V Findings and Recommendations

A large data gap exists for private lands, which reduces the capability to model fire behavior using public agency modeling tools. Alternative models which use remotely sensed satellite data may help improve modeling on private lands without the need to enter landowner property and thus maintain privacy.

The effects of climate change on forest growth should be included in future modeling efforts to assess how changes in vegetation composition and total biomass may impact potential fire severity and fire risk.

Fuel treatments, even when only treating a fraction of the landscape, help reduce fire severity significantly and should be implemented on the private parcel landscape.

Hand-thinning was found to be less efficient than mechanical thinning from a time and financial perspective. Funds garnered for fuel treatments would be best utilized by investing in physical and labor capital for mechanical treatment.

Large woody debris piles were found to increase fire severity even relative to a no-treatment scenario. Removal of piles within the first year is necessary in order to maximize the benefits of fuel treatments.

Large financial, physical, and labor capacity gaps exist that preclude landowners from investing in fuel treatments without external assistance.

Enhanced public-private collaboration through financial, physical, and technical capacity building is essential to achieve significant reductions in fire severity for potentially at-risk private lands.

Acknowledgements and References

This project would not have been possible without the dedicated support and guidance that we received from our advisors, collaborators, client, and donor. We would specifically like to thank the following people and organizations for their advice and support in working with us to bring this project to fruition:

C. Naomi Tague, PhD; Steve Haze, John Heywood, and the Sierra Resource Conservation District; Chubb; Christopher Heckman; John Jostes; Max Moritz; Allison Horst, PhD; James Frew, PhD; Sarah Campe; Charles Ashley; Olivia Roe, Lauren Pile, and additional U.S. Forest Service personnel who provided us with insight on this project.

References:
Map baselayer: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS user Community; Icons from flaticon.com (Flaticon, Freepik, Pixel perfect, Smashicons, mynamepong, Nikita Golubev, Darius Dan); thenounproject.com (shashank singh, Tomas Knopp).

BREN SCHOOL
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Motivating Public-Private Collaboration to Reduce Fire Severity in the Southern Sierra Nevada Mountains

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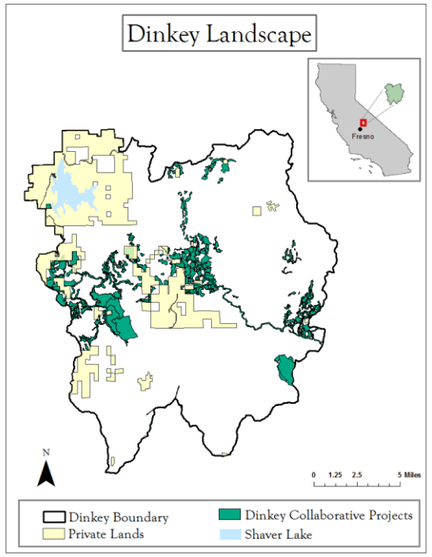
ON THE WEB AT HTTP://WWW.BREN.UCSB.EDU SPRING 2018

I Background

Area of Interest

The Dinkey Collaborative Forest Landscape is a landscape in the Sierra National Forest that includes over 24,000 acres of private lands. The landscape is part of a federal program that encourages the collaboration of local public and private entities with the U.S. Forest Service (USFS) to improve the restoration of the landscape and management of the forest. The Dinkey Landscape falls within the jurisdiction of the Sierra Resource Conservation District (SRCD), this project's client and an active member of the Collaborative.



Problem

Decades of fire suppression in the southern Sierra Nevada Mountains have led to unnaturally dense forest stands and high levels of combustible fuels on the landscape making it vulnerable to high severity, stand-replacing fires. These fires differ from the natural, low-intensity fires that used to maintain the forest prior to fire suppression, and pose health, safety, and economic risks to communities in the Wildland-Urban Interface on the fringes of national forest land, and may cause drastic environmental damage to the landscape. Although the USFS has begun to change their forestry practices on public lands, the USFS's budget still prioritizes fire suppression activities over pre-emptive fire risk management. Even in areas where pre-emptive fire management is performed through fuel thinning activities, private lands are mostly excluded from active management. This project aimed to inform our client, the SRCD, about the impact of fuel treatments on private lands on landscape-scale fire severity, the costs and benefits of such fuel treatments, and potential programs and grants that would support treatment implementation.

II Project Strategy

Goal

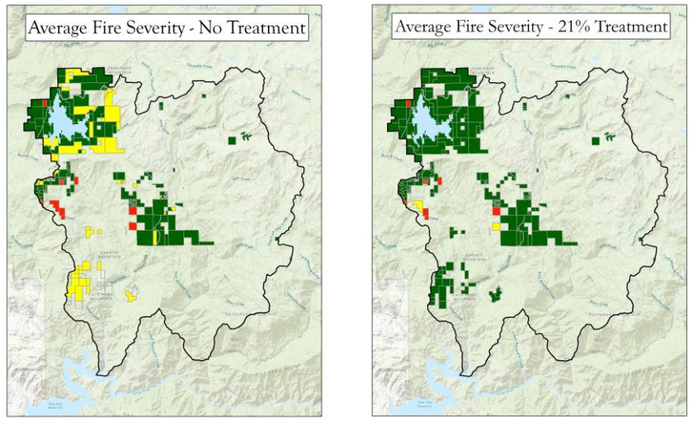
Motivate action to reduce fire severity on private lands in southern Sierra Nevada Wildland-Urban Interface communities. Three objectives were devised to achieve this goal:

