

# Geospatial analysis and mapping tools to operationalize spatial fire planning

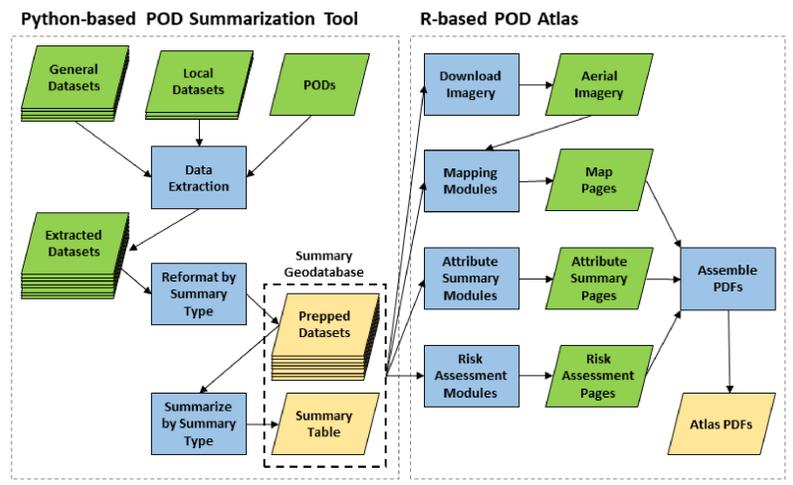


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Spatial fire planning with Potential wildland fire Operational Delineations (PODs) is gaining popularity as a framework to develop localized fire response strategies based on control opportunities, values at risk, and land management objectives. We co-developed two applications with fire managers to operationalize spatial fire plans by removing barriers to information needed to promote strategic thinking:

1. a geospatial **POD Summary** tool that attributes PODs with relevant fire management information for GIS use and integration with existing decision support systems, and
2. a **POD Atlas** mapping and data visualization tool to promote rapid situational awareness of conditions within a POD and the surrounding landscape.

Both tools were designed with flexibility in mind. Users can supplement national inputs with local data such as the results of a quantitative wildfire risk assessment (QRA). The output geodatabase includes a PODs feature class with summary attribute table and all the input data reprojected, resampled, and clipped to the POD network. The Atlas allows users to select from several template map, tabular, and visual data themes to construct a multipage map book for each POD.



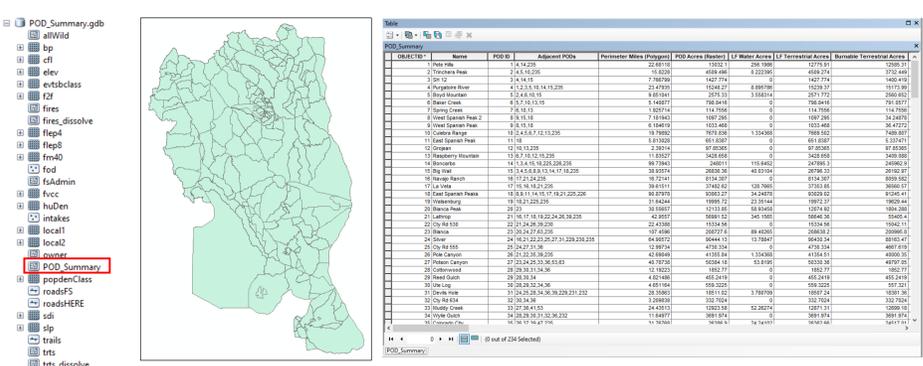
The Wildfire Risk Management Science (WRMS) team develops and applies risk analysis, economics, and decision science research to improve the scientific basis for wildfire management.

For more information about PODs, visit the WRMS website: <https://www.fs.usda.gov/rmrs/groups/wildfire-risk-management-science-team/potential-operational-delineations-pods>  
 Contact us via email: [sm.fs.wrms@usda.gov](mailto:sm.fs.wrms@usda.gov)  
 Learn more about these tools in the following publication:  
 Thompson MP, Gannon BM, Caggiano MD, O'Connor CD, Brough A, Gilbertson-Day JW, Scott JH (2020) Prototyping a geospatial atlas for wildfire planning and management. *Forests* 11, 909. DOI:10.3390/f11090909

## POD Summary Geodatabase

The POD Summary Tool is a Python-based geospatial analysis workflow used to consistently attribute PODs with information for pre-fire planning and incident management. The products of the tool include:

1. a geodatabase with all national and local data inputs clipped, reprojected, and resampled to the same spatial reference system for ready access, viewing, and analysis in a desktop GIS, and
2. a POD summary feature class with attributes on fire history, fire hazard, fuels, values at risk, ownership, accessibility, operational difficulty, and local fire management concerns for gaining rapid situational awareness and for sorting, prioritizing, and classifying PODs.

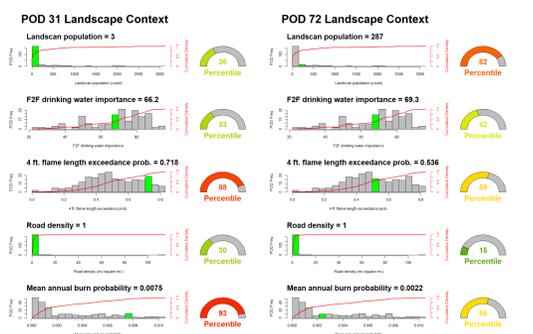


### National Attributes and Data Sources

- Fire history
- Modeled burn probability and flame lengths
- Population
- Fuels and vegetation
- Drinking water importance
- Drinking water population served
- Suppression difficulty index (SDI)
- Fuel treatment history
- Roads
- Trails
- Ownership/management agency

