2024 Early-winter mule deer surveys

Summary

In early winter 2024, we conducted Yukon's first aerial deer surveys using a fixed-wing drone equipped with infrared capabilities (Figures 1-4). The combined survey areas covered 415 km^2 along the Alaska-Klondike highway corridor from Kusawa Lake to Lake Laberge (Whitehorse North), as well as selected areas near Haines Junction and Carmacks.

The objective of the survey was to estimate the population size and composition of deer in these areas. In total, we observed 130 deer, consisting of 14 large bucks, 6 yearling bucks, 67 does, 13 fawns and 30 unclassified individuals. We estimated a maximum buck-to-doe ratio of 30 bucks per 100 does. These surveys provide Yukon's first aerial baseline dataset for deer and represent an important step toward improving population monitoring and informing future wildlife management decisions.

Figure 1. SW-117 Remotely Piloted Aircraft System (RPAS) Fixed-wing drone (Superwake Inc.) used to survey deer in Whitehorse North, Haines Junction and Carmacks in November-December 2024.

Figure 2. Superwake Inc. drone flightlines illustrating 500m transects

Acknowledgements

We thank the landowners on the North Klondike Highway and Alaska Highway who gave permission to launch and land drones on their properties. Thanks to the entire crew from Superwake for their expertise (https://www.superwake.ca/). The survey areas overlap the Traditional Territories of the Kwanlin Dün First Nation (KDFN), Ta'an Kwäch'än Council (TKC) and Champagne and Aishihik First Nations (CAFN).

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Methods

We conducted the survey from November 6th to December 1st 2024, using two fixed-wing SW-117 RPAS drones equipped with high-resolution infrared and colour cameras (Superwake Inc., North York, Ontario; Figure 1). The drones flew evenly spaced transects approximately 500 meters apart across three study areas: approximately 250 km^2 along the Alaska-Klondike highway corridor from Kusawa Lake to Lake Laberge (Whitehorse North), 85 km^2 near Haines Junction and 80 km^2 near Carmacks (Figure 2). This transect spacing provided full coverage of the survey areas and total counts of deer and other target wildlife.

The drones were able to fly on 14 of the 26 days during the survey period, completing approximately 61.5 hours of flight time at temperatures ranging from +3°C to -30°C. The aircraft operated quietly, producing virtually no sound detectable at ground level, thereby minimizing disturbance to wildlife and livestock. The drones performed well in high winds but were unable to fly on days with a high risk of wing icing. Upon detection, Superwake navigators counted and classified deer by sex and age class in real-time. We subsequently reviewed all video footage with wildlife observations to confirm species identification, counts, and classifications (Figures 3 and 4).

We quantified drone sightability by comparing drone detections with known locations of GPS-collared deer present during the survey. This comparison allowed us to evaluate sightability and determine whether deer were double-counted or missed.

Figure 3. Still image of drone Infrared footage of deer from the Whitehorse North survey area, early-winter 2024.

Figure 4. Still image of colour footage of deer from the Whitehorse North survey area, early-winter 2024.

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Results and discussion

The drone survey detected a total of 130 mule deer across the surveyed areas. Most observations occurred between the Takhini River Road and lower Lake Laberge (Whitehorse North; Figure 5), an agricultural area that supports the highest reported deer density in the Yukon and where most permit holders harvest deer. In contrast, the drones detected only four deer in the Haines Junction and Carmacks survey areas (Figures 6 and 7).

Of the 130 deer observed, we confidently classified 100 individuals by sex and age class including 14 adult bucks, 6 yearling bucks, 67 does and 13 fawns. We could not reliably classify the remaining 30 deer because of image quality limitations; however, antler visibility and body size suggest that these individuals were unlikely to be large bucks. Based on the classified sample, the buck-to-doe ratio in Whitehorse North was 30 bucks per 100 does. Because most unclassified deer were likely not adult bucks, the true buck-to-doe ratio is likely lower than this estimate.

For small or spatially restricted populations, many jurisdictions recommend maintaining higher post-harvest buck-to-doe ratios of at least 30–40 bucks per 100 does. The estimated sex ratio in Whitehorse North suggests that recent buck harvest levels in this area are near the upper limit required to maintain this sex ratio within the recommended range.

Data from 15 GPS-collared adult mule deer does allowed us to evaluate drone sightability. During the survey period, 12 of the 15 collared does overlapped spatially and temporally with drone flight paths, and the RPAS detected 11 of these individuals, resulting in an estimated sightability of 92 per cent (8 per cent missed). The combination of optical zoom and infrared imaging improved detection of animals compared to human observers in helicopters, particularly in densely vegetated areas where deer are well camouflaged. Given this high sightability and the timing of the survey, the total count of 130 mule deer likely provides a reliable estimate of abundance within the surveyed areas. For the Whitehorse North area, this corresponds to an estimated population of 126–136 deer.

