

DIVERSIFIED ENVIRONMENTAL SERVICES

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

FIXED-WING TELEMETRY MONITORING FLIGHT – JUNE 24-25, 2017

Date: June 30, 2017

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

Executive Summary

On June 24-25, 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, 103 were heard transmitting normal VHF signals, one was transmitting a mortality signal (SCEK186), and one was transmitting a double-pulse low-battery signal. The remaining 3 collars were not detected, including 1 VHF collar and 1 GPS/satellite collar believed to have recently exceeded their battery lives and 1 VHF assumed to be beyond detection range in the Northwest Territories.

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 June 24-25, 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 June 24-25, 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 June 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. 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 June 24-25, 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 2,151 km. Of 108 caribou collar frequencies scanned, 103 were transmitting normal VHF signals, one was transmitting a double-pulse low-battery signal (Chinchaga GPS SCEK170b), and one was transmitting a mortality signal (Kotcho GPS SCEK170b). GPS data received subsequent to the June flight confirmed the suspected mortality of this animal.

VHF beacons of the remaining 3 caribou collars were not detected. These included one VHF collar suspected to have recently failed (Fortune VHF SCEK086), one GPS/Satellite collar suspected to have recently failed (Parker GPS SCEK238), and one VHF collar most recently located well into the Northwest Territories (Calendar VHF SCEK125).

Of the 14 wolf collar frequencies scanned during the June 2017 flight, only one normal VHF signal was detected. The remaining 13 wolf collars were not detected. These include 9 GPS/satellite collars whose GPS data transmissions ceased prior to the June monitoring flight and one that continues to transmit GPS data (BW038, Elleh Pack). 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 June 24-25, 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 | 6/25/2017 | 10 | 633941 | 6639407 | normal |
| SCEK113 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 621127 | 6618960 | normal |
| SCEK120 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 596272 | 6636528 | normal |
| SCEK122 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 617276 | 6677589 | normal |
| SCEK123 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 602322 | 6625553 | normal |
| SCEK125 | Caribou | Calendar | Calendar | Lotek VHF | not heard | 6/25/2017 | 10 | n/a | n/a | VHF signal not detected; last heard in NWT |
| SCEK134 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 621238 | 6638595 | normal |
| SCEK136b | Caribou | Calendar | Calendar | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 611736 | 6609986 | normal |
| SCEK137 | Caribou | Calendar | Calendar | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 625905 | 6644729 | normal |
| SCEK146b | Caribou | Calendar | Calendar | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 608051 | 6638967 | normal |
| SCEK180 | Caribou | Calendar | Calendar | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 606167 | 6670922 | normal |
| SCEK181b | Caribou | Calendar | Calendar | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 613102 | 6611952 | normal |
| SCEK183 | Caribou | Calendar | Calendar | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 595096 | 6626823 | normal |
| SCEK126b | Caribou | Calendar | RRA-C | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 593295 | 6654760 | normal |
| SCEK107 | Caribou | Calendar | RRA-D | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 618972 | 6640821 | normal |
| SCEK195 | Caribou | Chinchaga | Etthithun | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 650260 | 6409033 | normal |
| SCEK224 | Caribou | Chinchaga | Etthithun | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 639302 | 6414246 | normal |
| SCEK026b | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 663008 | 6299407 | normal |
| SCEK029 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 648400 | 6329659 | normal |
| SCEK032 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 658025 | 6366205 | normal |
| SCEK033b | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 635194 | 6343759 | normal |
| SCEK035 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 625044 | 6360224 | normal |
| SCEK036b | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 616067 | 6367561 | normal |
| SCEK041 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 645862 | 6360122 | normal |
| SCEK054 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 647447 | 6348116 | normal |
| SCEK057 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 645505 | 6324600 | normal |
| SCEK059 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 623483 | 6344589 | normal |
| SCEK060 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 581240 | 6364559 | normal |
| SCEK061 | Caribou | Chinchaga | Milligan | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 661706 | 6339882 | normal |
| SCEK196 | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 627935 | 6353516 | normal |
| SCEK198 | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 641780 | 6304360 | normal |
| SCEK201 | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 663973 | 6290280 | normal |
| SCEK223 | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 638371 | 6332148 | normal |
| SCEK226 | Caribou | Chinchaga | Milligan | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 669947 | 6300103 | normal |
| SCEK048 | Caribou | Chinchaga | RRA-A | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 601537 | 6424902 | normal |
| SCEK170b | Caribou | Chinchaga | RRA-A | Vectr-Vertex | 42 ppm double | 6/24/2017 | 10 | 650027 | 6453520 | double pulse |
| SCEK189 | Caribou | Chinchaga | RRA-A | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 607811 | 6450909 | normal |
| SCEK213 | Caribou | Chinchaga | RRA-A | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 605882 | 6447006 | normal |
| SCEK214 | Caribou | Chinchaga | RRA-A | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 605581 | 6448784 | normal |
| SCEK215 | Caribou | Chinchaga | RRA-A | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 640252 | 6438637 | normal |
| SCEK009b | Caribou | Fort Nelson | Fort Nelson | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 517320 | 6553407 | normal |
| SCEK166 | Caribou | Fort Nelson | Fort Nelson | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 518890 | 6545629 | normal |
| SCEK007b | Caribou | Maxhamish | Capot-Blanc | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 449968 | 6538682 | normal |
| SCEK066b | Caribou | Maxhamish | Capot-Blanc | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 451592 | 6564575 | normal |
| SCEK076 | Caribou | Maxhamish | Capot-Blanc | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 456016 | 6584410 | normal |

