirty unrecovered caribou collars not detected in the past 6 months and assumed to have exceeded their battery lives were not scanned.

Of the 108 caribou collars scanned, 105 were heard transmitting normal VHF signals and 1 was transmitting a double-pulse low-battery signal; no mortality signals were detected. The remaining 2 collars were not detected, including 1 VHF collar and 1 GPS/satellite collar which ceased GPS data transmission on April 5, 2017.

Background

Between December 17, 2012 and March 31, 2016, 240 individual adult boreal caribou were radio-collared in British Columbia's boreal caribou ranges as part of the *British Columbia Boreal Caribou Implementation Plan* (BCIP). These radio-collars are monitored by fixed-wing telemetry flights conducted at regular intervals throughout the year. Information collected is used to identify caribou mortalities and estimate annual adult female survival rate and population trend.

On May 25-26, 2017, Diversified Environmental Services (DES) conducted a fixed-wing telemetry monitoring flight under contract to the BC Oil and Gas Research and Innovation Society (OGRIS; formerly the *Science and Community Environmental Knowledge Fund* [SCEK]) on behalf of the Research and Effectiveness Monitoring Board (REMB).

Objectives

The objective of the May 25-26, 2017 monitoring flight was to determine the approximate location and VHF beacon status of all boreal caribou and wolf radio-collars believed to be active in BC's boreal caribou ranges. These included caribou and wolf collars deployed on behalf of OGRIS (*hereafter*, SCEK collars), caribou collars deployed on behalf of the Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO), and wolf collars deployed for a University of Alberta research program funded by Nexen Inc.

Methods

The monitoring flight was conducted using a Cessna 180 fixed-wing aircraft equipped with 1 outward-facing directional antenna affixed to each wing strut. Collar frequencies were scanned using Lotek™ STR 1000 and Lotek BioTracker telemetry receivers. The flight was conducted at 1,000-1,500 m above ground level at an average speed of 160 km/hr. The VHF beacon status of all detected collars was recorded on hard copy forms. In the case of VHF collars (Lotek LMRT4), status was recorded as either normal (60 pulses per minute [ppm]) or mortality mode (120 ppm), and a location (+/- 1 km) was recorded using a hand-held GPS unit. As GPS/satellite collars are programmed to log multiple daily locations with high precision, additional effort to obtain collar locations after VHF signal detection is not necessary. Therefore, waypoints for GPS/satellite collars were typically recorded at the location from which the collar was heard, with corrections for estimated bearing and distance, unless the VHF beacon status indicated a collar malfunction or mortality, in which case, more precise locations were obtained.

Results

During the May 2017 monitoring flight, 108 caribou collar frequencies were scanned, including 107 SCEK collars (55 Vectronic Vertex and 52 Lotek VHF) and 1 previously-deployed MFLNRO VHF collar. Thirty unrecovered collars assumed to have exceeded their battery lives were not scanned. These include 28 SCEK GPS collars which have not transmitted data within the past 6 months and 2 MFLNRO VHF collars not detected in the past 8 months. In addition, 14 wolf collar frequencies were scanned during the flight, including 11 SCEK wolf collars (7 Lotek Iridium, 4 Lotek VHF) and 3 University of Alberta/Nexen collars (Lotek Iridium). Several unrecovered SCEK Iridium wolf collars assumed to have exceeded their battery lives were not scanned.

Results of the May 25-26, 2017 monitoring flight are presented in Table 1. Flight paths searched within and adjacent to each boreal caribou core habitat area are shown in Figure 1. Total flight line distance was 2,160 km. Of 108 caribou collar frequencies scanned, 105 normal VHF signals and one double-pulse

low- battery signal were heard; the VHF beacons of the remaining 2 caribou collars were not detected (Fortune VHF SCEK086 and Parker GPS SCEK238). No caribou mortality signals were detected.

Of the 14 wolf collar frequencies scanned during the May 2017 flight, 3 normal VHF signals and 1 low-battery VHF signal (BW044nex) were detected. The remaining 10 wolf collars were not detected. These include 7 GPS/satellite collars whose GPS data transmissions ceased prior to the May monitoring flight. No wolf mortality signals were detected.

