

INTERNATIONAL

Journal of Wilderness

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- Wilderness fire policy and stewardship
- Wildland fire management
- Wildland fire and social influences
- South Africa, Alaska, Montana



APRIL 2006

VOLUME 12, NUMBER 1

Journal of Wilderness

APRIL 2006

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FRONT: Morning Light on Little Horn, Cradle Mountain, Tasmania, Australia. Photo by Peter Dombrovskis, © Liz Dombrovskis.

INSET: Rainforest fungi, Southern Ranges, Tasmania, Australia. Photo by Peter Dombrovskis, © Liz Dombrovskis.

International Journal of Wilderness

The *International Journal of Wilderness* links wilderness professionals, scientists, educators, environmentalists, and interested citizens worldwide with a forum for reporting and discussing wilderness ideas and events; inspirational ideas; planning, management, and allocation strategies; education; and research and policy aspects of wilderness stewardship.

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International Journal of Wilderness (IJW) publishes three issues per year (April, August, and December). *IJW* is a not-for-profit publication.

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Business Management and Subscriptions: WILD Foundation, P.O. Box 1380, Ojai, CA 93024, USA. Telephone: (805) 640-0390. Fax: (805) 640-0230. E-mail: info@wild.org.

Subscription rates (per volume calendar year): Subscription costs are in U.S. dollars only—\$35 for individuals and \$55 for organizations/libraries. Subscriptions from Canada and Mexico, add \$10; outside North America, add \$20. Back issues are available for \$15.

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Submissions: Contributions pertinent to wilderness worldwide are solicited, including articles on wilderness planning, management, and allocation strategies; wilderness education, including descriptions of key programs using wilderness for personal growth, therapy, and environmental education; wilderness-related science and research from all disciplines addressing physical, biological, and social aspects of wilderness; and international perspectives describing wilderness worldwide. Articles, commentaries, letters to the editor, photos, book reviews, announcements, and information for the wilderness digest are encouraged. A complete list of manuscript submission guidelines is available from the managing editor.

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Anticipating Change for Wildland Fire Use in Wilderness Ecosystems

BY ALAN E. WATSON

F. Stuart Chapin, in the Alaska theme issue of *IJW* (vol. 10, no. 2, August 2004) suggested to the wilderness community that we manage not for a set of uniform physical attributes but for protection of a wilderness character that is difficult to define, and that acknowledges the integral nature of the dynamic relationship between people and land. Chapin stressed that we need to orient our management toward uncertain but inevitable change, rather than managing to prevent change. If you went to the 8th World Wilderness Congress (WWC) in Anchorage, Alaska, this past October, you probably noticed that a major focus of technical and plenary sessions there was fueled by Chapin's comments in 2004.

One of 11 technical session themes at the WWC was Wilderness Stewardship in a Changing Environment, and was chaired by David Parsons of the Leopold Institute. To give us a greater understanding of some of the changes we need to anticipate and how to respond to them, there were more than 40 presentations in sessions plus workshops on everything from climate change and monitoring methods to detect change, to the effects of changing social balance in African countries and bemoaning the inevitable loss of wild time to civilization. One of the sessions, organized and moderated by Katie Knotek of the Leopold Institute was on The Challenge of Wilderness Fire Stewardship in a Changing Environment. The presentations from this single session form the core of the papers in this theme issue.

It is with great excitement that *IJW* brings you not only articles from agency, academic, and nongovernmental scientists on the challenges of fire restoration in wilderness due to change, but also from wilderness managers in both Alaska and South Africa to give us broader understanding of the influence of social, environmental, and political changes. Some additional pieces were invited that were believed to illustrate some of the issues discussed in the WWC presentations by Knotek, Aplet, Morton, Miller, and Krüger, or that expanded the discussion into areas not addressed at the WWC. Borrie, Liljeblad, Gunderson, Doane, and Hossack provided those articles. All articles were reviewed by two or more of the other authors or outside reviewers, and several authors read all papers before final revision of their papers, allowing some cross-fertilization and references.

If you are not aware of some of the challenges associated with wildland fire use for resource benefits in a time of such change, we hope this issue will be informative. We hope it reflects or goes beyond the presentations and discussion at the session within the WWC. We hope it stimulates progress in science, education, stewardship, and international circles to act quickly to facilitate better fire use decisions in wilderness and on adjacent lands. We expect the theme of change and its implications for wilderness stewardship is one that we'll see given increasing attention in future *IJW* issues. **IJW**

Take Back the Conservation Movement

BY DAVE FOREMAN

In my 35 years as a conservationist, I have never beheld such a bleak and dreary situation as I see today. The evidence for my dismay falls into three categories: the state of Nature, the power of anticonservationists, and appeasement and weakness within the conservation and environmental movements. None of this is reason for shrugging our shoulders and giving up, however. The bleakness we face is all the more reason to stand tall for our values and to not flinch in the good fight. But it is important for us to understand the parts and pieces of our predicament, so we might find ways to do better.

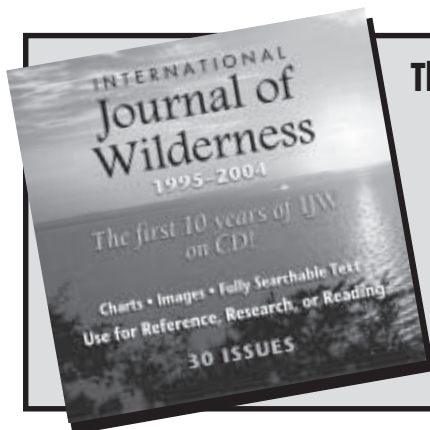
The State of Nature

I've just authored a book, *Rewilding North America* (Island Press, 2004; see book review in this issue), which goes into considerable detail describing and analyzing the Seven Ecological Wounds that drive the Sixth Great Extinction, which is the fundamental fact and problem in the world today. Around the world, direct killing of wildlife, habitat destruction, habitat fragmentation, loss of ecological processes, invasion by exotic species and diseases, ecosystem pollution, and catastrophic climate change are worsening. We six-and-a-half-billion too-clever apes are solely to blame

(Lovejoy 1980; Wilson 1992; Leakey and Lewin 1995). Duke University ecologist Stuart Pimm (2001) has shown in careful detail how humans are now taking 42% of Earth's net primary productivity (NPP). As we add half again as many people in the next few decades, how much NPP will we be gobbling up? How much will be left for the other several million species with which we share Earth? Despite impressive successes here and there, the overall state of Nature continues to decline. This is simple reality, despite the scolding we hear not to be doom-and-gloomers.

Power of the Anticonservationists

In the United States, the federal government has become the sworn enemy of conservation. Not only have the corporate toadies running the presidency and Congress stopped any progress for the conservation and restoration of Nature, they are dedicated to overthrowing the 20th century's legacy of conservation and environmental policy and programs. They are unabashedly trying to go back to the unfettered, uncaring era of the robber barons in the late 19th century. This revolution is both philosophical and practical (Pope and Rauber 2004). Bad as this is, the radical right is also dedicated to shredding science, particularly



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biology, and time-traveling back to before the Enlightenment.

While the United States is an extraordinary political case, elsewhere some of the supposedly most civilized nations on the planet, such as Canada, Norway, and Japan, are again waging 19th-century crusades against wild Nature: frontier-forest mining, slaughter of troublesome animals (such as seals, wolves, bears), and commercial whaling, just for starters. Japanese, European, Chinese, and American businesses are looting the last wild places for timber, pulp, wildlife, minerals, and oil, opening up such places to further habitat destruction and bushmeat hunting by local people.

Although the radical-right control of the U.S. presidency and Congress was gained by a very small margin in 2004 (no mandate), it is backed by powerful and popular forces and by a shocking descent into prescientific irrationality by large sections of the public.

Appeasement and Weakness in the Conservation and Environmental Movements

Efforts to protect wild Nature and to clean up pollution face internal subversion from the right and left that leads to deep compromises not only on policies but also on fundamental principles. We can stuff these calls to back off into several boxes, including sustainable development, resourcism, Nature deconstruction, politically correct progressivism, and anthropocentric environmentalism—which I combine under the umbrella of *enviro-resourcism*.

First, some brief definitions: conservation or Nature conservation is the movement to protect and restore wildlands and wildlife (Nature for its own sake); resourcism or resource conservation is the resource-extraction ideology of multiple-use/sustained

yield as practiced by the U.S. Forest Service and other agencies around the world (Nature for people); environmentalism is the campaign to clean up pollution for human health and make cities livable (the “built” environment for people). When they turn their attention to Nature, environmentalists can be either conservationists or resourcists. I call those environmentalists with a resourcist approach to wild Nature *enviro-resourcists*.

Internationally since the 1980s, conservation efforts to protect wildlands and habitat by means of national parks, game reserves, and other protected areas have been undermined as financial-aid agencies, and even some top international conservation groups have shifted to promoting so-called sustainable development and community-based conservation over protected areas. Dutch botanist Marius Jacobs warned the IUCN against this approach in 1983 but went unheeded (Jacobs 1983). Although these approaches are sometimes sound conservation tactics, in practice they have elbowed Nature into second place (Oates 1999; Terborgh 1999; Soulè 2000/2001). This establishment undercutting of Nature conservation has been aided by the leftist passion of some anthropologists and other social engineers to reject protected areas in favor of indigenous extractive reserves and land redistribution for peasants. Shockingly, criticism of protected areas rides high in the pages even of *Conservation Biology* (Terborgh 2005), and sustainable development gains more and more adherents in



Figure 1—Rafting on the Salmon River in the Frank Church River-of-No-Return Wilderness in Idaho (Bureau of Land Management). Photo by George Wuerthner.

resource management graduate schools and large “conservation” organizations. In some circles “conservation” is seen as a poverty alleviation tool, not as a way to protect wild species and habitats. Some members of the academic left have become deconstructors of Nature, denying that it independently exists, proclaiming that we invent it; therefore there is no reason to protect it (Soulè and Lease 1995; Vale 2002). Right-wing advocates of resource extraction glom onto the arguments of the wilderness deconstructionists (Whitlock and Knox 2002).

Pressured from the left and right during the last 25 years, conservation and environmental organizations worldwide have moved away from forthright calls for zero population growth, even though human overpopulation is the underlying cause of all conservation and environmental problems (Kolankiewicz and Beck 2001; Ryerson 1998/1999). We hear a growing drumbeat that there is a dearth of births and that developed nations face economic collapse because of fewer young people (Longman 2004). Conservationists and environmentalists stand silent in the face of this cornucopian madness.

Similarly, the conservation and environmental movements in general shy away from acknowledging the reality of human-caused mass extinction. If we don't even clearly state the problem, how can we do anything about it?

We can also see a shift in the United States from conservation to resourcism among several prominent and influential entities. Once the preeminent conserver of biological diversity, The Nature Conservancy (TNC) has been steadily moving to a resourcist approach. They talk now of "working timberlands and ranches," a fancy euphemism for logging and livestock grazing, and insist that their employees talk about people instead of Nature (Weigel 2004). Nonetheless, TNC also continues to protect priceless hotspots of biodiversity.

I am particularly concerned about the strengthening whip hand enviro-resourcists hold over the conservation movement. Enviro-resourcists are generally progressive-movement professionals who believe that conservation should be about people, not Nature. They are found among staff and board members of grant makers, consulting and training groups that help conser-

push them, including grassroots wilderness groups, into enviro-resourcism in these ways: (1) downplay Nature-for-its-own-sake values in favor of economic and other anthropocentric values as the reason for conservation; (2) replace strict protected areas, such as wilderness areas and national parks, with sustainable development, ecosystem management, "working" ranches, and extractive reserves; (3) "retire Cassandra" or downplay doom-and-gloom in favor of smiley-face optimism; (4) negotiate with other "stakeholders," including anticonservationists, for "win-win" compromises for land management; (5) get measurable results, including the designation of new wilderness areas and other protected areas, even if they represent a net loss of wildness, and then proclaim unvarnished victory—Canadians seem particularly good at this (Paquet 2005); and (6) emphasize the health of the organization over its mission. Not all enviro-resourcists push all of these approaches.

Such enviro-resourcists are aided and abetted internationally on the political right by international funding institutions such as the World Bank and

organizations to essentially go out of business and just become part of the progressive wing within the Democratic Party (Werbach 2004; Shellenberger and Nordhaus 2004). In the United States, the overwhelming identification of environmentalism with the progressive movement and the Democratic Party is a key reason that it lacks credibility with much of the American public.

Just as there has been a worrisome shift in attitudes among large segments of the public, so have there been troubling changes among members of the conservation public. To be blunt, many of the employees and activists with conservation groups are ignorant of our history and have not read the classic books of conservation. There is a stunning lack of intellectual curiosity in the movement. On the whole, staff and leaders of radical-right groups both read and think more than do conservationists and environmentalists (interestingly, most of the criticism of an earlier version of this paper was directed at this claim). As far as outdoor recreation goes, young people, who once would have been hikers and backpackers, now seek thrills on mountain bikes and thus cut themselves off from experiencing true wilderness and from having self-interest in protecting roadless areas. I don't see kids out messing around in little wild patches; they're inside, plugged in to a virtual reality.

Take Back the Conservation Movement

These are trends. Of course there are exceptions. There are true-blue conservationists in all of the outfits I mentioned above, including land- and wildlife-managing agencies. And I'm limited by available space from backing up my warnings and assertions. Dwelling on the exceptions, though, keeps us from

corporations, and by United Nations agencies.

Several bright young men have gained a disturbing amount of attention with their recent speeches about the "death" of environmentalism. Insofar as they consider Nature protection at all, they demand that conservationists drop their priorities to focus on social justice and other anthropocentric progressive causes. Overall, they call on environmental

The bleakness we face is all the more reason to stand tall for our values and to not flinch in the good fight.

vation groups with "organizational effectiveness," media consultants watering down the messages of conservation groups, new leaders and staff members of conservation groups motivated by ambition and lacking a gut feeling for wilderness, and in the ranks of anthropologists and other social scientists working for poverty alleviation. With a crowbar of financial support and organizational control, enviro-resourcists break into conservation groups and

doing something about the real problems. I'm not doing "nuance" here. This sober, unapologetic cataloging of the array of problems Nature conservationists face is, however, the first step in developing a more effective strategy for Nature lovers to take back the conservation movement, which I believe is essential for halting or at least lessening the destruction of wild Nature. Other steps include the following:

- Recognize the differences between resourcism, environmentalism, and conservation. Seeing the protection and restoration of wildlife and wildlands as a separate conservation movement will eliminate confusion and allow Nature lovers to focus on our priorities.
- Overcome the "environmentalist stereotype." In the United States, environmentalists and conservationists are stereotyped as part of the progressive wing of the Democratic Party, urban, politically correct, vegan, and antihunting. Whether or not certain conservationists fit into this stereotype is irrelevant. The stereotype discourages many who would otherwise support conservation measures from supporting conservation groups. Similar "greenie" stereotypes plague conservationists outside the United States.
- Proudly proclaim the basic values of Nature conservation. Don't be shy about saying, "I love wilderness and big cats!" Our distinguishing field mark is that we cannot live without wild things, that we try to protect snow leopards, whales, ivory-billed woodpeckers, and their habitats for their own sakes, not for specific benefits to humans. Celebrating the intrinsic value of all life-forms and the magnificent process that has brought all this

diversity into being is the bedrock of the conservation mind (Leopold 1949; Ehrenfeld 1981; Naess 1986; Foreman 1991). So long as we do not hide our fidelity to the intrinsic value of other species, it is acceptable to use utilitarian arguments in favor of protected areas and other conservation measures. We should also encourage *sustainable use* of resources in areas that are no longer wild.

- Recognize that the outstanding problem is human-caused mass extinction, and its driving cause is the

Let us instead offer a bold, *hopeful* vision for how wilderness and civilization can live together.

human population explosion, revved up by rising affluence, technology, and globalization. Although many organizations at all levels work to protect and restore threatened and endangered species, few forthrightly talk about the human-caused Sixth Great Extinction. Indeed, were a poll taken, I doubt that most members of conservation groups would show awareness of mass extinction or rate it as the highest priority. The retreat of resourcist, environmental, and conservation groups from calling for population stabilization as we did 30 years ago is perhaps the most astonishing and shameful deed in our history. Conservationists need to be seized by how growing human populations cause the loss of species and the degradation of habitats (Crist 2003).

- Be strong and unwavering in protecting and restoring wild Nature. Nearly everyone wants to be a player, to rub shoulders with the rich and powerful. The cost of doing so, however, is to water down your views, to hide your emotions and outrage, and to wink at self-serving resource industries playing good guys at international conservation conferences. Conservationists need not be rude, but we do need to be honest and forthright.
- Defend strict protected areas as "the most valuable weapon in our conservation arsenal" (Soulè and Wilcox 1980). Conservation biologists and conservation activists have long seen protected areas, the stricter the better, as the centerpiece of conservation (Nash 1967; Noss et al. 1999). Many now embrace the "rewilding" approach to protected area design: restoration of missing carnivores and other ecologically effective species; protection of large roadless core protected areas; and identifying and protecting important linkages for the movement of wildlife and natural ecological processes (Soulè and Noss 1998; Foreman et al. 2000; Ray et al. 2005).
- Strategically redirect conservation funding to build a powerful movement for the long run (Lavigne and Orr 2004). Over the last 40 years, the radical right has directed hundreds of millions of dollars into funding think tanks, training young activists, supporting leaders and organizations for the long term, and underwriting books and lectures. Resource extraction industries and ideological opponents of public lands and conservation have been mainstays of that funding. The radical right has been

disciplined about thinking and acting for the long term; we have failed in part because we do not have a long-term strategy to which we stick. Conservation funders are often fickle and fund short-term projects with measurable results. They have not built the movement by backing ideas, leaders, books, lectures, and so on.

- Encourage intellectualism within the conservation movement. Sad to say, the opponents of conservation have been better funded to build an intellectual basis for doing away with land and wildlife protection. Numerous hard-right think tanks with good funding have developed new ideas and strategic plans to kneecap conservation, and they have taught their “children” well. Conservation funders have ignored think tanks and the intellectual needs of the conservation movement. Young conservation staffers are generally not well-read and are unfamiliar with the lore and history of conservation. It is a priority to give them the intellectual grounding to be better leaders.
- Reach out to the political mainstream, including moderate Republicans and their counterparts in other countries. Conservation will fail if it confines itself to the left. By only modestly strengthening our support among moderate Republicans or their counterparts elsewhere, close votes in Congress and parliaments could go our way. For example, in the fall of 2005, a handful of brave House Republican moderates killed plans for oil drilling in the Alaska National Wildlife Refuge. Conservationists need to fold our ideas and projects into the language of traditional

conservatism: prudence, piety, posterity, responsibility, and anti-materialism (Bliese 2001).

- Proclaim and work for a vision that is bold, practically achievable, scientifically credible, and hopeful. Ask the public if we have the generosity of spirit, the greatness of heart to share Earth with other species and wild places. A movement is not made strong simply by opposing its foes. Conservation needs a big, bold, hopeful vision that can grab people in their hearts, an overarching vision into which all our efforts can fit. Continental-scale rewilding networks, such as the North American Wildlands Network, can do this (Soulè and Noss 1998; Soulè and Terborgh 1999; Foreman 2004).

These are just a few of the steps conservationists need to climb if we are to take back our movement from enviro-resourcists and to boldly tackle the forces of ecological destruction.

In December of 1776, the American Revolution was in its darkest hour. In response, Tom Paine wrote his first “Crisis” paper:

These are the times that try men’s souls. The summer soldier and the sunshine patriot will in this crisis, shrink from the service of his country; but he that stands it now, deserves the love and thanks of man and woman.

General Washington had the paper read to his miserable, disheartened troops in their frozen winter camps. There was no surrender. Years of hard battle lay ahead but victory was gained (Fast 1945).

We need Tom Paine conservationists in *our* dark hour. Let us not apologize for loving wild Nature, for caring about other species, for speaking the truth. Reach out to others.

Make deals when they are good deals. But let us not be frightened and brow-beaten into appeasement. Let us instead offer a bold, *hopeful* vision for how wilderness and civilization can live together, and be unyielding in defending and restoring wild Nature and standing up for the idea and reality of wilderness areas and other protected areas. **IJW**

Acknowledgments

Adapted from the Introduction to Foreman’s *Myth(s) of the Environmental Movement* forthcoming in 2006. *Myth(s)* will develop these thoughts and others in greater detail. Thanks to Rewilding Institute Fellows for comments on this paper.

REFERENCES

- Bliese, John R. E. 2001. *The Greening Of Conservative America*. Boulder, CO: Westview Press.
- Crist, Eileen. 2003. Limits-to-growth and the biodiversity crisis. *Wild Earth* Spring: 62–65.
- Ehrenfeld, David. 1981. *The Arrogance of Humanism*. New York: Oxford University Press.
- Fast, Howard. 1945. *Selected Work of Tom Paine/Citizen Tom Paine*. New York: The Modern Library, 44–47.
- Foreman, Dave. 1991. *Confessions of an Eco-Warrior*. New York: Crown.
- Foreman, Dave. 2004. *Rewilding North America: A Vision for Conservation in the 21st Century*. Washington, DC: Island Press.
- Foreman, Dave, Kathy Daly, Barbara Dugelby, Roseann Hanson, Robert E. Howard, Jack Humphrey, Leanne Klyza Linck, Rurik List, and Kim Vacariu. 2000. *Sky Islands Wildlands Network Conservation Plan*. Tucson, AZ: The Wildlands Project, Sky Island Alliance, Naturalia, New Mexico Wilderness Alliance, and Southwest Forest Alliance.
- Jacobs, Marius. 1983. The spirits of Bali. *IUCN Bulletin* 14: 64.
- Kolankiewicz, Leon, and Roy Beck. 2001. *Forsaking Fundamentals: The Environmental Establishment Abandons U.S. Population Stabilization*. Washington, DC: Center for Immigration Studies.
- Lavigne, Peter M., and David W. Orr. 2004. Rethinking green philanthropy. *OneNorthwest*, September 8, <http://blogs.onenw.org/onestlist/001685.html#comments>.

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Evolution of Wilderness Fire Policy

BY GREGORY H. APLET

Just as wilderness ecosystems have been shaped by fire (and the condition of those ecosystems has shaped fire behavior), wilderness policy has been affected by fire policy (and vice versa). The Wilderness Act and subsequent wilderness bills have addressed fire, and policy has evolved to recognize the free play of fire as a natural process. Similarly, fire policy has evolved to accommodate the peculiar demands of wilderness.

This co-evolution has its origin in the confluence of ecological thought and wilderness philosophy that occurred in the late 20th century. For most of the century, fire was considered a universal threat to people, resources, and wildlands. Eventually though the observations of foresters like Aldo Leopold (1924) and Elers Koch (Arno and Fiedler 2005) added to the research of scientists such as Harold Weaver (1943) and Herb Stoddard (1935) to force realization of the role of fire in sustaining species and maintaining the character of ecosystems. In 1963 a panel of ecologists responded to the National Park Service's request for a management review with the suggestion that "The goal [of park management] is to maintain or create the mood of wild America" (Leopold et al. 1963). They recommended fire be restored to the national parks.