- Define and quantify fire severity under different forest conditions
- Identify costs and benefits of performing fuel treatments
- Determine the implementation feasibility for private lands

III Our Approach

Modeling Fire Severity

In this study, fire severity is defined by a wildland fire's flame length, or the distance between the flame tip and the ground surface at the wildfire's front. Fuel and fire models developed and used by the USFS and Cal Fire were used to simulate forest growth, fuel treatments of varying intensity and scope, and subsequent wildfire behavior. The results of the fuel and fire modeling found that thinning forest stands on private lands would significantly reduce fire severity. In fact, treating between 15% and 21% of the landscape reduced fire severities to a similar level achieved by a full landscape treatment. Additionally, fuel treatments that encompassed at least 10% of the landscape still produced significant benefits of fire severity reduction when compared to a no treatment scenario.



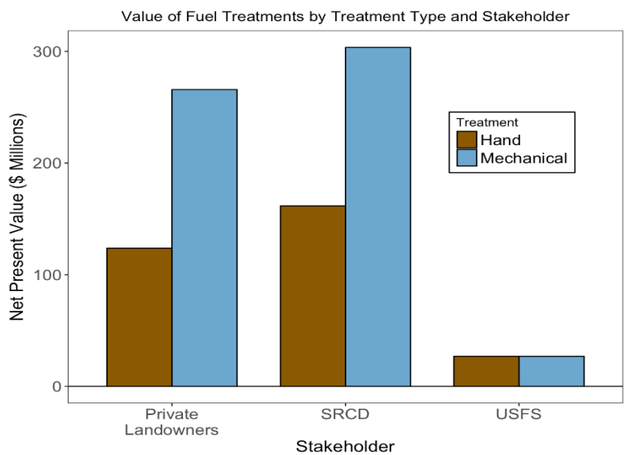
Low Severity
Medium Severity
High Severity

Although the goal of this project was to simulate the impacts of fuel treatments on fire severity for private lands, an important finding of this study was that the data needed as inputs for these federally and state utilized models does not exist for private lands. Therefore, regression analysis was used to translate the fire modeling results from public to private lands, introducing a large degree of uncertainty into the results. This lack of sufficient data for private lands demonstrates a need for alternative models or better data collection on private lands.

Quantifying Costs and Benefits

Three separate cost-benefit analyses were performed to examine the costs and benefits of overall fire risk reduction (fire severity and fire frequency through 2050) for this project's three stakeholders: private landowners, the SRCD, and the USFS.

These cost-benefit analyses demonstrate that although it is in the best financial interest of private landowners to implement fuel treatments, upfront costs would amount to a minimum of $8 million, or $12,800 per landowner, to achieve landscape-scale impacts. For many of these landowners the upfront costs of treatment are prohibitive without external financial assistance. Additionally the analyses illustrated that mechanical thinning is more cost-efficient than hand-thinning and that public entities benefit greatly from private land fuel treatments.



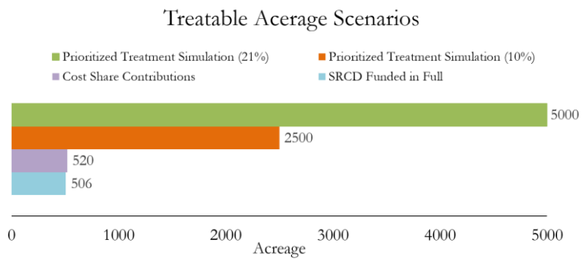
Assessing Capacity and Feasibility

Three distinct grant packages were identified that the SRCD is eligible for and whose funds can be used to implement fuel treatments on private lands. Additionally, three programs, that are currently under-utilized in the area, were identified which provide private landowners with direct partial reimbursement for the costs of fuel treatments on private lands.

Theoretical Funding Scenario	
Grant Packages Acquired	Assumed Funds ($)
A + B + C	1,350,000

SRCD Covers Entire Cost of Treatment	
Mechanical Thinning (Acres)	Hand Thinning (Acres)
506	165

SRCD Covers Portion of Costs of Treatment	
NRCS Cost Share (Acres)	Cal Fire Cost Share (Acres)
519	522



We presented two options for the use of grant funds (1) the SRCD pays contractors directly to perform fuel treatments on the lands of willing private landowners, and/or (2) the SRCD covers the difference between the reimbursement provided by existing assistance programs and the actual cost of fuel treatments to make these programs more accessible to private landowners. Regardless of how the SRCD uses the funds, even under a best case funding scenario, the amount of acres that can be treated through available grant funding is not sufficient to achieve fire severity reduction at the landscape-scale. Fire severity reduction would be achieved, however, at the local scale.

IV Explore Online

We developed an online interactive tool through ShinyApp to help better connect private landowners to information and findings from this report, landscape data from various public agencies, and a calculator for estimating the costs and benefits to individual private landowners when treatments are performed across the landscape through community collaboration to reduce fire severity.

Please feel free to explore our web app to deepen your knowledge of the Dinkey Landscape and how proactive management strategies can help reduce fire severity, create healthier forests, and improve community resilience.

The tool will be hosted on the SRCD's website.

For additional resources:
For copies of the poster, brief, or paper please visit:
UCSB Bren School's Master's Group Project:
https://www.bren.ucsb.edu/research/masters_gp.htm