

Annual Interim Report: F19AP00849 Ungulate Movements and Spatial Ecology in Montana  
Reporting Period: October 1, 2020 – September 30, 2021  
State: Montana  
Agency: Montana Fish, Wildlife and Parks

## **Background and Purpose**

In 2019, Montana Fish, Wildlife and Parks (MFWP) Statewide and Regional Wildlife Program Managers identified two priority ungulate populations where movement data were needed to inform ungulate habitat management. The purpose of this project is to collect ungulate movement data in these two populations, the Devils Kitchen elk and Carbon County mule deer. This information will inform ungulate habitat and management decisions, and enhance the management of Montana's ungulate populations, their habitats, and the public's opportunity to enjoy them.

The primary information need for elk in the Devil's Kitchen area is to delineate current seasonal ranges and movement corridors, and document elk movements during the hunting seasons. The elk population far exceeds numerical population objectives, and recent observations regarding changing elk distributions and timing of seasonal movements has resulted in local conflict and controversy, challenging the community's ability to develop effective harvest and habitat management strategies. Recent elk GPS movement data do not exist in this area, and the only existing movement data are from VHF collars deployed in 1990, making decisions regarding elk habitat and harvest management challenging. Fine-scale location data will identify important seasonal habitats and movement corridors, as well as provide information regarding the timing of movements to refine harvest management strategies that maximize the effectiveness of harvest regulations in achieving harvest objectives in this area.

The primary information need for mule deer in Carbon County is to delineate current seasonal ranges and movement corridors, identify connections between this population and adjacent mule deer populations, and to better inform conservation and management of mule deer in this area. The recent detection of Chronic Wasting Disease (CWD) in the southern Carbon County area raises questions about movement patterns of mule deer in this area. No telemetry data have ever been collected for mule deer in this area, and seasonal observations of deer numbers suggest that a portion of the population is migratory. While summer ranges of these deer are unknown, local knowledge suggests that some of these deer migrate south into Wyoming where mule deer herds are infected with CWD, north into areas with higher-density, uninfected populations of mule deer and white-tailed deer in Montana, and west into higher-elevation areas in or near Yellowstone National Park (YNP). With an emphasis on reducing the spread of CWD, it is important to understand the movement patterns of these mule deer, and how their movements overlap with adjacent infected mule deer populations in Wyoming and presumably uninfected mule deer populations in Montana. Seasonal location and movement data will contribute to our knowledge of the potential avenues for CWD spread across this region of Montana and Wyoming.

Specific goals for this reporting period include:

1. Collect elk movement data in the Devils Kitchen area.
2. Capture and collar an additional 30 mule deer in southern Carbon County and continue mule deer movement data collection.

