Project Completion Report
Rocky Mountains Cooperative Ecosystem Studies Unit (RM-CESU)

Project Title: Climate Change Impacts on Key Carnivores in the Northern Rockies

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Project Summary, including descriptions of products, work accomplished and/or major results. If the information is restricted (e.g. location of endangered species or cultural resources), indicate the title and location of the final report. Also add web sites where project-related information may be found. See attached progress report for 2010.

Number of students participating in this project: undergraduates, graduate students, degrees conferred. 0

Lessons Learned from this project. Work continues to complete this project.

GRIZZLY BEAR RESPONSE TO HABITAT & HUMAN INFLUENCE IN THE FLATHEAD & LOWER ELK DRAINAGES, BRITISH COLUMBIA

Progress & Data Summary

Year 3 - 2010

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For

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December, 2010

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ACKNOWLEDGEMENTS

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Recommended Citation:

Apps, C., and B. McLellan. 2010. Grizzly bear response to habitat and human influence in the upper Flathead and lower Elk drainages, British Columbia – Progress and data summary report 2010. Aspen Wildlife Research Inc and British Columbia Ministry of Forests and Range. For submission to the US Fish & Wildlife Service and the University of Montana.

INTRODUCTION

The Crown of the Continent (COC) defines a region where many natural resources are shared among provincial, state, and federal jurisdictions on both sides of the USA-Canada border. Here, the conservation of wide-ranging carnivores has been highlighted as a significant and challenging issue[1]. Of particular concern are the long-term cumulative impacts of existing, planned and projected human activities within the southern Canadian Rocky Mountains, particularly within the Flathead and Elk drainages. This landscape defines the focal area (Figure 1) for a study of multi-scale responses by grizzly bears (*Ursus arctos*) and wolverines (*Gulo gulo*) to human activities and actions, in the context of underlying and changing habitat conditions. In addition to behavioral and ecological responses, data specific to population vital rates are being collected with the expectation that population-level responses will also be addressed, particularly if the research time-frame extends beyond 4 years. In this report, we summarize the approach, activities, and preliminary data for years 1 - 3 (2008 - 2010) specific to grizzly bears and human use. For progress on the wolverine component, please see the separate report prepared by Kyran Kunkel. Initial stages of this program was also to address toxicological impacts to river otters (*Lutra canadensis*), progress on which is also reported separately.

Below, we describe activities and progress for 2008 - 2010 specific to grizzly bear space-use and movements as well as human use. Background specific to hypotheses and models to be evaluated through this research will be presented in future years. Ultimately, outputs from this study will inform the quantitative assessment of current and projected cumulative human impacts on carnivores within our study area and elsewhere across the COC.

[1] Apps, C. D., J. L. Weaver, B. Bateman, P. C. Paquet, and B. N. McLellan. 2007. Carnivores in the southern Canadian Rocky Mountains: core areas and connectivity across the Crowsnest Highway. Wildlife Conservation Society Canada Conservation Report No. 2, Toronto, Ontario, Canada.

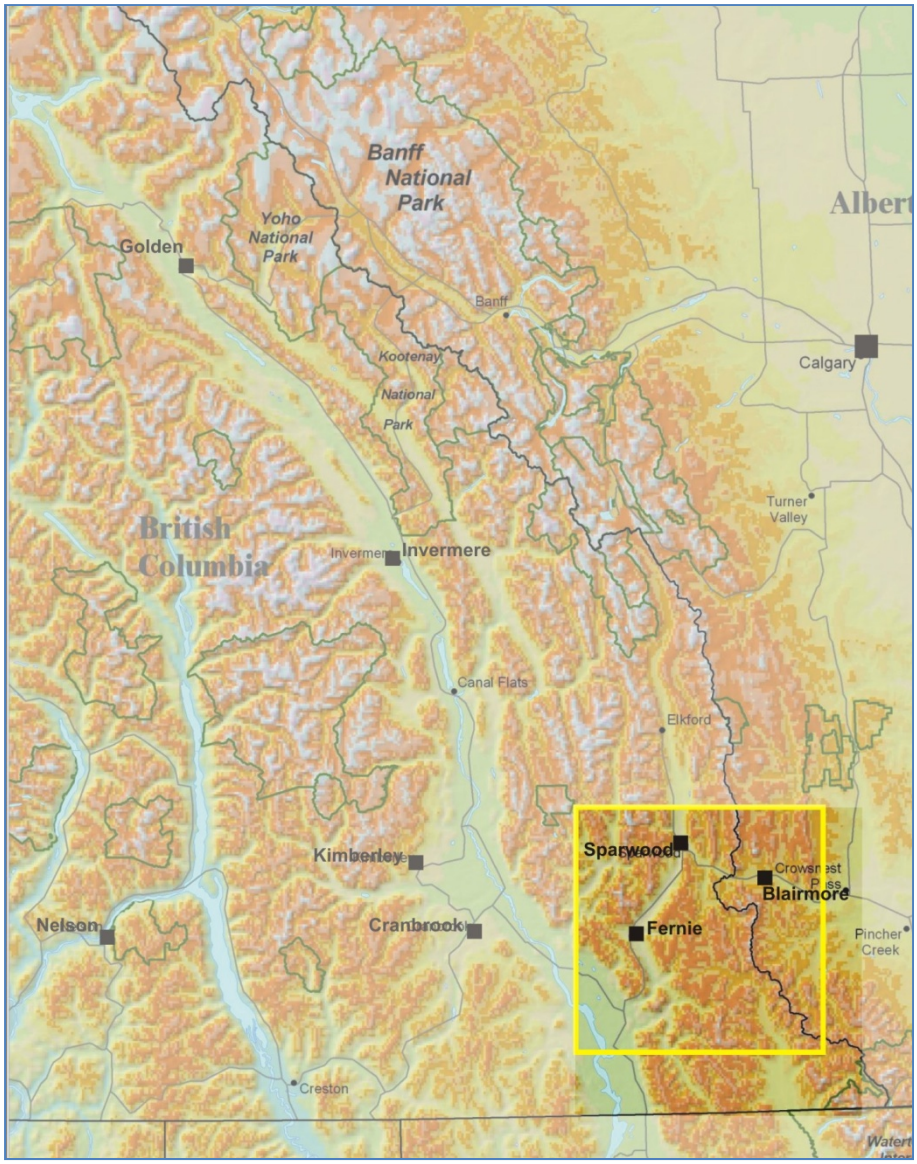


Figure 1. General location of lower-Elk / upper-Flathead study area for evaluating carnivore response to habitat and human influence.

GRIZZLY BEAR SPACE USE AND MOVEMENTS

Approach

We are sampling space use and movements by grizzly bears by deploying GPS tracking collars on adult individuals captured within our defined study area. Collars deployed are primarily Lotek™ (Newmarket, Ontario) 4000, 4400M, and 7000MU remotely-downloadable GPS collars with considerable scheduling flexibility (including remote re-programming upon deployment). We programmed collars to attempt fixes at intervals ranging from 0.75 to 2.0 hrs, and they are expected to function for 2 years prior to battery replacement with shut-down during the winter denning period. Some collars are also set to collect activity data in 5-min increments. Collars are either programmed to release and drop after 2 years, and/or they have been modified with insertion of canvas "rot-off" spacers to ensure they release from study animals in the event that they are not otherwise removed. We captured potential study animals during May/June and September/October using standard helicopter-darting and cable-snare methods. We employed fixed-wing and helicopter aircraft to monitor the status of deployed collars, download data, and recover some dropped collars. In capture and handling, we strive to meet or exceed provincial standards for animal care.

Preliminary Results and Data

Field Work 2008 - During 2008, we captured and collared 6 (3M, 3F) grizzly bears that are known to reside at least partially within our study area (Table 1). We used helicopter search and darting to collar 2 males and 1 female during June and another female during October. We employed ground-based trapping to collar one male and one female in October. One female from an existing long-term monitoring program (southern Flathead) has been found to reside within our study area and we include her as a study animal. While she is currently carrying a conventional VHF collar, we may elect to switch this to GPS during spring capture work. One female from previous research had been carrying a GPS collar with a functioning VHF beacon. We attempted to re-capture and change the collar on this female but we were not successful before the collar dropped. We recovered this collar, and an additional collar that had dropped in 2007. In October, we also recovered the collar we deployed in June on M14, which had dropped prematurely as noted below.

Field Work 2009 - During 2009, we captured 10 bears and collared 9 (5M, 4F) within the study area (Table 1). We used helicopter search and darting to collar 2 males and 4 females during June. We employed ground-based trapping to collar another 3 males in late-September and October. Three collars from existing study animals were dropped and recovered this year. Two additional collars are known to be stationary (likely dropped) and we will attempt recovery in the spring. At present, we have 2 GPS collars in hand that can be deployed without refurbishment or battery replacement.

Field Work 2010 – We did not attempt to capture new study animals during 2010. However, we attempted recapture of 2 animals by heli-darting to retrieve collars, one of which we replaced. Two additional collars were dropped and recovered, and another one was detected on mortality in Nov and will be recovered in the spring. There has been a problem in retrieving activity data from all retrieved collars, and location data from one (F22). All collars will be returned to Lotek to hopefully obtain the data.

Below, we briefly summarize the history and status of each study animal to date. We identify each animal according to a numbering convention that is a continuation of a collaring program in the Hwy-3 region from previous years.

