Targeted Elk Brucellosis Surveillance Project
2024 Annual Report

EXECUTIVE SUMMARY

Montana Fish, Wildlife & Parks (MFWP), in partnership with Montana Department of Livestock (DOL), is conducting targeted elk brucellosis surveillance to evaluate the prevalence and spatial extent of brucellosis exposure in elk populations, elk spatial overlap with livestock, and interchange between elk populations. This report is an annual summary of the targeted elk brucellosis surveillance project. Throughout 2023 and into March 2024, we monitored movements of 30 elk from the eastern Pioneer Mountains. In January 2024, we sampled 122 adult female elk from the Highland Mountains and screened blood serum for exposure to *B. abortus*. All Highland Mountains elk tested negative for exposure to *B. abortus* (prevalence = 0%, 95% CI: 0-3.1%, n = 122). We collared 30 elk in the Highland Mountains and are monitoring potential overlap with livestock and interchange between elk populations with GPS radio collars.

INTRODUCTION

Montana Fish, Wildlife & Parks (MFWP) has conducted surveillance for brucellosis in elk populations since the early 1980s. Surveillance consists of screening blood serum for antibodies signifying exposure to *Brucella abortus*, the bacteria that causes the disease brucellosis. Brucellosis may cause abortion in pregnant elk, typically from February through May (Cross et al. 2015) and is primarily transmitted through contact with infected fetuses, birthing fluids, placenta and fetal membranes, milk, and materials contaminated by those (fomites). Elk that test positive for exposure to *B. abortus* (seropositive) may or may not be actively infected with the bacteria. Although not a true indicator of infection or the ability of an animal to shed *B. abortus* on the landscape, detection of seropositive elk indicates brucellosis is present in the area and indicates the potential for elk to transmit the disease to livestock or other elk.

Brucellosis is a concern for Montana livestock producers due to the financial, regulatory, and biological impacts (i.e., abortions, quarantine, restricted sales) caused by detection of brucellosis infection in a livestock herd. Seropositive livestock are removed from herds for additional diagnostic testing, and the remaining herd is placed in quarantine. Herds in which brucellosis infection is confirmed are subject to extended quarantine and repeated testing to ensure that all remaining animals in the herd are brucellosis free. The Montana Department of Livestock (DOL) established the brucellosis Designated Surveillance Area (DSA) in 2010 as an area in southwest Montana where brucellosis infected wildlife exist, posing a transmission risk to cattle and domestic bison. Within the DSA, livestock are routinely screened for exposure to brucellosis. The purpose of the DSA is to prevent infected livestock from moving out of the area, limit disease transmission, and instill confidence with livestock trading partners that Montana's livestock are brucellosis free.

To increase understanding of brucellosis in elk populations, MFWP partnered with DOL and initiated a targeted elk brucellosis surveillance project in 2011. The goals of the project are to 1) evaluate the prevalence and spatial extent of brucellosis exposure in elk populations, and 2) document elk

movements to evaluate the extent of spatial overlap with livestock and interchange between elk populations. To achieve these goals, MFWP has conducted targeted sampling and collaring efforts focused on 1 – 2 elk populations per year since 2011. Elk populations targeted for surveillance are identified through collaborative discussions between MFWP, DOL, and landowners and are both inside and outside the State of Montana brucellosis Designated Surveillance Area (DSA, Figure 1). Selection is based on proximity to the known distribution of brucellosis and/or significant livestock concerns.

SAMPLED POPULATIONS

Since 2011, we have sampled 23 elk populations (Figure 1). In January 2023, we sampled elk in the eastern Pioneer Mountains (HD331 and HD329), deployed 30 GPS collars, and monitored movements through March 2024. In January 2024, we sampled elk in the Highland Mountains (HD340), deployed 30 GPS collars, and are currently monitoring movements.

