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Recent Social Science on Forest and Fire Management from the Greater Flagstaff, Arizona Area

Melanie Colavito, Catrin Edgeley, and Niki vonHedemann



Ecological Restoration
Institute



School of Forestry

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Ecological Restoration Institute Northern Arizona University



Our Mission:

The ERI serves diverse audiences with objective science and implementation strategies that support ecological restoration and climate adaptation in our western forest landscapes.



What We Provide:

Best available science

- Ecology
- Socio-political
- Economic
- Operational efficiency



To Whom:

A wide variety of audiences including:

- Federal and state land managers
- Academic researchers
- Elected officials and policy makers
- Federal land stakeholders, the public, and non-profit organizations

Historically

A natural fire regime with low-intensity ground fires to rejuvenate soils and maintain open structure

Leading to open, park-like, diverse undergrowth, with wildflowers, grasses, forbs and shrubs



Today

Forests are crowded with weak trees susceptible to disease, infestation, and fire

Fire moves from the ground into the canopy, impacting soils, water, and devastating entire landscapes







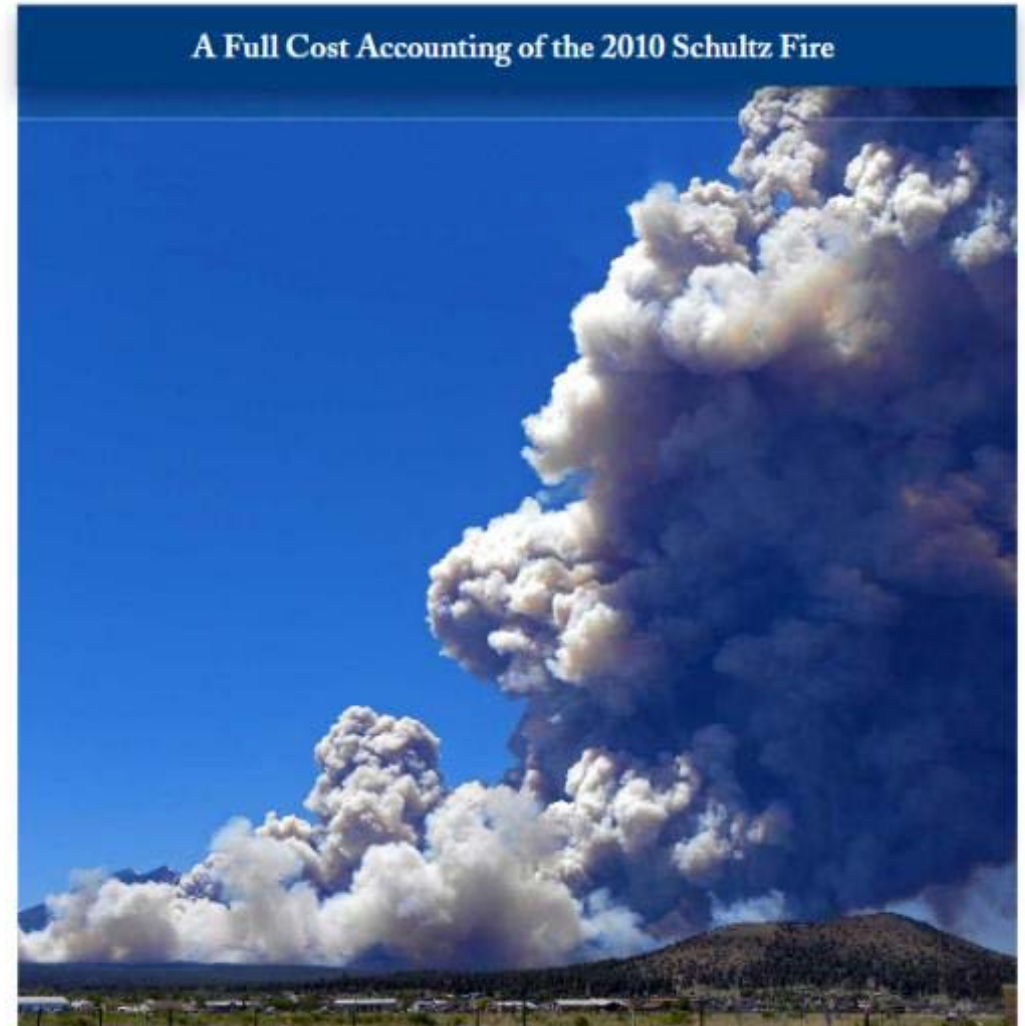


2010 Schultz Fire Full Cost Accounting



Study approach

- 2013 full cost accounting
 - Estimated \$133-\$147 million in costs
- 2020 collaborative effort to re-measure full costs after a decade
- Partial remeasurement of costs for:
 - Household costs
 - Insurance
 - Prevention and mitigation
 - Government agencies and utilities
 - Mexican spotted owl (MSO) habitat
 - House sale price losses
- Household survey
 - Also measured long-term well-being and mental health effects

