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Skunkworks in the Embers of the Cedar Fire: Enhancing Resilience in the Aftermath of Disaster

Bruce Evan Goldstein

Abstract A coalition of environmental activists and professionals created the San Diego Fire Recovery Network (SDFRN) while the largest wildfire in California history was still burning at the city's edge in October 2003. Acting quickly while the citizenry questioned governmental ability to protect their rapidly growing region, SDFRN proposed to reduce fire risk in a way that altered residential knowledge practices and identity while reshaping governance relationships. While this effort stalled after governmental agencies restored public confidence through massive fire prevention initiatives, SDFRN's efforts may not have been in vain. Retained within collective memory, SDFRN contributed to community resilience by diversifying possible responses to environmental change and uncertainty. In this way, flexible, informal learning organizations such as SDFRN may serve as "skunkworks," seizing on disaster in order to incubate social–ecological relationships that might avert greater tragedies to come.

Keywords Resilience · Disaster · Co-production · Adaptive learning · Networks · Environmentality

Introduction

Natural disasters such as hurricanes, tsunami, earthquakes, and wildfires have been occurring with dreadful frequency over the past decade.[1] While recognition of the fragility of human life and collective will to promote social change often prove ephemeral even a few months after a disaster (Marshall *et al.* 2005), these traumatic events may provide reformers with a rare opportunity to advance new social–ecological relationships (Hull 2006; Cocks 2006). However, efforts to take advantage of this space for social innovation must struggle against pervasive social conservatism after natural disaster, when familiar landmarks are destroyed and public confidence in values and institutions is shaken (Oliver-Smith and Hoffman 1999). Understanding the interplay of these supportive and countervailing conditions is necessary if reformers want to seize these tragic moments in order to advance new ways of understanding, living, and governing that might avert greater tragedies to come.

This study investigates the San Diego Fire Recovery Network (SDFRN), a coalition of conservationists and resource professionals that mobilized during the Cedar fire, the largest wildfire recorded in California history, which burned through 273,246 acres of San Diego County's scrubland and subdivisions in 2003, killing 14 people and destroying 2,232 homes. In the year after the fire, SDFRN's leaders devised an array of initiatives to enable residents to self-organize and adapt to environmental challenges by maintaining a heightened sensitivity to social and ecolog-

B. E. Goldstein (✉)
Urban Affairs and Planning Program,
School of Public and International Affairs, Virginia Tech,
Blacksburg, VA 24061, USA
e-mail: brugo@vt.edu

[1] A disaster is a process leading to an event that involves a combination of a potentially destructive agent from the natural or technological sphere and a population in a socially produced condition of vulnerability (Oliver-Smith and Hoffman 1999:4)

ical interdependence brought on by the fire, instead of allowing this sensitivity to decline as normalcy returned to the San Diego region.

Despite these efforts, normalcy did return over the following year, and funding constraints and disputes with the region's natural resource agencies further diminished the capacity of SDFRN's activists to foster community capacity for ecological reasoning and landuse practices. Drawing on resilience theory and Agrawal's 2005 idea that new forms of "environmentality" are created through the coproduction of knowledge, identity, and governance, I suggest that SDFRN's efforts were not just a futile struggle against overwhelming institutional power. In a community traumatized by wildfire, SDFRN played the role of a transformative "skunkworks" (Gunderson 1999), a self-coordinated social network that incubates new ways of life through innovative thinking and experimentation in ways that could help a community rapidly respond to future environmental crises that overwhelm ways of reasoning, living, and governing that previously had proven resilient (Adger *et al.* 2005).

Shifting Identity, Shaping a Resilient Society

Over the past two decades a growing number of scholars have been making ethnographic and theoretical contributions towards a better understanding of the relationship between knowledge and institutional arrangements in the resilience of social–ecological systems across different levels of governance—from the local to the global (Gunderson *et al.* 1995; Walker *et al.* 2004; Folke *et al.* 2005; Turner and Berkes 2006; Berkes and Turner 2006). While natural disasters—particularly extended droughts—are often the proximal cause of social–ecological collapse (McIntosh *et al.* 2000; Diamond 2004), resilience analysts suggest that disasters may be an opportunity to gain new knowledge and develop the "...capacity to expect the unexpected and absorb it" (Folke *et al.* 2005:453). In this way, resilience analysts generalize Fredrich Nietzsche's observation "that which does not kill us makes us stronger"—as long as affected communities can learn from a near-death experience. Large fires at the wildlands–urban interface can be learning opportunities of this sort because large wildfires are terrifying even for people living far from the flame front. Large fires can even catalyze social learning and reform across the whole country, as signaling events (Slovic 1991) that enhance public awareness that something is wrong with society's relationship with the natural world. Signal fires of this kind have erupted across the United States during the past decade, such as the Los Alamos, New Mexico fire that escaped control on nearby public timberlands and burned hundreds of homes in 2000. Along with this awareness the public has lost faith in firefighting organizations and government agencies such as the U.S. Forest Service (USFS), whose fire prevention policies are held responsible for increasing the incidence and intensity of fires, even when the destructive effects of wildfire are compounded by landuse policies that encourage mixing residential developments with flammable forest (Pyne 2004).

While agency actions and policies are often in the spotlight after disaster, resilience analysts suggest that state bureaucracies such as the USFS rarely increase social–ecological resilience after these events take place (Adger *et al.* 2005; Folke *et al.* 2005). Social–ecological resilience is defined as how far a particular relationship between social processes and ecological dynamics can be perturbed without dramatic loss of complexity of both, rather than the speed at which the status quo can be restored after disturbance (Holling 1973; Hahn *et al.* 2006). While governments usually focus on restoration of the status-quo after disaster, informal networks within civil society and the private sector are more likely to enhance resilience by devising a diversity of responses to rapid change and uncertainty (Folke *et al.* 2005). Even after the pre-existing institutional order is restored, disasters may provide an opportunity for these informal networks to foster innovations that may later prove useful, provided there is sufficient social capital and organizational capacity to preserve memory and expertise (McIntosh *et al.* 2000; Hahn *et al.* 2006). Even disastrous situations may become normalized so they are not experienced as disaster, but rather are anticipated and incorporated into cultural patterns, in the way that Sahelian nomads adapted to episodic droughts by developing interethnic cooperative linkages with farmers in permanent settlements and by relying on alternative migration routes (Lovejoy and Baier 1975).

