Wildland Fire Response in the United States: *The Limitations of Consequentialist Ethics When Making Decisions Under Risk and Uncertainty*

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ABSTRACT One of the dominant ethics of natural resource management (NRM), and arguably Western culture, is consequentialism, which evaluates the ethical merit of decisions based solely on consequences or outcomes of those decisions. When used in NRM, this ethic is largely applied as the default, without interrogation of whether it is appropriate or useful. In this case study, we examine the intersections of consequentialism, decision psychology, and fire response in the United States. We explore how trying to maximize beneficial outcomes creates dilemmas for fire managers who must make decisions despite considerable risk and uncertainty about outcomes. Consequentialism as a guiding ethic may exacerbate risk aversion and fire suppression and ultimately contributes to a dilemma, wherein fire managers trying to reduce negative outcomes may increase the probability of negative outcomes (via catastrophic wildfire) in the long run. In place of consequentialism, we explore how virtue ethics in fire response and moral pluralism may ultimately better support the goals of risk management and positive outcomes. From this case study, readers will gain insight on the challenges of applying ethical theory to current natural resource issues, the way cognitive biases can affect decision-making, and alternative ethics to the dominant consequentialist system in NRM. **KEYWORDS** ethics, public lands, psychology, wildfire, human behavior, United States

INTRODUCTION

Consequentialism and Natural Resource Management (NRM)

While ethics are important for NRM they often fail to explicitly enter decision-making and thus the ethical status quo often serves as the foundation of NRM without reflection.

Thoughtful and defensible environmental management requires decisions to be made based on a variety of factors, including scientific evidence and values. Indeed, many environmental decisions are fundamentally a question of ethics (i.e., they are prescriptive, attempting to help us decide what we ought to, or should, do). Yet, the ethical dimensions of many environmental decisions are often neglected. When ethical dimensions are not explicitly considered, dominant ethical frameworks will be employed by default without interrogation or assessment. This does not necessarily mean that the decisions and actions based on those ethical frameworks will be unethical or nonethical, rather they will simply perpetuate the status quo. If that ethical status quo either helps cause or props up current environmental problems, then the decisions and actions based upon it are unlikely to help us address those environmental problems.

Further, beliefs simply assumed without interrogation or assessment are, by definition, dogmatic. Ethical dogma occurs when assumptions about values and the way to evaluate the ethical quality of actions and policies are built into belief systems and acted upon without reflection. In many cases in NRM, the ethical dimensions are dogmatic.

In the US, the ethical status quo for NRM is called consequentialism.

Because it reflects larger Western culture, in NRM in the United States, a dominant ethic of decision-making is consequentialism, which evaluates decisions for their ethical merit solely based on the consequence or the impact of a decision (and not, e.g., the intent behind the decision) (Vucetich & Nelson, 2013). Consequentialism is simply assumed in many facets of NRM. Perhaps most famous is Gifford Pinchot's utilitarian guiding philosophy

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to forest management: "the greatest good for the greatest number over the long run" (Pinchot, 1998). In wildlife management, for example, consequentialism permeates management, where success is defined based on some desired outcome such as the availability of successful hunting or fishing opportunities (Heffelfinger et al., 2013). Consequentialist ethical thinking is so prevalent in conservation and NRM that at times it seems conflated with ethics itself.

Because we generally frown upon dogmatic decision-making, we should critically evaluate whether consequentialism is an adequate ethical foundation for natural resource management.

It is worth interrogating when consequentialism as an ethical approach to decision-making is appropriate. Natural resource decision-making based solely on consequentialism could be appropriate or inappropriate in at least two ways. First, we could ask whether the decision-making system is built on a sound ethical theory. This is to ask: Is consequentialism a good ethical theory in the first place? Second, if ethical theories are supposed to help guide action, we should expect them to be practical to implement. This is to ask: Does consequentialism help guide actions in a way that maximizes positive outcomes?

There are several standard criticisms of consequentialism—we will mention only a few that are especially relevant to NRM. For a more thorough overview of weaknesses and critiques of consequentialism, we recommend Alexander and Moore (2021) and Sinnott-Armstrong (2023) as starting points. Critics have pointed out that since, according to consequentialism, actions or policies are to be evaluated based on their outcomes or consequences, the way we arrive at positive outcomes does not matter. This is captured in the expression that "the ends justify the means." We can, however, easily imagine unethical ways to accomplish desirable ends: appealing to overall economic gains, for example, does not justify a practice like slavery as means to those gains. Critics of commercial trophy hunting of African lions suggest the fact that, via revenue generation, such hunting might benefit conservation overall is insufficient to justify the practice (Nelson et al., 2016). In short, it is generally appreciated that ethical evaluation should not just be about outcomes.