M14 - This male was captured in the vicinity of Olivia Creek on 31 May, 2008. He has a previous capture record from May 2005 in Ladner Creek, however his collar had failed shortly after and no GPS data has previously been collected from M14. Unfortunately, he slipped and dropped his collar on 3 June after only 4 days. During this period, he moved north across the Hartley Pass road into the headwaters of Sulphur Creek (Figure 2) and his collar functioned with a successful and reliable fix rate (SRFR) of 77%.

F19 – This female was captured within the Alexander Valley on 1 June, 2008. She was without cubs (although one, 2-year-old was seen very close by) and was mated with M20 at the time of her capture. A data download in early October indicated that she has resided largely within and moved extensively throughout the Alexander Valley (Figure 2). Her home range abuts against Highway 3 in the south, and she has made forays to the east across the Continental Divide into the Alison Creek drainage and to the west into Erickson Creek directly adjacent to the Elkview coal mine. Her collar functioned with a SRFR of 94%. Her collar continued to function during 2009 (92% SRFR) but became stationary on July 13. The collar has not yet been recovered at the time of this report.

M20 – This male was captured within the Alexander Valley on 1 June, 2008 (was mated with F19). We did not find this bear until early November, at which time he was near the headwaters of Nez Pearce Creek, north of Highway 3 in Alberta. We attempted a data download by aircraft prior to the programmed winter shut-off date of the VHF beacon but were not successful due to weather conditions. Since the collar is still functioning normally and is apparently still being carried, we anticipated a successful data download in the spring. However, we again could not find this bear during 2009 until November when a general location was obtained (no download) northeast of Crowsnest Mountain. The collar was apparently stationary but an attempt to retrieve it (on the last day before programmed shutoff) was unsuccessful. We anticipate the collar recovery of the collar in the spring.

F21 – This female was captured from helicopter near Mid-Kootenay Pass on 9 September, 2008. She was fitted with a Televilt™ GPS collar, which is remotely downloadable, but, the reliability of the collars after downloads is reduced. Other than periodic VHF locations, we will wait until this collar is recovered to obtain GPS fixes. However, her last VHF location indicated that she had moved

north to Cate Creek as of late October. She has 3 yearling cubs. During 2009, her 3 cubs were still with her. However, she dropped her collar sometime prior to September, and it has been recovered.

F22 – This female was captured by heli-darting in the vicinity of Flathead Ridge on 9 October, 2008 and was with 3 cubs of the year. Downloads occurred to 22 Oct, 2009 (SRFR = 74%). She was recaptured (heli-darting) and the collar was retrieved and replaced in October 2010, at which time she was with two 2-year cubs (lost one). Data over the past year was not directly retrievable from the retrieved collar, and we will be sending it to Lotek to hopefully obtain the data.

F18 – The collar on this female had been deployed in May 2007. We attempted to recapture her by heli-darting on 8 August 2008 in order to change her collar, but we were unsuccessful. Her collar then dropped (rotten/torn canvas insert) on 12 August adjacent to Sand Creek where we retrieved it. During her monitoring period, F18 used a core area centered on Fairy Creek, upper Iron Creek, the Lizard Basin, and Sand Creeks (Figure 2), with some of her movements in close proximity to relatively high levels of human activity. The 2 cubs-of-year with which F18 was observed during her initial capture were still with her as of August of the next year (2008). Her collar functioned with a SRFR (non-denning) of 86%.

M23 – We captured this young male (likely yearling) by ground-trapping (cable snare) near the upper Flathead River on 14 October. Like F21, he was also fitted with a Televilt™ collar and so we must also reserve any summary of his movements until the collar is recovered. A late-October telemetry flight indicated that M22 had moved south, into the Commerce Creek area. During 2009, his last live-fix was 8 August. His collar had dropped as of September, and was subsequently recovered.

F24 – This female has been carrying a VHF collar for several years as part of the southern Flathead population monitoring program (corresponds to identifier GF157; B. McLellan, MOFR). Her periodic VHF locations (average 28-day sampling interval) indicate that she resides in and around the Cate Creek drainage of the upper Flathead (Figure 2). During 2009, her last live-fix was 8 August. Her collar had dropped as of September, and was subsequently recovered.

M25 – This adult male was captured by heli-darting and collared near Middlepass Creek on 7 June, 2009. He dropped his collar on 14 May, 2010. The collar and all data have been retrieved.

F26 – This adult female was captured by heli-darting and collared near East Iron Creek on 7 June, 2009. She has been successfully located during since then and data have been downloaded. Her collar continued to function as of November (SRFR = 98%). She was not observed with cubs during capture, and she has not been observed direction during telemetry flights.

F27 – This adult female was captured by heli-darting on Piaysoo Ridge and collared on 8 June, 2009. She has been successfully located since then and data have been downloaded. Her collar continued to function as of November (SRFR = 71%). She was with one (unusually small) cub of

the year at the time of capture, without which she was observed in 2010. She dropped her collar on 11 May, 2010 and it along with the location data not already downloaded was retrieved.

F28 – This adult female had been previously collared with VHF. She was recaptured by heli-darting and fitted with a GPS collar on 9 June, 2009. She resides primarily in the Castle drainage. Her collar successfully collected data only until 22 October, 2009, and she dropped the collar (immediately before heli-dart recapture attempt) in October, 2010.

F29 – This adult female was captured by heli-darting on 9 June, 2009 when she was with a single yearling cub. She has been successfully located since then and data have been downloaded prior to denning (SRFR = 69%). Although the VHF beacon was functioning normally at her last download flight in October, the GPS component of her collar ceased obtaining successful fixes in September. She was not found during 2010 and collar failure is suspected.

M30 – This male was mated with F19 and was captured by heli-darting in Alexander Creek and collared on 10 June, 2009. Unfortunately, we were not able to subsequently locate this bear during 2009, despite extensive searching. We continued to search during 2010 with no luck.

M31 – This male was captured by cable-snaring in the upper Flathead on 3 October, 2009. He was subsequently located and downloaded prior to denning (SRFR = 85%). His collar was located on mortality in Nov 2010 and downloaded, data from which indicate that the collar has been stationary (likely dropped) since 27 May. It will be retrieved in spring 2011.

M32 – This male was captured by cable-snaring in the upper Flathead on 24 September, 2009. He was difficult to fit with a collar due to his large size (535 lbs). As a result, he slipped his collar the next day prior to the collection of any meaningful data. His collar has since been recovered.

M33 – This male was captured by cable-snaring in the upper Flathead on 2 October, 2009. He was subsequently located and downloaded prior to denning (SRFR = 93%). He could not be successfully downloaded during 2010 but will be attempted again in spring 2011.

Table 1. Study animals (and current status) handled and monitored during years 1 - 3 (2008 - 2010) of research specific to grizzly bear behavioral responses to habitat and human influence in the lower-Elk and upper-Flathead drainages, British Columbia. Cubs observed are for current year only.

Sex-ID	Age Class	Cubs (yr)	Date Collared	Area Used	Collar Type	Last Live-Fix	Collar Status	Animal Status	Last Flight Found
M14	adult		05/31/2008	Sulphur Ck to Brule Ck	Lotek 4400M	03/06/08	recovered	unknown	n/a
F19	adult	No	01/06/2008	Alexander Ck	Lotek 4000	13/07/09	stationary	unknown	Oct 09
M20	adult		01/06/2008	Alexander to Livingstone	Lotek 4400M	Unknown	unknown	unknown	n/a
F21	adult	3 (2nd)	09/09/2008	Middle Pass to Cate	Televilt	Unknown	recovered	unknown	Sep 09
F22	adult	2 (2nd)	09/10/2008 18/10/2010	Flathead Ridge – Broadwood	Lotek 4400M Lotek 4000	22/10/09	Retrieved Functional	alive	Nov 10
F18	adult	??	16/05/2008	Mt Fernie to Sand Ck	Lotek 4400M	12/08/08	recovered	unknown	n/a
M23	subadult		14/10/2008	Upper Flathead to Commerce	Televilt	08/08/09	recovered	unknown	Sep 09
F24	adult	??	02/09/2005	Cate Creek	VHF	08/08/09	recovered	unknown	Sep 09
M25	adult		07/06/2009	Middlepass – Commerce	Lotek 7000M	14/05/10	recovered	unknown	May 10
F26	adult	??	07/06/2009	East Iron Ck	Lotek 7000M	22/10/09	functional	alive	Oct 09
F27	adult	1 (1st)	08/06/2009	Piaysoo Ridge	Lotek 4400M	11/05/10	recovered	unknown	May 10
F28	adult	No	09/06/2009	Castle River	Lotek 4400M	22/10/09	recovered	alive	Oct 10
F29	adult	1 (2nd)	09/06/2009	Hartley Pass	Lotek 7000M	22/10/09	failed?	unknown	Oct 09
M30	adult		10/06/2009	Alexander Ck - ??	Lotek 4400M	Unknown	unknown	unknown	n/a
M31	adult		03/10/2009	Upper Flathead – Broadwood	Lotek 7000M	27/05/10	stationary	unknown	Nov 10
M32	adult		24/09/2009	Upper Flathead - ??	Lotek 7000M	24/09/09	recovered	unknown	Oct 09
M33	adult		02/10/2009	McLatchie - Carbondale	Lotek 7000M	22/10/09	functional	alive	Sept 10