There were no opportunities for First Nations field assistance on this monitoring flight.

Cordially,

A handwritten signature in black ink, appearing to read 'Brad Culling', with a stylized flourish at the end.

Brad Culling, R.P. Bio
Diversified Environmental Services
Fort St. John, BC

Table 1. VHF signal status and location of boreal caribou and wolf collars detected during the May 25-26, 2017 OGRIS fixed-wing telemetry monitoring flight.

ID	Species	Range	Core	Collar Type	Status	Date	Zone	East	North	Comments
SCEK112	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	655258	6667371	normal
SCEK113	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	595093	6621185	normal
SCEK120	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	601519	6641527	normal
SCEK122	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	627421	6677534	normal
SCEK123	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	601305	6621501	normal
SCEK125	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	645853	6682166	normal; in NWT
SCEK134	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	648847	6681795	normal
SCEK136b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	5/26/2017	10	609530	6607489	normal
SCEK137	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	5/26/2017	10	n/a	n/a	Heard not located; in NWT
SCEK146b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	5/26/2017	10	607317	6637258	normal
SCEK180	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	5/26/2017	10	646769	6669598	normal
SCEK181b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	5/26/2017	10	621363	6613020	normal
SCEK183	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	5/26/2017	10	593065	6622563	normal
SCEK126b	Caribou	Calendar	RRA-C	Vectr-Vertex	42 ppm	5/26/2017	10	604183	6657701	normal
SCEK107	Caribou	Calendar	RRA-D	Lotek VHF	60 ppm	5/26/2017	10	610246	6635465	normal
SCEK195	Caribou	Chinchaga	Etthithun	Vectr-Vertex	42 ppm	5/25/2017	10	645927	6404404	normal
SCEK224	Caribou	Chinchaga	Etthithun	Vectr-Vertex	42 ppm	5/25/2017	10	634176	6429148	normal
SCEK026b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	671471	6293680	normal
SCEK029	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	641733	6343059	normal
SCEK032	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	642357	6366965	normal
SCEK033b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	663469	6325471	normal
SCEK035	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	632957	6356262	normal
SCEK036b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	611510	6369350	normal
SCEK041	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	637370	6364563	normal
SCEK054	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	639840	6348718	normal
SCEK057	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	634995	6350661	normal
SCEK059	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	647182	6333533	normal
SCEK060	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	602871	6364024	normal
SCEK061	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	5/25/2017	10	667267	6332628	normal
SCEK196	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	630745	6353707	normal
SCEK198	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	655617	6313954	normal
SCEK201	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	664476	6290122	normal
SCEK223	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	634842	6346924	normal
SCEK226	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	5/25/2017	10	670287	6300205	normal
SCEK048	Caribou	Chinchaga	RRA-A	Lotek VHF	60 ppm	5/25/2017	10	600874	6434029	normal
SCEK170b	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm double	5/25/2017	10	648769	6445217	double pulse
SCEK189	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	5/25/2017	10	612938	6440590	normal
SCEK213	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	5/25/2017	10	605191	6451099	normal
SCEK214	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	5/25/2017	10	609938	6442590	normal
SCEK215	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	5/25/2017	10	622855	6448864	normal
SCEK009b	Caribou	Fort Nelson	Fort Nelson	Vectr-Vertex	42 ppm	5/25/2017	10	521879	6548367	normal
SCEK166	Caribou	Fort Nelson	Fort Nelson	Vectr-Vertex	42 ppm	5/25/2017	10	518804	6545459	normal
SCEK007b	Caribou	Maxhamish	Capot-Blanc	Vectr-Vertex	42 ppm	5/25/2017	10	445192	6549473	normal
SCEK066b	Caribou	Maxhamish	Capot-Blanc	Vectr-Vertex	42 ppm	5/25/2017	10	446578	6566837	normal
SCEK076	Caribou	Maxhamish	Capot-Blanc	Lotek VHF	60 ppm	5/25/2017	10	459295	6579562	normal
SCEK086	Caribou	Maxhamish	Fortune	Lotek VHF	not heard	5/25/2017	n/a	n/a	n/a	VHF signal not detected
SCEK128	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	5/25/2017	10	519510	6629616	normal
SCEK129	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	5/25/2017	10	539927	6620389	normal
SCEK164	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	5/25/2017	10	529650	6621354	normal

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the May 25-26, 2017 OGRISfixed-wing telemetry monitoring flight.