Accordingly, resilience theorists have put some effort into thinking about the function and design of informal networks that might compress the long time that indigenous peoples have required to elaborate adaptive knowledge, practices, and institutions (Turner and Berkes 2006). Gunderson *et al*. (1995) and Gunderson (1999) suggested that social networks that nurture and sustain innovation thrive best outside of organizational hierarchies and formal accountability structures and regulatory regimes. Free from scrutiny, pressure, and obligation, these so-called "skunkworks" (Gunderson 1999; Holling 2001) are free to think flexibly and creatively across organizational barriers, incubating possibilities that may be useful in the event that another disaster provides an opening for behavioral or policy change (Kingdon 1984).

This use of the odd phrase "skunkworks" to describe a sheltered node of experimentation and innovation deserves

a quick genealogical review, since it will serve to illustrate a critical distinction between different forms of resilience. The term is widely used in the private sector[2] to describe an organizational unit whose members are shielded from corporate reporting and auditing requirements and are encouraged to develop their own rules to collaborate closely together to optimize production processes or create innovative products. The often-cited archetypical skunkworks is the Lockheed-Martin Corporation's military research facility where many of the U.S. Air Force's most innovative aircraft were developed, including the P-38 "Lightning," the U-2, the SR-71 "Blackbird," and most recently, the F-35 "Joint Strike Fighter." Lockheed Martin's Skunk Works™'s ability to move quickly from concept to prototype has been attributed in part to its organizational streamlining, such as a ban on reports over 20 pages long, and its loose organizational culture, which is credited with having originated the term KISS (Keep It Simple, Stupid) as a design principle (Boyne 1991).

Skunkworks is only one of many terms used within the business world to describe efforts to foster organizational learning and shared purpose through free association, voluntary exchange of knowledge and expertise, and self-coordination (Kickert *et al.* 1997; Mandell 2001; Agranoff and McGuire 2001).[3] These initiatives can be seen as a response to concern over the loss of autonomy and initiative within what Power (1997) has called the "audit society," characterized by an increasing density of formal accountability regimes as late-modern societies attempt to cope with increasing complexity and imperfect knowledge.

From a resilience perspective, skunkworks and other networked alternatives can be interpreted as a response to managers' inability to prescribe the scope and purpose of action beforehand in order to optimize output to pre-existing specifications, like a fishery maintained at maximum sustained yield. As Berkes and Folke (1998:8) note, "...tight fit... between society and its institutions... is maladaptive—it is not resilient to changes in environmental conditions." The increasing popularity of these network forms speaks to the increasing complexity of corporate operations when a firm's functions, suppliers, and customers are spatially dispersed, globally connected, and always changing (Castells 1989). By maintaining flexibility, adaptability, and openness in structure, process, domain and goals (Huber 1991; Mendizabal 2006), skunkworks enhance a firm's adaptive resilience, defined as a system's potential to remain in a particular configuration and maintain its continuity and integrity by reorganizing in response to changing conditions (Walker *et al.* 2004).

Theories of network learning emphasize that skunkworks and other variants have the potential to go beyond learning how to achieve intended consequences—which Argyris and Schon (1974) call "single-loop learning"—and progress to "double loop learning," in which organizations re-examine their assumptions and rethink strategy. However, the fact that the purpose and scope of these initiatives is set by their corporate sponsors constrains their ability to progress to "triple-loop learning," which involves questioning and revising the institutional assumptions in which the host organization's governing values are nested (Nielsen 1993). The inadequacy of Lockheed-Martin's skunkworks as a prototype for a triple-loop learning network prompts a return to the genealogy of the term, to uncover another layer of meaning that preceded its adoption by military contractors. The term "skonk works" first appeared in the depression-era cartoon "Lil Abner," whose creator Al Capp leavened his strip with absurdity and political commentary, creating characters such as "Jack S. Phogbound," a caricature of southern politicians who opposed the New Deal, and the Shmoo, a creature whose usefulness and generous nature made it a threat to civilization (Berger 1996). Capp's skonk works was an illegal still operated by "Hairless Joy" and "Lonesome Polecat," who produced bootleg "kickapoo joy juice" from a curious blend of ingredients that included worn shoes and dead skunks. The adaptation of skonk works to "Skunk Works™" occurred after Capp objected to Lockheed-Martin's adoption of his term to describe its secretive research facility (Boyne 1991).

Despite its innovative operating principles, Lockheed-Martin's Skunk Works™ had none of the marginal and even subversive connotations of Capp's original invention. With a little imaginative stretch, Capp's variety of skunkwork can be seen as a vehicle for pursuing "transformative" resilience. Within resilience theory, transformability is the capacity "...to create untried beginnings from which to evolve a new way of living" (Walker *et al.* 2004:7) when ecological, economic, or social conditions make the existing system untenable. The very success of efforts to enhance adaptive resilience—for example, the construction of flood levees in the marshy outskirts of the City of New Orleans—might have the unanticipated consequence of increasing the possibility of extreme loss of social and ecological integrity by inducing development in the area (Gregg and Houghton 2006). When further adaptation is impossible, a transformative skunkworks can "...introduce anew components and ways of making a living, thereby changing the state variables, and often the scales of key cycles, that define the system." (Folke *et al.* 2005:457).

[2] As of 6/22/2007 there were over 597,000 entries on the term "skunkworks" on Google, of which 208,000 occur on .com domains, despite Lockheed-Martin's vigorous defense of its trademark on the term.

[3] Others include "communities of practice" (Lave and Wenger 1991) and "virtual teams" (Creech and Willard 2001).

