

DIVERSIFIED ENVIRONMENTAL SERVICES

BOX 6263, FORT ST. JOHN, B.C. V1J 4H7 PHONE/FAX (250) 787-9101

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

FIXED-WING TELEMETRY MONITORING FLIGHT – SEPTEMBER 17-18, 2017

Date: Sep 30, 2017

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

Executive Summary

On September 17-18, 2017, 107 boreal caribou collar frequencies and 13 wolf collar frequencies were scanned during a scheduled fixed-wing telemetry monitoring flight. Thirty unrecovered caribou collars assumed to have exceeded their battery lives were not scanned.

Of the 107 caribou collars scanned, 100 were heard transmitting normal VHF signals and one was transmitting a VHF mortality signal (Parker GPS SCEK016b). The remaining 6 collars were not detected and are suspected to have exceeded their battery lives.

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 September 17-18, 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 September 17-18, 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 September 17-18, 2017 monitoring flight, 107 caribou collar frequencies were scanned, including 106 SCEK collars (54 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. In addition, 13 wolf collar frequencies were scanned during the flight, including 10 SCEK wolf collars (7 Lotek Iridium, 3 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 September 17-18, 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 2,122 km. Of 107 caribou collar frequencies scanned, 100 were transmitting normal VHF signals and 1 (Parker GPS SCEK016b) was transmitting a VHF mortality signal. GPS data transmissions

from SCEK016b indicated the animals died on September 6, 2017; a satellite mortality alert was received on September 10.

The remaining 6 caribou collars were not detected during the September 2017 flight. These included 5 Vectronic GPS collars that ceased GPS data transmission prior to the September flight (SCEK170b, SCEK233, SCEK238, SCEK239, SCEK240) and one Lotek VHF collar suspected to have failed (Fortune VHF SCEK086). An additional Vectronic GPS collar (SCEK232), has not transmitted GPS data since June 01, 2017, but continues to transmit a normal VHF signal.

Of the 13 wolf collar frequencies scanned during the September 2017 flight, only one normal VHF signal was detected. The remaining 12 wolf collars were not detected. These include 9 GPS/satellite collars whose GPS data transmissions ceased prior to the September flight.

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 period 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 September 17-18, 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	9/18/2017	10	639952	6641534	normal
SCEK113	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	616347	6614574	normal
SCEK120	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	n/a	n/a	VHF signal normal but not located
SCEK122	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	629311	6676273	normal; in NWT
SCEK123	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	598765	6619738	normal
SCEK125	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	641413	6686643	normal; in NWT
SCEK134	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	629866	6632837	normal
SCEK136b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	9/18/2017	10	609086	6606458	normal
SCEK137	Caribou	Calendar	Calendar	Lotek VHF	60 ppm	9/18/2017	10	632190	6641978	normal
SCEK146b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	9/18/2017	10	610127	6634089	normal
SCEK180	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	9/18/2017	10	632030	6649549	normal
SCEK181b	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	9/18/2017	10	609625	6608871	normal
SCEK183	Caribou	Calendar	Calendar	Vectr-Vertex	42 ppm	9/18/2017	10	597253	6623838	normal
SCEK126b	Caribou	Calendar	RRA-C	Vectr-Vertex	42 ppm	9/18/2017	10	607552	6644354	normal
SCEK107	Caribou	Calendar	RRA-D	Lotek VHF	60 ppm	9/18/2017	10	618994	6635061	normal
SCEK195	Caribou	Chinchaga	Etthithun	Vectr-Vertex	42 ppm	9/17/2017	10	649840	6403674	normal
SCEK224	Caribou	Chinchaga	Etthithun	Vectr-Vertex	42 ppm	9/17/2017	10	639128	6417095	normal
SCEK026b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	655239	6309929	normal
SCEK029	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	643515	6328449	normal
SCEK032	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	661532	6355161	normal
SCEK033b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	641766	6321839	normal
SCEK035	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	622350	6344025	normal
SCEK036b	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	615792	6347939	normal
SCEK041	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	636693	6352594	normal
SCEK054	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	638150	6359650	normal
SCEK057	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	638553	6345607	normal
SCEK059	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	621465	6347584	normal
SCEK060	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	582868	6368550	normal
SCEK061	Caribou	Chinchaga	Milligan	Lotek VHF	60 ppm	9/17/2017	10	661211	6341494	normal
SCEK196	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	635325	6362939	normal
SCEK198	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	646857	6309240	normal
SCEK201	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	663270	6290840	normal
SCEK223	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	640089	6333321	normal
SCEK226	Caribou	Chinchaga	Milligan	Vectr-Vertex	42 ppm	9/17/2017	10	672504	6303021	normal
SCEK048	Caribou	Chinchaga	RRA-A	Lotek VHF	60 ppm	9/17/2017	10	596574	6421381	normal
SCEK170b	Caribou	Chinchaga	RRA-A	Vectr-Vertex	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last data Jul 21, 17
SCEK189	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	9/17/2017	10	618489	6460226	normal
SCEK213	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	9/17/2017	10	604555	6443431	normal
SCEK214	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	9/17/2017	10	605167	6432893	normal
SCEK215	Caribou	Chinchaga	RRA-A	Vectr-Vertex	42 ppm	9/17/2017	10	638028	6439700	normal
SCEK009b	Caribou	Fort Nelson	Fort Nelson	Vectr-Vertex	42 ppm	9/17/2017	10	519513	6548592	normal
SCEK166	Caribou	Fort Nelson	Fort Nelson	Vectr-Vertex	42 ppm	9/17/2017	10	516495	6546850	normal
SCEK007b	Caribou	Maxhamish	Capot-Blanc	Vectr-Vertex	42 ppm	9/17/2017	10	453480	6583978	normal
SCEK066b	Caribou	Maxhamish	Capot-Blanc	Vectr-Vertex	42 ppm	9/17/2017	10	443693	6575526	normal
SCEK076	Caribou	Maxhamish	Capot-Blanc	Lotek VHF	60 ppm	9/17/2017	10	459709	6580320	normal
SCEK086	Caribou	Maxhamish	Fortune	Lotek VHF	not heard	9/17/2017	n/a	n/a	n/a	VHF signal not detected; battery assumed

