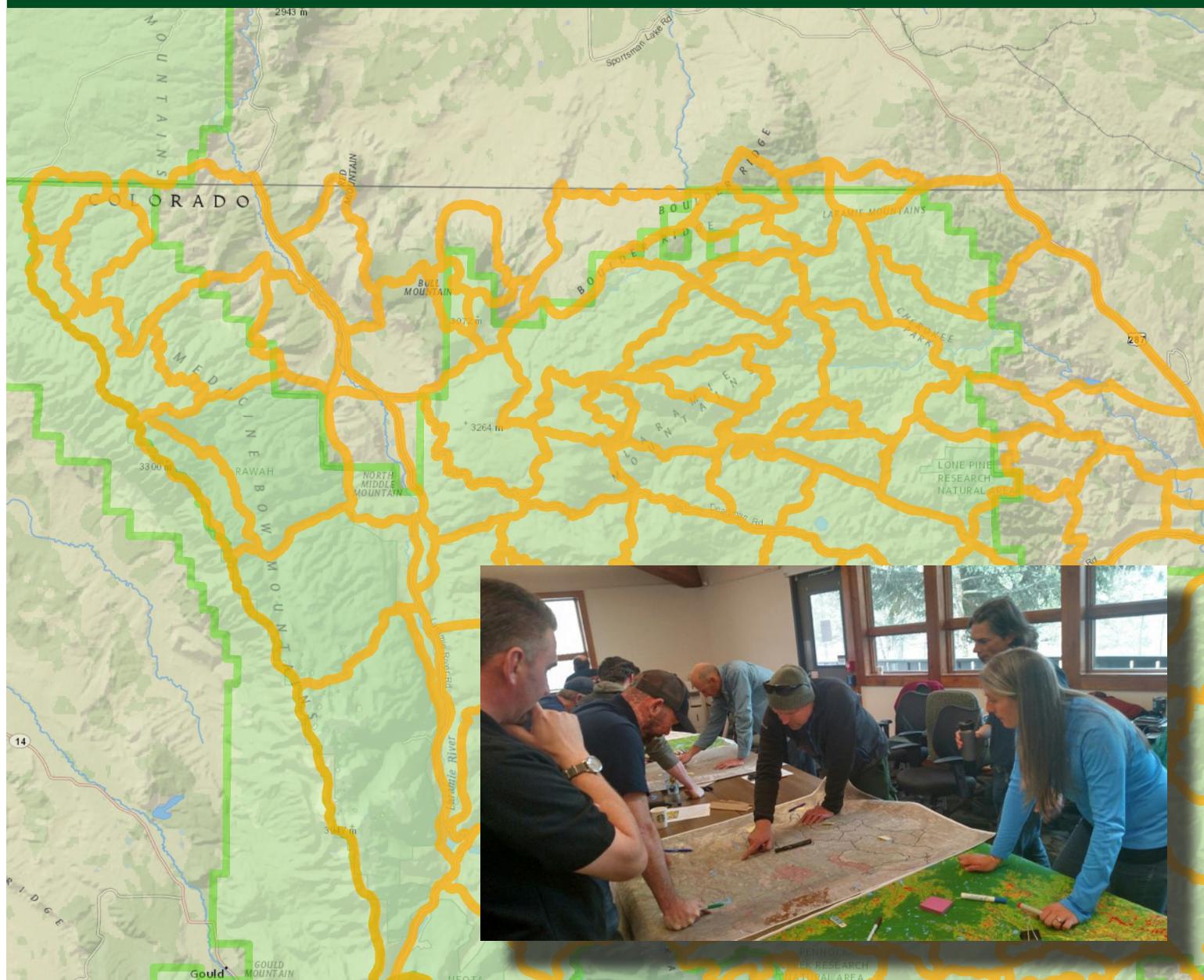


Collaboratively Engaging Stakeholders to Develop Potential Operational Delineations



August, 2019
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Highlights

- *PODs are a strategic planning tool developed using a combination of local expertise and advanced spatial analysis. They identify the safest and most effective control lines used to contain a wildfire and can assist in integrating land management objectives and incident response.*
- *This report presents an overview of Potential Operational Delineations (PODs), discusses how to develop PODs collaboratively by engaging stakeholders, identifies associated information products, maps, and reports that can assist in land use planning and fire response, and notes observations and lessons learned from facilitating POD development workshops on multiple Forests.*
- *PODs can address the needs of multiple stakeholders and can facilitate cross-boundary communication and planning while informing strategic wildfire response. PODs can be used to make reports and maps that summarize ecological conditions, fire behavior, hazards, and values at risk, all at an operational scale.*
- *The PODs framework provides the opportunity for a robust multi-stakeholder collaborative process on issues related to cross-boundary land management planning and risk informed fire response.*
- *Depending on the degree of collaboration and stakeholder involvement during the POD development process, the collaboration itself and the conversations between stakeholders may be as valuable as any of the information products that are developed.*

Table of Contents

OVERVIEW.....	2
COLLABORATIVE MODELS FOR POD DEVELOPMENT.....	4
Agency-Centric Approach.....	4
Collaborative Approach.....	5
Hybrid Approach.....	5
Potentially Conflicting Mandates:.....	5
POD PRODUCTS.....	5
POD ATLAS.....	6
ACKNOWLEDGEMENTS.....	10
LITERATURE CITED.....	10

