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Translating climate change policy into forest management practice in a multiple-use context: the role of ethics

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Abstract Managers of public multiple-use landscapes are charged to balance a spectrum of interests and objectives, a task that has become increasingly challenging in light of global climate change. Forests supply a diverse array of social, economic, and environmental goods and benefits, but also stand to contribute to climate change mitigation by sequestering and storing carbon. The scientific dimensions of management decisions made against this backdrop are well appreciated, but their ethical complexity tends to be, at best, understated. Focusing on the issue of carbon storage for climate change mitigation in federal forests of the United States Pacific Northwest, we employ the method of argument analysis to highlight the role of normative or ethical judgments in multiple-use forest management. We demonstrate that such decisions are logically predicated on normative judgments about which public interests merit recognition and prioritization in the decision context. We show that a generalized commitment to multiple-use is insufficient as a normative basis for management decisions, and that more ethically explicit judgments are required to reach actionable conclusions about appropriate management objectives.

1 Introduction

Forests have been widely recognized as critical allies in the international response against global climate change, largely for their capacity to sequester and store carbon from the atmosphere (McKinley et al. 2011). Directives from international levels of governance have provided overarching impetus for nations to integrate climate change mitigation into their forest management programs, as part of a broader social agenda for sustainable development (United Nations 2015). In the USA, national policies related to climate change mitigation in forests have similarly been situated within a multiple-use framework (MUSY 1960; USFS 2012), presenting carbon storage as one of many social, economic, and ecological objectives of

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federal forest management (e.g., White House Office of the Press Secretary 2013). Managers on the ground must interpret these policies to determine whether or in what capacity they should incorporate carbon sequestration and storage into current and future management strategies (Dilling and Failey 2013).

Although dynamics of carbon in forests are well understood (McKinley et al. 2011), which forest management strategies most effectively sequester and store carbon is a matter of some debate (e.g., Law and Harmon 2011; Miner et al. 2014). Running parallel to the scientific questions underpinning these debates are ethical questions about whether or to what extent forests *should* be managed to sequester and store carbon. However, while the scientific dimensions of carbon management in forests are well appreciated and highly researched (e.g., McKinley et al. 2011), its ethical dimensions have received comparatively little attention. The aim of this paper, therefore, is to illustrate why ethics are pertinent to the discourse around carbon storage and forest management. Using a standard philosophical method called argument analysis, we illustrate some of the ethical judgments embedded within decisions about whether or how to incorporate climate change mitigation into forest management on the ground. We focus on federal forests of the US Pacific Northwest (PNW), whose large stocks of carbon render them highly significant to the international agenda of climate change mitigation (Smithwick et al. 2002; Keith et al. 2009).

After a brief background establishing the regulatory context for carbon management in federal forests of the PNW, we explain the method of argument analysis and its application to the topic at hand. Using this method, we demonstrate that a generalized commitment to serve the public good and provide for multiple uses, as advanced in national policy directives for climate change mitigation in US federal agencies, does not in itself point to any particular management strategy on the ground. We show that any operational management prescription necessitates more ethically explicit normative judgments, which we suggest need to be more systematically incorporated into decision-making processes. The observations in this paper are applicable to contexts beyond federal forest management in the USA, and are also not unique to the issue of carbon management and climate change mitigation. As we hope will become clear, whenever objectives are set or decisions are made, particularly in a multiple-use public lands context, ethical judgments are inherently and unavoidably involved. However, this point takes on heightened significance in light of global climate change, which compounds not only the complexity but also the urgency of forest management decisions. With high stakes and stakeholders at local, national, and global scales, the impact of forest management decisions, particularly in the carbon-dense federal forests of the PNW, are profound. For this reason, we suggest the ethical dimensions of carbon management for climate change mitigation merit concerted attention from the forest management community.

2 Background

Federal forests in the PNW were harvested intensively throughout most of the twentieth century, to the extent that they represented a net source of atmospheric carbon (Cohen et al. 1996). With the implementation of the 1994 Northwest Forest Plan, the intensity and level of federal forest harvest dropped sharply throughout the region (Thomas et al.