While transformative skunkworks share the qualities of flexibility, adaptiveness, free association, voluntary exchange, and self-coordination characteristic of adaptive skunkworks, their ability to experiment with new cultural models suggests their affinity to new social movements such as women's health (Morgen 2002), deep ecology (Ingalsbee 1996), and AIDS treatment (Epstein 1996). New social movements are credited with a capacity to create and sustain new forms of collective knowledge and identity, in addition to influencing governance (Larana *et al.* 1994). Melucci (1989) entitled his book on new social movements "Nomads Of the Present" to suggest their adoption of network forms of organization and, like the Sahelian nomads mentioned above, their ability to sustain alternate meanings and ways of life while submerged within modern societies.

In describing how adaptation and transformation occur, resilience analysts propose that new knowledge is incorporated into practices, which in turn may influence both the formal rules and informal norms and conventions that comprise institutions (Turner and Berkes 2006). For example, Hahn *et al.* (2006) describe how the coordinator of a small regional organization increased social–ecological resilience in the Kristianstad wetlands of Sweden by providing a non-threatening setting for communication and development of new ideas about system processes and feedbacks. Adopting language from the multistakeholder collaborative process literature (e.g. Wondolleck and Yaffee 2000), the authors claim that this association enabled stakeholders to reduce conflict by identifying common interests and jointly pursuing "win-win" proposals that were compatible with a commitment to protecting "ecosystem values."

While this framework provides a sound theoretical foundation for analyzing how skunkworks and other network forms can enhance adaptive resilience through gradual, consensual actions that are compatible with existing institutions, it is less useful for understanding how to envision and initiate transformation in social–ecological resilience. A transformative skunkworks may not be able to "reorganize, or self-organize" stakeholders as Hahn *et al*. describe, because this transformation may be radically incompatible with the interests of some stakeholders. In addition, this transformation may rely upon knowledge practices that are not shared or might even be incompatible with other stakeholder's ways of knowing, a possibility Hahn *et al*. overlook in their endorsement of "learning and adapting based on an accumulation of ecological knowledge." For resilience theorists, the adaptive unit—whether society or community—adapts to natural disturbance by learning as a single entity that can "...aggregate decision-making processes and actions of the people (actors)" by employing compatible knowledge practices (Berkes and Turner 2006:9).

The limits of resilience theory as a guide to envisioning and initiating social–ecological transformation can be traced in part to its grounding in the scientific realism of ecosystem analysis (Holling 1978). While resilience analysts have surveyed a wide variety of ways of knowing across cultures and through history, these knowledge practices are described as instrumental resources that can be combined to yield a hybrid epistemic vigor. This approach does not take into account the potential incommensurability of knowledge practices and verification standards generated by people who occupy a particular perspective, position, and embodiment, sustaining their particular form of expertise through ongoing, culturally-embedded practice (Haraway 1996). Resilience analysts remain committed to separating the reliable measurement of phenomena in the external world from the interior world of the culturally situated observer, allowing them little purchase on the possibility that gathering, evaluating, and deploying knowledge has something to do with individual identity or institutional context.

Similarly, theories of resilience do not account for the possibility that individual identity itself may be shaped by knowledge practice and institutional culture. Instead, resilience analyses describe autonomous individuals who respond to the institutional order by rationally optimizing their well-being or by detracting from collective well-being by retaining maladaptive values (e.g. Folke *et al.* 2005:457). As Agrawal (2005) suggests, this rational actor model informs common property analysis (e.g. Ostrom 1990), the field that provided resilience analysts with a theoretical framework for understanding how collective institutions other than those directed by the market or the state can be effective in managing natural resources (Gunderson *et al.* 1995; Adger *et al.* 2005; Folke *et al.* 2005). This perspective is at odds with a poststructuralist conception of individual identity as a precarious and often contradictory set of thoughts and emotions that lie within, or even are constituted by, a web of historically contingent discourses that are bound together by state power (Weedon 1997).

In the absence of a situated conception of knowledge and identity, the dialectics of resilience theory are limited to the co-construction of social institutions and ecologies. In this piece, I draw on the concept of coproduction to extend the scope of dialectical interaction to include the simultaneous creation of knowledge practices, social identities and institutions. Knowledge, in a coproductionist framework, is understood as neither a simple reflection of truth about nature nor a product of social interests. Rather, co-production calls attention to the social dimensions of cognitive commitments and understandings, while at the same time underscoring the epistemic and material correlates of institutions. In addition to suggesting how

knowledge can help stabilize a particular social order, a coproductionist framework opens up new possibilities for societal change, since shifts in knowledge practices may stimulate social change, or vice versa.

The idea of coproduction emerged early within the field of science and technology studies. Latour (1998) described how Louis Pasteur's influence and power were based on the location of his laboratory as the place where the activities of microbial agents were translated into a solution for diseases of livestock, epidemics, and sanitation problems. While we now live in a world where Pasteur's theories are beyond question because they are embedded in our scientific practices, medical procedures and systems of public health, Latour described how spontaneous generation was a legitimate alternative in its own time, with significant support among rural health practitioners whose authority was dependent in part on the exercise of this theory. Pasteur prevailed by building a network of alliances between natural facts, funding entities, disciplinary allies, and wider publics that was stronger than that held together by his opponents. Pasteur's triumph was accompanied by the emergence of public health agents of the centralized bureaucratic state, whose methods and practices both contained the new germ theory and provided institutional support for the extension of germ theory throughout France, and then the world.

Latour (1995, 1999) has continued to describe the sweat and struggle that accompanied efforts to coproduce specific technoscientific worlds. His more recent work incorporates a wider range of actors other than the entrepreneurial scientist who labors to place everyone and everything in their actor-network (Star 1991). In addition, over the past few years a host of analyses (Cussins 1997; VanDeveer 2004; Miller 2004; Doubleday 2007) have followed Jasanoff (2004) in tracing how knowledge practices become authoritative and legitimate knowledge within emergent institutions. My analysis is aligned with this body of work by a common concern with the process through which ways of knowing about the world relate to possible ways of living in the world. I call attention to the social dimensions of cognitive commitments and understandings while at the same time underscoring the epistemic and material correlates of social formations.

