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Examining the response of mountain goats in Cathedral Provincial Park, BC to wildfire during the 2023 Crater Creek fire

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Background

British Columbia's protected areas are experiencing an abrupt, climate-induced increase in wildfire activity in recent years. Understanding the immediate responses of wildlife to wildfires is critically important for ensuring individuals can survive wildfire events, but major challenges remain:

- The majority of our knowledge comes from investigating behaviour after a wildfire has occurred[1]
- Direct effects of fires on wildlife are largely unknown[1]
- Wildfires are stochastic in nature, making study design challenging
- The limited existing studies are based on low intensity controlled burns[1]
- It is particularly concerning for vulnerable species or a population at risk in areas at risk of megafires.

Given these knowledge gaps and challenges, we set out to answer two questions:

How do mountain goats respond to a naturally occurring fire?

Do changing properties of the fire affect mountain goat responses?

Methods

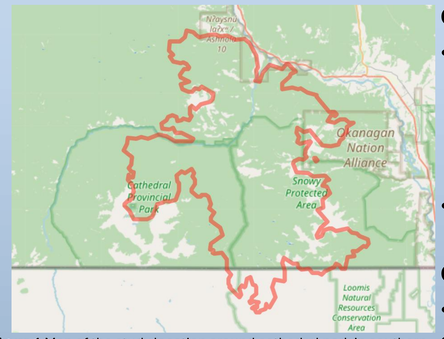

Figure 1 Map of the study location around cathedral park in southern BC. The orange lines show the final fire boundaries of the Crater Creek fire.

Cathedral Provincial Park

- Located in the southern interior of BC on the US-Canada border on unceded Syilx Okanagan Nation territory (Fig. 1)
- North-east region of the Cascade Mountain Range

Crater Creek wildfire (K52125)[2,3]

- Size: 46,504 hectares
- Severity: High
- Fire dates: Jul 22 to Oct 26

In 2023, 6 mountain goats (*Oreamnos americanus*) were continuously monitored via GPS tracking during the Crater Creek wildfire. Using the collected GPS data, we will quantify:

i. Coarse-scale movement and home range size using continuous-time stochastic processes with a moving window approach

ii. Fine-scale habitat use using integrated step-selection analysis

Using remote sensing data, we will model the Crater Creek wildfire behaviour focusing on:

iii. fire velocity

iv. fire intensity

Results

Mountain goats in Cathedral Park did not appear to respond to the Crater Creek Fire at a coarse temporal scale.

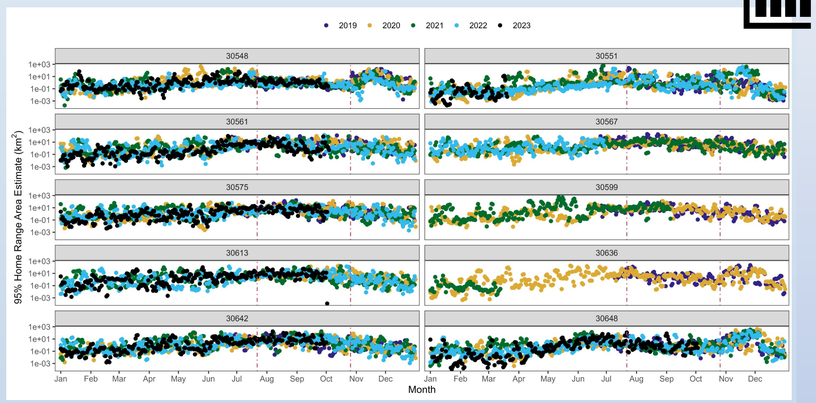

Figure 1 Mountain goat 95% home range sizes over time between 2019-2023. The red dashed lines indicate the start and end dates for the Crater Creek fire.

