



Federalism meets Social Cognition: Temporal and Substantive Variation in Risk Perception across Levels of Government.

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Temporal Variation in Risk Perception across Levels of Government

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Abstract

As wildfires' complexity increases, there are more government actors at multiple levels and private actors involved in and affected by fire response. The wildland fire response community has broadly adopted risk management principles and practices to guide decision making on complex wildfire events. As a result, risk perception is a key factor in shaping decision making and subsequent response. While there is a well-developed literature on general public risk perception of disasters, less is known about the risk perception of key decision makers. Therefore, understanding risk perception variation across stakeholder groups may offer valuable insight into points of tension and conflict on multi-jurisdictional disasters. This paper aims to address this gap by conducting a within and cross-case analysis of risk narratives from responders on the same incidents from ten of the most complex U.S. events in 2017. Data are from interviews with 89 agency administrators and representatives of federal, tribal, state, local, and private jurisdictions. Analysis of risk narratives revealed variation among levels of government and sector in temporal bounding of risk perception within substantive areas. We found actors view risk differently, with commercial landowners focusing more on long-term economic impacts, federal landowners on immediate tactical risk to firefighters, state landowners on immediate public safety, and local landowners expressing a variety of risk concerns. Findings provide perspective on differing risk perceptions, which may ease communication and strategic decision-making processes around risk prioritization and fire management among jurisdictions.

Background and Study Focus

In the U.S., emergency management and response is an important function of public management and administration (Petak, 1985; Kapucu & Van Wart, 2006), involving multiple levels of government and coordination between public and private sector organizations. It is particularly important that the network of responders share common understandings, because “lacking shared common language is a serious threat to” [collaborative] emergency management, not “just for first responders from different jurisdictions and agencies” but for risk communication and for “government officials to discuss the risk management issues” (Kapucu,

Arslan, & Demiroz, 2010, p. 456). These challenges apply equally to cooperation and coordination between multiple jurisdictions and elements of response operating under hierarchical incident command systems. For effective management in an emergency, managers should understand "...how emergency directions, disaster scene environments, and post-disaster assistance are mentally processed by those targeted and affected" (Woodbury, 2005, p. 28). Better understanding of agency leader perceptions and attributions of risk during emergency response can aid emergency managers, first responders, and other public managers and leaders at affected agencies (and private organizations) in realizing the scope of an incident. In turn, this understanding translates to planning, collaborating, and in building the trust and shared purpose necessary for a successful collaborative response network in the case of an emergency (Mandell & Keast, 2007).

While risk perception has been explored fairly extensively in an emergency management context, it has been examined largely as a factor of how individuals perceive risk generally as instinctual, or feeling-based, or as a type of analysis and then how they behave accordingly (ex. Slovic & Peters, 2006), how perception informs individual risk mitigation decisions prior to the occurrence of a wildfire in the WUI (ex. Brenkert-Smith, Champ, & Flores, 2007), and how the source of the information describing the risk impacts the likelihood that the individual will take such mitigation actions (ex. Brenkert-Smith, Champ, & Flores, 2012).

This research addresses the gap in previous literature by providing a more complete picture of how key decision makers, who are frequently in high risk situations, determine both the prominent substantive dimensions of risk (human safety; homes, infrastructure and communities; ecosystems and environment; social, political and economic), as well as the temporal dimensions of risk perception related to substantive areas. Gaining an understanding of risk across these categories may assist these multi-jurisdictional decision makers in gaining a common ground and understanding when working together on large incidents.

Here, we focus on perceptions of risk among leaders in agencies and organizations with jurisdiction over land threatened or impacted by multijurisdictional wildland urban interface (WUI) fires in the U.S. Examining these perceptions is particularly salient given ongoing changes in the severity and frequency of WUI fires in many areas of the U.S. The amount of land labeled as WUI is growing in the United States (Radeloff et al., 2018) and wildfires continue to increase in size due to changes in climate and fuels (Westerling, Hidalgo, Cayan, & Swetnam,

2006). Consequently, wildfire complexity is growing due to the increase in public and private actors involved in and affected by fire response, increasing the variety and number of people at risk (Fisher et al., 2016).

