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BEAVER WETLANDS BUILD WILDFIRE RESILIENCE

Unburned beaver complex in Last Chance Creek, California.

Beavers are nature's engineers. They build dams, dig canals, and thin vegetation around their habitat.[1] In doing so, they slow and spread water across the landscape, creating wetlands and raising water levels in mountain valleys. While beavers create these conditions for their own survival, beaver wetlands can also provide powerful and increasingly valuable benefits to nearby communities.[2]

Research shows that when wildfires burn, beaver wetlands can slow, redirect, and sometimes even stop the spread of fire.[3] Often located in forests where wildfires originate, these areas can play a frontline role in reducing fire intensity and creating **firebreaks**, which reduce the spread of fire to adjacent lands. Because they remain wet and resistant to burning, beaver wetlands also serve as critical **wildfire refugia**—or safety zones—for fish and wildlife during wildfire events.[4]

Not all beaver wetlands will influence wildfire behavior in the same way. Factors such as **burn severity**, size of the wetland, and consistency of water storage all play a role.[5] Researchers are studying these dynamics to better understand how restoring or mimicking beaver activity can maximize wildfire resilience and reduce risk across vulnerable landscapes.

The following case studies of real, recent wildfire events document the power of beaver systems in breaking wildfire spread and creating safety zones.[6] Together, they offer practical insights for incorporating beaver-based restoration into wildfire risk planning and management.

KEYWORDS

- **FIREBREAK:** Areas within a wildfire that act as a barrier to on-the-ground fire spread.
- **WILDFIRE REFUGIA:** Areas within a wildfire that remain unburned or burned at a low severity. These areas provide habitats for wildlife and vegetation to survive during a fire, persist in the postfire environment, and disperse into higher-severity burned areas.[7]
- **BURN SEVERITY:** A satellite-derived metric used to describe the impact of a wildfire event on the landscape. The categories are Unburned, Low, Moderate-low, Moderate-high, and High, where the percentage of tree mortality, soil disturbance, and overall impacts increase as the category increases.[8]

THE ROLE OF BEAVER-BASED RESTORATION

HAVE BEAVERS?

Prioritize conserving existing populations. Pair their activity with targeted stream restoration and strategic fuel reduction treatments to expand and connect wet, fire-resistant areas, improving the likelihood of slowing or stopping fire spread in the future.

NO BEAVERS?

Restore the conditions that support them. Techniques such as woody material additions, beaver mimicry, and sediment management structures can help revive streams and wet meadows. Where appropriate, beaver reintroduction may also be considered as part of a broader restoration strategy.

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Fire Breaking: Williams Fork Fire—Colorado 2020

The Williams Fork fire ignited on August 14, 2020, burning 14,833 acres of the Arapaho National Forest.

Along the southwestern boundary, the fire progressed until it reached a series of beaver wetlands that extinguished, redirected the burning front, or were paired with fire-fighting operations to stop the fire's progression further west.

