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The Futility of Reason: Incommensurable Differences Between Sustainability Narratives in the Aftermath of the 2003 San Diego Cedar Fire

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ABSTRACT *After the largest wildfire in California over the past century, natural resource agencies described how they could reduce vulnerability to fire hazard by sustainability managing fuel levels. A community coalition challenged this narrative by placing the fire within evolutionary time and describing how sustainability could be achieved through collective action within a dynamic and vulnerable landscape. The agencies rejected the coalition alternative as a dangerous and scientifically dubious distraction from their security responsibilities. In this clash, differing knowledge practices delimited the possibilities of citizenship and governance in which alternative sustainability narratives had meaning and significance. Ambivalence persisted because sustainability narratives were informed and justified by knowledge practices that were both driver and outcome of efforts to achieve different sustainabilities.*

KEY WORDS: Sustainability, security, narrative, disaster, knowledge, incommensurability

Introduction

From its origins in progressive-era forestry in the early twentieth century (O'Riordan, 1988), the idea of sustainability has been adopted across a wide range of planning and policy arenas to identify how humans should organize themselves and relate to their environment. With the diffusion of sustainability, the idea has been both praised and criticized for having many and contradictory meanings (Newton & Freyfogle, 2005; Redclift, 2006; Williams & Millington, 2004). The editors of this special issue (Voß *et al.*, 2007) suggest that this range of meanings reflects a distribution of values and risks across a range of social objectives. Walker & Shove (2007) argue that this diversity is not only inevitable but also inescapable, since efforts to reconcile its multiple meanings fail because the language used to describe sustainability is both unstable and contingent.

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This multiplicity of definitions has nurtured more than a decade of intellectual fecundity in which sustainability has served as the "mantra that launched a thousand conferences",[1] including the one that sponsored this collection of papers. Scholarship has thrived in part because a diversity of meanings is so unacceptable to those with a passionate interest in promoting adoption of a particular definition of sustainability. One prominent example of this has played out within the field of international affairs. First, a group of scholars, journalists and activists proposed that sustainable management of the environment and natural resources was a prerequisite for national security. Environmental degradation and scarcity, they argued, were linked directly to the destabilizing flow of environmental refugees and struggles between states to secure natural resources, whether timber, oil or water (Homer-Dixon, 1999; Kaplan, 2000).

While this coupling of sustainability and security succeeded in convincing some Clinton-era policy elites to support what Prins (2004) called the "security bonus" of enhanced governmental commitment and resources for environmental programs, the effort was also criticized for pandering to the interests and perspectives of the powerful (Barnett, 2001; Dalby, 2002). Dalby and his fellow critics suggested that linking environmental programs to national security concerns might yield the honest trifles of state patronage, only to betray efforts to realign human–environmental relationships in deepest consequence by re-inscribing exploitative neocolonial geopolitics, instrumental conceptions of nature and Western consumerism. Their critique focused on theoretical fallacies and factual errors of interpretation, particularly in relation to the idea that environmental deterioration would drive Third-World anarchy across First-World borders. According to Dalby and his allies, concerns about this supposed threat were not supported by the historical record of conflict dynamics or data on each nation's reliance on global resource flows. Drawing support from history, economics, ecology and political science, these critics sought to demonstrate that the only way to achieve security was to displace the referent of sustainability from the Western consumerist state to the encompassing biosphere.

This debate highlighted two approaches to sustainability, one couched in the language and assumptions of the politically powerful, the other drawing on a myriad of intellectual disciplines to challenge those assumptions and frame a transformative alternative. Tactically, the choice between these two approaches to advocating sustainability hinges on the faith that one has in the capacity and willingness of others to consider evidence that calls their existing commitments into question, and then realign with an alternative vision of sustainability. Can factual and theoretical arguments narrow the differences between adherents of different approaches to sustainability, or even help them to appreciate the basis of these differences? Is convincing others to adopt a new definition of sustainability just a matter of overcoming ignorance, entrenched interests and bias, or are there other reasons why reason is unable to overcome the ambivalence of sustainability?

This paper addresses these questions by describing an intense and intimate engagement between proponents of two definitions of sustainability, each quite similar to the alternatives proposed within international affairs. In the aftermath of the 2003 Cedar fire in San Diego, the largest wildfire in California over the past century, a coalition of scientists and activists developed a conception of sustainability that was akin to Dalby's ideas about the need to sustain the biosphere to ensure security. This coalition was opposed to the policies of regional natural

resource agencies, who had long garnered the 'security bonus' embedded in a progressive-era[2] narrative of sustainable resource conservation. The scientists and activists attempted to convince the natural resource agencies to adopt policies compatible with the coalition's conception of sustainability by deploying what they regarded as sound and compelling scientific arguments.

The results were not what the coalition had hoped. Far from welcoming their advice, the natural resource agencies rejected the coalition's scientific arguments and acted swiftly to silence the community-based initiative. Coalition members attributed their failure to the agencies' scientific ignorance and refusal to acknowledge truths that threatened the established order. A more symmetrical approach to understanding their frustrated efforts is taken here, by placing the agencies' seemingly intolerant reaction to coalition science in the context of the long-standing reliance of San Diego's government agencies on other forms of knowledge and expertise. Pitted against these long-established ways of knowing, the community coalition's scientific expertise was recognized neither as authoritative nor relevant to achieving agency objectives. Quite the contrary—what was compelling knowledge to the coalition activists was not only inaccurate to the agencies, it also threatened their capacity to pursue their own ideas about sustainability.