Passage of the Wilderness Act in 1964 represented the culmination of the "fight for the freedom of the wilderness" begun by John Muir and sworn to by Robert Marshall (1930) and the other founders of The Wilderness Society in 1935. According to the Wilderness Act definition, "Wilderness [retains] its primeval character and *influence* [and] generally appears to have been *affected primarily by the forces of nature*" (emphasis added). It became clear that those "forces of nature" include fire.

The purpose of this article is to briefly review the policy history of wilderness fire, identify some barriers to its increased use, and propose some policy changes that could lead to more harmonious relations among people, fire, and wilderness.

Wilderness Fire Policy

This article is by no means intended to provide a comprehensive review of wilderness fire policy. For such a review, there is the excellent work of Kilgore (1986) and Parsons and Landres (1998), a number of papers presented at the 1999 Wilderness Science Conference (Agee 2000; Parsons 2000; Zimmerman and Bunnell 2000), or, for a more poetic treatment, Pyne's 1995 "Vestal Fires and Virgin Lands." Together, these reviews characterize the history of policy from the advent and growth of wilderness fire management, to the calamity of Yellowstone in 1988, and through rebirth and recovery.

Briefly, wilderness fire policy history began with the fires of 1910, which burned millions of acres in Idaho and Montana, killing 86 people and destroying entire communities. That experience led to a policy of intolerance and all-out suppression of fire throughout most of the 20th century. The accumulation of scientific evidence and societal desire to leave some parts of the country beyond direct human control, however, led to a shift in policy, initiated by the National Park Service in 1968 and followed by the USDA Forest Service in 1978, whereby some natural fires could be allowed to burn in specified locations under previously identified conditions. Over two decades, this prescribed natural fire (PNF) policy spread from its original application in California to national parks and wilderness areas across the country (see figure 1).

Whatever momentum had built up over that period ended abruptly in the summer of 1988 when a succession of fires that were allowed to burn in Yellowstone National Park encountered extreme fire weather and blew up into the



Greg Aplet. Photo by Sander Aplet.

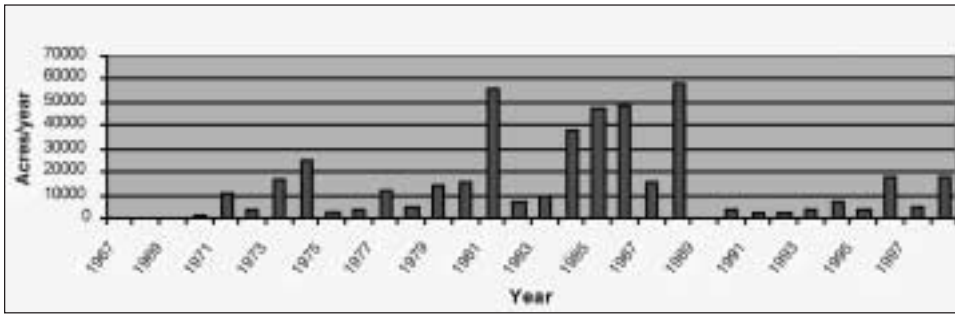


Figure 1—Natural fire acres burned on National Park Service lands, 1967–1998. Data from Parsons (2000).

largest fire event in the United States since that catalyzing year of 1910. Immediately, federal officials suspended the PNF policy, although a review of federal policy immediately after the Yellowstone fires concluded that the objectives of prescribed natural fire programs were sound (Wakimoto 1990).

In the years since Yellowstone, federal fire policy has been modified many times, with each revision fundamentally endorsing wilderness fire. The most important of these, the 1995 Federal Wildland Fire Management Policy and Program Review, changed the nomenclature of fire management but firmly endorsed Wildland Fire Use for Resource Benefit (WFU) as an appropriate response to natural fire. So strong was the wording of the policy that federal fire managers (Zimmer-

man and Bunnell 2000) concluded that wilderness fire implementation opportunities and accomplishments would grow as federal agencies implemented the 1995 Federal Wildland Fire Management Policy. Another review and update of the fire policy in 2001 directed “wildland fire will be used...and, as nearly as possible, be allowed to function in its natural ecological role,” and the 10-Year Comprehensive Strategy, developed to implement the National Fire Plan in 2002, established a goal to restore, rehabilitate, and maintain “fire-adapted ecosystems.”

It seems clear that federal fire management policy strongly supports wilderness fire. Parsons (2000), however, found that, in 1998, less than 15% of wilderness areas outside of Alaska had fire management plans that allowed some natural fires to burn,

leading him to conclude skeptically, “The optimism evinced by Zimmerman and Bunnell ... is promising but must be more fully evaluated.” Although the years leading up to 1998 showed a pattern of increasing Wildland Fire Use, the trend has not continued. The number of acres burned through Wildland Fire Use saw increases in 2003 and 2005, but the number of incidents of WFU has remained relatively stable (see figure 2).

Barriers to Implementation

For better or worse, environmental policy in the United States largely tends to be written in a way that allows for good decisions to be made but does not require those decisions to be made. To the extent that WFU is implemented, it is a direct result of the commitment of dedicated professionals who are willing to take risks for the benefit of the land. Managers face a number of impediments, many of which have been discussed in the policy reviews cited above. Here, I classify them into three groups for discussion: attitudinal, institutional, and political barriers.

Attitudinal Barriers

Attitudinal barriers are those impediments to WFU resulting not from policies per se, but from individuals’ beliefs. These barriers may apply to wilderness managers themselves, but more often, they apply to their superiors, who are in positions to influence fire use decisions. First and foremost among these barriers is the legacy of “suppression bias” afflicting land management agencies. Most agency personnel are trained in the techniques of fire suppression; they perceive themselves to be suppression professionals whose job it is to put fires out, not to let them burn. The very idea of letting a natural fire burn may be anathema

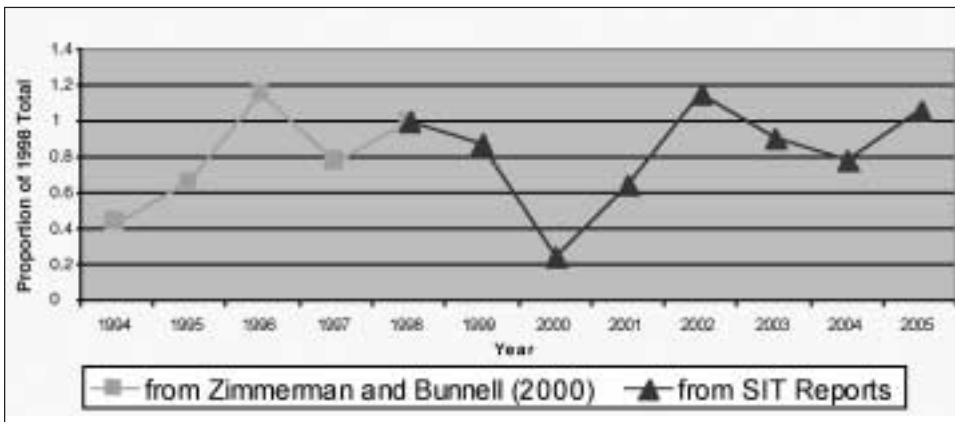


Figure 2—Number of Wildland Fire Use events on National Park Service and USDA Forest Service lands, 1994 through October 2005.

Note: Data from 1994 to 1998 are from Zimmerman and Bunnell (2000); data from 1998 to 2005 are derived from the final Incident Management Situation Report for each year (see <http://iys.cidi.org/wildfire/>). The two data sets share only 1998 in common, and because the values are different in each data set, the number of WFU events is normalized to a common 1998 value for display.

to them, and this bias can be an impediment to wilderness fire.

Another attitudinal barrier is the fact that wilderness managers often do not perceive tremendous support within their agencies. In some agencies, such as the Forest Service and Bureau of Land Management, wilderness management was traditionally relegated to “lesser” subdivisions of the bureaucracy, such as recreation or cultural resources, and not considered by some senior managers as part of the core mission of the agency. As a result, wilderness management, and maintaining wilderness fire in particular, was considered “somebody else’s job” and consequently was not supported by superiors responsible for making WFU decisions.

One especially challenging attitudinal barrier results from the sheer difficulty of managing wilderness fire. Whether the perceptions are of altered ecosystems resulting from fuel build-ups, threats of invasive plants, presence of threatened or endangered species, or of fragmented ownership and the proliferation of the wildland–urban interface, many managers perceive the job of fire restoration as prohibitively difficult.

Institutional Barriers

Although attitudes can prevent some managers from considering WFU, the dedicated manager, who understands WFU as part of the job, can still run into impediments and disincentives. Institutional barriers result from procedural requirements of WFU itself and from other forces external to wilderness fire. An example of the former is the additional *process* required by WFU. A WFU decision requires that a sound fire management plan (FMP) has been developed that provides for WFU. While FMPs exist for most federal administrative units, many are out-of-date and

do not allow for WFU. Bringing an FMP into compliance with fire policy represents extra work for the managers. Similarly, implementation of WFU requires the preparation of a Wildland Fire Implementation Plan (WFIP) during the fire event, which some managers may see as “more trouble than it’s worth.” Often, risk aversion in advance of a fire has led to such small “burn windows” (i.e., the envelope of fuel, weather, and topographic conditions

tion goal; however, a change in policy in 2003 prevented wildland fire use events from being counted as “acres treated,” thus removing a powerful incentive to implement WFU (Gregory 2005). Similarly, WFU events, because they are managed for resource benefit, are not eligible for postfire emergency stabilization funds. Therefore, a manager who otherwise wants to restore fire, but who is concerned about possible undesirable effects, is less inclined

There are many excellent managers distributed around the federal agencies who support wilderness fire, but they struggle against a culture of suppression.

inside of which WFU could be allowed) that it is difficult even to produce an implementable WFIP.

Another procedural barrier to implementing WFU is the requirement to arrange for emergency suppression personnel and equipment to be on hand, should conditions change and the fire exceed prescription. Also, certain types of experts, such as long-term fire analysts and fire behavior analysts, which are not typically staffed on site, must be brought in to help manage a WFU event.

Another type of institutional barrier is disincentives (or, often, simply the absence of incentives) to make the WFU decision. For example, under the National Fire Plan, agency managers are under tremendous pressure to show that they have addressed hazardous fuel conditions through fuel treatments such as prescribed fire and thinning. The “acres treated” are reported back up through the agency and serve as a basis for determining future budgets. Historically, WFU acres were considered fuel treatments and counted toward the hazard reduc-

tion goal; however, a change in policy in 2003 prevented wildland fire use events from being counted as “acres treated,” thus removing a powerful incentive to implement WFU (Gregory 2005). Similarly, WFU events, because they are managed for resource benefit, are not eligible for postfire emergency stabilization funds. Therefore, a manager who otherwise wants to restore fire, but who is concerned about possible undesirable effects, is less inclined

to choose WFU because funds will not be available to mitigate damage. As powerful as these disincentives are, none is as powerful as individual exposure to liability. A fire manager who selects the option of WFU is exposing him/herself to tremendous personal and professional risk. No one has ever been faulted for making the decision to suppress fire, but careers have ended as a result of decisions to allow fire. Until line officers are provided some limitation from liability—and provided a formal incentive to support wilderness fire—fear of professional exposure will continue to affect fire use decision making.

Political Barriers

Even if a manager has a positive attitude toward wilderness fire and can overcome institutional barriers, external political influences can hinder WFU. Although the benefits of fire have been well-known to the scientific community for years, the public has been slow to embrace them. People, understandably, remain



Figure 3—Smoke from a wilderness fire. Because of the way air quality laws are written, natural fire is often subordinated to these interests, and many WFU events have been extinguished to make room in the airshed for other sources of pollution.

concerned for their safety in the event of fire, and sensationalist media coverage has not helped to educate them on the nuances of fire ecology. Recent public opinion polling has shown that public acceptance of fire has increased, but managers' perceptions of public fear can dissuade the fire use decision. Similarly, public concerns about smoke, whether for nuisance or health reasons, can translate into political pressure to extinguish WFU events or avoid them altogether. This pressure can be especially strong from communities

Because of the way air quality laws are written, natural fire is subordinated to these interests, and many WFU events have been extinguished to make room in the airshed for other sources of pollution (see figure 3).

Policy Solutions

Although many of these challenges have no easy solutions, there are some changes that could be made relatively quickly to improve prospects for wilderness fire. One of the most important is to establish a supportive culture within agencies. There are many excellent managers distributed around the federal agencies who support wilderness fire, but they struggle against a culture of suppression. Strong statements of support from agency leaders, matched by supportive budgets, would send a loud signal that "It is your job!" Directions could begin with notification that revised Land and Resource Management Plans should be

that depend on tourism for their economic base.

Another source of external pressure comes from commercial interests that oppose fire. Particularly powerful among them are other "airshed consumers," such as agriculture or electric power, that depend on their ability to pollute, and see natural fire as competing with their interests.

developed to maximize the use of fire as a management tool, and fire management plans should be developed to maximize the conditions under which WFU may be implemented. Most important, though, is for managers to know that their WFU decisions will be supported at the top levels. Therefore, establishment of policies limiting personal liability if the proper decision-making process is followed is likely to have a greater effect than any other single change.

A complementary policy change that is likely to have far-reaching effects would be to provide incentives for WFU, such as the institution of formal performance measures that encourage WFU decisions. An obvious example is to restore the counting of WFU events as "acres treated" under the National Fire Plan. Another would be to track the proportion of planning areas in which WFU may be considered or the number of candidate ignitions that are classified as WFU events. Of course, decisions to implement WFU must be supported by adequate resources for the development of good FMPs, resources (both personnel and budgets) to manage WFU events, and access to emergency stabilization money, should damage occur during WFU events.

Another important way in which policy can support WFU is to fund research to solve the difficult challenges of fire management. Questions remain about appropriate "burn windows," effects on invasive species, quantifying benefits, and mitigating risk to communities. Fire managers need good tools for analyzing where and when WFU is appropriate (see figure 4). Recent research combining fire behavior analysis and GIS/remote sensing has dramatically improved our ability to model various real-world scenarios. Continued funding of wilderness fire



Figure 4—Firefighters from the Kings Peak Fire Use Module monitoring weather on a WFU event. WFU depends on managers who are willing to take risks for the good of the land. Photo by Northern Arizona Type 2 Incident Management Team.

research will help address the uncertainties and resulting fears that currently prevent managers and the public from taking full advantage of WFU.

Policies should also support public education about the benefits of fire to wilderness ecosystems and to people. Smokey Bear and other fire prevention programs have proven the effectiveness of public education. Similar efforts aimed at increasing public knowledge about fire, particularly efforts aimed at changing sensationalist media coverage, could also mitigate public fear and produce a society supportive of wilderness fire. A better understanding of fire ecology will be necessary among the public, but especially among air quality regulators, before policies can be developed that simultaneously address human health effects of smoke and sustain healthy wildland ecosystems.

Finally, perhaps the most important policy step that can be taken is to address public fear through necessary fuel treatment work in and around communities to lower fire danger. Only when people begin to feel safe in their homes will they warm to the idea of expanded wilderness fire. Resources are urgently needed to support planning and implementation of fuel

treatment on private lands where the community protection challenge is most acute. **IJW**

REFERENCES

- Agee, J. K. 2000. Wilderness fire science: A state-of-knowledge review. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. S. F. McCool, D. N. Cole, W. T. Borrie, J. O'Loughlin, 5–22. May 22–26, 1999, Missoula, MT. Proceedings RMRS-P-15-VOL-5. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Arno, S. F., and C. E. Fiedler. 2005. *Mimicking Nature's Fire: Restoring Fire-prone Forests in the West*. Washington, DC: Island Press.
- Gregory, L. 2005. Following the Money: National Fire Plan Funding and Implementation. Washington, DC: The Wilderness Society.
- Kilgore, B. M. 1986. The role of fire in wilderness: a state-of-knowledge review. In *Proceedings: National Wilderness Research Conference: Issues, State of Knowledge, Future Directions*, 70–103, ed. R. C. Lucas. July 23–26, 1985, Fort Collins, CO. Gen. Tech. Rep. INT-220. Ogden, UT: USDA Forest Service, Intermountain Research Station.
- Leopold, A. 1924. Grass, brush, timber, and fire in southern Arizona. *Journal of Forestry* 22(6): 1–10).
- Leopold, A. S., S. A. Cain, C. H. Cottam, I. N. Gabrielson, and T. L. Kimball. 1963. Wildlife management in the national parks. *American Forests* 69(4): 32–35, 61–63.
- Marshall, R. 1930. The problem of the wilderness. *Scientific Monthly* 30: 141–48.
- Parsons, D. J. 2000. The challenge of restoring natural fire to wilderness. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. S. F. McCool, D. N. Cole, W. T. Borrie, J. O'Loughlin, 276–82. May 22–26, 1999, Missoula, MT. Proceedings RMRS-P-15-VOL-5. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Parsons, D. J., and P. Landres. 1998. Restoring fire to wilderness: how are we doing? In *Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription*, ed. T. L. Pruden and L. A. Brennan, 366–73. Proceedings of the Tall Timbers Fire Ecology Conference, no. 20.
- Pyne, S. J. 1995. Vestal fires and virgin lands. In *World Fire: The Culture of Fire on Earth*, 238–55. New York: Henry Holt.
- Stoddard, H. L. 1935. Use of controlled fire in southeastern upland game management. *Journal of Forestry* 33: 346–51.
- Wakimoto, R. H. 1990. National Fire Management Policy. *Journal of Forestry* 88(10): 22–26.
- Weaver, Harold. 1943. Fire as an ecological and silvicultural factor in the ponderosa pine region of the pacific slope. *Journal of Forestry* 41:7-15.
- Zimmerman, T., and D. Bunnell, 2000. The Federal Wildland Fire Policy: Opportunities for wilderness fire management. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. S. F. McCool, D. N. Cole, W. T. Borrie, J. O'Loughlin, 288–97. May 22–26, 1999, Missoula, MT. Proceedings RMRS-P-15-VOL-5. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

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ume 5: Wilderness Ecosystems, Threats, and Management, comp. D. N. Cole, S. F. McCool, W. T. Borrie, and J. O'Loughlin, 276–82. Proceedings RMRS-P-15-Vol-5. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Parsons, D. J., and P. B. Landres. 1998. Restoring natural fire to wilderness: How are we doing? Proceedings of the Tall Timbers Fire Ecology Conference, No. 20, 366–73.

Radeloff, V. C., R. B. Hammer, S. I. Stewart, J. S. Fried, S. S. Holcomb, and J. F. McKeefry. 2005. The wildland-urban interface in the United States. *Ecological Applications* 15:799–805.

USDA and USDI 2001. *Review and Update of the 1995 Federal Wildland Fire Manage-*

ment Policy. Washington, DC: United States Department of Agriculture and United States Department of the Interior.

USDA and USDI. 2003. *Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy*. June 20. Washington, DC: United States Department of Agriculture and United States Department of the Interior.

USDA and USDI 2005a. *Wildland Fire Use Implementation Procedures Reference Guide*. May. Washington, DC: United States Department of Agriculture and United States Department of the Interior.

USDA and USDI 2005b. Interagency standards for fire and fire aviation operations. In *Fire Management Planning*, ch. 8. Washington,

DC: United States Department of Agriculture and United States Department of the Interior. <http://www.fire.blm.gov/Standards/Redbk/Chapter08.pdf>.

USDA and USDI 2005c. Quadrennial fire and fuel review report. Final content draft for comment. May 20.

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Wilderness Fire Stewardship on the Kenai National Wildlife Refuge, Alaska

BY JOHN M. MORTON, EDWARD BERG, DOUG NEWBOULD,
DIANNE MacLEAN and LEE O'BRIEN

Introduction

The policies of all four federal agencies responsible for managing wilderness in the United States recognize the importance of fire as a natural ecological process and the desirability of restoring the



John M. Morton. Photo from U.S. Fish and Wildlife Service.

historic role of fire to wilderness ecosystems (Parsons and Landres 1998). In 1995 the Departments of the Interior and Agriculture issued *Federal Wildland Fire Management: Policy and Program Review*, which provided policy direction for all federal wildland fire activities. A guiding principle of this new policy is that the role of wildland fire as an essential ecological process will be incorporated into the planning process. This new policy allows naturally ignited

fires to be managed for resource benefits wherever an approved fire management plan is in place (Parsons et al. 2003).

However, despite the increased emphasis on managing wilderness fire for resource benefits—Wildland Fire Use (WFO)—no agency has a fully successful wilderness fire management program (Parsons 2000). In addition to the policy and administrative constraints that have limited the use of natural fire, even on the larger units, there are other reasons why natural fire can never be expected to be allowed to burn in some wilderness units.

In this article, we review the 2005 fire season on the Kenai National Wildlife Refuge (KENWR), especially the five lightning starts in wilderness. The decision process for suppressing these fires, or not, clarifies some of the major obstacles to allowing wildland fires in wilderness.

Kenai National Wildlife Refuge

The 2-million-acre (800,000-ha) KENWR is in south-central Alaska on the Kenai Peninsula, which is formed by the Cook Inlet and Prince William Sound. KENWR shares

boundaries with Chugach National Forest and Kenai Fjords National Park. KENWR was established in 1941 as the Kenai National Moose Range but was renamed under the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. ANILCA also gave KENWR its mandates, of which the primary purpose is to conserve fish and wildlife populations and habitats in their natural diversity.

Biodiversity is unusually high for this latitude because of the juxtaposition of two biomes on the peninsula: the northern fringe of the Sitka spruce-dominated (*Picea sitchensis*) coastal rainforest on the eastern flank of the Kenai Mountains, and the western-most reach of boreal forest in North America on the western side of the Kenai Mountains. Forests on KENWR are dominated by white (*P. glauca*) and black spruce (*P. mariana*) with an admixture of aspen (*Populus tremuloides*) and birch (*Betula neoalaskana*). Extensive peatlands are interspersed among spruce in the Kenai Lowlands. Lichen-dominated tundra replaces mountain hemlock (*Tsuga mertensiana*) and subalpine shrub above treeline in the Kenai Mountains and Caribou Hills.

Unlike the other 15 refuges in Alaska, KENWR has a fairly substantial urban interface with issues more typical of the lower 48 states, such as high recreational use and expanding adjacent resident population, but also with oil and gas activities, contaminants, and commercial fisheries. More than 50,000 people live on the Kenai Peninsula, and as one of only two Alaskan Refuges on the road system, KENWR is a recreational destination for many Anchorage residents and tourists.

Wildfire and spruce bark beetles (*Dendroctonus rufipennis*) are the dominant disturbance processes on KENWR. There are two distinct fire cycles: black spruce has a mean fire return interval of 79 years (De Volder 1999), whereas white spruce burns much less frequently, averaging once in 400 to 600 years

(Berg and Anderson, in press). The two largest fires in the last century were in 1947 (310,000 acres; 125,506 ha) and 1969 (86,000 acres; 34,818 ha).

Fire Management

In 1980 Congress designated 1.35 million acres (550,000 ha) or about 69% of KENWR as wilderness in three separate geographic units. Wilderness on KENWR is managed in accordance with the Wilderness Act, ANILCA, National Wildlife Refuge System Administration Act, Federal regulations (50 CFR), and U.S. Fish and Wildlife Service (USFWS) policy. The 1985 Comprehensive Conservation Plan (CCP) established the current directives for managing fire and wilderness on KENWR. Specifically, WFU is allowed on 97% of KENWR, prescribed fire is not allowed in wilderness, and wildfires not contributing to management goals are suppressed using the “minimum appropriate tool.” WFU is naturally ignited wildland fire whereas prescribed fire is management-ignited fire; both are managed to achieve specific, planned resource objectives in approved land and fire management plans.

