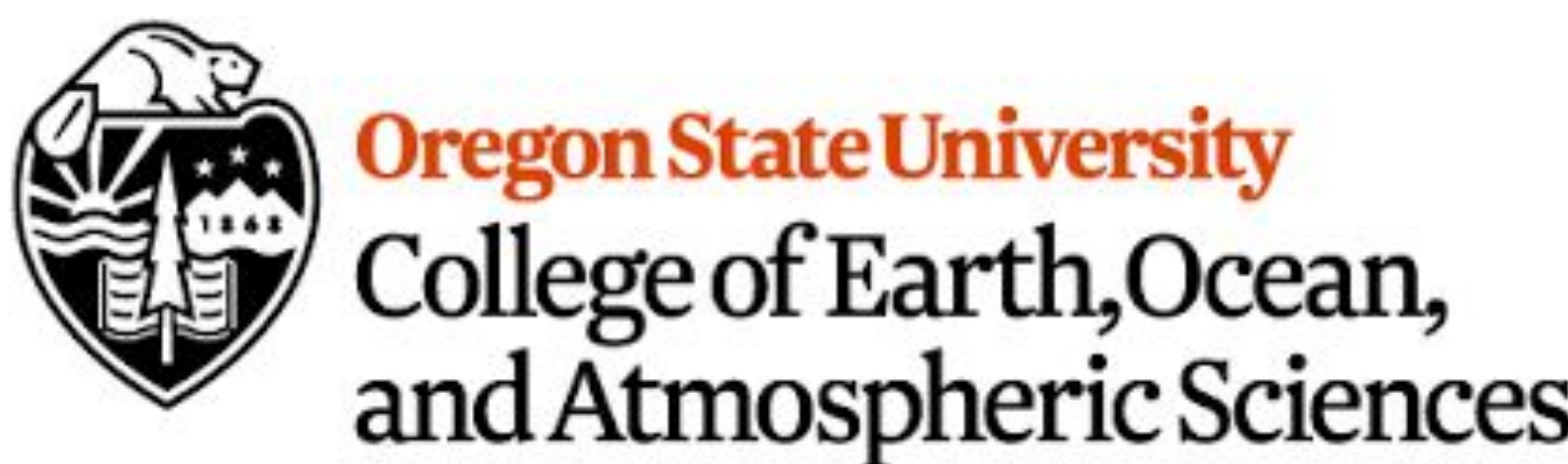




Perceptions of Wildfire Recovery in Redding, California, Following the Carr Fire

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Study Aims

This study aims to explore the differences between objective and subjective measures of wildfire recovery in the Wildland-Urban Interface (WUI) communities in and surrounding Redding, California, focusing on the 2018 Carr Fire. By comparing the Social Vulnerability Index (SVI) (Smith & Boruff, 2021) and remote sensing indices (Normalized Burn Ratio (NBR) (Mockrin et al., 2018) and Normalized Difference Vegetation Index (NDVI) (Mockrin et al., 2018)) with qualitative and quantitative data from community interviews, this research seeks to understand how residents' perceptions of recovery align or differ from objective measures of community vulnerability and vegetation recovery.

The study employs the Community Capitals Framework to analyze how various forms of community capital—social, human, cultural, political, financial, natural, and built (Smith & Boruff, 2021)—influence perceptions of recovery. By exploring how these capitals affect resilience and recovery, this study aims to fill knowledge gaps regarding post-wildfire recovery dynamics in WUI communities (Flora & Flora, 2013).

Additionally, this research investigates how perceptions of recovery differ between residents and decision-makers. This distinction is critical for identifying gaps in communication and alignment between community members and those in positions of authority, ultimately informing more cohesive recovery efforts. By integrating both quantitative and qualitative data, the study aims to provide an in-depth understanding of the complex dynamics at play in post-wildfire recovery and to offer a comprehensive understanding that may contribute to more effective and inclusive recovery strategies in the future.