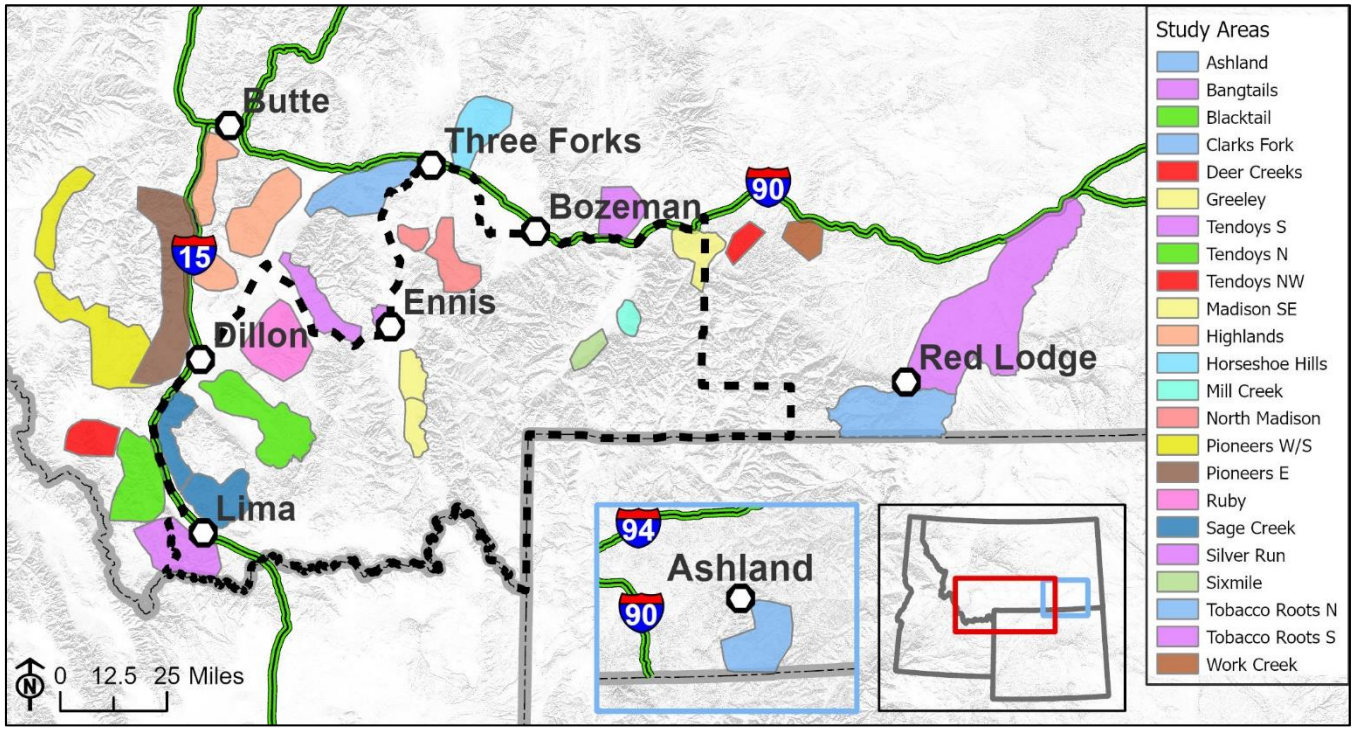

Figure 1. Elk populations sampled during the 2011 – 2024 targeted elk brucellosis surveillance project. The area inside the black dashed line is the Montana Brucellosis Designated Surveillance Area (DSA).

METHODS

To evaluate brucellosis presence and prevalence, we captured adult female elk in the Highland Mountains using helicopter net-gunning and collected a blood sample to screen animals for exposure. Exposure was determined by the presence of antibodies to *B. abortus* in an animal's blood serum. Blood serum samples were tested at the Montana Department of Livestock Veterinary Diagnostic Lab (Diagnostic Lab) using the buffered acidified plate antigen (BAPA) test. Samples classified as suspect or reactors to this screening test were further tested with the florescence polarization assay (FPA) tube test. Final classification of serostatus (i.e., seropositive or seronegative) was based on test results received from the Diagnostic Lab.

We deployed satellite GPS collars on a sample of elk in the Highland Mountains population to track movements and evaluate risk of brucellosis transmission to livestock and other elk populations. The collars are programmed to record locations every hour and have a timed-release mechanism that releases the collar after 62 weeks, allowing collars to be retrieved and redeployed. All collars have a mortality sensor that notifies researchers if the collar is stationary for > 10 hours. This report also summarizes movement data from the eastern Pioneer Mountains elk population that we monitored in 2023-2024. Movement data collection was completed for the eastern Pioneer Mountains in March 2024.

RESULTS

Brucellosis surveillance

In January 2024, we sampled 122 adult female elk in the Highland Mountains (HD340) and deployed collars on 30 elk (Figure 2). All elk tested negative for exposure to *B. abortus*, giving the population an estimated seroprevalence of 0% (95% CI = 0-3.1%).