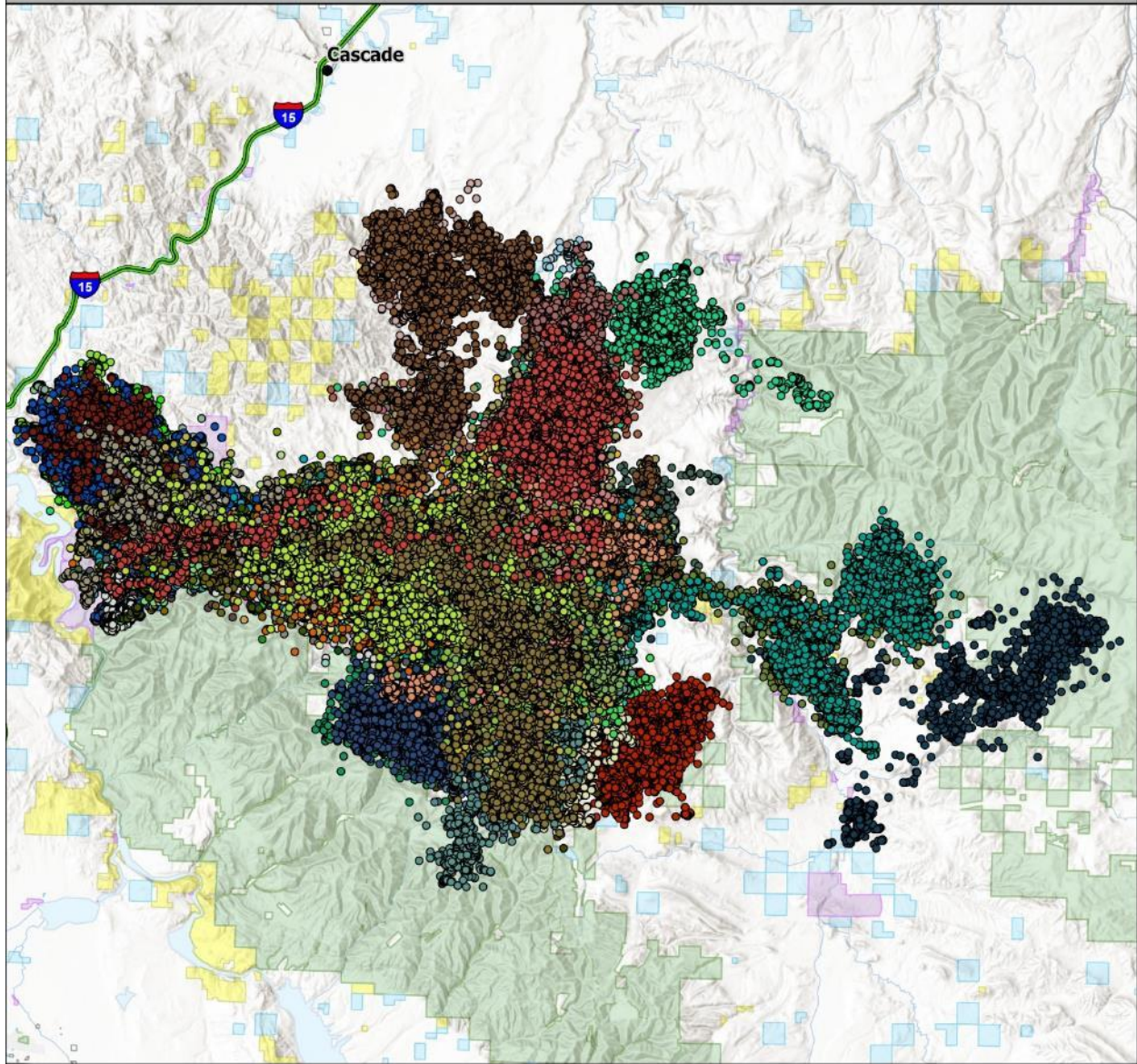
## **Location**

The Devils Kitchen elk data collection is occurring in Cascade and Meagher Counties and the Carbon Country mule deer data is being collected in Carbon County, Montana.

**Objective 1: Collect elk movement data in the Devils Kitchen area.**

We used a combination of helicopter netgunning and chemical immobilization to capture 50 female elk in the Devil's Kitchen study area during February 2020 and 15 female elk during February 2021. During both capture operations, we collected a blood sample to test for pregnancy and for disease surveillance, and we collected a tooth for aging animals. Blood serum was obtained from 49 of 50 elk in 2020 and from 15 of 15 elk in 2021. We estimated a pregnancy rate of 88% (n=49) in 2020 and 87% (n = 15) in 2021. Serum collected in 2020 was tested for antibodies of infectious agents including *Brucella abortus*, Bovine Herpes Virus (BHV-1 aka IBR), Anaplasmosis, Epizootic Hemorrhagic Disease (EHD), Bluetongue Virus (BTV), Parainfluenza-3 (PI3), Leptospirosis (5 serovars), Bovine Respiratory Syncytial Virus (BRSV), and Bovine Viral Diarrhea I and II (BVD I and II). A positive result on these serological tests indicates exposure to an infectious agent but does not confirm infection status. All elk tested negative for exposure to *Brucella abortus*. Results from serological testing were generally similar to other herds in Montana. None of the elk tested had evidence of exposure to BTV, BRSV, or BVD I and II. Elk showed evidence of exposure to BHV (n=1, 2.0%), Anaplasmosis (n=40, 81.6%), EHD (n=1, 2.0%), Leptospirosis (n=3, 6.1%) and Parainfluenza-3 (n=48, 98.0%). Exposure to Anaplasmosis and PI3 is quite variable among elk herds in Montana, but high seroprevalence is not uncommon. Serum collected in 2021 was tested for antibodies of *Brucella abortus* only, and all elk tested negative for exposure. Elk ages ranged from 1.5 to 17.5 (mean = 6.5) in 2020 and from 2.5 to 9.5 (mean = 6.5) in 2021.

Each elk was outfitted with a Lotek LiteTrack collar programmed to collect hourly locations until February 2023. Location data are uploaded daily through the Iridium satellite service. Collars transmit a mortality notice if the collar is stationary for more than 10 hours. To date, 10 animals have died, 4 collars have malfunctioned, and 51 collars are actively collecting location data. We have collected a total of 639,479 GPS locations (Figure 1). The core of the elk winter range was located on the Beartooth Wildlife Management Area and nearby private ranchlands (Figure 2). In spring (Figure 3) and summer (Figure 4), elk dispersed eastward to summer ranges. During fall, many elk dispersed westwards toward winter range (Figure 5).