Risk is an important factor in emergency management, and the wildland fire response community has broadly adopted risk management principles and practices to guide decision making on complex wildfire events (Thompson, MacGregor, & Calkin, 2016). As a result, risk perception of agency leaders is a key factor in shaping decision making and subsequent disaster response. Further, to the extent that perceived risk guides decision making, actors who share a common risk narrative will be more likely to also find greater common ground in decision making and will act more efficiently, as differences in goals and preferences among members of a team lead to inefficiency (Mohammed, Hamilton, Sánchez-Manzanares, & Rico, 2017). Therefore, the understanding of how risk perception may vary across stakeholder groups may offer valuable insight into points of tension and conflict on multi-jurisdictional disasters. We address: How does risk perception differ among leaders and decision makers representing different levels of government and private land interests?

Relevant Literature

Individual risk perceptions and categories of risk

Risk can be defined as “an individual's assessment of how risky a situation is in terms of probabilistic estimates of the degree of situational uncertainty, how controllable that uncertainty is, and confidence in those estimates” (Sitkin & Weingart, 1995, p. 1575). Understanding individual assessments of risk and patterns that assessment may hold for certain groups is particularly salient in a hazard situation like a wildfire where uncertainty abounds. While risk perception is individual, it is also influenced by situational factors as well as the perceptions and behaviors of others. For example, studying risk perception before fires, Dickinson, Brenkert-Smith, Champ, & Flores (2014) found that social interactions may allow mitigation and prevention behaviors to spread throughout a community increasing the likelihood that the community members will participate in fuel reduction efforts to minimize effects from wildfires. In management literature, Sitkin and Weingart (1995) determined that the more inclined a person is to take risks, the less risk they will perceive in a situation, and that familiarity with a particular risk reduces the associated perception of danger. In addition to different perceptions of risk based

on immediacy and proximity, the context in which risk is perceived and processed can affect decision making and behavior. Kinateder, Kuligowski, Reneke, & Peacock define risk perceptions in the context of fire evacuation as a “psychological process that describes the subjective (conscious and unconscious) evaluation (as opposed to objective risk assessment)” influenced by emotions and prone to cognitive biases (2015, p. 6). Perceptions can also differ based on anticipated outcomes. For example, in a public management context, Bailey et al. (1992) found community leaders near a hazardous landfill in Alabama trusted the facility operator’s assessment of minimal risk in exchange for economic benefits, while the general public found this less compelling than concerns about the environmental risks.

How different groups see risk differently

In addition to differences in perceived risk between individuals, research has found differences in risk perception between leaders and community members (Bailey, Faupel, & Holland, 1992) and that leader acceptance of risk can be affected by how information is framed (Roberts & Wernstedt, 2018). Roberts and Wernstedt (2018) found that county-level emergency managers in important decision-making capacities were more risk averse when the outcome was framed as a gain instead of a loss. Bailey et al. (1992) found that community leaders focused on potential economic gains from a particular type of development, while community members focused on risks involving environmental damages or losses.

In other contexts, research on first responders shows risk perceptions vary at all levels from first responders to the decision makers. Prati and Pietrantonio (2012) found that emergency responders on highways adhere to safety procedures and use protection devices if they perceive a high level of risk from a work-related accident and when a climate of safety is promoted by those above. This indicates that perceptions of risk and associated actions are a combination of individual perceptions and those held by the organization. When combined with differing understanding and opinions of fire management strategies and goals, perceived risk of gains and losses can differ greatly among different groups of emergency responders as well. In a wildfire response context, Black et al. (2011) argued that the unpredictable, dangerous nature of Type 3 fires make it imperative that we understand how firefighters communicate risk in the early stages of a fire to prevent spreading. The risk perceptions of the fire management team are continuously

updated based on the most recent risk-related information communicated to them (Black et al., 2011).

Wilson et al. (2011) found that managers on large wildfires demonstrated a “tendency to prefer minimizing short-term risk in their decision making, leading to general risk aversion in the short term and discounting of long-term risk.” They interpreted one subject’s explanation that “[the] immediate priority is to protect life and property now. Measures can be taken later to prevent the long term risk” as indicative of the importance of addressing immediate threats in hopes of shifting the likelihood of future catastrophic events but also noted “this discounting was less pronounced among managers with more experience” (812-813). Additionally, Wilson et al. (2011) found that pressures outside of the fire organization, like societal and organizational attitudes towards risk, could override the individual’s risk preferences. Similarly, Steelman and McCaffrey (2011) found that while “the traditional suppression focus is seen as more likely to put firefighters at risk and misuse resources while losing opportunities to reintroduce fire,” (454) agency decision-makers can be averse to allowing naturally ignited fires to burn for “wildland fire use” because these strategies are seen as politically risky.