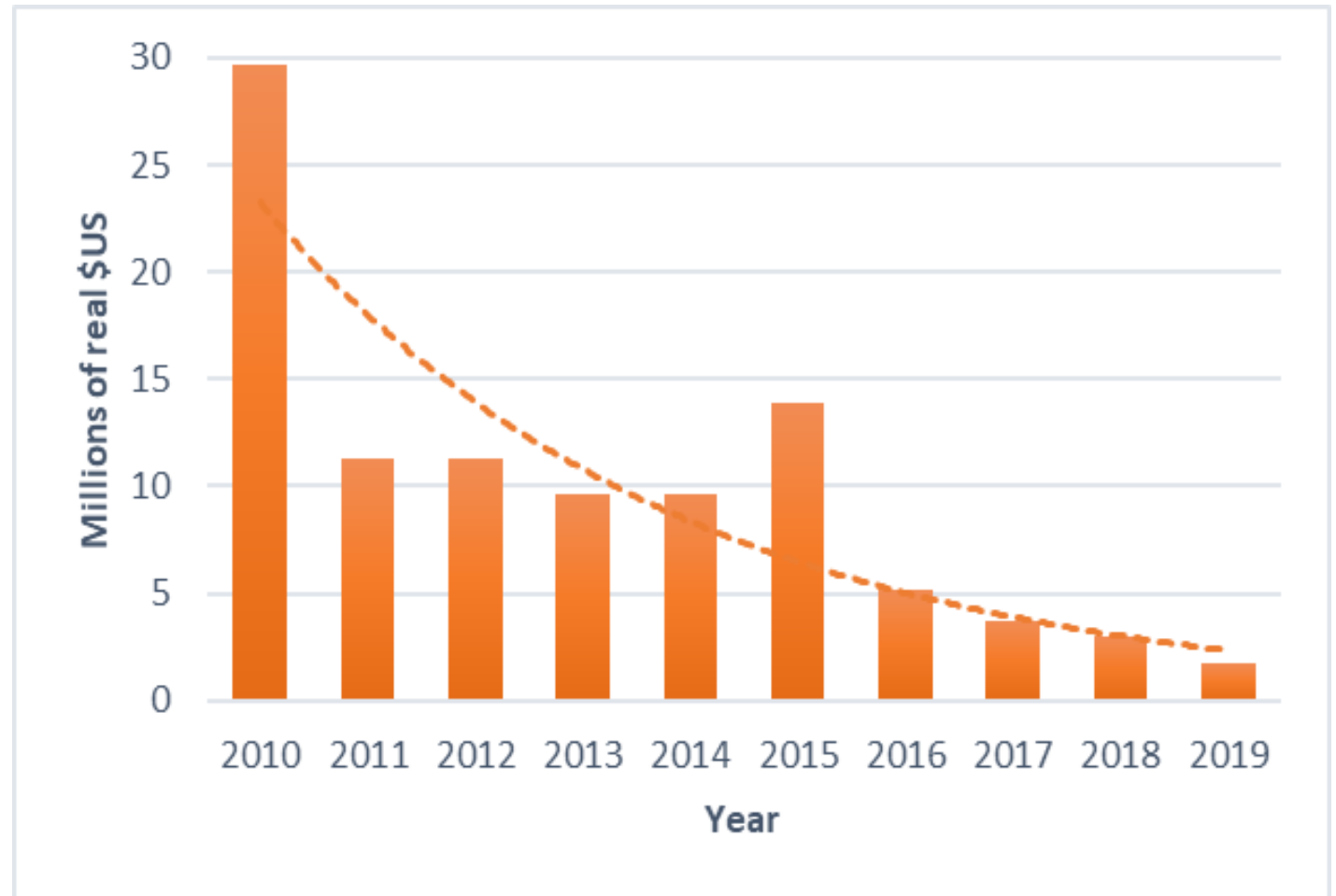


Total Costs for the 2010 Schultz Fire

Cost Types	Total Costs
Government and utility expenses 2010-2019	\$72,392,991
Mexican spotted owl habitat displacement	\$1,080,500 (range \$546,000–\$1,615,000)
House sale price losses	\$9,920,000
Insurance	\$5,611,193 (range \$4,613,866–\$6,608,520)
Prevention and mitigation measures	\$4,368,748 (range \$3,437,271–\$5,300,225)
Loss of life	\$9,760,000
Structural damage	\$3,470,499
Cleanup	\$2,044,592
Unpaid labor	\$1,698,409
Home contents	\$614,158
Fire evacuation costs	\$250,456
Total	\$111,211,546 (range \$108,748,242–\$113,674,850)

Schultz Fire indirect costs: 2010-2019

- 89%** **Indirect costs**
(government mitigation, loss of life, structure damage)
- 10%** **Direct fire suppression costs**
- 1%** **Direct fire costs from MSO habitat loss**



Treatment costs vs. wildfire costs

- Schultz Fire cost \$7,345/ acre
- Potential cost savings with treatments planned before the fire
 - *Estimated treatment costs*
 - \$1,285/ acre for mechanical thinning
 - \$300/ acre for prescribed fire
 - Total treatment cost of \$12.5 million
- The full cost of fire was 4.5 times the proposed cost of restoration



Long term effects of Schultz Fire on well-being

- 12%** reported that their **physical health** suffered as a result of the fire's impacts
- 18.9%** reported that their **mental health** suffered as a result of the fire's impacts
- 25.3%** experienced **significant stress** as a result of the Schultz Fire
- 8.3%** reported that **pre-existing health conditions were worsened** by Schultz
- 4.4%** reported that they were **still experiencing health issues** related to the Schultz fire at the time of our 2020 survey
- 14.5%** **don't like living in the area** as much since the Schultz fire and flooding events.

2019 Museum Fire and Post-Fire Flooding



Longitudinal mixed-mode surveys

2019 survey

- Mixed mode
 - Mail survey packet + reminder postcard
 - Online versions - Qualtrics and City of Flagstaff website
- 787 responses, 22.3% response rate

2022 survey

- Mixed mode
 - Mail survey packet + 2 x reminder postcard
 - Online versions - Qualtrics
- 612 responses, 16% response rate



Fire response and communication: 2019

- 59.0% reported using social media to find emergency info
- 84.5% reported that they are signed up for Coconino County emergency alerts
- 41% expected to be notified in person about evacuation
 - [Need to dispel this expectation](#)
- **Coconino County has new evacuation zone map**