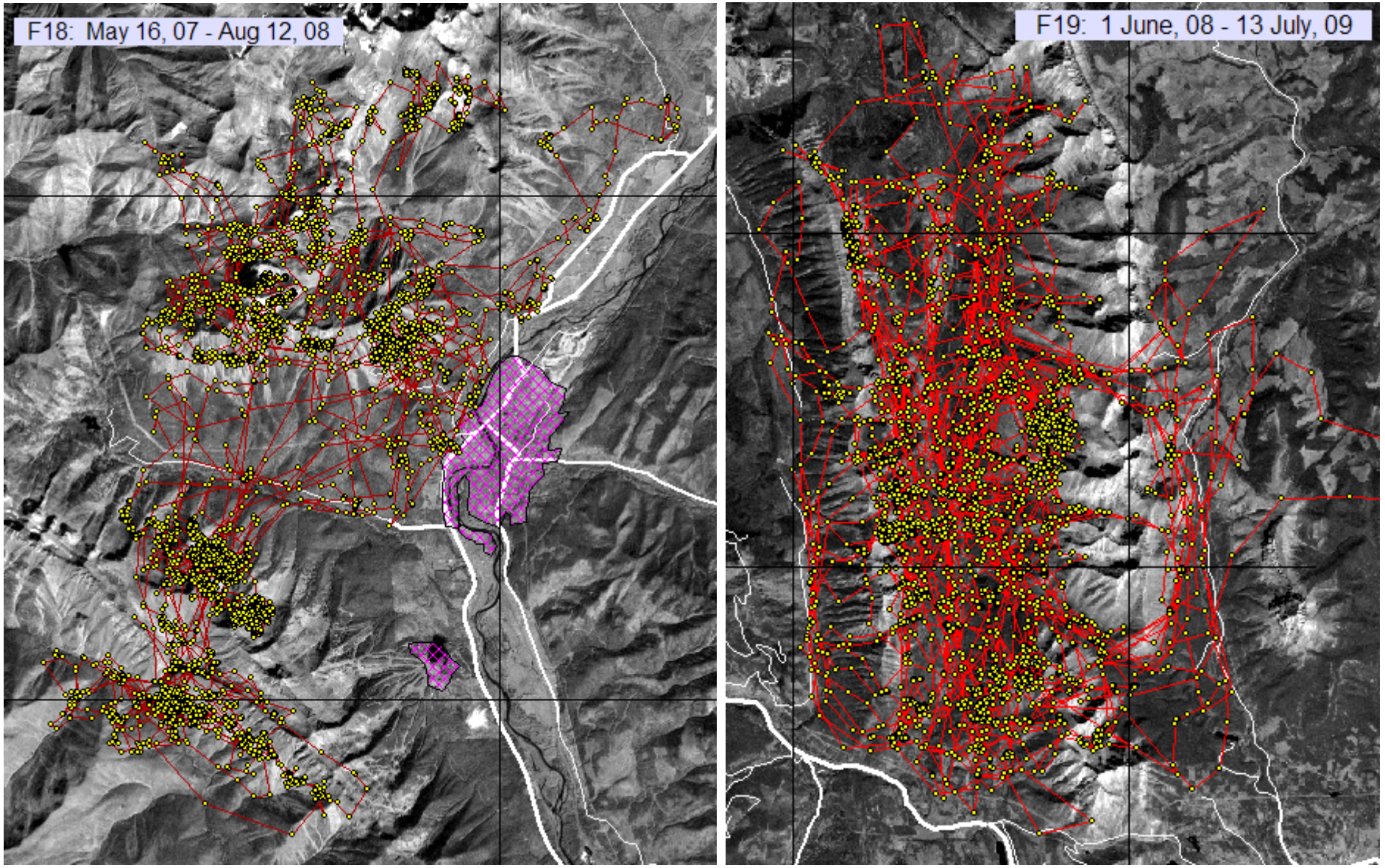


Figure 2. Plots of grizzly bear GPS location/movement data for select study animals in the lower-Elk and upper-Flathead drainages, British Columbia. Overlaid UTM grid is 10 km. Pink hatched area is urbanized, and roads and highways are shown in white. Figure continues on next page.

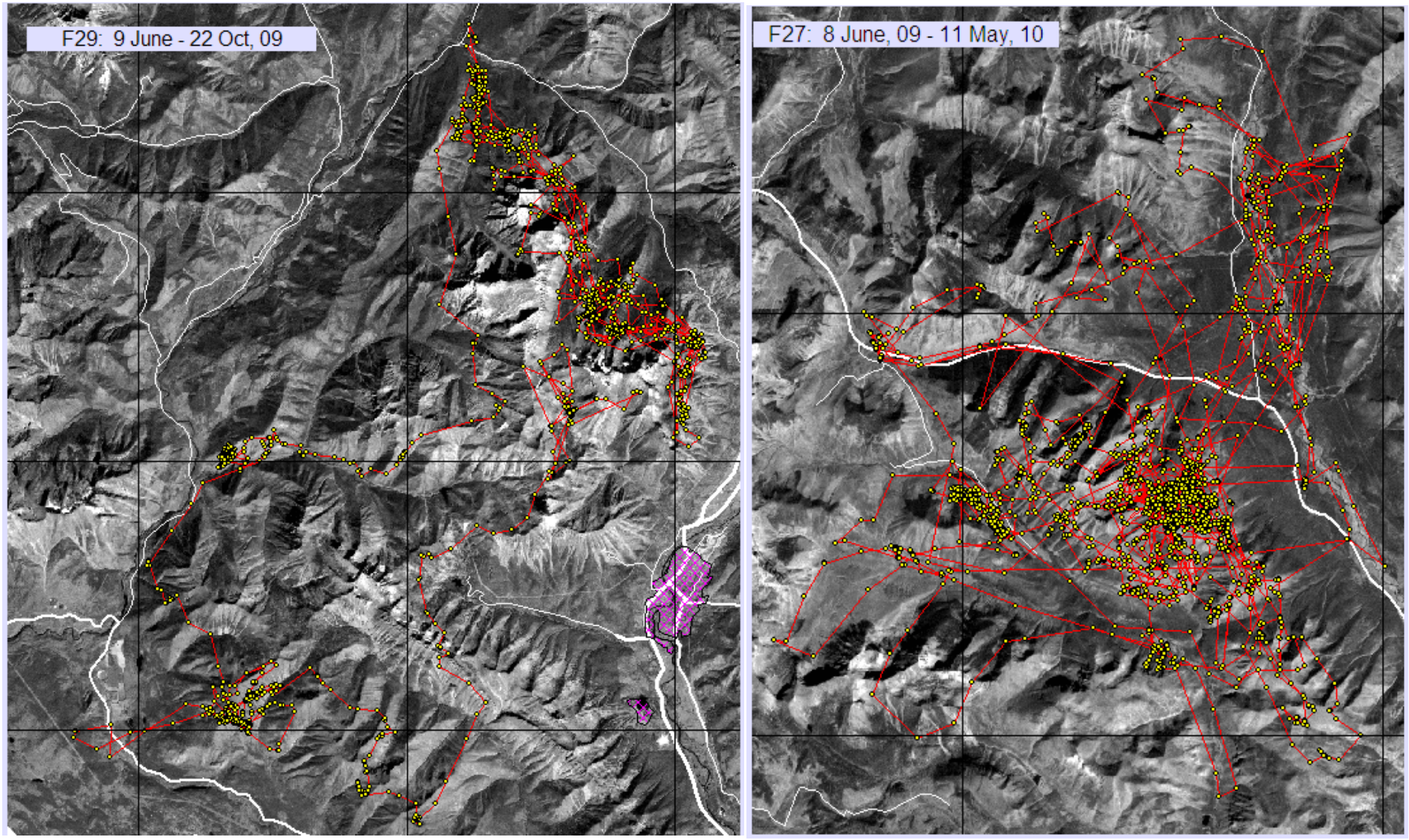


Figure 2. Study animal data plots continued.