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the June 24-25, 2017 OGRIS fixed-wing telemetry monitoring flight.

| ID | Species | Range | Core | Collar Type | Status | Date | Zone | East | North | Comments |
|----------|---------|----------------|--------------|--------------|-----------|-----------|------|--------|---------|---|
| SCEK086 | Caribou | Maxhamish | Fortune | Lotek VHF | not heard | 6/24/2017 | n/a | n/a | n/a | VHF signal not detected |
| SCEK128 | Caribou | Maxhamish | Fortune | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 523788 | 6630790 | normal |
| SCEK129 | Caribou | Maxhamish | Fortune | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 535345 | 6631553 | normal |
| SCEK164 | Caribou | Maxhamish | Fortune | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 536876 | 6626130 | normal |
| SCEK177 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 527901 | 6633719 | normal |
| SCEK178 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 539726 | 6625121 | normal |
| SCEK205 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 543543 | 6627243 | normal |
| SCEK206 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 540278 | 6626376 | normal |
| SCEK208 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 486496 | 6629243 | normal |
| SCEK221 | Caribou | Maxhamish | Fortune | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 533676 | 6630092 | normal |
| SCEK062 | Caribou | Maxhamish | Kiwigana | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 527610 | 6570228 | normal |
| SCEK064 | Caribou | Maxhamish | Kiwigana | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 516981 | 6577751 | normal |
| SCEK168 | Caribou | Maxhamish | Kiwigana | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 549820 | 6561705 | normal |
| SCEK211 | Caribou | Maxhamish | Kiwigana | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 523185 | 6566898 | normal |
| SCEK231 | Caribou | Maxhamish | Kiwigana | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 525404 | 6572063 | normal |
| SCEK232 | Caribou | Maxhamish | Kiwigana | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 522447 | 6565895 | normal VHF; GPS data sporadic; last June 01, |
| SCEK015 | Caribou | Parker | Parker | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 492308 | 6521287 | normal |
| SCEK016b | Caribou | Parker | Parker | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 478419 | 6511834 | normal |
| SCEK194 | Caribou | Parker | Parker | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 487424 | 6522917 | normal |
| SCEK238 | Caribou | Parker | Parker | Vectr-Vertex | not heard | 6/24/2017 | n/a | n/a | n/a | VHF signal not detected; last data Apr 05, 17 |
| SCEK049 | Caribou | Prophet | Prophet | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 552212 | 6448300 | normal |
| SCEK161b | Caribou | Prophet | Prophet | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 596174 | 6434196 | normal |
| SCEK217 | Caribou | Prophet | Prophet | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 556701 | 6449244 | normal |
| SCEK019 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 569017 | 6506542 | normal |
| SCEK020b | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 588385 | 6487091 | normal |
| SCEK024 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 573332 | 6498026 | normal |
| SCEK025 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 552877 | 6494260 | normal |
| SCEK068 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 563421 | 6539439 | normal |
| SCEK070 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 569677 | 6500840 | normal |
| SCEK145 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 593335 | 6548872 | normal |
| SCEK148 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 589956 | 6447964 | normal |
| SCEK149 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 567984 | 6499579 | normal |
| SCEK150 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 596932 | 6481483 | normal |
| SCEK152 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 560437 | 6498165 | normal |
| SCEK156 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 536263 | 6498393 | normal |
| SCEK157 | Caribou | Snake-Sahtaneh | Clarke | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 574276 | 6502288 | normal |
| SCEK193 | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 565034 | 6504608 | normal |
| SCEK218 | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 555751 | 6543045 | normal |
| SCEK220 | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 604471 | 6480582 | normal |
| SCEK239 | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 545356 | 6493186 | normal |
| SCEK240 | Caribou | Snake-Sahtaneh | Clarke | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 565499 | 6494159 | normal |
| SCEK103 | Caribou | Snake-Sahtaneh | East Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 635507 | 6561638 | normal |
| SCEK105 | Caribou | Snake-Sahtaneh | East Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 640209 | 6576683 | normal |
| SCEK088 | Caribou | Snake-Sahtaneh | North Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 629682 | 6556727 | normal |
| SCEK089 | Caribou | Snake-Sahtaneh | North Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 606580 | 6590960 | normal |