2022 communication about flood events

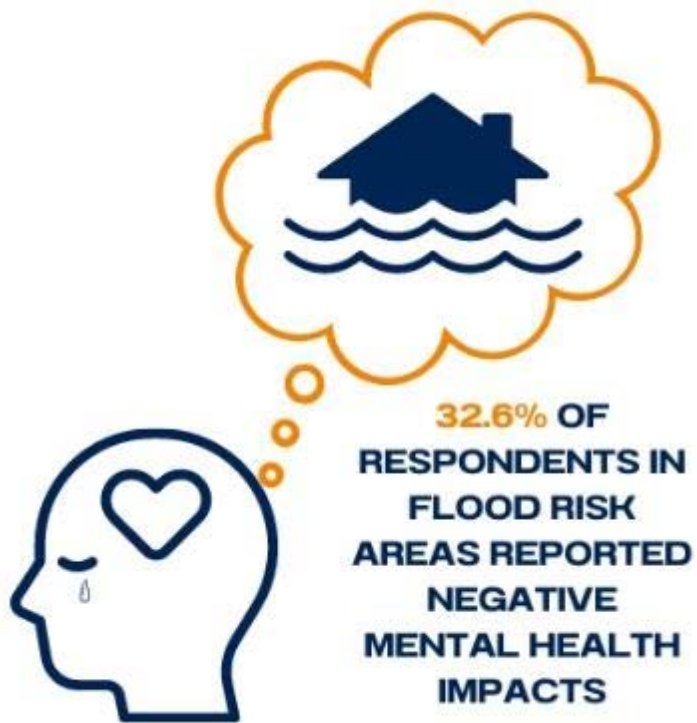


- 56% received a flash flood warning on their phones from the National Weather Service/Coconino County emergency alert system
- 48.4% saw floodwater begin to collect in their neighborhood
- 30.2% observed local weather forecasting
- 0.8% had an official come to their property to alert them

Trust in information sources over time

	2019: trustworthy for information related to <u>Museum Fire</u>	2022: trustworthy for information for making decisions about <u>flood risk</u>
USFS	79.0%	47.5%
Coconino County	73.8%	60.6%
Law enforcement	69.1%	40.1%
Local fire department	66.7%	37.1%
City of Flagstaff	65.6%	57.4%