In this way, the article draws on ideas about the co-production of knowledge and the social order (Jasanoff, 2004) to suggest that the rejection of coalition claims by the natural resource agencies was not motivated merely by bias and vested interest. For each side in this conflict, the manner in which knowledge was co-produced is traced, along with the other institutional commitments that constituted their respective sustainability discourses. Complementing Walker & Shove's (2007) concern with the irreducible ambiguity of the language of sustainability, it is concluded that conceptions of sustainability may be incommensurable because they are informed and justified by different knowledge practices. If knowledge practices not only underpin associated conceptions of sustainability but are also co-produced with them, knowledge is both a driver and an outcome of the efforts of particular actors to achieve a particular conception of sustainability. This dialectic of knowledge and the social order precludes the possibility of a universally valid science that can adjudicate between contesting sustainabilities.

Incommensurability

Incommensurability was defined by Kuhn (1970) as part of his questioning of the existence of a single scientific community and the continuity of scientific progress. Kuhn began by identifying the basis of epistemological pluralism among the different scientific disciplines. In each discipline, unique research methods, model experiments, and technical languages served to define which questions were significant and prefigure the appropriate answers. Communication between communities, let alone collaboration, was hampered by these methods, experiments and languages because they could not be acquired easily, since they were learned through practice rather than explicit formulation and constituted a kind of 'craft knowledge'. Even specialists within disciplines were unable to agree with their scientific colleagues during times when their discipline was undergoing a 'paradigm shift' in response to new ideas and findings. Kuhn held that the disciplines could not be integrated sensibly because science was not a seamless whole.

This insight applied both between scientific disciplines and through time within scientific disciplines, since introduction of a new paradigm created incommensurability, the impossibility of thinking back into what preceded it.

Kuhn's ideas had profound implications for understanding enduring social differences, since incommensurability suggests that knowledge is not independent of the particularities of how it was produced and that ways of coming to knowledge cannot be collapsed in accordance with a single and universal logic. However, Kuhn did not consider how scientific communities engaged with the broader society and culture or examine the ways that non-scientific knowledge communities functioned (Fuller, 2000). Because of this circumspection, Kuhn's ideas about scientific knowledge do not constitute an overt challenge to the predominant instrumental view of science within planning and policy making, a view that science is useful to political stakeholders only in order to rationalize support policies previously arrived at through political calculation (Flyvbjerg, 1998; Majone, 1989). For example, a powerful political faction could use expertise as a means to close policy debate by turning discussion from desired ends to efficient means (Ellul, 1964), although the flow of events can produce contingencies that allow policy entrepreneurs to identify appropriate problems and apply prepackaged solutions whose virtues are demonstrated by credible expertise (Kingdon, 1984). Within this tradition, while scientific truths may be politically convenient or inconvenient they are not constitutive of policy and perspectives, nor are these truths shaped by social dynamics outside of science. Social dynamics can only degrade scientific truths by introducing a source of bias.

Anthropological studies of the interrelationships between traditional or place-based knowledge and cultural identity were first to breach this firewall separating knowledge practices from culture and society. This appreciation for heterogeneous knowledge practices was accompanied by analysis of how peripheral communities could be deprived of the benefits of their own expertise as well as their cultural integrity when central governments exercised power in the name of scientific rationality (Scott, 1998; Wynne, 1996). However, these studies that established the relationship between traditional knowledge and maintenance of a traditional social order did not always apply this analytical framework symmetrically to scientific knowledge. For example, Coburn (2003) suggested that science is distinguished from local knowledge precisely by the possession of invariant characteristics, such as a commitment to falsifiability (Popper, 1959). Scott (1998, p. 331) suggested a functional explanation for this categorical distinction between local and scientific knowledge, since "High modernism has needed this 'other', this dark twin, in order to rhetorically present itself as the antidote to backwardness".

In the 1970s and 1980s, science studies researchers questioned this epistemological privilege claimed by science over any other forms of knowledge and began to integrate scientific practice within a broader matrix of social practices, institutional context and cultural norms (Hess, 1997). Inspired by Foucault's (1977) ideas about the inextricable relationship between knowledge and power, analysts began examining all forms of knowledge as "situated" (Haraway, 1996), both individually in relation to a perspective, position and embodiment and collectively in terms of governance and cultural expression. As one seminal co-productionist study concluded, "Solutions to the problem of knowledge are solutions to the problem of social order" (Shapin & Schaffer, 1985, p. 332). Early work concerned with public policy and the environment examined how scientific truths were shaped by controversy and contestation, such as Jasanoff's (1987) work on how

regulatory scientists rely heavily on statistical evidence in order to endure legal scrutiny. More recent studies have examined how science is situated in particular settings, from the co-production of regulatory science and policy in different nations (Jasanoff, 2005) to new knowledge practices within the emergent regulatory agencies of the European Union (Waterton & Wynne, 2004), the failure of entrepreneurial geneticists to define a meaningful unit of analysis of the human genome (Reardon, 2004) and the formation of epistemic communities of climate scientists within an international treaty system (Miller, 2004). In each of these studies, science provides more than rhetorical window dressing for underlying power relations; it shapes the conditions of possibility for the expression of power.