ID	Species	Range	Core	Collar Type	Status	Date	Zone	East	North	Comments
SCEK177	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	525252	6617381	normal
SCEK178	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	543884	6623911	normal
SCEK205	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	544165	6623625	normal
SCEK206	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	539130	6620294	normal
SCEK208	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	485827	6624964	normal
SCEK221	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	5/25/2017	10	545767	6625333	normal
SCEK062	Caribou	Maxhamish	Kiwigana	Lotek VHF	60 ppm	5/25/2017	10	527916	6573038	normal
SCEK064	Caribou	Maxhamish	Kiwigana	Lotek VHF	60 ppm	5/25/2017	10	513091	6576505	normal
SCEK168	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	5/26/2017	10	548604	6561808	normal
SCEK211	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	5/25/2017	10	524154	6573858	normal
SCEK231	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	5/25/2017	10	532487	6569114	normal
SCEK232	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	5/25/2017	10	526709	6563563	normal VHF; GPS data sporadic
SCEK015	Caribou	Parker	Parker	Lotek VHF	60 ppm	5/25/2017	10	493337	6520097	normal
SCEK016b	Caribou	Parker	Parker	Vectr-Vertex	42 ppm	5/25/2017	10	483068	6517963	normal
SCEK194	Caribou	Parker	Parker	Vectr-Vertex	42 ppm	5/25/2017	10	478545	6518523	normal
SCEK238	Caribou	Parker	Parker	Vectr-Vertex	not heard	5/25/2017	n/a	n/a	n/a	VHF signal not detected; last data Apr 05, 17
SCEK049	Caribou	Prophet	Prophet	Lotek VHF	60 ppm	5/25/2017	10	561151	6448387	normal
SCEK161b	Caribou	Prophet	Prophet	Vectr-Vertex	42 ppm	5/25/2017	10	591694	6441727	normal
SCEK217	Caribou	Prophet	Prophet	Vectr-Vertex	42 ppm	5/25/2017	10	583437	6438622	normal
SCEK019	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	574093	6504972	normal
SCEK020b	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	570882	6464926	normal
SCEK024	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	571558	6498177	normal
SCEK025	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	564952	6499276	normal
SCEK068	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	559813	6536089	normal
SCEK070	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	574152	6502964	normal
SCEK145	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/26/2017	10	610573	6560200	normal
SCEK148	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	595049	6445128	normal
SCEK149	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	571517	6495576	normal
SCEK150	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	603964	6479055	normal
SCEK152	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	567816	6501010	normal
SCEK156	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	546707	6499147	normal
SCEK157	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	5/25/2017	10	569998	6500838	normal
SCEK193	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	559080	6503633	normal
SCEK218	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	555644	6538830	normal
SCEK220	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	607373	6486931	normal
SCEK239	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	530027	6503236	normal
SCEK240	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	5/25/2017	10	582411	6476916	normal
SCEK103	Caribou	Snake-Sahtaneh	East Kotcho	Lotek VHF	60 ppm	5/26/2017	10	634760	6562057	normal
SCEK105	Caribou	Snake-Sahtaneh	East Kotcho	Lotek VHF	60 ppm	5/26/2017	10	638600	6573588	normal
SCEK088	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	5/26/2017	10	640565	6567728	normal
SCEK089	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	5/26/2017	10	604848	6600606	normal
SCEK090	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	5/26/2017	10	597771	6594178	normal
SCEK092	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	5/26/2017	10	603277	6603158	normal
SCEK097b	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	5/26/2017	10	622901	6582864	normal
SCEK100b	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	5/26/2017	10	626037	6561731	normal
SCEK186	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	5/26/2017	10	588394	6569240	normal
SCEK229	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	5/26/2017	10	609416	6565807	normal
SCEK230	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	5/26/2017	10	585353	6595389	normal
SCEK096	Caribou	Snake-Sahtaneh	Paradise	Lotek VHF	60 ppm	5/25/2017	10	558818	6531441	normal

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the May 25-26, 2017 OGRIS fixed-wing telemetry monitoring flight.