Is consequentialism feasible to implement? Implementing consequentialism as an ethical approach should lead to a "better" world. However, this requires that we can reasonably understand the future and what consequences might obtain. Of course, we can reasonably understand the future and consequences for smaller scale or interpersonal decisions. For example, we can predict the relevant consequences of injuring strangers or being cruel to loved ones. Therefore, we can reasonably conclude from a consequentialist standpoint that those actions would be wrong. However, it is far less obvious that we can predict outcomes in natural resource decision-making, where problems are complex, wicked, and actively evolving. Climate change, we know, will increase uncertainty about the future. Hence, planning for the outcome of enhancing resilience under climate change might be difficult if not impossible. Besides the technical difficulty of accurately predicting consequences associated with decisions made in a changing climate, humans routinely struggle to make decisions that maximize utility under conditions of risk and uncertainty (Kahneman, 2011).

Wildfire response provides an important example of the limitations of a consequentialist ethic.

In this case study, we focus on the difficulties of implementing a consequentialist ethic. We are interested in the psychology of judgment and decision-making and the ways it is difficult for people to maximize utility even when that may be a justified ethical theory and valid goal. We demonstrate these difficulties by looking at the specific case of *wildland fire response* in the United States.

In the United States, wildfires are managed in three phases. Prefire preparedness includes all actions to reduce the probability of wildfire (e.g., reducing fuel loads on a landscape), reduce the consequences of wildfire when it does occur (e.g., home-hardening), and preemptively improve the efficacy of fire response (e.g., national staging of firefighting resources). Fire response includes all actions taken when a wildfire is present on a landscape, such as suppression-oriented strategic decision-making or tactical placement of resources on a fire line. Postfire recovery includes all actions taken after the fire, such as community recovery and ecosystem restoration. In this case, we focus specifically on *fire response*. Wildland fire response is an important case study to examine, give the increasing impact of wildfires in the United States. Negative impacts are expected to increase in a warmer world and thus we can expect wildland fire response to be an

important issue for the foreseeable future (Abatzoglou & Williams, 2016; Spracklen et al., 2009). It is, therefore, important to understand how this ethical mindset plays out in the context of fire managers making decisions on the fire line. To that end, we describe the current state of fire management and in particular fire response in the United States.

Wildfire in the United States

Wildfire is a significant hazard in the United States, posing risk to ecosystem and human health. The dominant fire management strategy in the twentieth century emphasized fire response that suppressed at the smallest possible size. Wildfire was considered a nuisance by public land agencies due to the perceived negative *consequences*, especially to humans. Under this mindset, wildfire was perceived first and foremost as a hazard that could destroy structures and jeopardize natural resources important for human use. However, for decades, there has been a push to move away from the suppression-dominated approach to wildland fire and instead incorporate more managed fire, prescribed burning, and cultural burning into land management (e.g., Calkin et al., 2014, 2015; Wildland Fire Executive Council [WFEC], 2014).

Interestingly, much of the justification for moving away from suppression-dominated fire management and fire response is often still couched in consequentialist terms (though the authors may not explicitly highlight consequentialism as motivating their thinking—after all, as previously argued, the ethical theory underlying NRM decisions often goes unarticulated). For example, a consequentialist argument may point out that suppressing fires increases the risk of catastrophic fire in the long run, ultimately contributing to greater costs and structures losses (Calkin et al., 2014; Ingalsbee & Raja, 2015). As costs for wildfire suppression grew rapidly, an increasing emphasis was placed on quantitative risk analysis that compared the cost of suppression to the value of the resources (e.g., Calkin et al., 2012; Finney, 2005). Thus, instead of suppression, a new paradigm of *risk management* is advocated for fire response (Thompson et al., 2018), where the positive and negative consequences of wildfire are considered, and the goal is to deploy resources in ways that ultimately lead to more efficient, positive outcomes for human well-being and ecosystem health. This is reflected in guiding policy documents for wildfire management. For example, the National Cohesive Strategy provides a vision and goals for fire management in the United States. In the National Strategy, "safe and effective fire response" is the highest priority and is categorized by structure protection and effective initial response (WFEC, 2014).