Field Methods and Narrative Analysis

This study takes advantage of the introspection and social mobilization that occurs in the wake of disasters (Oliver-Smith, 2002) to examine interaction within and between two distinct groups: (i) the San Diego Fire Recovery Network (SDFRN) that emerged following the 2003 wildfires near San Diego; and (ii) the established federal, state and county fire agencies. An understanding of the case was informed by meeting summaries, an extensive (500 + messages) email listserv archive of SDFRN communications, planning documents and newspaper articles and editorials. This material was supplemented with interviews, in person and by phone, with key informants associated with these organizations. In-person interviews were recorded and transcribed. Text files of all documents were entered into NVIVO™ qualitative analysis software, which facilitated use of a grounded theory methodology, in which data collection and analysis proceed simultaneously and initial theoretical concepts are modified continuously to reflect and interpret the data (Strauss & Corbin, 1990). Documents were analyzed using a common set of codes, which were then clustered according to whether they came from an SDFRN or agency source.

In another analysis of this case, each group's position on science, management, policy and land use was defined in relation to their conceptions of how nature and society function together in a fire-prone landscape, contrasting two different 'social fire regimes' (Goldstein & Hull, 2007). Using approaches to narrative and discourse analysis (Eckstein, 2003; Roe, 1994), this paper re-examines these positions in relation to their respective visions for sustainability and assembles a composite narrative from the many written and oral accounts told by members of each group. This approach draws on the work of planning analysts who examine planning communications as future and action-orientated narratives that direct attention toward what should be done and who has the authority and legitimacy to act (Sandercock, 2003; Throgmorton, 2003). Planning stories have a problem-solving dimension, focusing on a central inciting event or circumstance and laying out the conflict, crisis and resolution in a way that the characters defined in the story can act upon. Sustainability narratives, like all planning stories, had characteristic scales, spanning a timeline and range of space which had a critical influence on what features become visible and what remain hidden or untold (Soja, 1980). Specific knowledge practices are intrinsic to this story-telling process, as shown in Hajer's (2003) study of how scientific terms such as 'ecological corridor' and 'target types' provide the means and justification to intervene in a nature conceived as 'infrastructure'.

The latter half of this analysis describes the intention and outcome of coalition member efforts to make compelling scientific claims to influence the natural resource agencies. These accounts were drawn principally from observations during three visits conducted to the region, as well as confidential interviews and document analysis. Preliminary drafts of this manuscript were provided to a key informant within each of the respective narrative perspectives and their responses and corrections were incorporated.

The Natural Resource Agencies

The largest of the 2003 wildfires in southern California began on October 25 when a lost hunter set a signal fire in a steep roadless area in rural San Diego County. The conditions were ideal for the outbreak of fire—low humidity, high temperatures and steady high winds, in a landscape already parched by years of drought. County and state firefighters were stretched thin by eleven other fire ignitions in southern California, and this new fire—called the Cedar fire—was difficult to control because it occurred in a highly-flammable shrubland called 'chaparral' that was the dominant vegetation type in San Diego's wildland–urban interface, with its narrow, twisting roads and patchwork of houses. By the next morning the Cedar fire had grown to 100 000 acres—an almost inconceivable spread rate—and began burning into the City of San Diego's suburbs. Local and national media were saturated with dramatic stories and images showing burning homes and landscapes, and area residents demanded that fire agencies explain why the fires could not be controlled. When it was finally extinguished ten days later after the winds died down and rain began to fall, the Cedar fire had become the largest fire recorded in California history at 273 246 acres. Fourteen lives and 2232 homes were lost, and control efforts required 4275 personnel at a cost of $US27 million.

For the next six months after the fire, elected representatives, resource management agencies and firefighting organizations of the region scrambled to respond to continued questioning about whether everything possible had been done to prevent these losses. First, the United States Forest Service and California Department of Forestry (CDF) (2003) released detailed accounts of the 'fire siege' that emphasized the limited resources they had available to deploy against the wildfire. The State of California (2006) and the County of San Diego (2004) then convened formal policy review commissions. Within these documents as well as in public testimony, agency leaders relied on a common story to explain the crisis and identify an appropriate response, which is reconstructed as follows:

> *A century of fire suppression and five years of drought were responsible for an unnatural accumulation of dry brush in the San Diego region, creating the potential for an historically unprecedented firestorm. After the Cedar fire began, firefighters lacked the firefighting capacity and surveillance and communications capabilities required to rescue helpless residents whose homes were constructed of highly flammable materials and surrounded by flammable vegetation. To sustain our communities, professional agency land managers should be provided with adequate staffing, enhanced technologies and regulatory powers to reduce risk to life and property by actions such as prescribed burning in the backcountry and creating defensible perimeters around structures.*

As noted above, this narrative has strong affinity to the connection between sustainability and security circulating within the field of international relations (Homer-Dixon, 1999; Kaplan, 2000). Centered on the actions of the state agencies, the narrative emphasizes a growing external threat from a natural world that is described instrumentally and mechanistically in terms of fuel accumulation. Providing security requires strengthening border protection between wildlands and vulnerable populations and resources as well as acting pre-emptively beyond this border to reduce fuels through prescribed burning. Only governments have the relevant expertise, so the citizenry should consent to increased regulation and surveillance as well as providing additional tax revenue for equipment, staffing and command and control capacity. Once state powers are augmented in this way, citizens could continue their accustomed lives unmolested by fire, without changing their settlement patterns or land-use practices or assuming any culpability for the crisis.