The Rise and Fall of the San Diego Fire Recovery Network

The Cedar Fire

Coastal southern California and northern Mexico contain one of the most flammable vegetative communities on earth, a scrubland called chaparral. Over the past 30 years, during the autumn dry season when there is low humidity and sustained high "Santa Ana" winds, huge wildfires have raged through the chaparral, jolting the people of the region into a heightened awareness of the precariousness of living there. As awareness faded after each fire, urban centers such as the City of San Diego have expanded to become more intermingled within these flammable wildlands. The legacy of each fire has been an expensive and elaborate fire research and control capacity, neighborhood fire prevention efforts coordinated through the state's "FireSafe" program, and design guidelines and materials that encourage people to build homes that might not burn so readily.

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 of dense chaparral in rural San Diego County. The conditions were ideal for the outbreak of fire—low humidity, high temperatures, and gusty Santa Ana winds, in a landscape already parched by years of drought. County and state firefighters were stretched thin by 11 other major fires in southern California, and this new one—called the Cedar fire—was difficult to control because it occurred in one of San Diego's more challenging wildland–urban interfaces, with narrow, twisting roads, and a patchwork of houses, many of which were built with highly flammable materials such as cedar-shake roofs. By the next morning the Cedar fire had grown to 100,000 acres of chaparral—an inconceivable spread rate in any other vegetation type—and began burning into the City of San Diego's suburbs. Local and national media filled with dramatic stories and images showing burning homes and landscapes, and scared area residents demanded that fire agencies explain why the fires were not controlled. As the fire stretched on for 10 days before being extinguished when the rain came and the wind shifted, residents even channeled their anger at firefighters, who were surprised and disheartened by this unaccustomed criticism (United States Forest Service and California Department of Forestry 2003).

SDFRN

While the Cedar fire was still burning, the San Diego Fire Recovery Network (SDFRN) was created at a hastily assembled meeting arranged by some of the region's prominent activists, environmentally-oriented land managers, and ecological consultants. About ten of these individuals led the effort (they are referred to in this paper as "core SDFRNers"), guiding the remainder of the coalition[4] during monthly meetings and chairing SDFRN

[4]SDFRN never had a formal "membership" in the sense of requiring dues or working through an elected leadership. SDFRNers are defined simply through participation in SDFRN activities.

subcommittees on media outreach, volunteer coordination, public policy, and ecological research.

While core SDFRNer's had not worked together before and had little fire ecology or fire management experience, they were familiar with each other's work through their involvement in the region's intricately networked community of conservation activists and professionals, who circulated within a variety of affiliated organizations, such as the San Diego Natural History Museum and the California Native Plant Society. They had all been deeply engaged in regional conservation efforts over the past decade, especially the establishment of habitat preserves for the chaparral-dependent California Gnatcatcher and other endangered species. The individuals in SDFRN's core group had long focused their efforts on alleviating the impact of urban sprawl on biodiversity, a subject in which they claimed expertise as biologists and field naturalists. When opportunities arose to place incremental controls on development they were usually in the vanguard—in late 2003, many of them were involved in promoting the Rural Lands Initiative, a proposition on the March, 2004 ballot that would have restricted small-parcel development on a large portion of northern San Diego county.[5] At the same time, their concerns were often expressed in terms of the need for more fundamental change in order to avert imminent threats to species survival and biospheric integrity. Their intimate knowledge of biological diversity and conviction of its critical importance to the region's rapidly growing human population united their concerns in a way that was reminiscent of Barry Lopez's (2001:40) description of naturalists as "emissaries" who are "... working to reestablish good relations with all the biological components humanity has excluded from its moral universe."

During the two months following the fire, core SDFRNers maintained close communication through frequent meetings, sharing draft articles and editorials on their website,[6] and exchanging over 200 emails on the group listserv.[7] Agreeing that wind-driven wildfires were inevitable in chaparral regardless of firefighting prowess or fuel accumulation, the core SDFRNers drafted a set of "general messages" for policymakers and the public that concluded that San Diegans had little choice but to bring landuse practices into harmony with fire's dynamic rhythms or continue to lose property and lives. These messages reflected SDFRNers' shared sense of the limits of human control of dynamic ecosystems which were shaped over evolutionary time and whose species and habitats were expressions of global patterns of biodiversity, governed within self-regulating ecosystems (Goldstein and Hull 2007). Their reliance on the ecological sciences while formulating this position was complemented by reliance on their extensive field knowledge of the distribution of local flora and fauna in San Diego county.

Reforming Governance by Reworking Identity

Attendees at a SDFRN meeting in January 2004 focused on four governmental responses to wildfire that they found particularly foreboding:

- Large-scale erosion control treatments on burned slopes;
- Efforts to hire more firefighters and secure additional helicopters for water drops;
- Preparation of a San Diego County ordinance requiring brush removal within a hundred feet of rural homes; and,
- State subsidies to establish vegetation-free buffer zones between wildlands and entire neighborhoods.

SDFRNers concluded that these local, state, and federal government initiatives were not only founded on the incorrect assumption that chaparral fire could be contained and controlled, they also reinforced the helpless dependency of exurban homeowners on a government whose primary purpose was extending the umbrella of civil defense against fires. Simply opposing these initiatives was an inadequate response, since the public was demanding action and the fire provided a rare opportunity to foster change. Responding directly to each of these four initiatives, SDFRN crafted four alternative approaches to reducing fire vulnerability that they agreed might foster a new civic identity for rural homeowners grounded in ecological awareness, collective capacity building, adaptation to place, and self-reliance.

From Erosion Control and Government Dependency to Volunteerism and an Engaged Citizenry

Government agencies were quick to respond to heightened concern about landslides on slopes denuded of vegetation by the fire. The agencies proposed to broadcast seeds on the landscape and to "hydromulch," which involves spraying a bright green papier-maché-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 govern-

[5]This initiative was defeated by a 63-–37 percentage margin.