Land Ownership

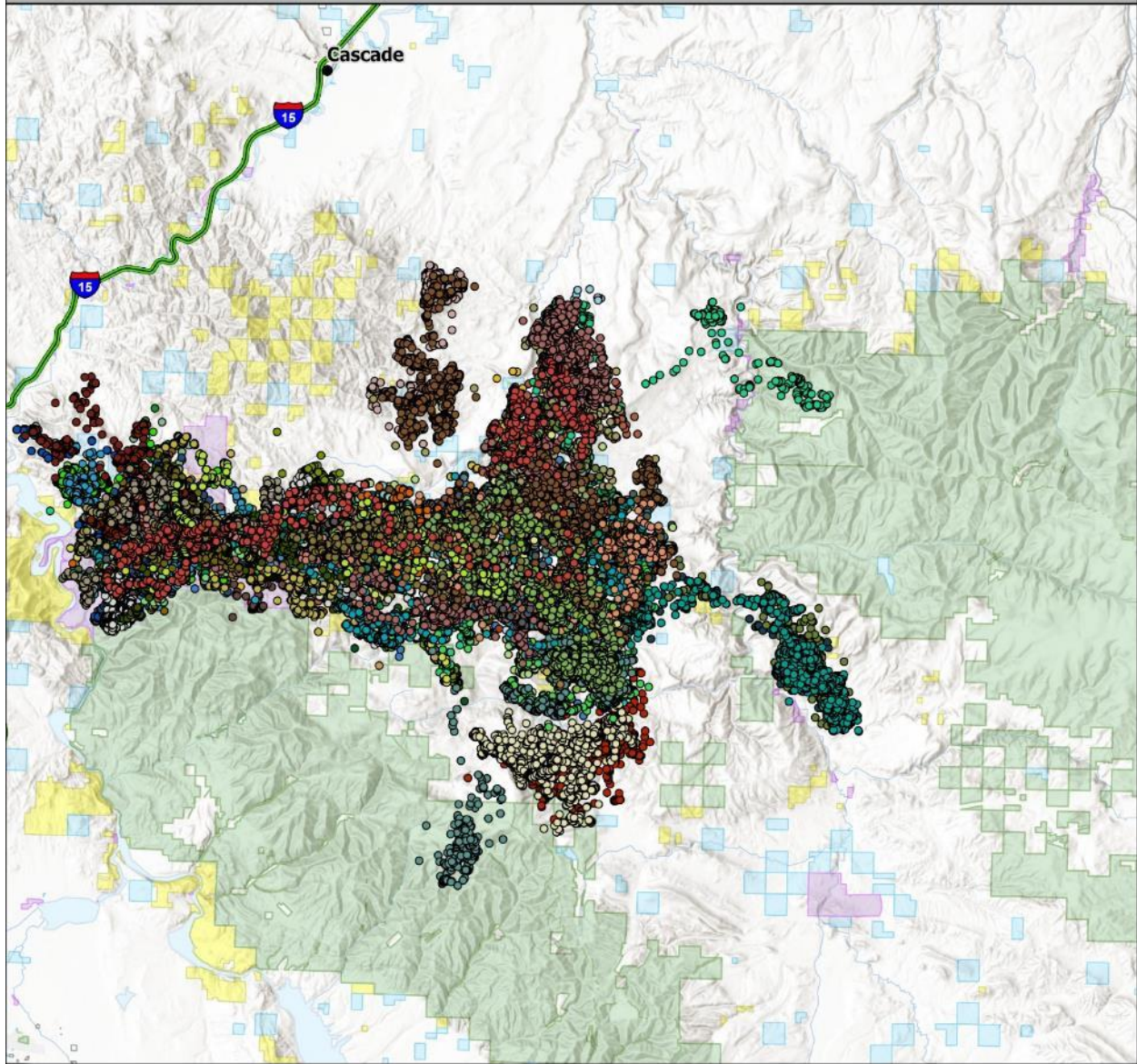
- US Bureau of Land Management
- US Forest Service
- State Lands
- Private
- Montana Fish, Wildlife, and Parks

0 5 10  
Miles



Administrative boundaries and FWP Lands data from Montana Fish, Wildlife & Parks, Helena, MT. Background Imagery from ESRI, Esri, NASA, NGA, USGS, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS

Figure 1. Location data collected from 65 collared female elk in the Devil's Kitchen area northeast of Helena, MT.



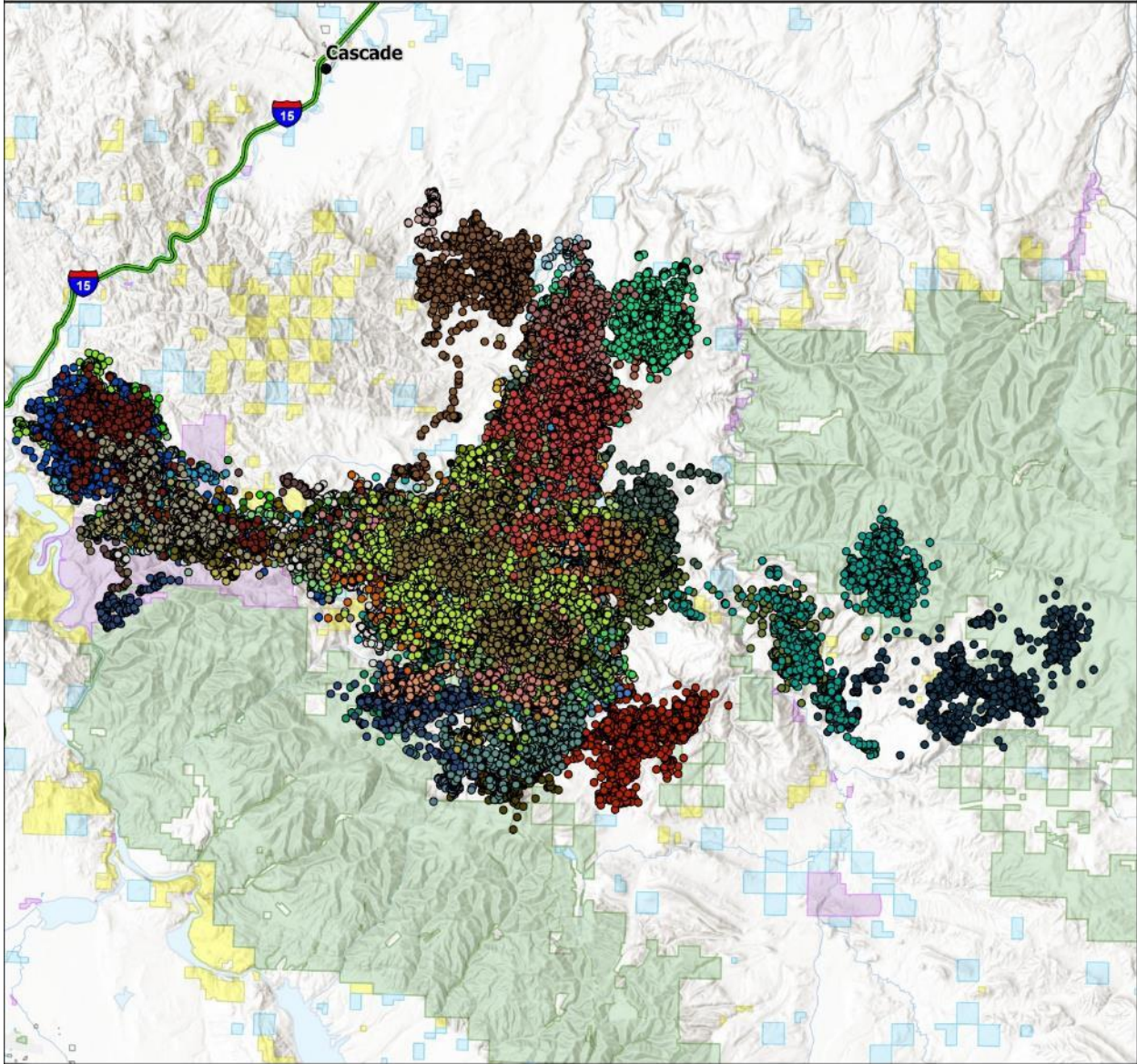
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Figure 2. Winter (01 December – 31 March) location data collected from collared female elk in the Devil's Kitchen area northeast of Helena, MT.



