Understanding and Applying Wildfire Risk Science and Decision Support Tools

The Southwest Ecological Restoration Institutes (SWERI) are widely recognized for working closely with practitioners, researchers, and policymakers on the development and application of wildfire risk science and spatial decision support tools (DSTs). The SWERI apply DSTs with collaborative groups to integrate natural resource planning with fire response, as well as evaluate the factors that affect DST use and share best practices for applying DSTs in wildfire mitigation, response, and post-fire recovery. This briefing paper highlights several ongoing SWERI projects working to advance the use and application of DSTs before, during, and after wildfires.

Spatial Wildfire Decision Support Program

Managers and communities face overwhelmingly complex decisions about how to locate and prioritize forest and fire management actions to have the greatest impact. To that end, the SWERI help develop and facilitate the use and application of DSTs to inform wildfire response decisions across jurisdictional boundaries. The SWERI work to customize, apply, and adapt existing spatial wildfire DSTs so they are useful for, and used by, managers and partners to achieve forest and fire management goals. These include Potential Operational Delineations (PODs), Quantitative Wildfire Risk Assessments (QWRA), and scenario investment tools initially developed by the USDA Forest Service's Research and Development. PODs are a spatial planning framework that bring together firefighters' local knowledge and spatial analytics to identity wildfire control opportunities (e.g., roads, rivers, ridges). QWRA and scenario investment tools can then be used to determine how local values will be impacted by fire, identify wildfire response strategies, and prioritize wildfire mitigation actions.

The SWERI have facilitated the development of PODs in 26 landscapes and led the development of 13 DSTs and processes in pre- and post-fire contexts across the West (Figure 1). SWERI staff work with collaborative groups and partners to situate DSTs within environmental analysis and decision-making (e.g., NEPA), community wildfire protection plans, and consider applications of these platforms for monitoring. SWERI staff also advance the science and practice of DSTs through geospatial, biophysical, and applied social science research, combined with targeted communication and outreach to diverse partners. SWERI social science documents lessons learned, opportunities, barriers, and innovations in DSTs in forest and fire management contexts.

Spatial Wildfire Decision Support

- Collaborative development of PODs in 26 local landscapes.
- Collaborative development of 13 place-based pre- and post-fire risk assessment decision support (RADS) processes at forest, county, and project scales.
- Ongoing engagement and learning with partners and communities to adapt and innovate DSTs.
- Work with partners to integrate DSTs within local planning, implementation, and monitoring.
- Conduct biophysical and social science research to advance science and practice of salient, credible, and useful DSTs.
- Evaluation of DSTs and their uses across 91 wildland fire incidents.
- Produce targeted outreach, communication, and education to diverse audiences.

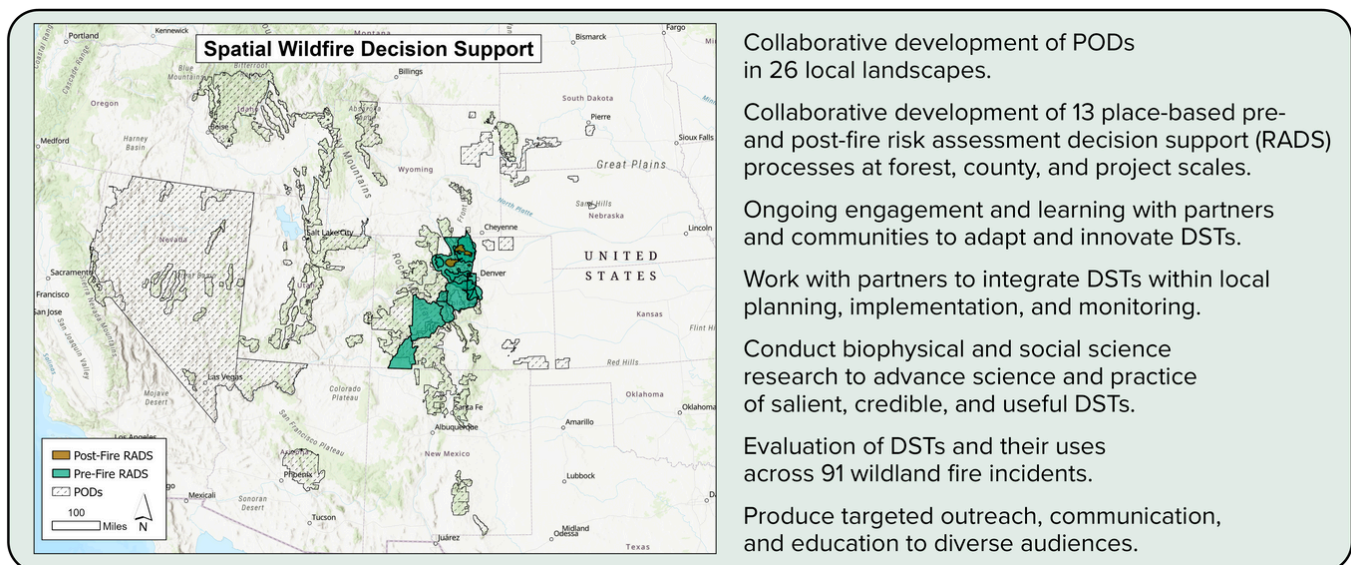Legend: Post-Fire RADS; Pre-Fire RADS; PODs; 100 Miles; N