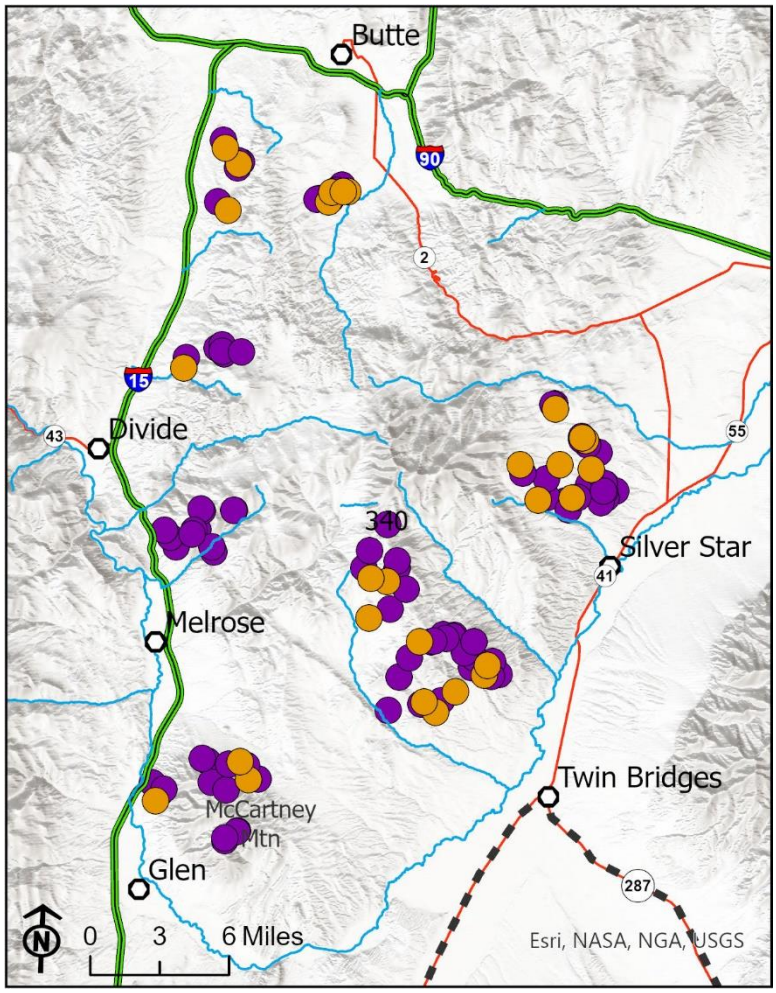

Figure 2. Capture and sampling locations of elk with collars (orange) and elk without collars (purple) from HD340 in the Highland Mountains during January 2024.

Based on hunter harvest and targeted elk brucellosis surveillance (2010-2024), we estimate brucellosis seroprevalence in elk varies spatially across southwest Montana, ranges from 0 – 38% (Figure 3), and has not been detected outside of southwest Montana.