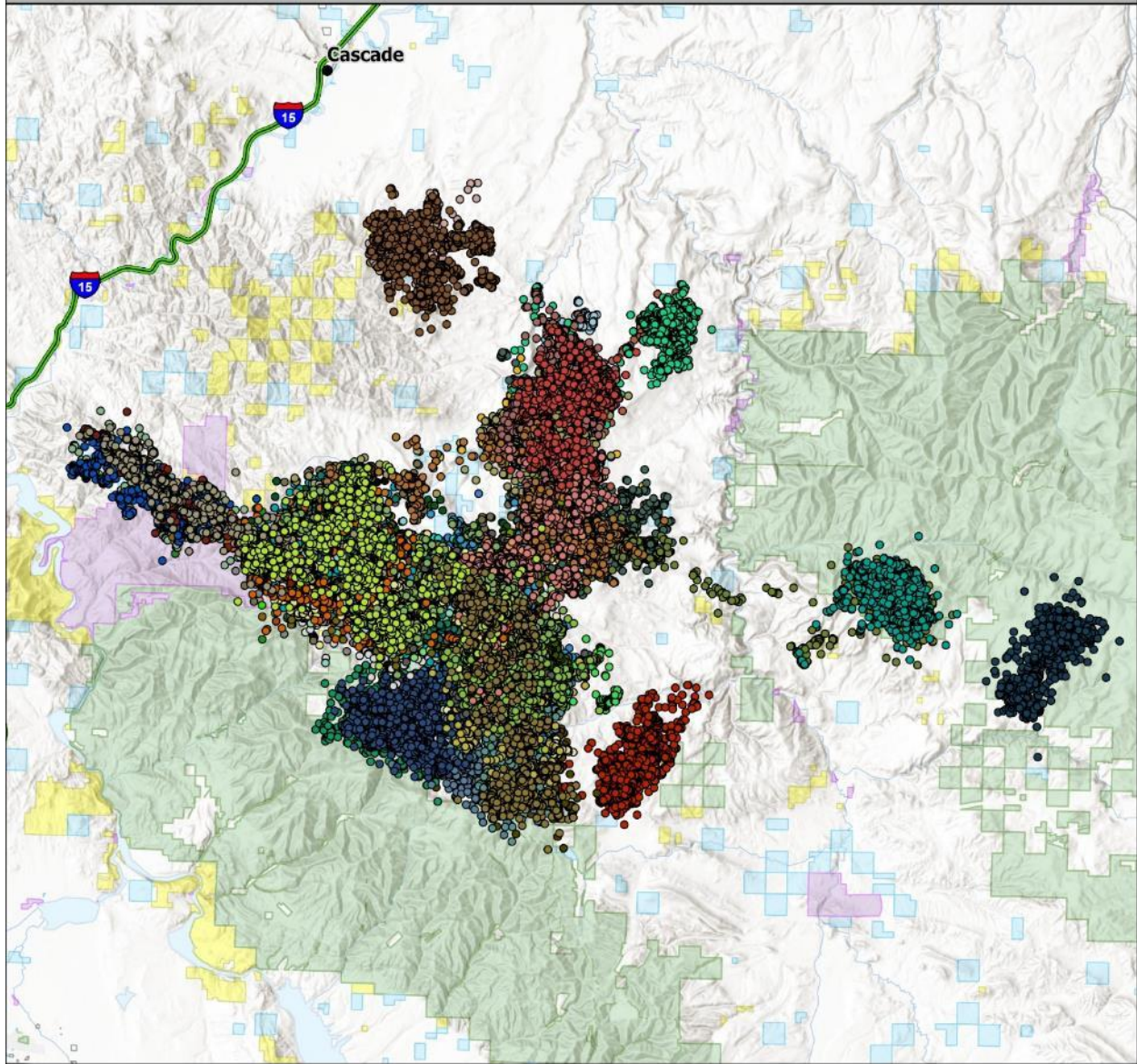
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Figure 3. Spring (01 April – 30 June) location data collected from collared female elk in the Devil's Kitchen area northeast of Helena, MT.