The 1998 Alaska Interagency Wildland Fire Management Plan further defines how fire is managed on KENWR. This plan defines four Fire Management Options that can be applied by KENWR to help define suppression priorities and the default response to wildland fires in different areas. The options range from Critical, where human life or inhabited property is at stake, to Full where uninhabited property or cultural/historic sites are at risk, and to Limited where there are few anthropocentric resources. Under the Modified option, fire is managed as Full until a conversion date changes the option to Limited. Only in Limited is the default response (i.e., initial attack) to allow a fire to burn, whereas suppression is the default for the other three

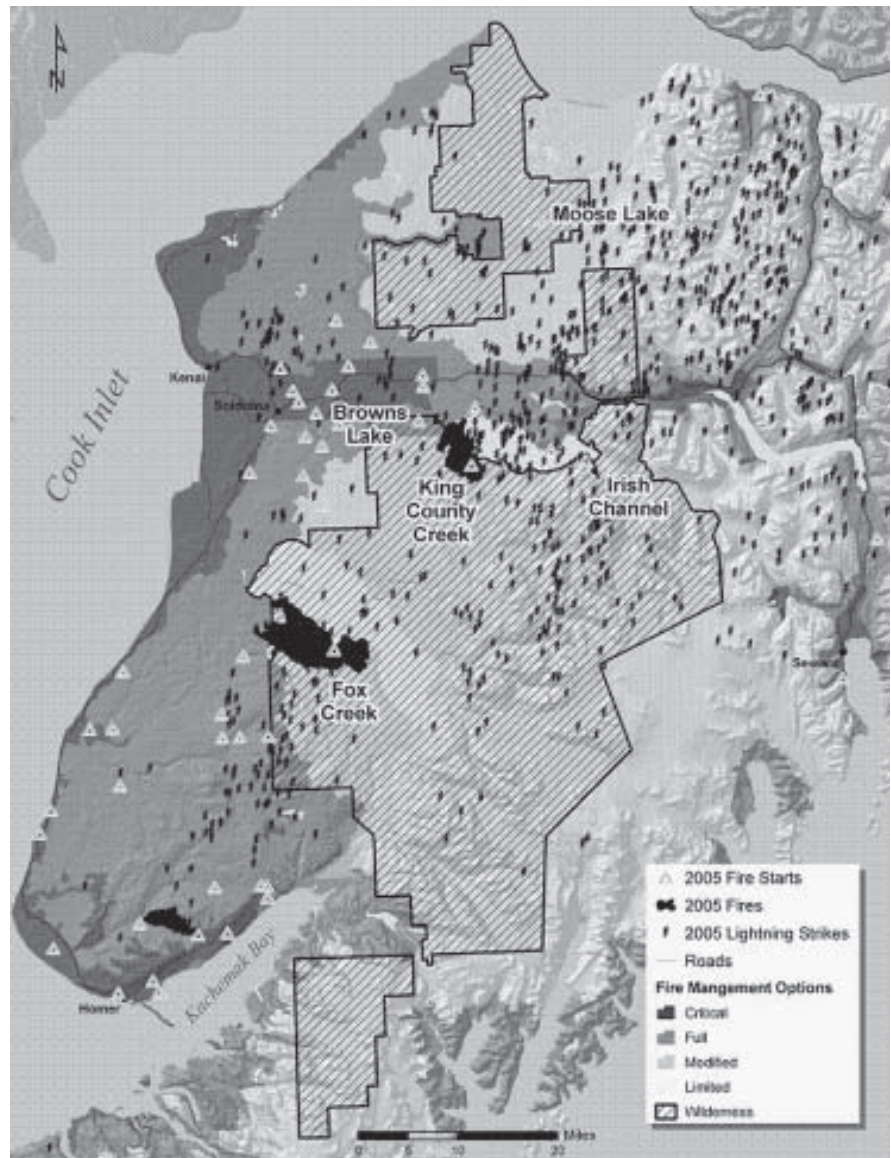


Figure 1—Lightning strikes, fire starts and Fire Management Options on the Kenai Peninsula in 2005, with specific reference to five wildfires in wilderness. Map courtesy of U.S. Fish and Wildlife Service.

options. This classification, which is unique to Alaska and applies only to naturally ignited fires (all human-caused fires are suppressed), was first applied to KENWR in 1984. In 2004, Fire Management Options on KENWR were adjusted to increase the likelihood of natural wild-fire being managed for resource benefit. The Limited option area was increased from 780,000 acres (316,000 ha) to 1,283,000 acres (520,000 ha), effectively placing 97% of wilderness under the Limited option. This change helped set the stage for the relative success of fire management activities in 2005.

In 2005, there were 54 fire starts on the Kenai Peninsula, of which 30 were anthropogenic, 22 were lightning strikes, and two were from unknown sources (see figure 1). Of the 22 lightning-ignited fires, 15 were on KENWR. All but two of the 15 wildfires were suppressed, despite the fact that six occurred in Limited and five were in wilderness.

The Brown's Lake Fire was a lightning start in black spruce in a Full option area. It was immediately suppressed due to its proximity to several subdivisions and the community of Funny River, at a cost of \$5,000. Similarly, the Moose Lake

Fire was a lightning start in black spruce, but it occurred in a Limited option area. Although the default response should have been to allow it to burn, it was suppressed for three reasons: (1) there were several other concurrent fire starts on KENWR, (2) the fire was showing extreme behavior, and (3) there was concern that personnel at a nearby research facility could not be evacuated safely. This fire was small (13.5 acres, 5.4 ha), but suppression costs were \$114,000.

The King County Creek Fire was a lightning start in black spruce, initially in a Limited option area. However, the fire spread rapidly to the northwest toward areas designated as Full surrounding the town of Sterling. This is one of the few areas on KENWR where Wilderness is designated as Full rather than Limited management option due to the values at risk. The Incident Management Team contained the fire within natural barriers using aerial ignition to burn out unburned fuels in advance of the wildfire. The firing operation consumed an area almost as large as the wildfire footprint, with suppression costs estimated at \$3 million for a fire that totaled 10,100 acres (4,100 ha).

The Fox Creek Fire was a lightning strike in beetle-killed white spruce in a Limited option area. It was designated for WFU (i.e., allowed to burn) because it was flanked to the north by Tustumena Lake, and to the east and west by wildfire scars from 1994 and 1996, respectively, with no nearby human habitation or structures to the south. However, the fire advanced westward into the remnant fuels left by the 1996 fire, threatening private cabins outside both wilderness and refuge boundaries. The fire also spread toward a historical cabin on the Tustumena Lake shoreline. Consequently, firefighters used aerial and hand ignition methods to both flank the fire in the west and to defend the cabin, both of which proved to be successful

actions. The fire ultimately burned 26,300 acres (10,650 ha), with suppression costs estimated at \$1 million.

The Irish Channel Fire was a lightning strike in mountain hemlock in a Limited option area. It was designated for WFU fairly soon after detection because it was flanked on the east by a previous fire in 2003, to the north and west by Skilak Lake, and to the south by tundra and glacier. This fire slowly consumed 925 acres (375 ha); management costs were negligible, essentially restricted to surveillance.

These five wildfires in wilderness demonstrate some of the vagaries of wilderness fire stewardship on KENWR. All five fires were lightning strikes in wilderness, four of which were in Limited. Three were suppressed in varying degrees, and two were allowed to burn as managed wildfires. The 27,225 acres (11,025 ha) burned by these latter two fires were the only WFU acreages reported by the USFWS in 2005. The 37,325 acres (15,111 ha) burned by all fires approximates the total acreage (41,350 acres/16,740 ha) that had previously been burned by anthropogenic and natural wildfire during 1985–2004 on KENWR.

Discussion

We recognize that managed wildfire must be used more effectively on KENWR. Several factors constrain WFU on KENWR, the most significant of which is the proximity of the urban interface to wilderness boundaries. Furthermore, because Wilderness on KENWR is fragmented into three units, the wilderness boundary (470 miles/760 km) exceeds the refuge boundary (409 miles/660 km), even though the former is within the latter. This geometric artifact increases the risk of wildfire to human safety, property, and structures.

The threat of personal liability to the refuge manager may be a substantive hindrance to WFU. Frankly, few managers would approve the Maximum

Manageable Area of 128,400 acres (52,000 ha) that was defined for the Fox Creek Fire. A fire of this magnitude raises public and political ire both locally and in Anchorage. Air quality degradation associated with fire elicits complaints and sometimes financial penalties from the Alaska Department of Environmental Conservation. Fortunately, most peninsula residents were supportive of the decision to not suppress the Irish Channel and Fox Creek Fires. Both fires were remote, and local educational outreach about the need for fire appeared to be successful; most complaints originated from Anchorage, not the peninsula.

Logistics played a role in the decision to suppress the Moose Lake Fire, even though it was in Limited Management Option in wilderness. This fire was detected shortly after a severe June lightning storm and several fires elsewhere on the peninsula were already being managed or suppressed. Fire management resources on the peninsula and elsewhere in Alaska are limited and may have been inadequate for controlling multiple, concurrent large fires with extreme fire behavior.

Prescribed fire has been the land management tool most advocated for mimicking or restoring natural fire regimes in wilderness. In the lower 48, the USFWS has relied almost entirely on prescribed fire to accomplish wilderness management objectives, including the reduction of hazardous fuels, range improvement, wildlife habitat enhancement, and restoration of natural fire regimes (Parsons 2000). However, there continues to be considerable opposition both within and outside the USFWS and other agencies to prescribed fire in wilderness. Prescribed fire is viewed by many as inappropriate intervention that detracts from the wild or untrammled nature of wilderness, and that its use conflicts

with the primary purposes of wilderness. Perhaps of greatest concern is that the use of prescribed fire could become an accepted alternative to natural ignitions and as such would soon become the dominant wilderness fire management strategy (Parsons 2000).

During a recent USFWS workshop, five situations were identified in which prescribed fire might be an appropriate tool in Alaskan wilderness: (1) to restore or enhance habitats of federally listed threatened and endangered species; (2) to control or eradicate invasive flora; (3) to increase the likelihood of naturally ignited fire to burn unimpeded (by reducing hazardous fuel loads around structures and the urban interface); (4) to restore a natural fire regime that has been temporarily altered (e.g., extreme fuel loads due to blowdown from a hurricane); and (5) to mimic a natural fire regime that has been altered and is not expected to be restored due to constraints on wildfire management.

Currently, situations 1, 2, 4, and 5 do not apply to KENWR. KENWR does not have listed species, invasive flora have not yet been identified that require fire treatment, and the fire regime at a landscape scale does not appear to be altered, temporarily or otherwise. However, situation 3 is a need that has been identified on KENWR. Aerial ignitions were used during the 2005 season to both contain wildfire (King Country Creek) and protect structures (Fox Creek). The use of prescribed fire to remove fuels or convert forest types would have presumably been safer and less expensive than managed wildfires. In this context, using prescribed fire to reduce fire risk at the wildland-urban interface, around structures, and along administrative boundaries may be an important approach to increasing the likelihood of WFU in wilderness.

The use of prescribed fire within wilderness has been proposed in the draft

revised CCP for KENWR. Despite high suppression rates, there is concern that the natural fire regime is gradually being accelerated by increasing ignition rates, a 10-year outbreak of spruce bark beetles of unprecedented magnitude and size (Berg et al., in press), and a resident human population growing at 2.2% per year

Prescribed fire in wilderness is not without its concerns. Collateral damage associated with fire management activities may include exotic plant introduction, physical impacts associated with mechanical treatments, use of constructed fire lines for legal and illegal access by snowmachines and other off-road vehicles. Translating landscape-level estimates of the natural fire regime into when and which acre gets burned is also highly problematic; most fire behavior models are not spatially and temporally explicit at this resolution.

We are also concerned that historic fire regimes may be changing in response to global climate change. For example, long-term colonization of peatlands by black spruce will provide continuity of fuels across previously wet muskegs that served as firebreaks in fires such as the 1947 fire (Klein et al. 2005). This expanded fuel bed, coupled with longer, drier summers may be conducive to larger and more severe fires in the lowland black spruce forests, as well as putting more fire on the flanks of upland white spruce stands. As yet, we are not aware of any policy that articulates how historic fire regimes should be viewed (i.e., is it “natural?”) as global climate change becomes more apparent. **IJW**

REFERENCES

- Berg, E. E., and R. S. Anderson. In press. Fire history of white and Lutz spruce forests on the Kenai Peninsula, Alaska, over the last two millennia as determined from soil charcoal. *Forest Ecology and Management*.
- Berg, E. E., J. D. Henry, C. L. Fastie, A. D. De Volder, and S. Matsuoka. In press. Long-term histories of spruce beetle outbreaks in spruce forests on the western Kenai Peninsula, Alaska, and Klauane National Park and Reserve, Yukon Territory: Relationships with summer temperature. *Forest Ecology and Management*.
- De Volder, A. 1999. Fire and climate history of lowland black spruce forest, Kenai National Wildlife Refuge, Alaska. Unpublished MS thesis, Northern Arizona University, Flagstaff, AZ.
- Klein, E., E. E. Berg, and R. Dial. 2005. Wetland drying and succession across the Kenai Peninsula Lowlands, south-central Alaska. *Canadian Journal of Forest Research* 35(8): 1,931–41.
- Parsons, D. J. 2000. The challenge of restoring natural fire to wilderness. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, ed. D. N. Cole, S. F. McCool, W. T. Borrie, and J. O’Loughlin, 276–82. May 23–27, Missoula, MT. Proceedings RMRS-P-15-Vol-5. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Parsons, D. J., and P. B. Landres. 1998. Restoring natural fire to wilderness: How are we doing? (eds.). In *Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription*, ed. T. L. Pruden and L. A. Brennan, 366–73. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tallahassee, FL: Tall Timbers Research Station.
- Parsons, D. J., P. B. Landres, and C. Miller. 2003. Wildland fire use: The dilemma of managing and restoring natural fire and fuel in the United States wilderness. In *Proceedings of Fire Conference 2000: The First National Congress on Fire Ecology, Prevention, and Management*, ed. K.E.M. Galley, R. C. Klinger, and N. G. Sugihara, 19–26. Misc. Publ. No. 13. Tallahassee, FL: Tall Timbers Research Station.
- U.S. Fish and Wildlife Service. 1985. *Kenai National Wildlife Refuge Comprehensive Conservation Plan*. Anchorage, AK 99503.
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Wilderness Fire Management in a Changing World

BY CAROL MILLER

Several strategies are available for reducing accumulated forest fuels and their associated risks, including naturally or accidentally ignited wildland fires, management ignited prescribed fires, and a variety of mechanical and chemical methods (Omi 1996). However, a combination of policy, law, philosophy, and logistics suggest there is



Carol Miller.

a more limited set of fuels management activities that are appropriate in wilderness (Bryan 1997; Parsons and Landres 1998; Nickas 1998). Naturally ignited wildland fires is the commonly preferred fuels management strategy in wilderness (Miller 2003), with management-ignited prescribed fire being considered in some cases (Landres et al. 2000). Restoring the ecological role of fire to wilderness has proven difficult,

as the majority of lightning-caused ignitions in wilderness are suppressed for myriad biophysical and social reasons (Morton et al. this issue; Miller and Landres 2004; Parsons and Landres 1998). This article discusses fire management options currently available to managers of wilderness in the United States and speculates how these might change with nationally and globally important influences.

Wildland Fire Use in U.S. Wilderness

Wilderness fire managers in the United States have a range of options for responding to unplanned (naturally or accidentally caused) ignitions, and the appropriate response should be based on ecological, social, and legal consequences of the fire (USDA and USDI 2001). U.S. federal fire policy currently distinguishes two types of wildland fire that can result from unplanned ignitions: wildfire and Wildland Fire Use (WFU). Wildfire is unwanted fire that

results from either human or natural causes, and the management objective is to stop the spread of the fire and extinguish it at the least cost (USDA and USDI 2001). In some cases, concerns about firefighter safety and suppression costs will result in a less aggressive suppression response to a wildfire, with features of the landscape being used to allow fire to burn within a designated area. WFU is the management of naturally ignited wildland fires to protect, maintain, and enhance resources in predefined areas outlined in fire management plans (USDA and USDI 2001). The management objective is to allow fire, as nearly as possible, to function in its natural ecological role. In some cases, certain suppression tactics might be used with WFU to protect life, property, or specific values of concern. Recently, there has been discussion about effectively dissolving the distinction between wildfire and WFU, and managing all wildland fires with an appropriate management response (AMR) (USDA and USDI 2005c).

The use of naturally ignited wildland fires to achieve resource objectives on federal lands began in the 1960s (Aplet, this issue). At that time, these fires were called Prescribed Natural Fires (PNFs); a policy change in 1995 introduced the new terminology of Wildland Fire Use (WFU). Since the early 1970s, when policies were first implemented to use natural ignitions, well over 1 million acres (404,858 ha) have been allowed to burn by either PNF or WFU in national parks and national forests, with the vast majority of PNF or WFU occurring within designated wilderness. Over the past 35 years, WFU has been implemented with varying degrees of success in wilderness. In recent years there has been increased application, and the expectation by managers is that it will continue to increase (Miller and Landres 2004). There is also increasing application of WFU outside wilderness, and a significant portion of the total area burned by WFU during the fire season of 2005 occurred outside designated wilderness.

Information collected through telephone and email interviews in 2003 indicate that at least 29% of wilderness units in the United States have the necessary authorization for WFU in approved land and resource management plans (LRMPs) and fire management plans (FMPs) (unpub. data) (see figure 1). The percentage of areas with authorization for WFU has likely increased in the past two years as the FMP process has continued (e.g., USDA and USDI 2005b). Furthermore, all federal lands in Alaska have strategies equivalent to WFU, but the terminology of WFU is not necessarily used. More than half of the wilderness units in Alaska have a written FMP that explicitly allows WFU, but those that don't are not included in the 29% figure.

Not surprisingly, there is a tendency for managers of larger wilderness areas to have the WFU option (see figure 2). Because fires are more likely to escape from a smaller wilderness area, local and regional staff may consider WFU an infeasible strategy in those smaller areas, and WFU is less likely to be authorized in the plans. Oftentimes, the considerable effort involved with revising and updating a plan is not seen as worthwhile if there is little opportunity for WFU.

However, even in many wildernesses where the fire management plan allows for WFU, the majority of lightning ignitions are suppressed (Morton et al., this issue). Where the potential for fire to escape the wilderness boundary is high and when fire behavior can be expected to be erratic or of high intensity, managers may feel less comfortable making the WFU decision (Miller and Landres 2004; Doane et al. 2005). Furthermore, there is an inherent difference in the longevity of a typical suppression fire versus a WFU event. Suppression fires typically have a lifetime of days or a couple of weeks, whereas the WFU decision requires commitment by a manager to living

with that fire—along with any changes in resources or weather—for the remainder of the fire season.

Forces of Change

To anticipate the future of WFU in U.S. wilderness, one needs to consider the dynamic human and ecological environments within which any wilderness area resides. Many factors can be expected to restrict or expand the range of options available to fire managers, but two of the strongest influences will likely be human development patterns and climate.

Rural areas, particularly in the western United States, have seen dramatic increases in human populations during the past few decades. Much of this increase has resulted in the creation and expansion of the wildland-urban interface (WUI), where wildland vegetation and houses intermingle (Radeloff et al. 2005). As housing densities increase and the WUI continues to expand, the potential threats to life and property from wildland fire increase (Hammer et al. 2004). Where WFU is not yet an option, the continued expansion of the WUI casts serious doubt on whether

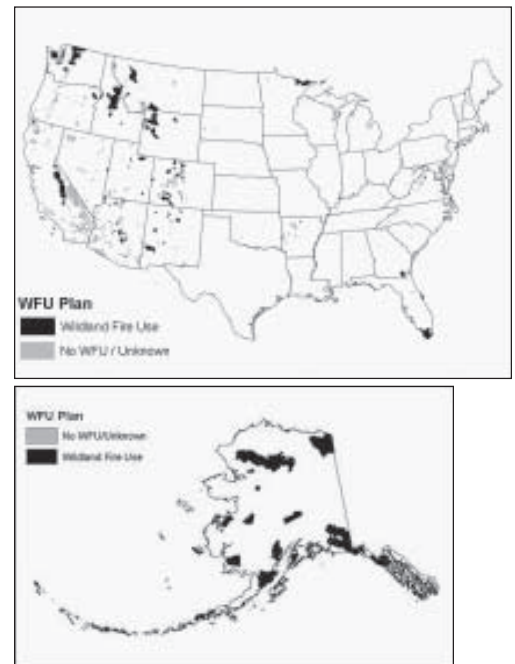


Figure 1—Status of authorization for WFU in US wilderness areas.

revisions of management plans will ever authorize the strategy. Where WFU is already an option, wilderness fire managers will find it increasingly difficult and costly to mitigate the risks posed by WFU. The result could be fewer decisions to exercise the WFU option.

The impact of encroaching human development will be felt most intensely

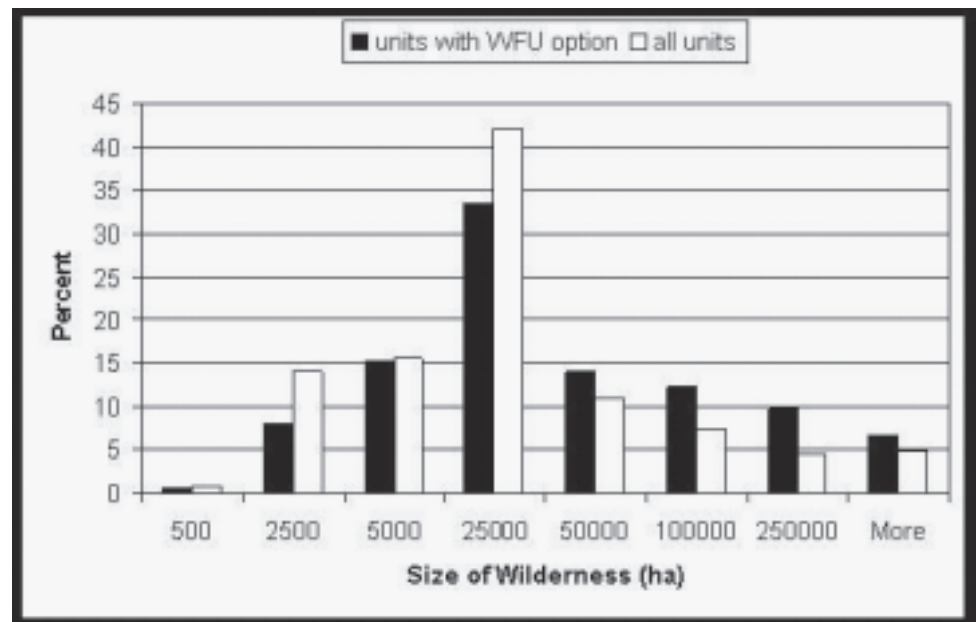


Figure 2—Size distribution of wilderness units with the necessary authorization for WFU in approved LRMPs and FMPs compared to size distribution of all wilderness areas.



