Research Summary: A Case Study in Cost-Effectiveness of Linear Fuel Breaks in Wildfire Management

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Sagebrush rangelands are shrinking across the western U.S., due to pressure from a variety of factors including development, invasive species, and altered fire regimes. The past few decades has seen an increase in fire size and frequency within the sagebrush steppe, largely fueled by invasive annual grasses. In particular, the invasive annual grass cheatgrass (*Bromus tectorum*) increases fuel continuity and alters plant communities. The shift in fire regime caused by cheatgrass also leads to increased dominance of the species--referred to as the grass-fire cycle. Across the Great Basin, this cycle is becoming an increasing threat to both the underlying ecology and to rural economies. To address this, land managers are looking for ways to combat wildfire in rangeland ecosystems with minimal financial resources. Fuel breaks offer a potential solution. A case study from the Twin Falls Bureau of Land Management District of southern Idaho analyzes the costs of fuel break implementation and wildfire, finding that properly maintained fuel breaks could provide significant economic benefits to land managers in the Great Basin.

KEY FINDINGS

- **Fuel breaks pay off:** Through analysis of the Jarbidge Fuel Break Complex and the 2019 Pothole Fire in the Twin Falls BLM District, researchers found that the presence of fuel breaks during this wildfire event could have reduced total wildfire management costs by an amount equal to or greater than the full implementation and maintenance costs of the fuel breaks.
- **Modeling for fuel break efficacy:** A partner study whose data was used in this analysis indicates that the Jarbidge Fuel Break Complex could have been responsible for reducing the 2019 Pothole Fire size by as much as 66%.
- **Fuel breaks may reduce suppression costs:** When comparing suppression costs of the 2019 Pothole Fire to other wildfires of similar size that burned in the Great Basin around the same time, Pothole Fire suppression costs were markedly lower, both on an absolute and per-acre basis ($8.61 vs. an average of $51.69).
- **The far-reaching effects of wildfire costs:** Wildfire costs including suppression costs, post-fire rehabilitation, forage replacement, and grazing fee loss, could have catastrophic impacts on rural economies.
- **Importance of fuel break maintenance:** Maintaining fuel breaks makes up a small fraction of overall fuel break costs. In order for fuel breaks to pose the best chance at reducing burned acres and providing economic benefits, maintenance must be conducted on a consistent basis into the future.

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The Rangeland Center is bridging the gap between science and land management by engaging stakeholders to develop solution-based research that has valuable and real world implications for Idaho rangelands.

WHAT ARE FUEL BREAKS?

A fuel break is an area where the existing vegetation is cleared or altered to disrupt fuel sources, allowing land managers to moderate wildfire activity and improve containment. Fuel breaks function by compartmentalizing wildfire distribution, reducing flame length, fire-line intensity, and rate of spread. Fuel breaks are generally created one of three ways: mechanically, chemically, or through targeted grazing. Typically this looks like altering vegetation in strips (100-150 meters in width) along roadways. When designing placement, type, and maintenance strategies for fuel breaks, important considerations include: wildlife habitat, other land uses, and ignition risk.

CASE STUDY DESIGN

The case study of the Jarbridge Fuel Break Complex and 2019 Pothole Fire used a cost-benefit analysis design, comparing the two factors listed below:

A.) The costs of fuel break implementation and maintenance over eight years in the Twin Falls BLM District of southern Idaho (2016-2024). Implementation and maintenance actions included vegetation mowing, seeding, and herbicide spray.

B.) The potential cost savings accrued from the 2019 Pothole Fire, compared to other outcomes had the fuel break complex not been present. Cost components include direct wildfire suppression costs, post-fire rehabilitation expenses, and loss of cattle forage and grazing fees.

To strengthen the dataset, researchers compiled wildfire costs for other wildfires in the Twin Falls BLM District and broader Great Basin region, to identify trends and increase data accuracy.

Fuel break along Wickahoney Road. (Photo: BLM Idaho)

CONCLUSION

With wildfires of increasing size, intensity, and frequency occuring accross the Great Basin and Inland Northwest, fuel breaks have been identified as an efficient method for wildfire mitigation. The results of this study show that properly maintained fuel breaks have the potential to provide significant economic benefits to rural communities and land management agencies by reducing wildfire-burned acreage and associated costs.

FURTHER READING

Johnston, A. (2024). An Economic Evaluation of Linear Vegetative Fuel Breaks and Wildfire in Southern Idaho [University of Idaho]. https://verso.uidaho.edu/esploro/outputs/996671548901851?image=#file-0

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Shinneman, D.J., Aldridge, C.L., Coates, P.S., Germino, M.J., Pilliod, D.S., and Vaillant, N.M., 2018, A conservation paradox in the Great Basin—Altering sagebrush landscapes with fuel breaks to reduce habitat loss from wildfire: U.S. Geological Survey Open-File Report 2018–1034, 70 p. https://doi.org/10.3133/ofr20181034.

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