2006), and PNW federal forests have since seen a steady increase in carbon stocks (Krankina et al. 2012). Although temperate rainforests of the PNW, particularly in the late-successional classes, rank among the world's highest capacity forests for carbon sequestration and storage (Smithwick et al. 2002; Luyssaert et al. 2008), researchers project increasingly frequent and severe wildfires in the western USA, especially in forests grown dense from years of fire suppression, a trend that could generate higher carbon emissions (Spies et al. 2010; Wimberly and Liu 2014). Some have suggested thinning treatments to reduce wildfire severity and related carbon emissions (e.g., Hurteau and North 2009), but these proposals are not without controversy. Indeed, in some modeling analyses, the net carbon emissions produced by fuel density treatments are actually higher than the emissions that would result from wildfire in an untreated forest (Mitchell et al. 2009; Campbell et al. 2012). Still, while thinning treatments may not enhance carbon storage and sequestration, they can serve other important objectives, such as public safety and forest health, by reducing wildfire severity (Mitchell et al. 2009). This is particularly important to bear in mind given the multiple-use context of federal land management.

US federal management agencies were established on the basis of utilitarian principles, in which natural resources are managed and conserved for the public benefit to provide "the greatest good of the greatest number" (Pinchot 1947). The utilitarian foundation of agencies such as the Bureau of Land Management (BLM) and the United States Forest Service (USFS) found clear expression in key environmental legislation passed in the mid-twentieth century, including the 1960 Multiple-Use Sustained-Yield Act (MUSY) and the 1976 National Forest Management Act. Today, federal management agencies remain committed to a multiple-use philosophy, providing for a range of public benefits within the limits of healthy, adaptive, and resilient ecosystems (USFS 2012). Against this backdrop, federal land management agencies have increasingly been asked to incorporate global climate change into their objectives (Smith 2008; Olander et al. 2012). For example, the Climate Change Roadmap issued under the 2008 Strategic Framework for Responding to Climate Change placed carbon sequestration and storage on the USFS agenda, on the grounds that,

> Managing America's forests and grasslands to adapt to changing climates will help ensure that they continue to produce the benefits that Americans need while helping to mitigate the effects of a changing climate and to compensate for fossil fuel emissions through carbon storage in healthy forests. (USFS 2010, p. 2)

Several years later, President Obama's Executive Order 13653 stipulated,

> recognizing the many benefits the Nation's natural infrastructure provides, agencies shall, where possible, focus on program and policy adjustments that promote the dual goals of greater climate resilience and carbon sequestration, or other reduction to the sources of climate change. (White House Office of the Press Secretary, 2013, Sec. 3)

Recently, the Council on Environmental Quality (CEQ) ruled that federal managers must account for potential carbon impacts when environmental assessments are conducted in accordance with the National Environmental Policy Act (NEPA), citing as justification the purpose of NEPA to, "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man [*sic*]" (cited in CEQ 2016, p. 2, footnote 5).

These national policy statements provide minimal direction about when, why, how, to what extent, or under what circumstances carbon sequestration and storage for climate change mitigation should be prioritized (or not) as federal forest management objectives. Instead, policy directives offer only generalized appeals to the standard principles of federal land management outlined above, namely, the public good and multiple-use, to guide decision-making on the ground. In the analysis that follows, we will consider whether these two general principles provide sufficient normative justification for managers to incorporate climate change mitigation into their actions and objectives.

3 Methods

Arguments are basic building blocks of philosophy, including the philosophical sub-discipline of ethics. By articulating ideas formally as arguments, philosophers are able to examine, assess, and critique underlying values, beliefs, and assumptions. This mode of analysis can also be used to assess the reasoning behind decisions made in natural resource management (Nelson and Vucetich 2012). Formally, an argument is composed of a series of premises (P) leading to a conclusion (C) (Copi and Cohen 2009). According to the rules of deductive logic, if a conclusion necessarily follows from its premises, an argument is *valid*. If an argument is valid and all its premises are true or appropriate, the argument is *sound*. Consider the following simple argument:

P1. All trees are plants.
P2. All plants have flowers.
C. Therefore, all trees have flowers.