In addition, there are clear differences in the ways that federal and state agencies, or representatives from different levels of government, perceive wildfire-related risks and subsequently align agency missions for response. Fleming, McCartha, and Steelman (2015) found greater perceived alignment in missions regarding land use and wildfire management between federal agencies than between federal and state agencies. Abrams et al. (2017) found that locally-based rangeland associations involved in incident response had goal misalignment with federal representatives, but that after training and incident response interactions with Bureau of Land Management representatives had more alignment. Bodin and Nohrstedt (2016) found greater levels of collaboration among organizational representatives at comparable levels in Swedish wildfire response, with those with more wildfire management tasks to attend to collaborating with others with many tasks and less with local responders. Studies also show perspective matters in evaluating wildfire performance, with differences in individual, agency, subgroup, and network performance and perceptions of performance based on sensing (the type of information encountered), on sense-making (interpreting the information), and on normative assessments and evaluations based on importance of different outcomes to individuals and professional biases (Nowell et al., 2016).

Past experiences and interactions among response network actors and with the public matter, as they lay the foundation for trust in future teams (Steelman & Scott, 2019; Albrecht, Chen, Nowell, & Steelman, 2017; Lanaj, Foulk, & Hollenbeck, 2018), and more in-depth planning and strategizing ahead of disasters, differential risk perception and all, is shown to help develop community capacity, leading to increased resilience in the event of a disaster (Kapucu, Arslan, & Collins, 2010). We would therefore expect to see variation in how people look at risk and risk tradeoffs, especially in relation to where they sit as an actor in a disaster response network. It is therefore particularly important for emergency response teams to communicate well and understand each actor's perceptions of risk to make better informed decisions that serve the goals of each involved jurisdiction.

Temporal differences and tradeoffs in risk perception

Research from a number of fields including public health, education, and public management as well as disaster studies has focused considerable attention on the linkage between perceived immediacy of risk and decision-making and behavior. For example, in public health and medical literature, perceived immediacy of risk is discussed in response to diagnosis of disease (ex. Cykert, 2004) or public response to a threat (ex. Lui, Huang, & Brown, 1998). In education literature, researchers have analyzed how emergency communicators interpret the concept of timeliness in campus emergency notification decision-making (Madden, 2017) and how perceptions of time impact the responses of both those in the decision-making capacities and those impacted by emergencies (Duncheon & Tierney, 2013). Agriculture literature discusses spatial and temporal risk perception in terms of the likelihood of flooding while considering the effect of crop growth stages on the total damage (Shokoohi, Ganji, Vali Samani, & Singh, 2018). Spatial and temporal risk have also been considered as drivers for acceptance of certain vaccinations (Railey, Lembo, Palmer, Shirima, & Marsh, 2018), and in measuring potential risk factors for contracting certain illnesses like dengue fever (Kong, Xu, Mu, Li, & Qiu, 2018).

But, there are differences between perceptions of the immediacy of risk versus actual temporal dimensions of risk (think, “first the fire, then the flood”). Risk from disasters is recognized in the literature as operating at different timescales. For example, risk analysis literature discusses the temporal perceptions of landslides in terms of their immediate hazards to

human life and safety, as well as their long-term economic impacts to the individual landowners and the community at large (Bonachea, Remondo, Díaz De Terán, González-Díez, & Cendrero, 2009). In public management literature, temporal risk perception is used to discuss public managers facing strong opposition to proposed new programs that will have positive economic impacts, and potentially negative public health and safety impacts (ex. Lindell & Earle, 1983; MacGregor et al., 2018). Gaining an understanding of the potential variations in temporal perceptions of risk across stakeholder groups may offer valuable insight into points of tension and conflict on multi-jurisdictional disasters.