Land Ownership

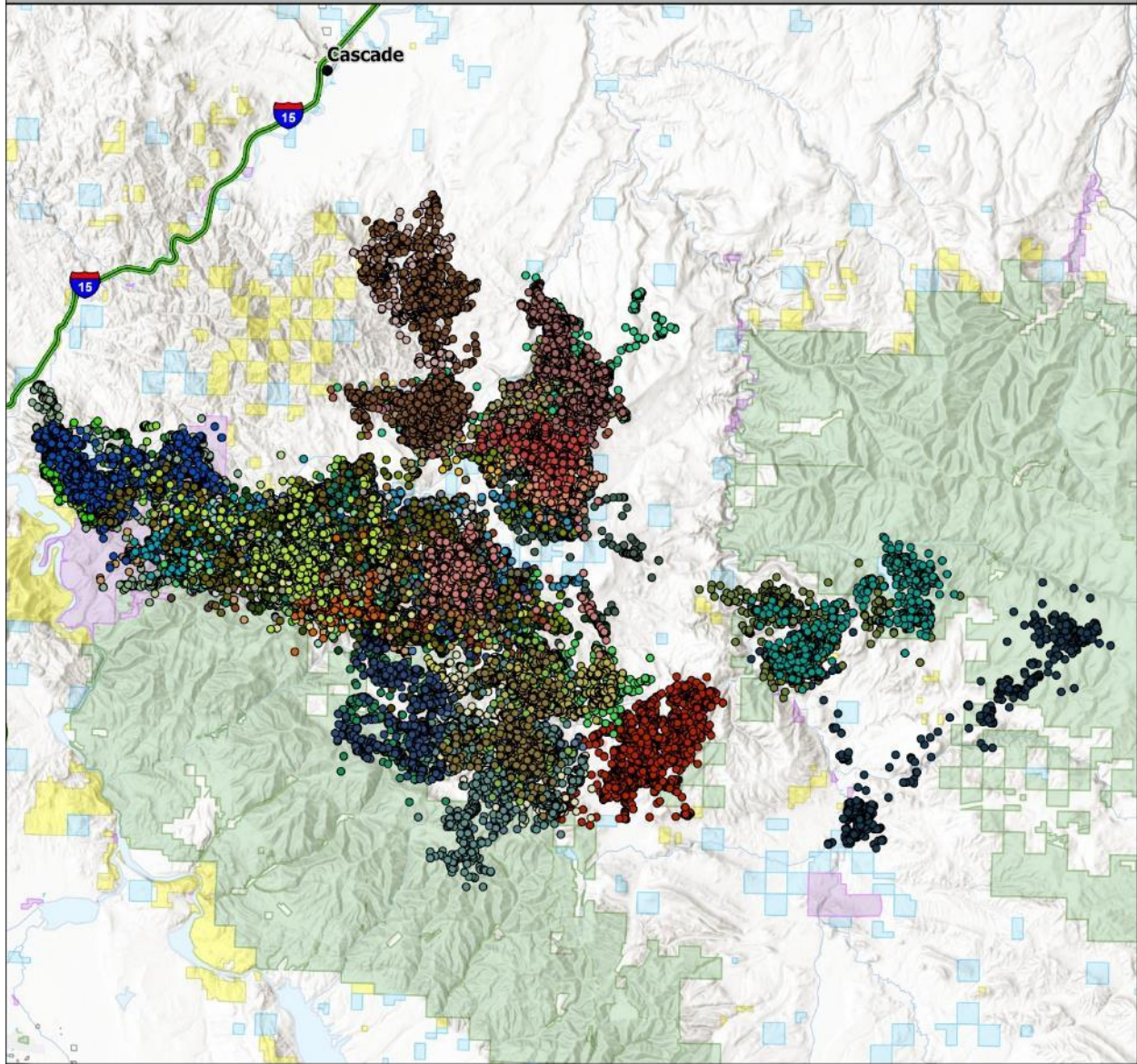
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0 5 10  
Miles



Administrative boundaries and FWP Lands data from Montana Fish, Wildlife & Parks, Helena, MT. Background Imagery from ESRI Esri, CGIAR, USGS, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS

Figure 4. Summer (01 July – 31 August) location data collected from collared female elk in the Devil's Kitchen area northeast of Helena, MT.



Land Ownership

- US Bureau of Land Management
- US Forest Service
- State Lands
- Private
- Montana Fish, Wildlife, and Parks



Administrative boundaries and FWP Lands data from Montana Fish, Wildlife & Parks, Helena, MT. Background Imagery from ESRI Esri, NASA, NGA, USGS, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS

Figure 5. Fall (01 September – 30 November) location data collected from collared female elk in the Devil's Kitchen area northeast of Helena, MT.

During the monitoring period, the majority of elk locations occurred on private lands and the proportion of all elk locations on privately owned lands was 0.70. Elk locations also occurred on Bureau of Land Management (ppn =0.02), US Forest Service (ppn =0.04), Montana State Trust (ppn =0.09), and FWP lands (ppn =0.17). Use of different landownerships varied by season (Table 1) and individual (Figure 6).

Land Ownership	Winter	Spring	Summer	Fall
Private	0.55	0.82	0.74	0.67
Montana Fish, Wildlife, and Parks	0.46	0.16	0.20	0.25
Montana State Trust Lands	0.08	0.09	0.10	0.12
US Bureau of Land Management	0.01	0.01	0.03	0.04
US Forest Service	0.03	0.05	0.09	0.04

Table 1. The proportion of seasonal elk locations occurring on private lands and public lands managed by the Bureau of Land Management (BLM), US Forest Service (USFS), Montana State Trust, and Montana Fish, Wildlife, and Parks (FWP).