Introduction

Wildfires are increasingly recognized for their significant socio-ecological impacts on affected communities. The Carr Fire, which began July 23, 2018, in Northern California, illustrates the significant disruption to communities caused by wildfire. The fire ravaged much of the Wildland-Urban Interface (WUI) surrounding Redding, California, destroying over 1,600 structures, including more than 1,000 residential homes, and disrupted the livelihoods of many residents (Stewart et al., 2007; Lareau et al., 2018).

Recovery from wildfires involves not only the restoration of the built and natural environment but also the social and emotional rehabilitation of the community. The interplay between these recovery aspects is crucial for understanding the overall recovery of the affected areas. Previous studies highlight the disparity between objective recovery measures and subjective perceptions of recovery (Kent et al., 2003; Mockrin et al., 2018). Kent et al. (2003) found significant differences between objective measures of recovery, such as economic impact, employment rates, and property damage, and residents' subjective perceptions, including feelings of community well-being and personal loss. The study highlighted that social and psychological impacts, often overlooked by objective measures, played a crucial role in residents' perceptions. Decision-makers perceived the recovery as faster and more successful due to progress in economic and infrastructure restoration, while residents, influenced by personal loss and community cohesion, had a more negative view. Mockrin et al. (2018) found significant differences between how decision makers and community groups perceived recovery. Decision makers prioritized rebuilding housing, land use planning, and mitigation and adaptation strategies, whereas community groups' perceptions of recovery were influenced by their immediate needs and experiences.

Social Capital: encompasses the networks, social trust, and norms that allow community members to act effectively together to pursue shared goals. It is critical in the recovery process due to its ability to facilitate cooperative efforts and the sharing of resources (Aldrich & Meyer, 2015).

Human capital: the combination of education, health, skills, and physical abilities within a community. It is significant in creating effective recovery efforts after disasters because it encompasses the collective ability of a community to make informed decisions and perform necessary tasks (Smith & Boruff, 2021).

Cultural capital: includes the shared values, practices, and traditions that can strengthen community cohesion and provide comfort as well as a sense of identity for members of a community in the aftermath of a disaster (Smith & Boruff, 2011).

Political capital: a community's ability to mobilize resources, influence decisions, and get support from external authorities for local recovery agendas. Effective local leadership and political advocacy are critical in facilitating an effective and quick recovery process (Edgington, 2011).

Community Capitals Framework

Financial capital: includes economic assets and financial resources available to a community, which are crucial for funding recovery efforts, rebuilding damaged infrastructure, and supporting the economic revival of the community (Zhang et al., 2020).

Natural capital: encompasses the natural environment and resources a community can utilize, which are crucial in sustaining life and providing resources and services essential for recovery efforts (Smith & Boruff, 2011).

Built capital: the physical infrastructure of a community, including roads, buildings, and utilities. Recovery efforts commonly require significant investment in restoring or enhancing built capital to increase community resilience (Miles & Chang, 2008).

Methods

This study aims to address the following research questions:

How do community residents that experienced the 2018 Carr Fire perceive the social and ecological recovery of the area impacted?

How do these perceptions differ from objective measurements of social (buildings, SVI index) ecological recovery (remote sensing NBR & NDVI)?

How do these perceptions differ between community residents and decision-makers that led recovery efforts?

Sampling:
Purposive and chain referral sampling
Residents are defined as individuals who lived within the fire perimeter before, during, and after the Carr Fire.
2 groups based on housing density:
• Wildland-Urban Interface (higher density)
• Interspersed (lower density, rural)

Data Collection: Qualitative interviews
Photo questionnaire (recovery and preference ratings)
Perceptions of community and environmental recovery
Social interactions, socio-economics, landmarks
Lessons learned and future vision

Data Analysis:
Qualitative thematic analysis of interview transcripts using community capitals framework (Flora & Flora, 2008; Emery & Flora, 2006)
Inductive and deductive coding
Quantitative analysis of photo recovery and preference ratings