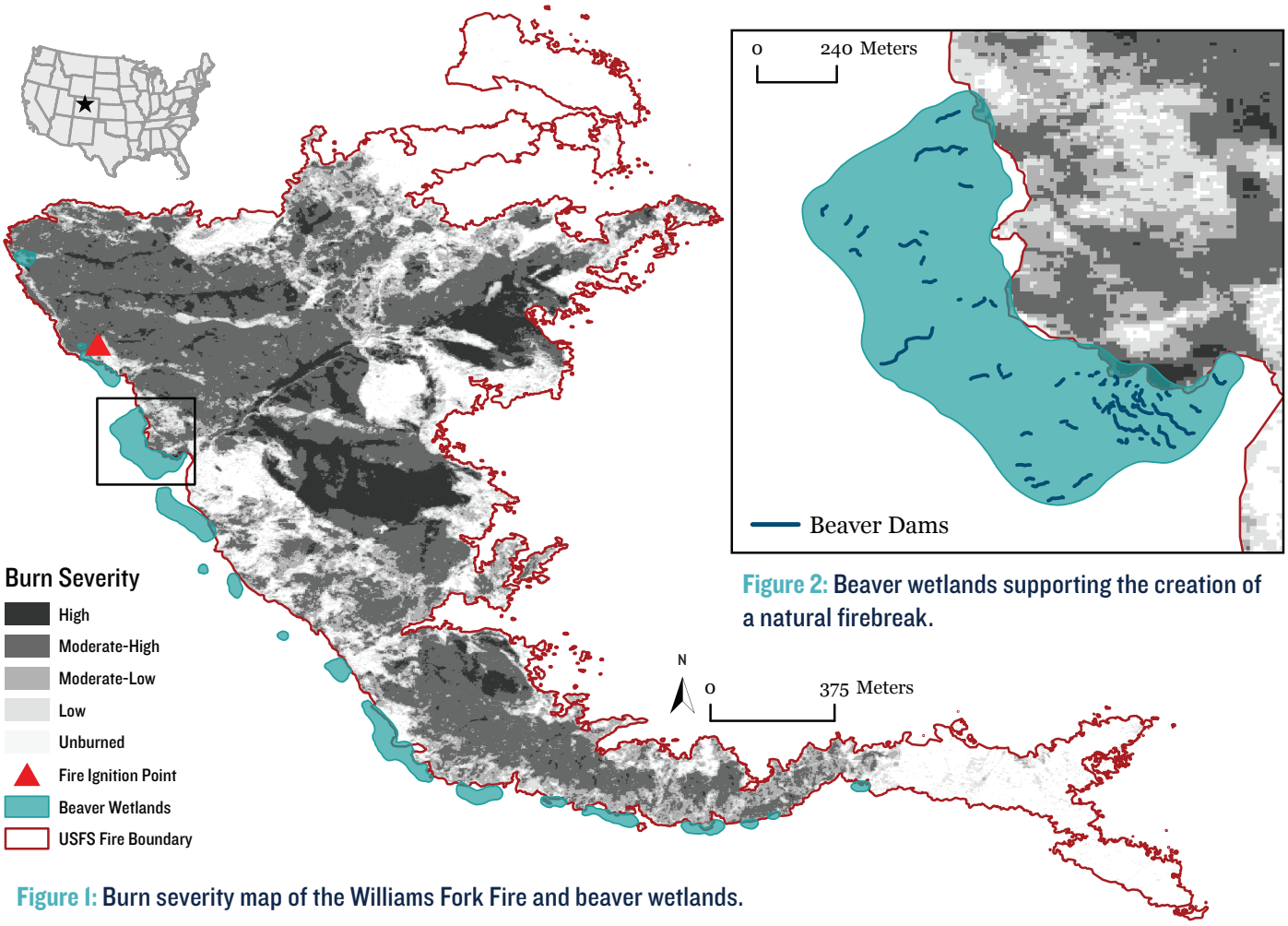


Figure 1: Burn severity map of the Williams Fork Fire and beaver wetlands.

Figure 2: Beaver wetlands supporting the creation of a natural firebreak.