Overview

Potential Operation Delineations (PODs) is a spatial wildfire planning framework that identifies wildfire control lines on the landscape using a combination of local expert knowledge, advanced wildfire modeling, and spatial analysis (Thompson et al. 2016). The framework is being developed by researchers at the Rocky Mountain Research Station, Oregon State University, and the Colorado Forest Restoration Institute at Colorado State University. PODs builds on the longstanding practice of firefighters pre-identifying locations and features on the landscape which could serve as safe and effective control lines during wildfire operations. Control lines, often comprised of roads, fuel treatments, old wildfire scars, or fuel type transitions are first identified, then aggregated to form areas where fires can likely be contained (Figure 1). POD boundaries follow control lines where there is the highest likelihood of successfully engaging and suppressing wildfires. Like the wildfires they are designed to help manage, POD boundaries do not necessarily follow jurisdictional boundaries.

PODs provide a big picture perspective summarizing risk and opportunities across the landscape, and help translate land management objectives into on-the-ground strategies and tactics. Because they pre-identify control lines where wildfires are most likely to be effectively suppressed, PODs are operationally relevant and can inform indirect incident response strategies that: reduce risk to high-valued assets including homes and utility infrastructure, and minimize the exposure of firefighters tasked with suppressing the fire. PODs can be used when wildfires prove difficult to suppress through direct attack, when the values at risk do not necessitate putting firefighters at risk, or when it has been determined that reintroducing fire in a particular area will promote ecological health or align with land management objectives. PODs can also be used for planning and communication purposes. Some Forests are using PODs in conjunction with quantitative

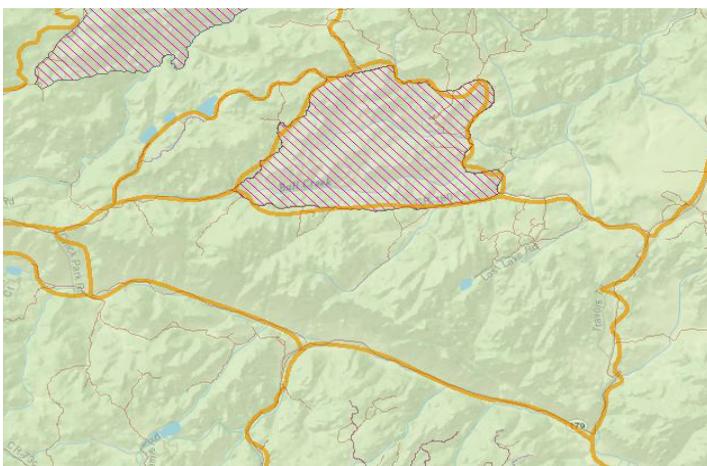


Figure 1. Control lines are aggregated to form areas where fires can likely be contained.

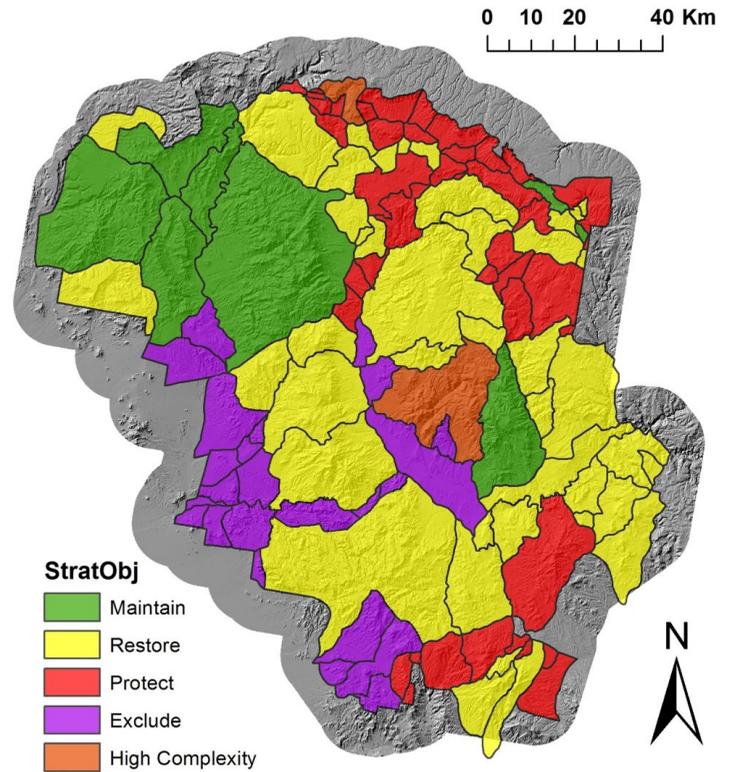


Figure 2. PODs on the Tonto National Forest in Arizona. The Tonto is using PODs in conjunction with quantitative risk assessments to identify strategic response zones. In green/maintain zones, for example, managers have determined that fire under the right conditions can be managed for resource benefits. (Credit: Christopher D. O'Connor)

risk assessments to identify strategic response zones and quantitatively predict how values at risk would respond to different levels of fire intensity (Figure 2). Doing this enables managers to collaboratively identify areas where fire needs to be suppressed, areas where fire could help achieve ecological objectives, and areas where fire might have a positive effect on resources depending on conditions.