The rapid and simultaneous expression of this sustainability narrative across a range of local, state and federal agencies had occurred many times before when fires burned homes and aroused the citizenry, such as the 1993 Laguna fire that occurred just up the coast from San Diego. The reappearance of this narrative reflected institutional commitments made at the apogee of European imperialism a century before, when colonial states extended their international reach over natural resources using the rhetorics and practices of forest conservation, irrigation and soil protection (Worster, 1994). Public lands agencies such as the US Forest Service (USFS) were founded in order to conserve valuable timber resources, both from profligate waste by a feckless citizenry and from conflagrations such as the Great Fires of 1910, which killed 85 people as they burned through three million acres in Idaho and Montana (Pyne, 1982). By mid-century the USFS operated a comprehensive system of wildland fire management, funding laboratories in the applied disciplines of forestry, agronomy, hydrology and related agricultural sciences and spreading forestry methods and fire control techniques through co-operative programs with other federal agencies, private firms and the states. The USFS coordinated a national war on wildfire as an off-shoot of the Cold War, as surplus military equipment from World War II and Korea promoted the mechanization of firefighting along with the adoption of military concepts, language and organizational structure (Pyne, 1982).

Since the 1970s, the single-minded pursuit of the war on fire was tempered by recognition that forests that did not burn might accumulate fuels, increasing the risk of uncontrollable wildfire. In order to reduce wildfire risk, resource agencies developed expertise in fuel loading and fire behaviour that allowed them to decide when lightning fires could be allowed to burn or deliberate 'prescribed fires' be set. The top priority of the fire agencies became protection of vulnerable communities at what they termed the "wildlands–urban interface". The Cedar fire was a catalyst for passage of a national law that promised "Healthy Forests" in exchange for funding and permission to aggressively log, burn and thin forests to reduce the accumulation of hazardous fuels. Simultaneously, the response to the Cedar fire was resonant with the concern for territorial security emerging two years after the 9/11 terrorist attacks. Congressional representative Susan Davis reinforced this integration of firefighting with homeland security issues during the California Blue Ribbon Commission hearings examining the southern California fires (Governor's Blue Ribbon Fire Commission, 2004):

> I think we must all be very clear that fire fighting in the urban areas, in the wild lands and in the interface is also a homeland security issue. Preparedness must envision the ability to respond to unexpected but massive and even simultaneous events in the future.

SDFRN

While the Cedar fire was still burning, email went out to mobilize San Diego's environmental activists, an engaged and intricately networked community that had spent a decade conducting advocacy and planning to protect open space and conserve the region's many endangered species. Eighty of these conservation activists, land managers and biological consultants gathered at a hastily assembled meeting on 30 October 2003, where they agreed to take part in an association that they named the San Diego Fire Recovery Network (SDFRN). For the next four months SDFRNers remained in nearly daily contact with one another, defining their collective perspective on the causes and consequences of the fire into a narrative that was radically different than the agencies, reconstructed as follows:

> *The chaparral ecosystem is dynamic and self-regulating, and the Cedar fire was a normal, natural event, an inevitable and recurring feature within an ecosystem that has evolved with fire over millennia and needs large, stand-replacing fires. Homes sprawled throughout the backcountry only added extra fuel to the fire. While fire frequency has varied since human arrival in the region, humans have never been able to control or prevent chaparral fires, and efforts to reduce fire risks through controlled burning, clearing, or re-vegetation have only caused conversion of this vulnerable, globally significant biodiverse chaparral into highly fire-prone non-native grassland. The people of the region should collectively mobilize to perform restoration efforts that emphasize native species and pre-settlement conditions adapted to fire, as well as to catalyze land use planning that prevents sprawl.*

This fire narrative has strong affinity with Dalby's (2002) previously noted approach to coupling sustainability and security. The Cedar fire is placed within an evolutionary context spanning from before human occupation to the indefinite future, a time span that is inclusive of human occupation but not exclusive to it. Over this longer time span, big fires are normal and natural occurrences that serve to maintain biodiversity, measured in relation to global ecology rather than anthropocentric worth. A precautionary approach to manipulating environmental conditions is advised since natural systems are dynamic, self-regulating and only partly understood, and efforts to control them may cause ecological degradation. Rather than conforming with the agency narrative's spatial imaginary of vigilance at the border separating people and their resources from external threats, the SDFRN narrative suggests that sustainable human communities exist within healthy natural ecosystems. Since destructive wildfires are the inevitable result of living out of ecological balance and will occur regardless of governmental fire fighting capacity or fuel accumulation, citizens have little choice but to bring their land-use practices into harmony with fire's dynamic rhythms or continue to pay a steep price in property and lives. This adaptation is the primary responsibility of civil society, with only a supporting role for governmental coordination of collectively agreed-upon constraints on land use.