Here the chain of inference is valid, since the conclusion must be true if both P1 and P2 are true. However, P2 is untrue, so the argument is not sound.

Unlike the example above, which is purely descriptive, arguments for management decisions are prescriptive or normative, i.e., they suggest we *should* or *ought to* pursue some strategy or objective. As a basic rule of logic, normative conclusions cannot follow from descriptive premises alone. It would be impossible to argue, for example,

P1. Old-growth forests store large amounts of carbon.
C. Therefore, old-growth forests should be preserved.

This is an example of the "is-ought" fallacy, so named because it is logically impossible, or fallacious, to conclude something *ought to be* the case solely on the basis of what *is* the case (Hume 2000). There must be a normative premise to justify the normative judgment reached in the conclusion, e.g.,

P1. Old-growth forests store large amounts of carbon.
P2. Forests that store large amounts of carbon should be preserved.
C. Therefore, old-growth forests should be preserved.

P2 states the critical value judgment linking P1 and C together, thereby avoiding the is-ought fallacy.

Any practical management recommendation or decision can be stated formally as an argument, a useful exercise that renders both the scientific and normative premises underpinning management decisions apparent and open to critical assessment. In this

paper, we focus primarily on normative premises, in line with our stated purpose to highlight the role ethics play in translating climate change policy into practicable forest management objectives.

4 Analysis

As dictated by high-level policy directives, climate change mitigation is supposed to be incorporated into management objectives for federal forests in the USA, including the PNW. A common theme underlying these various directives (see quotations above) is an appeal to the public good. In argument form this might be stated:

P1. PNW federal forests should be managed to serve the public good.
P2. Addressing global climate change serves the public good.
C. Therefore, PNW federal forests should be managed to address global climate change.

At face value, the argument seems sound. P1 can be considered generally appropriate, if we agree natural resources should be held and managed in the public trust (Baer 1988).[1] P2 is also generally true, if only because it is difficult to dispute such an ambiguous premise. To "address climate change" (USFS 2010; CEQ 2016) might mean any number of things, e.g., to adapt to, mitigate, acknowledge, or even dismiss global climate change. "Addressing global climate change" does not commit managers to any particular action or objective, but merely obligates them to somehow or in some capacity account for it. On the assumptions that climate change is pertinent to forest management; that management decisions are better, on the whole, when all pertinent considerations are taken into account; and that the public benefits (again, in the most general sense), from better rather than worse federal forest management decisions, we can consider the premise true. However, because P2 is not particularly meaningful neither is the conclusion, offering little by way of concrete guidance as to how, in operational terms, managers should "address global climate change." The ambiguity of the conclusion reflects the ambiguity of the second premise, which in turn reflects the generality of the first premise and "the public good" to which it appeals. Here, it is important to recognize that "the public" is not a single, uniform entity. Especially in the context of land management, many and diverse publics can be defined according to any number of different criteria, e.g., shared geography, shared culture, or shared interests (Fraser 1990; Morrell and Harrington-Buhay 2012). Without precisely delimiting "the public," we are unable to specify "the public good," and so can make only general proposals about how it is served.

To arrive at an operational conclusion, i.e., a specific management decision or recommendation, it is first necessary to more clearly characterize "the public good." Since climate change affects or will affect populations around the world, present and future, it perhaps makes sense to start by defining "the public" in the broadest sense, i.e., the global public, present and future:

P1. PNW federal forests should be managed to serve the broadest public good.

Next we must determine what serves "the broadest public good," by establishing what interests the broadest public has in relation to PNW federal forests. We might be inclined to approach the task scientifically, eliciting attitudes and preferences from a representative sample of the broadest public to determine which management strategies in PNW federal forests are

[1] However, the public trust doctrine is not without controversy (e.g., Lazarus 1986; Vucetich et al. 2017).

perceived to be in its own best interest. At least two problems immediately arise with this approach. First, the logistical challenges of accurately measuring and fully representing global public perceptions of forest management in the PNW are formidable, and likely prohibitive. Second, even were it possible to overcome logistical challenges and poll the global public, it is not possible to poll the future public.