As of August 2019, over 20 National Forests are beginning to implement this planning framework. Several Forests are already using it to make decisions both on actual wildfire incidents and during fuel treatment planning efforts (Caggiano, 2018; O'Connor and Calkin 2019). Starting in 2018, we observed and participated in the process of developing and utilizing PODs across several National Forest landscapes including the Santa Fe, Carson, San Juan, Rio Grande, Arapaho Roosevelt, and Pike San Isabel National Forests. While there is a growing body of literature on the quantitative aspects of PODs and spatial risk assessments (Scott, Thompson and Calkin 2013; O'Connor, Thompson, and Rodríguez y Silva 2016, Dunn et al. 2017), our focus herein is centered on discussing the process of POD development and utilization, and the process of collaborative stakeholder engagement. We also share initial observations, lessons learned, and best management practices.

Developing PODs

PODs are created by local firefighters with knowledge of a particular landscape who delineate the most appropriate control line locations. Often this is done by pairing their expert knowledge with maps of modeled fire behavior and suppression difficulty, and maps of predicted control line effectiveness based on historical data. To start the exercise we often designate a hypothetical fire start and instruct participants to identify the nearby control features they would use to contain the fire if they were to use indirect attack strategies. Analytical products can serve as additional data points to validate local knowledge and help firefighters identify control lines and place POD boundaries in effective locations; Suppression Difficulty Index (SDI) models fire behavior, firefighter access, and firefighting effectiveness (Silva, Martínez, and González-Cabán 2014), while Potential Control Lines (PCL) predict locations where fires are likely to stop by examining where local fires have historically stopped (O'Connor, Calkin, and Thompson 2017). In POD development



Figure 3. Local firefighters familiar with the landscape hand draw lines on a map created with SDI and PCL base layers.

workshops we have observed high levels of agreement between local knowledge and analytical products.

Often the process of delineating PODs involves first having local firefighters familiar with the landscape hand draw lines on a map created with SDI and PCL base layers, then digitizing hand drawn lines into a Geographic Information System (Figure 3, 4). This process normally involves several meetings, first to introduce the concept and get support from Forest Leadership, next to present the idea to fire management staff, then additional meetings—often with cooperators—to delineate PODs or discuss how they are to be used. Additional meetings may be required to validate POD boundaries. Some or all meetings may require facilitation by someone familiar with the POD development process. Once lines are drawn on a map, they need to be digitized by a Geographic Information Systems specialist or mapping technician. Once they are in an electronic format, POD boundaries can be shared both internally within an agency and externally with cooperators, and used for planning, operational, or communication purposes as discussed further below.

Collaborative Engagement

Developing PODs collaboratively can provide opportunities to get stakeholder buy-in, align agency priorities, have important pre-season conversations, and generate support for decision support frameworks that jointly consider resource concerns, land management objectives, and firefighter exposure (Figure 5). From a fire operations standpoint, cross-boundary collaboration may be limited to the US Forest Service (USFS), affected landowners whose property may be bisected by a POD boundary, and other organizations with fire response authority. However, collaboration for preplanning

