Research Report Tombstone

Interim Report – May 2026

Project title: Monitoring climate driven vegetation and habitat changes and their impacts on wildlife

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This interim report provides a summary of the research conducted by Dr. Isla Myers-Smith and her research group (Team Shrub) from the University of British Columbia in Tombstone Territorial Park over the summer of 2025 (for more information see https://teamshrub.com/). Team Shrub has also conducted research in Tombstone in 2022. This research was conducted under the Scientists and Explorers Licences 22-53S&E, 24-77S&E and 25-44S&E.

In 2025, Team Shrub research was conducted under the following Scientists and Explorers Act Licenses: 25-60S&E, 25-41S&E, 25-42S&E, 25-44S&S, 25-45S&E, 25-46S&E. See previous research reports (https://teamshrub.com/research-reports/).

Summary

Team Shrub has studied climate-driven vegetation change in Kluane and on Qikiqtaruk for over two decades. In 2025, our research efforts expanded beyond previously established sites to investigate the impact of climate-driven landscape change on wildlife habitat in the Central Yukon. Team Shrub had planned to study climate-driven vegetation changes occurring in Tombstone Park and the impacts of these changes on abundance, behaviour and habitat quality of (1) collared pika, (2) Dall sheep, (3) Fortymile caribou and (4) insect pollinators. Dall sheep and pollinator work was not completed in Tombstone in 2025 as outlined below.

Background

Global change impacts the tundra and boreal ecosystems in the Western Canadian North and is a significant threat to sustainable food systems, wildlife populations and resilient communities. The high latitudes are warming more rapidly than the global average[1,2]. Indigenous people of the Canadian North have well-developed knowledge of how the climate is changing[3,4]. As the climate warms, rapid vegetation change is underway[5–7]. However, how vegetation change will influence wildlife habitats in alpine ecosystems remains unclear.

Alpine habitats are critical for wildlife. Changes to alpine vegetation have implications for culturally and ecologically essential species such as Dall sheep, collared pika, caribou and insect pollinators. By studying vegetation changes in both boreal and alpine habitat, we aim to uncover how climate mediated vegetation shifts are affecting wildlife and insect pollinators. This will inform Yukon Parks, Tr'ondëk Hwëch'in and other groups that manage these habitats as they continue to shift under climate change.

Purpose and objectives of the project

1. Quantify shrub composition in boreal forest across the Yukon.
2. Contribute to long-term pika occupancy and habitat monitoring in Tombstone Territorial Park and to expand on this research by using autonomous recording units (ARUs) to determine the effect of climate driven habitat changes on pika behaviour, abundance and distribution in the future.
3. Understand how fire and shrub encroachment is shaping caribou and Dall sheep alpine habitat and how these changes are impacting wildlife behaviour and abundance.
4. Investigate how climate-driven shifts in plant community composition and flowering time are impacting insect pollinator timing and abundance as well as berry plant productivity.

Projects:

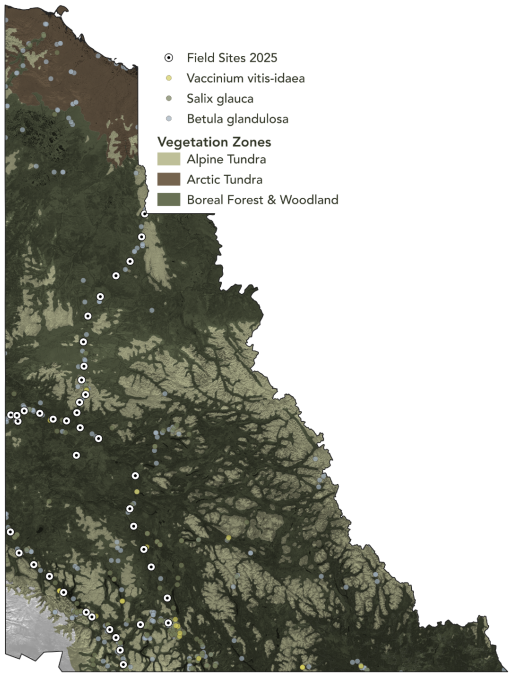
1. **Boreal Forest vegetation change**

Objective: Quantify shrub species distribution across the Yukon to predict species distribution change under climate change scenarios.