Much of the literature on risk perception focuses on risk during a particular phase of the event, rather than across several temporal dimensions. For example, focusing on the time before a wildfire incident, McCaffrey, Stidham, Toman, and Shindler (2011) found that homeowners in the western United States did not expect the government to take mitigation action for them but instead wanted information about what to do as they viewed mitigation as their responsibility. Studies of behaviors before fires have shown a positive association between higher levels of risk mitigation when information about that risk comes from trusted, local sources like local volunteer fire departments, county wildfire specialists, and neighbors (Brenkert-Smith et al. 2012). In analyzing risk perceptions and associated behavior during a wildfire incident, Lindell et al. (1985) found that people who did not evacuate from an emergency situation stated that they did not believe real danger existed, that they stayed to protect their personal property, to help others, or that they were not ordered to evacuate. Those who follow evacuation orders do so as a result of the clarity of the threat (Lindell et. al, 1985), influence from trusted sources (Lindell et. al, 1985; Mawson, 2005), and the availability of resources to do so (Riad, Norris, & Ruback, 1999). These studies demonstrate that the source and type of information an individual receives during a hazard event affect risk perceptions and decision-making, and they also suggest that different groups may be likely to view different values as being at risk. But, when we look at overall risks, we find differences not in substantive values, but rather the same substantive values perceived to be at risk by different actors in differing temporal dimensions.

Data and Methods

The purpose of this research was to gain insight in how multijurisdictional stakeholders in large wildfire incidents understand and perceive of risk. To better understand how responders

view risk in complex multijurisdictional wildfires, we identified the most jurisdictionally complex U.S. WUI events in 2017 and conducted semi-structured telephone interviews with tribal, federal, state, local, and private representatives. Data represent a grounded theory approach based on case studies of 10 of the most jurisdictionally complex WUI wildfires of 2017. All incidents in this study involved a Type I Incident Management Team (IMT) in response at some point. Incidents include both federal and state led fires. The fires in the sample had maximum variation in stakeholder composition, as well as the values threatened, IMTs assigned and geographic region.

We conducted 87 interviews with respondents representing federal, tribal, state, local, and private interests across six states and six Geographic Area Coordination Centers (GACC). Interviewees include: Agency Administrators, Agency Representatives, representatives of private organizations, and Incident Commanders of IMTs. Federal landowners were those acting in Area Administrator and Agency Representative roles, specifically representing a federal jurisdiction affected by a wildfire event. The National Wildfire Coordinating Group defines the Agency Administration as the administrator managing the jurisdiction that is responsible for the incident. They included forest supervisors and administrators from other federal land management agencies. Tribal representatives were those acting on behalf of interests of tribes with affected lands or cultural values. State actors comprised both agencies working to respond to the wildfire incident as well as state agencies responsible for protecting or representing affected lands. Private landowners, for this study, were defined as private commercial entities that were both operationally involved and significantly impacted by the fire. This group includes both local landowners and large private companies with significant landholdings in the area of the wildfire most of which manage timber that often borders other jurisdictions. Incident Commanders (ICs) are assigned to incidents based on availability and training level that corresponds to the fire designation. ICs are responsible for the leadership of all aspects of the emergency, including developing incident objectives, managing operations, allocation of resources, and overarching responsibility for all persons involved (see Tables 1 and 2).

Jurisdiction	Count	Percentage
Federal	33	38%
Local	11	13%
Private/Commercial	16	18%
State	25	29%
Tribal	2	2%
Grand Total	87	100%

Formal Role	Formal role count	Percentage
AA	36	41%
AR	13	15%
IC	16	18%
None	6	7%
Private/Commercial	16	18%
Grand Total	87	100%

We asked interviewees about the nature of their involvement in the incident, about network governance structures, and governance before the fire, as well as perceptions of risk. Interview data related to risks include questions focused on areas of most concern for the interviewee when the incident was at its most intense in terms of its implications for their agency or jurisdiction, questions on other risks that needed to be managed during the fire, and other descriptions of perceived risk that came up as part of narratives around involvement or in response to governance questions. To achieve trustworthiness in our grounded theory approach, the research team utilized a constant comparative method in which we analyzed data to compare codes as they emerged and then revisited and integrated the coding frameworks to clarify definitions.

To understand how individuals and groups of stakeholders perceive risk, we conducted a within and cross-case analysis of risk narratives from responders on the same incidents representing different levels of government. These designs in qualitative research enable the researcher to become absorbed in the data and facilitates the trustworthiness of the analysis (Merriam & Tisdell, 2015; Patton, 2015). Within case analysis design focuses the researcher on a single case of the phenomena in order to fully understand the patterns that emerge in order to “support, refute, or expand (a) a theory that the researcher has selected or (b) the propositions that the researcher has derived from a review of the literature and/or experience with the phenomenon under study” (Mills, Durepos, & Wiebe, 2010, p. 972). Here, we did a thematic coding of the content of the risk narrative for each case and looked at variation in narratives across groups. We found that the variation in substantive codes was far less prominent than the temporal scaling. As such then did a second order analysis of the data to assign it a temporal code

based on immediate threat to firefighters and the public, the potential of what the incident could become, and the long term implications of the incident or potentiality. We then looked at patterns of these codes across groups.