However, despite these long-standing calls to move beyond suppression, there have been considerable challenges to implementing a risk management approach to wildfire response on public lands (Schultz et al., 2019; Thompson et al., 2023). While there have been improvements in using response strategies other than full suppression (Young et al., 2020), the vast majority of fires (over 85%) are still suppressed and contained at 10 acres or fewer (Short, 2021). The factors encouraging a consequentialist mindset that favors fire suppression are numerous and occur at multiple stages of fire management. As described, fire management includes prefire planning, fire response, and postfire recovery. Prefire planning and the political and social landscape around fire management fundamentally shape the decision space and the incentives when a fire is on a landscape during fire response. For example, in places such as the wildland urban interface, policy may dictate that all fires are managed for suppression only (Steelman & McCaffrey, 2011). Even when policy is flexible, fire managers may face political or public pressure to minimize certain consequences and suppress fires at the smallest size possible (Calkin et al., 2012; Canton-Thompson et al., 2008). Challenges to adopting a risk management paradigm are numerous and include political, cultural, psychological, and economic barriers (Thompson, 2014; Thompson & Calkin, 2011; Thompson et al., 2016; Thompson et al., 2023).

In this case study, we focus on one facet of fire management, fire response. We examine the barriers to moving away from a fire suppression approach to a risk management approach in fire response. We explore the way consequentialism underpins fire manager decision-making and interacts with human cognition to favor fire suppression over risk management. Finally, we broaden our scope of ethical thinking and examine how moral pluralism and virtue ethics may contribute to "better" fire response.

CASE EXAMINATION

A risk management approach to fire response values efficient placement of resources that ultimately maximize the positive impacts of fire on the landscape and minimize the

negative impacts (Calkin et al., 2011). However, there are a variety of psychological barriers that make it difficult for fire managers to identify and implement efficient tactics (Thompson, 2014). Selecting efficient fire response strategies and tactics requires making repeated and path-dependent choices in a rapidly changing and uncertain context (Thompson et al., 2017). The fire response decision space is categorized by time pressure, risk, and uncertainty. In this environment, fire managers are unlikely and often unable to rationally deliberate between alternatives and optimize their response. Instead, fire managers are likely to use satisficing and make heuristic-based decisions.

Satisficing, in comparison to optimizing, is a decision criterion of bounded rationality; decision-makers establish a threshold of what constitutes a "good enough" decision and then select the first alternative meeting that threshold (Simon, 1956). One of the ways individuals satisfice is by using heuristics, which are decision rules or shortcuts that enable fast, "good enough" decisions (Gigerenzer & Gaissmaier, 2011). An example heuristic is "take the best," which speeds up the information search and evaluation process by strategically ignoring information and only considering the most predictive piece of information before making a choice (Gigerenzer & Goldstein, 1996).

Heuristics are not inherently bad and are frequently adaptive, enabling rapid decision-making with relatively little loss in accuracy (Gigerenzer, 2008). Heuristics enable experts to make efficient decisions under extreme time pressure where lengthy deliberation is not possible or prudent (Klein, 2008). However, heuristic-based decision-making can introduce or exacerbate cognitive biases that lead decision-makers astray in consistent and predictable ways (Kahneman & Klein, 2009). Consequentialism as the guiding ethical worldview may exacerbate cognitive biases and encourage fire managers to use heuristics that on average prioritize suppression instead of risk management in fire response. Consequentialism creates difficulties for fire manager decision-makers for two reasons. First, because fire response decision-making is categorized by *uncertainty*, it is difficult to even identify what a "good" decision is. Second, because fire response decision-making is categorized by *risk*, fire managers are subject to a variety of distortions and biases that ultimately favor minimizing certain risks and favoring the status quo. We consider each in turn.

The Challenges of Uncertainty: What Makes a Good Decision?

Uncertainty in decision-making is when the range of potential outcomes or the probability of those outcomes are unknown in some way. *Risk* in decision-making is when the potential outcomes and their probabilities are known with relative certainty, but the specific outcome is not. A coin flip, for example, has a discrete number of outcomes and a known probability of each outcome. Calling the coin flip represents decision-making under risk. In comparison, if the coin were weighted such that there were still two outcomes, but the probability of each outcome was not precisely known, this would be decision-making under uncertainty.