Rather than attempting to understand the broadest public's subjective perceptions of its own good, we can instead approach the question analytically, to determine which sorts of actions or strategies would objectively serve the interests of this broadest public (Wellstead et al. 2003). Federal forests in the PNW provide many tangible benefits and resources, including timber, employment, and recreational opportunities (e.g., Williams et al. 2017). We can consider these "concentrated" benefits, in the sense that they are directly beneficial and distributed among a small, discrete number of individuals (Overdevest 2000). While local publics may have a strong interest in management strategies emphasizing provision of concentrated benefits, the broadest public is likely better served by provision of "diffuse" benefits, which are widely shared, often indirectly beneficial, and generally small per capita (Overdevest 2000). Carbon storage and climate change mitigation fall into this latter category.

If the global public is more likely to benefit from diffuse rather than concentrated benefits, and climate change mitigation is considered a diffuse benefit, we can continue the argument:

P2. PNW federal forest management prioritizing global climate change mitigation serves the broadest public good.
C1. Therefore, PNW federal forest management should prioritize global climate change mitigation.

Since the strongest defense forests offer against climate change is their capacity to sequester and store carbon from the atmosphere (Pan et al. 2011), it is reasonable to posit that management prioritizing climate change mitigation will maximize carbon sequestration and storage capacity:

P3. Carbon sequestration and storage in forests mitigates global climate change.
C2. Therefore, management of PNW federal forests should prioritize carbon sequestration and storage.

Concluding the argument with a specific management recommendation requires a next premise to operationalize C2, by proposing a particular management strategy that prioritizes carbon sequestration and storage. In general terms,

P4. Prioritizing carbon sequestration and storage in PNW federal forests means doing X.
C3. Therefore, PNW federal forest management should do X.

The nature of "X" is a matter of scientific contention (Law and Harmon 2011; Miner et al. 2014). In some contexts researchers suggest carbon can most effectively be sequestered and stored by restricting the frequency and intensity of forest harvest (DellaSala et al. 2015). In other cases, researchers suggest forests will most effectively sequester and store carbon when managed on relatively short, intensive rotations, taking advantage of the high sequestration rates of young forests and the storage capacity of durable wood products (Miner et al. 2014). Some researchers suggest a combination of both strategies (Favero et al. 2017). It is not our purpose here to weigh in on the scientific debates around forest carbon management, so we leave this part of the argument in generic form.

In this argument, we had to specify a particular public before we were able to arrive at a practical recommendation. As a starting point, we used the broadest (global, present and future) public, but what happens if we characterize "the public" differently? For instance, it could be argued that managers are accountable primarily to proximate publics, i.e., local populations who reside or work in the immediate vicinity of federal forests. In premise form:

P1. PNW federal forests should be managed to serve the proximate public good.

Proximate publics are diverse and have diverse interests. Consider, for example, communities in and around national forests in the Blue Mountains of eastern Oregon and Washington. Years of fire suppression have resulted in dense but also dry, often drought-stricken forests, which are at high risk of catastrophic wildfire (Mutch et al. 1993), particularly as the climate shifts to hotter temperatures and dryer summer seasons (Wimberly and Liu 2014). For these local publics, the concentrated benefits of fuel treatments that both provide employment and reduce fire severity (Mitchell et al. 2009) are likely greater than the diffuse benefits of carbon sequestration and storage. Indeed, stakeholders in many eastern Oregon communities have a strong expressed interest in promoting fire resilience (Davis et al. 2017). Therefore, a management decision based primarily on the good of these proximate publics might be defended, in argument form, as follows:

P2. Management enhancing the resilience of fire-prone PNW federal forests serves the good of the proximate public.
P3. Density thinning treatments enhance the resilience of fire-prone PNW federal forests.
C. Therefore, fire-prone PNW federal forests should be managed with density thinning treatments.