ID	Species	Range	Core	Collar Type	Status	Date	Zone	East	North	Comments
BC1028	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	5/25/2017	10	562703	6595710	normal
SCEK079b	Caribou	Snake-Sahtaneh	Tsea	Vectr-Vertex	42 ppm	5/25/2017	10	523065	6602788	normal
SCEK082	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	5/25/2017	10	561397	6598868	normal
SCEK127	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	5/25/2017	10	559329	6604631	normal
SCEK131	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	5/25/2017	10	554029	6592007	normal
SCEK132	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	5/25/2017	10	552449	6609296	normal
SCEK233	Caribou	Snake-Sahtaneh	Tsea	Vectr-Vertex	42 ppm	5/25/2017	10	555552	6607935	normal
SCEK091	Caribou	Snake-Sahtaneh	West Kotcho	Lotek VHF	60 ppm	5/25/2017	10	615255	6568438	normal
SCEK209	Caribou	Snake-Sahtaneh	West Kotcho	Vectr-Vertex	42 ppm	5/25/2017	10	509588	6569264	normal
SCEK219	Caribou	Snake-Sahtaneh	West Kotcho	Vectr-Vertex	42 ppm	5/25/2017	10	551992	6611289	normal
BW034	Wolf	Calendar	July	Lotek VHF	not heard	5/26/2017	n/a	n/a	n/a	VHF not detected
BW043nex	Wolf	Calendar	July	Lotek Iridium	not heard	5/26/2017	n/a	n/a	n/a	VHF not detected; last data June 14, 16
BW044nex	Wolf	Calendar	July	Lotek Iridium	50 ppm double	5/26/2017	10	624943	6617510	VHF low battery signal; last data Apr 10, 16
BW002	Wolf	Chinchaga	Big Arrow	Lotek VHF	60 ppm	5/25/2017	10	620723	6360766	normal
BW053	Wolf	Chinchaga	Kahntah	Lotek Iridium	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected; no data since May 14, 17
BW038	Wolf	Clarke	Elleh	Lotek Iridium	50 ppm	5/25/2017	10	558382	6494235	VHF normal; GPS data normal
BW039	Wolf	Clarke	Elleh	Lotek Iridium	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected; last GPS data Sep 29, 16
BW040	Wolf	Clarke	Elleh	Lotek Iridium	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected; last GPS data Feb 13, 17
BW032	Wolf	Fortune/Tsea	Petitot	Lotek VHF	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected
BW049nex	Wolf	Fortune/Tsea	Petitot	Lotek Iridium	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected; last data Dec 22, 16
BW036	Wolf	Maxhamish	Fortune	Lotek Iridium	not heard	5/25/2017	n/a	n/a	n/a	VHF not detected; last GPS data Jan 20, 16
BW024	Wolf	Snake-Sahtaneh	Kwokullie	Lotek Iridium	50 ppm	5/26/2017	10	611614	6567549	VHF detected; last data Nov 17, 16
BW026	Wolf	Snake-Sahtaneh	Kwokullie	Lotek VHF	not heard	5/26/2017	n/a	n/a	n/a	VHF not detected
BW052	Wolf	Snake-Sahtaneh	Kwokullie	Lotek Iridium	not heard	5/26/2017	n/a	n/a	n/a	VHF not detected; last data Nov 24, 16

