Post-Wildfire Debris Flow Infrastructure Risk Modeling in Colorado

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Introduction

- Research needed for post-wildfire debris flow due to several wildfires and floods in Colorado
- To determine high risk locations based on hydrology, current infrastructure, wildfire risk, and climate change models.
- Used to better plan, prepare, and reinforce in future.

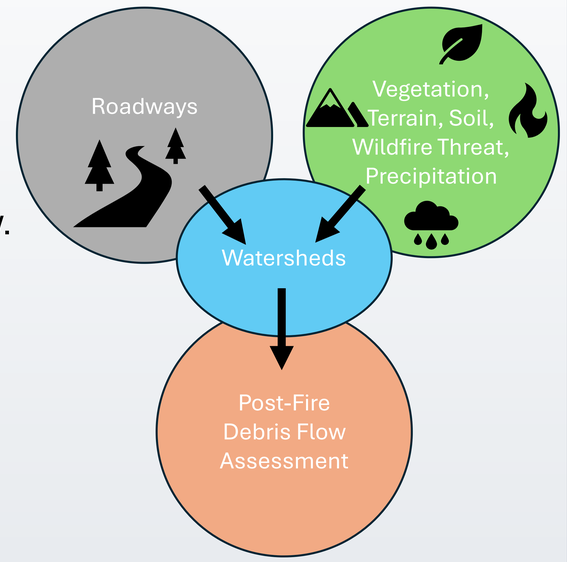
Background

- Wildfires destroy vegetation, which loosens soil and creates bigger floods.
- Climate change has worsened wildfires and other natural disasters.
- Attempt to predict where infrastructure like roads or bridges are most vulnerable.
- Helps in resource allocation, preparedness, and post-event response measures through informed decision-making.

Figure 1. Post wildfire debris flow in Colorado

Methodology

- Colorado watershed information along with the vegetation cover, terrain, soil, etc. are used to calculate debris flow likelihood.
- The roadway network of CO is used to assess the vulnerable sections to debris flow.
- Post-wildfire parameters are used to estimated the debris-flow risk for roadways and bridges.



Data Collection and Analysis

Figure 2. CO watersheds

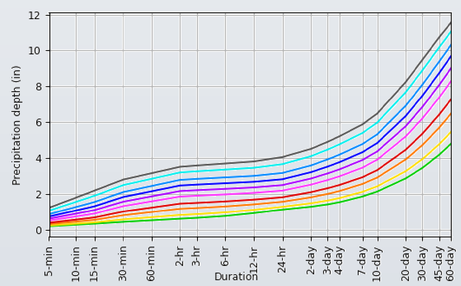


Figure 3. CO precipitation estimates

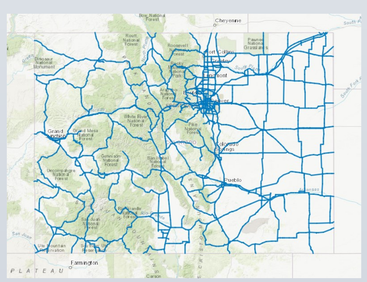


Figure 4. CO highways

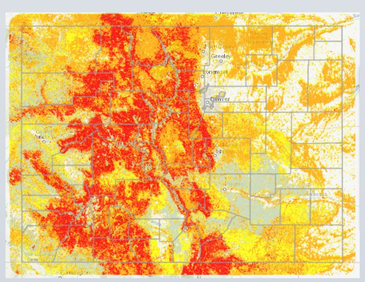


Figure 5. CO wildfire risk intensity

Discussion

- Climate change is exacerbating fire and precipitation events, so debris flow modeling for infrastructural risk has become more relevant than ever.
- Need to develop & use resilience strategies for future infrastructure such as safe-to-fail.

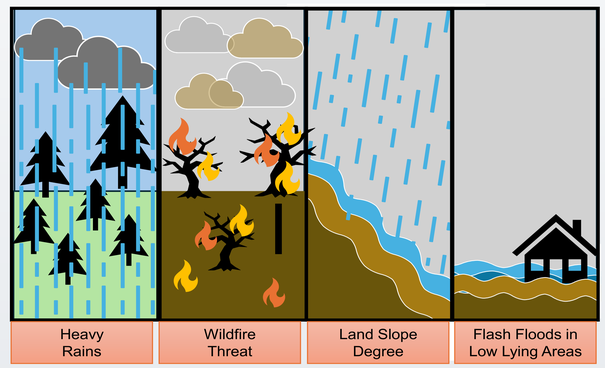


Figure 6. Post-wildfire debris flow factors

Future Work

- Use spatial analysis to determine where waterflows intersect with roadways.
- Use predictive models to determine where flow and fire occurrences will increase.
- Results can be helpful to determine which infrastructure needs to be refurbished, strengthened, or moved.
- Becoming critical as climate change has altered weather patterns.

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