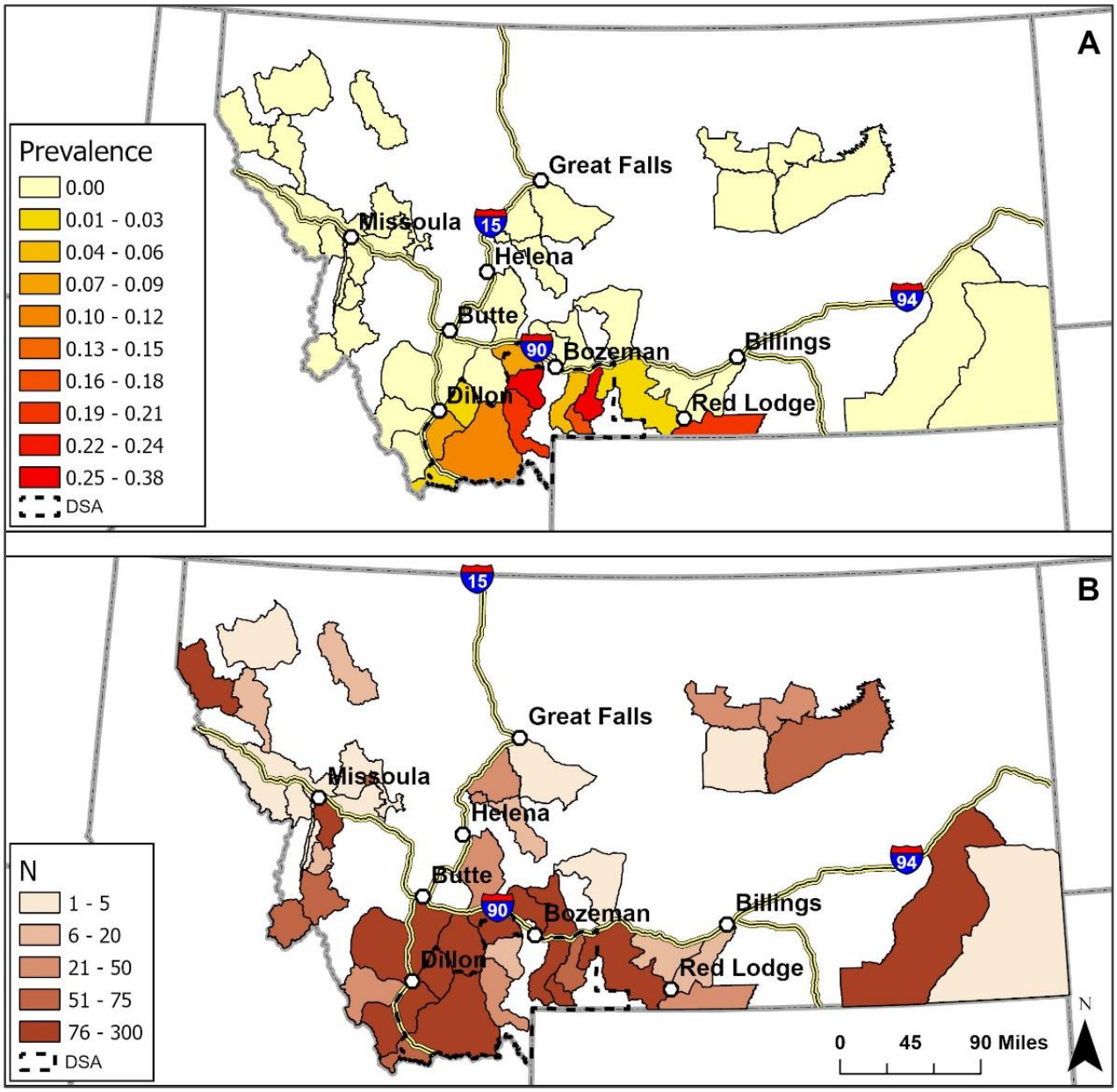

Figure 3. The estimated brucellosis seroprevalence (Panel A) and number of samples screened (n, Panel B) for adult female elk by hunting district* during 2010-2024. Samples include those collected opportunistically during fall hunter harvest, during targeted winter sampling for this project, and screening done on other winter elk captures conducted by FWP since 2011. Note some seroprevalence estimates are derived from a low number of samples. The black dashed line denotes the boundary of the Montana brucellosis designated surveillance area (DSA). *Hunt district boundaries as set for 2024, including recent adjustments.

Elk movements

Highland Mountains elk movements

In January 2024 we deployed 30 collars in the Highland Mountains. Two elk died within days from capture related causes and are not included in any movement summary. An additional collar failed in late May 2024 and stopped transmitting. We are continuing to monitor the remaining 27 collars and present movement data collected through July 2024 (Figure 4). A complete movement summary, including fall and early winter, will be detailed in the 2025 annual report.

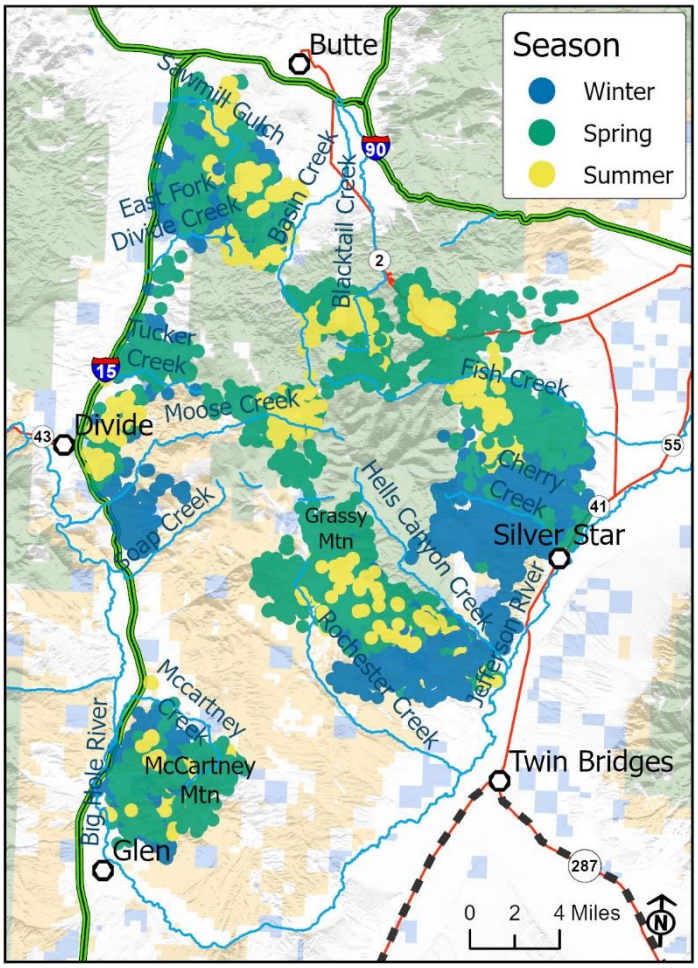

Figure 4. Annual locations (circles) of elk by season [Winter: Jan-Mar, Spring: Apr-Jun, Summer: July] from the Highland Mountains elk population, January – July 2024.

Elk collared just south of Butte (n = 6) are all residents, residing primarily in the foothills on the northern end of the Highland Mountains (Figure 4). Three elk captured southwest of Butte and 1 elk captured southeast of Butte are using the Sawmill Gulch area south to East Fork Divide Creek. The remaining 2 elk captured southeast of Butte are generally just north of Basin Creek with 1 moving farther south in summer.

Elk collared just west of Silver Star (n = 8) appear to be a mix of residents (n = 3) and migrants (n = 5; Figure 4). Residents spent most of the winter near Cherry Creek, drifting farther north towards Fish Creek in spring and summer. Migrants typically migrated from mid to late April, moving north towards upper Fish Creek. Three migrants localized around upper Basin and Blacktail Creeks, while another

moved just north of MT-2. The fifth migrant moved north to Fish Creek and then west to Upper Moose Creek.

