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GOVERNANCE
PRINCIPLES:
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Water utility risk perceptions and engagement in wildfire mitigation activities in watersheds in the western United States

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Background

Forests are key to source water in the western US (Fig. 1)

- Forests and grasslands supply drinking water to almost 90% of the people in the western US
- National forests provide about 50% of the surface water supply in the western US

Wildfires are negatively impacting forests and grasslands and thus source water

- Post-fire erosion leads to loss of reservoir capacity
- Impaired water quality leads to increased filtration and treatment costs
- Post-fire debris flows damage water supply infrastructure

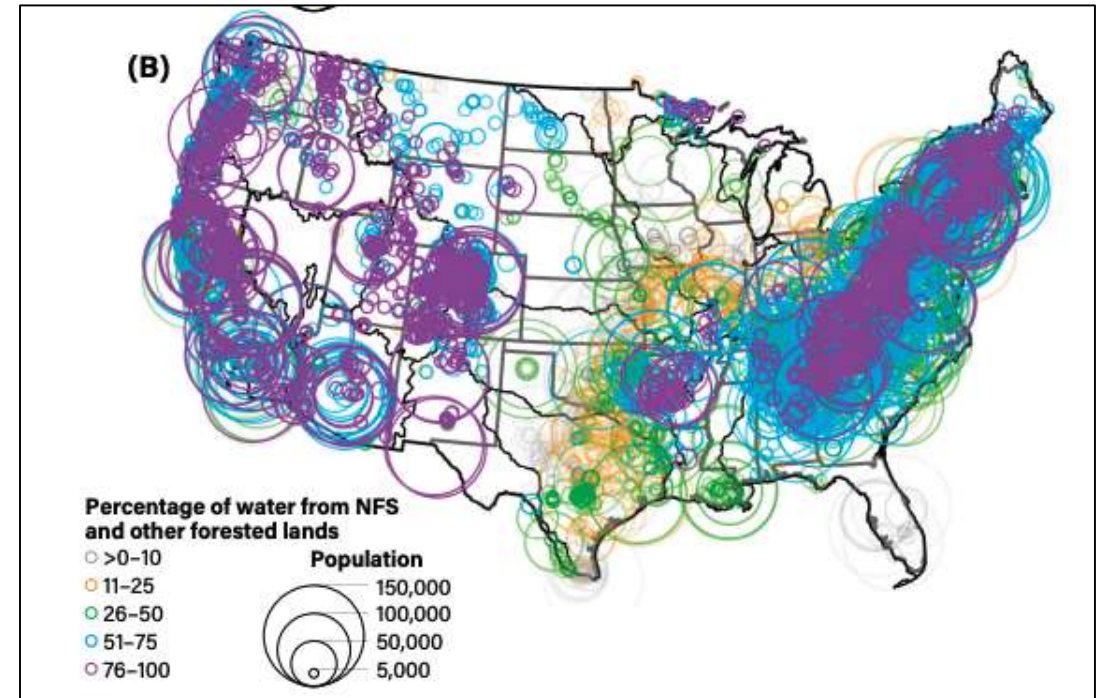


Fig. 1. Percentage of source water from forested lands. Source: Liu et al. (2022), USFS Technical Report.

Background

Nature-based management can reduce wildfire risk and restore watershed function:

- Proactive fuels reduction (prescribed burning, mechanical thinning)
- Post-fire rehabilitation efforts (mulching, stream restoration, reforestation)

To address scale of the wildfire threat there is a need for:

- More partnerships and collaboration across land ownership types
- Diversified and sustainable funding sources
 - scale up federal and state programs
 - **partnerships with water utilities**
 - environmental impact bonds
 - local self-imposed taxes



Research Questions and Study Area (Fig. 2)

- 1) What is the level of concern about future wildfire events (risk perceptions) among water utilities in the western US and how does this vary?
- 2) How much redundancy do water utilities in the western US have to deal with wildfire and what operational changes and strategies are they making?
- 3) Do water utilities in the western US feel responsible for addressing wildfire risk and restoring watershed function? What factors explain their perceived personal responsibility?
- 4) What pre- and post-wildfire management actions are water utilities in the western US conducting, and what are the barriers?



Fig. 2. Map of states included in this study that make up the western US (Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, Arizona, Nevada, and New Mexico). Source: USGS.