Figure 3—Because of the risks involved, WFU may not be feasible in all wildernesses, and in such cases, management-ignited prescribed fire may be a viable option. Photo by U.S. Forest Service.

by managers of smaller wilderness areas, where there is a higher likelihood of fires escaping. Managers of wilderness with certain shapes and geographic orientations will also face additional challenges. For example, wilderness areas situated along mountain ranges in the western United States are typically oriented north-south, as are the adjacent populated valleys. This orien-

tation is problematic for the fire manager because the prevailing wind direction—which influences direction of fire spread—is west-east. In these kinds of settings, the decision to implement WFU may be especially difficult.

Forecasts about future climate include warmer temperatures in winter and summer, with an unprecedented rate of warming (IPCC 2001). This is likely to lead to increased drought, longer fire seasons, and more area burned (McKenzie et al. 2004). Snowmelt will occur earlier at high elevations, bringing more area within a wilderness into the fire season for a longer period of time. All of these forecasted changes will compound the challenges currently faced by wilderness managers. Wilderness managers may find it more difficult to handle the increased load of fire activity that can be expected under a future climate. Longer fire seasons will require longer-term commitments to managing a WFU, potentially stretching the comfort level of many managers. Fire intensities and spread rates increase with dry conditions (Catchpole et al. 1998). If WFU decisions are limited now by

concern over expected behavior and risk of escape, managers may become even more reluctant to make the WFU decision in a warmer and drier climate. Finally, under drier conditions, we can expect individual fires to be larger, and perhaps more often spread out of a wilderness.

The Prescribed Fire Option

Because of the risks involved, WFU may not be feasible in all wildernesses (Parsons 2000), and in such cases, management-ignited prescribed fire may be a viable option (see figure 3). Changes in housing development patterns and climate that present increased challenges for the application of WFU may make prescribed fire an attractive option to wilderness managers (see figure 4). However, for philosophical, ecological, and practical reasons, the use of prescribed fire in wilderness will likely be limited. Philosophically, prescribed fire represents a manipulation that is inconsistent with the “untrammeled” intent of wilderness described in the 1964 Wilderness Act (Nickas 1998). Ecologically, prescribed fires may not be an adequate substitute for natural fire (Baker 1994). Finally, prescribed fire will not be a practical option for many wilderness areas that are typically difficult and costly to access.

The implementation of prescribed fire in wilderness is fundamentally different from WFU implementation. To meet the requirements of the 1969 National Environmental Policy Act, prescribed fires must undergo some form of public review, but this review can be done on a case-by-case basis and so prescribed fire use does not have to be approved in the LRMP or FMP. Even so, as of 2003, 42% of wilderness units had the authorization for prescribed fire explicit in their management plans. This is probably because many wilderness fire managers do not feel



Figure 4—The impact of encroaching human development will be felt most intensely by managers of smaller wilderness areas, where there is a higher likelihood of fires escaping. Photo by U.S. Forest Service.

comfortable conducting prescribed burns in wilderness unless the fire management plan explicitly prescribes it.

Conclusion

How we steward wilderness fire in a changing environment requires that we recognize our management options may be changing. The combination of increasing development and a warmer climate is likely to make the decision to implement WFU more difficult in the future. It is more important than ever for the wilderness management community to fully exploit available options now. Management actions taken today will influence the range of options that will be possible in the future, widening or narrowing the future decision space for WFU.

The option of WFU needs to be made available in many areas where it doesn't currently exist. In many cases, this requires not only the revision and update of FMPs, but also revision of LRMP. The recent trend in fire management planning efforts of extending the WFU option to lands outside wilderness, especially in the western United States, will improve the ability of managers to more fully realize WFU objectives. In many cases, improved cooperation across agencies will also be necessary. The management flexibility of allowing a WFU fire to cross political boundaries essentially increases the effective size of wilderness and makes it easier for a wilderness manager to make the WFU decision.

Where WFU is already an option, managers need support and incentives for implementation (Aplet, this issue). Fire management decisions made today have great potential to keep future management options open because today's fires can serve as tomorrow's strategic firebreaks on the landscape. Increasing the implementation of WFU will mean helping managers overcome

WFU is the management of naturally ignited wildland fires to protect, maintain, and enhance resources in predefined areas outlined in fire management plans.

some of the barriers and disincentives for WFU (Doane et al. 2005).

WFU is arguably one of the most effective fuels management strategies we have, but it needs to be integrated with other fuels management strategies on surrounding lands, and in some cases, in wilderness. As WFU becomes more difficult to implement, wilderness managers will need to identify if, when, and where WFU needs to be supplemented with prescribed fire or other fuel manipulations. As such, we can expect the debate about when and where prescribed fire is appropriate in wilderness to intensify in the future. Although this debate may not be easily resolved, it will play a key role in shaping future stewardship of wilderness. **IJW**

REFERENCES

- Baker, W. L. 1994. Restoration of landscape structure altered by fire suppression. *Conservation Biology* 8: 763–69.
- Bryan, D. C., ed. 1997. Conference proceedings: *Environmental Regulation and Prescribed Fire: Legal and Social Challenges*. Tampa, FL, March 14–17, 1995. Tallahassee, FL: Center for Professional Development, Florida State University.
- Catchpole, W. R., E. A. Catchpole, B. W. Butler, R. C. Rothermel, G. A. Morris, and D. J. Latham. 1998. Rate of spread of free-burning fires in woody fuels in a wind tunnel. *Combustion Science Technology* 131: 1–37.
- Doane, D., J. O'Laughlin, P. Morgan, and C. Miller. 2005. Barriers to wildland fire use in USDA Forest Service wilderness areas as perceived by wilderness fire managers. Contribution No. 1006, College of Natural Resources Experiment Station, University of Idaho, Moscow.
- Hammer, R. C., S. I. Stewart, R. L. Winkler, V. C. Radeloff, and P. R. Voss. 2004. Characterizing dynamic spatial and temporal residential density patterns from 1940–1990 across the north central United States. *Landscape and Urban Planning* 69: 183–99.
- IPCC. 2001. *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, ed. J. T. Houghton, Y. Ding, D. J. Griggs, M. Noguer, P. J. van der Linden, X. Dai, K. Maskell, and C. A. Johnson. Cambridge, UK, and New York: Cambridge University Press.
- Landres, P., M. W. Brunson, L. Merigliano, C. Sydorik, and S. Morton. 2000. Naturalness and wildness: The dilemma and irony of managing wilderness. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. D. N. Cole, S. F. McCool, W. T. Borrie, and J. O'Laughlin, 377–81. Proceedings RMRS-P-15-Vol-5. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- McKenzie, D., Z. Gedalof, D. L. Peterson, and P. Mote. 2004. Climatic change, wildfire, and conservation. *Conservation Biology* 18: 890–902.
- Miller, C. 2003. Wildland fire use: A wilderness perspective on fuel management. In *Fire, Fuel Treatments, and Ecological Restoration: Conference Proceedings*, ed. P. N. Omi and L. A. Joyce, 379–85. April 16–18, 2002, Fort Collins, CO. Proceedings RMRS-P-29. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Miller, C., and P. B. Landres. 2004. *Exploring Information Needs for Wildland Fuels and Fire Management*. RMRS-GTR-127. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Nickas, G. 1998. Wilderness fire. *Wilderness Watcher* 10: 1, 4–5.
- Omi, P. N. 1996. Landscape-level fuel manipulations in greater Yellowstone: Opportunities and challenges. In *The Second Biennial Conference on the Greater Yellowstone Ecosystem*, 7–14. September 19–21, 1993, Yellowstone National Park, Wyoming.
- Parsons, D. J. 2000. The challenge of restoring natural fire to wilderness. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. D. N. Cole, S. F. McCool, W. T. Borrie, and J. O'Laughlin, 377–81. Proceedings RMRS-P-15-Vol-5. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

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Understanding Social Influences on Wilderness Fire Stewardship Decisions

BY KATIE KNOTEK

Abstract: Federal land managers and the public engage in many decisions about stewardship of wilderness in the United States, including decisions about stewardship of fire. To date, social science research lacks a holistic examination of the decision-making context of managers and the public about stewardship of fire inside wilderness and across its boundaries. A conceptual model is presented to guide research on this decision-making context, with emphasis placed on social influences on public and manager decision making.

Introduction

The Wilderness Act of 1964 mandates that the natural conditions of wilderness be protected and preserved while being managed for human uses and values. Wildland fire (any nonstructure fire in a wildland area) is a natural disturbance process in many wilderness ecosystems, and therefore, in these places wilderness stewardship (careful and responsible



Katie Knotek. Photo by Jeff Brooks.

management) must allow the occurrence of fire to preserve natural conditions. At the same time, wilderness stewardship must also consider how fire interacts with human uses and public values associated with wilderness and adjacent lands. Thus, federal land managers, engaged with the public, must

make decisions about the appropriate stewardship of fire inside and across wilderness boundaries (see figure 1).

Strategies for fire stewardship can include both suppression and use of wildland fire (either naturally ignited or management ignited). Guided by the 2001 Federal Wildland Fire Management Policy in the United States, managers must assess the costs and benefits of these options when making stewardship decisions, taking into account both short- and long-term ecological and social outcomes. For example, managers must consider the impact (positive or negative) of different decisions

on ecological elements, such as flora, fauna, air and water quality, and social elements, such as human life, private property, and local, regional, and national values attached to public lands. Members of the public must also consider such impacts when evaluating fire stewardship decisions proposed by land management agencies. This creates a complex decision-making context for managers and the public concerning the stewardship of fire inside and outside wilderness.

This article presents a model to guide research in understanding and facilitating these decisions. Because social factors are among the primary influences on decision making, emphasis is placed on understanding how these factors can influence fire stewardship decisions and how research can facilitate such decisions. A model originally proposed to explain social influences on wilderness policy, human and ecological values, and codes of behavior for wilderness visitors (Watson and Landres 1999) has been adapted to understanding social factors that influence manager and public decisions about fire stewardship. The adapted model (see figure 2) provides insight into social influences on fire stewardship decisions generally, which includes decisions regarding the stewardship of fire in wilderness ecosystems specifically.

Cognitive Disposition toward Fire

Decisions made by managers and the public about fire are directly influenced by their cognitive disposition (see figure 2), reflecting human values, value orientations, attitudes, norms,

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and behavioral intentions. The Cognitive Hierarchy, a theoretical framework (Fulton et al. 1996; Vaske and Donnelly 1999), suggests that an individual's personal view of the environment is shaped by these cognitive components, and that each of these components builds upon the other, from fundamental values (the center of one's personal belief system) to specific behaviors. Thus, the theory holds that fundamental values and value orientations can be used to understand and predict human attitudes, norms, and behavioral intentions with reference to a specific object or subject such as the stewardship of wildland fire.

A large proportion of social science research applied to fire issues has focused on investigating the various components of the Cognitive Hierarchy and their influences on decision making (Machlis et al. 2002). For example, scientists have assessed value orientations (Bright et al. 2003), attitudes (Jacobson et al. 2001; Manfredi et al. 1990; McCool and Stankey 1986), norms (Kneeshaw et al. 2004), and behavioral intentions (Jacobson et al. 2001) related to fire stewardship inside and outside wilderness. Such research has been emphasized because, as purported by the Cognitive Hierarchy, knowledge of human values, attitudes, and norms is critical to predicting human behavior and decision making. This line of research, however, lacks an examination of more broad social influences that ultimately drive cognitive dispositions toward stewardship of fire (see figure 2).

General Societal Trends and Specific Influences

In order to fully understand the context within which managers and the public make decisions about fire stewardship, there is a need to link the study of cognitive components held by individuals, such as values and attitudes, to larger societal influences (Manfredi

et al. 2004). Detailed below are a select set of some general societal trends and specific influences and discussion about their relationship to decisions regarding stewardship of wildland fire.

Shifting Orientations toward Natural Resources

Shifting orientations toward natural resources is a societal trend that has significantly influenced public land management, including stewardship of wildland fire. Historically, American society has dominantly displayed utilitarian or anthropocentric orientations toward natural resources, focusing public lands policy and management on the extraction and utilization of natural resources for economic benefit (Williams 2005). In the second half of the 20th century, however, American society has shifted to less utilitarian and more biocentric orientations toward natural resources, valuing resources for their inherent worth as amenities or scarce resources to be protected and conserved (Williams 2005). The former anthropocentric orientation toward natural resources spurred a fire policy of strict suppression emphasizing commodity protection (Pyne 1982; Williams 2005). But today, as society



Figure 1—Fire does not adhere to political or administrative boundaries, thus federal land managers and the public must make decisions about fire stewardship across the wilderness and nonwilderness interface. Photo by Josh Whitmore.

increasingly values natural resources as amenities, there is greater support for decisions to manage fire in ways that will preserve the natural features and functioning of wildlands (Manfredi et al. 1990; McCool and Stankey 1986).

Increased Knowledge of Natural Processes

Another societal influence on attitudes about fire stewardship is an increased understanding of natural processes. Scientific understanding of natural processes, such as wildland fire and its importance in proper ecosystem functioning, has increased over time, particularly since the 1970s (Pyne 1982). For example, fires within wilderness were previously perceived to

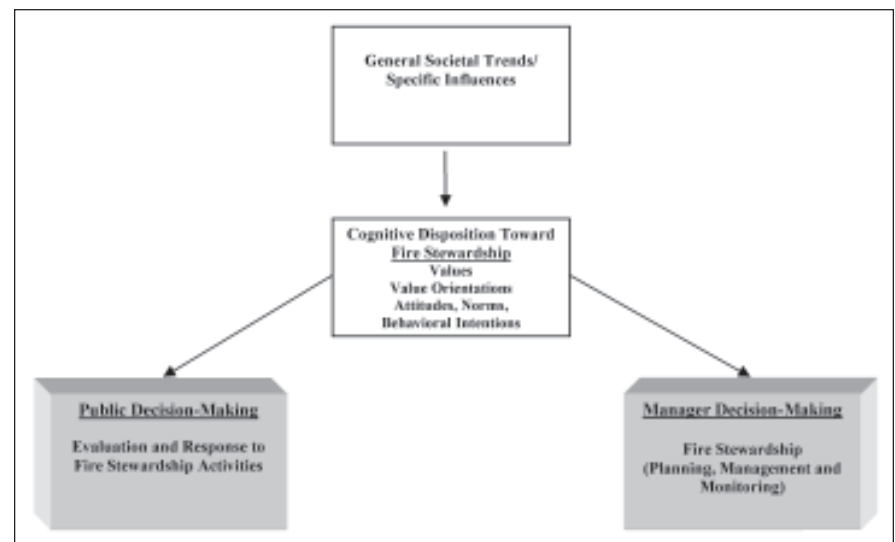


Figure 2—A model for understanding social influences on fire stewardship decisions.



Figure 3—It is important to consider how fire influences human relationships with wildlands and perceptions of appropriate fire stewardship activities. Photo by Josh Whitmore.

be detrimental to public resources and values, causing fire suppression to be viewed as essential for protecting wilderness values (Parsons 2000). Research has shown, however, that fire is indeed a natural process in many wilderness ecosystems, as it provides for nutrient cycling, regeneration of vegetation, and reduction of hazardous fuel loads, among other benefits (Pyne 1982). As a result, federal land management agencies initiated new policies in the late 1960s and 1970s that would allow some wildland fires to burn under prescribed conditions (Pyne 1982). As science produces new knowledge about wildland fire, these policies are being updated and expanded to increase the use of fire both inside and outside wilderness (Aplet, this issue).

Development and Growth of the Wildland-Urban Interface

One of the most influential societal changes that has affected fire stewardship decisions has been the development and growth of the wildland-urban interface (WUI) (Miller and Landres 2004). The growing WUI represents the increase in residential housing and recreational use in urban fringe areas that has occurred over the past several decades. In these areas, society is faced with the necessity and risk of wildland fire, while managers struggle to understand and meet public expectations regarding fire stewardship

(Jacobson et al. 2001; Winter and Fried 2000). At the same time, fire policy (e.g., the National Fire Plan) increasingly emphasizes community protection and risk prevention in the WUI (Glickman and Babbitt 2000), which often constrains decisions to use fire on adjacent areas, including wilderness. Social trends and projected growth in the WUI (Radeloff et al. 2005) is important information for managers and the public to inform decisions about fire and protecting values at risk across the interface of wilderness and adjacent lands. Data such as these, as well as other changes in the WUI environment will become increasingly important in making decisions about fire stewardship as growth of the WUI continues.

Public Trust

Public trust in land management agencies is an example of a specific influence on how the public evaluates and responds to policy governing fire stewardship (Liljebld and Borrie, this issue; Toman and Shindler 2003; Winter and Cvetkovich 2003). Trust in public land management agencies has been assessed through measurement of perceptions of shared values, direction, goals, views, actions, and thoughts (Earle and Cvetkovich 1995). Trust is facilitated through a collaborative relationship between the public and the agency, in which the agency takes responsibility for protecting the public purpose of public lands (Borrie et al. 2002). Therefore, public perception of the land management agency's ability to reflect public values, goals, direction, and so forth influences support for agency policy and decisions related to fire stewardship. Research to understand public trust in an agency's ability to make fire stewardship decisions that consider local values is crucial. Research of this type equips scientists with the ability to assess and monitor trust levels over time, providing feedback on stewardship decisions (Liljebld and Borrie, this issue).

Place Meanings and Attachments

The type and degree of attachments that people hold in regard to specific public lands influence their views of fire stewardship. Stewardship practices and environmental conditions acceptable in one setting are not necessarily acceptable in another, depending on place meanings and landscape context (Brunson 1993). Place-based meanings have been investigated through the concept of "place attachment" (Moore and Graefe 1994; Williams et al. 1992), defined as a psychological indicator of a person-place relationship and the meanings that are inherently a part of that relationship. All wildland fires have the potential to impact (positively and negatively) relationships humans have with places, and in turn, how they perceive wildland fire and decisions pertaining to its stewardship (see figure 3). Research has been used to map personal values and meanings across wilderness and nonwilderness lands to understand how place meanings and attachments can influence decisions about fire stewardship (see, for instance, Gunderson, this issue). The results of this research provide social understanding that, coupled with ecological modeling efforts, can be used to evaluate the social and ecological consequences of potential fire stewardship decisions. Research suggests that through the investigation and mapping of place meanings and attachments it is possible to better inform manager and public decisions concerning fire stewardship, providing a valuable tool to facilitate manager and public decision making in the future.

Conclusions

There are other examples of acknowledged, but not understood, social influences on decisions about fire stewardship, such as institutional incentives and disincentives, education initiatives to inform homeowners about personal

responsibility, increasingly urban populations, and cultural differences in place meanings and attachments. Guided by this conceptual framework, however, research should be aimed at not only individual cognitive components that predict decision making, but also these larger changing social factors that influence decisions about stewardship of fire inside and outside wilderness. Investigation of issues on the topic areas and relationships depicted in this model will provide a more detailed understanding of agency and public decision making. Such a research pursuit is timely as federal land managers, engaged with the public, act to restore the natural role of fire to many ecosystems. **IJW**

REFERENCES

- Borrie, W. T., N. Christensen, A. E. Watson, T. A. Miller, and D. W. McCollum. 2002. Public purpose recreation marketing: A focus on the relationships between the public and public lands. *Journal of Park and Recreation Administration* 20(2): 49–68.
- Bright, A. D., J. J. Vaske, K. Kneeshaw, and J. D. Absher. 2003. Scale development of wild-fire management basic beliefs. In *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan. Proceedings of the Ninth International Symposium on Society and Management*, comp. P. J. Jakes. 18–25. June 2–5, Bloomington, IN. Gen. Tech. Rep. NC-231. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station.
- Brunson, M. W. 1993. "Socially acceptable" forestry: What does it imply for ecosystem management? *Western Journal of Applied Forestry* 8(4): 116–19.
- Earle, T. C., and G. T. Cvetkovich. 1995. *Social Trust: Toward a Cosmopolitan Society*. Westport, CT: Praeger Publishers.
- Fulton, D. C., M. J. Manfredo, and J. Lipscomb, J. 1996. Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife* 1: 24–47.
- Glickman, D., and B. Bobbitt. 2000. *Managing the Impact of Wildfires on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000*. Washington, DC: U.S. Department of Agriculture and U.S. Department of the Interior.
- Jacobson, S. K., M. C. Monroe, and S. Marynowski. 2001. Fire at the wildland interface: The influence of experience and mass media on public knowledge, attitudes and behavioral intentions. *Wildlife Society Bulletin* 29(3): 929–37.
- Kneeshaw, K., J.J. Vaske, A. D. Bright, and J. D. Absher. 2004. Acceptability norms toward fire management in three national forests. *Environment and Behavior* 36(4): 592–612.
- Machlis, G. E., A. B. Kaplan, S. P. Tuler, K. A. Bagby, and J. E. McKendry. 2002. *Burning Questions: A Social Science Research Plan for Federal Wildland Fire Management*. Moscow, ID: Idaho Forest, Wildlife and Range Experiment Station, College of Natural Resources, University of Idaho.
- Manfredo, M. J., M. Fishbein, G. E. Haas, and A. E. Watson. 1990. Attitudes towards prescribed fire policies. *Journal of Forestry* 99(7): 19–23.
- Manfredo, M. J., T. L. Teel, and A. D. Bright. 2004. Application of the concept of values and attitudes in human dimensions of natural resources research. In *Society and Natural Resources: A Summary of Knowledge*, ed. M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, and P. J. Brown. Prepared for the 10th International Symposium on Society and Resource Management. Jefferson, MO: Modern Litho.
- McCool, S. F., and G. H. Stankey. 1986. Visitor attitudes toward wilderness fire management policy—1971–84. Res. Pap. INT-357. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- Miller, C., and P. Landres. 2004. *Exploring Information Needs for Wildland Fire and Fuels Management*. Gen. Tech. Rep. RMRS-GTR-127. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Moore, R. L., and A. R. Graefe. 1994. Attachment to recreation settings: The case of rail-trail users. *Leisure Sciences* 16: 17–31.
- Parsons, D. J. 2000. Restoration of natural fire to United States Wilderness Areas. In *Personal, Societal, and Ecological Values of Wilderness: Sixth World Wilderness Congress Proceedings on Research, Management, and Allocation*, vol. II, comp. A. E. Watson, G. H. Aplet, and J. C. Hendee. P. 42–47. October 24–29, 1998, Bangalore, India. Proceedings RMRS-P-14. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Pyne, S. J. 1982. *Fire in America: A Cultural History of Wildland and Rural Fire*. Princeton, NJ: Princeton University Press.
- Radeloff, V. C., R. B. Hammer, S. I. Stewart, J. S. Fried, S. S. Halcomb, and J. F. McKeefry. 2005. The wildland urban interface in the United States. *Ecological Applications* 15: 799–805.
- Toman, E., and B. Shindler. 2003. Hazardous fuel reduction in the blue mountains: Public attitudes and opinions. In *Fire, Fuel Treatments, and Ecological Restoration: Conference Proceedings*, tech. ed. P. N. Omi and L. A. Joyce. p.241–254. April 16–18, 2002. Ft. Collins, CO. Proceedings RMRS-P-29. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Vaske, J. J., and M. P. Donnelly. 1999. A value-attitude-behavior model predicting wildland preservation voting intentions. *Society and Natural Resources* 12: 523–37.
- Watson, A., and P. Landres. 1999. Changing wilderness values. In *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends*, prin. investigator H. K. Cordell, 384–88. Champaign, IL: Sagamore Publishing.
- Williams, D. R., M. E. Patterson, J. W. Roggenbuck, and A. E. Watson. 1992. Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences* 14: 29–46.
- Williams, G. W. 2005. *The USDA Forest Service—The First Century*. Washington, DC: USDA Forest Service, Office of Communication.
- Winter, G., and J. S. Fried. 2000. Homeowner perspectives on fire hazard, responsibility, and management strategies at the wildland-urban interface. *Society and Natural Resources* 13: 33–49.
- Winter, P. L., and G. T. Cvetkovich. 2003. A study of Southwesterners' opinions on the management of wildland and wilderness fires. Riverside, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

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Research suggests that through the investigation and mapping of place meanings and attachments it is possible to better inform manager and public decisions concerning fire stewardship.