Elk collared near Rochester Creek (n = 10) on the east side of the Highlands are primarily residents (n = 7) that remain in the foothills from Rochester Creek north to Hells Canyon Creek and always east of Grassy Mountain (Figure 4). Two of the remaining 3 elk are migrants who wintered in the same area as the residents but then migrated, 1 in mid-April and 1 mid-May, to upper Moose Creek. The last elk left immediately after capture and wintered along Cherry Creek like elk captured near Silver Star. In mid-April this elk followed the same route of a Silver Star elk and migrated north to Fish Creek and then north of MT-2.

Elk collared in the McCartney Mountain area (n = 3) appear to be residents, spending their time primarily on the north, west and southwest side of the mountain near Glen (Figure 4). The single elk collared in the Tucker Creek area appears to be a resident, with overlap across the months in the foothills from the Tucker Creek area south to Soap Creek, with the most recent use just east of Divide (Figure 4).

Pioneer Mountains elk movements

In January 2023 we deployed 30 collars in the eastern Pioneer Mountains. One elk captured near Canyon Creek died in June of natural causes and a second collar from the Dutchman Mountain area failed in late September. Most of the remaining collars dropped off in late March 2024, and the last 3 collars dropped by mid-April.

All 10 elk captured near Divide are migrants that spent the winter near the Big Hole River and Dry Gulch (Figure 5). One elk wintered slightly farther south between the Big Hole River

and I15. Elk began to migrate in late April/early May and generally moved west to Wise River. One elk remained just south of the town of Wise River, while 6 continued southwest to summer near Lost Horse Mountain. Two elk moved farther south to the upper Wise River area near Table Mountain and 1 elk moved to the upper Canyon Creek area. Fall migration was initiated in late October to early December, reaching Divide by mid-January after travelling through Vipond Park.

Elk captured near Canyon Creek west of Melrose are a mix of residents (n = 8) and migrants (n = 5; Figure 5). During winter the 8 resident elk mostly stayed near Dry Hollow Gulch and then in April started to meander between Canyon and Cherry Creeks a little farther west. The 5 migrant elk began moving west in early May. Four migrated to the upper Wise River near Table Mountain and 1 migrated to the upper Canyon Creek area. Fall migration began in late October to early December with elk back near Canyon Creek by early-January.

The 3 elk captured near Willow Creek just west of Glen are migrants and winter on the north side of Willow Creek (Figure 5). Two migrated north in late April to the upper Rock Creek drainage with a stopover on Sugarloaf Mountain. These elk started their fall migration by mid-December with a longer stopover on Sugarloaf Mountain. The third elk migrated west in late April to the upper Birch Creek area and didn't return to winter range until mid-January.

One elk captured near Dutchman Mountain is a resident and a second elk is a migrant that moved west in early August to Rattlesnake Creek and travelled north to Tent Mountain (Figure 5). This elk started to return to Dutchman Mountain in early December.

Two elk captured south of MT-278 near Bannack spent the winter in that area, moved north of MT-278 in early April with a stopover in the southern Pioneer Mountains before moving on to Grasshopper Valley west of Polaris (Figure 5). These elk began their fall migration in mid-December, spending a long time in the southern Pioneer Mountains before returning south of MT-278 in February.