Findings

Temporal patterns

Analysis of risk narratives revealed that while there is some small variation among levels of government and private actors in specific areas of risk within salient substantive dimensions of risk, the main difference lies in the temporal bounding of risk perception within substantive areas. Initially, we found substantive dimensions of risk coded from interview data include categories around human safety; built infrastructure; ecosystems and environment; and social, political, and economic risks. Human safety includes risk to firefighter and public safety; built infrastructure includes risk to homes, utility and transportation infrastructure, and communities; ecosystems and environmental risks include fire suppression impacts, threatened species, and threatened natural resources; and social, political, and economic risks include disruption of economies and effects on interagency relationships and public perceptions. While literature suggests different groups of actors may view different resources as being at risk, we found concern about these overarching areas of substantive risk during wildfire events were prevalent across interviewees. In other words, actors representing agencies at different levels of government and private interests reported very risk perceptions, with each of the substantive dimensions showing up in each group.

But, each of these substantive dimensions comprise specific values or elements at risk that vary temporally according to the immediacy of threat. We found temporal dimensions of risk varied based on respondent perceptions of threats tied to immediate and tactical elements of risk, the incident-level potential of risks, and the risk of long-term consequences that would endure after the fire was extinguished. Immediate and tactical risk comprise resources most at risk during the current operational period. Incident level risks comprise resources generally at risk across the temporal scope of the entire wildfire incident. Long term risks extend beyond the incident into the days and years after the event.

For example, risks to human safety were described in the immediate/tactical dimension to be to fire fighter safety as a result of engagement in firefighting tactics, and to immediate public

safety in relation to members of the public coming into contact with the fire, while at the incident level, risk to human safety comprised risk to firefighters based on duration of exposure and total exposure hours and to public health from prolonged smoke exposure. Perceived long-term risks to human safety involved concerns around mudslides, flooding, and activities undertaken toward recovery. Perceived risks to ecosystems and the environment at the immediate and tactical level include suppression impacts on natural resources, at the incident level include threats to endangered species and habitat and destruction of natural resources such as timber and grazing lands, and in the long-term include ecological health, risk exposure for future incidents, and aesthetic and recreational values. All four substantive risk categories appeared across all three temporal dimensions of risk, with the exception of risk to homes, infrastructure, and communities, which was perceived to lie at the immediate/tactical and incident levels, but not to persist as a long-term risk (see Table 3). We found incident level risk held the most attention among this group of wildfire responders and decision-makers, with 60% of risk narratives overall focused on incident level risks, 28% on immediate risk, and 12% on long-term risk.

We also considered differing risk perceptions of private landowners and those representing different levels of government versus actors responsible for leading incident response. In examining differences between perceptions of risk among groups, we did not find any meaningful variation between those leading incident response and other actors involved in response (see Figure 1). But, we did find some general differences in perception among private actors, and actors at different levels of government. Based on our findings, actors involved in wildfire response and decision-making tend to view risk differently in terms of issues that are most salient to their role narratives, or what they feel is expected of them based on their position and organizational home. Generally, private landowners focused more on long-term economic impacts, federal landowners spoke in depth about immediate tactical risk to firefighters, state landowners were occupied with immediate public safety, and local landowners expressed a variety of risk concerns. Differences in perceptions among these groups are discussed in further detail below.

Table 3. Substantive and Temporal Dimensions of Risk			
Temporal dimension of risk:	Immediate / tactical	Incident level	Long-term
Substantive risk to: <i>Human safety</i>	Risks to fire fighter safety Immediate public safety	Firefighter risk exposure hours on long duration incident Community/public health risk from prolonged smoke exposure	Post-fire risks, mudslides, flooding, recovery
<i>Homes, infrastructure, and communities</i>	Immediately threatened values	Fire potential to impact public infrastructure and communities	--
<i>Ecosystems and environment</i>	Fire suppression impacts on natural resource values	Threats to endangered species & habitat Destruction of natural resources (timber, grazing lands)	Ecological health of the wildland and associated risk exposure for more intense future wildfires Aesthetic and recreational value of the land
<i>Social, political, and economic</i>	Inter-agency coordination	Political risk and negative public perceptions Risks to cultural sites Cost (suppression dollars) Disruption of local economies	Long term impacts to local economies Public and political support of public lands