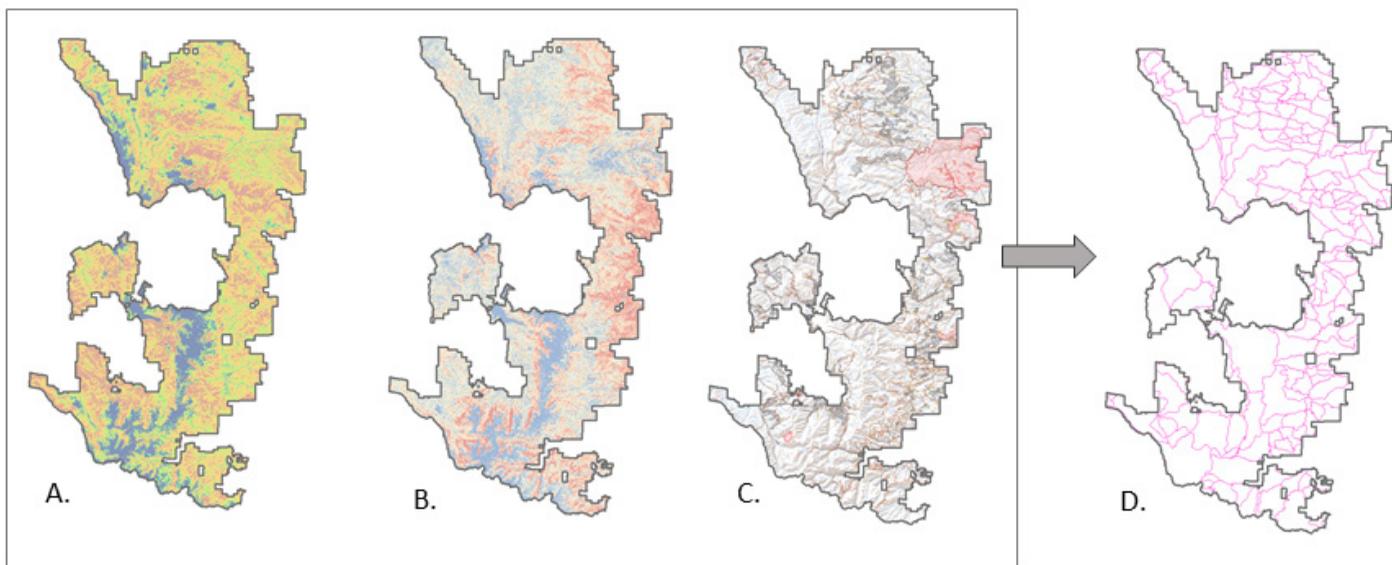


Figure 4. Workshop participants use maps with Suppression Difficulty Index (A), Potential Control Locations (B), and reference layers (C) to hand draw lines (Figure 3) identifying effective control lines across the landscape. Hand drawn POD boundary lines are then digitized into an electronic format using Geographic Information Systems (D).

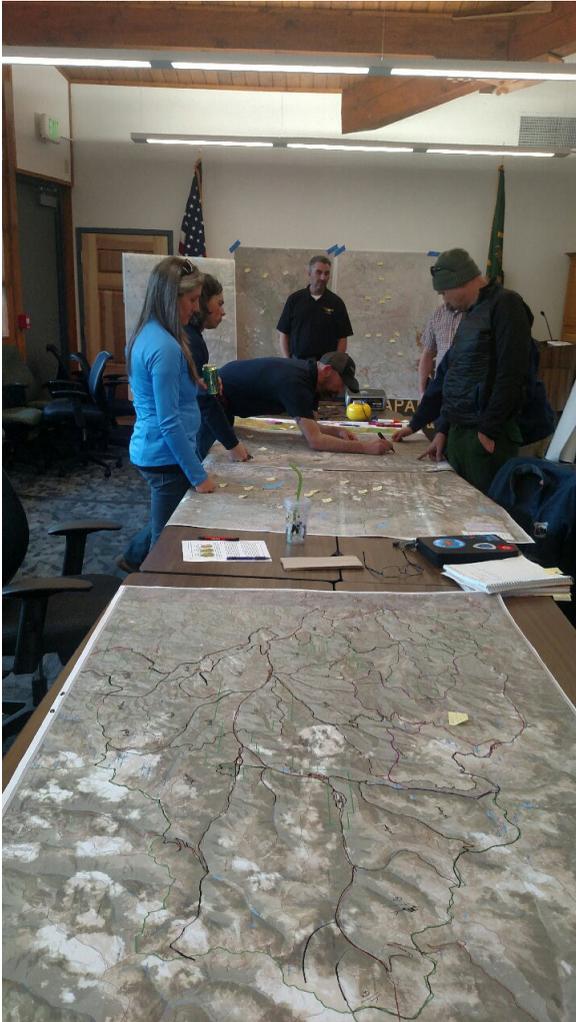


Figure 5. Developing PODs collaboratively can provide opportunities to get stakeholder buy-in, align agency priorities, have important pre-season conversations, and generate support for decision support frameworks that jointly consider resource concerns, land management objectives, and firefighter exposure.

purposes has the potential to be much more robust since there are often additional organizations involved in fuel treatment planning and implementation, or have an interest in land management decisions. Figure 6 details several of the stakeholder groups who commonly attend POD development meetings.

PODs can assist with incident decision making and can be used operationally in the field to set strategy and tactics that are in line with collaboratively developed land management objectives. In this manner, PODs can foster intra-agency collaboration by allowing resource specialists and line officers to integrate land management objectives and resource concerns into operational fire management. The framework can also provide line officers with insights regarding the hazards and values at risk within specific PODs.

When wildfires increase in complexity, local agencies can use PODs to inform discussions with incoming Incident Management Teams (IMT). By providing

pre-identified control lines, hazards, values at risk, and land management objectives at an operational scale and in a useful format, the local unit can provide information relevant for fire operations to the IMT. By summarizing local knowledge using PODs, the local unit can contribute to and help improve the decision making process of the IMT.

PODs can also be used as tools to communicate with county commissioners, homeowner associations, or other interested parties not directly involved with fire response. Because PODs are operationally relevant, they can provide those without firefighting experience a window into the strategies firefighters use to manage wildfires, how direct vs indirect response strategies are weighed, and how decisions are made about where to draw boxes used to contain wildfires. PODs can be used as an educational outreach tool for homeowners whose homes may be located in hazardous areas. Showing homeowners where their home is located relative to a POD boundary may underscore the need to implement defensible space, conduct fuel reduction activities, or the need for early evacuation.

Collaborative Models for POD Development

The PODs framework is versatile and can be used to answer a variety of questions surrounding suppression difficulty, resources at risk, ecological benefits of fire, fire management strategies, and hazardous fuel reduction project planning. The PODs framework provides the opportunity for a robust collaborative process surrounding these issues, and this process itself and the discussions it facilitates may be as important as any product that is developed. Below we outline several models which represent a continuum of the extent to which agencies are engaging stakeholders and collaboratively developing PODs (Figure 6). While we do this to provide a roadmap and menu of options groups may wish to consider if implementing their own POD-based spatial fire planning framework, it is important that stakeholders first identify, communicate, and negotiate the questions they seek to answer in order to tailor the process and products accordingly.