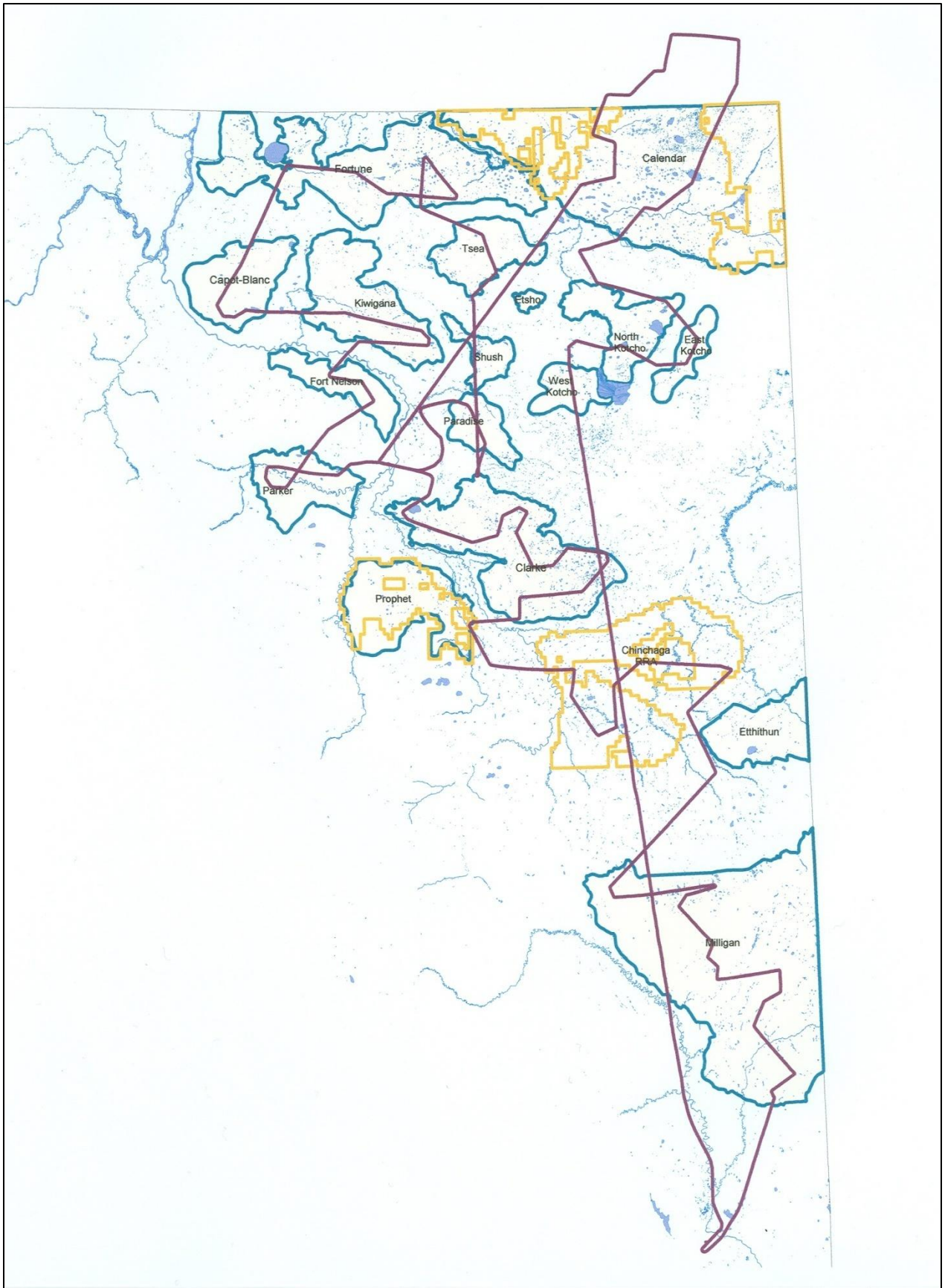


Figure 1. Flight paths flown during the May 25-26, 2017 OGRIS boreal caribou and wolf fixed-wing telemetry monitoring flight.