In composing this narrative, SDFRNers defined the Cedar fire within the context of evolutionary time and the patterns of global biodiversity, and interpreted the landscape as a self-regulating, dynamic ecosystem. Their reliance on ecological science was accompanied by frequent reference to their own field observations of the distribution of local flora and fauna, acquired through years of patient observation around San Diego county. For example, many SDFRNers were part of San Diego's active community of naturalists, whose dedication was shown in the publication of a 645-page *Bird Atlas of San Diego County* (Unitt, 2005), produced by 400 volunteers who spent over 55 000 hours conducting field observations between 1997 and 2002.[3] This capacity to join together ecology and natural history facilitated conversation and forging of common purpose across a group composed of environmental educators and activists, naturalists, ecologically trained land managers and consultants, and research ecologists.

Table 1 compares features of the contrasting narratives of government agencies and SDFRN in the aftermath of the Cedar fire. Structured along similar thematic lines, the narratives corresponded to radically different conceptions of sustainability.

SDFRNers concurred that the Cedar fire provided an opportunity for them to demonstrate that public safety required reorientating settlement patterns and land-use practices to accommodate periodic and inevitable fires. They were also motivated by a collective sense of urgency to develop alternatives to state-sponsored fire remediation efforts that government agencies were proposing after the wildfire. Not only would erosion-control treatments and prescribed burning distract the public from what was required to achieve sustainability, these efforts would catalyze the arrival of additional backcountry homeowners who would demand that agencies burn and thin, increasing the disruption of ecological systems in futile attempts to alter the timeless return of huge chaparral fires.

Given this concern, SDFRNers decided to focus on providing the natural resource agencies with scientific advice, reasoning that the basis of their own political influence and credibility was their knowledge of ecological science and the

Table 1. Contrasting narratives of government agencies and SDFRN in the aftermath of the Cedar fire

Features of narrative	Agency sustainability narrative	SDFRN sustainability narrative
Temporality	From the origins of the agencies to resolution of fire problem in the immediate future	From the evolution of species into the indefinite future
Spatiality	Division or boundary maintained between area with excess fuels and human community	Integration of human communities within natural landscape
Cause of security threat	External resource imbalance (excess of fuels)	Human actions within ecological systems
Knowledge and control	Environment is well understood and humans are capable of manipulating it to their benefit	Partial knowledge of ecological dynamics require precaution
Leadership and governance	Government agencies protect people and resources from fire	Civil society takes lead in maintaining healthy relationship between human communities, ecological systems and fire

area's natural history. Their hope was that once the agencies understood the poor scientific basis for erosion control and prescribed burning, the agencies would redirect resources toward activities compatible with SDFRN's sustainability narrative, such as protecting sensitive ecological sites and allowing native chaparral ecosystem to naturally regenerate over time. As the following account shows, things did not work out this way—the agencies rejected SDFRN's arguments, concluding that the scientific advice provided by the community group was neither legitimate nor credible, and that the policy alternatives SDFRNers proposed were a distraction from the need to perform critical and time-sensitive landscape interventions.

Scientific Advice on Erosion Control Measures

Destructive landslides are as regular a feature of disaster coverage as catastrophic fires in the newspapers of southern California, where expensive houses cling to steep mountain sides in a tectonically active landscape. Since most of the year's rainfall comes during spring rains that follow the fire season, concern about landslides arose immediately after the Cedar fire. Government agencies were quick to respond to this heightened concern about erosion by proposing to hire firms that would broadcast seeds on the landscape and 'hydromulch', which involves spraying a bright green papier mâché-like substance over burned slopes. SDFRNers were alarmed by these proposals, reasoning that this would interfere with chaparral's evolutionary capacity to recolonize burnt areas and facilitate the irreversible establishment of highly flammable non-native grasslands in chaparral's place. In addition, they were concerned that these highly visible remediation projects would reassure residents that they could rely on government agencies to protect them from their environment, recent experience during the fires notwithstanding. As one SDFRNer put it, erosion control measures:

> . . . tend to give people a false sense of security that something has been done to reduce the risk of erosion and slope failures, and tend to perpetuate the myth that human intelligence supersedes the collective intelligence of over 2 billion years of evolution on Earth.

SDFRNers initiated a dialogue with one erosion control company, and a representative of this firm attended an SDFRN meeting and provided a packet of journal articles that demonstrated that hydromulching and planting quick-growing vegetation stabilizes the soil surface and reduces erosion immediately after a fire. SDFRNer's responded skeptically—one wrote on the group's listserv that these articles were "industry-generated and financed", "biased to the point of deception" and "little more than sales brochures in academic or pseudo-academic clothing". Recognizing a distinction between his own scientific practices and those of the erosion control consultants, this SDFRNer also noted that ". . . the 'journals' are oriented to traditional concepts and applications more than questioning conventional practice".