When making tactical decisions, such as where to send personnel, what resources to order, or where to place containment lines, the outcomes of these decisions are not completely in the fire managers' control and outcomes are *uncertain*. For example, weather plays a pivotal role in fire response and is a key driver of the success of a tactic (Finney et al., 2009; Hand et al., 2017). However, spot weather forecasts such as short-term surface winds are difficult to predict and the effect weather has on fire behavior can be nonlinear (Bayham et al., 2020; Young et al., 2019). Without knowledge of the possible range of consequences or their probability, it is difficult to choose tactics that maximize utility.

This challenge is largely acknowledged in the literature on risk management (Thompson et al., 2023). When making decisions in uncertain conditions, good fire management decisions (including prefire planning, fire response, and postfire recovery) should be judged based on the decision-making process, not the outcome (Maguire & Albright, 2005). Good decisions are those where fire managers acted in line with available information in order to uphold stated goals. However, there are multiple goals in fire and forest management. While there are policies in place to provide guidance on priorities, for example, firefighter safety as the priority (National Interagency Fire Center [NIFC], 2019), it is often not clear for fire managers how to prioritize diverse goals during response when a fire is on a landscape. When policy goals are ambiguous, fire managers will prefer to minimize short-term risk, which will tend to favor suppression-oriented tactics (Schultz et al., 2019). Difficult trade-offs and goal uncertainty may be clarified through inclusive dialogue and deliberation in a prefire planning context (O'Connor et al.,

2016; Thompson et al., 2022). Importantly, this dialogue needs to occur before a fire is on a landscape, when decisions are made rapidly or with little time for collaborative deliberation. Nevertheless, even when fire managers have a clear consequence or outcome in mind they are striving toward, there is inherent risk in fire response.

The Challenges of Risk: What Makes a Good Decision-Maker?

People routinely violate norms of economic rationality, especially when decisions involve risk (Kahneman, 2011; Newell et al., 2014; Tversky & Kahneman, 1974). Superficial characteristics of the decision, such as how information is framed, can heavily influence which alternatives people prefer and which decisions can be influenced by a variety of motivational and cognitive biases. It is important to assess how that poses challenges for normative economically rational decision-making and systems that evaluate the ethics of a fire response decision based on the consequences. Research suggests that fire managers are subject to a variety of heuristics and biases that induce risk aversion and favors fire suppression (see Maguire & Albright, 2005; Thompson, 2014 for overviews). For demonstration, we consider two challenges: loss aversion and affective risk perception. Loss aversion and affective risk perception are functions of human cognition; we are not suggesting they are the result of consequentialism. Rather, the interaction of these heuristics and consequentialist thinking ultimately contributes to fire response that favors aggressive suppression over risk management.

Decision preferences are readily influenced by loss aversion. Loss aversion is the phenomenon where, in general, the disutility of losing an object is larger than the utility from gaining it; or put another way, losses are more painful (and therefore more influential on decision-making) than foregone gains (Kahneman et al., 1991). What is a loss versus what is a foregone gain is often not an objective category, but rather a function of how information is framed. When emphasis is placed on a consequentialist mindset, loss aversion may lead fire managers to prefer suppression over risk management. It is expected when fire managers are choosing between the risk of *losing* values under direct threat from an ongoing fire versus *foregoing the gains* that could be achieved from restoring fire, loss aversion will encourage them to favor suppression.

Another challenge to normatively rational decision-making under risk is that people rarely experience risk in a calculative way, as the probability of exposure multiplied by the severity of the consequence. Rather, the affect or emotional feeling evoked by the risk informs risk tolerance. Risks that are affectively rich (dread-evoking, involuntarily imposed, novel) are perceived as riskier and thus less tolerable than affectively poor risks of the same magnitude and consequence (Slovic, 1987; Slovic et al., 2004). Because framing can alter how affectively rich a risk is, this can lead to inconsistent risk preferences. For example, when choosing between fire response tactics, fire managers were much more willing to accept risk to firefighters when those risks were framed less affectively (hours of exposure) than when those risks were framed more affectively (expected fatalities per 1,000 fires) (Hand et al., 2015). Currently, certain risks in fire management are framed more affectively than others. The dominant culture of wildfire management perpetuates norms that frame fires as emergencies where human life is imminently at risk (Thompson et al., 2018).