Table 1 cont. VHF signal status and location of boreal caribou and wolf collars detected during the June 24-25, 2017 OGRIS fixed-wing telemetry monitoring flight.

| ID | Species | Range | Core | Collar Type | Status | Date | Zone | East | North | Comments |
|----------|---------|----------------|--------------|---------------|-----------|-----------|------|--------|---------|--|
| SCEK090 | Caribou | Snake-Sahtaneh | North Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | n/a | n/a | normal; heard but not located. |
| SCEK092 | Caribou | Snake-Sahtaneh | North Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 604732 | 6589237 | normal |
| SCEK097b | Caribou | Snake-Sahtaneh | North Kotcho | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 598765 | 6583739 | normal |
| SCEK100b | Caribou | Snake-Sahtaneh | North Kotcho | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 640320 | 6572373 | normal |
| SCEK186 | Caribou | Snake-Sahtaneh | North Kotcho | Vectr-Vertex | 84 ppm | 6/25/2017 | 10 | 597819 | 6569639 | MORTALITY |
| SCEK229 | Caribou | Snake-Sahtaneh | North Kotcho | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 607413 | 6574141 | normal |
| SCEK230 | Caribou | Snake-Sahtaneh | North Kotcho | Vectr-Vertex | 42 ppm | 6/25/2017 | 10 | 584470 | 6592054 | normal |
| SCEK096 | Caribou | Snake-Sahtaneh | Paradise | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 557537 | 6537617 | normal |
| BC1028 | Caribou | Snake-Sahtaneh | Tsea | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 554194 | 6603844 | normal |
| SCEK079b | Caribou | Snake-Sahtaneh | Tsea | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 529848 | 6599214 | normal |
| SCEK082 | Caribou | Snake-Sahtaneh | Tsea | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 555298 | 6601742 | normal |
| SCEK127 | Caribou | Snake-Sahtaneh | Tsea | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 562515 | 6606260 | normal |
| SCEK131 | Caribou | Snake-Sahtaneh | Tsea | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 555193 | 6596819 | normal |
| SCEK132 | Caribou | Snake-Sahtaneh | Tsea | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 554932 | 6594796 | normal |
| SCEK233 | Caribou | Snake-Sahtaneh | Tsea | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 554815 | 6600637 | normal |
| SCEK091 | Caribou | Snake-Sahtaneh | West Kotcho | Lotek VHF | 60 ppm | 6/25/2017 | 10 | 604618 | 6581245 | normal |
| SCEK209 | Caribou | Snake-Sahtaneh | West Kotcho | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 512693 | 6575824 | normal |
| SCEK219 | Caribou | Snake-Sahtaneh | West Kotcho | Vectr-Vertex | 42 ppm | 6/24/2017 | 10 | 561783 | 6608751 | normal |
| BW034 | Wolf | Calendar | July | Lotek VHF | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected |
| BW043nex | Wolf | Calendar | July | Lotek Iridium | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected; last data June 14, 16 |
| BW044nex | Wolf | Calendar | July | Lotek Iridium | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected; last data Apr 10, 16 |
| BW002 | Wolf | Chinchaga | Big Arrow | Lotek VHF | 60 ppm | 6/24/2017 | 10 | 621596 | 6358914 | normal |
| BW053 | Wolf | Chinchaga | Kahntah | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; no data since May 14, 17 |
| BW038 | Wolf | Clarke | Elleh | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; GPS data normal |
| BW039 | Wolf | Clarke | Elleh | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; last GPS data Sep 29, 16 |
| BW040 | Wolf | Clarke | Elleh | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; last GPS data Feb 13, 17 |
| BW032 | Wolf | Fortune/Tsea | Petitot | Lotek VHF | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected |
| BW049nex | Wolf | Fortune/Tsea | Petitot | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; last data Dec 22, 16 |
| BW036 | Wolf | Maxhamish | Fortune | Lotek Iridium | not heard | 6/24/2017 | n/a | n/a | n/a | VHF not detected; last GPS data Jan 20, 16 |
| BW024 | Wolf | Snake-Sahtaneh | Kwokullie | Lotek Iridium | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected; last data Nov 17, 16 |
| BW026 | Wolf | Snake-Sahtaneh | Kwokullie | Lotek VHF | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected |
| BW052 | Wolf | Snake-Sahtaneh | Kwokullie | Lotek Iridium | not heard | 6/25/2017 | n/a | n/a | n/a | VHF not detected; last data Nov 24, 16 |