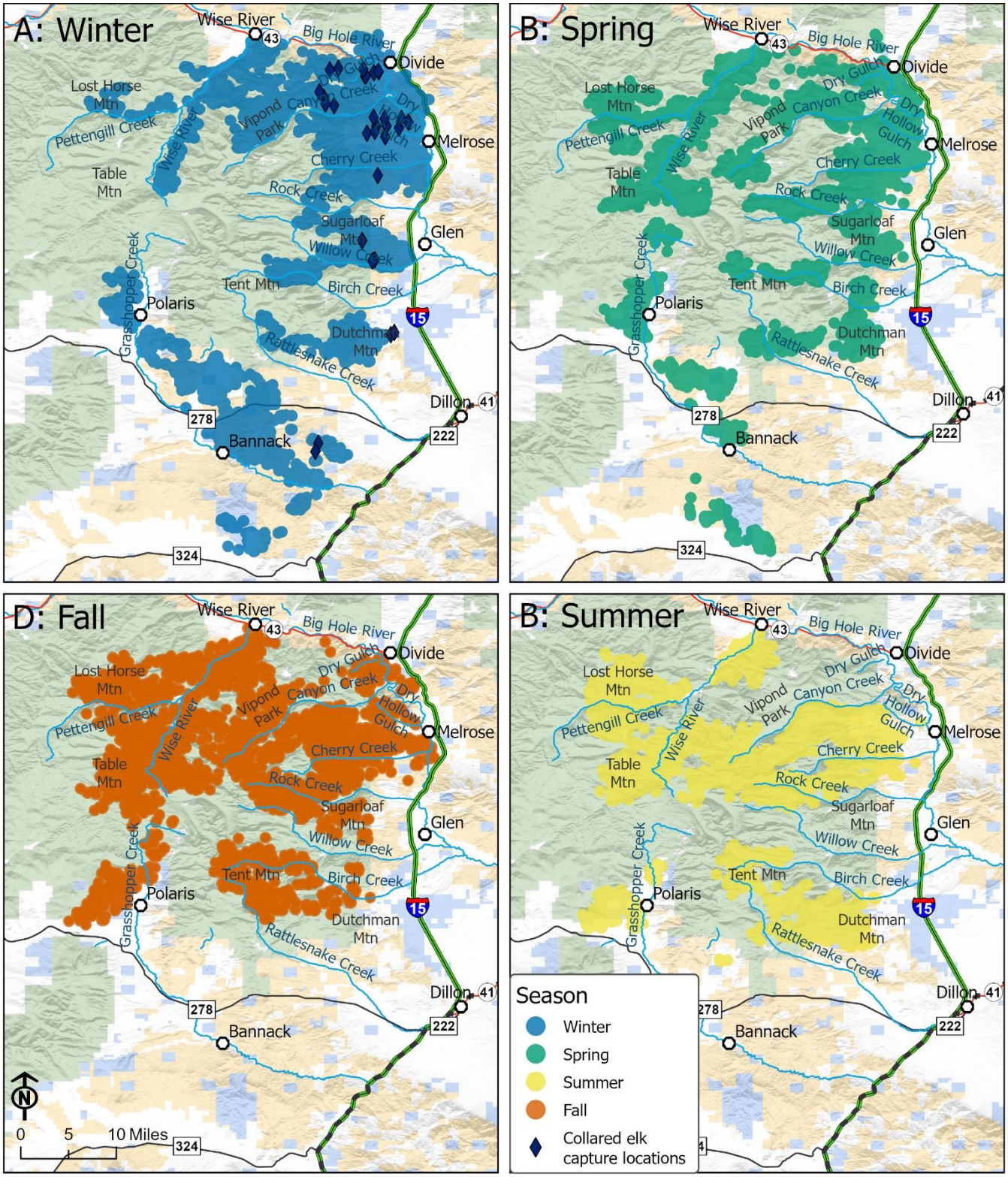

Figure 5. Movement data by season from elk captured in the Pioneer Mountains, January 2023 – April 2024. Panels show seasonal movement clockwise from top left: Panel A: Winter (blue, Dec-Mar) with capture locations of collared elk (dark blue diamonds), Panel B: Spring (green, Apr-Jun), Panel C: Summer (yellow, July-Aug), and Panel D: Fall (orange, Sept-Nov).

Migration Corridors

Twenty one out of 30 collared elk were migrants. Long distance migration (> 6 km; n = 18) was more common than short distance (< 6 km, n = 3). Spring migration for all population segments was initiated in late April and early May. Initiation of fall migration was more varied, starting sometime between late October and early December. Stopover sites were used more commonly and for longer periods during fall migration. The average spring migration lasted 12 days, whereas the average fall migration lasted 42 days.

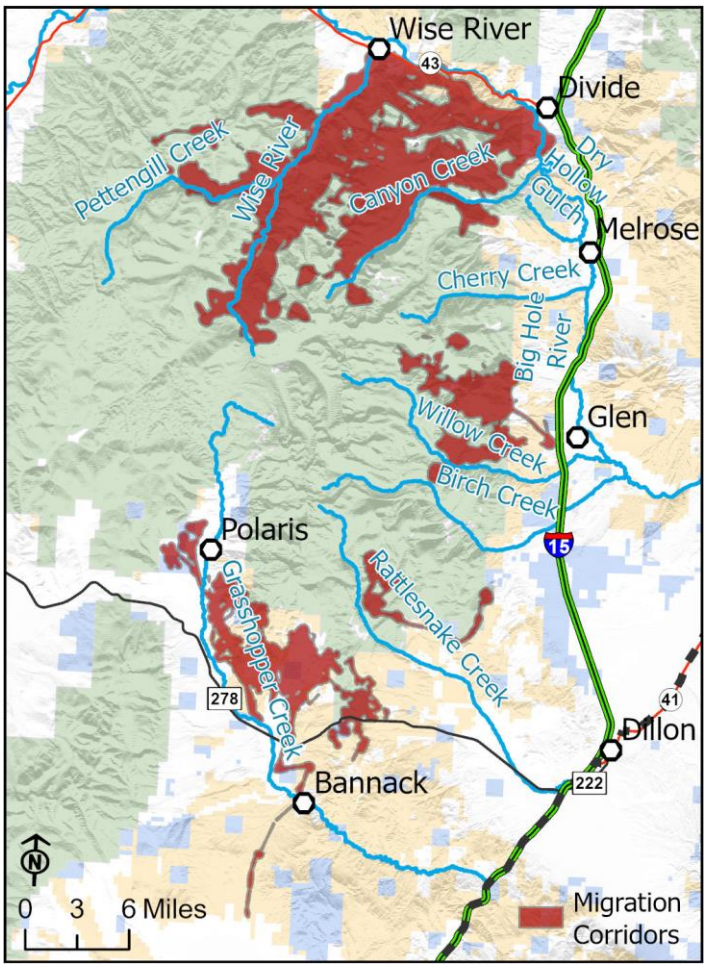

Figure 6. Migration corridors of the eastern Pioneer Mountains elk population, January 2023 – April 2024.

