A *Superior* Research Reader

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Photo Credit: USFS General Technical Report: RMRS-GTR-315

Greetings and welcome to A *Superio*r Research Reader, a monthly reader on what we believe is current and relevant research to science and resource management on the Superior.

This Month's Edition: Wildfire Risk Assessment

This month we focus on *Wildfire Risk Assessment,* a forest priority that has recently been engaging Superior National Forest staff and our partners. Risk assessment is the process of estimating the likelihood and consequence of an event. Wildfire Risk Assessment estimates the probability of fire intensity levels using wildfire simulation. The framework we are using addresses exposure by mapping out *highly valued resources and assets* (HVRAs) and intersecting them with fire simulation results. The effects are characterized by developing response functions based on the best available science. Finally the relative importance is determined based on law, regulation, policy, and social values.

Last month Don Helmbrecht, a wildfire risk assessment expert, came to the Superior National Forest to identify and map the Forest's HVRAs. With the help of partners from the state, surrounding counties and the Bands our team determined how each of our highly valued resources might respond to different fire intensities. Next month, we will move forward with the next stage of this risk assessment, where the leadership team assigns a relative importance rank to each HVRA based on their relation to existing guidance, policy, and social values. Wildfire risk assessment helps address important wildfire and land management questions, and design efficient management strategies. You can learn more about wildfire risk assessment and our current assessment on the Superior by reading on...Enjoy!!

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1. Mark Finney explores wildfire risk analysis and characterizing fire behavior distributions and probabilities across large landscapes.

2. Learn more about the wildfire risk assessment framework conducted on the Superior National Forest here!

3. Check out the Blue Mountains Forest Resiliency Project, which aims to move forests to more resilient conditions by decreasing density of overstocked dry forest areas, while also proposing treatments in moist forests to protect these valuable resources

4. Our TEAMS risk assessment expert Don Helmbrecht and his collaborators apply the same wildfire risk assessment framework we are conducting on the Superior to the Lewis and Clark National Forest in Montana.

The challenge of quantitative risk analysis for wildland fire.

Finney. 2005. Fire Ecology and Management.

ABSTRACT: Quantitative fire risk analysis depends on characterizing and combining fire behavior probabilities and effects. Fire behavior probabilities are different from fire occurrence statistics (historic numbers or probabilities of discovered ignitions) because they depend on spatial and temporal factors controlling fire growth. That is, the likelihood of fire burning a specific area is dependent on ignitions occurring off-site and the fuels, topography, weather, and relative fire direction allowing each fire to reach that location. Research is required to compare computational short-cuts that have been proposed for approximating these fire behavior distributions. Fire effects in a risk analysis must also be evaluated on a common scale for the variety of values susceptible to wildland fire. This means that appraisals of fire impacts to human infrastructure and ecological values must be measured by the same currency so that the risk assessment yields a single expectation of fire effects. Ultimately, this will help guide planning and investment into management activities that can alter either the probabilities of damaging fire or the susceptibility to those fire behaviors.

A Wildfire Risk Assessment Framework for Land and Resource Management.

Scott et al. 2013. USFS General Technical Report: RMRS-GTR-315

ABSTRACT: Wildfires can result in significant, long-lasting impacts to ecological, social, and economic systems. It is necessary, therefore, to identify and understand the risks posed by wildland fire, and to develop cost-effective mitigation strategies accordingly. This report presents a general framework with which to assess wildfire risk and explore mitigation options, and illustrates a process for implementing the framework. Two key strengths of the framework are its flexibility— allowing for a multitude of data sources, modeling techniques, and approaches to measuring risk—and its scalability, with potential application for project, forest, regional, and national planning. The specific risk assessment process we introduce is premised on three modeling approaches to characterize wildfire likelihood and intensity, fire effects, and the relative importance of highly valued resources and assets that could be impacted by wildfire.

Blue Mountains Forest Resilient Project

Weseman. 2016. Blue Mountains Restoration Strategy

ABSTRACT: Maintaining the health, diversity and productivity of our national forests is important for meeting the needs of present and future generations. We want to manage for resilient landscapes to provide communities with an abundance of natural resources- such as clean water, productive fish and wildlife habitat, quality recreation opportunities, timber and forage, and many other benefits. The Forest Resiliency Project aims to move forests to more resilient conditions by decreasing density of overstocked dry forest areas, while also proposing some limited treatments in moist forests to protect these valuable resources. Treatments considered in this project include commercial harvest, non-commercial thinning and prescribed fire.

Integrated wildfire risk assessment: Framework development and application on the Lewis and Clark National Forest in Montana, USA

Thompson et al. 2013. Integrated Environmental Assessment and Management.

ABSTRACT: The financial, socioeconomic, and ecological impacts of wildfire continue to challenge federal land management agencies in the United States. In recent years, policymakers and managers have increasingly turned to the field of risk analysis to better manage wildfires and to mitigate losses to highly valued resources and assets (HVRAs). Assessing wildfire risk entails the interaction of multiple components, including integrating wildfire simulation outputs with geospatial identification of HVRAs and the characterization of fire effects to HVRAs. We present an integrated and systematic risk assessment framework that entails 3 primary analytical components: 1) stochastic wildfire simulation and burn probability modeling to characterize wildfire hazard, 2) expert-based modeling to characterize fire effects, and 3) multicriteria decision analysis to characterize preference structures across at-risk HVRAs. We demonstrate application of this framework for a wildfire risk assessment performed on the Little Belts Assessment Area within the Lewis and Clark National Forest in Montana, United States. We devote particular attention to our approach to eliciting and encapsulating expert judgment, in which we: 1) adhered to a structured process for using expert judgment in ecological risk assessment, 2) used as our expert base local resource scientists and fire/fuels specialists who have a direct connection to the specific landscape and HVRAs in question, and 3) introduced multivariate response functions to characterize fire effects to HVRAs that consider biophysical variables beyond fire behavior. We anticipate that this work will further the state of wildfire risk science and will lead to additional application of risk assessment to inform land management planning.