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the September 17-18, 2017 OGRIS fixed-wing telemetry monitoring flight.

ID	Species	Range	Core	Collar Type	Status	Date	Zone	East	North	Comments
SCEK128	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	9/17/2017	10	531784	6633067	normal
SCEK129	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	9/17/2017	10	529726	6629003	normal
SCEK164	Caribou	Maxhamish	Fortune	Lotek VHF	60 ppm	9/17/2017	10	534735	6625363	normal
SCEK177	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	530011	6631511	normal
SCEK178	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	548388	6625421	normal
SCEK205	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	540944	6621218	normal
SCEK206	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	542802	6622968	normal
SCEK208	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	475859	6629182	normal
SCEK221	Caribou	Maxhamish	Fortune	Vectr-Vertex	42 ppm	9/17/2017	10	540140	6623880	normal
SCEK062	Caribou	Maxhamish	Kiwigana	Lotek VHF	60 ppm	9/17/2017	10	528069	6569489	normal
SCEK064	Caribou	Maxhamish	Kiwigana	Lotek VHF	60 ppm	9/17/2017	10	528442	6564501	normal
SCEK168	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	9/17/2017	10	528352	6565843	normal
SCEK211	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	9/17/2017	10	528292	6567426	normal
SCEK231	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	9/17/2017	10	523188	6572693	normal
SCEK232	Caribou	Maxhamish	Kiwigana	Vectr-Vertex	42 ppm	9/17/2017	10	531871	6562027	VHF signal detected; last data Jun 01, 17
SCEK015	Caribou	Parker	Parker	Lotek VHF	60 ppm	9/17/2017	10	494124	6521954	normal
SCEK016b	Caribou	Parker	Parker	Vectr-Vertex	80 ppm	9/17/2017	10	483720	6515901	MORTALITY VHF; GPS alert Sep 10, 2017
SCEK194	Caribou	Parker	Parker	Vectr-Vertex	42 ppm	9/17/2017	10	490164	6522285	normal
SCEK238	Caribou	Parker	Parker	Vectr-Vertex	not heard	9/17/2017	n/a	n/a	n/a	VHF signal not detected; last data Apr 05, 17
SCEK049	Caribou	Prophet	Prophet	Lotek VHF	60 ppm	9/17/2017	10	546023	6453230	normal
SCEK161b	Caribou	Prophet	Prophet	Vectr-Vertex	42 ppm	9/17/2017	10	602401	6444448	normal
SCEK217	Caribou	Prophet	Prophet	Vectr-Vertex	42 ppm	9/17/2017	10	559249	6447411	normal
SCEK019	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	576314	6502882	normal
SCEK020b	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	9/17/2017	10	566628	6471710	normal
SCEK024	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	543184	6504268	normal
SCEK025	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	564495	6503186	normal
SCEK068	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/18/2017	10	554800	6536361	normal
SCEK070	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	565637	6502450	normal
SCEK145	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/18/2017	10	593311	6547351	normal
SCEK148	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	553275	6465841	normal
SCEK149	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	575226	6500186	normal
SCEK150	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	606114	6485076	normal
SCEK152	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	565465	6497701	normal
SCEK156	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	543579	6501769	normal
SCEK157	Caribou	Snake-Sahtaneh	Clarke	Lotek VHF	60 ppm	9/17/2017	10	566689	6501731	normal
SCEK193	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	9/17/2017	10	563361	6505839	normal
SCEK218	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	9/18/2017	10	557741	6538182	normal
SCEK220	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	42 ppm	9/17/2017	10	606093	6482378	normal
SCEK239	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last data Jul 24, 17
SCEK240	Caribou	Snake-Sahtaneh	Clarke	Vectr-Vertex	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last data Jul 18, 17
SCEK103	Caribou	Snake-Sahtaneh	East Kotcho	Lotek VHF	60 ppm	9/18/2017	10	630066	6557033	normal
SCEK105	Caribou	Snake-Sahtaneh	East Kotcho	Lotek VHF	60 ppm	9/18/2017	10	641246	6576508	normal
SCEK088	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	9/18/2017	10	627142	6548597	normal
SCEK089	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	9/18/2017	10	617295	6559392	normal
SCEK090	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	9/18/2017	10	609783	6576807	normal
SCEK092	Caribou	Snake-Sahtaneh	North Kotcho	Lotek VHF	60 ppm	9/18/2017	10	608544	6578145	normal