During the February to June risk period (Figure 7), all elk spent the majority of February through April on winter range near their general capture areas. Migrants began moving in late April and May, reaching summer range by June with an average duration of 12 days.

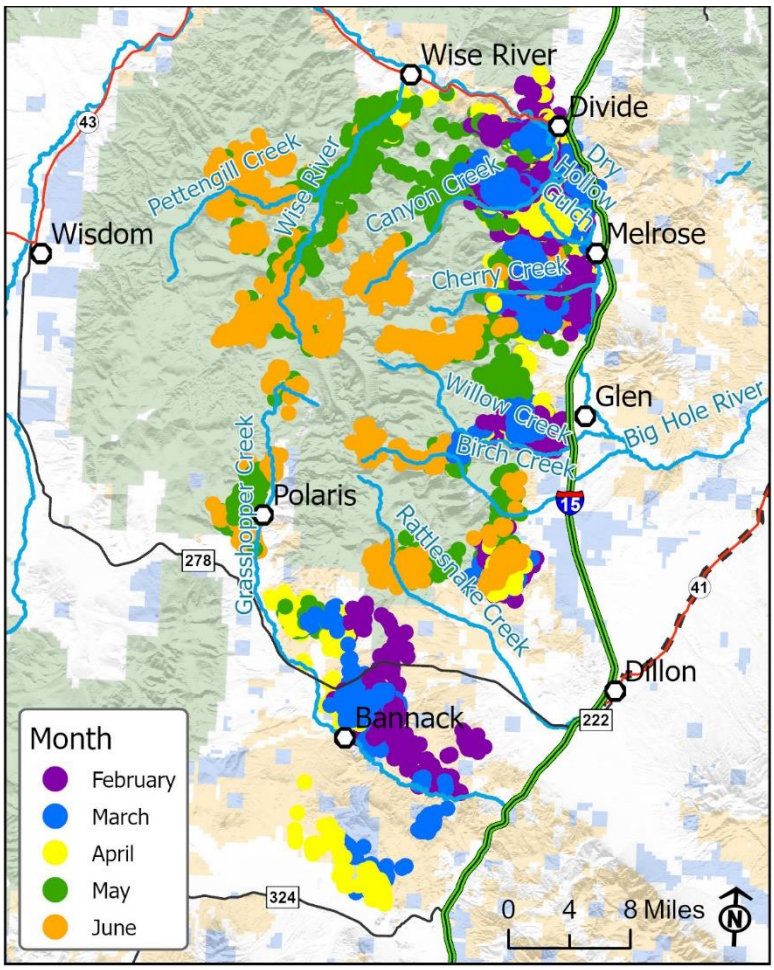

Figure 7. Risk period locations (circles) of elk by month from the eastern Pioneer Mountains population, February 2023 – June 2023 and February 2024 – April 2024.

A comparison of movement data collected in 2013 from the western and southern elk populations of the Pioneer Mountains versus movements collected in 2023 from the eastern and southern elk populations shows overlap during the risk period (Feb-Jun) in the center of the Pioneer Mountains along Pettengill Creek, the upper Wise River, and Rattlesnake Creek (Figure 8). During the 2024 captures, 2 elk were captured and collared near Bannack and migrated northwest towards Polaris in the summer. In 2013 elk were also captured and collared near Bannack and immediately north of MT-278. Capture locations and movements from the 2013 collars are similar to the 2023 collars, likely representing the same elk group and thus do not represent overlap of different groups in the Bannack/Polaris area (Figure 8). There is, however, potential mixing of elk that winter in the south with both western and eastern Pioneer Mountains elk north of Polaris in the upper Wise River area and the southeast near Rattlesnake Creek. In addition, 2 elk collared in 2013 on the west near Wisdom moved to the south near Bannack shortly after capture and stayed in the area until April (Figure 8). Most of the overlap occurs during spring (Apr-Jun; risk period) and summer (July-Aug).