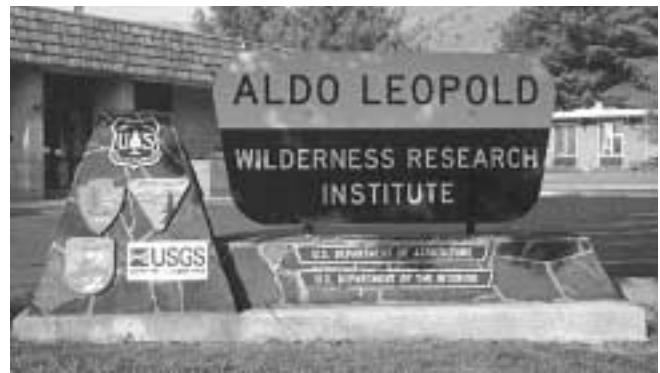
Amphibians and Wildfire in the U.S. Northwest

BY BLAKE R. HOSSACK

Recent evidence of amphibian declines along with outbreaks of large wildfires in western North American conifer forests has underscored our lack of knowledge about effects of fire on amphibians in these ecosystems. Understanding the connection between amphibian declines and wildfire is proving complex in some areas because the past century of fire suppression and other management activities have already altered amphibian habitats. For example, ponderosa pine forest types typically had low severity understory fires that likely maintained open habitats preferred by some amphibians. Fires in these, or other forests that have been altered by fire suppression, may be more intense than what occurred historically, and may have immediate negative effects on amphibians (direct mortality) or long-term beneficial effects (habitat restoration).

Amphibian communities in the southeastern United States benefit from frequent (1–5 years) low intensity fires, and prescribed fire is now a tool in managing some forests for biodiversity. In western North American forests, wildfire was the dominant historic disturbance, but there have been surprisingly few studies on its short- or long-term effects on amphibians. Notably, one study in Oregon and Washington found that abundance or richness of most terrestrial and stream-dwelling amphibians did not differ between young (40- to 80-year-old) and old-growth (up to 450-year-old) Douglas fir forests. Although this was not directly a fire study, it was conducted in forests naturally regenerated after stand-replacing wildfire, and the results suggest few long-term effects of fire.

There are several studies now underway in the Northwest examining the role of fire in amphibian conservation. D. J. Major (Utah State University) and R. B. Bury (U.S. Geological Survey) are investigating the effects of fire on fuel loads and terrestrial salamanders in the Klamath province of northern California. Initial results from that study suggest that downed



wood and fine fuels (e.g., leaf litter) were reduced after fire, but strong negative effects on the salamander community were not immediately evident. Covering a larger geographic area, D. S. Pilliod (California Polytechnic University–San Louis Obispo), R. B. Bury, and P. S. Corn (USGS–Leopold Institute) are conducting a five-year study of the patterns of distribution and abundance of stream amphibians in areas burned by recent wildfires in the northern Rocky Mountains (including the Frank Church–River of No Return Wilderness) and southern Oregon. The amphibian community of headwater streams in these study areas is often dominated by either the Rocky Mountain tailed frog or the Pacific tailed frog, depending upon location. Species such as tailed frogs and other stream-breeding amphibians are expected to be especially sensitive to disturbances such as wildfire because they breed in cold headwater streams, have larvae that can take more than three years to metamorphose, and are sensitive to increases in stream sedimentation and temperature. Data from this study so far suggest densities of tailed frog larvae are reduced by wildfire, especially in south-facing watersheds, and younger larvae are more susceptible to environmental changes that ensue.

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Understanding Place Meanings for Wilderness

Personal and Community Values at Risk

BY KARI GUNDERSON

Abstract: Information about human relationships with wilderness is important for wilderness management decisions, including decisions pertaining to the use of wildland fire. In a study about meanings attached to a national forest, local residents were asked to identify places they valued on the forest, why they valued them, and how fuel treatments affected those values. Local residents attach many meanings to the wilderness part of the landscape and they have opinions about the use of wildland fire as a fuel treatment there. Understanding the meanings humans attach to wilderness and how it influences their perceptions of fire and fuels management there can help managers anticipate public response to planned activities.

Introduction

Information about human relationships with wilderness is important for wilderness management decisions, including decisions pertaining to the use of wildland fire. In a study about meanings attached to a national forest, local residents were asked to identify places they valued on the forest, why they valued them, and how fuel treatments affected those values. Local residents attach many meanings to the wilderness part of the landscape, and they have opinions about the use of wildland fire as a fuel treatment there. Understanding the meanings humans attach to wilderness and how it influences their perceptions of fire and fuels management there can help managers anticipate public response to planned activities.

The importance of considering the interests of local residents in public land decision making is growing (Brandenburg and Carroll 1995; Eisenhauer, Krannich, and Blahna 2000; Endter-Wada, Blahna, Krannich, and Brunson 1998; Mitchell, Force, Carroll, and McLaughlin 1993; Schroeder 1996; Vining and Tyler 1999). Human connectivity is an important influence on public response to public land management policies. The connection between humans and places may be due to emotional attachments, be activity driven, and/or incorporate functional meanings. The study reported here attempts to create an understanding of

the meanings local people attach to the wilderness portion of a national forest landscape and their opinions about the use of wildland fire in fuels management there.

Human Connectivity to Public Lands

People have relationships with places, and scientists have contributed substantially to understanding these relationships. Some locations are more important than others to people, and in order to anticipate public response to proposed resource management activities, managers need to understand these relationships. Tuan (1977) referred to “geopiety” as an individual’s bonding with nature in general, and specific places in particular. He described *place* as a center of meaning constructed by experience. Place attachment has been associated with choices of homes, neighborhoods, and communities (Feldman 1990). The concept of place attachment has been an important research issue in public lands planning (Moore and Graefe 1994; Schreyer, Jacob, and White 1981; Williams, Patterson, Roggenbuck, and Watson 1992; Williams and Roggenbuck 1989).



Kari Gunderson. Photo by Anne Dahl.

PEER REVIEWED

The Bitterroot National Forest

The Bitterroot Valley is located in western Montana, south of Missoula. The Bitterroot Front, on the west side of the Bitterroot Valley, features an east to west continuum, beginning with developed private lands in the valley floor, transitioning to the wildland/urban interface, then to roaded national forest lands, then upslope to roadless nonwilderness areas, and finally reaching the Selway-Bitterroot Wilderness to the west (see figure 1). About 77% of the property in the watershed is within the Bitterroot National Forest.

Ravalli County, which includes most of the Bitterroot watershed, experienced a 43% increase in population during the 1990s and was the fastest growing county in Montana (Swanson 2001). Today the Bitterroot Valley is characterized by an influx of new people with different values and economic means. The once very rural communities are evolving into communities of commuters to the Missoula area, retirees, and a growing service and high technology business center, while trying to maintain a strong relationship with agriculture and the area's natural resources largely managed by the Bitterroot National Forest. Most of the Bitterroot Range above the Bitterroot Valley is protected as wilderness and is a source of much of the water that flows down and through the otherwise fairly arid valley environment. The quality of life in the Bitterroot Valley is high, and it is deeply connected to the area's natural resources, outdoor recreational opportunities, and naturalness of the mountain landscape.

During the summer of 2000, wild-fires burned more than 350,000 acres (141,700 ha) of Bitterroot National Forest, Montana State Trust, and private forest land in southwestern



Figure 1—The meanings local people have for the wilderness portion of the National Forest landscape, like this forest area, need to be heard through their own words. Photo by Kari Gunderson.

Montana. Since the occurrence of these fires, relationships between local residents and the forest, with each other, with the Forest Service, and with firefighters have changed. There is an “inseparability of fuels management and fire psychology” (Daniels 2000). Daniels states (pp. 30–31):

People who built their houses in the valley had powerful feelings about their place in nature. People's dreams as well as their life savings are connected to their homes and their properties; they identify with the land around them, and now it's burned.

A postfire assessment of the Bitterroot Valley fires of 2000 resulted in two major postulates about community member beliefs: (1) there was a need to change current forest stewardship practices to more effectively reduce wildland fire fuels, and (2) there was a lack of trust in the Forest Service to make decisions about fuel and fire management that consider local values (Watson 2001). Research was needed to create understanding of the local values attached to

the 471,000-acre (190,688-ha) Bitterroot National Forest landscape by local residents to allow them to be more efficiently and effectively considered in fuel treatment programs.

Methods

There were 12 semistructured interviews with Bitterroot Valley residents from four principal communities in Ravalli County; eight key informant interviews with people recognized as community leaders (including one member of the Confederated Salish and Kootenai Tribes); and two focus groups with intact community organizations. Participants were asked to indicate: (1) the specific places you spend the most time on the Bitterroot Front; (2) the areas that you consider important, but that you have seldom or never spent time; (3) the reasons these places are important to you; and (4) feelings about hazardous fuel treatments, including wildland fire use at these important places. Maps were available for respondents to locate specific places that had meaning to them,

and all interviews were tape-recorded for transcription and analysis.

Participants were also shown two fixed-point photographs illustrating common conditions before and after fuel treatments. Respondents were told that examples of fuel treatments could include using fire alone, using mechanical fuel treatments alone, and using a combination of burning and mechanical treatments, although interviewees were informed that mechanical treatments could not be applied in the wilderness portion of the forest.

Results

Respondents commonly indicated some of the most important areas to them to be in the wilderness (Gunderson, Watson, Titre, and Nelson 2004). A variety of meanings are attached to places they go and don't go within the wilderness boundary (e.g., emotional, symbolic, and functional), using a variety of terms to describe the character of these places (e.g., remote, roadless, pristine, few people). For example:

I think that not very many people get up into any of these. ... [It] is extremely remote, extremely remote. ... It's a long ways from trails up there. Not very many people are willing to crawl on their hands and knees with a full backpack. It's very pristine. The remoteness. In fact, with all of these areas the reason is that it feels like rarely do people get up there. (Interview # 05-01)

I want to pull that wilderness boundary down to where we delineate that that is roadless, that it'll never be roaded and that we should extend the wilderness boundary to that place to give that area the protection the Wilderness Act gives it. (Interview # 02-01)

It is all important. There were certain trails and passes over

the divide, through the wilderness over into Idaho that were used by families for thousands of years and they're continually used. Not only is it our aboriginal territories for the tribes and me individually, I'd say that it's more than just a special place. It's our homeland, you know? (Interview # 06-01)

Several respondents offered opinions on the use of wildland fire in the Selway-Bitterroot Wilderness and its compatibility with the values they associate with some of the important places they had indicated there. For example:

Fire will reintroduce itself. I don't think we need to go in there with fire. Let nature take over. I would say that with much of this, where these prescriptions may be proposed, let's back off with our intensive practices of scarifying the land and let nature come in. (Interview # 04-03)

Fine, let it burn ... it burned for eons of time before we ever saw it, and we're just a speck on the flow of time there. (Interview # 02-01)

There should be absolutely zero manipulation of woody material in wilderness areas. I think in wilderness fires ought to be let burn. (Interview # 05-01)

If there is a great big, huge forest fire I just say let it rip and not go in there and do anything. See, the problem is that they try to go fix things and when they go in there and fix things and they disturb things that's when they make it worse. But naturally, if a fire burnt through there naturally I wouldn't see that you would need to do any treatments. Because it'd come back naturally. (Interview # 06-03)

If we're talking about fuels reduction ... either the wilderness is going to burn or it's not going

to burn, or we're going to allow that to kind of run its normal course. And if there's a beautiful place in there that I like burns up, that's just what's going to happen in my lifetime. I'm not going to lose any sleep over that one. (FOCUS GROUP # 01)

Responses from Bitterroot Valley residents indicated uncertainty regarding whether wildland fire use is considered a fuel treatment tool and identified some barriers to use of wildland fire on this landscape. For example:

Are you going to classify wildland fire use fires as hazardous fuel reduction? It's not very precise, it's kind of heavy-handed sometimes because, and especially some of those places down in those drainages. They're due to burn up big time, not just nice little pretty underburn to make it look beautiful 10 years from now. It's going to cook. (FOCUS GROUP # 01)

Getting back to wilderness, the Selway-Bitterroot Wilderness, we do have authorization or authority to allow wildland fire to meet resource management objectives in those areas. But certainly the issue with that is that we're limited in our ability to do that, just based on typical weather patterns, topography, geography of the area, and historically how fires once being established up canyon have a tendency to move out onto the face. But, I mean, that is a fuels reduction tool we have in the wilderness. (FOCUS GROUP # 02)

There was some support for allowing "naturally occurring fire" to play a role in reducing fire hazards both inside and adjacent to the Selway-Bitterroot Wilderness, if trust between the public and the Forest Service can become stronger. For example:

Local residents attach many meanings to the wilderness part of the landscape, and they have opinions about the use of wildland fire as a fuel treatment there.

I think ultimately we're going to come to the realization, as we have with wilderness, that natural fire will play a role, as it always has. And that will apply also to roadless lands and other lands of the national forest. We will let fire have its head in many instances in the national forest, but this extreme denudation of the landscape with fire I think in the worst of these examples is unconscionable. And we really need to stand by research that gives us some balance with this and avoid the pitfall of justifying treatment, fire treatment, where the bottom line is getting the logs out. (Interview # 04-03)

The biggest issue with regards to fuel management on the Bitterroot Front is probably trust, I guess. The public understanding of the need to do the work to accomplish objectives. (FOCUS GROUP # 02)

Conclusion

The research briefly described here provides insight into how current emphasis on fuel treatment on public lands in the United States may influence relationships humans have with landscapes. Many of the comments obtained about wilderness places and needs for fuel management there gravitated toward fuel buildup and things that might be accomplished at the interface between wilderness and nonwilderness in order to protect both. Concern about homes at risk of wildfire and the risk of undesirable landscape modification due to stand replacement fires certainly influ-

ence support of fuel treatment objectives on all parts of the landscape. Fears of hidden agendas connected to fuel management likely suggest the feeling that some members of the public are suspicious of how well the agency understands or represents the values local people attach to this landscape.

This study provided insight into meanings that local residents attach to the wilderness portion of the landscape. This knowledge is needed by agency managers and planners to more effectively consider how fire and fuels management activities inside wilderness and across its boundaries will affect human relationships with the landscape and, in turn, public response to management activities. Managers need to hear from people about their relationships with places, including wilderness, and understand how management actions might influence these relationships.

Efforts to understand human connectivity to the national forest landscape may contribute to building trust in the agency (Liljebland and Borrie, this issue). Information gained from this research in the Bitterroot Valley was used, along with ecological modeling, to propose fuel treatment locations to accomplish ecological restoration and hazardous fuel reduction targets. When projecting the long-term effects of fire on the landscape, under alternative fuel treatment scenarios, anticipating the influence of social response to alternative treatment options is vital.

Future research needs to provide more complete understanding of the influences of alternative fuel treatments on human

relationships with the landscape. Although there has been progress in capturing variation in the spatial scale of attachments, it is likely that the attachments might also vary in the intensity of feelings about how that place on the landscape contributes to identity, provides some functional value, or is unique.

Future efforts to proactively include this type of social science data in modeling efforts to locate priority areas and determine appropriate methods for fuel treatment are crucial. Currently, fire and fuels management programs on public lands are placing an increased emphasis on building public trust, understanding and protecting economic and noneconomic values at risk associated with public lands, and gaining more collaborative engagement with the public. This kind of research will contribute to all of these objectives. **IJW**

REFERENCES

- Brandenburg, A. M., and M. S. Carroll. 1995. Your place, or mine: The effect of place creation on environmental values and landscape meanings. *Society and Natural Resources* 8: 381–98.
- Daniels, S. 2000. Conference presentation. In *National Conference on the Social Acceptability of Fuel Treatments on Western Public Lands*, ed. J. Burchfield, 30–34. Final report. USDA, Rocky Mountain Research Station, Fort Collins, CO.
- Eisenhauer, B. W., R. S. Krannich, and D. J. Blahna. 2000. Attachments to special places on public lands: An analysis of activities, reason for attachments, and community connections. *Society and Natural Resources* 12: 421–41.
- Endter-Wada, J. D., D. Blahna, R. Krannich, and M. Brunson. 1998. A framework for understanding social science contributions to ecosystem management. *Ecological Applications* 8(3): 891–904.
- Feldman, R. M. 1990. Settlement identity: Psychological bonds with home places in a mobile society. *Environment and Behavior* 22: 183–229.
- Gunderson, K. I., A. E. Watson, J. Titre, and R. Nelson. 2004. *Mapping Place Meanings on the Bitterroot National Forest—A Landscape-level Assessment of Personal and Community Values as Input to Fuel Hazard Reduction Treatments*. Report to the Bitterroot Ecosystem Management Research Project, USDA

- Forest Service, Rocky Mountain Research Station. On file, Aldo Leopold Wilderness Research Institute, Missoula, MT.
- Mitchell, M. Y., J. E. Force, M. S. Carroll, and W. J. McLaughlin. 1993. Forest places of the heart: Incorporating special spaces into public management. *Journal of Forestry* 91(4): 32–37.
- Moore, R. L., and A. R. Graefe. 1994. Attachments to recreation settings: The case of rail-trail users. *Leisure Sciences* 16: 17–31.
- Schreyer, R. M., G. Jacob, and R. White 1981. Environmental meaning as a determinant of spatial behavior in recreation. *Papers and proceedings of the Applied Geography conferences: Vol. IV, 294–300*. Kent State University, Kent, OH.
- Schroeder, H. W. 1996. Ecology of the heart: Understanding how people experience natural environments. In *Natural Resource Management: The Human Dimension*, ed. A. Ewert, 13–27. Boulder, CO: Westview Press.
- Swanson, L. 2001. The Bitterroot Valley of western Montana area economic profile. O'Conner Center for the Rocky Mountain West, the University of Montana, Missoula.
- Tuan, Y. F. 1977. *Space and Place*. London: Arnold.
- Vining, J., and E. Tyler. 1999. Values, emotions, and desired outcomes reflected in public responses to forest management plans. *Human Ecology Review* 6(1): 21–34.
- Watson, A. E. 2001. Bitterroot National Forest. Community telephone survey open-ended questions analysis. Report to the Bitterroot National Forest. March 2001. Available from Bitterroot National Forest and the Aldo Leopold Wilderness Research Institute.
- Williams, D. R., and J. W. Roggenbuck. 1989. Measuring place attachment: Some preliminary results. In *Abstracts: 1989 Leisure Research Symposium*, eds. L. H. McAvoy and D. Howard, 32. Arlington, VA: National Recreation and Park Association.
- Williams, D. R., M. E. Patterson, J. W. Roggenbuck., and A. E. Watson. 1992. Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Science* 14: 29–46.
- Williams, D. R., and S. J. Stewart. 1998. Sense of place: An elusive concept that is finding a home in ecosystem management. *Journal of Forestry* 96: 18–23.

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From TAKE BACK CONSERVATION MOVEMENT on page 8

- Leakey, Richard, and Roger Lewin. 1995. *The Sixth Extinction: Patterns of Life and the Future of Humankind*. New York: Doubleday.
- Leopold, Aldo. 1949. *A Sand County Almanac and Sketches Here and There*. New York: Oxford University Press.
- Longman, Phillip. 2004. The global baby bust. *Foreign Affairs* May–June.
- Lovejoy, Thomas E. 1980. Foreword. In *Conservation Biology: An Evolutionary-Ecological Perspective*, ed. Michael E. Soulè and Bruce A. Wilcox. Sunderland, MA: Sinauer.
- Naess, Arne. 1986. Intrinsic value: will the defenders of nature please rise? In *Conservation Biology: The Science of Scarcity and Diversity*, ed. Michael E. Soulè, 504–15. Sunderland, MA: Sinauer.
- Nash, Roderick. 1967. *Wilderness and the American Mind*. New Haven, CT: Yale University Press.
- Noss, Reed F., Eric Dinerstein, Barrie Gilbert, Michael Gilpin, Brian J. Miller, John Terborgh, and Steve Trombulak. 1999. Core areas: Where nature reigns. In *Continental Conservation*, ed. Michael E. Soulè and John Terborgh, 99–128. Washington, DC: Island Press.
- Oates, John F. 1999. *Myth and Reality in the Rain Forest: How Conservation Strategies Are Failing in West Africa*. Berkeley: University of California Press.
- Paquet, Paul. 2005. *Faith Based Conservation—A Risky Investment*. Raincoast Conservation Society's science comments on Sufficiency Analysis.
- Pimm, Stuart L. 2001. *The World According to Pimm: A Scientist Audits the Earth*. New York: McGraw-Hill.
- Pope, Carl, and Paul Rauber. 2004. *Strategic Ignorance: Why the Bush Administration Is Recklessly Destroying a Century of Environmental Progress*. San Francisco: Sierra Club Books.
- Ray, Justina C., Kent H. Redford, Robert S. Steneck, and Joel Berger. 2005. *Large Carnivores and the Conservation of Biodiversity*. Washington, DC: Island Press.
- Ryerson, William N. 1998/1999. Political correctness and the population problem. *Wild Earth* Winter: 100–103.
- Shellenberger, Michael, and Ted Nordhaus. 2004. The death of environmentalism: Global warming politics in a post-environmental world. Speech to the Environmental Grantmakers' Association. September 29. Kaua'i, Hawaii.
- Soulè, Michael. 2000/2001. Does sustainable development help nature? *Wild Earth* Winter: 56–61.
- Soulè, Michael E., and Bruce A. Wilcox. 1980. Conservation biology: its scope and its challenge. In *Conservation Biology: An Evolutionary-Ecological Perspective*, ed. Michael E. Soulè and Bruce A. Wilcox, 4. Sunderland, MA: Sinauer.
- Soulè, Michael E., and Gary Lease, eds. 1995. *Reinventing Nature? Responses to Postmodern Deconstruction*. Washington, DC: Island Press.
- Soulè, Michael, and Reed Noss. 1998. Rewilding and biodiversity: Complementary goals for continental conservation. *Wild Earth* Fall: 18–28.
- Soulè, Michael E., and John Terborgh, eds. 1999. *Continental Conservation*. Washington, DC: Island Press.
- Terborgh, John. 1999. *Requiem for Nature*. Washington, DC: Island Press.
- Terborgh, John. 2005. Letters. *Conservation Biology* 19(1): 5–6.
- Vale, Thomas R., ed. 2002. *Fire, Native Peoples, and the Natural Landscape*. Washington, DC: Island Press.
- Weigel, Lori. 2004. Lessons learned regarding the "language of conservation" from the national research program. Public Opinion Strategies memorandum to The Nature Conservancy/Trust for Public Land.
- Werbach, Adam. 2004. Is environmentalism dead? Speech to the Commonwealth Club in San Francisco. Dec. 8.
- Whitlock, Cathy, and Margaret A. Knox. 2002. Prehistoric burning in the Pacific Northwest: Human versus climatic influences. In *Fire, Native Peoples, and the Natural Landscape*, ed. Thomas R. Vale, 222–23. Washington, DC: Island Press.
- Wilson, Edward O. 1992. *The Diversity of Life*. Cambridge, MA: Harvard University Press.