Household flood impacts: 2022

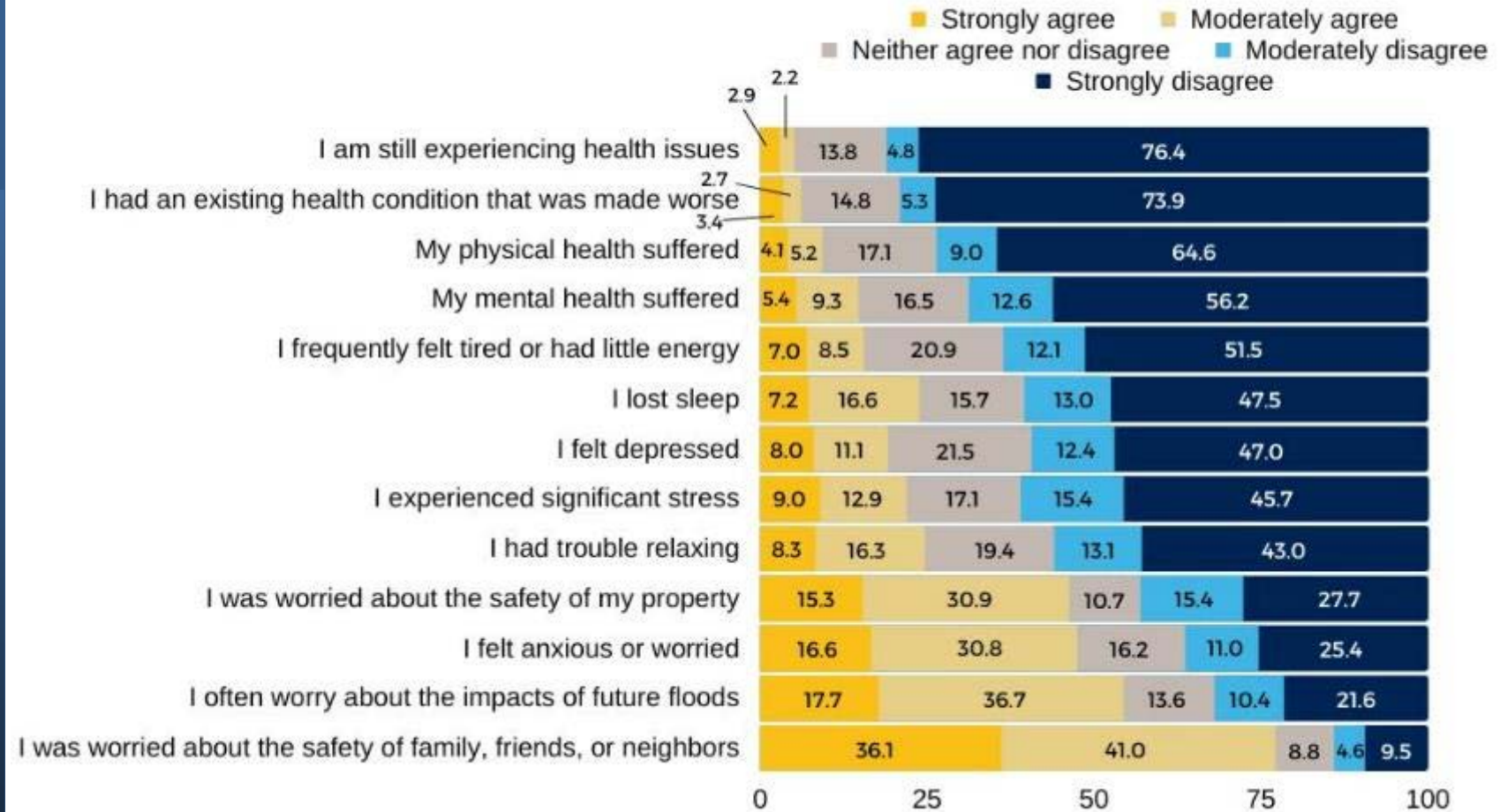


- 30.2% reported property damage from 2021 floods
 - 83.7% reported non-structural damage (e.g., driveways, landscaping, fencing)
 - 21.9% reported damage to interior of home
- 32.8% of respondents had to rearrange schedules
- 11.1% couldn't attend work



Mental and physical health impacts: 2022

Because of flood risk or flood experiences...



Flood insurance: 2022

- 22.3% purchased flood insurance (most commonly between July and August 2019)
- 63.8% had retained their coverage from 2019-2022
- 4.7% filed insurance claims related to flood damage in 2021
- 15.6% had flood impacts that were not covered by insurance (average cost: \$33,362)

**50.0% OF RESPONDENTS PLAN
TO RENEW FLOOD INSURANCE
INDEFINITELY**



Flood mitigation on private property: 2022

Sandbag use more than doubled:

13% in 2019



vs.



27% in 2022

- 36.9% cleared flood debris from drainage areas, roads, sidewalks
- 23.9% parked vehicles off the street
- 16.3% built an emergency “stay kit”
- 66.5% didn’t take action because they felt their property’s flood risk was too low to warrant mitigation efforts

Post-fire flooding experiences - summary



- People look to different information sources depending on hazard
 - The same sources are perceived as having different trustworthiness
 - Post-fire flood communication is not as mature as during fire communication
 - May indicate a need to test different messaging with groups
- Emphasize the connection between preparation and mental health, the unpredictability of monsoon flooding and the importance of maintaining flood insurance
- Explore grants, cost shares, or other funding mechanisms related to insurance and/or other forms of flood mitigation