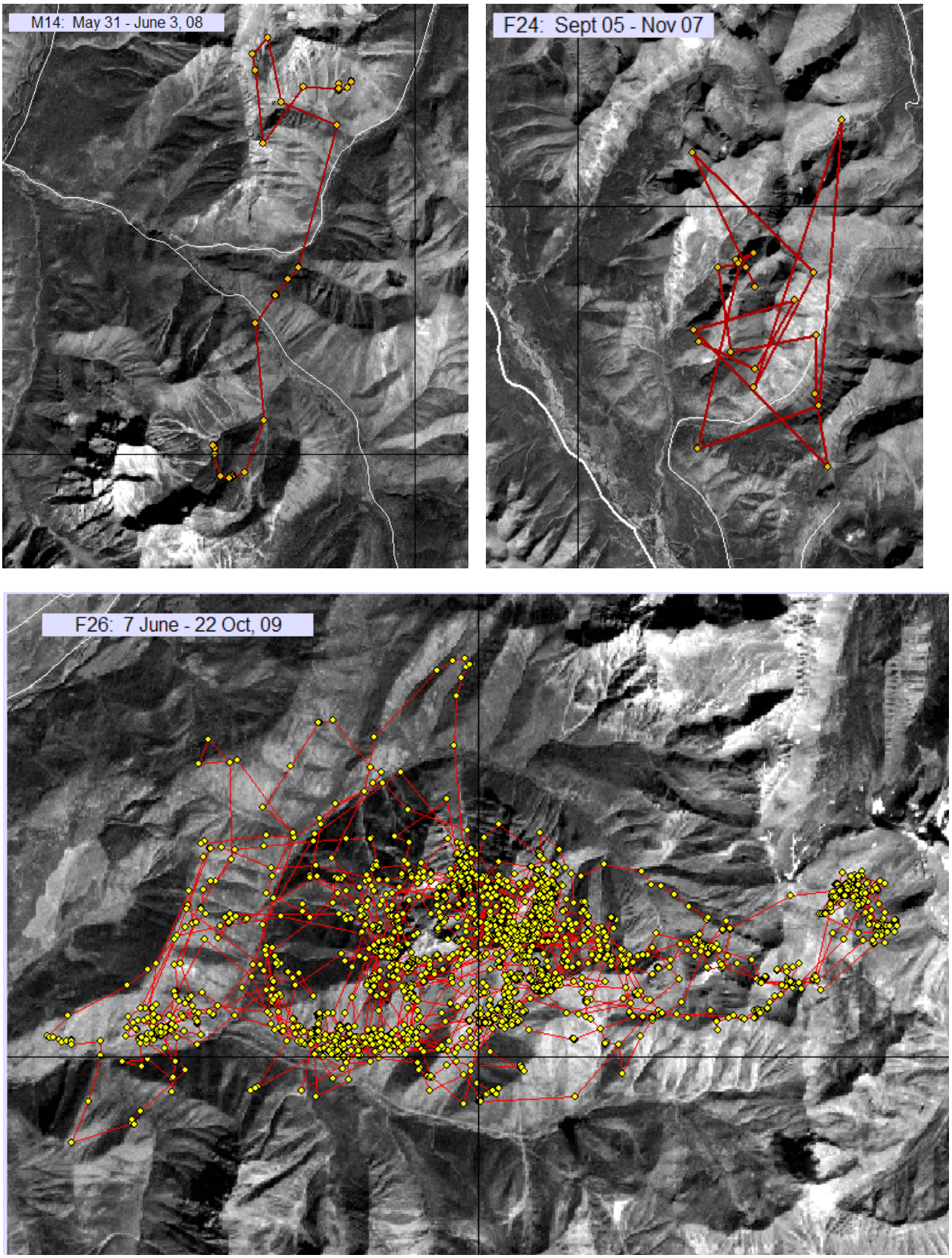
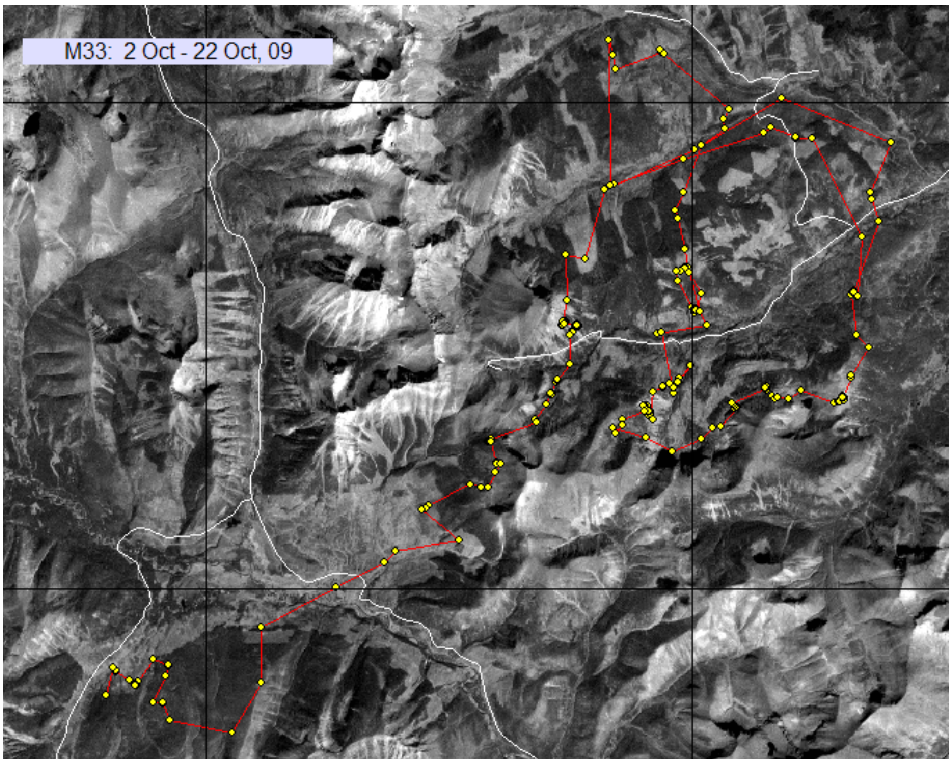
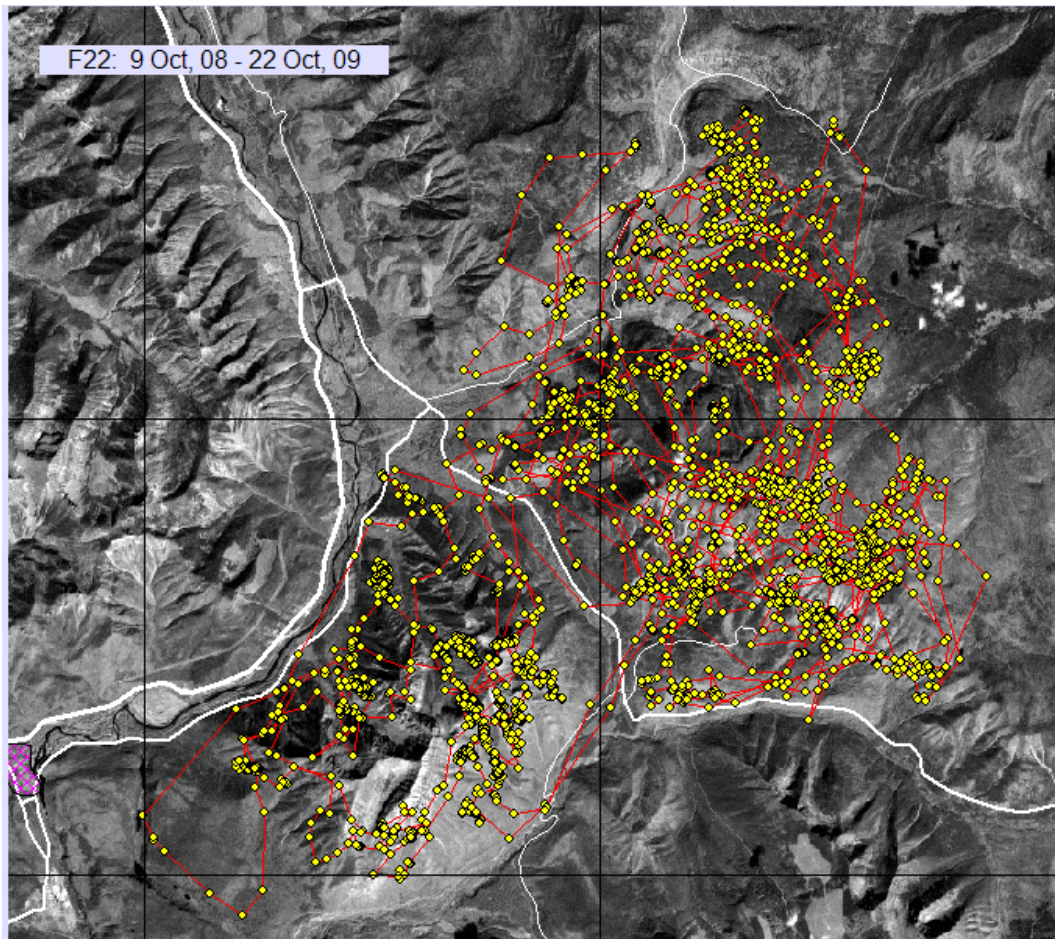


Figure 2. Study animal data plots continued.





