Beaver, Bats, and Burned Riparia:

Effects of beaver modified riparia on bat activity within burned and non-burned watersheds in the Methow Valley, WA

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Introduction

Figure 1: Long-Eared Myotis drinking water

As ecological engineers, North American beavers (*Castor canadensis*) have the capability to alter riparian systems in ways that benefit other organisms including insectivorous bats (Vespertilionidae; Nummi et *al.* 2011). Within the Methow River watershed of north central Washington State, beavers are being reintroduced to low order streams within sub-watersheds that have been compromised by severe wildfire to reverse channel incision and restore riparian functions (Figure 2). Wildfire is a natural process that creates heterogeneous forest habitats which benefit many organisms. However, across the globe climate change is leading to more frequent and intense wildfires, which have the potential to alter stream morphology and dynamics (Bend et *al.* 2003).

Functional river systems play a critical ecological role for obligate and generalist species including bats which require lentic and lotic water bodies for foraging and hydration. Bats, in turn, play an important role in transferring nutrients from riparian to upland habitats (Christy et *al.* 1993). Riparian disturbances, whether anthropogenic or natural, affect aquatic-terrestrial nutrient fluxes which ultimately regulate the distribution and abundance of obligate species (Magnus and Eby 2016). However, how beaver dams impact bat activity in burned watersheds of the Pacific Northwest is not well understood.

Figure 2: Beaver complex after severe wildfire

Objective

- **Determine how beaver dams interact with fire to influence bat activity in both burned and non-burned sub-watersheds of the Methow River watershed**

Methods

Study Area

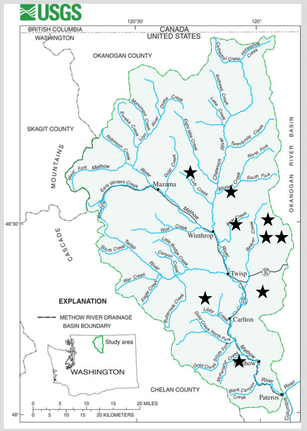

Figure 3: Map of sampling locations within the Methow River watershed

Figure 4: Beaver pond within burned sub-watershed

Figure 5: Non-burned beaver pond with recording setup

- Nine 1st to 2nd order streams with hydrologically significant beaver impoundments were selected within the Methow River watershed (Figure 3).

Sampling Methods

- Two SM2BAT bat detectors were placed adjacent to the stream, one at the dam within the beaver complex, and another 0.4-0.8 km up or downstream
- SMX-UT microphones were placed 3 m from the stream edge, 1 m off the ground, and set 45° of horizontal (Figure 5)
- Bat activity was recorded for one night per site, from 7:00 PM to 7:00 AM, from 20 July to 9 August 2018.

Statistical Analysis

- Kaleidoscope analysis software by (Wildlife Acoustics) was used to analyze recordings
  - determined number of bat passes per night
  - visually determined the number of feeding buzzes recorded at each site based on patterns of echolocation (Figure 6)
- Two by Two Factorial Analysis of Variance used to compare mean recorded bat passes and feeding buzzes between beaver and non-beaver sites within burned and non-burned sub-watersheds.

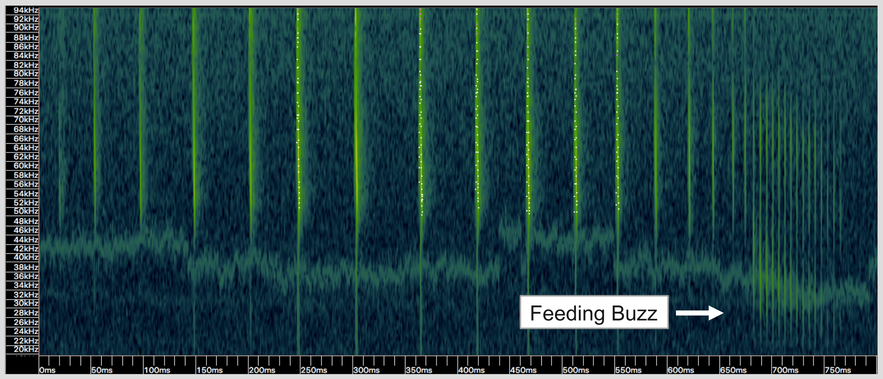

Figure 6: Sonogram of bat feeding buzz

Results

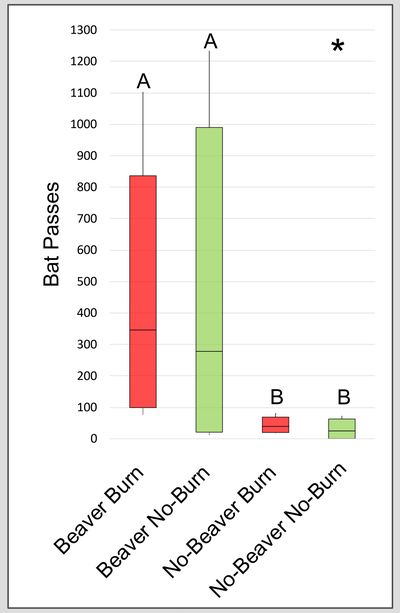

Figure 7: Number of bat passes recorded per night at beaver dams and free flowing reaches within burned and non-burned sub-watersheds (letters indicate statistical difference)

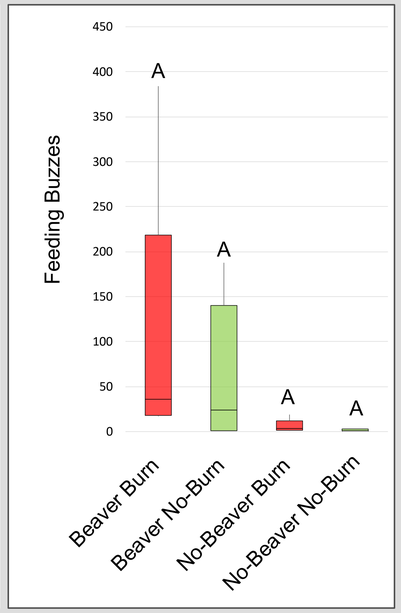

Figure 8: Number of bat feeding buzzes per night recorded at beaver dams and free flowing reaches within burned and non-burned sub-watersheds (letters indicate statistical difference)

- 4501 bat passes were recorded over the course of nine sampling days
- Number of passes recorded at each site ranged from 1234 (beaver, no-burn) to 0 (no-beaver, no-burn)
- Sights without beaver had fewer bat passes (P=0.024*, DF=1; Figure 7)
- No difference in the number of bat passes recorded at beaver dams within burned and non-burned watersheds (P=1.0, DF=1; Figure 7)
- No significant difference in the number of bat feeding buzzes was detected among sites with and without beaver dams (P=0.11, DF=1) or among burned or non-burned sites (P=0.34, DF=1; Figure 8) given sample size and equipment used

Conclusion

- Increased bat activity observed at dam sites suggests beaver dams are selected by native bat species residing in Methow River watershed.
- Beaver dams within sub-watersheds impacted by severe wildfire serve as important habitat for bat species native to the Methow River watershed

Acknowledgements

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References/Citations

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https://greatnorthernlcc.org/sites/default/files/images/locationmap_methow.jpg

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