Vegetation composition of the boreal forest has shifted as species expand northwards, a process referred to as borealization[8]. Understory vegetation, especially shrubs, play a pivotal role in ecosystem functioning and demonstrate a rapid response to climate change[9,10]. Research indicates that climate warming is a key factor driving the latitudinal expansion of shrub species across northern ecosystems[11]. This movement will be most pronounced in ecotones, the transition zones between ecosystems, where shrub growth sensitivity to climate is highest[12].

Despite improved knowledge of climate driven movement of vegetation, the trajectories of this movement cannot be accurately predicted without a comprehensive understanding of the climatic drivers controlling species establishment[12,13]. Temperature is a well-established primary driver of shrub distribution in tundra ecosystems, but moisture is also an important driver of shrub growth[14], and thus a potential determinant of rates of future shrub range expansion. In boreal forest ecosystems, moisture limitation is potentially a more significant control on growth than warming.

The Yukon includes three major ecosystem types, boreal forest, treeline, and tundra, that encompass many climate-responsive shrub species, making this an ideal location for capturing species movement across climate gradients.



Site 24 - 64.85647°N 138.30855°W
Site 25 - 64.65518°N 138.39091°W
Site 26 - 64.43893°N 138.25402°W

Figure 1. On the left, the map indicates the 41 field sites visited in the 2025 field season (points). The other colored points indicate the recorded occurrences of three different shrub species we are looking at from GBIF (Global Biodiversity Information Facility). The coordinates of the sites surveyed in Tombstone Territorial Park and a photograph of an example site are indicated on the right.

In 2025, field surveys were conducted across 41 sites in the Yukon (Figure 1), documenting understory shrub presence and absence data spanning boreal forest, treeline, and tundra ecosystems. We conducted fieldwork in Tombstone Territorial Park from July 16-17. Of the species we were looking for in our vegetation surveys these were the ones we found present at the three sites in the park: *Betula gladulosa, Empetrum nigrum, Salix alaxensis, Salix glauca, Salix pulchra, Salix reticulata, Vaccinium uliginosum, Vaccinium vitis-idaea*.

Combining these field observations with circumboreal occurrence records from the Global Biodiversity Information Facility (GBIF), we conducted a principal component analysis (PCA), a type of ordination analysis that looks at the climates where these shrubs are found. We modelled the climate niche space across 19 bioclimatic variables including temperature, precipitation across different seasons. These results revealed distinct but partially overlapping climate niches among three focal species, explaining 71.7% of total variance (Figure 2).

Preliminary species distribution models generated from this dataset produced habitat suitability surfaces across the Yukon for *Betula glandulosa*, *Salix glauca*, and *Vaccinium vitis-idaea*, illustrating clear spatial differentiation in predicted suitable habitat (Figure 3). These initial results suggest that the three species occupy distinct climate spaces, providing a foundation for evaluating the relative contributions of temperature and moisture to current shrub distributions and projecting range shifts under future climate scenarios. This research is ongoing and will be completed over 2026-2027.