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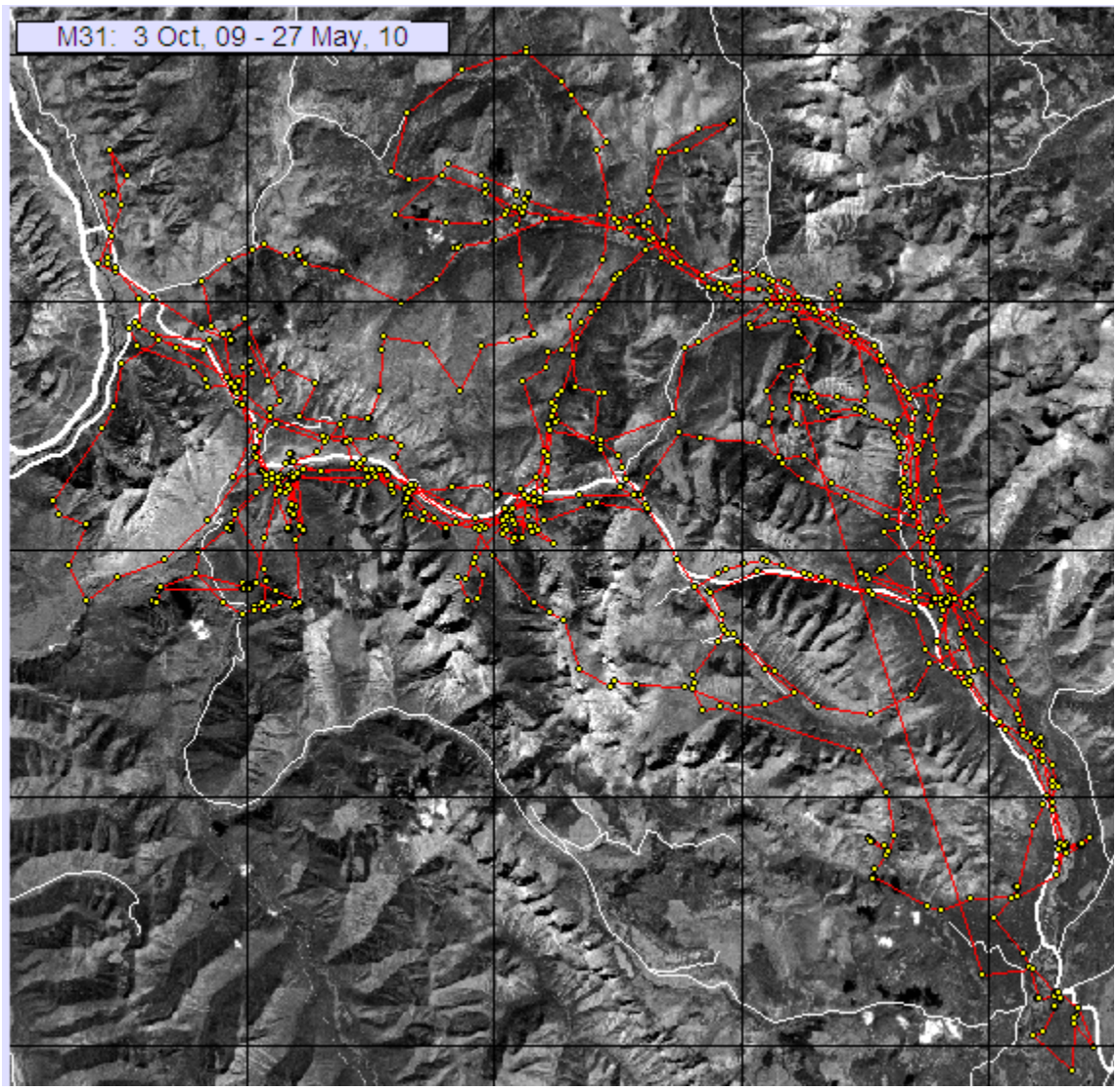

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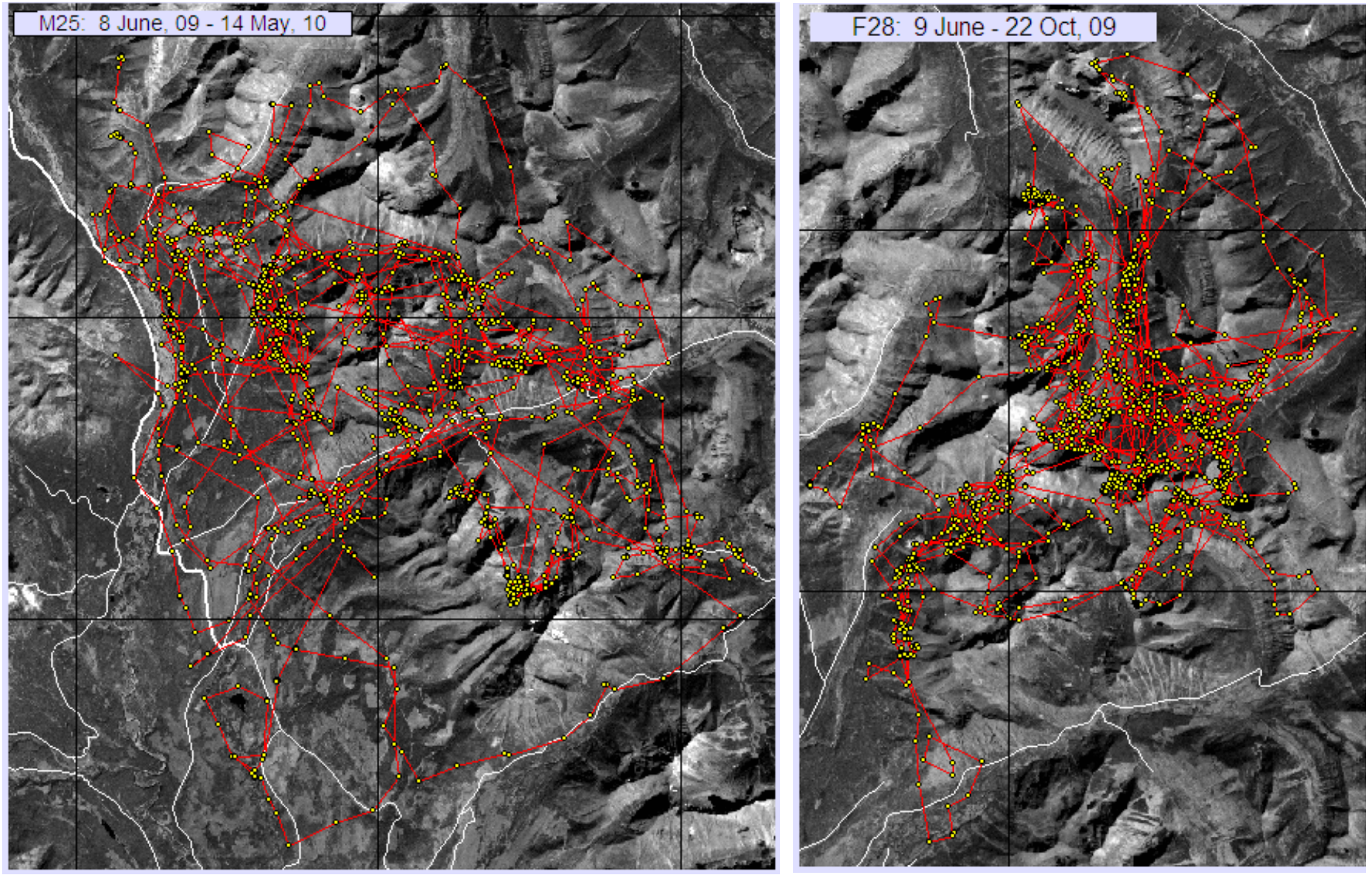


Figure 2. Study animal data plots continued.

HUMAN USE

Approach

Given our objectives, the sampling of human-use types and levels is an important aspect of this study that will be used to model broad-scale variation in human activity and factors that potentially explain variation in carnivore space-use, movements, and survival among landscapes, in addition to finer-scale spatio-temporal behavioral responses. We are presently sampling vehicle traffic as a direct proxy for human activity. We are using electromagnetic vehicle traffic counters (TRAFx Research Ltd, Canmore, AB) as our primary sampling tool to characterize and model spatial and temporal patterns of vehicle use.

In 2008, we deployed 8 TRAFx™ vehicle counters that were purchased for the project. We placed counters strategically, selecting locations that we expected to be informative and representative of the variation in vehicle traffic patterns within our study area (Figure 3). Each counter was programmed and calibrated according to the specific road type (e.g., width, lanes) and associated traffic patterns (e.g., type, volume, speed). Counters were deployed in early August and data were downloaded in mid-October. They are continuing to collect data year-round, although we may choose to adjust sampling locations by season and/or year to optimize sampling and to opportunistically test localized behavioural responses by GPS-collared study animals.