Perceptions of Forest and Fire Management



Understanding the Museum Fire: 2019

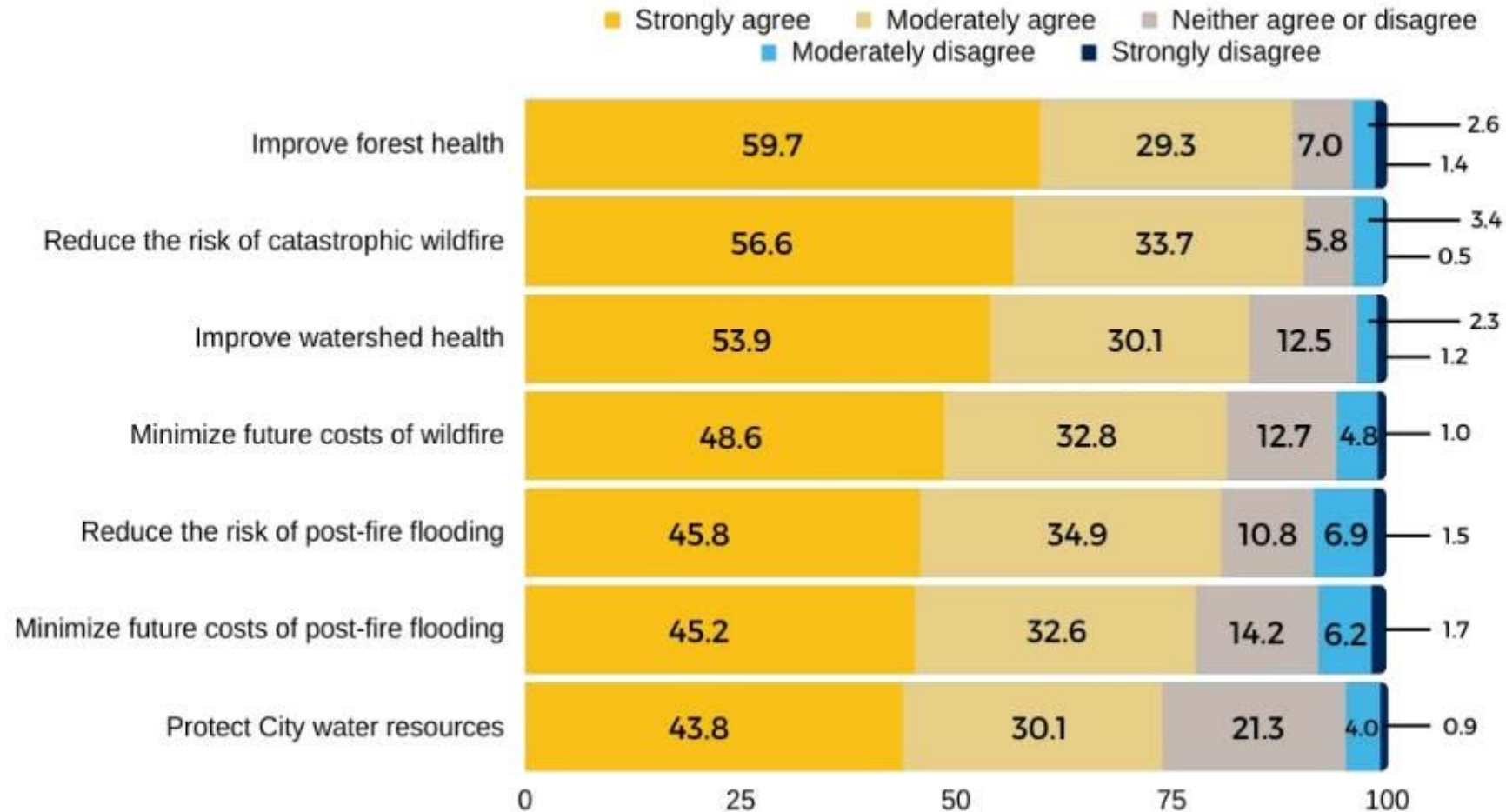
85.2% responded that they were aware of the reported cause of the Museum Fire

86.5% of respondents agree that fire is a “natural part of the landscape around Flagstaff”

74.3% agree that “the landscape will recover from the impacts of the Museum Fire”