SDFRNers decided to attempt to change agency erosion control practices by providing scientific advice to the Burned Area Emergency Response (BAER) team, an interagency group of fire rehabilitation specialists who were flown in to San Diego to prioritize all federally funded erosion control activities. SDFRNers were concerned that the BAER team's hydrologically orientated protocol and rushed timetable would lead to heavy-handed landscape modification, ignoring

the habitat requirements of vulnerable species and interfering with chaparral's capacity to recover on its own. To help the BAER team appreciate the sensitivity of regional flora and fauna, ten SDFRNers worked furiously for two weeks to compile their decades of local field experience into a 36-page guide to the location and condition of vulnerable species and habitats (San Diego County Biological Resource Researchers, 2003). The guide urged the BAER team to take a precautionary approach to habitat alteration and to initiate intensive long-term ecological monitoring—as one SDFRNer concluded; "This is a huge ecological experiment that must be carefully monitored over both long and short terms so we can learn something". SDFRNers agreed that the best member of their group to deliver the report to the BAER team was the Forest Supervisor of the Cleveland National Forest, where much of the Cedar fire had burned. The Forest Supervisor had played a critical role in forming SDFRN, an action that was characteristic of her unorthodox collaborative management style and commitment to biodiversity conservation.

When the Forest Supervisor attempted to hand SDFRN's species and habitat guide to the leader of the BAER team, he refused to include it as an appendix to the BAER team's official report, responding that BAER teams worked autonomously and did not accept public comment that would delay their efforts and compromise the professional integrity of their recommendations. Astounded by what she later described as the BAER team leader's inflexibility and unwillingness to adapt to local conditions, the Forest Supervisor argued that he should accept the guide, but the answer was final—and the BAER team leader carried the issue further by writing an administrative complaint against the Supervisor for attempting to force the guide on him. Within weeks, the Pacific Southwest regional forester involuntarily transferred the Forest Supervisor to an administrative position in northern California. Rather than move, the Forest Supervisor retired. She continued to work closely with SDFRN—indeed, she was able to devote more of her time to the effort—but association with this controversy and the loss of ready access to the staff and resources of the Cleveland National Forest cost the group dearly over the months to come. SDFRN's compilation of the location and vulnerability of species and habitats was never used by the BAER team, which filed their recommendations for slope stabilization and hazardous tree removal and then departed the region.

Scientific Advice on Prescribed Fire

SDFRNers agreed that large-scale prescribed burning in chaparral caused ecological harm without providing any public safety benefits. This was an unusual position for a group of environmentalists and ecologists to take, since prescribed burning had long been heralded as an effective means to address large destructive fires that were the consequence of a century of fire exclusion on forested public lands across the country (Busenberg, 2004). Yet some commentators have questioned this reformist story that fire should be put back on every landscape. As Pyne (2004, p. 11) put it, this "absolutism ... is simplistic in ways that make reform more difficult and that, having become canonical, it tends to exclude all the other stories". From the beginning of their engagement with fire, SDFRNers attempted to identify the appropriate fire policy by identifying the appropriate "fire regime" for the area, which they understood to mean the characteristic frequency, season, severity and size of fires on a landscape, which are driven by

climate and biophysical setting (e.g. vegetation, topography and soils). The challenge they faced was that chaparral fire regime science had long been riven by a disagreement among the field's two leading researchers. Richard Minnich of the University of California Riverside (1983) had adopted the reformist interpretation of fire-starved ecosystems, arguing that creating a vegetative patchwork through prescribed burning would reduce wildfire risk while restoring southern California's chaparral to health after a century of fire suppression. Minnich had been challenged by Jon Keeley (Keeley *et al*., 1999) of the US Geological Service, who asserted that fire suppression has not altered the frequency of catastrophic fires over the last century, since unstoppable fires burn through chaparral of any age if moisture was low and winds were high. Years of high-profile debate had only resulted in the hardening of positions on both sides and a widely known personal animus between the two scientists, who regularly traded accusations of misrepresentation and bias.

Since both Minnich and Keeley were respected scientists, SDFRNers sought to consider the merits of both sides of the controversy by organizing a scientific forum to evaluate the two positions and by asking both scientists to respond to queries on the SDFRN listserv. After a few weeks of deliberation SDFRNers concluded that a critical distinction between the two scientists was that Minnich, a biogeographer by training, analyzed chaparral simply as a fuel source, rather than as a diverse ecological community. In contrast, Keeley, who was an ecologist by training, emphasized the possible ill-effects of too frequent burning of chaparral, which could lead to a "type-conversion" of chaparral to non-native grasslands of little value to native wildlife. SDFRNers also were concerned that Minnich sanctioned burning that could potentially lead to irreversible alteration of native chaparral into non-native grasslands. As one SDFRNer concluded: "We should use restraint in our desires to 'do something' and always err on the side of caution when making recommendations on how best to manage these diverse, complex, and unpredictable ecosystems".