Importantly, it is not inherently unethical or misguided to use affect (i.e., emotions, feelings, and mood) to inform risk preferences. Risk as a calculation of the number of people exposed to a hazard and the severity of the consequences can leave important attributes out of the equation if the consequence is not easily quantifiable or if there is disagreement about the severity of the consequence. For example, one goal of fire response is not to spend more on suppression than the worth of the values at risk. Despite that, fire managers are often relatively insensitive to cost and willing to spend much more on suppression resources to save a home than the home is worth (Calkin et al., 2012). However, it is arguably ethically defensible to claim that houses are worth more than their financial value. Regardless, the ramification for risk management is that when fire managers try to strike a balance between risks, they do so at least in part by considering how affectively rich or emotionally provoking those risks are. Immediate risks are richer in affect than distant risks, and risks to human health will likely be richer in affect than other risks. Thus, even when trying to balance risks, there will be a propensity to prioritize and minimize those risks that are mitigated through suppression.

The Limits of Consequentialism and Fire Response

These challenges demonstrate that, because of the consequentialist foundation of decision-making, even

deliberative fire managers endorsing risk management may still arrive at risk averse decisions that favor fire suppression. Fire response is categorized by uncertainty—fire managers may not know the possible outcomes if they choose a given management strategy. It is difficult to make optimal decisions based on the consequences when the consequences are uncertain and not in the decision-maker's control in important ways. However, even under conditions of risk, when the potential outcomes are known, and expected utility can be calculated, fire managers, like all people, struggle to maximize utility due to cognitive biases and heuristics. Thus, when fire managers evaluate their decisions against a standard of consequentialism, they will put weight on known, affectively rich, near-term outcomes. This may manifest as fire suppression and appear to be inefficient or ineffective risk management.

To be clear, this is not a criticism of fire managers, or a criticism of consequentialism as the ultimate ethic of fire *management*, but rather it is an acknowledgment of the limitations of consequentialism as the guiding ethic of, at least, fire *response*. Fire managers have considerable expertise and are able to leverage their expertise to rapidly make well-reasoned decisions under emergency conditions during fire response (Drews et al., 2015; Rapp et al., 2020). Deliberation and preoccupation with the full range of consequences of wildfire are reasonable and defensible and are a key component of prefire planning that facilitates effective risk management during fire response (Greiner et al., 2021; Thompson et al., 2022). Risk and uncertainty do not preclude quality decisions in all contexts. With time, transparency, and deliberation, decision-makers can come to reasonable and defensible decisions that increase the probability of positive outcomes.

However, to be useful, an ethic must arguably be feasible to implement and lead to its own definition of a "better" world when implemented. Consequentialism, despite being the dominant ethic of fire response, may not provide clear guidance and is difficult to implement. It is important to note that this is not a definitive refutation of all consequentialist or even utilitarian mindsets as a guiding principle for fire management. However, consequentialism is one ethical theory among many in natural resource and fire management. In the interest of looking beyond consequentialism as a guiding ethic, we examine the idea of *moral pluralism in fire management*, with particular emphasis on virtue ethics as an additional or alternative guiding worldview for fire response.

Moral Pluralism and Fire Management

In this case study, we have looked at one ethical theory, consequentialism. However, when making decisions with ethical components in NRM, people may evoke and use multiple moral systems (Gore et al., 2011; Vucetich et al., 2021). For example, when justifying wildlife management actions, members of the public use a variety of systems including natural law theory (in brief, that which is natural is ethically good) and consequentialism (Gore et al., 2011). Ethical systems can also be adapted. In our discussion, we have largely categorized consequentialism in line with the tradition of *act utilitarianism.* However, ethicists have developed other systems of utilitarianism to address some of the broader criticisms (Sinnott-Armstrong, 2023). Importantly, none of these archetypes of utilitarianism or consequentialism are applied in fire management or fire response in their purest form, given the challenges to applying them in this real-world context.

Moral pluralism is arguably necessary for fire management given the diversity of ethical issues in fire management, from decision-making under risk and uncertainty, to metaethics, epistemological considerations, and more (see Goldstein & Kennedy, 2022 for a review). Within the context of wildfire risk management, moral pluralism asks us to be thoughtful about the different ethical systems used at the various stages of wildfire management. Consequentialism can create a dilemma wherein even fire managers who value a risk management perspective may still make overly risk-averse, suppression-oriented decisions because the decision context is categorized by considerable risk and uncertainty. To be sure, the consequences of a fire should not be removed from fire response decision-making. However, can other ethical systems in addition to or in lieu of consequentialism support transparent and defensible decision-making in fire response? For illustration, we consider one ethical system, virtue ethics, and highlight the ways in which virtues already play a role in fire response.