Agency-Centric Approach

Some Forests and Ranger Districts have started by developing PODs internally with fire staff. Agency fire staff use their own local knowledge and SDI and PCL products to identify control lines. Control lines are primarily kept on USFS lands, but extend onto private land or other jurisdictions when no good opportunities exist for control lines on USFS land. It is uncertain if this model will be successful if it is not adopted by a wide range of partners. This model does allow the USFS to

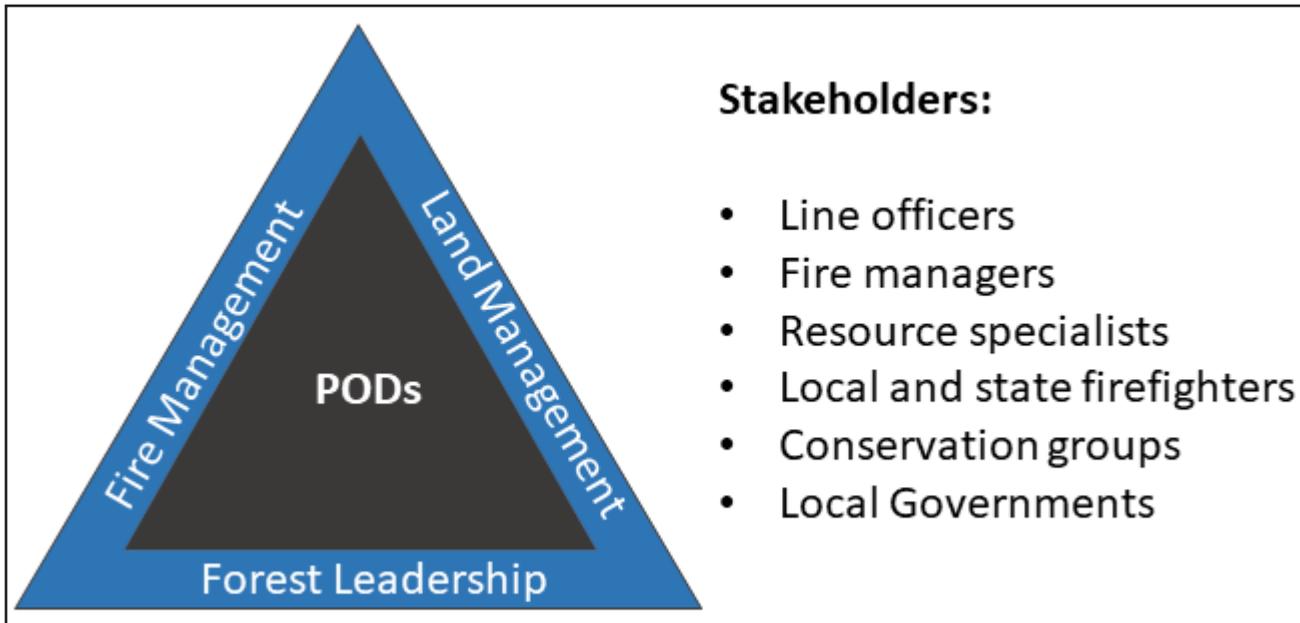


Figure 6. The POD collaborative engagement triangle: PODs provides a framework to integrate land management, fire management and forest leadership in a way that leverages multiple stakeholder groups to contribute to risk informed land management and resource informed fire response.

develop internal consistency before engaging cooperators. However, outside entities may be hesitant to follow the initiative if they have not been included in helping to delineate POD boundaries.

Collaborative Approach

Other Forests have engaged stakeholders from the start. This model takes more up-front coordination but has the potential to generate more support from local stakeholders. Engaging other fire response agencies and allowing them to help draw POD boundaries may set the stage for a more integrated response because cooperators have a better understanding of USFS response strategies and the logic behind them. Involving stakeholders from the start also provides additional opportunities for conservation groups and other stakeholders who are not involved in fire response to voice their concerns and identify the resources at risk and values they find important. It is helpful for watershed and forestry collaboratives to understand how fires are likely to be managed, and which features would likely be used to contain a fire. Disseminating this knowledge helps with cross-boundary planning and allows stakeholders to implement fuel treatments in locations that can strengthen control lines and therefore be leveraged for a larger impact.

Hybrid Approach

Another option is a hybrid of the two aforementioned models, where PODs are initially developed internally, and stakeholders are brought on as they become interested in using the framework on their own lands. Slowly developing products and methods, engaging more stakeholders, and iteratively extending POD network onto

neighboring jurisdictions may represent a more organic development path given limited resources. If PODs provide a useful tool, over time agencies can continue to develop PODs and related products to further integrate land management and fire operations into a cross-boundary framework.

Potentially Conflicting Mandates:

One potential pitfall of POD planning relates to divergent agency missions and mandates. The USFS has a multiuse mandate and is directed to manage for sustainable ecosystem services for current and future generations. Accordingly, the Forest Service may choose to allow the reintroduction of fire for ecological objectives. Sometimes this approach is in tension with that of state and local fire response organizations that have suppression mandates. Conflicts may arise depending on the jurisdiction where the fire is occurring. Preplanning for cross-boundary fires and identifying PODs that cross jurisdiction boundaries with different agency mandates can inform preseason conversations on appropriate risk management and response strategies. State or local agencies can still use PODs even when they are driven solely by a suppression mandate. These agencies can use the associated suppression difficulty and control line effectiveness models to identify areas where suppression can be safe and effective for direct response, as well as options for indirect attack strategies when warranted.