GPS location data from adult female mule deer in the Whitehorse North survey area provided additional context for interpreting survey results. In November 2024, does occupied relatively small early-winter home ranges averaging approximately 10 km², generally within 2 km of the Alaska–Klondike Highway and concentrated around agricultural properties (Figure 8). These movement patterns closely aligned with survey coverage, indicating that drone flights encompassed the primary early-winter distribution of mule deer in this area, when deer are most aggregated. Seasonal variation in snow depth and forage availability likely causes deer to range more widely at other times of year. As a result, the early-winter population estimate likely represents a substantial proportion of the broader regional mule deer population (Figure 9).

In addition to mule deer, the drones detected elk, moose, bison, caribou, lynx, coyote, feral horses and wolves.

Mortality

Most human-caused mortality in these deer populations is due to vehicle collisions and harvest. In 2024, six bucks were harvested by licensed hunters, and 25 deer-vehicle collisions were reported within the Whitehorse North survey area. Combined, these known mortalities represent approximately 23 to 25 per cent of the estimated mule deer population. This estimated mortality does not include First Nation subsistence harvest because this information is not available.

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Conclusions and management implications

- The 2024 early-winter aerial fixed-wing drone survey provides the first aerial baseline estimate of the mule deer population in the Whitehorse North area, as well as several smaller surrounding survey areas.
- We estimate the Whitehorse North mule deer population at 126-136 animals. This early-winter population estimate likely represents a substantial proportion of the broader regional mule deer population.
- Reported human-caused mortality from licensed harvest and vehicle collisions accounted for 23 to 25 per cent of the estimated population in the Whitehorse North survey area in 2024.
- A total of 130 mule deer were observed, with a maximum buck-to-doe ratio of 30 bucks per 100 does. For small or spatially restricted populations, many jurisdictions recommend maintaining higher buck-to-doe ratios of at least 30–40 bucks per 100 does. The observed ratio suggests that buck harvest levels prior to this survey were near the upper limit required to maintain sex ratios within this recommended range.
- Management measures aimed at reducing vehicle collisions—such as improved signage and reduced speed zones along high-risk road segments—would likely reduce mule deer mortality while improving human safety.
- Continued monitoring of mule deer populations across Yukon is recommended to track population trends, assess harvest sustainability, and inform future management decisions.