Other proximate publics may be better served by other objectives, including some not directly related to climate change mitigation or resilience. For example, since the early days of the Northwest Forest Plan, calls have been made to increase timber production on federal lands for various reasons, including economic recovery in communities adversely affected by the decline in federal harvest (see, e.g., Tuchmann and Davis 2013). The argument here might be:

P2. Managing PNW federal forests sustainably for a higher yield of timber serves the good of the proximate public.
C. Therefore, PNW federal forests should be managed sustainably for a higher yield of timber.

Again, our intention is not to substantively evaluate these arguments, but to demonstrate that a general commitment to "the public good" does not justify any particular management action on the ground without additional normative specification. The composition of "the public" is neither fixed nor given, but rather defined by a process of selection reflecting, at least in part, judgments about the interests most relevant to the decision context (Reed et al. 2009). As discussed below, these judgments are inherently ethical.

It could be contended that the arguments formulated above are straw men, since the charge of federal land managers is not to serve any single public, but to provide a suite of benefits for the overall greatest good (MUSY 1960; USFS 2012). Next we consider whether a commitment to multiple-use, as an extension to and elaboration of the principle of management for the public good, provides a suitable normative basis for forest management decisions. In this

section, we briefly depart from the context of climate change, per se, so as to avoid unnecessary distraction with empirical details.

We begin with a premise built from MUSY (1960) stating the US federal forest manager's multiple-use obligation:

P1. PNW federal forests should be managed for multiple uses in a combination that best meets the needs of the American public.

Although the multiple-use doctrine does appeal to a general American public, it also presupposes that this public is variegated in its interests with regard to public lands. While we do not, consequently, need to specify a single public or public interest, we do need to clarify what it means to "best meet the needs of the American public," especially given the fragmented and often conflicting interests of its various sectors (Culhane 1981; McCool and Guthrie 2001). Referring again to MUSY (1960), which stipulates, "coordinated management of the various resources…with consideration being given to the relative values of the various resources" (Sec. 5, 10–4), we construct the premise:

P2. Multiple use management best meets the needs of the American public when it reflects the relative values at stake.
C1. Therefore, PNW federal forests should be managed for multiple uses in a combination that reflects the relative values at stake.

Although we have arrived at a general maxim for management, the critical next step is to define the values at stake and their relative importance in the decision context. Stated generically in variable form,

P4. The values at stake are X, Y, and Z.
P5. In importance, X>Y>Z.
C2. Therefore, we should manage for X, Y, and Z in a combination that reflects the relative importance X>Y>Z.

Operationalizing these statements of priority is the next step, and the argument could continue with a premise asserting that some management action or alternative appropriately reflects the values at stake. However, we stop here. As noted above, our intent is neither to assess specific management strategies, nor to comment on any specific values or their relative importance. The purpose of this formal analysis is to highlight the additional, ethically explicit judgments (P4 and P5) logically required to supplement the multiple-use maxim in order to arrive at a specific management decision or recommendation. But on what grounds do we claim P4 and P5 are ethical judgments?

Acknowledging values at stake is itself a value-laden process of selection. Deciding whether to buy a bottle of water, for example, I recognize that the decision bears not only on my interests, but also on the interests of other people, nonhuman beings, and the abiotic environment, all of whom are affected to some degree by my consumption choices. These recognitions reflect my values and beliefs. By the same token, I am not likely to recognize the interests of the bottle. The bottle, in my mind, has no good of its own or interests at stake, and so will not even enter my decision calculus. Ethicists refer to this act of basic recognition as "moral consideration." To grant consideration to some object or entity, X, is "to consider X (to attend to, to look at, to think about,

where appropriate to sympathize or empathize with X, etc.) with the goal of discovering what, if any, direct ethical obligations one has to X" (Birch 1993, p. 315). Returning to the argument, P4 can be interpreted as the result of a selection process by which only those deemed worthy of moral consideration are recognized as stakeholders. Only their values are brought to the table, while others are ignored and subsequently excluded, effectively reduced to the status of non-entities with no say, bearing, or representation in the decision context. While the definition of values is in part a social or political process (Reed et al. 2009), it is and should also be treated as an exercise of ethical judgment, given the potentially profound moral implications of excluding morally relevant interests or denying consideration where it is due, whether intentionally or not. Either outcome stands to enact harm and perpetuate injustice, which are both inherently ethical concerns.[2]