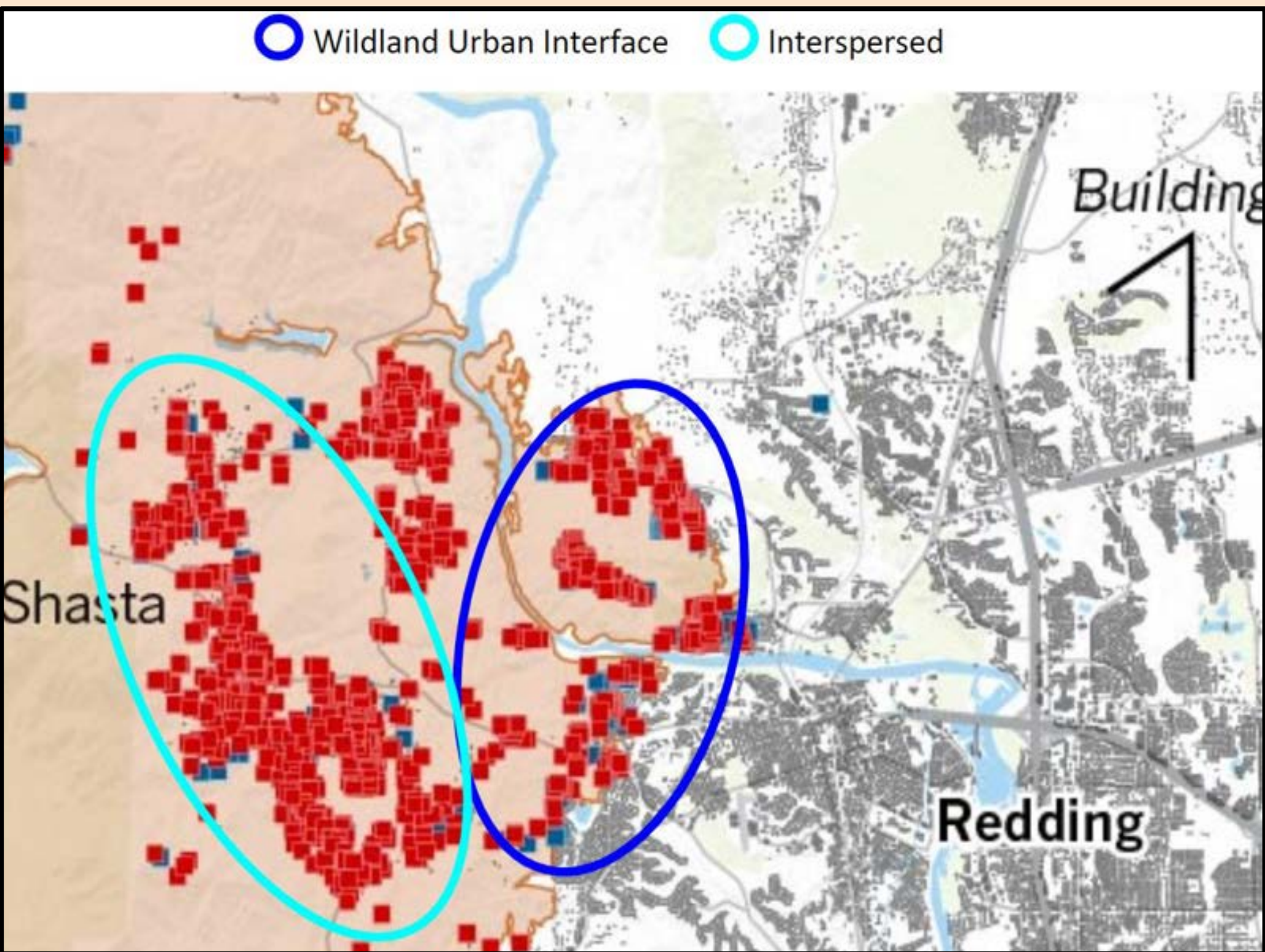
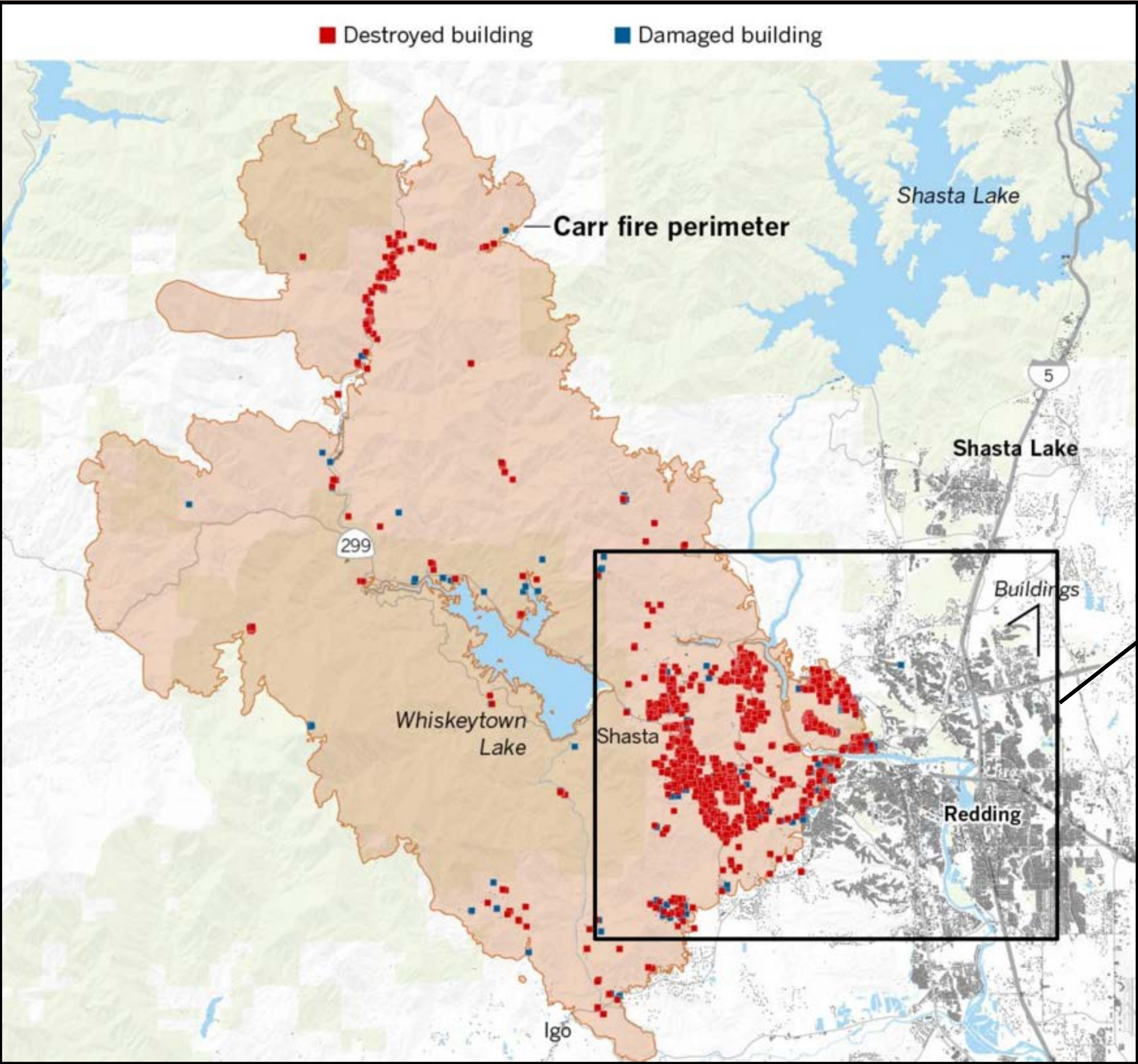
Data Collection:
Socioeconomic Status, Household Composition and Disability, Minority Status and Language, and Housing and Transportation data sourced from the Centers for Disease Control and Prevention (CDC) SVI database.
Normalized Burn Ratio (NBR) and Normalized Vegetation Difference Index (NDVI) data from the USGS Land Change Monitoring, Assessment, and Projection (LCMAP). Data will be clipped to the study area to later be used for comparison in data analysis.