Federal Jurisdictions

Overall, those representing federal jurisdictions emphasized concern with immediate firefighter safety and incident level issues. To note, as the fires in this study are those assigned Type I federal incident management teams, all incidents described here had a federal jurisdiction hosting the IMT. This host or lead agency role also means that the federal jurisdiction has specifically ordered a highly trained Type I IMT to address a wildfire on their land. Many federal

landowners expressed that firefighter safety is the number one priority for them in their strategy decisions.

The thing that always keeps me up at night is the safety of our folks, in our care.

So, I guess it's pretty easy for me to answer that - the most important things that come to mind are, of course, public and firefighter safety and then next down the list...the teams all list the values there in the IAPs so that we can do our best to communicate all of those values up and down the line and that's really part of something I'd taken pretty close to heart, which is intent-based planning. I'm really trying to describe the why. When I just list public and firefighter safety, okay, what's after that? I can't remember the full suite of everything off the top of my head, but I know that the top list is of course public and firefighter safety, infrastructures, and sociopolitical relationships, that sort of stuff.

Firefighter safety and public safety. What could happen out there. Initially, with the crew that we were deploying and the conditions they were working with tough that was certainly something that kept me up.

State Jurisdictions

The priority for state jurisdictions is to ensure safety for private landowners, and as such their tactics often differ from federal jurisdictions. Paramount concerns for state entities were public safety issues such as evacuations. Alongside the concerns for human life, structure destruction and the potential for political fallout also played a role in state actors' risk perception.

When the fire got established in what we call the back country of the [forest], that that was going to get into the wilderness and that was going to be a long-term fire and there was not much we can do with that. Our number one priority based on values at risk and politics, really, was dealing with the structure threat and the evacuations. I mean, we evacuated pretty much the city. I mean, there was some significant evacuations. And, then I'm assuming you guys understand the political part of [this area] and who lives there. And, when you evacuate [here] what that means. So, you know, you've got big players, you've got big media people, you've

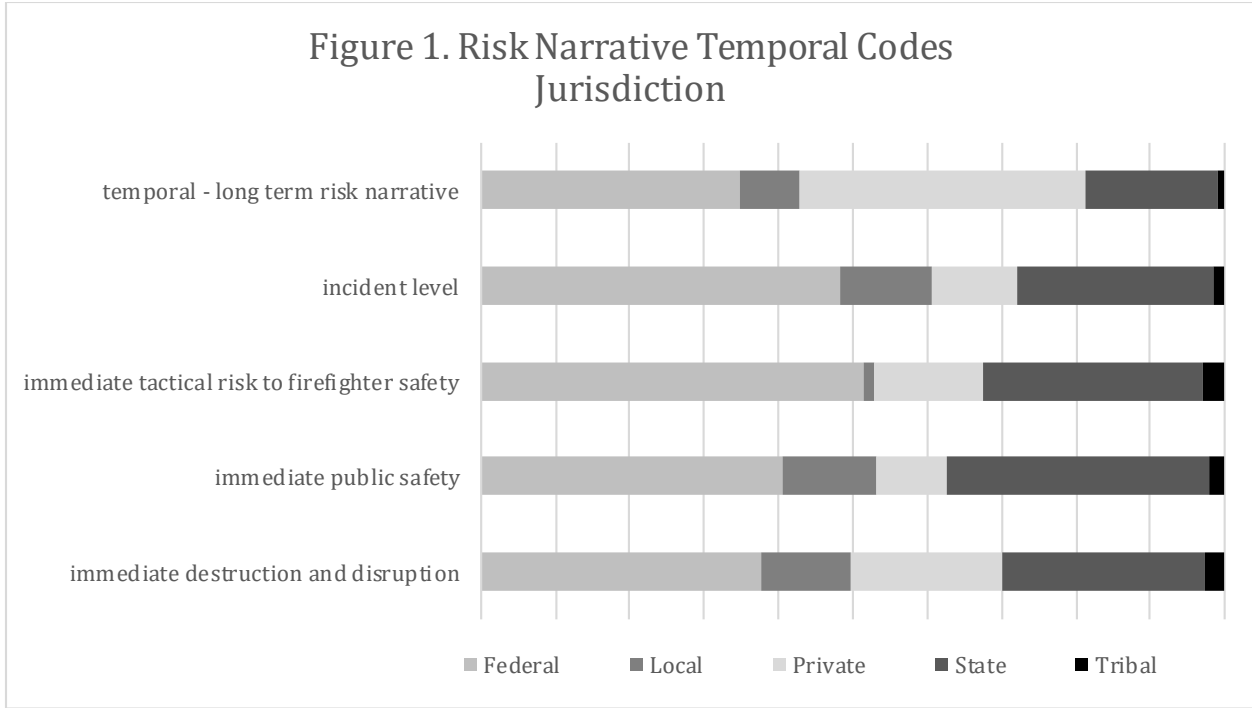
got -- and so you know, the obvious priority was dealing with this structure threat. And, then not just values at risk, we're talking -- we're not talking 100,000-dollar homes. We're talking, you know, 20, 30, 50-million-dollar houses that we're about ready to lose.