Virtue Ethics and Moral Pluralism in Fire Response

One ethical theory that is quite different than consequentialism is known as "virtue theory." This theory suggests a moral person, or the ethically appropriate policy or action, is the one that strives to embody and manifest a set of characters traits or virtues (Hursthouse & Pettigrove, 2023). Some virtue theorists suggest that only by focusing on virtuous motivations and actions, we will

facilitate positive outcomes. Hence, while virtue theorists are interested in facilitating a better world, they believe this is accomplished by not focusing on consequences of actions and policies but by focusing on the enhancement of certain virtues. Common examples of the virtues we should be working to manifest include humility, respect, care, love, empathy, courage, and gratitude.

Concern over the justifications of killing millions of animals annually in the name of conservation, "compassionate conservation" is a recent movement in wildlife management attempting to refocus on virtue ethics; namely the virtue of compassion (Wallach et al., 2018). Compassionate conservation asserts that the manifestation of the virtue of compassion requires that we acknowledge both individual lives and collectives such as species and ecosystems matter morally and need to be accounted for in our natural resource decision-making. Advocates of compassion in conservation also assert the importance of emotion in moral understanding and reasoning and not just the calculation of expected utility (Batavia et al., 2021). In disaster response, many virtues are important, including prudence, care, humility, courage, justice, and others (Geale, 2012).

What virtues may lead to better fire response? We can look to several sources for guidance, namely, fire managers themselves. As discussed, the research on the decision psychology of individual fire managers has highlighted the challenges to normatively rational decision-making. However, research on the social-psychological determinants of fire response focuses on the attributes of fire managers that contribute to effective fire response team functioning. Resoundingly these studies reiterate the importance of interpersonal and communication skills for effective information flow, maintaining a shared mental model, and coordinating decision-making. There are overlaps in findings and three main takeaways emerge from this work: (1) Clear and inclusive communication skills and effective leadership are valued by fire managers as skills necessary for effective and safe fire response (Black & McBride, 2013; Boyatzis et al., 2017; Hayes & Omodei, 2011). (2) Good leaders are competent decision-makers, personally genuine displaying humility and benevolence, and act with integrity by being reliable, sticking to their word, and relaying information to their crews (Waldron et al., 2015). (3) Trust between fire managers serving on an incident is critical for team success and safe response (McLennan et al., 2006) and trustworthy team members display competence, integrity, and benevolence (Rapp & Wilson, 2022). Rapp and Wilson (2022) find that competence derives from operationally sound decision-making, integrity derives from honesty, humility, and accountability, and benevolence derives from sincere care and concern for other firefighters.

WHAT ARE THE VIRTUES IN FIRE RESPONSE? A consequentialist ethic can lead to a dilemma wherein fire managers struggle to achieve the best outcomes under that standard. The virtues valued in fire response ought to facilitate transparent and defensible decision-making, or at least not lead to behavioral dilemmas. From the work on the social-psychological attributes of team functioning, we can draw evidence for the kinds of virtues that may facilitate ethical fire response in the absence of clear consequentialist decision criteria. Repeatedly, humility, honesty, and compassion for fellow team members emerge as important character traits for fire response. Facilitating or cultivating these virtues would require incorporating them into formal and informal reward systems. For example, the Standard Fire Fighting Orders of the 1950s encouraged firefighters to adopt certain virtues, such as alertness, discipline, and diligence (Thackaberry, 2005). Similar to the ways consequentialism influences fire management, virtue ethics as a guiding philosophy were not explicitly mentioned as a motivator for the Standard Orders, but they still represent a manifestation of such a system.

Importantly, focusing on virtues rather than (or in addition to) consequences does not preclude reasoned or deliberative analysis of the expected outcomes of decisions. In fact, it may lead to better outcomes (and consequences) overall. For example, a fire manager who embodies humility is open to new information and is willing to adapt when a tactic is not working. This is important for overcoming issues such as sunk cost bias and framing effects from seeing an issue from only one frame. Honesty allows for clear communication, which is critical for up-to-date information to reach decision-makers and for decision-makers to understand the full range of opportunities and consequences. Honesty is also important for trust, which is necessary to reduce the number of resources people must dedicate to monitoring and double-checking each other in time- and resource-limited decision spaces. Finally, a fire manager who embodies compassion may use affect (feelings, emotions, mood)

deliberately and thoughtfully to inform their risk preferences, rather than trying to remove affect from the decision-making process (which may not remove affect, but rather, make its influence unknown or uninterrogated).