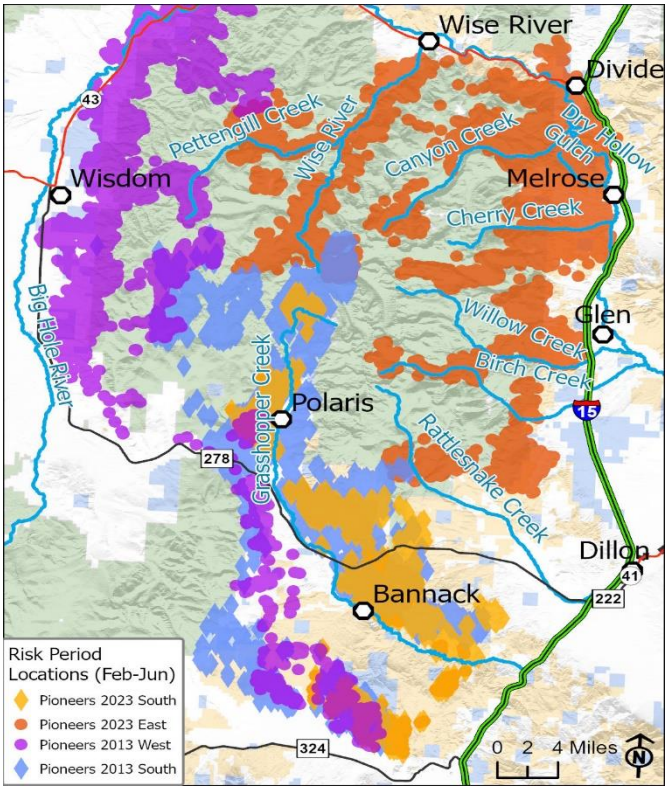

Figure 8. Risk period (Feb-Jun) locations of elk captured in 2013 along the western (purple circles) and southern (blue diamonds) Pioneer Mountains, versus elk captured in 2023 along the eastern (orange circles) and southern (yellow diamonds) Pioneer Mountains illustrating overlap between elk herds in the mountain range.

Data from elk collars has improved our understanding of elk movement and potential routes for the spatial spread of brucellosis or other diseases among elk populations (Figure 9). Elk movements have been and will continue to be used to determine the timing and degree of spatial overlap between elk and livestock in focused analyses.

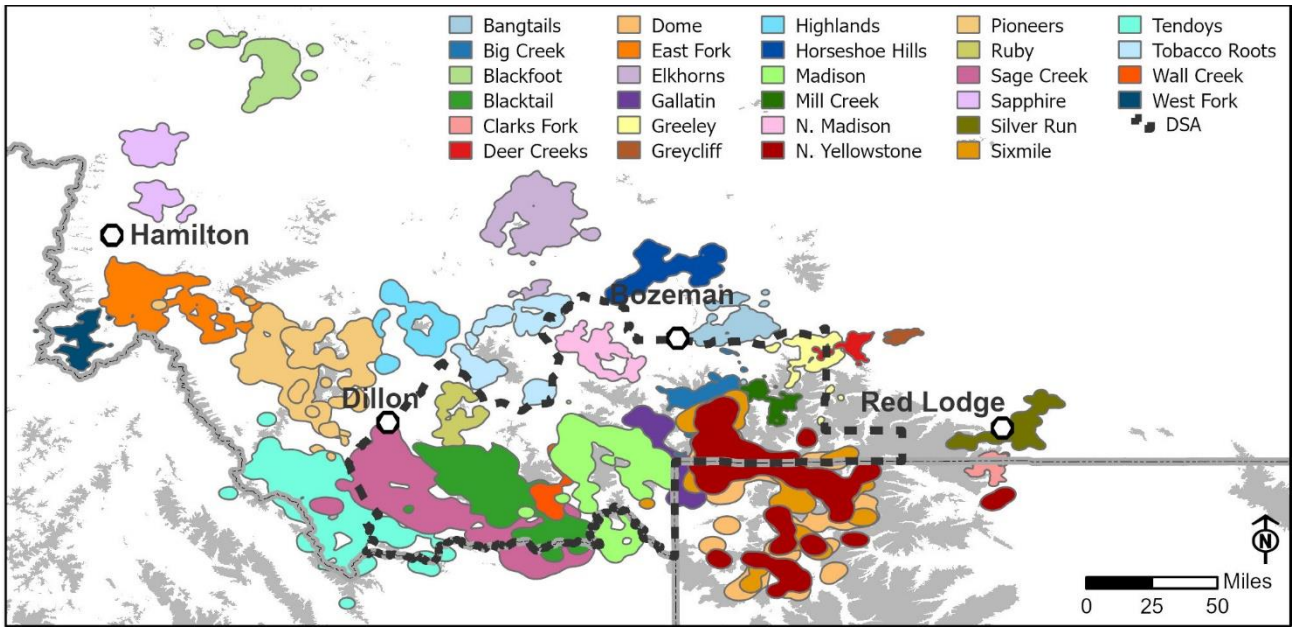

Figure 9. Annual kernel density distributions of all sampled elk populations in southwest Montana showing the potential overlap and interchange between populations. Gray polygons represent mountain ranges.

Acknowledgements

We would like to thank the landowners and hunters that supported this project. Without landowner cooperation, this project would not be possible. Funding for the project was supplied by USDA-APHIS through an agreement with Montana Department of Livestock and MFWP, a Federal Aid in Wildlife Restoration grant to MFWP, the sale of hunting and fishing licenses in Montana, and the Rocky Mountain Elk Foundation. We would also like to thank the MFWP biologists, pilots, and wardens for their efforts in helping with landowner contacts, capture and field operations, collar retrieval, and continued support of the project. Drs. M. Zaluski, E. Liska, T. Szymanski, and B. De Groot from Montana Department of Livestock provided important insights and advice throughout the project.

Literature Cited

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