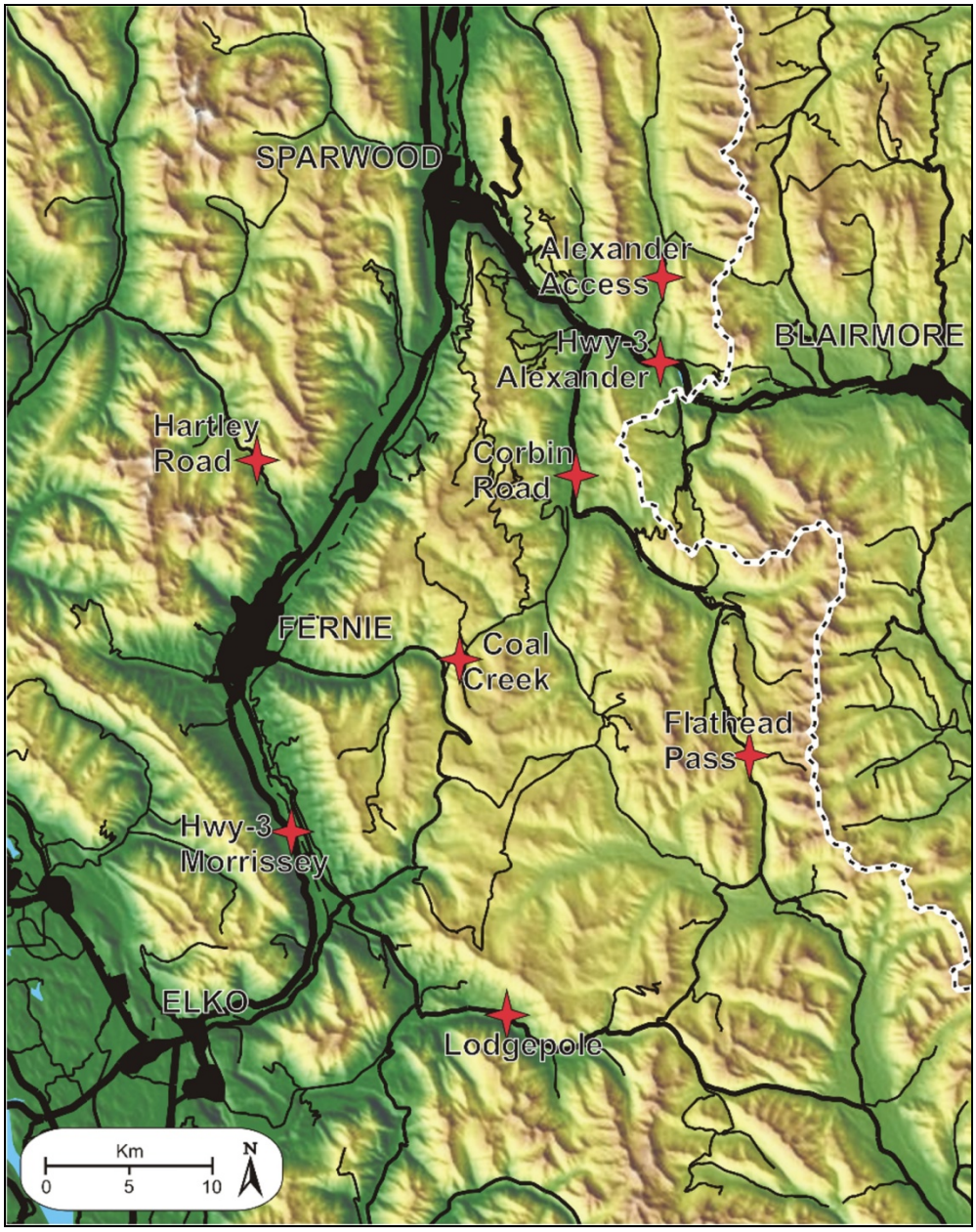


Figure 3. Placement of vehicle traffic counters, during August, 2008 – September, 2010, among 8 roads and locations within the lower-Elk and upper-Flathead drainages, British Columbia.

Sampling Results and Preliminary Data Summary

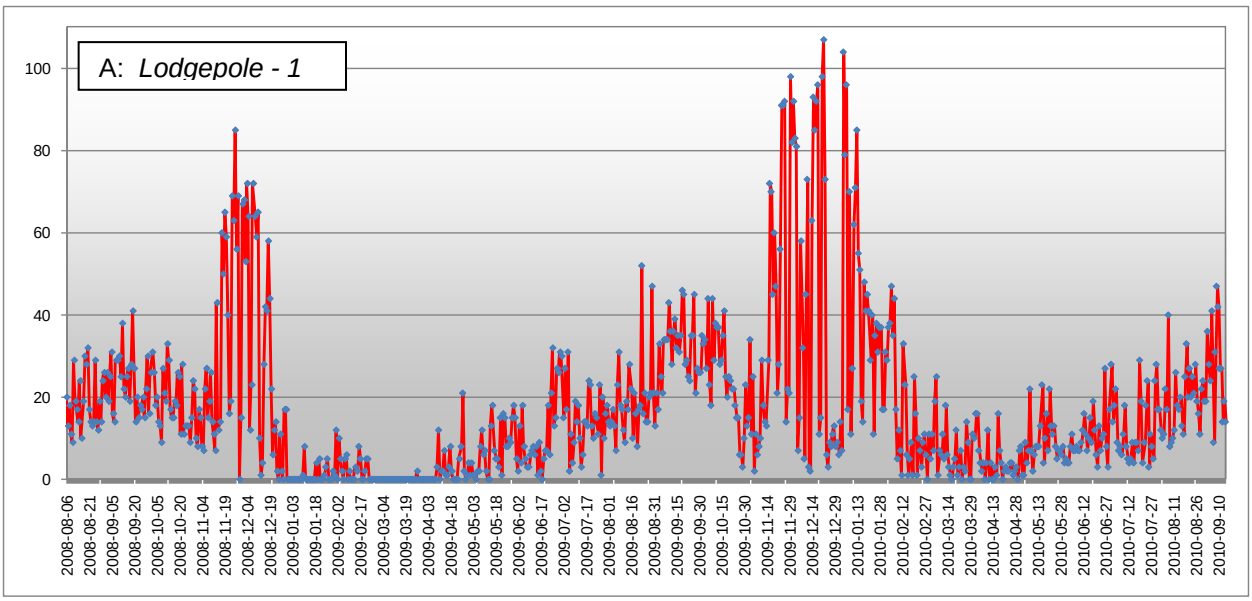
Below, we summarize the datasets downloaded from the 8 traffic counters deployed during the August, 2008 – September 2010 sampling period (Table 2, Figure 4). One of these counters (Hwy-3/Morrissey) initially failed due to a programming error or systemic malfunction, so data collection begins at a later date than the others. Another counter (Alexander Road) was lost after the first field check, so the sampling period is truncated.

We sampled traffic volume and associated variation on Highway-3 at a site near the Continental Divide (HWY-3/ALEXANDER). Daily totals clearly indicate variation ranging from 940 (Christmas Day) to 8,536 (Friday of Aug long weekend) vehicles per day, with traffic volume being higher in August, higher during weekends (especially Fridays and long-weekends), and lower during mid-week (Figure 4). The hourly summary illustrates an expected diurnal pattern of traffic volume that gradually peaks during mid-afternoon and with a nadir at about 3:00 AM (Figure 5). We expect that a significant proportion of the traffic on Highway-3 stems from vehicles traveling between Calgary and Fernie, and therefore Highway-3 traffic volume is less southwest southwest of Fernie (HWY-3/MORRISSEY).

One counter was located on the paved access road to the Corbin mine and townsite (CORBIN ROAD). Given the industrial use of this primary access road, traffic totals reflect higher week-day use (Figure 4), and high diurnal variation (Figure 5). Other counters were situated on secondary-gravel and backcountry roads ranging from relatively high use (e.g., LODGEPOLE) to little use (e.g., FLATHEAD PASS). Both average traffic volume and patterns of daily variation tended to differ among roads (e.g., Figure 5).

Table 2. Daily vehicle traffic statistics, during August, 2008 – September, 2010, among 8 roads and locations within the lower-Elk and upper-Flathead drainages, British Columbia.

Station	Period Start	Period End	Mean	Median	SD	Min	Max	Wkday Mean	Wkend Mean
Coal Creek	05/08/2008	20/07/2010	3.9	2.0	5.3	0	34	3.2	5.5
Hwy3-Morrissey	--	17/03/2010	2514	2334	738	276	5792	2574	2362
Lodgepole	06/08/2008	15/09/2010	17.6	13.0	19.1	0	107	18.6	15.1
Flathead Pass	06/08/2008	15/12/2009	2.6	1.0	3.9	0	40	2.1	3.8
Corbin Road	06/08/2008	12/06/2009	197.8	163.0	71.8	32	367	219.6	143.0
Hwy3-Alexander	06/08/2008	24/02/2010	3196	2398	951	940	8536	3240	3088
Alexander Rd	06/08/2008	08/09/2008	18.1	16.0	11.1	2	52	19.3	15.4
Hartley Road	07/08/2008	13/09/2010	17.2	10.0	19.5	0	98	13.9	25.2