As demonstrated, these virtues are intended to facilitate transparent and defensible decision-making and to uphold the goals of wildland fire risk management. Further, these virtues are not new or absent from fire response; they are derived from the attributes fire managers already recognize as important and valuable for team functioning. Our suggestion fundamentally is one of interrogating the status quo of fire management and asking if there are already alternative systems available that are thoughtful and actionable. Virtue ethics as a guiding ethic, we argue, is theoretically defensible, practical to implement, and may help alleviate the behavioral dilemma consequentialism exacerbates. We use virtue ethics as an example, but moral pluralism is also not limited to a choice between virtue ethics or consequentialism. A full treatment of possibilities is outside the scope of this article, but other ethical systems potentially relevant to fire response include ethics of care, Indigenous or feminist ethics (see Noddings, 1995; Whyte & Cuomo, 2017 for examples) and duty ethics (Thackaberry, 2005).

CONCLUSION

Consequentialism permeates NRM, at times serving as the dogmatic ethical underpinning of decisions. However, we ought to interrogate dogmatic ethical systems and ask ourselves if they are appropriate and defensible. It is difficult to successfully apply a consequentialist ethic to wildfire response in the United States. Wildfire response is categorized by significant risk and uncertainty, which makes it difficult to evaluate the consequences (and therefore ethical appropriateness) of one's decisions. Further, the psychology of judgment and decision-making reveals the way it is difficult for decision-makers to maximize utility, and indeed fire managers ultimately may face a behavioral dilemma where trying to take a risk management perspective leads to risk-averse, suppression-oriented management that ultimately increases the probability of negative outcomes in the long run.

An important feature of fire response is the extreme time pressure that may not be applicable to other non-hazard natural resource issues. However, this same interrogation of underlying ethical assumptions ought to be applied to all NRM issues, many of which use or are influenced by a consequentialist ethic. As climate change leads to greater uncertainty for many NRM issues, understanding the consequences of management actions may be difficult. Rather than applying a poorly fit system or precluding ethics from the discussion altogether, practitioners and decision-makers ought to ask what system or systems make sense to guide their behavior. As the status quo of natural systems changes, we argue the status quo ethical systems we apply may need to as well.

CASE STUDY QUESTIONS

1. In this case study, we argue that heuristics (rules or shortcuts that enable fast decision-making) are not inherently good or bad. They enable rapid, "good enough" decision-making but can introduce or exacerbate cognitive biases. We focused on some of the problems from heuristics. How might heuristics help NRM decision-making?

2. In this case study, we looked at only two ethical theories in detail: consequentialism and virtue ethics. What would it look like to implement a different ethical theory in fire management (e.g., natural law theory, care ethics, deontology/duty ethics, etc.)?

3. Repeatedly we see ethical theories influence decision-making without direct consideration (e.g., consequentialism influencing the idea of risk management, or Standard Firefighting Orders representing virtues). How can ethical systems be incorporated explicitly into fire management? For example, how would virtues like compassion and honesty become part of the incentive structure of fire response?

4. Select a NRM issue you are interested in. What are the built in assumptions about what constitutes a "right" decision about that natural resource?

5. We discuss the idea of *moral pluralism*, that people may not ascribe to one ethical system but rather use multiple ethical systems to guide or justify their behavior. Which moral reasoning do you think is most appropriate for NRM issues? Taking a step back: How should one choose which moral reasoning is most appropriate for a given natural resource issue?

6. We propose humility, honesty, and compassion as virtues for fire response. Do you agree with these virtues for fire response or fire management? Taking a step back: What virtues (if any) should we try to embody for environmental management more broadly?

7. How ought the virtues described (humility, honesty, compassion) be encouraged in fire response? Should these virtues be encouraged formally through policy, or informally through cultural norms? How?

Review the Teaching Slides (Supplemental File) as needed while discussing the Case Study Questions.

AUTHOR CONTRIBUTIONS

Conceptualized, wrote, reviewed, and edited the manuscript: CR, MPN.

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The authors have declared that no competing interests exist.

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SUPPLEMENTAL MATERIAL

Teaching Slides: Example slides instructors may use to introduce the key points in the case study and stimulate classroom discussion.PPTX file.

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