We are also required to make value judgments describing our different moral obligations and responsibilities to various entities within the class of morally considerable beings (Goodpaster 1978). To grant consideration is to recognize an interest, but mere recognition says nothing about where that interest stands relative to all others in the decision context, or the weight it should be granted. Ethicists refer to the relative importance of morally considerable beings as their "moral significance" (Goodpaster 1978; Hale 2011). In management contexts, judgments of moral significance entail weighing, comparing, ranking, and/or prioritizing stakeholder interests and values, resulting in judgments such as those stated generically in P5 above. Again, although these judgments may be influenced by social, political, or even administrative and logistical considerations, they are also fundamentally ethical in the sense that they bear on the representation, welfare, rights, and at times even survival of certain stakeholders.

In summary, the very process of identifying values at stake (P4) has ethical implications, as does the subsequent process of weighing and arbitrating among them (P5). At a basic level, these two premises express beliefs about who counts and how much, judgments that both fall squarely in the ethical domain. Though federal management agencies in the USA all begin with the overarching normative premise that federal lands should be managed for multiple-use (P1), the multiple-use mandate does not in itself support specific management actions or objectives. To arrive at the practical conclusion "managers should do X," the normative multiple-use premise must, as a matter of logic, be bolstered by more ethically explicit judgments about the values at stake and their relative importance.

5 Discussion

At both national and international levels of governance, federal land management agencies in the USA have been charged to address global climate change. However, this charge has not generally materialized in management priorities or practices on the ground (Failey and Dilling 2010; Timberlake and Schultz 2017). Ellenwood et al. (2012) report that climate change mitigation is "on the radar," but in the absence of clear policy mandates, managers are uncertain about how to integrate climate change mitigation into their operations. Our analysis

[2] By the same line of reasoning, choosing how to define "the public," as in the first set of arguments above, also involves ethical judgment.

is consistent with these findings. We demonstrated that generalized appeals to principles such as "the public good" or multiple-use do not in themselves suggest specific management decisions or recommendations for climate change mitigation. To arrive at practical management decisions necessitates ethically explicit judgments defining relevant interests and values, as well as their relative significance. This task is formidable given the multitude of actors and interests at stake in both forest management and climate change mitigation (Reed et al. 2009). It is unsurprising, in this sense, that managers have struggled to integrate climate change mitigation objectives without clear normative guidance.

Although we have focused specifically on the US PNW, the observations in this paper may be pertinent to other issues in forest management or environmental governance where multiple-use or some iteration of it underpins operative policy frameworks. For example, the 2015 Paris Climate Agreement advances climate change mitigation as part of a broader agenda that also includes sustainable use, protection of ecosystem integrity, economic development, and poverty eradication (United Nations 2015). In a similar vein outside the immediate climate change arena, the United Nations Convention on Biological Diversity appeals to the good of present and future generations, seeking to protect the multiple benefits and values of biodiversity (United Nations 1992). In deciding how best to achieve a suite of goals, national policymakers have a wide berth of discretion in distributing costs and benefits of climate change mitigation (or biodiversity conservation) among various governmental and non-governmental sectors (Buizer et al. 2014; Hale 2016). Following the logical structures illustrated above, these high-level directives will ultimately be translated into action on the ground (Buizer et al. 2014), where relevant decision-makers must decide how to execute policy in a way that appropriately balances diverse interests at multiple scales (Adger et al. 2006). This necessitates ethical choices about who should be represented, and with what level of priority their interests should be served.