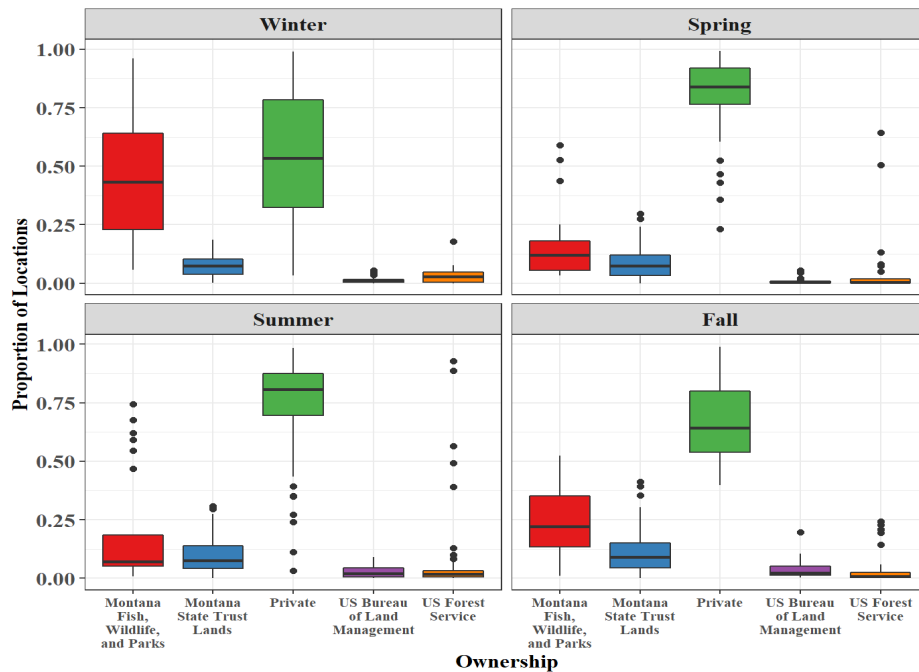


Figure 6. The proportion of individual elk locations occurring on Montana Fish, Wildlife and Parks, Montana State Trust, Private, Bureau of Land Management and Forest Service lands during winter, spring, summer, and fall. The median proportional land use across all individuals in a given season is shown by the horizontal black bar. Individual seasonal use that occurs at higher or lower proportion than expected based on the population median are shown as individual dots.



**Objective 2: Capture and collar an additional 30 mule deer in southern Carbon County and continue mule deer movement data collection.**

We used helicopter netgunning to capture 30 female and 10 male mule deer in the Carbon County study area on 28 February 2020 (Figure 7). Each mule deer was outfitted with a Lotek LiteTrack collar programmed to collect locations every 2-hours for 3-years. Location data are uploaded daily through the Iridium satellite service. Collars transmit a mortality notice if the collar is stationary for more than 6 hours.

At the end of the 2020 calendar year, 25 of 30 female and 1 of 10 male deer remained alive for continued movement monitoring. Causes of mortality for female deer included 1 capture-related mortality and 4 of unknown causes. Causes of mortality for male deer included 1 of unknown cause and 8 cases of hunter harvest during the 2020 hunting season (Table 2). On January 25-26, 2021 we conducted a second capture session via helicopter netgunning and captured and collared an additional 19 female and 11 male mule deer. Of the 44 females being monitored following that capture in early 2021, there were 12 mortalities and 32 surviving through the calendar year (Table 2). Of 12 males being monitored in early 2021, there were 8 mortalities and 4 surviving through the calendar year.

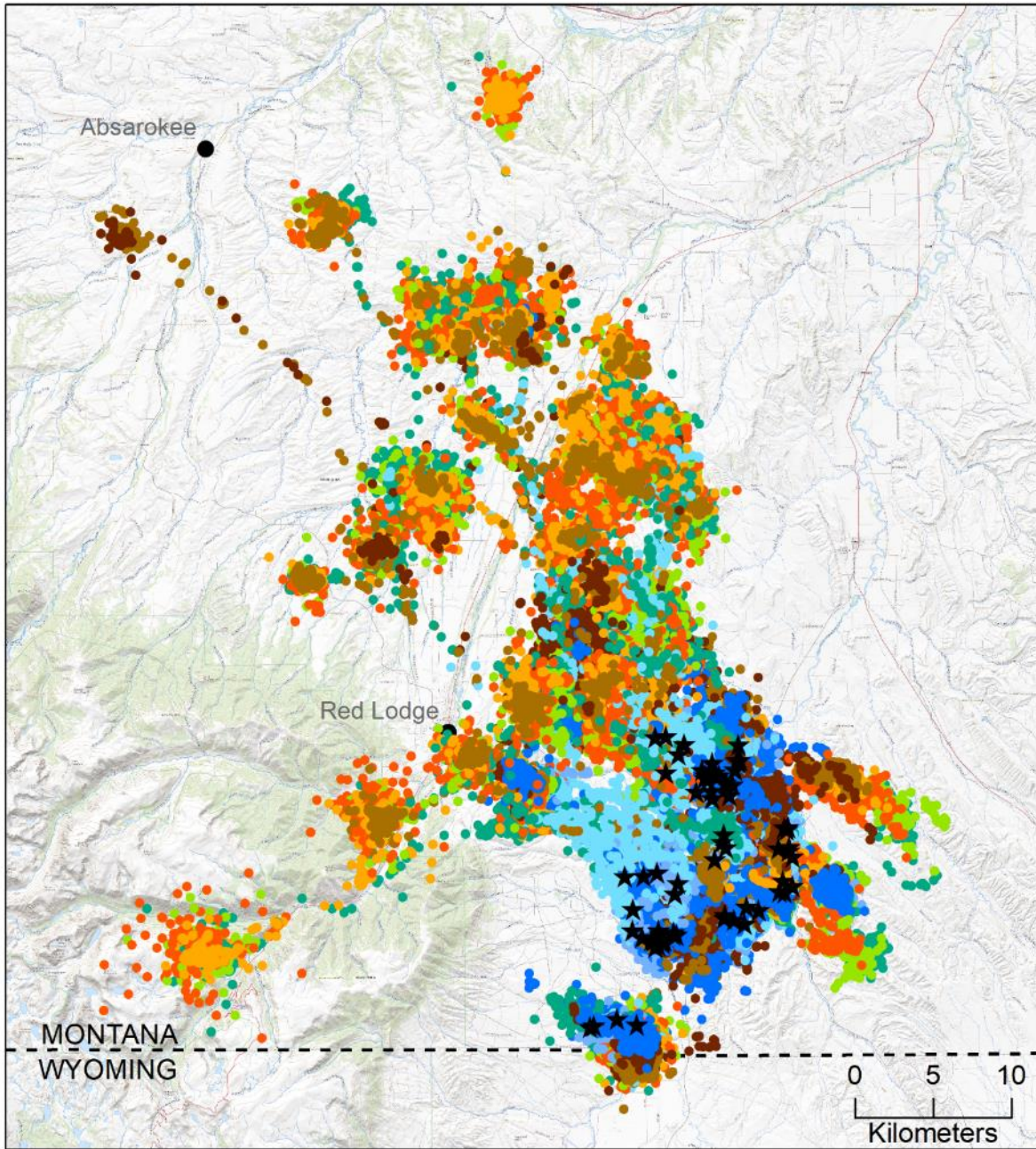
*Table 2. Fates, as of 31 December 2021, of 70 mule deer monitored during studies in Carbon County, 2020–2021.*