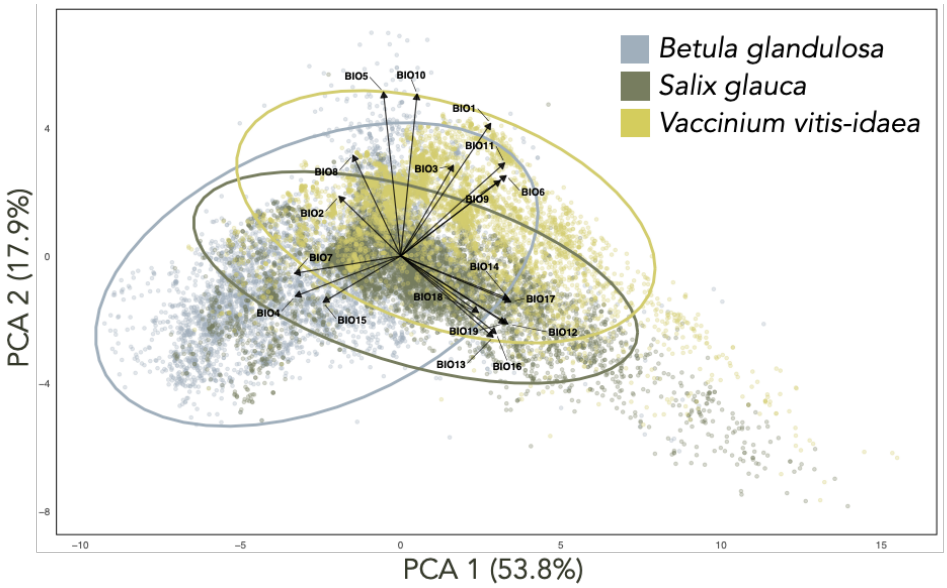


Figure 2. Principal component analysis (PCA) of climate niches for three boreal shrubs. PCA using recorded occurrences from field surveys along with GBIF (n=19,255) and 19 bioclimatic variables. Ellipses show 95% confidence intervals. Arrows indicate variable loadings (71.7% variance explained).

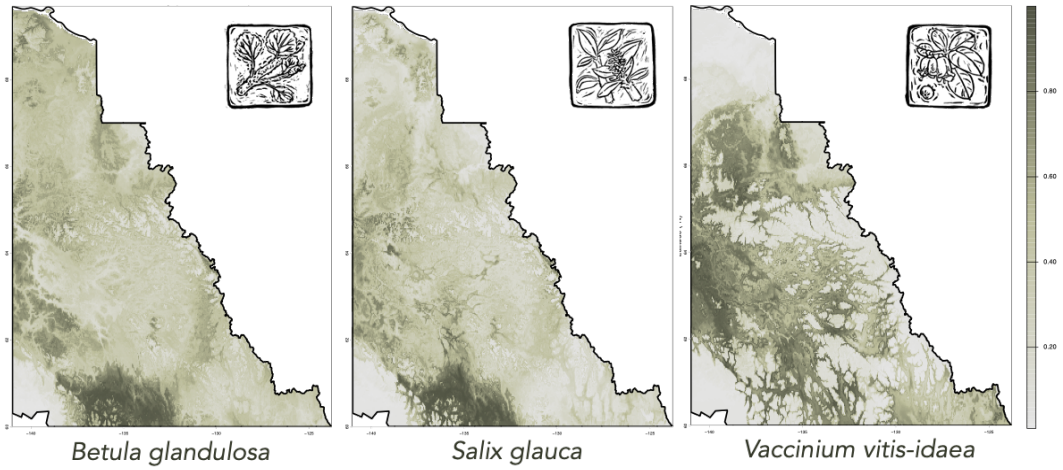


Figure 3. Preliminary species distributions for three boreal shrubs (*Betula glandulosa, Salix glauca, Vaccinium vitis-idaea*). Habitat suitability is on a scale from 0-1, 0 being unsuitable (light gray) and 1 being suitable (dark green).

2. Monitoring pika habitat and abundance using audio recorders

Objective: Monitor the influence of warming temperatures and shrub increase on pika populations

Pikas are a cold adapted alpine mammal with a narrow temperature niche, and are considered climate sensitive, particularly to heat[15-17]. Pikas retreat into cooler subsurface spaces among the talus under high temperatures, limiting foraging and potentially affecting survival[18,19]. Given their limited physiological ability to tolerate warmer temperatures, collared pika have been listed as a species of special concern under the Canadian Species at Risk Act[20].

Quantifying the influence of heat events on the activity and heat-avoidance behaviours of pika will improve our understanding of whether pikas can persist under warming alpine conditions. This research

will contribute to Yukon Government's long-term pika monitoring in the Kluane and Kusawa regions of the southern Yukon and Tombstone Territorial Park in the central Yukon.

In 2025, we visited 10 sites across the central and southern Yukon (Figure 4). Three sites were located in Tombstone Territorial Park (Mt. Adney, Angelcomb North and Grizzly Lake) at established Yukon Government collared pika monitoring sites.

At each site, we set up five audio recorders (ARUs) in a 50 by 50 metre diamond shape, with one ARU in the centre (Figure 5). We recorded audio over a period of at least three days to capture pika vocalizations continuously over 24 hours. Alongside ARUs, temperature loggers were deployed above and below the talus at each site. Next, vegetation and rock talus size surveys were conducted in addition to drone surveys.