Data Analysis:
Qualitative and quantitative analysis
Comparison of perception data with objective measures (SVI index, NBR, NDVI)
Comparative analysis to highlight discrepancies and alignments between perceived and measured recovery

Sampling:
Purposive and chain referral sampling
USFS, CAL FIRE, BLM, NPS, Sheriff, City of Redding, Shasta County Government

Data Collection: Qualitative interviews
Photo questionnaire (recovery and preference ratings)
Perceptions of community recovery
Recovery goals and alignment
Communication and metrics
Challenges and vision

Data Analysis:
Qualitative thematic analysis using community capitals framework and comparison of resident and decision-maker perceptions of recovery
Identification of recurring themes and patterns within the responses of each group
Quantitative data analysis comparing mean differences in photo ratings between residents and decision makers



Significance

This research aims to contribute to policy recommendations for disaster recovery and community resilience planning. By highlighting the gaps between community perceptions and objective recovery measures, this study underscores the need for recovery strategies that consider both social and ecological dimensions. Policymakers may utilize these findings to prioritize interventions that address the specific needs of communities before, during, and after wildfire events. The study also emphasizes the importance of improved communication and alignment between residents and decision-makers, fostering more cohesive and resilient recovery efforts.

References

Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American Behavioral Scientist*, 59(2), 254-269.

Edgington, D. W. (2011). Reconstruction after natural disasters: The opportunities and constraints facing our cities. *The Town Planning Review*, 82(6), v-xi.

Emery, M., & Flora, C. B. (2006). Spiraling-up: Mapping community transformation with community capitals framework. *Community Development: Journal of the Community Development Society*, 37(1), 19-35. <https://doi.org/10.1080/15575330609490152>

Flora, C. B., & Flora, J. L. (2008). The Community Capitals Framework: A Tool for Evaluating Strategic Interventions and Projects. Presented at the North Central Regional Center for Rural Development.

Kent, B., Gebert, K., McCaffrey, S., Martin, W., Calkin, D., Schuster, E., Martin, I., Wise Bender, H., Alward, G., Kumagai, Y., Cohn, P., Carroll, M., Williams, D., & Ekarius, C. (2003). Social and economic issues of the Hayman Fire. In R. T. Graham (Ed.), *Hayman Fire case study (RMRS-GTR-114)* (pp. 315-396). USDA Forest Service.

<https://doi.org/10.2737/RMRS-GTR-114>

Lareau, N. P., Nauslar, N. J., & Abatzoglou, J. T. (2018). The Carr Fire vortex: A case of pyrotornadogenesis?. *Geophysical Research Letters*, 45(23), 13-107. <https://doi.org/10.1029/2018GL080667>

Miles, S. B., & Chang, S. E. (2008). ResilUS--Modeling Community Capital Loss and Recovery. In *14th Annual World Conference on Earthquake Engineering*.

Mockrin, M. H., Stewart, S. I., Radeloff, V. C., Hammer, R. B., & Alexandre, P. M. (2018). Recovery and adaptation after wildfire on the Colorado Front Range (2010–2012). *International Journal of Wildland Fire*, 27(7), 551-564. <https://doi.org/10.1071/WF18026>

Smith, H., & Boruff, B. (2011). Cultural capital in community disaster resilience. *Journal of Cultural Heritage Management and Sustainable Development*, 1(2), 103-114.

Smith, H., & Boruff, B. (2011). Natural capital and community resilience in disaster recovery. *Environmental Science & Policy*, 14(7), 870-877.

Smith, H., & Boruff, B. (2021). The role of community capitals in disaster recovery. *Journal of Rural Studies*, 82, 95-106.

Stewart, S. I., Radeloff, V. C., Hammer, R. B., & Hawbaker, T. J. (2007). Defining the wildland–urban interface. *Journal of Forestry*, 105(4), 201-207.

Zhang, H., Zhao, Y., & Pedersen, J. (2020). Capital assets framework for analysing household vulnerability during disaster. *Disasters*, 44(4), 687-707.

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