By early 2004 SDFRN's emerging narrative incorporated Keeley's position that unstoppable wind-driven wildfires were inevitable in chaparral regardless of fuel accumulation, a position that left San Diegans no choice but to bring land-use practices into harmony with fire's dynamic rhythms or continue to pay a steep price in property and lives. Accordingly, SDFRNers became concerned when a county land manager who had managed fires for decades began advocating prescribed burning to a variety of influential audiences, including San Diego County's elected supervisors. For SDFRNers, the county land manager's efforts appeared nakedly self-serving—as one SDFRNer put it, "Prescribed burning is a job that gets funding that buys equipment that pays salaries". If his views remained unchallenged, SDFRNers agreed that he could undermine their whole initiative. As one SDFRNer put it: "Preaching that firestorms are preventable if only the government would chip and burn our precious natural resources provides false hope and sets the stage for future disasters".

Once again, SDFRNers attempted to influence agency policy by providing scientific advice, this time by organizing a scientific peer review of the "Wildland Task Force Report", a document written by the county land manager that the county had released in August 2003, a few months before the Cedar fire. This report had cited Minnich's research to conclude that prescribed fire was required to redress the unnatural accumulation of woody biomass. An SDFRNer invited Minnich's antagonist Keeley and three of his colleagues to comment, who

obliged by providing critiques that accused the report of ignoring Keeley's oft-published alternative to Minnich's view, misrepresenting evidence addressing whether fires were controlled by fuel load or wind conditions, and fabricating bibliographic citations in order to support a preference for prescribed burning. SDFRNers attached these critiques to a hard-hitting cover letter and press release that concluded that task force report was "woefully inadequate", "biased in its treatment of available scientific information" and "flawed in many of its assumptions". In place of what they regarded as a scientific travesty, SDFRN suggested that county should formally withdraw the task force report and adopt an approach more in accord with SDFRN's approach to sustainability—as they concluded: "The new report should address, based on the best available information, the most effective, cost-efficient, and sustainable approaches for reducing risks to human life and property at the wildland–urban interface".

By early February 2004, the letter was in the hands of the San Diego County Chief Administrative Officer, county supervisors and the media. Publicly, the county's response to SDFRN's peer review was mild. Both the county land manager and a county supervisor told a reporter from the *San Diego Tribune* (Balint, 2004) that while there may have been some minor errors in the county's report, these errors did not justify withdrawing the report altogether. However, behind the scenes, infuriated administrators at county resource agencies directed their employees to discontinue attending SDFRN meetings or participating in SDFRN workshops. Word of this boycott spread within San Diego's environmental community, discouraging potential sponsors of SDFRN activities. Alarmed SDFRNers secured a meeting with top administrators within the County Department of Planning and Land Use in early May 2004, but found that county administrators did not share their agenda of reconciliation. The administrators accused the SDFRNers of "tailgunning" efforts to address urgent public safety priorities, and threatened that no one associated with SDFRN would ever get monitoring or research contracts from the county again, a threat that was particularly troublesome to SDFRNers whose consulting livelihoods depended on government contracts.

SDFRNers vowed to stand strong after the meeting with the county administrators, but key members of SDFRN began to withdraw from participation in the group. An attempt was made to rally the remaining SDFRNers and reorientate the group as a forum for all perspectives on fire within the county. While a flurry of workshops and speaking engagements were scheduled over the next six months, activity dropped off significantly on the listserv and at meetings, and SDFRN became a contact list for occasional mass emails. By the first anniversary of the Cedar fire in October 2004, with memory of the fires fading in the county, the principal legacy from the Cedar fire was that firefighting capacity in the San Diego region was better co-ordinated and equipped, government-directed tree and brush removal projects were implemented, and a range of new regulatory tools were available to increase the security periphery between landowners and flammable vegetation (Gross, 2005). Life continued largely as it had before in San Diego county, despite the warning from SDFRN of the threat posed by the fire next time.

Narrative Incommensurability

San Diego's natural resource agencies were more than merely unconvinced by SDFRN's science-based arguments—they described coalition claims as irrelevant

and even deliberately inflammatory. The depth of this divide between SDFRN and the natural resource agencies was most apparent during SDFRN's peer review of the county's Wildland Task Force Report. SDFRN advocated precaution, since complex ecological interactions could never be completely understood or predicted. For county land managers and the other resource agencies, precaution meant unacceptable inaction, and SDFRN's recruitment of a group of ecologists to declare that the county's most experienced fire manager was scientifically unfit was especially unwelcome at a time when the agencies were mobilized to restore public trust in their own capacity to restore order and maintain control.

The resource agencies' instrumental knowledge practices were situated in a century-long institutional objective of imposing machine-like predictability on the nation's forests by managing fuel levels and reducing hazard. This sustainable resource management narrative was temporally and spatially disjunctive with SDFRN's narrative, in which humans had to accommodate themselves to complex and unpredictable fire dynamics that played out over evolutionary time. For SDFRNers, society had to learn to accommodate fire or suffer the consequences, because humans would never be able to control large fires in a landscape that was both highly dynamic and vulnerable to unanticipated and undesired change. The agencies' singular focus on human safety and their apparent disregard for the ecological effects of hasty remediation activities were both scientifically and morally unacceptable to SDFRNers, within their conception of seeking sustainability within an encompassing ecology, and the need for civic expertise and broader participation in decision making.