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Wildland Fire Effects on Visits and Visitors to the Bob Marshall Wilderness Complex

BY WILLIAM T. BORRIE, STEPHEN F. McCOOL,
and JOSHUA G. WHITMORE

Abstract: Wildland fire can affect wilderness visits and scientific efforts to understand visitor relationships with wilderness places. Large-scale and long-lasting fires occurred in the Bob Marshall Wilderness Complex, Montana, in 2003. A study of visitors that year to monitor long-term trends in visit and visitor characteristics was repeated in 2004 to fully understand how the 2003 fires affected trend analysis. This article considers the question of how wildland fire changes the relationship people have with wilderness, particularly related to their visits and visitor attitudes toward fire management.

A Wilderness Visitor Study— And Dilemmas over Fire

In 2003 a survey was conducted of visitors to the Bob Marshall Wilderness Complex (BMWC), an area of 1.5 million acres (600,000 ha) straddling the continental divide in Montana. It is managed under the provisions of the Wilderness Act of 1964 and comprises three units of the National Wilderness Preservation System (the Great Bear, Bob Marshall, and Scapegoat Wildernesses). The BMWC is managed by the U.S. Forest Service and has proven to be an ideal setting for a variety of social science research and planning activities (McCool 2005).



Article co-authors (left) William Borrie and Stephen McCool and (right) Joshua Whitmore.

The BMWC is a mountain ecosystem, ranging in elevation from 4,000 feet (1,200 m) to more than 9,000 feet (2,800 m). It provides habitat for grizzly bears, mountain lions, moose, Canadian bighorn sheep, mountain goats, and many other plants and animals. Many of the ecosystems in the BMWC are fire-adapted, such as low-elevation ponderosa pine forests and higher elevation western larch–lodgepole pine forests, although it has been estimated that 80% of lightning-ignited fires in the BMWC were suppressed in the 1988–1998 period (Parsons 2000).

As part of the national forest plan revision process, a trend analysis of visit and visitor data was needed. Information on the characteristics of wilderness visitors, their trips into the BMWC, and their attitudes and preferences toward the management of the Bob were previously collected in 1970 (Lucas 1980) and 1982 (Lucas 1985; McCool 1983).

Sampling of recreation visitors to the BMWC began at 12 of the most popular trailheads in late June 2003. However, during the summer a series of lightning-ignited fires occurred, a pattern also seen in Glacier National Park just to the north. Beginning at the end of July, many popular trailheads were closed to public entry to reduce safety hazards. By the end of September 2003, when all trailheads had reopened, 41

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separate fires and nearly 100,000 acres (40,485 ha) had burned in the BMWC (Lasko 2004).

The presence of fires was quite noticeable throughout western and central Montana during this period. Not only were trailheads and trails closed, but roads and campgrounds near the wilderness boundaries were also inaccessible. News of fire activity was common in the local and regional media, and a large amount of information, including photographs and maps showing the extent of the fires, was available on a variety of websites. In addition, much of the region was clouded in smoke from these and other nearby fires. It is, therefore, reasonable to assume that almost all visitors to the BMWC were aware of fires burning in the wilderness.

Whether management-ignited or natural, fire impacts all aspects of the management of wilderness. Whereas the biological effects of wildland fire are relatively well known (e.g. Agee 1996, 2000; Brown et al. 1995), there is less known about the impact of fire on recreation and other human activities. The presence of wildland fire could be expected to influence wilderness visitors in a number of ways, both direct and indirect. Not only would some areas be inaccessible, the fires would also have changed conditions and experiences at these places. Thus, visitors might change their plans as a result of access restrictions, but they might also change their expectations or evaluations of wilderness visits. Visitors may have concerns for safety and avoid traveling near currently burning fires, through recently burned areas, or to locations where fire might “trap” them or otherwise disrupt their immediate travel plans. Fire and fire-related activity can damage recreation infrastructure, and visitors may want to avoid disruption of fire management activities.

# Visitors	Year of data collection	
	2003	2004
Contacted at trailheads	605	408
Refusals	7	12
Undeliverable addresses	6	3
Completed questionnaires returned	462	294
Response rate	76%	72%

Managers and scientists expressed concern that some visitors might be more affected than others by the fires. Perhaps those with more experience or more visits to the BMWC would feel less compelled to change their plans. There might also be influences from local knowledge and access to media information. Locals might have more flexibility in plans, with less commitment of time and resources to travel. Hikers might be more worried about their ability to leave the wilderness should the fires become too threatening, although horse riders might be particularly concerned about their stock and their ability to travel through burning or burned landscapes.

Our sampling plan had been predicated on all trails being open to the public, but many of the trailheads scheduled for sampling were closed. This first comprehensive study of visitors in the BMWC since 1982 may not be representative enough to understand trends in visits and visitors. Since this study involved contacting visitors at trailheads, access and infrastructure closures led to a reallocation of trailhead sampling. Visitors to the BMWC have choices when selecting a trail (there are about 75 trailheads in the complex), but relatively few (a dozen or so) account for about 50% of the use.

Sampling of four-day weekday blocks and three-day weekend blocks was conducted at trailheads, with probabilities proportional to size (so that

those trailheads with higher levels of use were sampled more frequently than those with lower levels of use). This bias toward higher-use trailheads was then accounted for in the analysis by weighting data inversely proportional to size of sample, as was undertaken in earlier 1970 and 1982 studies (Lucas 1985). On-site and mail-return questionnaires were used, with all respondents to the on-site survey included in the mail-back survey.

Results and Discussion

There is confidence that the 2003 sample accurately describes the visits, visitors, and visitor attitudes for that year, but findings could not be confidently compared to previous data points. That is, the visits and visitors of 2003 may not be representative of visitors and their responses if the fires had not occurred. Although it can be acknowledged that no one particular year of sampling can ever be perfectly generalizable, we were particularly concerned that the presence of large scale fires for a lengthy period, of regional firefighting activities, and of smoke may have made 2003 a particularly unrepresentative year.

As a result, sampling in 2004 was conducted to provide data for comparison to 2003. This was an opportunity to assess the consequences of the fires on wilderness visitors and their attitudes and behaviors, as well as provide confidence in trend analysis. No major

Table 2. Bob Marshall Wilderness Complex Visitor Characteristics (no significant differences $p \leq .05$).

	Year of data collection	
	2003	2004
Age	43.7	43.5
Sex (% male)	68.7	71.1
Level of education (years)	15.3	15.6
Place of residence (% in Montana)	64.8	62.4
Previous experience (# visits to the Bob)	11.1	13.8

fire events occurred in the BMWC or surrounding areas in 2004, thus survey data in that year were not directly affected by the presence of fire, although it should be noted that various impacts of the 2003 fires continued into 2004 (e.g., blackened vegetation, opened vistas, and minor damage to infrastructure) and will continue for the foreseeable future.

Although staff and resource limitations prevented a complete replication of the 2003 sampling plan, the 13 trailheads estimated to receive the heaviest use by wilderness visitors were again sampled from the beginning of the summer, when the majority of the trails first opened, through the first significant snow event in the fall, when access roads were covered with snow and visitation dropped off sharply (see table 1).

A nonresponse bias check comparing respondents to nonrespondents to the mail-back questionnaires in both years found no significant differences

on each of six key variables (education level, amount of previous experience in the BMWC, mode of travel, length of stay, use of outfitters, and season of use).

If fire is an important influence on visitors, we would expect to find significant differences between the years in use patterns, visitor characteristics, and attitudes toward management actions. To address these potential impacts, between-year comparisons are made in three time periods, since not all of the 2003 season was heavily affected by fire: (1) prefire (June and July)—before the 2003 fires started to have an impact on visitors; (2) during fires (August and September)—when trailhead closures had begun and areas of the BMWC were closed to recreational use; and (3) postfire (October)—after fires were extinguished and trailheads had reopened

The “prefire” and “postfire” time periods were not directly affected by fire

and firefighting activity in 2003. Thus, we generally did not find significant differences when compared with the same time periods in 2004. We found no significant differences in the characteristics of the visitors between 2003 and 2004. That is, the average age, sex, place of residence, level of previous experience in the BMWC, and level of education, did not differ between the two years generally (see table 2), or between the three individual time period groups specifically.

Although the characteristics we examined of people visiting the BMWC did not vary overall between 2003 and 2004, the nature of their visits did show some significant differences. We found changes in how people visited the complex, such as a greater percentage of visitors hiked in 2003 than in 2004 (65.5% versus 54.5%). As can be seen in table 3, this difference is most noticeable for the fire-affected period, with a smaller proportion of visitors traveling on horseback during this time in 2003 than in the nonfire-affected year. Paralleling this is a reduction in the average number of stock in the travel group in the fire-affected year (average of 7.5 in 2003 versus 10.8 in 2004). Visitors were less likely to use outfitters during the fires in 2003 than during that period in 2004 (11.8% versus 31.2%).

We also observed significant changes in recreational activity participation during the wilderness visit (e.g., fishing, hunting, rafting, swimming, etc.); most noticeably a smaller percentage reported fishing in 2003 than in 2004. This was most prevalent in the “during fires” period (see table 3). The average length of stay was also found to be significantly shorter in 2003 than in 2004. In particular, during August and September trip lengths were significantly shorter in the fire year. Finally, visitors in 2003 reported seeing fewer groups

Table 3. Bob Marshall Wilderness Complex Visit Characteristics (all response pattern differences significant at $p \leq .05$).

	Sampling period and year			
	August & September 2003	August & September 2004	Whole Season 2003	Whole Season 2004
Mode of travel (% hiking)	64.7	35.3	65.5	54.5
(% on horseback)	35.3	59.1	34.5	45.5
Percentage using an outfitter	11.8	31.2	14.0	21.9
Participated in fishing (%)	30.8	51.9	41.9	52.7
Average length of stay (# nights)	2.4	3.8	2.2	3.3
Number of groups encountered	3.8	5.2	4.2	5.5

**Table 4. Bob Marshall Wilderness Complex Visitor Attitudes
(% who found management action desirable)
(all response pattern differences significant at $p \leq .05$).**

Desirability of ...	Year of data collection	
	2003	2004
cemented rock fireplaces with metal grates	20.3%	13.8%
small, loose rock fireplaces (fire rings)	58.1%	44.8%
prohibiting wood fires where dead wood is scarce	54.4%	44.6%
eliminating grazing by visitors' horses (require carrying horse feed)	38.4%	33.9%
natural forest fire started by lightning	49.3%	68.4%

in the wilderness on their trip than visitors in 2004 reported seeing.

Respondents were also queried about their attitudes toward a large variety of social and physical conditions in the wilderness, as well as potential management actions (46 items total). There were few differences between the attitudes of 2003 visitors and those in 2004, with some notable exceptions. Table 4 shows the five attitudes that did differ between 2003 and 2004. The provision of fireplaces (cement or loose-rock fire rings), prohibiting wood fires, and eliminating grazing were considered desirable by more respondents in the fire year. And, very importantly, natural forest fires were considered desirable by a smaller proportion of visitors in 2003 than in 2004. In combination, these differences (and lack of other differences) indicate the likelihood that attitudes toward fire and fuels management were significantly altered by the fires in August and September of 2003.

Conclusion

In summary, the research opportunity presented by the BMWFC fires in 2003 has yielded some important insights about the impacts of wildland fire on visitors and on science. Sampling is based on a set of assumptions, one of those being that the conditions under which sampling occurs are representative. Whereas there is no such thing as an average year in the northern Rocky

Mountains, there are surely limits to generalizability. In 2003 we saw those limits exceeded. Had the study not been replicated in 2004, for example, a serious underestimate of outfitted use could have resulted in poor decisions about outfitter allotments.

Fortunately, there was an opportunity to replicate data collection in a year far less impacted by fires. Comparing data provided by visitors in each of the two years indicated no significant differences in the visitor characteristics we measured and in most of their attitudes. However, it does appear that the fires affected some visit characteristics. Visitors adapted to the presence of fires by staying fewer nights in the wilderness, were more likely to hike than to travel by stock, and were less likely to fish and/or use outfitters than visitors in 2004. A consequence of these changes was that visitors encountered fewer other visitors during their stay. Attitudes toward fuels and fire differed between 2003 and 2004, with those studied in the fire year expressing more support for fire control measures (see figure 1).

The impacts of numerous and widespread fire events in the

BMWFC are likely to be long-term and profound (large-scale fires occurred in 1988 and 2001 as well). As wilderness agencies move toward more than fire suppression for their wildland fire and fuels management, we could expect more fluctuation in the accessibility of specific areas within wilderness. Given the fire regime of many wildernesses in the northern Rockies—large, infrequent, but stand replacement regimes—the visual effects of these fires will be present for many years. In addition, we have identified some short-term impacts that have required response by researchers and managers alike. As fire becomes more a part of the wilderness landscape we need to be aware of its impact on visitors and the implications for social science data collection. **IJW**

REFERENCES

- Agee, James K. 1996. *Fire Ecology of Pacific Northwest Forests*. Washington, DC: Island Press.
- Agee, James K. 2000. Wilderness fire science: A state-of-knowledge review. In *Wilderness Science in a Time of Change Conference—Volume 5: Wilderness Ecosystems, Threats, and Management*, comp. D. N. Cole, S. F. McCool, W. T. Borrie, and J. O'Laughlin, 5–22. Proceedings RMRS-P-15-VOL-5. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Figure 1—Natural forest fires were considered desirable by a smaller proportion of visitors in the fire year than in 2004. Aldo Leopold Research Institute photo.

Barriers to Wildland Fire Use

A Preliminary Problem Analysis

BY DUSTIN DOANE, JAY O'LAUGHLIN,
PENELOPE MORGAN, and CAROL MILLER

Wildland Fire Use in Wilderness in the United States

American society has a general cultural bias toward controlling nature (Glover 2000) and, in particular, a strong bias for suppressing wildfire, even in wilderness (Saveland et al. 1988). Nevertheless, the Federal Wildland Fire Management Policy directs managers to “allow lightning-caused fires to play, as nearly as possible, their natural ecological role in wilderness” (FWFMP 2001). Each year, however, approximately 85% of natural fire ignitions in national forest wilderness areas are suppressed (Sexton 2004).

Roughly 20% of all national forest wilderness lands have been significantly altered from historical ecological conditions (Miller 2003), and the risk of losing key ecosystem components within these altered landscapes is high (Schmidt et al. 2002). Current management practices favoring suppression of natural ignitions cannot sustain the functional role of fire in wilderness areas (Cole and Landres 1996). Although concerns and issues that influence fire management decisions on U.S. federal lands have been identified (Miller and Landres 2004), to our knowledge there has not been a systematic national assessment to identify and measure Wildland Fire Use (WFU) barriers.

Three requirements must be met in order to manage a natural ignition as WFU in national forests. Managing a natural ignition as WFU requires a land and resource management plan (LRMP) that authorizes WFU, a fire management plan (FMP) that authorizes WFU, and a recommendation to manage a fire (i.e., natural ignition within the WFU management zone) as WFU (USDA/USDI 2005). If the fire management plan authorizes WFU, it is still possible that the majority of natural ignitions may be suppressed. The fire manager—the individual who counsels or provides advice to the responsible line officer, usually the forest supervisor—must make a recommendation that the fire be managed as WFU (USDA/

USDI 2005). The line officer then must accept the fire manager’s “go” recommendation. The line officer is ultimately responsible for all fire management decisions within the scope of the two plans. When the plans authorize WFU as an option, the line officer usually decides to accept the fire manager’s advice (Sexton 2004).

We used an Internet-based questionnaire (see www.cnr.uidaho.edu/wildernessfire) to collect data from fire managers in national forest wilderness areas covering the 2002–2004 period, sent electronically to all Forest Service units with wilderness responsibilities. These years were selected because of substantial policy changes in 2001. A total of 72 wilderness fire managers responded to the questionnaire, with at least one response from all nine Forest Service regions. The response rate is estimated at only 14% of potential respondents. We relied on the agency’s administrative hierarchy to identify the target group of managers and invite questionnaire responses from them. This approach was not effective in generating the response needed to generalize to all wilderness areas, but does provide insight into how these managers describe barriers.

Those responding indicated that 25% of the total natural ignitions in the 2002–2004 period were within wilderness areas that have been approved for WFU; and only 40% of this 25% received the “go” recommendation. These results suggest that even if WFU is authorized by plans, the majority of WFU opportunities may likely be suppressed.

Managing fire to attain wilderness objectives through WFU is likely constrained by five categories of factors: (1) organizational culture, (2) political boundaries, (3) organizational capacity, (4) policy directives, and (5) public perceptions (Doane et al. 2005). In this summary we focus only on barriers rated important by managers that can be mitigated by the agency, which includes factors related to organizational culture, capacity, and policies originating within the agency that influence WFU

planning and implementation decisions (see table 1). Results are based on responses from managers who identified and rated the importance of factors posing barriers to WFU on national forest wilderness areas. Political boundaries are important barriers but cannot be addressed by the agency, and results suggest that public perceptions can pose barriers, but not to the same extent as other factors (Doane et al. 2005).

Recommendations for Mitigating WFU Barriers

Eight general themes were developed from the 69 suggestions received from 38 wilderness fire managers (see table 2). Based upon managers' suggestions and recent literature, we developed seven recommendations for mitigating WFU barriers:

1. Encourage WFU at all levels within the organization in ways that provide support for managerial actions and decisions,
2. Provide district- or forest-level fire managers with greater flexibility in managing WFU in wilderness,
3. Emphasize the national directive to manage natural ignitions as WFU so as to increase awareness of it and clarify ambiguity,
4. Increase land areas available to WFU,
5. Increase the organization's knowledge of WFU,
6. Use management ignitions to support WFU efforts, and
7. Periodically assess and monitor the barriers to WFU.

Conclusions

Suppression of wildland fire alters ecological processes and conditions, often in ways that are counter to maintaining wilderness values. Results of our study identify many factors that make it difficult for managers to allow fires to burn freely in national forest wilderness. Other agencies may have similar problems, and

Table 1. Internal Factors Posing Barriers to Wildland Fire Use.

Planning factors preventing WFU from being an option:
<ol style="list-style-type: none"> 1. WFU is not the cultural norm of the forest and/or the region 2. Lack of time and resources to conduct a sufficient analysis to incorporate WFU into the LRMP or the FMP 3. Insufficient natural ignitions to justify the planning effort 4. Managing for wilderness objectives is not a priority for the forest and/or the region 5. The planning team's discomfort with the uncertainty associated with managing a WFU event, including political consequences 6. Lack of memorandum of understanding with adjacent landowners to transfer WFU fires across the boundary 7. Insufficient qualified personnel to manage a WFU event
Implementation factors leading to the suppression of candidate fires:
<ol style="list-style-type: none"> 1. The regional directive was to suppress all ignitions regardless of whether or not a natural ignition could have been managed as WFU 2. Lack of qualified personnel to make the decision to manage the fire as WFU 3. Personal discomfort with the political consequences associated with managing as WFU 4. The likelihood that the line officer would accept the recommendation to manage as WFU was low due to his or her discomfort and the political consequences associated with managing as WFU

Table 2. Managers' Suggestions for Increasing Wildland Fire Use Organized by Themes and Percent Responding.

<p>Increase training and education (22%)</p> <ul style="list-style-type: none"> • Educate the agency and the public on WFU • Provide more WFU training and experience with WFU in the agency • Evaluate the adverse effects of suppressing natural ignitions <p>Provide institutional support (19%)</p> <ul style="list-style-type: none"> • Provide encouragement for WFU from higher levels in the organization • Support and protect the wilderness fire manager and his or her decisions • Provide managers an incentive <p>Increase management flexibility (13%)</p> <ul style="list-style-type: none"> • Increase management flexibility for the wilderness fire manager <p>Increase lands available to WFU (12%)</p> <ul style="list-style-type: none"> • Increase the lands available for managing natural ignitions as WFU via memorandum of understanding (MOU) with Bureau of Indian Affairs, Bureau of Land Management, Forest Service, etc. • Purchase private inholdings (private property within wilderness areas) <p>Change organizational culture (7%)</p> <ul style="list-style-type: none"> • Revise <i>Forest Service Manual</i> 2320 (Wilderness section) to emphasize WFU • Emphasize the national directive to manage natural ignitions as WFU and managing for wilderness objectives • Make WFU fires equal to suppression fires when ordering resources <p>Utilize management ignitions (6%)</p> <ul style="list-style-type: none"> • Utilize management ignitions to support WFU efforts • Minimize impacts from smoke by treating fuels through management ignitions <p>Prevent negative outcomes from WFU events (3%)</p> <ul style="list-style-type: none"> • Prevent negative outcomes (e.g., destruction of private property) from WFU events <p>Miscellaneous (18%)</p> <ul style="list-style-type: none"> • Amend plans to make WFU an option • Forest is looking at WFU • Eleven other miscellaneous suggestions that do not fit any general theme
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Results of our study identify many factors that make it difficult for managers to allow fires to burn freely in national forest wilderness.

managing natural ignitions as WFU is likely even more challenging on nonwilderness lands. The Federal Wildland Fire Management Policy directive to restore natural fire regimes applies not just to national forest wilderness, but to all lands administered by the federal government (FWFMP 2001). Restoring fire will require cooperation among various levels within an individual agency, along with various federal, state, and local governments, and local and national communities (DellaSala et al. 2003).