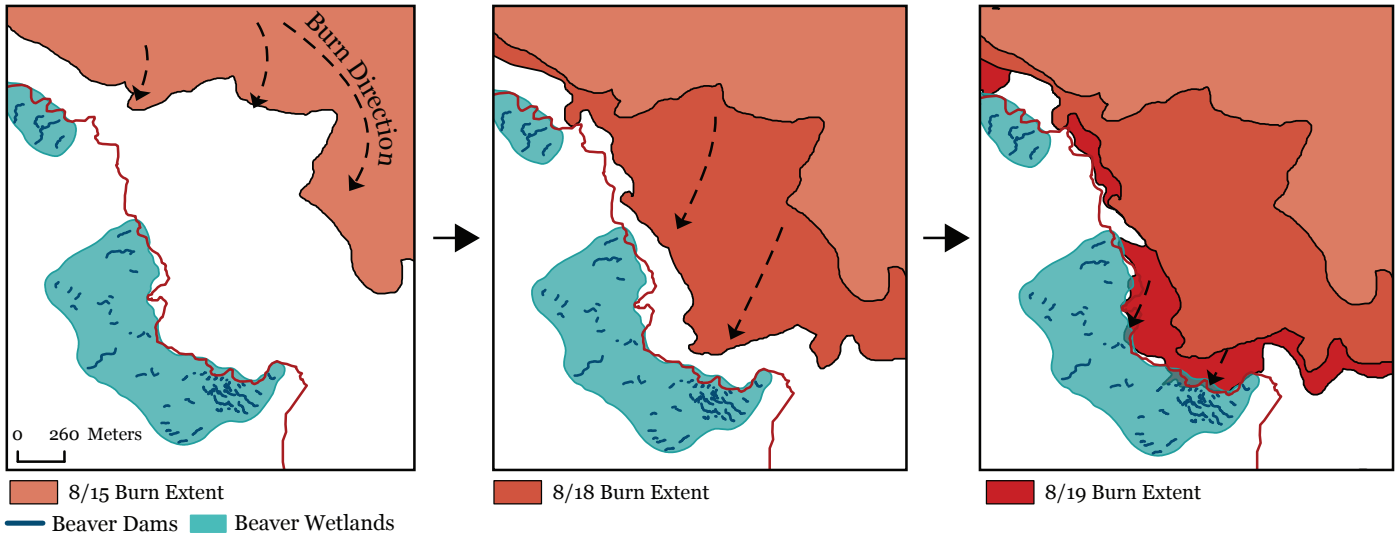


Figure 3: Burn progression map for a beaver wetland within the Williams Fork Fire showcasing the creation of a firebreak. Burn extents were mapped for August 15, 18, and 19, 2020.

Fire Breaking & Refugia: Naluk Fire—Alaska 2024

The Naluk fire ignited on June 20th, 2024, burning 23,406 acres of the Selawik National Wildlife Refuge.