Figure 1. SWERI Spatial Wildfire Decision Support across the West. SWERI has provided sustained engagement and supported application with 39 landscapes covering 137+ million acres across the western US.

Evaluating the Use of DSTs for Spatial Pre-Wildfire Planning and Wildfire Risk Mitigation

SWERI social science on the use of DSTs in spatial, pre-wildfire planning identified numerous facilitators and barriers, as well as provided recommendations, such as increasing communication about DSTs in a common language, working directly with DST users in development, and articulating leadership support and funding for DST use. This research has been supplemented by case studies exploring how PODs are being adapted for wildfire mitigation planning. For example, the San Isabel National Forest used PODs to prioritize locations to implement strategic fuel breaks as a starting point to moderate fire behavior and enhance firefighter safety and effectiveness across a 200,000-acre landscape. Recommendations from these case studies included: clear leadership direction and intent for using PODs; investing early and often in the collaborative process of developing and implementing PODs; developing robust communication and outreach programs on the use and application of PODs to partners; investing in technical capacity of staff to use and interpret tools; and committing to continual monitoring and adaptive management of PODs.

Evaluating the Use and Application of DSTs in Wildfire Incident Response

The USDA Forest Service developed Risk Management Assistance (RMA) in 2016 to enhance the use of risk-informed management principles and decision support tools that improve decision quality and accountability, protect values and assets of concern, achieve incident, land, and resource management objectives, and minimize unnecessary risk to firefighters. To evaluate and improve RMA, the USDA Forest Service Fire and Aviation Management requested assistance from the SWERI, which has included: 1) a survey of RMA use in the 2021 fire season; 2) case studies of RMA use in the 2022 fire season; and 3) interviews with RMA developers. This work has resulted in additional recommendations focused on increasing the use of DSTs during wildfire, including increased training, education, and socialization before fire season, tool updates and improvements, consistent communication across chains of command, and development of strategic plans that outlive incidents.

The Incident Strategic Alignment Process (ISAP) integrates collaborative dialogue with RMA and other spatial analytics to develop and deploy a consistent, science-based strategic planning model for incident management. The SWERI and Public Lands Policy Group have developed an exploratory assessment of ISAP to better characterize how risk and strategy are assessed, contested, and communicated during wildfire incidents; how developers and end users understand the purpose and efficacy of ISAP; what components of ISAP are working well and which could use improvement; what factors facilitate and frustrate the application of risk-based analytics and strategic planning; and how ISAP can be improved to enhance its use in wildfire incident management.

So far, our team has conducted in-depth on-site observation of ISAP across six wildland fire incidents of varying complexity. Initial recommendations included increased formal and experiential training among users and ISAP coaches or facilitators, actions to enhance alignment among Incident Management Teams, Agency Administrators, and ground resources, and the need for collaboratively identifying and prioritizing critical values at risk in the preseason to support incident response.

For a comprehensive list of publications and resource links, visit sweri.org/wildfire-risk-science-and-decision-support-tools*, or scan the QR code below.*

SWERI's work will also inform the national SWERI ReShape Project, which will compile and display existing information on fuel treatments and wildfires, coordinate and facilitate the use of these data and other DSTs, and analyze and report on fuel treatment effects (more information at *sweri.org/reshape-project*). In summary, the SWERI are working with diverse partners using an array of different DSTs across jurisdictional boundaries to develop strategies to better apply scientifically informed, robust, spatial DSTs before, during, and after wildfire.

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