Methods

Data Collection:

- Online survey instrument
- ~20 minutes to complete
- Emails sent to contacts in 9 states using the EPA's Safe Drinking Water Information System
- Targeted surface water users
- 173 useable responses (184 total responses)
- 18% response rate

Data Analysis:

- Descriptive statistics
- Graphical analysis to explore trends by 5 US Forest Service Regions
- Wilcoxon rank-sum tests to explore differences in median values across utility size, federal lands, wildfire exposure, and vulnerability assessment
- Logistic regression analysis to explore factors that influence feelings of personal responsibility to engage in wildfire management actions



Results: Risk perceptions

Concern for future wildfire events high (Fig. 3):

- 35% very concerned
- 33% concerned
- 27% somewhat concerned
- 4% not concerned

Concern for future wildfire events is higher if:

- Past exposure to a wildfire
- Federal agency owns land in the watershed
- Vulnerability assessment conducted for the watershed

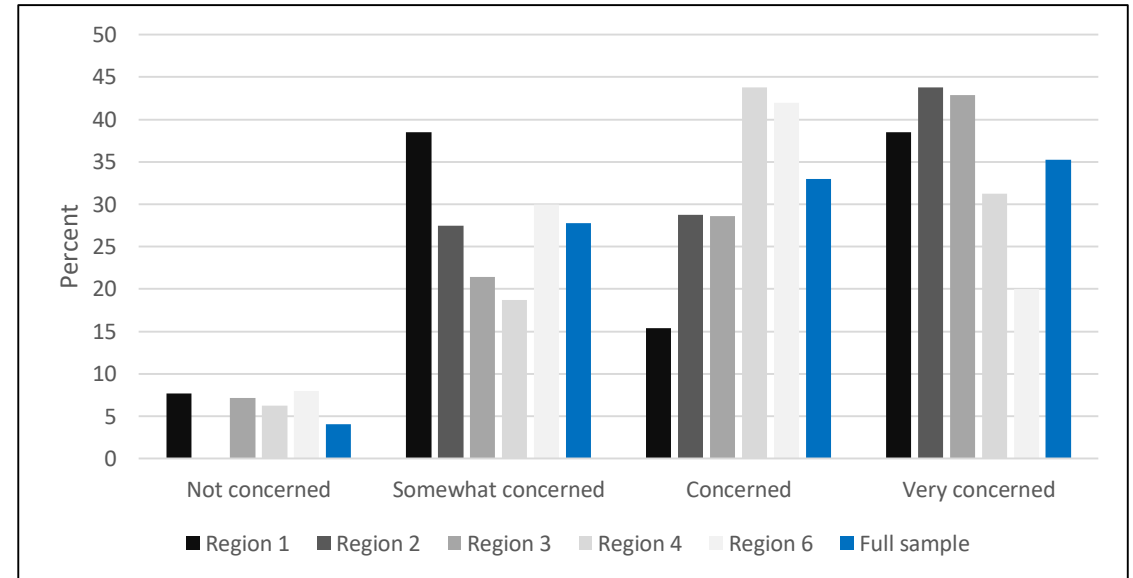


Fig. 3. Level of concern for future wildfire events and impacts on operations

Level of concern varies by:	Z-score
Past exposure	-2.36**
Utility size	-0.02
Federal agency land	-3.93***
Vulnerability assessment	-2.47**

Wilcoxon rank-sum tests; P-value: **95%, ***99%

Results: Personal responsibility

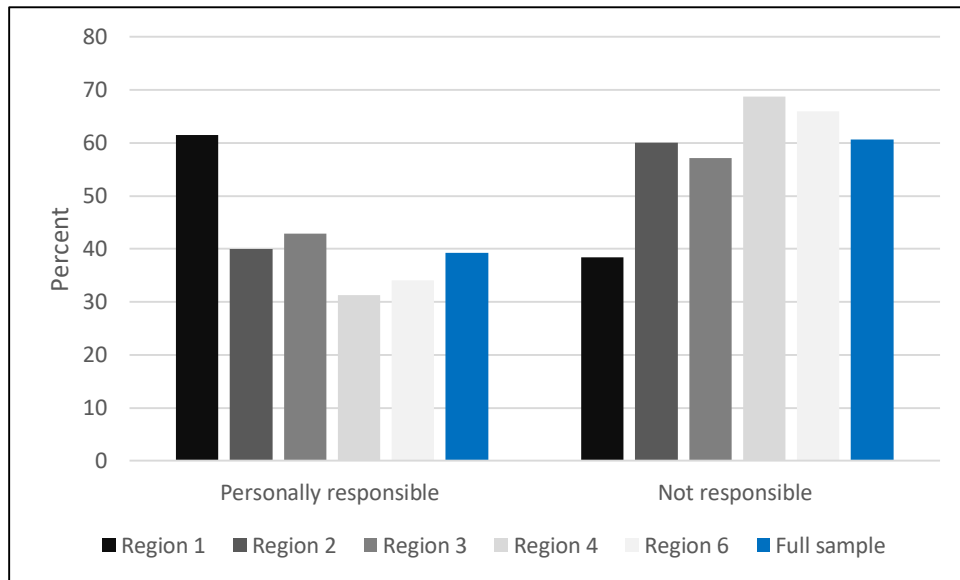


Fig 4. Feeling personally responsible for wildfire management actions

- 61% of water utilities felt they were **not responsible** for mitigating wildfire risk (Fig. 4)
- 39% felt they had **some responsibility** to mitigate risk (Fig. 4)