Learning to live with fire is a social issue (Dombeck et al. 2004). Wilderness can be a proving ground for demonstrating the benefits of restoring fire across the landscape. Suppression, however, is likely to remain the cultural norm unless barriers to managing natural ignitions as WFU can be overcome. This research suggests that viable options for mitigating these

barriers do exist, and we recommend systematic and periodic assessments of the factors influencing WFU implementation as part of program evaluation. A better understanding of the factors that influence managers is a meaningful complement to accountability measures of the number of fires allowed to burn freely and acres subjected to WFU. **IJW**

REFERENCES

- Cole, D. N., and P. B. Landres. 1996. Threats to wilderness ecosystems: Impacts and research needs. *Ecological Applications* 6(1): 168–84.
- DellaSala, D. A., A. Martin, R. Spivak, T. Schulke, B. Bird, M. Criley, C. Van Daalen, J. Kreilick, R. Brown, and G. Aplet. 2003. A citizen's call for ecological forest restoration: Forest restoration principles and criteria. *Ecological Restoration* 21(1): 14–23.
- Doane, D., J. O'Laughlin, P. Morgan, and C. Miller. 2005. Barriers to wildland fire use in USDA Forest Service wilderness areas as perceived by wilderness fire managers. Contribution No. 1006, College of Natural Resources Experiment Station, University of Idaho, Moscow.
- Dombeck, M. P., J. E. Williams, and C. A. Wood. 2004. Wildfire policy and public lands: Integrating scientific understanding with social concerns across landscapes. *Conservation Biology* 18(4): 883–89.
- FWFMP (Federal Wildland Fire Management Policy). 2001. Review and update of the 1995 Federal Wildland Fire Management Policy. Washington, DC: various governmental agency partners.
- Glover, J. M. 2000. Can we stop trying to control nature? *International Journal of Wilderness* 6(1): 4–8.
- Miller, C. 2003. Natural fire regimes in wilderness. *International Journal of Wilderness* 9(2): 33, 48.
- Miller C., and P. B. Landres. 2004. *Exploring Information Needs for Wildland Fire and Fuels Management*. RMRS-GTR-127. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Saveland, J. M., M. Stock, and D. A. Cleaves. 1988. Decision-making bias in wilderness fire management: Implications for expert system development. *AI Applications* 2(1): 17–30.
- Schmidt, K. M., J. P. Menakis, C. C. Hardy, W. J. Hann, and D. L. Bunnell. 2002. *The Development of Coarse-scale Spatial Data for Wildland Fire and Fuel Management*. RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Sexton, T. 2004. Personal communication. Fire use program manager, USDA Forest Service, Washington, DC, and National Interagency Fire Center, Boise, ID.
- USDA/USDI. 2005. *Wildland Fire Use Implementation Procedures Reference Guide*. Washington, DC: U.S. Department of Agriculture and U.S. Department of the Interior.
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- Brown, James K., Robert W. Mutch, Charles W. Spoon, and Ronald H. Wakimoto, tech. coordinators. 1995. *Proceedings: Symposium on Fire in Wilderness and Park Management*. USDA Forest Service Intermountain Research Station Gen. Tech. Rep. INT-GTR-320. Ogden, UT: Intermountain Research Station.
- Lasko, Rich. 2004. Wildland fire use: Decision, outcomes, and the future. Paper presented in March 2004 at the Wilderness Stewardship in the Rockies: Let's Talk conference of the Rocky Mountain Cooperative Ecosystem Studies Unit.
- Lucas, Robert C. 1980. Use patterns and visitor characteristics, attitudes and preferences in nine wilderness and other roadless areas. Research Paper INT-253. Ogden, UT: U.S.

- Department of Agriculture, Forest Service, Intermountain Research Station.
- Lucas, Robert C. 1985. Visitor characteristics, attitudes and use patterns in the Bob Marshall Wilderness Complex. Research Paper INT-345. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.
- McCool, Stephen F. 1983. The Bob Marshall Wilderness visitor study. School of Forestry, University of Montana, Missoula, MT. 89 p.
- McCool, Stephen F. 2005. Social science research and planning in the Bob Marshall Wilderness Complex. *International Journal of Wilderness* 11(2): 28–29.
- Parsons, David J. 2000. Restoration of natural fire to United States wilderness areas. In

Personal, Societal, and Ecological Values of Wilderness: Sixth World Wilderness Congress Proceedings on Research, Management, and Allocation, vol. II, comp. A. E. Watson, G. H. Aplet, and J. C. Hendee, 42–47. RMRS-P-14. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Trust in Wildland Fire and Fuel Management Decisions

BY ADAM LILJEBLAD and WILLIAM T. BORRIE

Abstract: Public land managers are stewards of public lands and of the relationship between the public and these lands. Maintaining one aspect of this relationship, trust in the agency, can be challenging. Lack of trust can influence public response to management decisions, including about wildland fire use. By considering the factors that influence trust, managers can be more effective in accomplishing fire stewardship objectives.

Trust—An Essential Element of Fire Stewardship

Today, resource managers are likely to consider social, economic, and ecological effects when making or implementing fire management decisions. However, recent studies have shown that significant portions of the public do not fully trust the fire and fuels decisions that managers make (Shindler and Toman 2003; Winter et al. 2004). This lack of trust is one of the primary factors influencing public evaluation of these decisions (Knotek, this issue; Brunson and Evans 2005; Vogt et al. 2002; Winter 2002).

Without trust, it is easy for the public to become disenfranchised and withhold their support for decisions regardless of the merit of the decisions (Shindler et al. 2002). Many of the political barriers to wildland fire use (WFU) described by Aplet (this issue) may be remedied by addressing issues of trust between the public and managers. Not only is wilderness fire management a matter of assessing what to do, but also of having the necessary public support to carry it out. Managers need, therefore, to maintain or increase public trust in wildland fire decisions if they are to be fully effective as public land stewards (see figure 1). As Shindler et al. (2002) suggest, trust building should be “the central long-term goal of effective public process” (p. 44).

Trust affects the public’s evaluations of public lands policy (Borrie et al. 2002). Although federal lands are national resources and need to be managed to meet intended national public purpose, managers are increasingly concerned about protecting the meanings that local residents attribute to these places, as well (Gunderson, this issue). Because of their prox-



Adam Liljebblad and Bill Borrie. Photo by Adam Liljebblad.

imity to wildlands, local residents are disproportionately impacted by fire management decisions (Danks 2001). Local community members frequently take issue with fire managers’ prioritization of available resources, have long-held beliefs about the desired conditions of the forest, and tend to be suspicious of outside influences on local land management decisions (see, for instance, Gunderson, this issue).

Recent research has shown that public attitudes toward fire management decisions are at least partially dependent on perceived impacts (Kneeshaw et al. 2004; Winter et al. 2003; Winter et al. 2004). In general, the greater the benefits the public perceives to be associated with each fire management option, the more trusting the public is likely to be. Similarly, the greater the perceived risk associated with each option, the less public trust. Using fire and fuel management techniques that the public considers to be unacceptable or believes to pose high risk will likely

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Figure 1—Having the trust of the public allows managers to be more effective stewards of the land. White Knoll Wildland Fire in the Manti-La Sal National Forest in 2005. Photo from U.S. Forest Service.

lead to a decrease in the public's trust in the agency (Winter et al. 2004).

In order to get support for management decisions, such as WFU, it requires a significant extension of public trust. WFU is inherently risky, and the public must have confidence that wildland fire managers will not let fires escape to threaten homes, lives, or other values at risk. Local residents also sometimes express distrust of fire and fuel managers because many incident command teams managing large fires are from outside the area and are less likely to understand local values or utilize local knowledge (Black et al. 2004; Carroll et al. 2005; Kent et al. 2003). These transient teams possess the level of experience and skill needed to manage larger fires—something local firefighters rarely have. However, as these managers take the firefighting reins, utilizing the knowledge and expertise of local firefighters and managers may contribute to trust. Local fire departments have much greater knowledge of the tradeoffs associated with decisions, are able to provide continuity, and have an understanding of historical events that transient managers do not (Danks 2001; McCool et al. in press).

Currently, some mechanisms do exist for considering local knowledge in the decision-making process. During the scoping process under National Environmental Policy Act, for example, there are numerous opportunities for local community residents to comment on proposed plans and policies. Most current methods of engagement, however, are not typically systematic attempts to incorporate knowledge about contributors to trust into this process.

Systematic Consideration of Trust Contributors

The public's trust is critical to long-term success of fire and fuel management decisions. Trust exists on multiple levels, from trust in an individual to trust in an institution (Kramer 1999). When the public trusts a management agency, it suggests managerial success through the implementation of effective policies and practices, a strong and attentive relationship between resource managers and the public, and perhaps most importantly, that managers are fulfilling their public purpose mandate to be stewards of natural resources as well as stewards of the relationship the public

has with public places (Watson and Borrie 2003).

Having a trusting relationship between a managing agency and the public not only directly benefits public lands but also the government as a whole, the specific managing agencies, and the public (Hardin 1993). Trust contributes, for example, to overall governmental effectiveness by minimizing transaction costs, the external costs associated with any interaction or exchanges between parties. With trust, there is a measure of faith in the actions and intentions of others, so there is reduced need for extensive regulation, contractual agreements, or litigation (Fukuyama 1995; Putnam 2000). Through these actions of voluntary compliance, parties are able to cooperate in a more open, honest fashion, consequently developing a moral consensus, which results in more mutually agreeable decisions. Relationships of all types are built around the notion of social capital, referring to the bonds of honesty, reciprocity, and trust that form between parties as they interact openly. Organizations high in social capital are believed not only to be more effective and innovative, but also are perceived as having greater legitimacy than organizations with lower levels of social capital, because there is an increased sense of a collective good (Putnam 2000).

A recent study examined the public's trust in one national forest's fire and fuel management program (Liljeblad 2005). Seventeen hypothesized contributors to trust were identified in a broad-reaching review of social science literature. Although each of those 17 items contributed significantly to trust, seven were determined to be the most influential. These seven interrelated items reflected the public's level of agreement with the actions of fire managers; their perceptions of the fairness and equity in the fire and fuel management process;

the public's willingness to endorse agencies to act as stewards on their behalf; how well managers are doing their job; the degree of confidence that the public has in the actions of fire and fuel managers; the extent to which managers can be relied upon to perform in a consistent manner; and the public's perceptions of how deserving managers are of trust.

The contributors to trust are specific to each particular set of circumstances, involved parties, and their histories with one another (Liljeblad 2005). Paired with the fact that fire and fuel management is by its very nature complex, controversial, rife with uncertainty, and varies as social and biological systems change (McCool et al. in press), it becomes impossible to definitively and precisely know the requirements for trust for each set of circumstances. The seven most influential contributors to trust in this landscape-level fuel treatment project, however, can be illustrated using an example from the 2005 fire season.

Under the 1998 Alaska Interagency Wildland Fire Management Plan, fires in limited suppression zones are lowest management priority and are generally not suppressed unless human life is in danger. Areas are designated as limited suppression based on three possible criteria: (1) when the cost of suppression may exceed the value of resources to be protected, (2) the environmental effects of suppression may have more negative impacts than the fire, (3) or if excluding fire is detrimental to fire-dependent ecosystems.

In interior Alaska, a lightning-ignited fire started in a remote, limited suppression fire management zone. Eighteen recreational cabins exist along the shores of a nearby fly-in-only lake. As the fire approached the cabins, landowners were concerned that the fire was not being

suppressed, especially since their cabins were threatened and they believed there were idle fire crews available. An attempt by one of the landowners to persuade suppression was not successful. Seeking to protect the structures themselves, landowners flew out to the lake with rudimentary firefighting equipment, with the hopes of protecting the structures (Dillon 2005a). Once landowners arrived at the lake, their lives were considered to be in danger due to their proximity to the fire, and smokejumpers and air tankers were then dispatched to suppress the fire. Only one small cabin and a cache were destroyed by the fire (Dillon 2005b).

The example of this 2005 fire presents a fitting lens through which to examine each of the contributors to trust in fire and fuel management decisions. *Agreement* is simply the belief that the objectives and actions of managers coincide with those of the public. According to newspaper reports, cabin owners did not agree with the state's policy of not protecting recreational structures in limited suppression zones. In order to maintain trust, managers would need minimally to acknowledge and address these opinions of residents when making decisions.

Procedural justice refers to the fairness, equity, and legitimacy of the fire management process. Property owners wanted an exclusion from the policy of limited suppression and protection of their recreational cabins surrounding the lake, prompting accusations of favoritism and inequity from the local media (A sound fire policy 2005). Because other remote property owners could most likely not receive the same treatment, a suppression decision would likely harm the general public's trust in fire decisions.

The public's *willingness to endorse* managing agencies to act on their behalf refers to the extent to which people extend their



Figure 2—Public confidence in the actions of wildland fire managers is important to management. Photo from U.S. Forest Service.

trust to agencies based on their perceptions of how the agency will perform. That is, in order for the public to trust the agency, the agency needs to fulfill the public's expectations. For example, the cabin owners likely would not be willing to endorse the fire managers' decisions to not suppress fires to protect recreational structures in the limited suppression zone. The public's willingness to endorse managing agencies reflects trust's voluntary nature, which is inherently contingent on perceptions of what managers will or will not do.

Effectiveness is the ability of managers to successfully accomplish their management decisions, or have the impact they intend. It implies that managers are productive, not just active. Managers were working within the restrictions of a limited suppression zone, which prevented the protection of recreational structures. However, once people's lives were put in danger, managers were obligated to do whatever possible to protect them. Managers were effective at adhering to both the restrictions of limited suppression, and then the need to protect the public, likely strengthening public trust.

Confidence is the degree of faith, certainty, or assurance that the public has in the actions of wildland fire managers (see figure 2). People expect a certain outcome or range of outcomes when managers make or implement a

decision. In the example, landowners were likely confident that if wildland firefighters were to respond to suppress the fire, they could and would protect the structures.

Reliability is a characteristic of managers themselves. It refers to the extent to which managers can be counted upon to perform a given function or behave in certain predictable manners, and reflects consistency of acting. If, for example, fire managers had been permitted to suppress the fire soon after it began, their swift response on that fire, like on dozens of fires previously, would be considered to be reliable because they had behaved in a consistent, predictable manner.

The last of the most influential contributors to trust is *trustworthiness*, which is the notion that fire managers conduct themselves in a manner deserving of trust of others. Conceptually, trustworthiness intertwines with the other contributors, and is a reflection of fire managers' general reputation, implying managers deserve the trust the public offers, and is suggestive of future behavior. These managers showed that they were worthy of the trust the cabin owners placed in them when they responded to suppress the fire to protect the owners. It suggests that they likely would respond in a similar manner were the situation to arise again.

It is possible for managers to foster some of the attributes of trust and not all of them. In the preceding example, managers behaved in a manner that likely harmed the trust of the cabin owners while building the trust of the general public, but also did things that likely harmed the trust of the general public, but built trust among cabin owners. There are times when managers must abrogate the public's trust in order to accomplish some higher level objective, such as conducting a back-burn through a prized recreation

area (normally associated with negative social implications) in order to protect a town (normally associated with positive social implications).

Conclusion

The contributors to trust presented here are an important subset of factors identified by Liljeblad (2005), and are believed to be the most critical to developing and maintaining trust in fire and fuel management decisions. In order to be effective stewards of wildland fire, managers need to be cognizant of the potential effects of each and every one of their actions. Resource managers have a public purpose mandate to consider the ecological, economic, and social implications of all decisions. If they can incorporate these considerations into how they manage fire, they are likely to be able to increase the public's trust in their decisions and in so doing, improve their overall managerial effectiveness. It is not a simple task, and requires managers to continually consider the effects of each action. In a time where forest management by lawsuit is becoming the norm, greater public trust means that lawsuits may be reduced, managers can be more effective stewards of public lands, and the benefits of fire can be assured on wilderness and nonwilderness lands alike. **IJW**

REFERENCES

- A sound fire policy. 2005. Editorial. June 25. *Fairbanks Daily News-Miner*.
- Black, A., C. Miller, and P. Landres P. 2004. *Wildland Fuels Management: Evaluating and Planning Risks and Benefits*. Final report to the Joint Fire Science Program: No. 99-1-3-16. Missoula, MT: Aldo Leopold Wilderness Research Institute.
- Borrie, W. T., N. Christensen, A. E. Watson, T. A. Miller, and D. W. McCollum. 2002. Public purpose marketing: A focus on the relationships between the public and public lands. *Journal of Park and Recreation Administration* 20(2): 49-68.
- Brunson, M. W., and J. Evans. 2005. Badly burned? Effects of an escaped prescribed burn on social acceptability of wildland fuels treatments. *Journal of Forestry* 103(3): 134-38.
- Carroll, M. S., P. J. Cohn, D. N. Seesholtz, and L. L. Higgins. 2005. Fire as a galvanizing and fragmenting influence on communities: The Case of the Rodeo-Chedeski fire. *Society and Natural Resources* 18: 301-20.
- Danks, C. 2001. Community-based wildfire management: An opportunity to integrate social and ecological objectives on federal lands. In *Enabling Policy Frameworks for Successful Community Based Resource Management Objectives*, ed. K. Suryanata, R. Dolcemascolo, J. Fisher, and J. Fox. Proceedings of the eighth workshop on community management of public lands. Honolulu, HI: East-West Center.
- Dillon, R.A. 2005a. June 29. Remote fire poses a problem. *Fairbanks Daily News-Miner*.
- Dillon, R.A. 2005b, June 30. Fire moves away from area homes. *Fairbanks Daily News-Miner*.
- Fukuyama, F. 1995. *Trust: The Social Virtues and the Creation of Prosperity*. New York: The Free Press.
- Hardin, R. 1993. The street-level epistemology of trust. *Politics and Society* 21: 505-29.
- Kent, B., K. Gelbert, S. McCaffrey, W. Martin, D. Calkin, E. Schuster, et al. 2003. Social and economic issues of the Hayman fire. In *Hayman Fire Case Study*, tech. ed. R. T. Graham, 315-88. Gen. Tech. Rep. RMRS-GTR-114. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Kneeshaw, K., J. J. Vaske, A. D. Bright, and J. D. Absher. 2004. Situational influences of acceptable wildland fire management actions. *Society and Natural Resources* 17: 477-89.
- Kramer, R. 1999. Trust and distrust in organizations: Emerging perspective, enduring questions. *Annual Review of Psychology* 50: 569-98.
- Liljeblad, A. 2005. Towards a comprehensive definition of trust: Understanding the public's trust in natural resource management. Unpublished Master's Thesis. The University of Montana, Missoula. Available from <http://leopold.wilderness.net/pubs/558.pdf>.
- McCool, S. F., J. A. Burchfield, D. R. Williams, and M. S. Carroll. In press. An event-based approach for examining the effects of wildland fire decisions on communities. *Environmental Management*.
- Putnam, R. D. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.
- Shindler, B. A., M. Brunson, and G. H. Stankey. 2002. *Social Acceptability of Forest Conditions and Management Practices: A Problem Analysis*. Gen. Tech. Rep. PNW-GTR-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

- Shindler, B. and E. Toman. 2003. Fuel reduction strategies in forest communities: A longitudinal analysis of public support. *Journal of Forestry* 101(6): 8–15.
- Vogt, C., G. Winter, and J. Fried, 2002. Antecedents to attitudes toward prescribed burning, mechanical thinning, and defensible space fuel reduction techniques. In Jakes, P.J. (comp), p. 74–83. Homeowners, communities, and wildfire: Science findings from the National Fire Plan: Proceedings of the Ninth International Symposium on Society and Resource Management; 2002 June 2-5; Bloomington, IN. General Technical Report NC-231. St. Paul, MN: North Central Research Station, Forest Service, U.S. Department of Agriculture.
- Watson, A. E., and W. T. Borrie. 2003. Applying public purpose marketing in the USA to protect relationships with public land. In *Nature-based Tourism, Environment and Land Management*, ed. R. Buckley, C. Pickering, and D. B. Weaver, 25–35. Oxon, UK and Cambridge, MA: CABI Publishing
- Winter, P.L. 2002. Californians' opinions on the management of wildland and wilderness fires. Unpublished report. Riverside, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 42 p.
- Winter, P.L.; Cvetkovich, G. 2003. The role of trust, knowledge, concern, and gender in the prediction of Californians' reactions to fire management. In: Narog, M.G. (technical coordinator). Proceedings of the 2002 Fire Conference on Managing Fire and Fuels in the Remaining Wildlands and Open Spaces of the Southwestern United States; 2002 December 2-5; San Diego, CA. General Technical Report PSW-189. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.
- Winter, G., C. Vogt, and S. McCaffrey. 2004. Examining social trust in fuels management strategies. *Journal of Forestry* 102(6): 8–15.

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There are several studies at various stages of completion in Glacier National Park investigating the relationship between wildfire, amphibians, and their habitats. Most of these studies were instigated by wildfires in 2001 and 2003 that burned areas where the area has been monitored for the distribution of breeding populations since 1999, providing the rare opportunity to document potential changes using prewildfire data. A general pattern that has emerged is the number of wetlands used for breeding by the western toad increases the year after wildfire, sometimes in areas where we had found few adults and no breeding activity in years before the fires, followed by a decline toward prefire numbers over subsequent years. The response of other widely distributed pond amphibians in the park, the long-toed salamander and Columbia spotted frog, seems minimal, with no apparent increases or decreases in the proportion of wetlands occupied by breeding populations in burned areas. We have tried to determine why toads rapidly increase their numbers in recently burned areas. We

found few changes to the wetland environment (e.g., temperature, nutrients) that would explain the colonization and expansion, but radio tracking of adult toads and GIS modeling of vegetation gradients suggest they may be responding to changes to the terrestrial environment rather than to the wetlands. Based on similar colonization events in other areas of the Northwest, we suspect the western toad is a habitat generalist that responds to a wide variety of disturbances. Exactly why disturbed habitats are preferred and whether or not the larger population of the area actually benefits from the colonization of new breeding sites is still uncertain and will be the focus of future research.

The 2003 wildfires in Glacier National Park burned half of a group of streams we had sampled in 2001 for Rocky Mountain tailed frog larvae. Postfire reductions in relative abundance and a shift in age structure of the populations were consistent with a moderate fire effect. We do not think the fire represents a long-term threat to the populations. Results from this study will be an important counterpart to the larger

study of wildfire and stream amphibians described above. Wildfire studies are never truly replicated, but similar results from different areas and fires increase our confidence that conclusions we may draw are robust.

Scientists are in the early stages of determining the relationship between wildfire and conservation of amphibians in the Northwest. It will not be surprising if we find that amphibian communities are healthier in areas where fire regimes more closely resemble those prior to European settlement, similar to the relationship between wildfire and amphibians in the Southeast. Also, because fire has often been managed differently in wilderness and national parks during the last 30 years or so, compared to actively managed forests, protected lands may be important to the conservation of many amphibians. **IJW**

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The Challenge of Wilderness Fire Stewardship in a Time of Change

A South African Perspective

BY SONJA KRÜGER

In keeping with the South African definition of wilderness (National Environmental Management: Protected Areas Act No. 57 of 2003), the policy is to preserve natural conditions by allowing natural ecological processes to operate without human interference. This policy presents managers with a dilemma for wilderness fire stewardship: What is the natural or historical fire regime, and is wilderness fire stewardship possible without human interference?



Sonja Krüger. Photo by Douglas van Zyl.

Although our wilderness areas are considered large enough for most natural processes to take their course, this does not hold true for fire. As a result of the ecological, social, and policy environments within which wilderness stewards operate, human interference is

essential. Active fire management is required to maintain ecological processes, protect life and property, and to ensure that burning takes place within the prescribed legal framework.

Human interference can be used to simulate the natural or historical fire regime. However, in order to implement the natural fire regime, we need to know: (1) what the natural fire regime is, (2) whether it is still beneficial in our current context, and (3) whether it is even possible to implement in a landscape that is vastly different from the historical one. Lightning-caused ignitions are accepted as being the primary source of natural ignitions, but on a continent

where fire has been used for centuries by indigenous people, these are often also considered natural ignitions (Hall 1984). As a result of these two sources of ignition, fire was probably more heterogeneous (patchy) in the past. The heterogeneity that used to occur at a regional level is, however, no longer possible. Decisions regarding wilderness fire stewardship can now only be implemented at a local level and are based on objectives and conservation targets of these areas and the social and political influences on them.

Fire Stewardship— Burning for Multiple Objectives

Southern Africa has a considerable body of fire research, which has been integrated into the management of natural areas. Fire stewardship plans for the grassland biome of the Drakensberg Mountains have recently been reviewed, and forms the focus of this article, with particular emphasis on fire stewardship within the uKhahlamba Drakensberg Park World Heritage Site (see figure 1).