With this data, we plan to build a species distribution model for collared pika by integrating site-level information with broader-scale remote sensing and climate datasets. We plan to use pika occurrence records (presence and absence) from the Yukon Government, community science data and occurrence data we collected during 2025 to assess factors shaping current and future pika distribution across the Yukon.

Initial data analysis from one site (Mt. Adney in Tombstone Territorial Park) shows that meeps, short, high-pitched alarm calls made by pikas, have a gradual increase with increasing temperature (Figure 7). This research is ongoing and will be completed over 2027-2028.

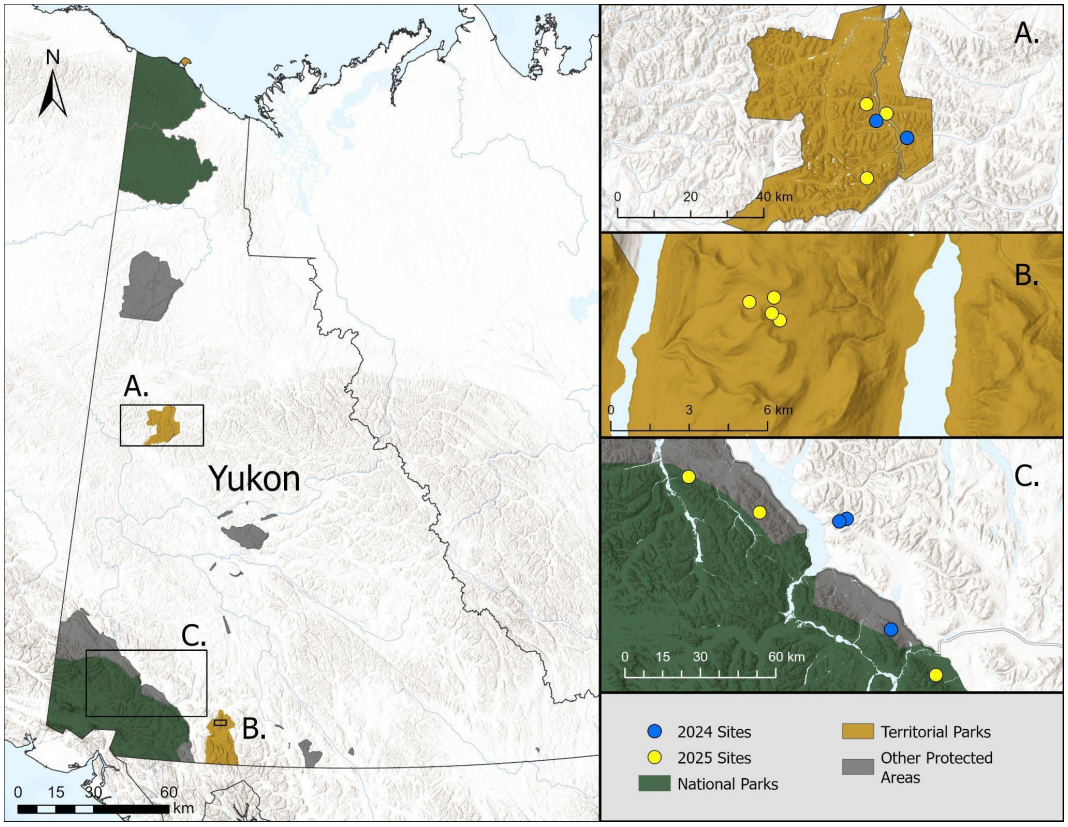


Figure 4. Map of the field sites across the Yukon visited during the 2024 and 2025 field seasons: (A) Tombstone Territorial Park, (B) Kusawa Territorial Park, and (C) the Kluane Lake region.

Figure 5. Example of the audio recorder setup in a diamond-dice formation (left), Mavic 3 drone preparing for a survey flight (right).

Figure 6. Recording plant species and talus rocks size data along a transect (left) and an audio recorder elevated off the ground by a tripod (right).