[6]www.sdfirerecovery.net

[7]These email communications were made available on a publicly accessible website (available as of 3/15/06 at http://groups.yahoo.com/group/SDFRN/).

ment agencies to protect them from their environment, recent experience 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."

Determined to develop an alternative that counteracted the ecological and social costs of erosion control measures, SDFRNers decided to organize local residents within the "San Diego Fire Recovery Volunteers." Taking a lighter approach to erosion control than the government agencies, these volunteer crews installed straw bales for erosion control and placed fencing to reduce off-road access into burned areas. In addition, the organizers of this initiative described their efforts in terms that reached beyond ecological restoration to restoring a body public:

> "We know that volunteer and community involvement efforts will bring meaning to thousands of people in San Diego, who want to take part in responding to the enormous changes in the landscape, communities, and politics... Expanded, sustained volunteer programs in the next decades will strengthen the commitment of San Diego residents to their healthy natural environments and their quality of life and their commitment to policies that enhance those environments."

From Enhancing Agency Firefighting Capacity to Promoting Sheltering in Place

SDFRNers were critical of proposals to spend more money on firefighting after the 2003 fires. These proposals were predicated on the widely-held assumptions that the Cedar fire could have been extinguished if helicopters were available to make water drops in the steep canyon where the fire began, and that homes and lives could have been saved if more firefighters had been available and they had been equipped with better communications gear. SDFRNers rejected these assumptions, arguing that since huge chaparral fires might occur when weather conditions were favorable and that they were virtually unstoppable once they began, it was impracticable to maintain enough firefighting resources to control the Cedar fire or protect lives and private property in the fire path. Instead of assuming this limitless budgetary commitment, SDFRN suggested that residents should accept personal responsibility for living in a fire-prone landscape and develop the capacity to protect their own lives and homes.

SDFRNers framed this alternative to enhancing the fire services while never criticizing the firefighters who fought the Cedar fire. Instead, they argued that reducing reliance on the fire services demonstrated true respect for firefighters, since anyone who asked firefighters to stand in the way of the implacable flames was putting heroic lives at risk without any real chance of success. As one SDFRNer put it, firefighters should not be "... given suicide missions." Instead of leading firefighters with new equipment and sending them back to the fireline, SDFRNers promoted the idea that residents lived in a landscape that occasionally burns and had to adapt to this pattern rather than vainly attempt to change it. One initiative that they pursued was to teach residents how to defend their own homes, which SDFRNers pointed out was common in comparable Mediterranean-type vegetation zones in Australia, where the practice is called "sheltering in place." To this end, SDFRNers planned workshops, prepared newspaper inserts, and developed interactive displays for the San Diego Natural History Museum's *Earth, Wind & WILDFIRE* exhibition that educated homeowners about how to retrofit existing homes with fire-resistant features such as boxed eaves, double-glazed windows, and ember-resistant attic vents. Through all these efforts SDFRNers emphasized the need for self-reliance—as one SDFRNer put it:

> "Chances are, firefighters are not going to be able to get to your home in time during a large event. Make it safe. Make it defensible. Let the fire burn around you. It's your responsibility."

From Setbacks to Ecolandscaping

Similarly, SDFRNers reconfigured another proposal to enhance government capacity and control to support a community-based ecological alternative. SDFRNers were quick to agree that having mature chaparral in close proximity to one's home was an invitation for immolation. However, they were opposed to a proposed county ordinance requiring property owners to remove most of the vegetation within a hundred feet of their homes, or else be subject to vegetation removal by government contractors whose fee would be added to the landowner's annual tax assessment. SDFRNers argued that removal of native vegetation would cause ecological harm as well as greater fire risk since cleared lots quickly became choked with highly flammable exotic annual grasses that had little value as forage or habitat. As an alternative to lot clearance, SDFRNers encouraged landowners to prune and cultivate native vegetation that was fire-resistant, non-invasive, drought tolerant, and attractive both to wildlife and to landowner aesthetics.

Once again, the intent of this recommendation was to foster both ecological and social reform. Homeowners could learn to appreciate chaparral ecology through this

intimate contact with their own land, sharing techniques and assisting one another while drawing on the expertise of community organizations like SDFRN to pick the right tools and techniques for their specific natural setting. SDFRNers suggested that this network of shared expertise could cultivate solidarity and political mobilization in a manner that was impossible to accomplish by forcing residents to choose between spending a weekend clearing around their property or paying a bill tendered by a brush removal firm under contract to local government.

From Fire Safe Councils to Smart Growth

SDFRN also proposed to reconfigure a governmental fire initiative to create more Fire Safe Councils, voluntary community associations that operate like "neighborhood watch" associations focusing on preventing fire rather than crime. San Diego County already had the greatest density of Fire Safe Councils in the state, and proposed to increase participation greatly after the 2003 wildfire through the incentive of eligibility for government subsidized chipping and brush removal. While SDFRNers supported the Fire Safe program, they expressed concern that its emphasis on vegetation management did not encourage landowners to participate in the broader suite of land use practices required to create communities that were both safe from fire and safe for the continued existence of fire-dependent natural communities. In particular, SDFRNers were concerned that by the time a "Fire Safe" community set itself to reducing fire risks, land use decisions had already placed homes in harm's way and instigated heavy-handed fire protection efforts that were conducted at public expense.

These issues of community form and communal responsibility had always been a part of the conceptual scope of the state Fire Safe and related federal FireWise programs,[8] although the Fire Safe Councils of San Diego County had focused their efforts almost entirely on brush control around existing communities, and had never contributed to the public debate about regional land use planning.[9] SDFRNers tried to bring these issues to the fore by participating in an atypical FireWise workshop in February 2004 that promoted community involvement in site planning. They also assembled a powerpoint presentation that advocated a broader role for Fire Safe Councils than coordinating brush clearance. SDFRNers took this slideshow to Fire Safe Council meetings in order to urge them to participate across a broader continuum of civic action, including fire-resistant home construction, maintaining native vegetation adjacent to homes, and design of a regional matrix of compact urban areas separated by open space preserves.