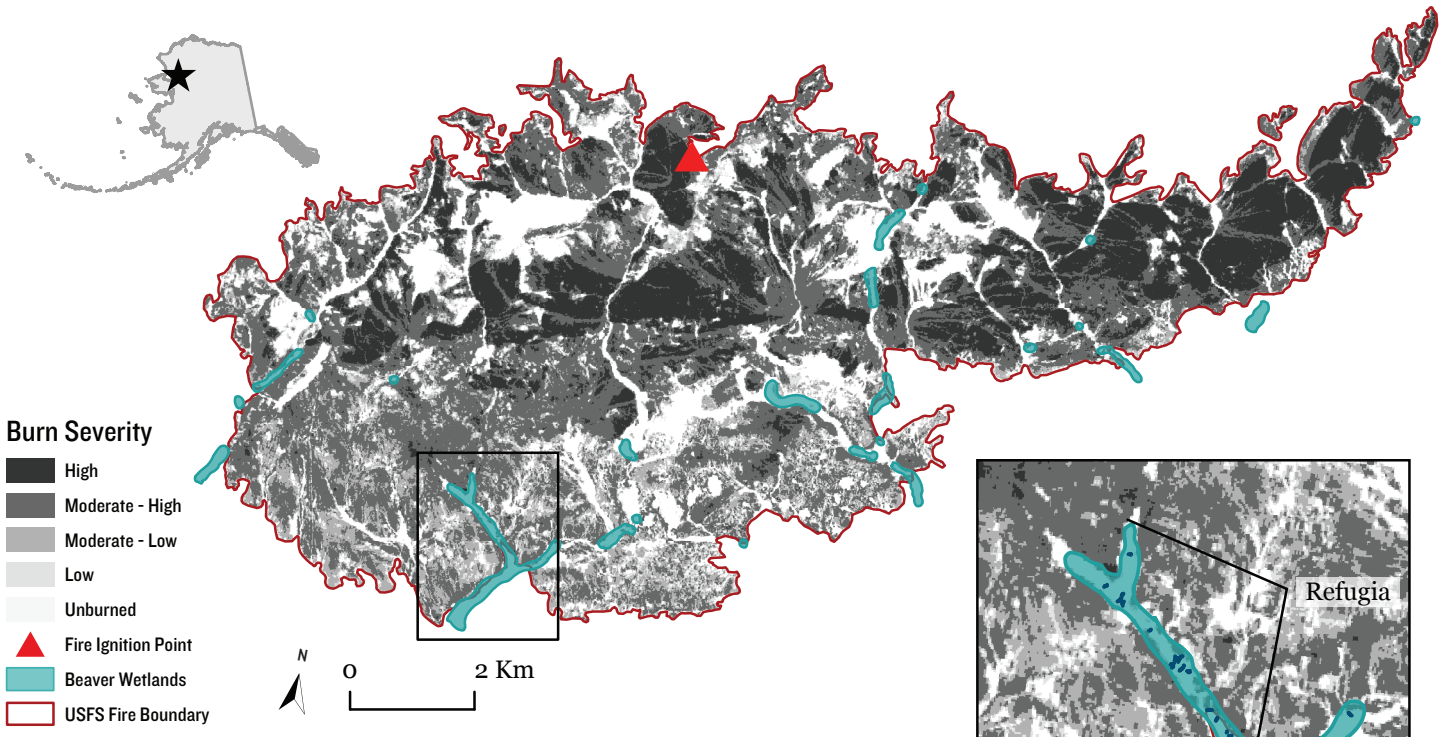


Figure 4: Burn severity map of the Naluk Fire and beaver wetlands.

Along the southern edge, the fire progressed until it reached a chain of beaver wetlands that acted as refugia and redirected the burning front to another beaver wetland that created a natural firebreak, extinguishing the fire. The large area of connected wetlands and low vegetation height likely contributed to the creation of a firebreak in this area. Other beaver wetlands within the fire boundary created additional refugia.

Figure 5: Beaver wetlands creating a natural firebreak and wildfire refugia.

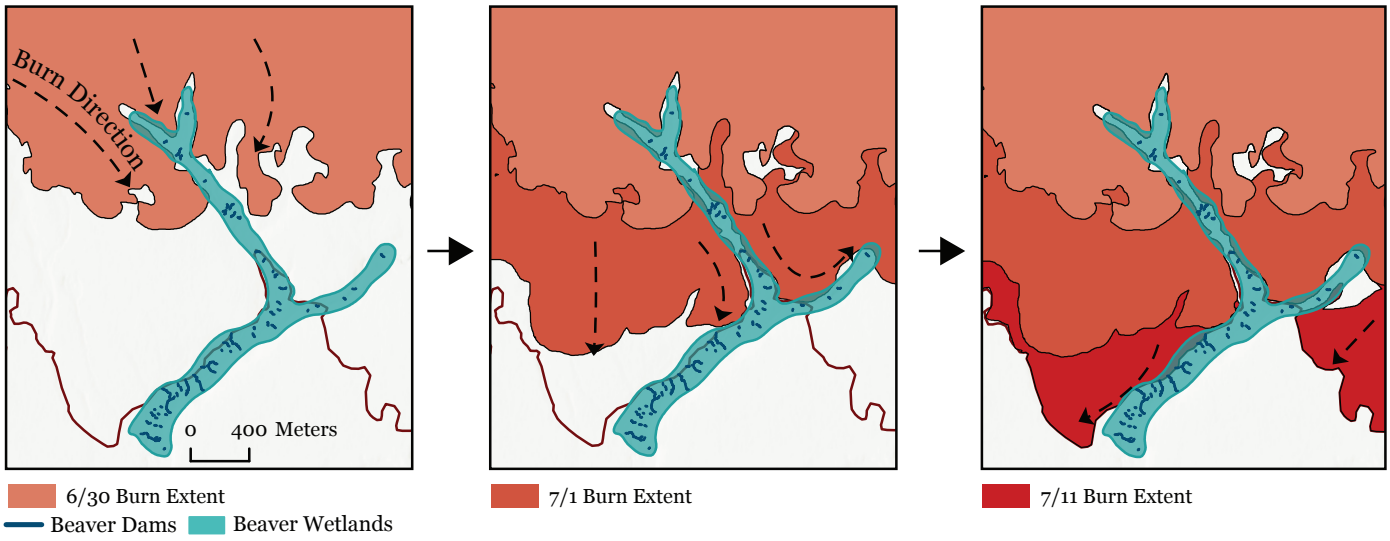


Figure 6: Burn progression map for a beaver wetland area within the Naluk Fire, showcasing redirection of the burning front away from the beaver wetlands and creation of a natural firebreak. Burn extents were mapped for June 30, July I, and July II, 2024.

Refugia: Trail Creek Fire—Idaho & Montana 2021

The Trail Creek fire ignited on July 8, 2021, burning 62,013 acres of the Beaverhead-Deerlodge National Forest and Salmon-Challis National Forest.