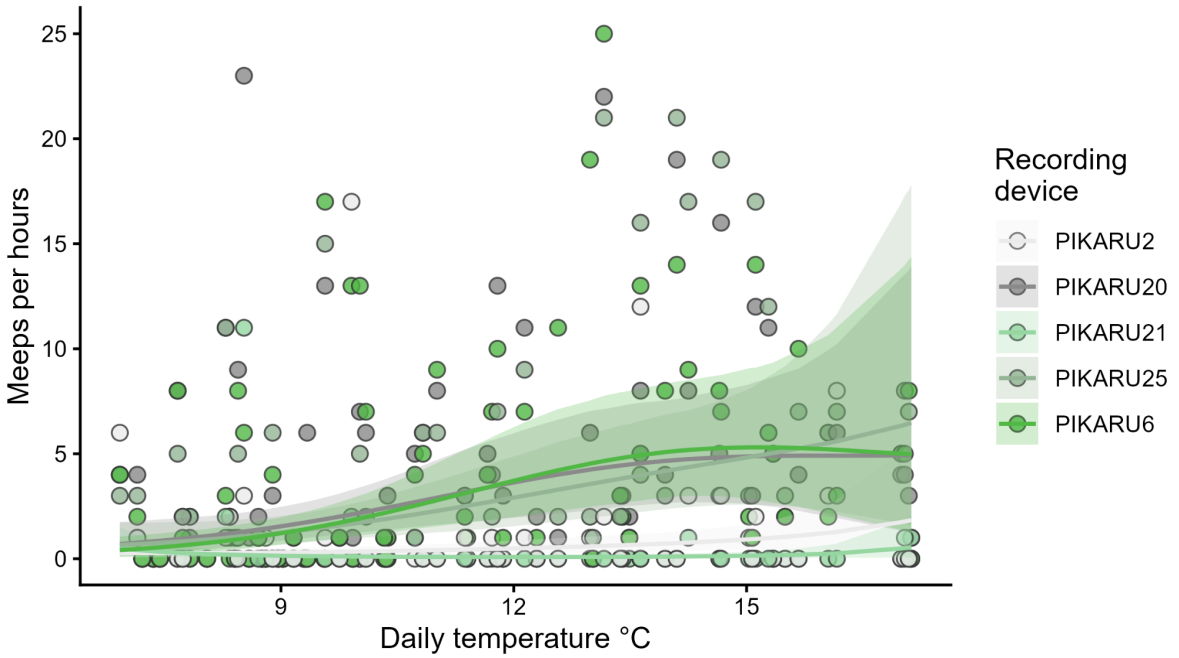


Figure 7. Meeps increase with increasing temperature for Mt. Adney site in Tombstone Territorial Park from 2nd - 5th August, 2025. Analysis conducted with a Bayesian model.

3. Monitoring Dall sheep and caribou habitat use and change

Objective: Combine remote sensing and population surveys to assess how shrub encroachment and fire alter alpine habitat and impact Dall sheep and caribou populations.

Planned work to monitor Dall sheep and caribou within Tombstone Territorial Park did not occur in 2025. Rather, these projects focussed efforts on different areas within the Yukon, specifically the Kluane region (Dall sheep), and west-central Yukon (caribou). We will explore expanding our sheep research to the Central Yukon in future years, particularly tracking any wildfires extending into sheep summer range.

4. Pollinator activity

Objective: Monitor pollinator activity using acoustic recording units and cameras to compare with records of plant phenology and berry productivity.

Planned work to monitor pollinator activity and lingonberry productivity in Tombstone Territorial Park did not occur in 2025. Wildfire conditions in June 2025 impeded access to these projected sites. As such, additional research efforts were refocused to the Kluane region of the Yukon and no data collection for this project occurred within Tombstone Territorial Park in 2025.

Additional information
Team Shrub at the University of British Columbia https://teamshrub.com/
The High Latitude Drone Ecology Network https://arcticdrones.org/
International Tundra Experiment https://www.gvsu.edu/itex/
Canadian Airborne Biodiversity Observatory: https://www.caboscience.org/
Herbivory Network https://herbivory.lbhi.is/
Team Shrub on Twitter https://twitter.com/TeamShrub/
Team Shrub on Instagram https://www.instagram.com/teamshrub/

Photography websites: http://vanishingislandphoto.com/, https://arcticabove.com/
Media coverage: https://teamshrub.com/media/
Team Shrub Blog Posts: https://teamshrub.com/lab-blog/

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