POD Products

After going through the process of collaboratively developing PODs, groups may wish to create various POD informed data and map products. Deciding which

POD products to create first requires the identification of specific questions or needs that will be addressed, as well as identifying one or more user groups. POD products can be created and tailored accordingly while maintaining consistency across products because of their use of a common framework.

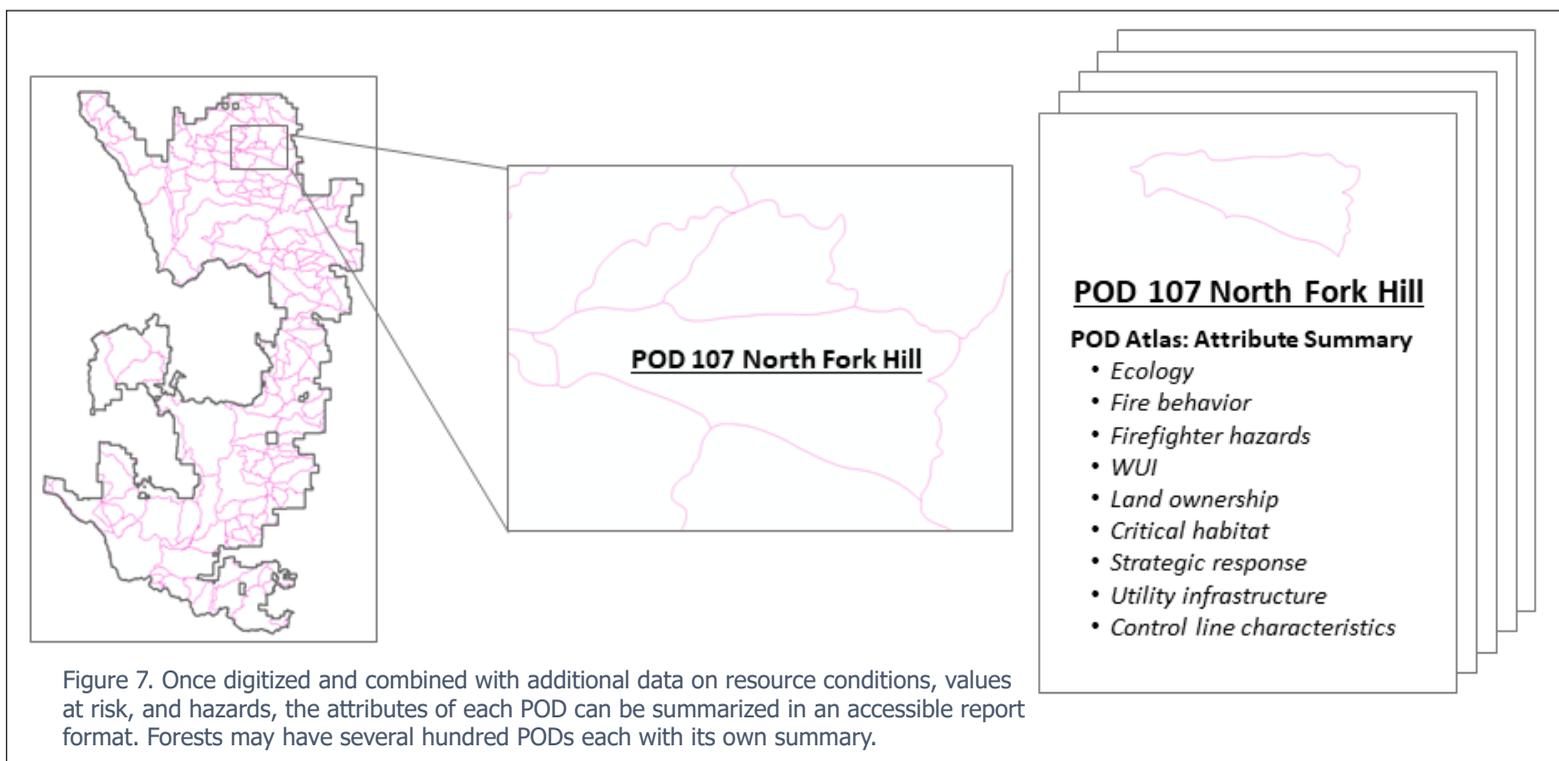
Once POD boundaries have been digitized they can be used for operational, planning, or communication purposes. Operationally, POD products can include electronic spatial data which can be: uploaded into wildfire decisions support systems, used to create field based maps, loaded onto GPS enabled mobile devices with other base maps for use in the field, or provided to incoming incident management teams. POD products—namely analysis maps and reports—can also be developed to support cross-boundary planning and communication efforts. POD boundaries overlaid on maps of critical resources, urban interface, or habitat can be used in conversations with resource specialists, cooperators, or other stakeholders. In this way, PODs can be used to facilitate discussions of current or desired conditions, prioritize mechanical or prescribed fire treatment locations, align expectations of fire response.