The dismissal of SDFRN's species and habitat guide by the Burned Area Emergency Response team highlights how differences over what was appropriate knowledge to achieve sustainability extended to include differences over who could claim to be a legitimate and credible expert. SDFRNers had assumed that the BAER team would welcome a compilation of their field observation of habitats and species acquired through years of patient observation around San Diego county. However, the long-established methodology of the BAER team was to assemble a team of experts drawn from the applied sciences of hydrology and soil science, experts whose objectivity was ensured by their association with the agencies rather than their personal experience and commitment to a specific place. For the BAER team leader, SDFRN's amalgam of ecological and local knowledge was not credible science. Instead, it was unsolicited public comment, an unwelcome intrusion into an activity whose scope was officially limited to ensuring public safety after an emergency through erosion control and other interventions. As the BAER team leader protested, taking this guide into account would only delay the BAER team's effort and compromise their professional integrity. This commitment to the exclusive legitimacy of agency scientists was coupled with a commitment to the exclusive authority of the state, in contrast to the paramount role of civil society expressed in SDFRN's sustainability narrative.

SDFRN's scientific advice fell flat when pitched over this discursive and epistemic divide. Furthermore, the controversy that the community coalition engendered through their scientific intervention led to the dissolution of their initiative, and even threatened SDFRNer careers and livelihoods. This discouraging outcome to SDFRN's attempt to steer the agencies toward their approach to sustainability underscores that just as local and traditional communities have their own culturally situated knowledge practices (Wynne, 1996), government agencies also have long-established commitments to specific configurations of knowledge that are

grounded in their own organizational history and institutional relationships. Even though the legitimacy of these agencies rests in part upon formally credentialed scientific knowledge and they labor under a legal obligation to use the 'best available science', this case suggests that agencies may resist the compelling force of a scientific argument when it is incongruent with their organizational knowledge practices and discursive frameworks. Just as a synthesis of knowledge, purpose and meaning is fundamental to agency identity, the scientific claims that underpin an alternative social order are more than merely meaningless—they are threatening. In this sense, people and ideas that cannot be aligned within an existing narrative are more than incompatible, they are "enemies" to the integrity of this specific arrangement of society and nature (Latour, 2004).

For both SDFRN and the natural resource agencies, their particular knowledge practices did much more than provide rhetorical window dressing for their pursuit of power (e.g. Flyvbjerg, 1998)—these knowledge practices provided a way to imagine what the future could hold, while delimiting the limits of possibility of citizenship and governance in which ideas such as sustainability had meaning and significance. Recognizing how the ambivalence of sustainability narratives is sustained by epistemic difference does not preclude the possibility of questioning a dominant narrative while still harvesting a 'security bonus', although the appropriate strategies for this kind of intervention have barely been explored within co-production research, beyond an acknowledgement for the need for "civic epistemology" (Jasanoff, 2005; Miller, 2005). Long-term studies suggest that discursive transformation can occur, although adoption of new narratives must be accompanied by shifts in knowledge practice and social identity. For example, Agrawal (2005) described how villagers in rural India were discursively reconstructed from greedy, ignorant peasants who were an obstacle to rational central planning of forest resources into resourceful practitioners of local knowledge, a shift that made decentralized, community-based forest management possible. Agrawal's success story and the failed effort in San Diego both underscore how the incommensurability of different forms of knowledge is reinforced by differences in individual subjectivity and institutional relations.

Conclusion

The scientific arguments that SDFRN deployed failed to convince San Diego's natural resource agencies to discard a century-old conception of fire security and sustainability in favor of an ecological alternative. SDFRNers agreed that this outcome was the unfortunate consequence of dealing with prickly bureaucratic personalities who had the power to ignore inconvenient truths. Their interpretation, which was consistent with the commonly held idea that scientific evidence functions as a *post-hoc* rationale for pre-existing policy, affirmed group solidarity during a stressful time. However, a more symmetrical interpretation emerges after considering the way that knowledge practices are vested within sustainability narratives. For both SDFRN and the agencies, distinct knowledge practices underpinned distinct conceptions of sustainability, and were an outcome of their efforts to bring those conceptions into being. The absence of jointly accepted scientific practice and expertise not only made it impossible for the two sides to resolve the ambivalence between their different conceptions of security and sustainability, it reinforced these divisions, as each side perceived the seemingly irrational claims

of the other side as an obstacle to achieving sustainability. In this way, the incommensurability of knowledge practices maintains the ambivalence of sustainability.

Notes

1. Architect Sim Vander Ryn, quoted in Dowie (1995, p. 205).
2. 'Progressive era' describes a period of US governmental reform from the 1890s to the 1920s, typified by a utilitarian approach to natural resources that provided for "the greatest good for the greatest number for the longest time", a phrase coined by Gifford Pinchot, the first Director of the US Forest Service.
3. Figure cited by publisher on http://www.sdnhm.org/research/birdatlas/ (accessed 8 April 2005). This amounts to an average of seventeen full eight-hour days per individual, or having an individual in the field watching birds around the clock over that entire time period.

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