Designing the New Resident

In the wake of the traumatic 2003 wildfires, government agencies reassured residents that they would be safe from the flames if they did not waver in their trust in government, whose responsiveness was vividly demonstrated in strips of green hydromulch laid across burned mountainsides. In return, residents were asked only to pay for more firefighting capacity, insulate the borders around their homes from flammable vegetation, and ensure conformity with official guidelines by gathering into neighborhood Fire Safe councils. From an SDFRN perspective, this social contract between residents and their government was the same one that America subscribed to after the 9-11 terrorist attack—a sacrifice of other civic privileges in the name of security, to be maintained through ever-stronger defenses against a fearsome external invader. Cradled within this promise of security, residents could remain complacent about fire risks, disengaged from any sense of responsibility for their lives or environment, ignorant about ecological relationships and the practical skills needed to protect their lives and property, and dependent on heroic rescuers when fire came bearing down on them. Within this guardianship model, government could continue to maintain its authority and legitimacy, while avoiding politically hazardous restrictions on the use of private property.

SDFRNers' efforts to reorient these policies relied on reconstituting residential identity (Table 1). Reconstituting the people of San Diego with these characteristics was the first step toward policy change, as one SDFRNer noted:

> "The debates are extensive, and if supported by educated and involved citizens, could lead to paradigm shifts in governance.... about wildland–urban interface, zoning vs. private rights to build–live anywhere, funding–organizing fire suppression, quality of life in urban settings, and more."

These "paradigm shifts in governance" resulting from creation of an informed and engaged citizenry within San Diego county could reconfigure relationships between chaparral and human settlements. Like present-day indigenous resource management systems (Berkes and Turner 2006), SDFRNers combined the old and new, synthesizing traditional ideas such as "sheltering in place" with contemporary ideas such as transit-oriented and cluster-oriented development (Garde 2004). SDFRNers were

[8] These broader concerns are well-represented on the program websites, http://www.firewise.org/ and http://www.firesafecouncil.org/.

[9] Interview with the Fire Safe Council Coordinator for San Diego County conducted summer 2004 at El Cajon office of the San Diego Fire Safe Council.

Table 1 SDFRN's Reconfiguration of Residential Identity

Identity Traits	SDFRNer Reference to this Trait
Self-reliant	"Nobody had any illusion that they were safe, or that someone would come and save them."
Adaptive to place	"If we do not respect and adapt to this fire-dependent landscape via reasoned actions, we are doomed to repeat such disasters."
Skilled and capable	"Homeowners can stay not only because structures are defensible, but also because understanding fire and knowing what to do when fire comes are basic skills in Australia."
Knowledgeable about relationship between humans and nature	"We need, as a society, to be more aware of ecosystem health. Despite the controversial nature of this phrase, it does express the point for the public and help them understand how human activity changes our environment."
Knowledgeable about wildfire risks	"Of those homes already within brushland? Do not expect fire fighters to risk their lives defending them. If they can't survive on their own, they are probably going to burn. Accept that reality."

agnostic about the specifics of how authority would be redistributed among elected bodies or state agencies or subordinated to a new centralized or community-based authority. Instead of proposing specific changes in governance, SDFRNers experimented with actions that might create a citizenry inclined to pressure its leaders into adopting policy changes and funding priorities that would distribute homes and infrastructure in a way that was more ecologically compatible with a landscape that burns.

The Window of Opportunity Closes

A scant six months after the fire in late 2003 there were signs that SDFRN's efforts to initiate reform were beginning to fade. Attendance began declining at meetings and workshops, there were fewer invitations to write and speak, and participation in the San Diego Fire Recovery Volunteers fell off. Attempts to institutionalize these activities by obtaining financial support to hire coordinators, buy equipment, and publicize events were not successful, despite a flurry of grant proposals to government agencies and community foundations. While many SDFRNers attributed these troubles to the passing of the sense of crisis and shared purpose that had prevailed in the immediate aftermath of the fire, the declining fortunes of SDFRN were influenced not only by passing time but also by the aggressive disaster response and prevention efforts of government agencies.

As noted previously, the Cedar fire led many citizens of the region to question the capacity and competence of their elected representatives, resource management agencies, and firefighting organizations. The first response from the agencies and jurisdictions was to organize a series of highly publicized and scripted public hearings and assemble publications describing the "fire siege" (United States Forest Service and California Department of Forestry 2003; U.S. Forest Service 2004). In each of these commissions and reports, the Cedar fire was described as a preventable breach in the fire security apparatus that was abetted by the insufficient capabilities of regional firefighting agencies. The appropriate response was greater vigilance, additional resources for fire defense, and greater governmental coordination and command and control capacity. Chaparral was described as a fuel matrix whose value as scenery had to be weighed against the vulnerability of housing sites. By describing the fire this way, these organizations focused the public on the need to extend instrumental control over nature through exercise of managerial sciences that would enhance risk assessment, fuel removal, prediction of fire behavior and slope stabilization (Goldstein and Hull 2007).

Government agencies vigorously implemented this instrumentalist managerial agenda, which contrasted sharply with the ecological consciousness-raising efforts of SDFRN. The public hearings and volumes of findings and recommendations provided ideas for high-profile legislative initiatives at every level of government, such as consolidating rural fire services into a single well-funded and coordinated agency. Brush removal crews fanned out through San Diego's backcountry, paid for by forty million dollars in federal funding. In the media, efforts by SDFRNers to promote the idea that citizens should accept responsibility for living in a landscape that inevitably burns vied with stories about government initiatives to prevent this burning from recurring, as well as with stories about efforts to hold a single individual accountable—Sergio Martinez, the lost hunter who had set the Cedar fire as a signal fire to rescuers (Soto 2005). All of these activities, while pursued by a wide array of often uncoordinated actors and agencies, were coordinated in one sense—the determined focus on governmental action to punish the guilty and enhance residential safety left little breathing room for SDFRN's efforts to mobilize an ecologically literate citizenry.