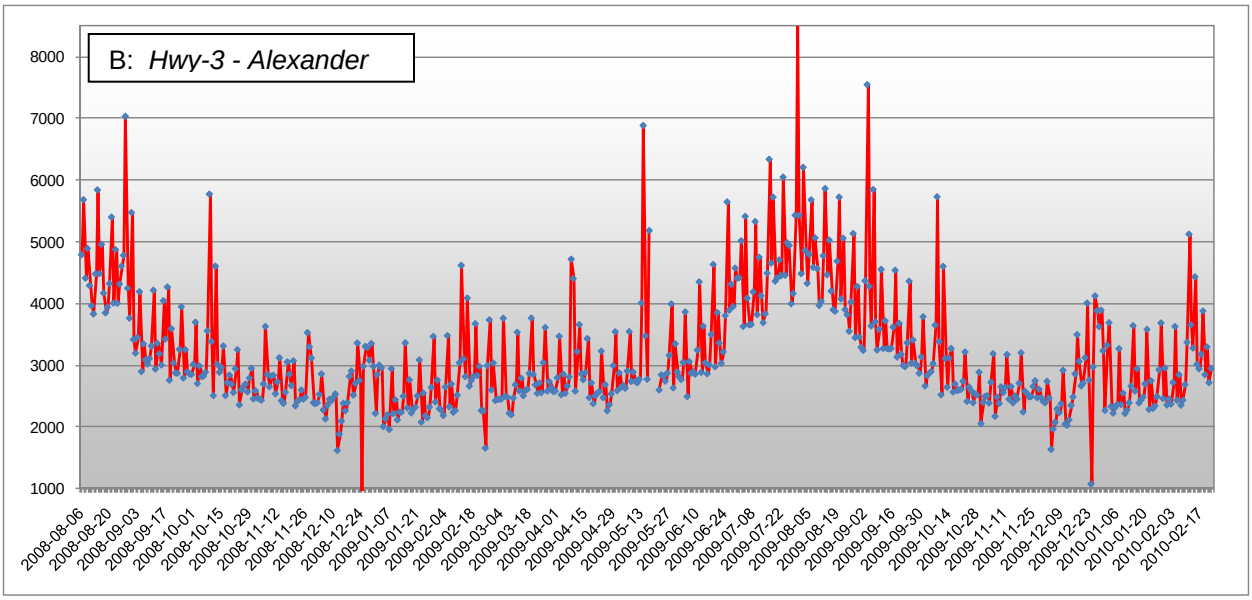
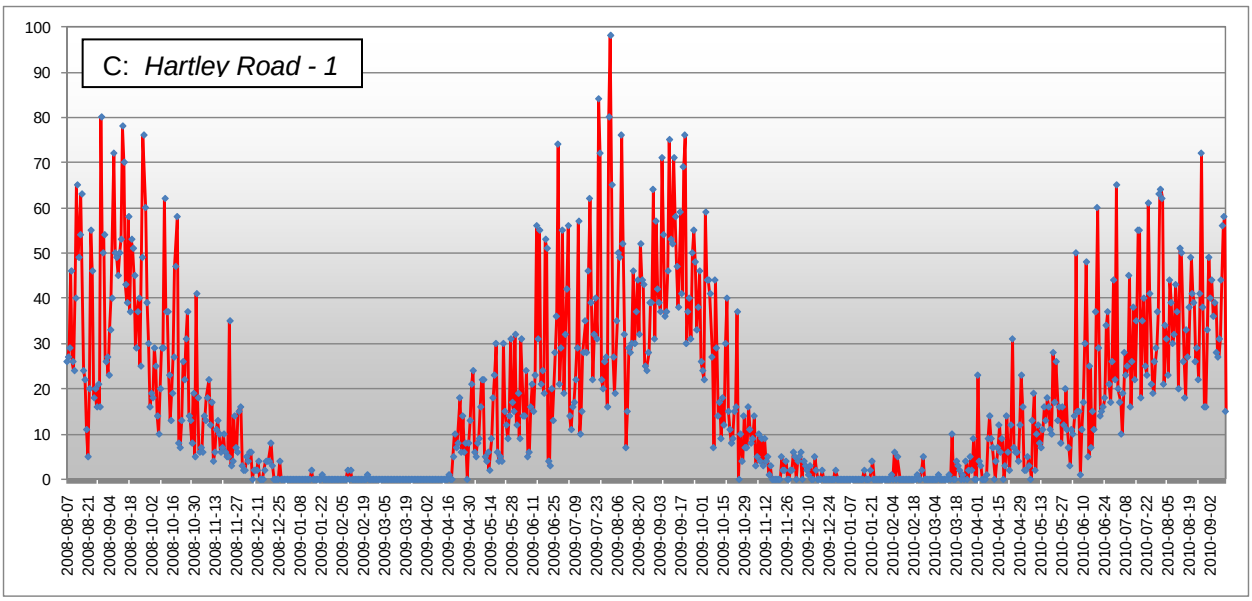
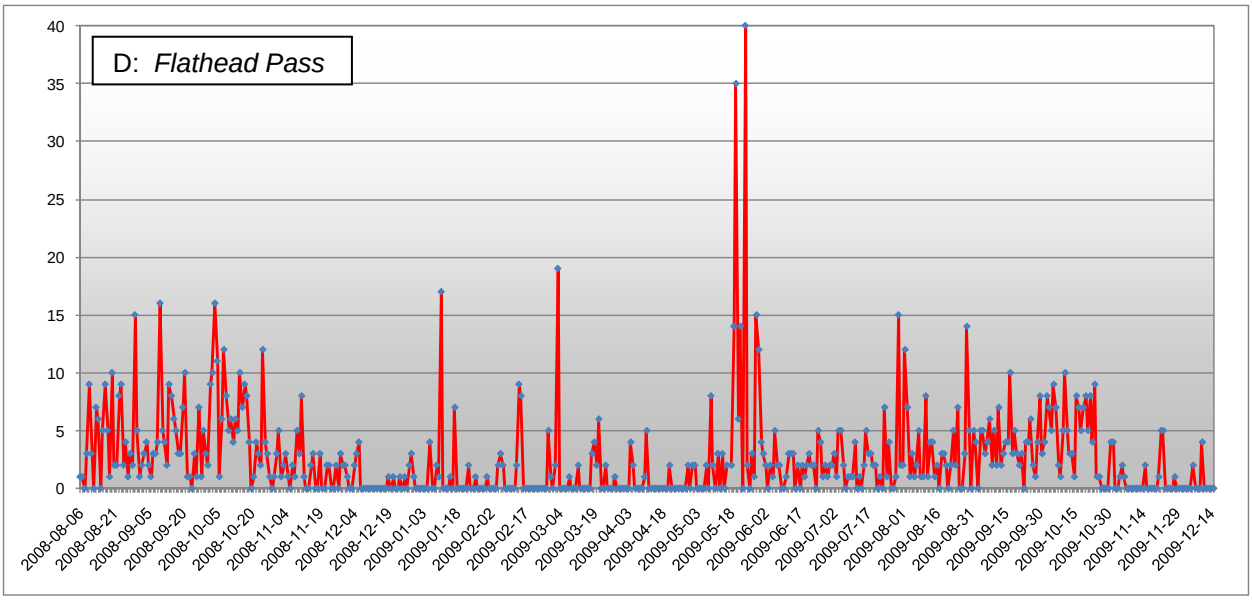


Figure 4. Daily variation in vehicle traffic, during August, 2001 – September, 2010, among 8 roads and locations within the lower-Elk and upper-Flathead drainages, British Columbia





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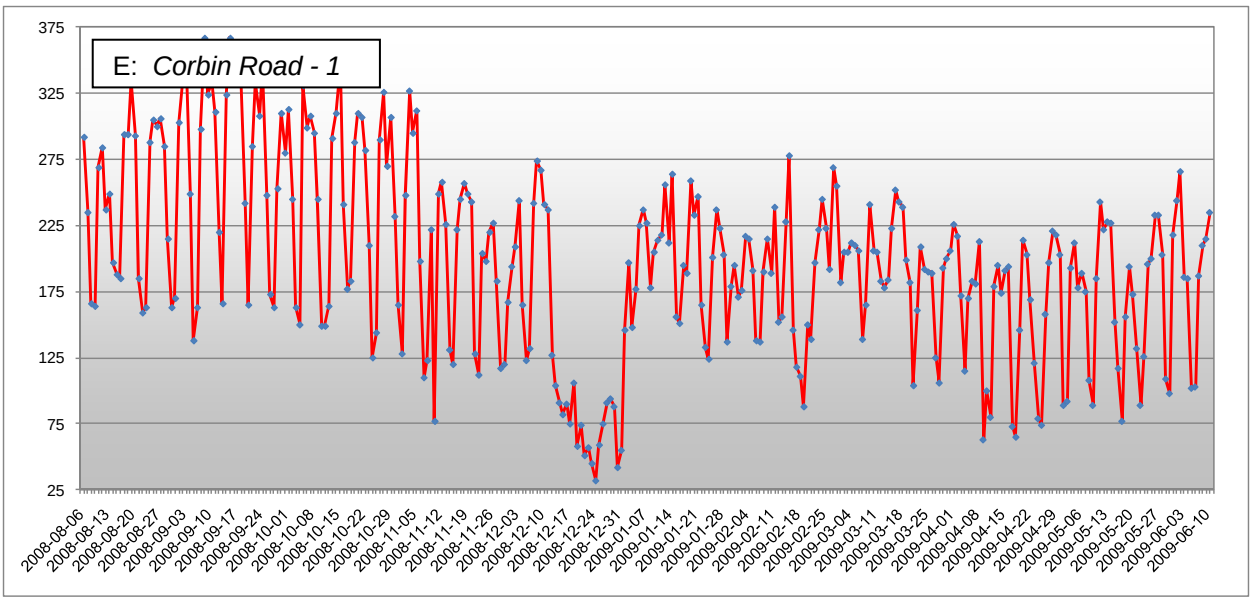