Several other examples of POD products for different user groups include: a joint report and map with POD boundaries and a summary of values at risk and hazards within that line officers and fire managers can use to help make decisions on strategic responses; and maps of ecological conditions or habitat within PODs that resource specialists can use while working with line

officers to integrate land management objectives into fire management. POD maps can also be used by fire department cooperators to understand land management agency objectives while responding to a fire, or by other stakeholders involved with planning or prioritizing fuel treatments.

POD Atlas

A POD atlas is an example of one POD product that can help integrate land management objectives and fire response. The process of creating the atlas can engage cooperators and generate collaborative buy-in for spatial fire planning in a way that integrates stakeholder concerns and land management objectives. A POD atlas can also summarize ecological conditions to help prioritize fuel treatments. When a wildfire ignition occurs on the landscape, it is difficult to know how the fire will grow and where it is likely to spread. Not being able to predict the extent of the wildfire or the effects it will have on resources of concern complicates incident decision making. Creating a POD atlas is one way to help address these concerns because it can begin to summarize conditions and predict outcomes before the fire starts. A POD atlas can summarize information about the control line characteristics along the POD boundary, and can also summarize data contributed by internal and external stakeholders. This might include summary statistics on expected fire behavior, forest ecology, urban interface or utility infrastructure, land ownership, critical watersheds, or habitat (Figure 7).



A POD atlas can simplify complex information on ecology, fire behavior, and fire operations into an easily digestible format, such as simple maps of each POD with corresponding summaries on the hazards and values at risk within (Figure 8, Table 1). Maps can visually summarize value at risk data or be more operational in nature. The simplistic format of the POD atlas can create

a common operating picture between initial response firefighters in the field and line officers and decision makers who may be working remotely or who may not be familiar with the specific landscape where the ignition occurs. A POD atlas can provide a snapshot of where the likely fire perimeter will be if indirect response strategies are used, what type of fire behavior to expect, how

Deadman Lookout

POD #

Basic Statistics

Size (sq miles)

Size (acres)

Perimeter (miles)

Drinking water importance

Watershed

Watershed

Values at Risk

Buildings

Building density (homes per acre)

Percent Forest Service

Percent Wilderness

WUI Type

Ecology

Forest Type

Fire Regime

Beetle Mortality

Fire Behavior

97th percentile fire behavior

90th percentile fire behavior

80th percentile fire behavior

Strategic Objectives

Strategic Response

Suppression Difficulty

Figure 8. A POD Atlas gives summary statistics about the POD and values it may contain, expected fire behavior, ecology, and fire operations. Paired with a simple map, the POD Atlas is a useful summary.

Characteristics to summarize in POD atlas			
Number of homes	Dominant forest types	Fire behavior	Firefighter hazards
Utility infrastructure	Fire regime	Suppression difficulty	Overstory mortality
Watershed	T&E habitat	Potential for control	
Land ownership	Current conditions	Resource Needs	QRA derived strategic response
Ideal burn window	Desired conditions	Additional information as requested	

Table 1. Characteristics and attributes that could be summarized at the POD scale in a POD atlas.

difficult the fire will be to suppress, what ecological or community values are at risk, acceptable burn windows, or current and desired ecological conditions.

Frequently Asked Questions and Lessons Learned

While the POD spatial fire planning framework is actively being developed and implemented on multiple landscapes, it builds off of longstanding firefighting practices. Accordingly, organizations have put it to use in different ways to suit their needs. We put together the following list of frequently asked questions we have received from firefighters, managers, and other stakeholders, as well as lessons learned which may guide those wishing to develop and implement the framework themselves.

1. How important is the collaborative process in developing PODs?

The value of using the POD planning framework can be amplified by involving multiple stakeholders and creating integrated data products for multiple audiences. While products, maps, and reports can assist in decision support, the process of collaboratively developing PODs is equally important. Pre-season conversations, with fire staff, cooperators, and key decision makers about PODs, hazards and values at risk within, and response strategies are critical to making informed decisions during incident management.

2. How do PODs integrate with other strategic planning tools?

At its simplest, a POD is an operationally relevant container bounded on all sides by pre identified control lines. In this sense it can easily be paired with quantitative risk assessments, spatial analysis or other prioritization efforts. Risks and hazards can be summarized at the POD level, similar to how risk assessments and prioritizations have traditionally occurred at the watershed, community, or Forest scale.

3. How are PODs used?

Once created, PODs can serve a variety of purposes and be used multiple ways. For example:

a. PODs can serve to capture and institutionalize expert or local knowledge on the locations of the most effective control lines and those likely to be used to during incident management. Much of this information is often in the heads of local firefighters and may be lost as staff retire or relocate.

b. PODs can be incorporated into operational

response maps and accessed on mobile devices used by firefighters in the field.

c. PODs can serve as a communication tool by giving line officers, stakeholders, and the public a better understanding of firefighting tactics and fire control opportunities in a particular landscape. In this way PODs can be used to create a common operating picture between stakeholders. They can also facilitate discussions between land management and fire response agencies regarding cross-jurisdictional wildfire response.

d. PODs can serve as a planning tool. Cooperators can use PODs to identify and prioritize strategic locations for fuel treatments. Fuel treatments can be used to strengthen POD boundaries, or treat the interior of a POD to modify fire behavior in areas where fire might have a negative impact on a resource.