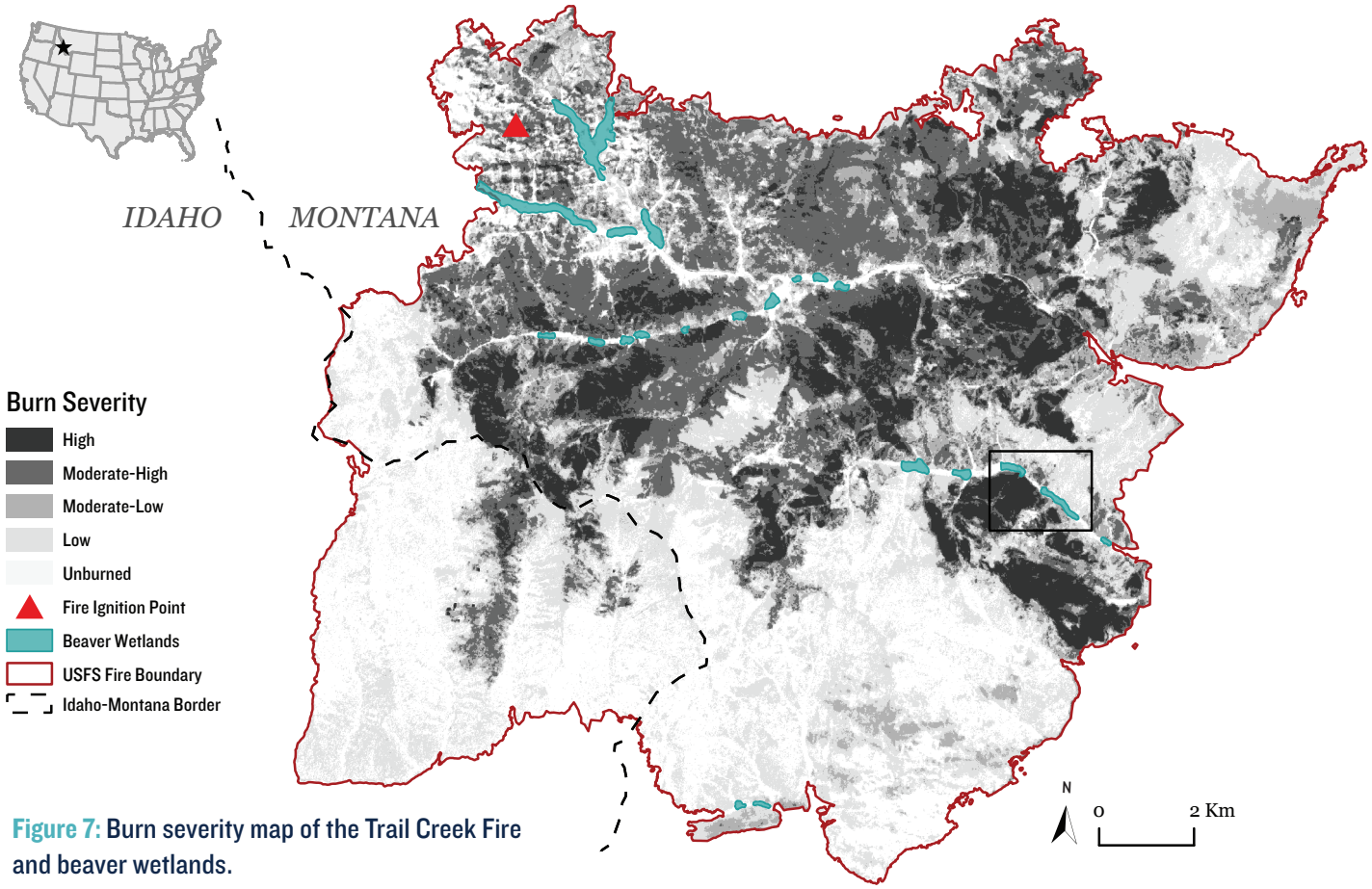


Figure 7: Burn severity map of the Trail Creek Fire and beaver wetlands.

Within the fire's boundary, all beaver wetlands were unburned, creating wildfire refugia. These areas occurred in all degrees of burn severity, often serving as connections to larger unburned areas that provided increased access to safety for wildlife.



Figure 8: Beaver wetlands creating refugia surrounded by high, moderate, and low burn severity.

ENDNOTES

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7 Meddens et al., "Fire Refugia."

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