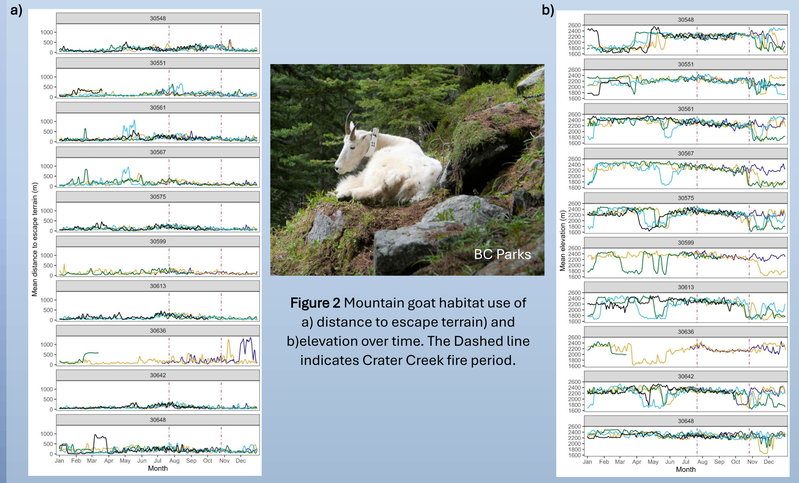

Figure 2 Mountain goat habitat use of a) distance to escape terrain) and b)elevation over time. The Dashed line indicates Crater Creek fire period.

Fire boundaries and behaviour were successfully reproduced and estimated.

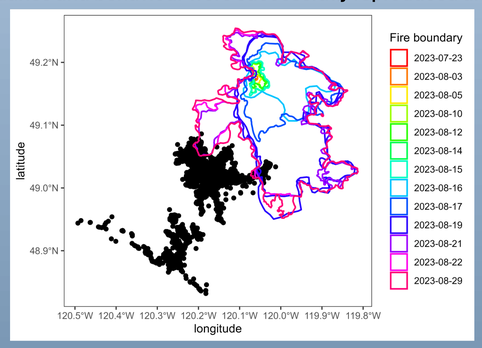

Figure 3 Crater Creek wildfire boundaries over time. Mountain goat GPS locations are indicated by the black dots.

Next steps...

Mountain goats may only respond to fire at a fine temporal scales.

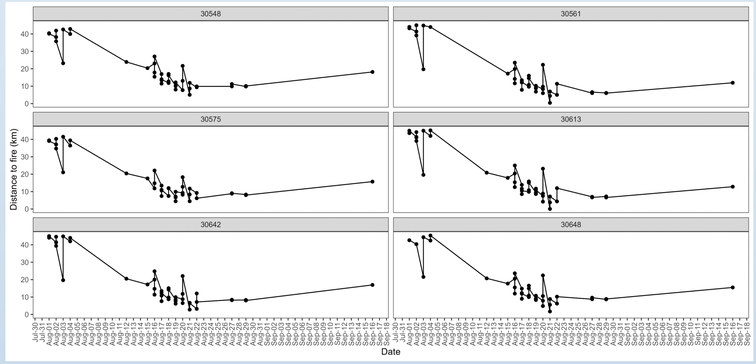

Figure 3 Mountain goat distance to the Crater Creek fire over time.

Fine-scale analysis

1. Perform integrated step-selection analysis for habitat use
2. Perform fire behaviour modelling to obtain fire velocity, spread, and intensity over time
3. Validate models
4. Calculate proximity (distance to fire) and fire encounters for mountain goats
5. Visualise results to illustrate findings

Take home message

Broad-scale results indicate that mountain goats are not significantly affected by wildfire.

Fine-scale analysis is required to disentangle behavioural responses of mountain goats to wildfire.

With the wildfire being projected to increase in frequency and severity, it is unknown how this vulnerable population mountain goats or wildlife will be shaped in the coming years.

References

1. Jolly, C. J. *et al.* Animal mortality during fire. *Global Change Biology* **28**, 2053–2065 (2022).
2. BC Wildfire Service. *BC Wildfire Fire Incident Locations - Historical*. https://catalogue.data.gov.bc.ca/dataset/e2dadc60-292f-4d98-b42b-56ca9e4fe694 (2024).
3. Forest Analysis and Inventory Branch. *Fire Burn Severity - Same Year*. https://catalogue.data.gov.bc.ca/dataset/04c5ad28-d8eb-4c49-90c5-48b9b98fdfe9 (2023).

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