Logistic regression for perceived personal responsibility to mitigate wildfire risk

	Odds Ratio
Utility size	1.14
Past exposure	1.29
Vulnerability assessment	2.26**
Concern about future wildfire event	1.72**
Federal agency land	0.22***
Water utility land	3.72***
Regional dummy variables	Included
<i>Observations</i>	172
<i>Pseudo R2</i>	0.15

P-value: **95%, ***99%

Results: Wildfire management actions

Water utilities with personal responsibility are implementing some wildfire management actions (Fig. 5):

- Thinning (~70%)
- Stream restoration (~50%)
- Everything else <30%

Partners on wildfire management actions:

- Local government (44%)
- US Forest Service (32%)
- Non-governmental organizations (25%)
- Other water utilities (24%)

Funding for wildfire management actions:

- User fees (49%)
- Cost sharing (29%)
- Grants (25%)

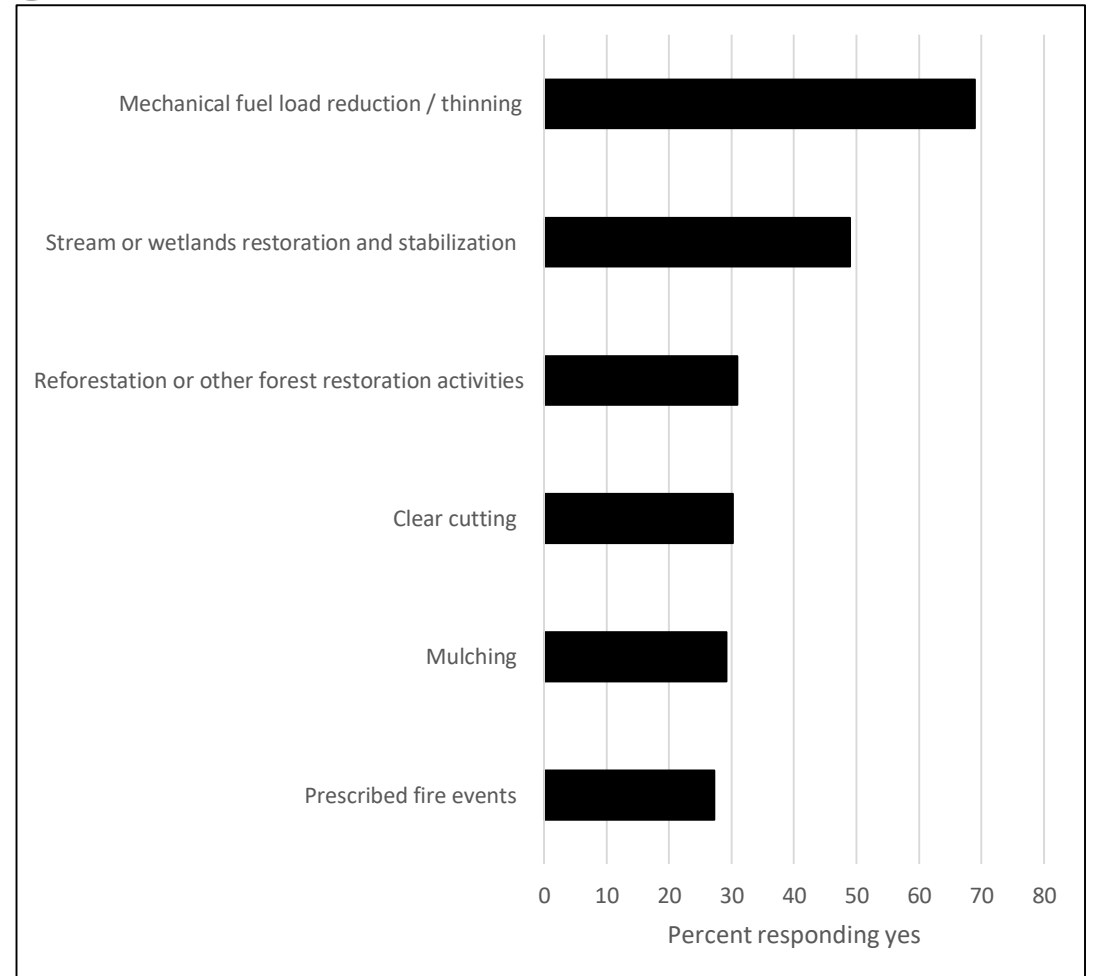


Fig. 5. Management actions taken to reduce threat of wildfire events

Results: Wildfire management actions

Wildfire management actions more common if:

- Larger water utility
- Located on Federal lands
- Past exposure to a wildfire

Barriers to wildfire management actions:

- Funding (77%)
- Land ownership (55%)
- Permitting requirements (40%)
- Having information and data (Fig.6)

Information and data needs:

- Wildfire modeling (90%)
- Post-fire erosion or water quality (90%)
- Economic assessments (88%)

Mitigation action varies by:	Z-score
Past exposure	-2.07**
Utility size	-2.08**
Federal agency land	-2.52**
Vulnerability assessment	-1.34

Wilcoxon rank-sum tests; P-value: **95%, ***99%

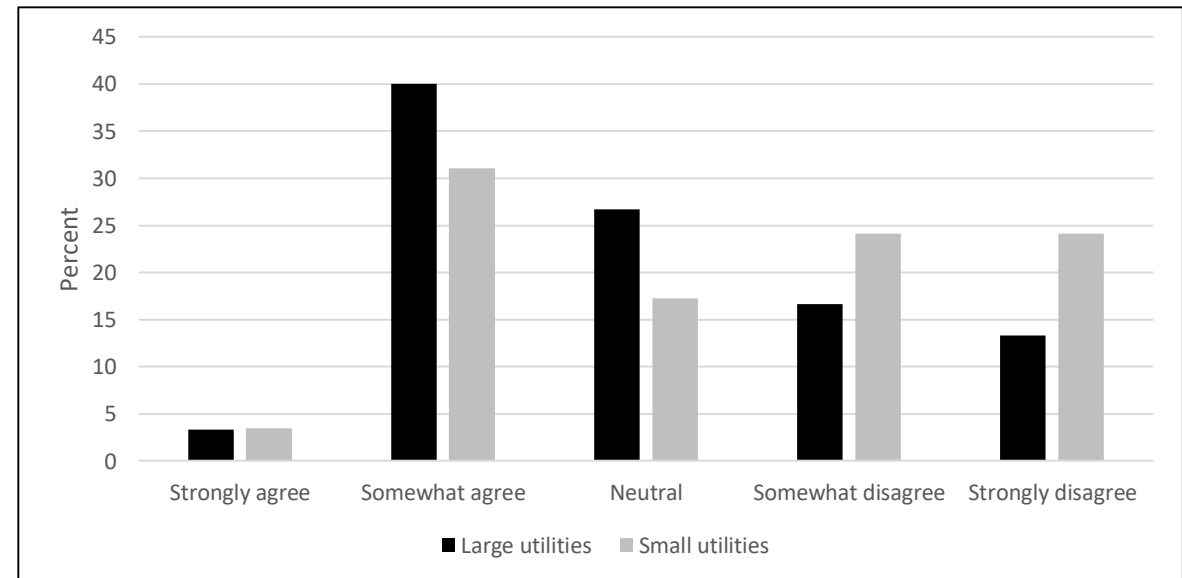


Fig. 6. Percent agreeing that they have all the information and data they need for wildfire mitigation decisions

Conclusions

- Concern for future wildfire impacts is **high** among water utilities in the western US
- Personal responsibility for wildfire mitigation/wildfire management is **low** among water utilities in the western US
- Need to address this **mis-match** to increase funding sources (utility user fees) and partnerships to scale up wildfire management actions in the western US
- Funding, land ownership, and lack of information are **barriers** for water utilities to engage in wildfire management



Recommendations

What	Why	Who
Conduct vulnerability assessments for/with water utilities	<ul style="list-style-type: none"> • Related to concern for future wildfire events/risk perceptions • Related to feeling personally responsible for wildfire management • Helps address data and information barriers to management actions 	Land management agencies and or universities
Increase outreach and engagement with water utilities on federal lands	<ul style="list-style-type: none"> • Utilities on federal lands felt less personally responsible • Need to smooth over negative relationships with federal land management agencies 	Land management agencies and or non-governmental organizations
Provide additional support for smaller water utilities	<ul style="list-style-type: none"> • Smaller water utilities have taken fewer management actions and have lower resiliency than larger utilities 	Non-governmental organizations and or foundations