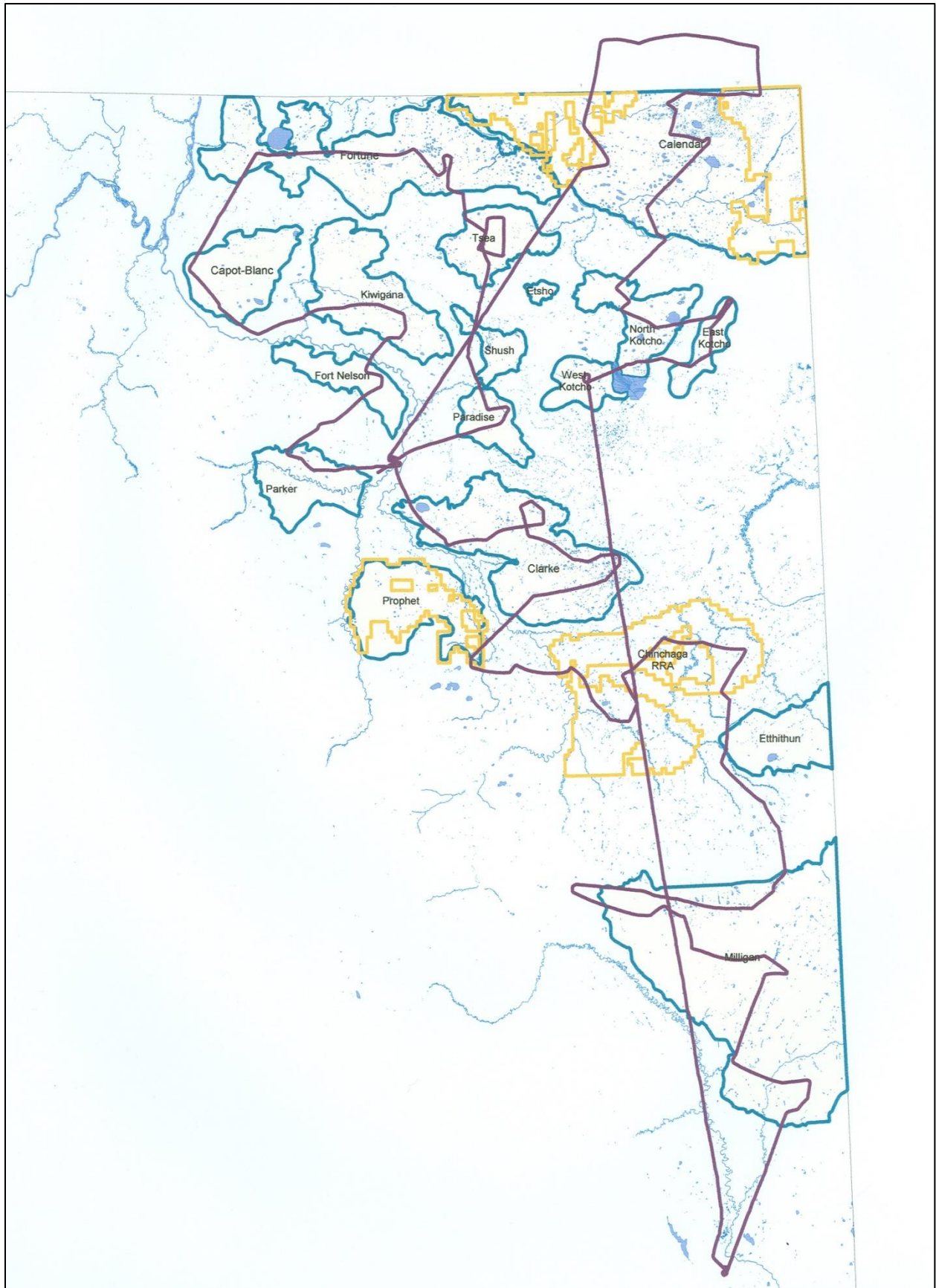


Figure 1. Flight paths flown during the June 24-25, 2017 OGRIS boreal caribou and wolf fixed-wing telemetry monitoring flight.