### Analyzing PODs

- The POD summary provides a landscape-level view of fire management concerns
- Facilitates sorting, prioritizing, and classifying PODs for pre-fire mitigation, strategic response planning, or containment efforts during an incident

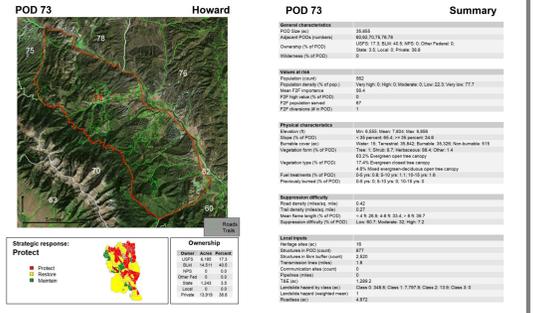


## POD Atlas

The POD Atlas Tool is an R-based mapping and data visualization workflow to generate multi-page PDFs summarizing local fire management concerns and opportunities to promote rapid situational awareness in the office or field.

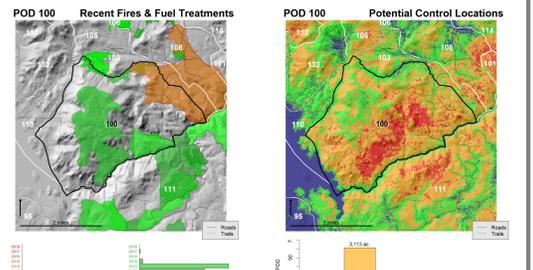
### Situational awareness

- Maps and tables designed to communicate fire management concerns
- Attributes relevant to fire management: ownership, values at risk, physical characteristics, suppression difficulty



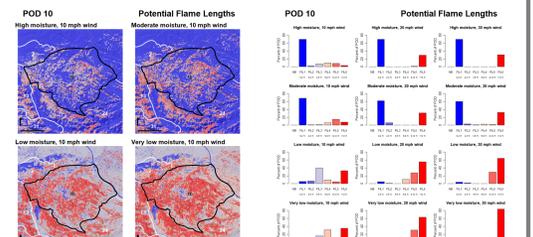
### Suppression opportunities

- Maps to highlight suppression opportunities and challenges
- Recent fuel treatments and wildfires
- Potential control location (PCL) and suppression difficulty index (SDI) analytics



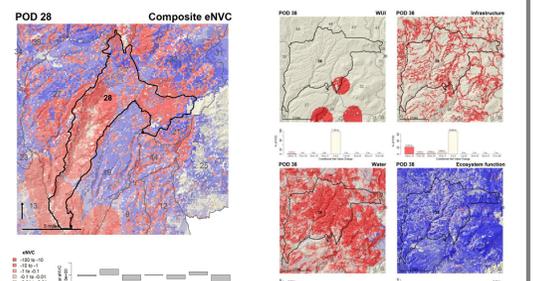
### Fire behavior summaries

- Maps and graphs of fire behavior across a range of fuel moisture and wind speed
- Fuel moisture and wind settings can be customized to local conditions



### Quantitative wildfire risk assessment results

- Maps and graphs of conditional or expected net value change
- Options to map composite measures or break results out by category

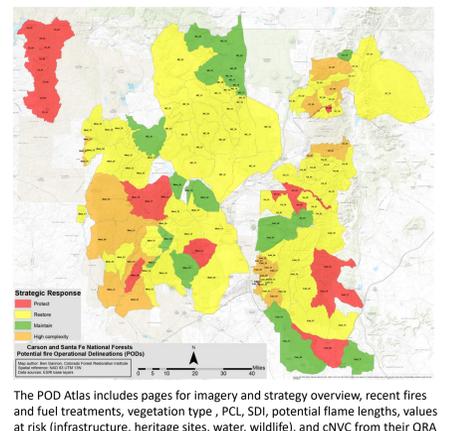


## Applications

Current and anticipated uses include strategic response planning, gaining rapid situational awareness, communicating incident strategy within and across organizations, and aiding tactical decision-making.

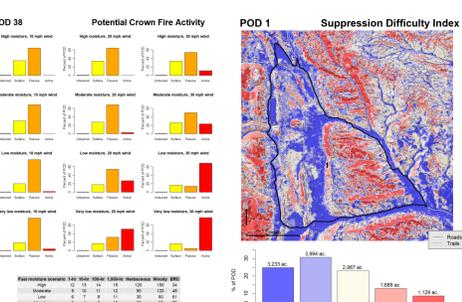
### Carson and Santa Fe National Forests

- Completed QRA, PODs delineation, strategic response assignments, and POD-oriented decision support products
- Collecting and organizing the values at risk data in the pre-season was perceived as a major benefit
- The enhanced accessibility to information during the 2020 fire season was described as “microweaveable situational awareness” by their fire planner



### Pike-San Isabel National Forest

- PODs delineation, strategic response assignments, and POD-oriented decision support products
- Preliminary strategic responses informed by state-level QRA
- Referenced decision support products for collaborative fire planning with water utilities



### Future directions

We are collecting feedback on product uses to refine information content and delivery. Most early users are high-level fire managers accessing the products to gain rapid situational awareness, inform strategic decision-making, and communicate with land managers. Feedback from our workshops highlights that there is also considerable interest in the atlas products from firefighters. We are exploring how to tailor content for different users and how to support data storage, access, and sharing. Our initial tools are well-suited for prototyping, but, in the long term, it would be ideal to integrate the most useful components into our national wildfire decision support system where they can be better supported and deployed to more users.