Although management decisions reflect social, political, and economic conditions and constraints (Brown and Corbera 2003; Adger et al. 2006), we suggest explicit attention should also be granted to their ethical dimensions. Decision-making authority in many forest management contexts, including US federal forestlands, still lies largely with agents of the state (Shackleton et al. 2002; Butler et al. 2015), but there is broad agreement that stakeholders should at least actively influence decisions impacting their interests (Lynam et al. 2007). To this end, we highlight argument analysis as a potentially valuable tool from the scholarly discipline of ethics. Argument analysis may be useful for managers or other decision-makers who seek to systematically integrate ethics into decision-making processes, perhaps in conjunction with established processes of stakeholder engagement or multi-criteria decision support protocols (Gamper and Turcanu 2007; Ananda and Herath 2009). By rendering transparent the normative premises underpinning management decisions, argument analysis can provide a platform for participatory processes representing diverse public interests, and also focalize key ethical questions for further scrutiny and discussion.

Issues of environmental governance, including climate change, span human interests at local, national, and global scales, and in any forest management context there will inevitably be more than one morally considerable human interest at stake (Adger et al. 2006). In adjudicating these interests, previous scholarship has emphasized that climate change mitigation should prioritize actions to enhance equity and social justice, particularly among historically disadvantaged groups in less developed nations (Brown and Corbera 2003; Okerere and Dooley 2010). But climate change and forest management arguably bear on morally considerable nonhuman interests as well,

suggesting these interests also ought to be represented (e.g., Eckersley 1999). Adding nonhumans to the list of stakeholders to or for whom decision-makers may be accountable only amplifies the already challenging task of arbitrating among human stakeholders across scales. Fortunately, many environmental ethicists have developed arguments that might provide guidance. VanDeVeer (1979), for example, proposes a hierarchy of significance that depends on the type of interest and the psychological capacity of the being in question. Sterba (1994) suggests human and nonhuman interests are appropriately balanced by adopting three basic principles that allow for aggression against nonhumans to defend or preserve human life, but not to meet non-basic human needs. Regan (1983) argues that humans should respect sentient nonhuman animals' rights to life and wellbeing, while Stone (2010) goes further in entertaining the idea that not only the moral but also the legal standing of nonhuman entities should be recognized. There is also a broad literature specifically on climate change ethics (Hayward 2012), which may help focus ethical discussions about obligations to various human and nonhuman stakeholders.

6 Conclusion

Climate change mitigation has been integrated into forest management programs around the world to different degrees and in different capacities (Okereke and Dooley 2010; Buizer et al. 2014). The USA has been identified among those nations most responsible for creating the problem of climate change, which arguably obligates it to also lead the global response to climate change (Gardiner 2004); and yet climate change mitigation has not so far taken priority status in federal forest management agencies (Dilling and Failey 2013). This has been explained, in part, by logistical constraints and scientific uncertainty (Dilling and Failey 2013; Timberlake and Schultz 2017), against which limitations scholars have offered strategies that may help managers more effectively integrate mitigation into action on the ground. Olander et al. (2012), for example, suggest first targeting mitigation actions that are more or less compatible with existing objectives. Millar et al. (2007) suggest an approach akin to the medical concept of triage, in which objectives are ranked and prioritized by urgency, capacity, and potential for impact. These are useful practical guidelines that we suggest should be employed in dialectic with ethical discourse, especially around appropriate recognition (i.e., moral consideration) and prioritization (i.e., moral significance) of interests.

Managing competing demands of the long-term, global interest against the short-term, local good is deeply challenging, and there may be powerful reasons, both social and psychological, why humans tend to prioritize the latter by default (Markowitz and Shariff 2012). We therefore suggest it is critical that ethical questions about when and why it is (or is not) appropriate to manage multiple-use forests for climate change mitigation receive more concerted attention from the research and forest management communities. Ethics is not a quantitative science, and we should not expect to discover any unambiguously "right" way to balance diverse stakeholder interests across multiple scales. But if ethical quandaries cannot be cleanly resolved, they can still be appropriately handled, by granting ethical considerations explicit attention in open, participatory processes. We suggest argument analysis may be a way to structure such processes, helping decision-makers pursue actions and objectives that are both scientifically and ethically defensible.

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