4. Who can help develop PODs?

Local firefighters from both federal and local agencies can help develop POD boundaries based on their familiarity with fire behavior in a particular landscape. While POD boundaries are best identified by experienced firefighters, other groups can also contribute information about hazards, land ownership, and values at risk within PODs which can help guide future actions.

5. Who can use PODs?

PODs are a spatial, operationally scaled wildfire planning tool that can be used by agencies responsible for land management or fire response, or more generally by any group concerned with forest or wildfire management. In our experience, we have seen numerous groups use PODs including: firefighters, fire management officers, line officers, incident management teams, resource specialists, and conservation groups.

6. What is the right scale for POD planning?

While there isn't one right scale to develop PODs, the framework tends to be most appropriate for large, fire-prone landscapes. Different scales and planning extents have tradeoffs in terms of efficiency, consistency, and the ability to engage local stakeholders. Working at the scale of a single Ranger District may encourage a broad range of stakeholder participation because cooperators do not have to travel far, and are more likely to share a common area of interest. Working at a larger extent may increase the number of interested parties, but some individuals may find it difficult to travel and stakeholder areas

of concern may not overlap as much. As noted earlier, neither wildfires, control opportunities, or POD boundaries follow jurisdictional lines, so no matter the planning extent used, it is important to consider the interests, resources, and perspectives of organizations responsible for land management and fire response in potentially affected jurisdictions.

7. Who needs to be involved?

When developing PODs it is important to get the right people and decision makers at the table. At a minimum this often involves Forest Leadership and Fire Management Officers. Deriving the POD boundaries should also involve participation from experienced firefighters from local, county, state, and federal agencies. Outside of line officers and those with firefighting expertise it can also be important to involve natural resource specialists and other stakeholders who have resources concerns. It is important to get buy-in and support at various levels and across the various groups who have an interest in land and or fire management.

8. How can my organization get involved?

Non-governmental organizations (NGOs) are often involved with fuel treatment planning but few have any role or responsibilities associated with fire management. NGOs do not necessarily help locate POD boundaries, but can contribute by identifying values within PODs and can become valuable end users who can use POD boundaries to help plan and prioritize fuel treatments.

9. How can PODs be used to educate the public?

Sharing POD boundaries can help stakeholders without fire response experience better understand how decisions are made during wildfire incidents and the strategies and tactics which are used to manage wildfires.

10. How can PODs help prioritize fuel treatments?

Stakeholders have suggested that fuel treatments, such as roadside fuel breaks can be implemented along POD boundaries to increase the likelihood control lines can effectively contain wildfires. In this way a small fuel treatment if strategically placed can be leveraged to facilitate managing a fire along a POD boundary, thereby increasing its benefit.

11. What are the highest valued resources in a POD?

Not all PODs are created equal, and each has its own unique set of resources and hazards. A

POD atlas can help identify ecological or societal values exist within each POD and how they might respond to fire. Some PODs might have high value timber or WUI which can inform how to best engage or manage a fire and help weigh the risks that fire poses to the resources within. Often the highest value resource in a POD are the firefighters sent in to suppress a fire. If there are no highly valued resources to protect, or the fire is burning under conditions that are not causing undesirable impacts, it may make sense to employ an indirect fire response strategy that uses a pre-identified POD boundary.

12. How big are PODs?

PODs do not have a set size. Usually PODs vary in size from several hundred to several thousand acres. POD size varies because their boundaries depend on the occurrence and location of control opportunities. PODs tend to be larger in wilderness or roadless areas, and smaller near the WUI or areas of active management where roads and treatments are more prevalent.

13. Do PODs have to comply with the National Environmental Policy Act (NEPA)?

PODs do not have to go through environmental clearance. PODs are not decisions but instead identify potential opportunities to contain wildfires. Many of these opportunities are already common knowledge to local firefighters.

14. Will fires stop at POD boundaries?

Fires may or may not stop at POD boundaries. This depends on the characteristics of individual control lines and on fire behavior at the time it reaches the boundary. Depending on conditions, a wide road devoid of fuel may be more effective than a fuel type transition. Fuel type transitions are often effective control lines during moderate conditions, but may become ineffective during extreme conditions. Some managers have begun to attribute POD boundaries according to their characteristics and/or confidence they have in them under different fire weather conditions.

POD boundaries may need to be strengthened or improved to ensure their success. This may involve roadside fuel treatments or prescribed burns before the fire season, or tree removal or burn out operations during a wildfire incident. If a POD boundary does not effectively contain a fire, the adjacent POD boundary may then become the next most effective opportunity to do so.

15. Will POD boundaries change over time?

POD boundaries occur in locations with the highest likelihood of success and the least firefighter exposure. That said, PODs will need to be revisited and maintained over time as conditions change. New wildfires, new fuel treatments, new roads, and new development in the wildland urban interface all have the potential to impact POD boundaries. Future wildfires and fuel treatments may provide additional opportunities to create new PODs or subdivide existing ones, while housing development or insect outbreaks might alter conditions, hazards, and values at risk within PODs.

16. Do POD boundaries need to be inspected?

Control lines and POD boundaries need to be inspected in the field prior to use. While POD boundaries may identify the best available control opportunities, lines need to be assessed with current conditions in mind. Often existing control lines are a good start but will likely need to be reinforced to successfully contain a wildfire.

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Figure 9. POD workshop participants delineating control lines.