On a few occasions the initiatives of SDFRN and government agencies even slipped beyond being at cross-purposes to being in open conflict (Goldstein 2007). For example, county administrators directed their employees to stop attending SDFRN meetings after SDFRNers publicly challenged the scientific integrity of a county report (San Diego

County Wildland Task Force 2003) that concluded that catastrophic fires could be prevented by reducing woody biomass that had accumulated over a century of strict fire prevention in the county. For the agencies, SDFRN's interventions were an aggravating distraction that challenged trusted and tactically useful agency expertise and prevented fast action on the urgent issues at hand, such as performing land treatments before landslides occurred and clearing brush while budgets were flush and regional agencies and jurisdictions aligned on the task.

By the second anniversary of the Cedar fire in October 2005, most of SDFRN's core members had withdrawn from regular involvement in the group, which now served principally as a means to organize speakers and workshops. However, they continued to be involved in an array of environmental organizations and initiatives in the county, and stated their readiness to mobilize again when the next opportunity comes to shape public knowledge and capacity. When asked about the legacy of the group, many SDFRNers responded in terms of the need to look beyond the immediate impacts on fire policy to a time when an ecological perspective on fire-adapted ecosystems might find more fertile ground. While acknowledging that SDFRN didn't change regional policy or have a very broad influence on the general population, one SDFRNer concluded that the most important legacy of the group was its impact on his own consciousness and capacity to make change:

> "The most important singular long-lasting impact of SDFRN has been on me. Honest to God. I just think that thing produced me. It got me involved. It lit a spark in my life, its allowed me to affect people. It gave me an avenue by which to be exposed to people I never would have met before, hammering on a particular thing that I find absolutely intriguing."

Transformative Skunkworks

While the 2003 Cedar fire did not sweep away dominant institutional forms and relationships, the fire did provide SDFRNers with an opportunity to experiment with new social–ecological relationships based in alternative ways of knowing, living, and governing. In this way, flexible, informal learning organizations like SDFRN may serve as "skunkworks," fostering a community's resilience to future ecological and social perturbations:

> "Skunkworks function to share information, communicate across traditional barriers, "unlearn" traps, and vet hypotheses, creating new and shared understanding of the system, and incubating options for the future." (Light and Blann 2003:5)

Changes in Identity, Changes in Environmentality

Shocked out of their regular routine and made newly suspicious of the purpose and effectiveness of state institutions, citizens were mobilized into civic action by the fire. Disasters like these can reveal life's contingencies by destabilizing assumptions about truth, accountability and representation, and even calling into question the legitimacy and authority of the state (Beck 1992; Folke *et al.* 1998; Wisner 2002). As Hoffman (1999:140) concluded from ethnographic study of the aftermath of disaster (and losing her own house in the 1991 fire in Oakland, California) after the initial shock and social atomization, "an aura of purpose, almost a higher purpose, arises and immerses victims." Responding to this impulse, San Diegans sought each other out and participated in projects that restored their sense of self.

SDFRN was organized even before the fire was extinguished, drawing upon a pre-existing social network of individuals with professional and voluntary ties and common epistemic and ethical commitments. SDFRNers agreed that the fire agencies' agenda of slope stabilization, vegetation clearance, and fire control reinforced the incapacity and helplessness of the citizenry. Community self-governance became impracticable, and enhancement of the technological capacity and authority of government became the only reasonable response to fire disaster. SDFRNers attempted to break this self-reinforcing cycle through volunteer restoration efforts, workshops, presentations, and other initiatives that provided San Diegans with the opportunity to participate in collective actions beyond those provided by the state, fostering their ecological knowledge and skills as backcountry land stewards and homeowners. These opportunities for residents to redefine themselves by enhancing their ecological knowledge and capabilities for informed action could be coproduced along with a change in the relationship between state and citizenry, from guardianship to a delegated arrangement in which government provided support for a network of citizen activists.

The inclusion of ecological relationships within this dialectical relationship is captured by Agrawal's (2005) concept of "environmentality," the idea that biocultural relationships are grounded in the coproduction of subjectivity, knowledge, and governance institutions. Environmentality complements the dialectics of social–ecological resilience by adapting Foucault's (1991) theory of governmentality, which was originally conceived to describe the constitution of the modern sovereign state not through expanded regulatory control but through the shaping of citizens as self-disciplined economically rational actors. Agrawal (2005) argued that governmentality also has emancipatory potential as an analytical lens for examining the emergence of new conjugations of citizenship, governance, and knowledge. He arrived at this idea by tracing

how political relations, institutional arrangements, statistical and place-based environmental knowledge, and peasant subjectivity were simultaneously reconfigured in the transition from bureaucratic control of forest resources to community-based forest management.

Agrawal's green adaptation of Foucault's chilling vision of market hegemony opens up an avenue for realizing transformative social–ecological resilience through institutional transformation accompanied by shifts in knowledge practices and social identity. These institutions and ecologies may co-emerge with knowledge practices and social identity in ways that are neither based on consent from free citizens nor legal coercion. Instead, SDFRN exercised power by constraining and structuring the rational alternatives and roles available to citizens. This conception of identity allows for partial expression of individual agency, steering a middle ground between a conception of institutional rules and norms as deterministic and enduring and an assumption of unconstrained individual freedom. In this sense, while maintaining incapacity and ignorance may be critical for some forms of governance, environmentality does not imply the imposition of disabling power through the application of normative, legal, and organizational constraints. Instead, environmentality empowers individuals, enabling them to accumulate knowledge, and requiring that they exercise judgment and select alternatives within particular fields of action (Lemke 2001).

Rather than simply tracing the application of this classical idea of constraining power, the analytics of environmentality allow for the exercise of power through knowledge practices that promote specific kinds of sense-making and self-disciplining, which in turn shape the conditions of possibility for collective action. Combining the system dynamic concerns of resilience theory with the coproductive dynamics of environmentality provides lenses through which to see this emphasis on identity as a productive and strategic way for a skunkworks to foster new forms of environmentality, rather than as a postmodern technique for sliding into solipsism (Cole, Hill, and Rikowski 1997). This continues the migration of the concept of governmentality from its origins as a specific historical diagnosis (Foucault 1991) to a general analytic concept (Agrawal 2005) to a source of insight for initiating social change.