Our biggest concern was just whether or not we would be able to evacuate that community in a timely manner. But what we see in as far as growth goes and the distance of that growth, you know, we put evacuations in but we can't forcefully make people leave and so a lot of people were still in there. And the biggest concern I have with the structural fire folks is that if they know somebody is in there, they're going to take a risk to go in themselves. And so our biggest concern in that probably one to two week period of time was really, you know, if the thing does get up and go like they were predicting, would we be in a position to be able to effectively protect the citizens?

While federal actors are most engaged with strategies and incident level issues, state actors reflect a more localized problem-solving orientation around immediate threats to public safety. In many areas of the rural western United States, there are checkerboard land ownership patterns where private land owners have inholdings, or plots of land surrounded by large areas of federal or state-owned lands. As the private inholdings are not part of municipal or county lands they are not under direct protection authority of either of these entities, meaning they do not have access to fire protection unless they buy into or fall under fire protection provided by another entity. Land ownership and direction protection authority may be matched, but often are not, and state fire agencies frequently have responsibility for protection of both federal and privately held land. As state agencies often have direct protection authority over structures that are not protected by county fire departments, this perception of risk aligns with expected role narratives.

Local Jurisdictions

Of the stakeholder groups represented in our data, local jurisdictional actors display the most balanced risk narratives, with fairly equal emphasis on long term risk, incident level risk, and immediate destruction and disruption or tactical risk to firefighter safety (see Figure 1).



At times, resource constraints mean that local actors may feel their risks are not given as much weight across an incident as risks perceived by other jurisdictions, especially when the fire has the potential to impact public infrastructure and communities.

I understand the city has got [X number of] people. The [other] community ... has got [Y number of] people. You guys are putting a lot of emphasis on protecting the water supply, the electrical supply, and all that in the city, why are you excluding the water supply, and pump station, and the electrical supply to the other [Y number of people] people across the bridge?

Across local respondents, there was a mix of risk perceptions, with the group as a whole describing risk that fell at various temporal scales. In addition, several individual local respondents expressed concern about risks at several temporal scales in relation to one another. For instance, one local respondent described both immediate concerns as well as the long-term effect to the landscape and damage to the watershed as well as the potential for landslides in the future.

You know, mainly there's two values at risk. And, of course, we know obviously the personal and private property that people own that were in the fire's direction. But, the other end translates into, which we don't often think about, are the watershed issues. That value at risk -- and, we lost a lot of watershed, if you will, in protecting it, because our area ... had not burned for over 60 years. And, now we have this enormous fire consuming every bit of that watershed and the protection thereof, root systems, the trees are gone. Now it's just barren, ash, moonscaped. It's a concern, because that part we know is going to be a problem, and which it had turned into, after the fire's over and the rains come. So, that was on our thought as well.

Similarly, another local actor drew attention to the immediate threat to a neighboring county and community, incident-level concerns around resource constraints and incident duration in relation to firefighter exposure and safety, and smoke-related public health concerns across the duration of the incident.

two things were a concern. Number one, the duration of the people fighting the fire since it's been in [this area] for five to six days.... So, from a fire chief's perspective and from an administrator's perspective this is where you do find yourself potentially having injuries, or what we call a tragedy on the incident, you know, because of those concerns. And, the other is the fact that we still had a district to run and protect and respond to on the day to day calls, including medical calls, calls for service.... as well as I think, one aspect of this from [this WUI incident], was the public's health. We had, in this case, more of an inversion layer, which the smoke didn't rise. It stayed down on the ground, and for several days it became unhealthy to be in the air particulate.... Those are the public safety hazards out of this incident.