	<u>Females</u>		<u>Males</u>	
	2020	2021	2020	2021
<u>Fate at end of year</u>				
Alive (out of total beginning year)	25/30	32/44	1/10	4/12
Dead, by cause				
Capture-related	1	2		
Hunter harvest		1	8	5
Vehicle collision		1		1
Natural mortality	4	8	1	
Unknown				2



*Figure 7. Net-gunning mule deer in the Carbon County study area, January, 2021. Photo by Shawn Stewart.*

We have collected a total of 355,600 GPS locations to date (Figures 8, 9). Mule deer were captured on winter range within 1–4km of the Clark’s Fork of the Yellowstone River near Belfry, Montana and south to the Wyoming border. In the subsequent summers of 2020–2021, mule deer in this population were partially migratory. Some deer remained resident in the same area with overlapping winter and summer ranges (Figure 8, 9, 10). However, many others migrated to distinct summer ranges, predominately to the west and northwest, with the longest migrations being approximately 40–45km straight-line distance (Figure 8, 9, 10). Generally, there was no clear distinction in migration patterns between males and females. There appeared to be variation in the proportionate use of migration paths, such that some areas were used by a single deer while others by multiple deer during migration (Figure 10).

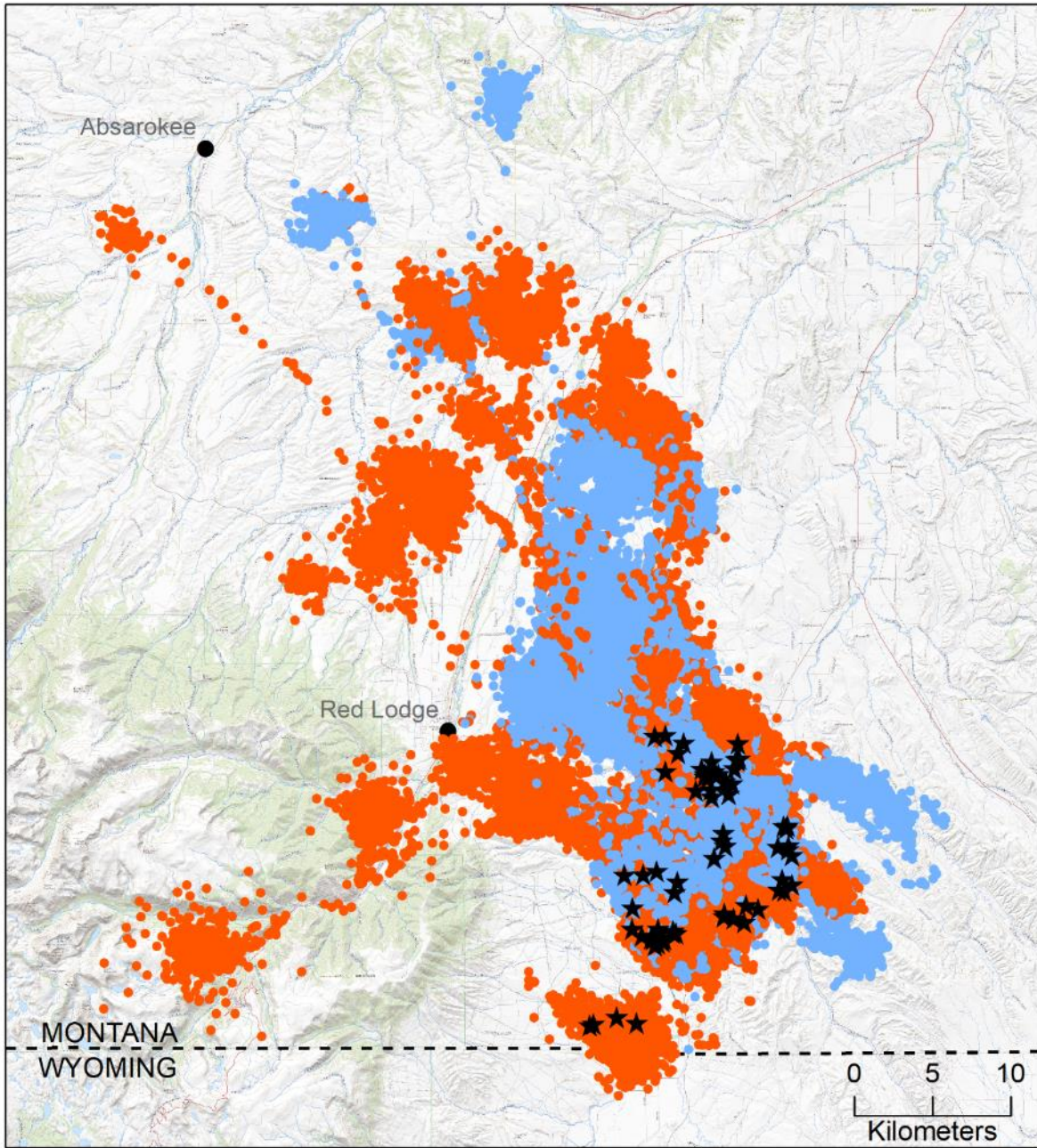


**Mule deer GPS data, by month**

- Jan    • May    • Sep    ★ Captures
- Feb    • Jun    • Oct
- Mar    • Jul    • Nov
- Apr    • Aug    • Dec



*Figure 8. GPS location data spanning March 2020–December, 2021, color-coded by month, collected from collared 49 female and 21 male mule deer in the Carbon County study area, near Red Lodge, MT. Winter capture locations for all deer shown with black stars.*

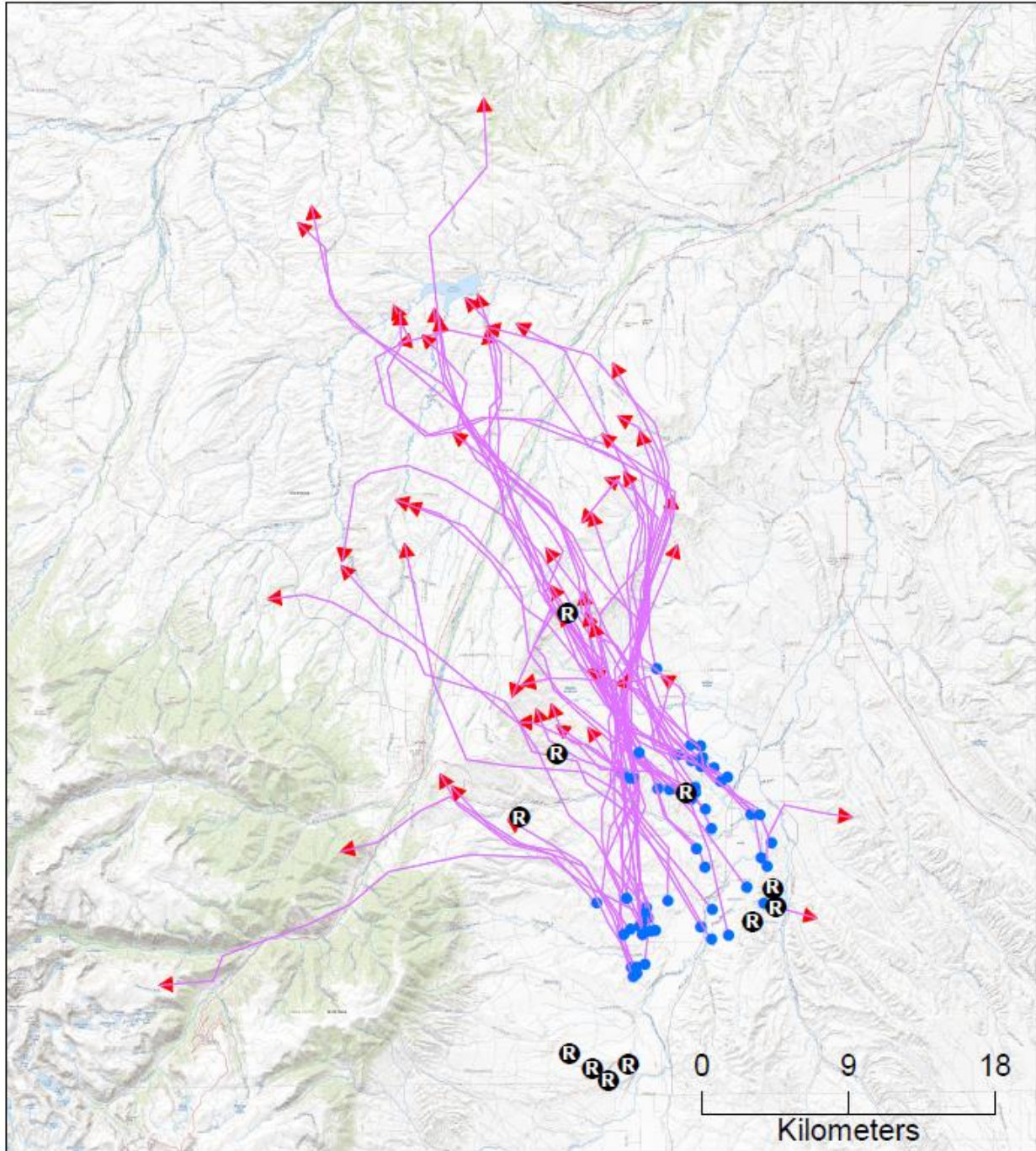


**Mule deer GPS data, by month**

- Female
- Male
- ★ Captures



*Figure 9. GPS location data spanning March 2020–December, 2021, color-coded by sex, collected from collared 49 female and 21 male mule deer in the Carbon County study area, near Red Lodge, MT. Winter capture locations for all deer shown with black stars.*



- resident\_centroids
- cco\_migrations



*Figure 10. Hand-sketched (informal) spring migration paths following mule deer GPS location data, March 2020–December, 2021, in the Carbon County study area, near Red Lodge, MT. Summer range centroids for deer that did not migrate are shown in black dots, labelled “R”.*