The Strength of Weak Skunkworks

Favorable conditions for operating a skunkworks diminished within a year of the Cedar fire, as state agencies reconsolidated their control over fire planning and management. Their autonomy and legitimacy threatened by public perception that they had not fulfilled their part of the social contract under the stress of disaster, state institutions responded vigorously to restore the social–ecological order that SDFRN was challenging. In addition, SDFRN's initiatives were not just unconvincing because they threatened the resource agencies' prerogatives. Abandoning their coproductionist approach, SDFRN grounded their disagreements with the agencies in what they regarded as timeless truths about nature, but these claims were dismissed as incompatible with agency instrumental knowledge practices that were situated in a century-long institutional objective of imposing machine-like predictability on the nation's forests by managing fuel levels and reducing hazards (Goldstein 2007). The dimensions of this incompatibility were manifold, corresponding to the full range of factors that Jasanoff (2005) includes under the rubric of "civic epistemology," including knowledge-making practices, approaches to establishing trust and accountability, ways of representing knowledge and establishing objectivity, and assumptions about the identity, visibility, and accessibility of experts. Accordingly, the agencies had little hesitation in dismissing SDFRN's ecological claims. Furthermore, agency initiatives diminished public interest in SDFRN by quickly restoring the legitimacy of the institutional and ecological relationships—what Goldstein and Hull (2007) call the "social fire regime"—in which the citizenry had been situated prior to the Cedar fire.

As opportunity faded, SDFRN dissolved. The group's fragility and impermanence would seem to negate any lasting contribution to resilience, given the assumption that in order to enhance a community's transformative resilience a skunkworks must persist until conditions for biocultural transformation are ripe. Indeed, Hahn *et al*. (2006) emphasize ways in which an informal and vulnerable network can sustain adaptive resilience in a social–ecological system by formalizing collaborative achievements in the institutional apparatus of the state, such as legal arrangements, nature reserve designation, and land use planning. In contrast, the means by which SDFRN was sustained demonstrates the distinctiveness of a transformative skunkworks. While SDFRN was short-lived, the participants and leadership continued their activity within the network of environmental professionals and activists from which SDFRN emerged. As the prior history of these activists during the endangered species controversies of the late 1990s suggests, over the long term SDFRN was only one of the many manifestations of a social network that quickly coheres into organizational form during times of crisis.

Melucci (1989) suggests that new social movements allow their members to exist in a double-level form of visibility and latency, with intense but temporary mobilizations that experiment with new cultural models by producing information and reinforcing shared identity and institutional resources, only to disperse and submerge back into everyday life between mobilizations. In this sense, the

very fragility of SDFRN may have been beneficial, since the easy sacrifice of SDFRN and submergence of its membership back into more durable social networks may allow the subaltern knowledge practices that it produced to be remembered and possibly be mobilized at a later time (McIntosh *et al.* 2000). SDFRN's members were even able to retain their jobs and influence within the very agencies that they were critiquing, a liminal position that allowed them to mobilize the resources and legitimacy of the state in the service of designing its potential replacement.

Within resilience theory, the cultivation and conservation of different forms of knowledge and ways of life constitute more than a normative commitment to pluralism, or an opportunity to recognize the contingency of the dominant socioecology by observing its refraction in a multiplicity of heterotopias (Foucault 1986). A skunkworks that provides a community or society with ready access to a broad diversity of alternative social–ecological configurations has enhanced its transformative resilience, should adaptation to restore the existing social–ecological configuration no longer be possible (Hahn *et al.* 2006).

Conclusion

While the 2003 San Diego Cedar fire still burned, the region's network of ecological activists, scientists, and managers rapidly mobilized to create the San Diego Recovery Network (SDFRN). SDFRNers proposed four initiatives that also accomplished the immediate goals of government agencies: slope stabilization, reduction of vegetative fuel loads immediately adjacent to homes, making firefighting safer and more effective, and organizing residents into community-based fire protection associations. Through volunteer ecological restoration squads, ecological landscaping workshops, smart-growth planning and sheltering-in-place, and community organizing, SDFRN shifted social agency from governments to loosely organized citizen networks. These actions also made the immediate goals of state agencies coherent with the SDFRNer's long -term objective of promoting different patterns of settlement and practices of citizenship.

SDFRN faded away as the fire disaster receded in public consciousness. This return to normalcy was stimulated by the vigorous efforts of government agencies to demonstrate their relevance and energy through special commissions of inquiry, brush clearing, funding for the fire services, and other actions intended to protect the community from fearsome, invasive fires. While there remained little tangible evidence of SDFRN's initiatives once the sense of crisis had passed, the group's innovations were retained within the broad social network of activists from which the group emerged. Ultimately, the group's significance may lie in its service as a "transformative skunkworks," articulating modes of social–ecological organization that could later prove useful if a crisis threatens to turn into catastrophe because of the failure of a social–ecological system that had previously proven resilient.

Diamond (2004) describes the recurrence of catastrophic moments like these throughout history when societies have failed to react and adapt to a challenge because they lacked experience coping with environmental conditions at a certain level of intensity or duration, the crisis was beyond their understanding and control, or their dominant mode of reasoning provided a false analogy for the situation at hand. Diamond notes that the speed at which society can respond is a factor in its preservation, and that resilient societies have the capability to reflect on the causes of their vulnerability and mobilize the resources and will to avert threats to their survival. During these moments of crisis, the presence of pre-articulated alternatives may channelize societal deliberation while a "window of opportunity" (Kingdon 1984) for transformation is still open. Laboring in times when societal transformation seems remote and existing institutions impossibly strong is an essential feature of resilience, in whose absence a society can only be more vulnerable to this epitaph:

> Everywhere and every time, when societies have perished they have done so through their own neglect and self-delusion. It was not their environments, however severe, that did them in; or anyway not their environments alone. It was their failure to rise to the challenges those environments posed. (Geertz 2005)

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