Most residents see forest management positively: 2022

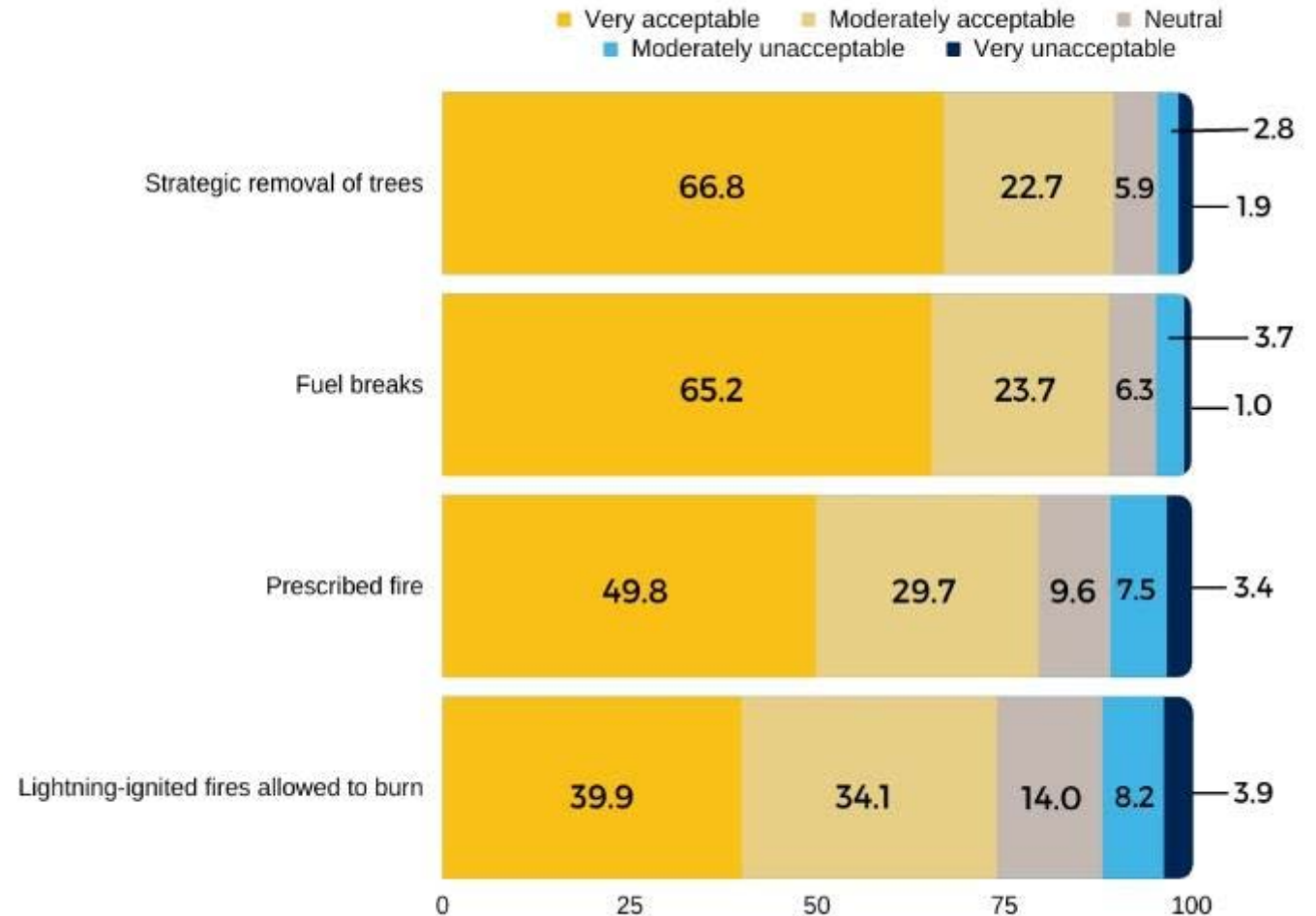
Continued forest management will:



Most residents are supportive of multiple types of forest management: 2022



Acceptability of forest management strategies:



Partnerships for forest management

89.6% (2022) (2019: 92.2%) agree that
“partnerships between the City, USFS,
and other organizations are the best
way to address fire risk to Flagstaff”

73.2% (2019) support future initiatives like
Flagstaff Watershed Protection
Partnership (FWPP) to reduce wildfire
and flood risk in Flagstaff



89.6% OF PEOPLE BELIEVE
PARTNERSHIPS ARE THE BEST WAY
TO ADDRESS FIRE RISK



Future forest management

- High levels of support for future forest management
 - Positive responses for diverse management strategies
 - Support included fire use
- Continued support for future initiatives for implementing forest management
 - Indicative that public understanding of fire in Flagstaff has reached a new threshold
- Local research collectively demonstrates high support, but a need for greater depth in public communication