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the September 17-18, 2017 OGRIS fixed-wing telemetry monitoring flight.

ID	Species	Range	Core	Collar Type	Status	Date	Zone	East	North	Comments
SCEK097b	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	9/18/2017	10	621501	6575704	normal
SCEK100b	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	9/18/2017	10	623219	6559952	normal
SCEK229	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	9/18/2017	10	611283	6572501	normal
SCEK230	Caribou	Snake-Sahtaneh	North Kotcho	Vectr-Vertex	42 ppm	9/18/2017	10	609110	6574425	normal
SCEK096	Caribou	Snake-Sahtaneh	Paradise	Lotek VHF	60 ppm	9/18/2017	10	552990	6537241	normal
BC1028	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	9/17/2017	10	555686	6597972	normal
SCEK079b	Caribou	Snake-Sahtaneh	Tsea	Vectr-Vertex	42 ppm	9/17/2017	10	550031	6596429	normal
SCEK082	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	9/17/2017	10	545611	6596389	normal
SCEK127	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	9/17/2017	10	551472	6596053	normal
SCEK131	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	9/17/2017	10	554852	6595440	normal
SCEK132	Caribou	Snake-Sahtaneh	Tsea	Lotek VHF	60 ppm	9/17/2017	10	553398	6597112	normal
SCEK233	Caribou	Snake-Sahtaneh	Tsea	Vectr-Vertex	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last data Jul 12, 17
SCEK091	Caribou	Snake-Sahtaneh	West Kotcho	Lotek VHF	60 ppm	9/18/2017	10	604244	6583221	normal
SCEK209	Caribou	Snake-Sahtaneh	West Kotcho	Vectr-Vertex	42 ppm	9/17/2017	10	524389	6571459	normal
SCEK219	Caribou	Snake-Sahtaneh	West Kotcho	Vectr-Vertex	42 ppm	9/17/2017	10	542763	6617269	normal
BW034	Wolf	Calendar	July	Lotek VHF	not heard	9/18/2017	n/a	n/a	n/a	VHF not detected
BW043nex	Wolf	Calendar	July	Lotek Iridium	not heard	9/18/2017	n/a	n/a	n/a	VHF not detected; last data June 14, 16
BW044nex	Wolf	Calendar	July	Lotek Iridium	not heard	9/18/2017	n/a	n/a	n/a	VHF not detected; last data Apr 10, 16
BW002	Wolf	Chinchaga	Big Arrow	Lotek VHF	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected
BW053	Wolf	Chinchaga	Kahntah	Lotek Iridium	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; no data since May 14, 17
BW038	Wolf	Clarke	Elleh	Lotek Iridium	50 ppm	9/17/2017	10	577805	6498784	VHF detected; last GPS data Aug 29, 17
BW039	Wolf	Clarke	Elleh	Lotek Iridium	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last GPS data Sep 29, 16
BW040	Wolf	Clarke	Elleh	Lotek Iridium	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last GPS data Feb 13, 17
BW032	Wolf	Fortune/Tsea	Petitot	Lotek VHF	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected
BW049nex	Wolf	Fortune/Tsea	Petitot	Lotek Iridium	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last data Dec 22, 16
BW036	Wolf	Maxhamish	Fortune	Lotek Iridium	not heard	9/17/2017	n/a	n/a	n/a	VHF not detected; last GPS data Jan 20, 16
BW024	Wolf	Snake-Sahtaneh	Kwokullie	Lotek Iridium	not heard	9/18/2017	n/a	n/a	n/a	VHF detected; last data Nov 17, 16
BW052	Wolf	Snake-Sahtaneh	Kwokullie	Lotek Iridium	not heard	9/18/2017	n/a	n/a	n/a	VHF not detected; last data Nov 24, 16