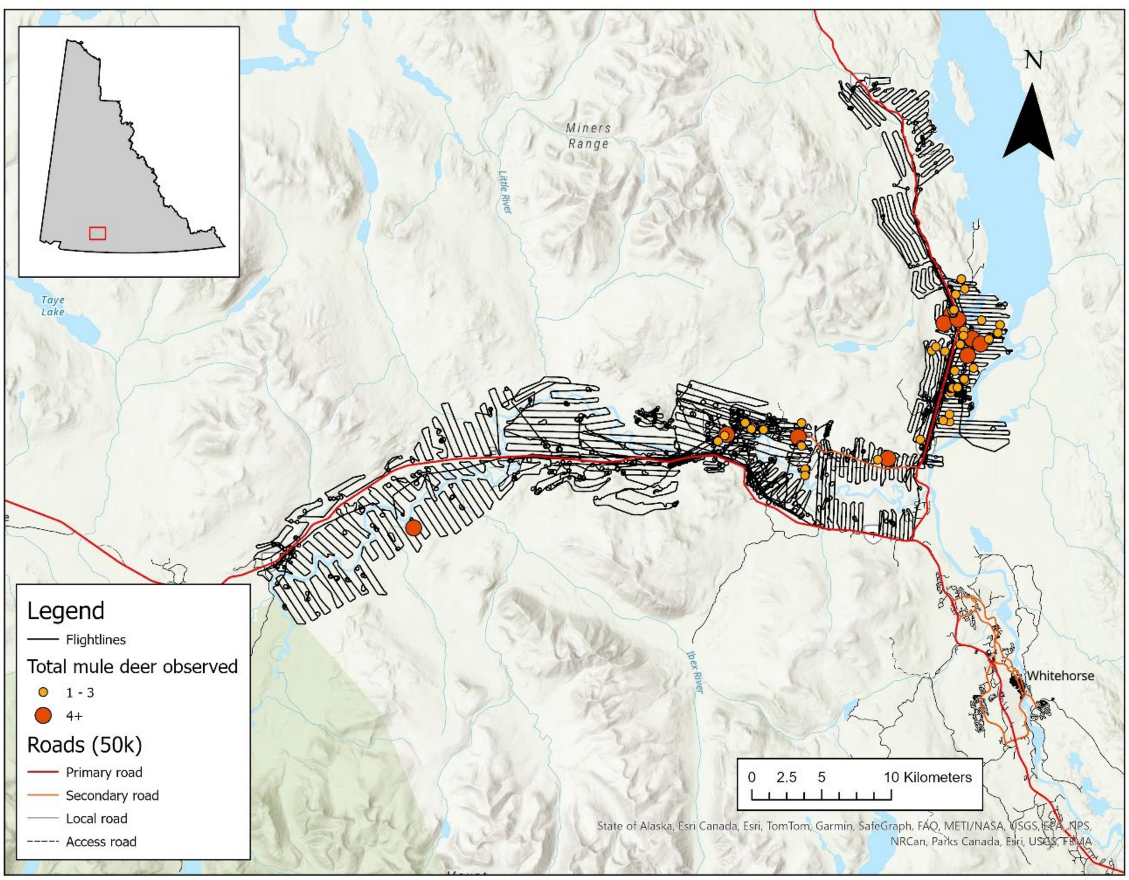

Figure 5. Drone flight lines and mule deer observations in the Whitehorse North survey area, November-December 2024. Symbols are scaled to reflect the size of each observed deer group,

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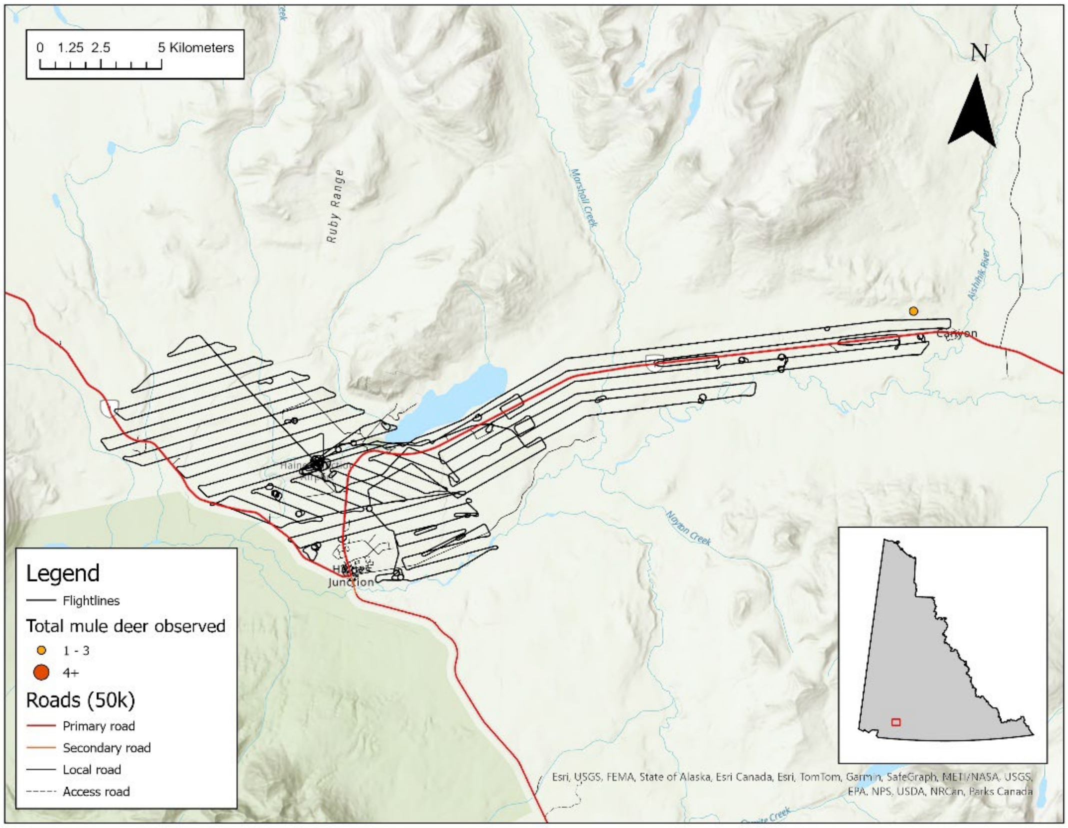

Figure 6. Drone flight lines and mule deer observations in the Hains Junction survey area, November-December 2024. Symbols are scaled to reflect size of each observed deer group