Smoke adaptation surveys: *Parks* (2021) and *Highlands FD* (2022)



Approach

Survey

- Mixed mode
 - Primary homes: in-person
 - Secondary homes: mail
- Parks: 367 responses (45%)
- HFD: 562 responses (20.6%)

Interviews (Parks only)

- 46 interviews with 56 individuals
- Average ~ 1 hour
- Survey respondents and non-respondents, professionals

Acceptability of fire ignition source

	Parks	HFD
A prescribed fire that is ignited by managers to reduce wildfire risk to homes	83.2%	89.0%
A prescribed fire that is ignited by managers to achieve forest health objectives	73.3%	85.1%
Slash pile burning of materials removed from forests to improve forest health	71.4%	83.4%
A wildfire that managers are attempting to suppress	70.4%	71.0%
A managed fire that is unintentionally ignited but allowed to burn to achieve forest health objectives	64.9%	73.3%
A lightning-ignited wildfire	48.8%	55.4%
A lightning-ignited fire started on public lands that is allowed to burn	47.7%	59.5%
A human-caused wildfire	2.4%	5.6%

Smoke tolerance

“I could tolerate unhealthy levels of smoke from...”



	Parks	Highlands Fire District
	Mean # days	Mean # days
A wildfire	5.2	5.6
A prescribed fire	5.2	5.3
A managed fire	5.4	5.1
Slash pile burning	4.6	4.9

Trustworthiness of smoke information sources

	Parks	HFD
Coconino County	69.1%	81.9%
Local fire department	68.5%	83.3%
U.S. Forest Service	67.2%	78.3%
AZDFFM	58.1%	67.6%
My neighbors, friends, or family	58.0%	50.2%
AZDEQ	50.9%	68.1%
My healthcare provider	38.2%	40.2%
EPA	36.3%	50.6%
My health insurance company	18.0%	19.8%

Interest in adaptation resources (Parks)

	Interested	Not interested	Already have access
A website or app that indicates when air quality is unhealthy	68.5%	15.3%	16.2%
Educational materials about air quality	51.2%	34.0%	14.8%
A household assessment conducted by an expert with recommendations for improving air quality	25.5%	69.4%	5.1%
Open houses or listening sessions with local fire professionals about smoke	45.7%	47.2%	7.0%
Opportunities to ask questions about forest and fire management to land managers	61.0%	31.7%	7.3%
An email or text messaging alert system to let me know when air quality is about to decline	79.8%	15.5%	4.7%

Smoke survey/interview takeaways

- High tolerance for smoke in the Flagstaff area
- Questions tend not to be about whether forest management is necessary, but instead the approaches used
- Shifting population; newcomers have greater trust in USFS and support for forest management
- Widespread interest in learning more about smoke
- Adaptation strategies that match community identity



Summary and Recommendations



Recent Social Science in the Southwest

Strengths: social acceptance of landscape treatments,
public support for management



Opportunities: diversity, smoke, post-fire flooding



A shift toward landscape, state, regional scales

- Focus on collaborative, policy-driven cases



Still a need for localized studies, restudies

Recommendations

- Wait 3-5 years post-fire to evaluate full costs.
- Emphasize connection between preparation and mental health.
- Continue communication about flood insurance, especially 2 years post-fire.
- Engage residents in more nuanced discussion about forest management.
- Provide information about management approaches and decision rationale.
- Address disconnects between short-term impacts of management versus long-term benefits.
- Continue to communicate and engage with new residents.

Questions and Contact Information

Cat Edgeley

Assistant Professor,
School of Forestry
Northern Arizona
University

catrin.edgeley@nau.edu

Melanie Colavito

Director of Policy and
Communications
Ecological Restoration
Institute Northern
Arizona University

melanie.colavito@nau.edu

Niki vonHedemann

Human Dimensions
Specialist, Ecological
Restoration Institute,
Northern Arizona
University

niki.vonhedemann@nau.edu



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