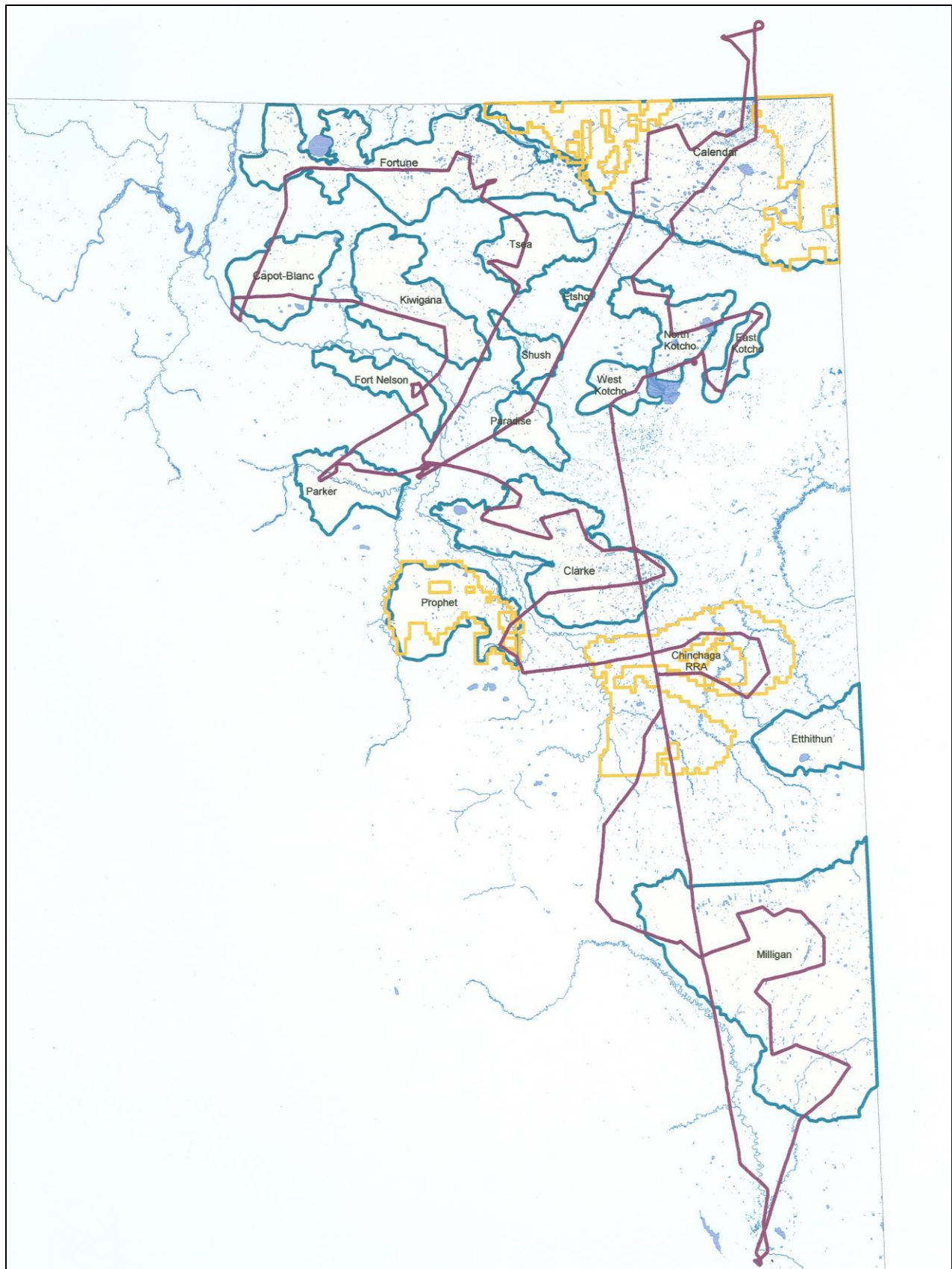


Figure 1. Flight paths flown during the September 17-18, 2017 OGRIS boreal caribou and wolf fixed-wing telemetry monitoring flight.