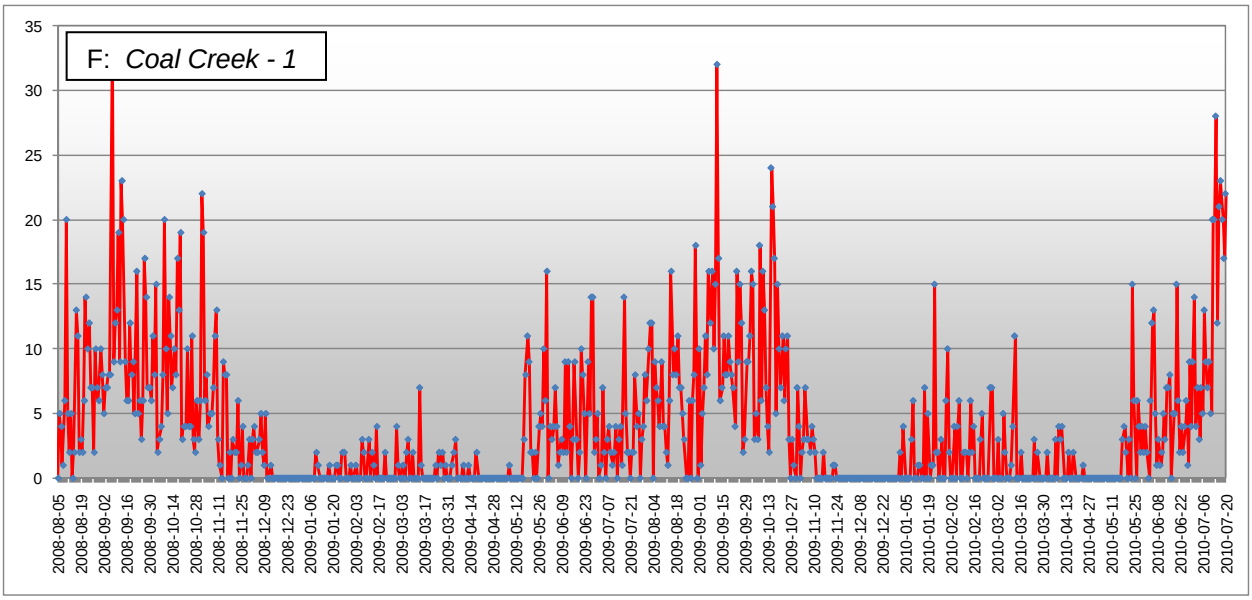
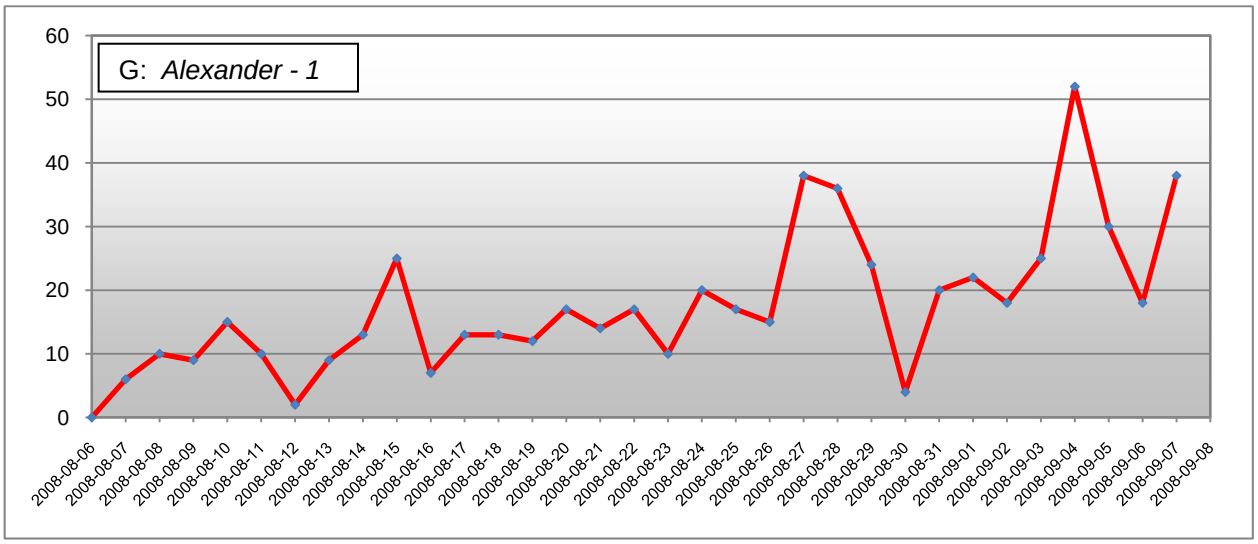


Figure 4. Continued.



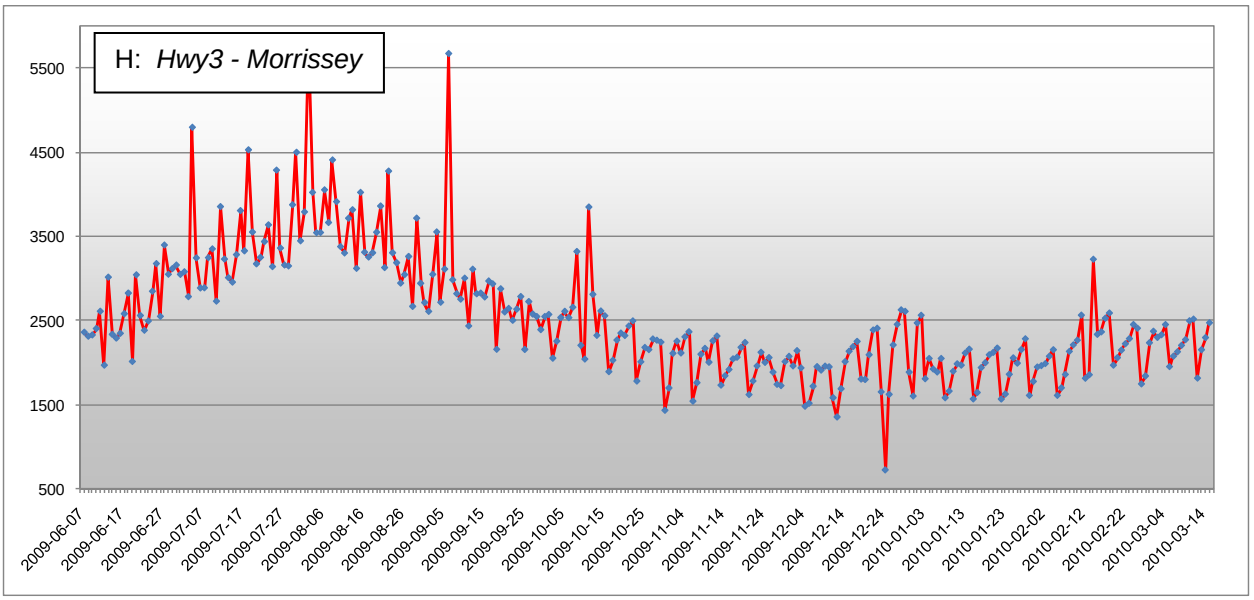


Figure 4. Continued.

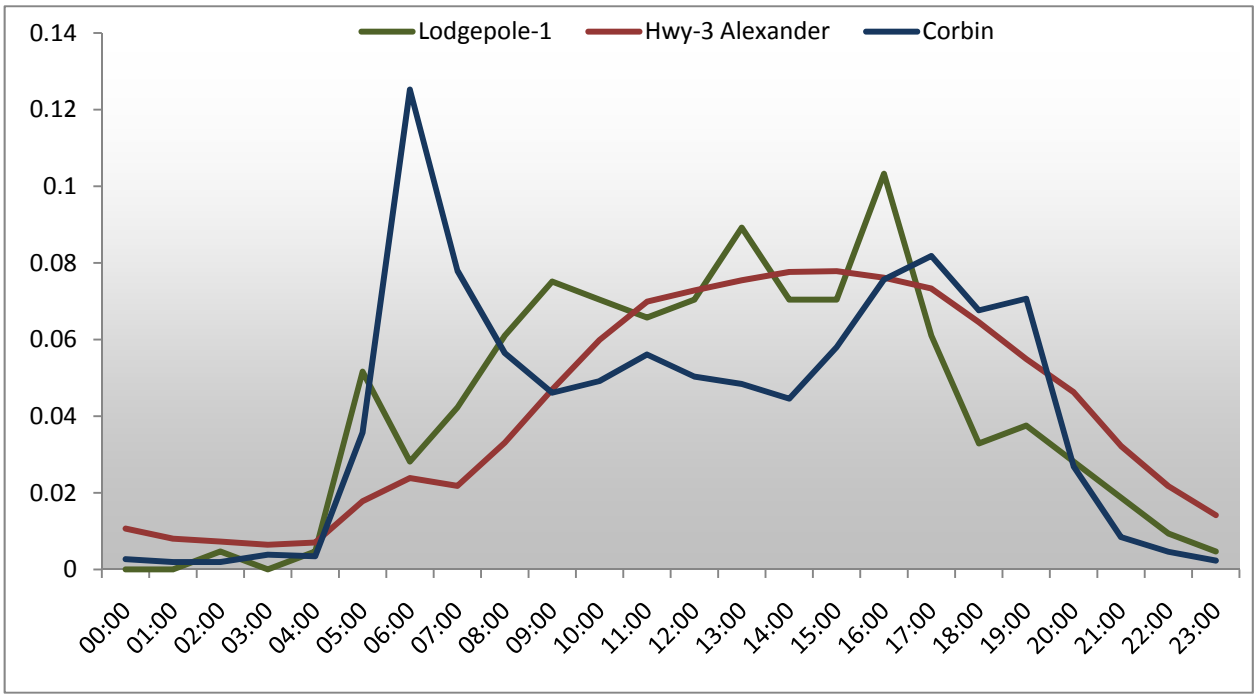


Figure 5. Comparison of diurnal distribution of vehicle traffic volume among 3 roads within the lower-Elk and upper-Flathead study area during August – October 2008.