Overall, local jurisdictions need to balance a multitude of concerns due to their positionality in the community as leaders and as middle men communicators between the community and the federal and state jurisdictions.

Private Landowners

Many private landowners have experienced past significant loss of resources due to a fire event and, as a result, their primary perception of risk in the wildfire incidents analyzed centered on economic loss. These economic concerns focused on economic losses sustained due to lost business during the incident response as well as the impact of long-term economic loss both to the particular private business and to the surrounding community.

I had already canceled all of my reservations and, you know, I realized that insurance can pay for, you know, a good part but economically it's not going to cover all of the loss. And that was-- that's-- you know, since this is part of our livelihood that it's probably, you know, the greatest stress.

But when it hits private ownership, now you're talking about someone's investment. Someone's retirement. And even though it does hit everybody hard, as far as like these larger land owner investors or pension funds or whatever the case may be. When it hits the smaller private land owner, I think it hurts them a lot more. Because a lot of them people are banking on that as being their retirement. And they started fighting fire basically like you do out west. Big box theory. Where you just go out and give yourself plenty of room and you light off timberland. The only problem with that is when you light off that timberland, it's not government land. That's somebody's retirement. That's somebody's grocery money. That's somebody's investment that they've made.

These concerns are directly related to the protection of their economic investments and a perspective that federal land agencies may not consider the substantial risk to their private landowner neighbors when establishing incident objectives, and assessing management decisions. Additionally, private landowners see risk as spanning time during and after the incident, with their temporal scope being broad.

Discussion and Conclusions

These findings provide perspective on differing risk perceptions, which may ease communication and strategic decision-making processes around risk prioritization and fire management among jurisdictions. While the risk narratives and their temporality fell in different

areas for the different groups of stakeholders, they also complement each other and provide needed diverse perspectives in areas with which each group is most familiar. Overall, we found general agreement about substantive risk perceptions around human safety; homes, infrastructure and communities; ecosystem and environment; and social, political, and economic risk between those representing private organizations and representatives of federal, tribal, state, and local government. This was somewhat unexpected given past research showing differences in perceptions across actors in response networks (ex. Fleming et al., 2015; Bodin & Nohrstedt, 2016; Nowell et al., 2016). However, when we looked at these substantive risk categories temporally, we found differences among actors that do not show up in the general perceptions of substantive risks.

At the temporal level, we found clear a pattern of concern across groups, with the majority perceived risk as most likely to accrue to the incident level. But, local fire service showed the most balanced view with concerns falling at immediate, incident, and long-term time periods. Federal representatives tended to focus on immediate risk to firefighter safety over long-term risk. This focus on firefighter safety by representatives of federal land agencies could be viewed as a mimetic institutional force, given that a plurality of the interviewees represent the USFS, and that the USFS Chief's Letter of Intent for Wildland Fire has for the past several years advised subordinates to seek fire management options with "the highest probability of success with lowest risk to firefighter safety". This institutional culture focusing on firefighter safety may therefore be shaping individual actor's risk perceptions to focus on firefighter safety first because of their role responsibilities. State government actors were generally more focused on immediate risks to public safety, with the likely explanation being that state agencies have direct protection responsibility for fire suppression or structural protection on many land areas in the western United States regardless of land ownership. The focus on long-term impacts was expressed in large part by private land-owners who recognize the long-term impacts to the economy from damage to industrial, recreational, and ecological values.

Understanding these similarities and differences in risk perceptions for different actors may help actors from different levels of government better understand and communicate with one another about risks and values at risk during wildfire events. Knowing that other actors likely perceive the same types of risk across groups but may be thinking and speaking about them with a different degrees of immediacy based on when they perceive the damage to the

value at risk to have the most effect can create a common understanding from which to discuss possible solutions and tradeoffs, assured that other actors share their concerns over risks and values at risk. Understanding that actors from different agencies and levels of government may perceive risk at different time periods with other risks taking precedence in perceived immediacy may help stakeholders better assess and understand the wide variety of considerations on a complex wildfire incident.

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