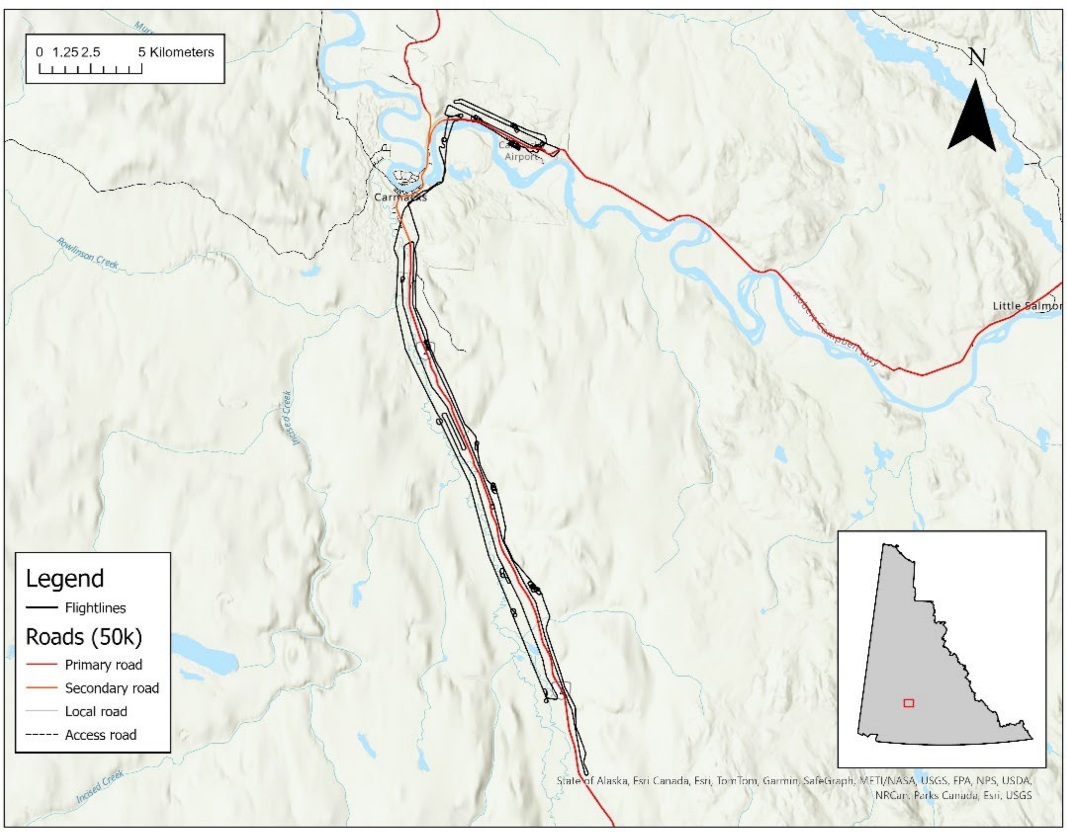

Figure 7. Drone flight lines and mule deer observations in the Carmacks survey area, November-December 2024. Symbols are scaled to reflect the size of each observed deer group

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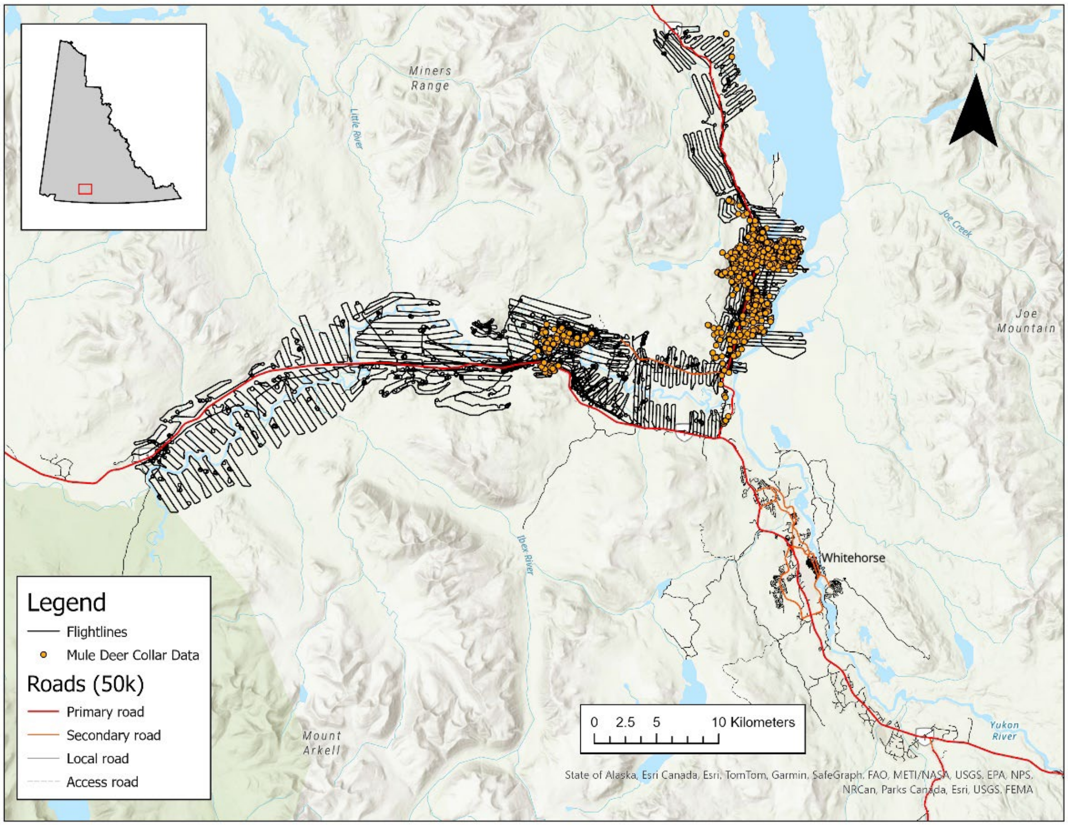

Figure 8. GPS collar locations from 16 mule deer does between November 1 and 30, 2024

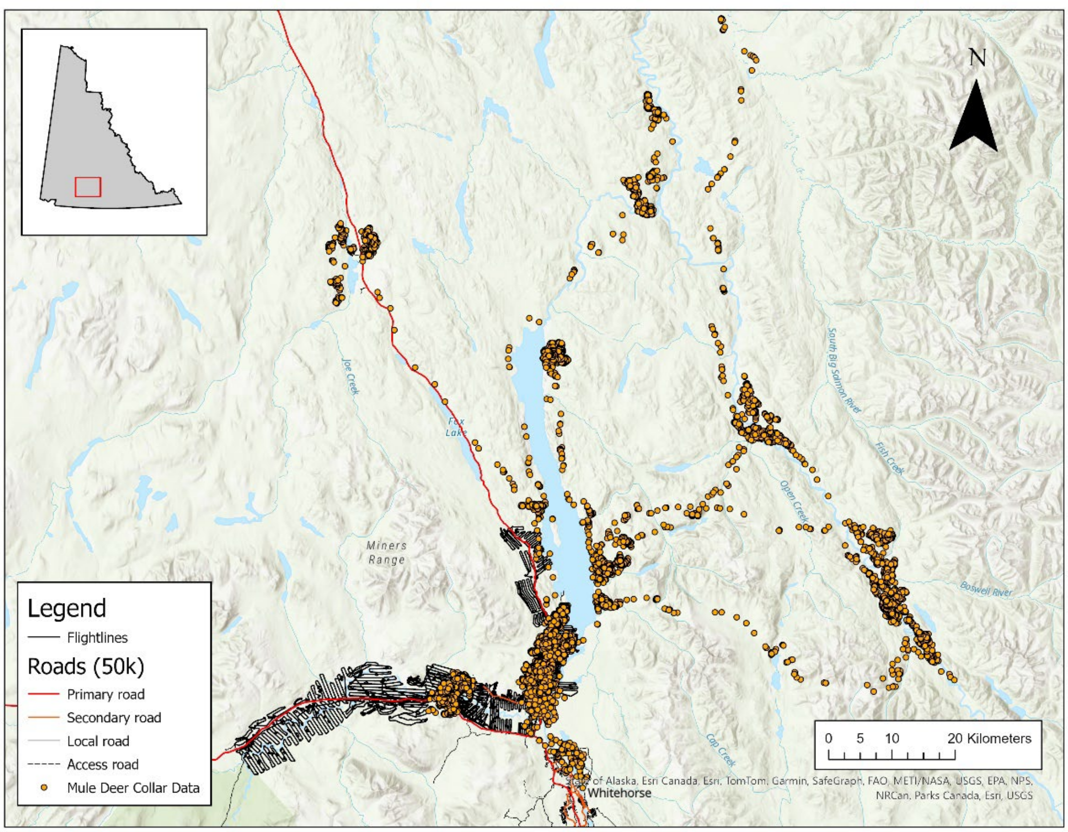

Figure 9. GPS collar location from 16 mule deer does between May 1 and October 31, 2024

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