The fire stewardship of the montane grassland biome was reviewed by the scientific community; first to determine the success of the existing fire management plan in meeting specific management objectives, and second to incorporate the results of recent fire research into a best-practice fire stewardship program (Uys et. al. in prep.). The review included the effects of fire on vegetation, vertebrates, invertebrates, water production, soil, wilderness values, and cultural heritage. The product of the partnership between scientists and managers is a practical fire stewardship program containing a set of defensible fire objectives and goals for nature conservation accompanied by relevant management actions.

The aim of reviewing fire stewardship programs is to constantly improve wilderness stewardship. An integral part of these reviews is the transfer of knowledge between regions and nations, which ensures improved decision making by incorporating expert opinion, applying ecological principles, and making sensible extrapolations. This adaptive management approach to wilderness fire stewardship is essential in an environment where changes in the ecological, social, and policy environments inform the fire stewardship program and provide a framework for the integrated management of the wilderness resource.

Ecological Environment

Increasing knowledge of the ecologically important role of fire has resulted in radical changes in fire stewardship programs over the years. Large sections of the Drakensberg were excluded from fire for several decades (Bainbridge 1999). Since this exclusion in the mid-1930s, however, ecologists have realized that the Drakensberg biome contains many species that are ecologically adapted to fire and that fire plays an important role in ecosystem functioning (Tainton 1981; Hall 1984).

The Drakensberg fire stewardship program recognizes that disturbance is a key feature of natural ecosystems essential to maintain biodiversity. A range of disturbances influence the environment, such as fire, grazing, drought, or geological forces. Of these, fire has the greatest potential in conservation areas for manipulation by management where the main objective is to maintain biodiversity and ecosystem functioning. Other fire stewardship objectives include maintaining the vigor of the grass layer, creating a heterogeneous mosaic of burned and unburned patches, alien plant control, protection of forest wilderness, and various species-specific objectives. An

example of species-specific burning in the Drakensberg is an autumn burn, which provides a green flush required to sustain small antelope, such as the endangered oribi, *Ourebia ourebi*, through the winter period.

Fire regimes need to be managed in order to maintain habitat heterogeneity and at least the existing plant and animal community composition, structure, and distribution at the local level. In the Drakensberg, these objectives are achieved by manipulating the fire frequency, fire intensity, the season of burn, and the type of fire by burning either with or against the wind. The fire stewardship program of the uKhahlamba Drakensberg Park takes into account the effects of fire on the globally significant biological and cultural diversity of the park and its importance as a water catchment area in the development of a best-practice strategy (Uys et. al. in prep.). This strategy is adopted in order to achieve the objective of ensuring that those natural processes responsible for generating and maintaining biodiversity and life support systems continue to function at a local level.

Water and soil conservation is an ecological challenge to wilderness stewards in the mountain catchment areas. Management actions need to ensure that a sustained yield of good quality water is maintained. Results from long-term research in several Drakensberg catchments indicate that fire has little influence on water production and soil erosion (Everson 1985). Fire, however, determines canopy and basal cover of the grass



Figure 1—The montane grassland biome of the Drakensberg Mountains, which contain 36% of the country's proclaimed wilderness areas. Photo from Ezemvelo, KZN Wildlife.

sward, which is responsible for maintaining water production (Tainton and Mentis 1984). In a country that is largely semi-arid, water is likely to become the national priority as urban and agricultural demands increase. Since the Maloti-Drakensberg Mountains produce approximately 25% of southern Africa's water, it is vitally important that we maintain the long-term security of this resource through proper fire management (see figure 2).

Cultural Environment

Managing cultural heritage risk presents another fire stewardship challenge. Cultural heritage is our legacy and because of its irreplaceability, it has always been well protected



Figure 2—The Drakensberg wilderness areas are situated in an important water catchment area. Photo from Ezemvelo, KZN Wildlife.

Although our wilderness areas are considered large enough for most natural processes to take their course, this does not hold true for fire.

by legislation in South Africa. Some cultural features, such as San rock art sites (painted shelters) and archaeological artifacts, can be damaged or altered by fire and justify some management intervention if they are to remain undamaged. Fire may also be a concern for some features of living heritage, for example historically important trees and grave sites within protected areas.

Previously, the focus of fire management in the Drakensberg has been water production and biodiversity conservation (Bainbridge 1999). The proclamation of the uKhahlamba Drakensberg Park as a World Heritage Site for its cultural values, however, has made reserve managers more aware of the impacts of burning practices on cultural resources. The impact of fire on cultural resources was thus taken into account as part of the review of the fire stewardship program of the park (Uys et. al. in prep.).

A provincial heritage agency is responsible for cultural resource management, and the local community is responsible for maintaining ancestral graves and living heritage sites. The conservation authority, however, as the custodians of the land, need to take cultural resources into account in their fire stewardship program and collaborate with the heritage agency and local community to resolve responsibilities for these resources and to prevent the degradation or destruction of non-renewable features of cultural heritage.

Social Environment

Wildfire poses serious risks to life and property. For this reason, the extensive

fires of the past cannot be simulated in the current landscape. Changes in the social environment have resulted in a reduction in the extent and connectivity of natural areas and an increase in the number of developments near wilderness areas, such as large-scale land transformation and residential developments. As a result, maintaining natural processes such as fire is no longer possible on a large scale. Controlled fire management is therefore necessary at a local scale to reduce the risk of disaster caused by unplanned fires.

Wilderness areas also face the threat of deliberately set arson fires and unplanned invasive fires from communities living and grazing their stock along the boundary of protected areas. These fires impact negatively on biodiversity, the security of visitors, and on the wilderness user's experience. Similarly, prescribed burns in wilderness, such as the straight, parallel lines of firebreaks, form a significant visual intrusion. To counter this, wilderness stewards attempt to burn large blocks rather than rigid firebreaks to create a more "natural" appearance and avoid prescribed burns that result in artificially shaped edges. These aesthetic impacts compromise the objective of maintaining the natural character of the wilderness areas.

Wilderness areas in South Africa contain numerous globally significant biological and cultural resources, including environmental services. The Drakensberg in particular contributes significantly to effective mountain catchment management, ensuring an optimal flow of good quality water in one of the major water catchment ar-

reas of South Africa. Although people depend on these resources for their livelihoods, current land-use practices outside protected areas are neither conducive to conservation ideals nor to the sustainable use of resources from the region. This is particularly true for fire management. Increased commercialization and human populations place pressure on natural resources, which are limited as a result of the reduction in the number and size of protected areas over the years.

The threats to wilderness from inadequate fire management in the buffer zones can be attributed to a lack of understanding of the impacts of fire and its correct use. Incorrect burning results in reduced grazing capacity and soil erosion. The misuse of fire is also a direct result of many communally owned areas bordering protected areas that no longer have a strong traditional leadership. Fire management at a community level is therefore not being coordinated.

Wilderness stewards face the challenge of finding ways in which to preserve the wilderness resource while ensuring that the needs of the local population are met in a sustainable manner. A process of knowledge transfer from conservation agencies to local communities will improve their understanding of the impacts of fire and the correct application of fire. In the long term, a focused environmental awareness program will result in responsible fire stewardship in communally owned areas also.

Policy Environment

The mitigation of the above-mentioned ecological and social risks is overseen by a body of legislation aimed at regulating burning activities in South Africa. Of the various sets of legislation that regulate fire management, the National Veld and Forest Fire Act No. 101 of 1998 represents the most important framework in which all fire activities

must be conducted. The purpose of this act is to prevent and combat veld (rangeland), forest, and mountain fires throughout the Republic. The act provides for the prevention of fires by requiring citizens to heed a fire danger rating system, burn firebreaks, acquire equipment, and have available personnel to fight fires.

South Africa is fortunate in that the national legislation has remained relatively constant over the years. Recent revisions of fire-related legislation indicate a transition to a new legal order in veldfire (rangeland fire) management and control in the country, proof that the government considers fire management a priority. For example, the National Veld and Forest Fire Act of 1998 repeals certain provisions of the Forest Act of 1984 and reforms the law on veld and forest fires. The act also makes provision for the establishment of Fire Protection Associations (see below).

Past fire policies were dictated by the exotic plantation forestry industry and the agricultural sector. The policies focused on reducing the risk of fires to timber plantations, and maximizing the production potential of agricultural land. Although the agricultural regimes generally did not favor biodiversity, conservation agencies could apply for exemption from burning restrictions in order to achieve biodiversity objectives in their fire stewardship program. The new Protected Areas Act No. 57 of 2003 benefits wilderness stewards where there is a conflict between any local or national legislation. The Protected Areas Act prevails if the conflict concerns the management or development of protected areas, which includes fire management.

The conflict between the objectives of plantation forestry companies, the agricultural sector, and conservation agencies will be addressed by the Fire Protection Associations. The associations

will deal with all aspects of veldfire prevention and firefighting, and are required to develop and apply a veldfire management strategy for a particular area. The strategy of the Fire Protection Associations will be developed according to the management objectives of the representatives of the association within its area of responsibility. This forum ensures public participation in fire stewardship decisions and provides a platform for knowledge transfer at a local level between conservation agencies and local communities.

A political challenge facing scientists and managers is one of insufficient resources to maintain existing long-term burning trials and establish new ones. Four long-term burning trials exist within the uKhahlamba Drakensberg Park, totaling more than 120 years of fire-related research. These trials are the most important in the country, providing invaluable information regarding fire impacts on biodiversity. There are insufficient of these long-term experiments within the country at present, representative of the various biomes, and those that exist are poorly resourced. It is these experiments, together with the information obtained from monitoring the actual fire regime, that provide the information required to better inform management decisions and formulate fire stewardship objectives when reviewing fire stewardship programs.

Conclusion

Examples from the Drakensberg indicate that wilderness fire stewardship in South Africa requires human intervention to develop clear objectives and targets for application within the current ecological, social, and policy environments. The collation of existing information and knowledge ensures that a fire regime is implemented that is appropriate in terms of the management constraints, legal constraints, and risk-management factors.

Fire stewardship is a dynamic process requiring regular review in the face of a dynamic environment. It is, however, essential that knowledge transfer take place from the conservation agencies to the neighboring communities. These communities depend on various natural resources for their basic needs. These resources are negatively affected by the burning practices employed by the communities, who do not understand the impacts of their practices on social, ecological, cultural, and wilderness resources. South Africa could also add value to, and benefit from, a knowledge transfer process through the exchange of wilderness fire stewardship models on an international scale. **IJW**

REFERENCES

- Bainbridge, W. R. 1999. A theoretical approach to fire management in wilderness areas. In *Wilderness Concepts and Practice Course Basic Level Reference Manual*, ed. Wilderness Action Group. The Centre for Environment and Development, University of Natal.
- Everson, C. S. 1985. Ecological effects of fire in the montane grasslands of Natal. Unpublished M.Sc. Thesis, University of Natal, Pietermaritzburg.
- Hall, M. 1984. Man's historical and traditional use of fire in South Africa. In *Ecological Effects of Fire in South African Ecosystems*, ed. P. de V. Booysen and N. M. Tainton, 2-17. New York: Springer-Verlag.
- Tainton, N. M., ed.. 1981. *Veld and Pasture Management in South Africa*. Pietermaritzburg: Shuter and Shooter.
- Tainton, N. M., and M. T. Mentis. 1984. Fire in grassland. In *Ecological Effects of Fire in South African Ecosystems*, ed. P. de V. Booysen and N. M. Tainton, 115-147. New York: Springer-Verlag.
- Uys, R., R. Lechmere-Oertel, S. Krüger, M. Hamer, and C. Everson. In prep. A review of scientific best practice for fire in the Maloti-Drakensberg mountains. uKhahlamba Drakensberg Park World Heritage Site, South Africa.

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Announcements and Wilderness Calendar

COMPILED BY STEVE HOLLENHORST and CHAD DAWSON

Kenton Miller Awarded the Bruno H. Schubert Environment Prize

Former World Conservation Union director general Dr. Kenton Miller has been awarded the Bruno H. Schubert Environment Prize, considered to be one of the most prestigious awards of its kind in the world. Dr. Miller, an American national, was awarded the prize for his lifetime achievements in conservation, particularly his pioneering work in protected area development and management. Dr. Miller has had a long and distinguished career. He was director general of the World Conservation Union (IUCN) from 1983 to 1988, served as chair of IUCN's World Commission on Protected Areas from 1976 to 1982 and again from 2000 to 2004, and served on the IUCN Council during the same period. He has received numerous international awards for his role in shaping the international protected areas agenda. His career has taken him to activities throughout Latin America, Africa, Asia, and briefly to Antarctica. He has been a university professor, field researcher, and author and recently retired as vice president for conservation at the World Resource "linkss Institute. Source: IUCN (<http://www.iucn.org/>).

Links between Protected Areas and Tourism

Many tourism companies include visits to protected areas as part of their tourism excursions. These visits could also benefit conservation and site protection, but this requires forging links between protected area managers and the tourism industry. "Links Between Protected Areas and Tourism" is based on interviews with tourism companies, provides practical guidance on better ways of understanding the tourism industry and on effective methods of developing links with tourism. It details what can be realistically expected from the tourism industry in terms of support for conservation.

Developed as a contribution to the Linking Conservation of Biodiversity and Sustainable Tourism at World Heritage Sites project, funded by the United Nations Foundation and implemented in partnership with the United Nations Educational, Scientific and Cultural Organization and United Nations Environment Programme, the manual builds on primary research on actual interactions and linkages between tourism companies and protected areas. In-depth interviews were conducted with 23 tourism companies, including international tour operators, ground operators, and hotel groups.

Online at <http://www.uneptie.org/pctourism/library/forging-links.htm>.

H. Ken Cordell Named to IJW Editorial Board

Dr. H. Ken Cordell is a research social scientist and project leader for the Recreation, Wilderness, Urban Forest, and Demographic Trends Research Group with the U.S. Forest Service (USFS). Dr. Cordell has accepted an appointment to the *IJW* editorial board. He earned his Ph.D. from North Carolina State University in 1975 and worked there for several years before joining the USFS. Dr. Cordell moved to Athens, Georgia, in 1997 to lead the USFS research project there. The research unit has been variously named over the last three decades with such titles as Urban Environmental Research and Recreation and Wilderness Assessment until its current project name. Dr. Cordell is a prolific author and recently released a book entitled *The Multiple Values of Wilderness*, for which he was principal coauthor with John Bergstrom and J. M. Bowker (look for a book review in the August 2006 issue of *IJW*). Dr. Cordell can be reached at the U.S. Forest Service, Recreation, Wilderness, Urban Forest, and Demographic Trends Research Group, 320 Green Street, Athens, GA 30602-2044, USA; or by email at kcordell@fs.fed.us.



Submit announcements and short news articles to GREG KROLL, *IJW* Wilderness Digest editor. E-mail: wildernessamigo@yahoo.com

Troy Hall Named to *IJW* Editorial Board

Dr. Troy Hall, associate professor of Protected Area Visitor Studies in the Department of Conservation Social Sciences at the University of Idaho (UI), has accepted an appointment to the *IJW* editorial board. Dr. Hall earned her Ph.D. at Oregon State University in 1996 and held faculty positions at Oregon State University and Virginia Tech before joining the



faculty at UI. Her research interest is in recreation planning and management to

develop creative ways to bring stakeholders together to solve challenges created by increasing demand and sociocultural changes in the United States. Recent research includes studies of displacement in wilderness and developed sites; investigates about boaters and their experiences on the Colorado River in the Grand Canyon; wilderness camper perceptions and evaluations of campsite conditions; and visitor knowledge at Yosemite National Park. Dr. Hall has been a contributing author and associate editor for *IJW* and the *Journal of Leisure Research*. We look forward to her involvement with *IJW* in the coming years as board member. Dr. Hall can be reached at the University of Idaho, Department of Conservation Social Sciences, College of Natural Resources, P.O. Box 441139, Moscow, ID 83844-1139, USA; or by email at troyh@uidaho.edu.

Steven Hollenhorst Leaves *IJW* Board

Dr. Steven J. Hollenhorst has been the Digest editor and a contributor to *IJW* for many years. He is leaving the *IJW* board to devote more



time to his work as a professor of Protected Area Policy and head of the Department of Conservation Social Sciences at the University of Idaho (UI). Dr. Hollenhorst was recently appointed as the co-editor-in-chief for the *Journal of Society and Natural Resources*, published by the International Association for Society and Natural Resources. He has been involved in *IJW* since 1996 as an associate editor and then editorial board member. We look forward to Dr. Hollenhorst's continued involvement in protected area policy at UI and management issues and wish him well in his new role with the *Journal of Society and Natural Resources*. He can be reached at the University of Idaho, Department of Conservation Social Sciences, College of Natural Resources, P.O. Box 441139, Moscow, ID 83844-1139, USA; or by email at: stevenh@uidaho.edu.

Wayne Freimund Leaves *IJW* Board

Dr. Wayne A. Freimund, a longtime *IJW* board member and contributor to web-based wilderness information and education issues, is leaving the *IJW* board to devote more time to his work as professor of Wildland Recreation and chairman of the Department of Society and Conservation at the University of Montana (UM). As author, educator, and scientist, Dr. Freimund has been director of the UM Wilderness Institute and is a co-operator in the Protected Area Management Program at the University of KwaZulu Natal in South Africa, a coleader of the UM International Seminar on Protected Area Management, and an executive committee member on the Consortium on Protected Area Management. We look forward to Dr. Freimund's involvement in wilderness



and protected area management issues in the United States and in other international initiatives. He can be reached at the University of Montana, Department of Society and Conservation, College of Forestry and Conservation, Missoula, MT 59812, USA; or by email at wayne.freimund@umontana.edu

Two New U.S. Wilderness Areas Designated in 2005

The U.S. lawmakers and president signed into law two new wilderness areas in 2005. The approximately 10,000-acre (4,048-ha) El Toro Wilderness was designated (P.L. 109-118) in Puerto Rico's Caribbean National Forest and protects numerous species of unique native orchids and the Puerto Rican parrot—considered to be one of the most endangered species in the world. The 11,183-acre (4,527-ha) Ojito Wilderness was designated (P.L. 109-94) in the Albuquerque District of the Bureau of Land Management in New Mexico and includes certain lands being held in trust for the Pueblo of Zia, a Native American community. These two designations were made through bipartisan legislative efforts to add significant new areas to the National Wilderness Preservation System.

National Landscape Conservation System Assessment

An effort by The Wilderness Society to assess the condition and stewardship of the Bureau of Land Management's 26-million-acre (10.5-million-ha) National Landscape Conservation System (NLCS) spotlighted the difficulty of stretching limited staff and funding to adequately protect a diverse American treasure. To evaluate the system at the five-year mark, The Wilderness Society examined issues ranging from accountability and resource monitoring to cultural site

protection and visitor management. They reviewed the stewardship and condition of 15 National Monuments, National Conservation Areas, and other special places or “units” in the system, and determined grades on the basis of more than 35 indicators. Grades of C and D dominate the report (see full report at <http://www.wilderness.org/Library/Documents/upload/StateOfTheNLCS-FinalReport.pdf>), although some units of the NLCS scored very well in specific areas, such as leadership and empowerment or visitor management. Overall, they found:

- Committed and passionate NLCS managers who are hobbled by a lack of empowerment and inadequate or unstable budgets to carry out their broad responsibilities.
- Road networks that fragment wildlife habitat and bring motorized vehicles near cultural resources.
- Incomplete information gathering. Inadequate monitoring of species, water quality, and unique cultural resources, in turn, hinders assessment of ecosystem and cultural site condition in the NLCS.
- Satisfactory efforts to educate visitors who call for information, but a glaring lack of field staff to address illegal off-road vehicle use, vandalism, and other problems that accompany increasing public access and recreational use.
- An absence of public reporting on NLCS management, condition, successes, and needs.

Despite underlining the need for improvement in many areas, the assessment also offered some encouraging words. Nearly all units in Arizona, California, Idaho, Montana, New Mexico, Nevada, Oregon, and Utah offer some “best practice” examples of stewardship that we highlight.

With agency leadership to replicate best practices across the NLCS, and to focus additional staff and funding on the system’s needs, The Wilderness Society notes that perhaps at the 10-year mark the BLM can be proud of its role in protecting America’s great western landscapes, wilderness, and ecosystems. Source: <http://www.wilderness.org/library/documents/stateofthenlcs2005.cfm>.

Ecosystem Services from Canada’s Boreal Forest

Research by the Pembina Institute for the Canadian Boreal Initiative puts the value of ecosystem services such as water filtration and carbon storage at roughly 2.5 times greater than the net market value of forestry, hydro, mining, and oil and gas extraction in Canada’s boreal region. The report argues that the degradation of natural ecosystems worldwide is at least in part because natural capital values aren’t taken into account in land use decisions around the globe, noting these values aren’t part of the universal international wealth indicator—gross domestic product.

“We are only just beginning to understand the true value of these services, including flood control, water filtration, climate regulation, and even pest control,” said CBI director Cathy Wilkinson. “We have the opportunity to get it right in Canada’s boreal, sustaining its natural capital and ecosystem services, while building other forms of wealth and maintaining community and cultural values.” The report estimates the value of the 67 billion tons of carbon stored in the trees and peatlands of Canada’s boreal region at \$3.7 trillion, and the annual value of carbon sequestration by the region at \$1.85 billion. “It is indeed time to broaden our understanding of the true ‘value’ of globally important

forests such as the boreal,” said Dr. David Schindler, professor of Ecology at the University of Alberta. “Failure to do so not only ensures continued ecosystem degradation, but the accelerating impoverishment of human societies, ours included.”

“An understanding of the Boreal region’s true value is essential to addressing important questions about how this natural heritage asset can continue to contribute to national and international well-being for generations to come,” said Mark Anielski, ecological economist and report coauthor. “For Aboriginal people, it has always been paramount that we take care of the land that takes care of us—the land, the air and the resources on it. It has not always been easy to have people understand the true total value of what it is that the land provides to us,” said Stephen Kakfwi, former premier of the Northwest Territories.

“Perhaps now with this report, it will be easier for us to begin to understand and have discussions about why we have to be responsible and not think only in terms of resource extraction and development but in terms of what damage and cost we inflict on ourselves and on the land’s resources in our quest for progress and development.”

Source and a copy of the study are available at www.borealcanada.ca.

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Book Reviews

Collapse: How Societies Choose to Fail or Succeed

by Jared Diamond. 2005. Penguin Group, New York, NY. 578 pp., \$29.95 (hardcover).

At the heart of debates over wilderness preservation are a number of extremely challenging questions. For example: What impact will increased ecological degradation have on contemporary societies? How can we control our propensity to destroy the Earth? What role do corporations and the public have in changing current environmental practices? And, will our destruction of the wilderness eventually lead to our own demise?

Pulitzer prize-winning author Jared Diamond asks these and related questions in his new book, *Collapse: How Societies Decide to Fail or Succeed*. Diamond reviews the historical, anthropological, and archaeological evidence from several failed and successful societies, including the Easter Islanders, Anasazi, and Mayans, in an attempt to answer the weighty question of why some societies fail and why some succeed over time. He identifies five sets of factors that explain past societies' failures: environmental damage, climate change, hostile neighbors, lack of friendly trade partners, and society's response (or lack thereof) to its environmental problems.

Diamond's analysis can be disconcerting. For example, although he encouragingly believes that we will resolve our environmental problems within the lifetimes of our children, he also notes,

The only question is whether they will become resolved in pleasant ways of our own choice, or in unpleasant ways not of our own choice, such as warfare, genocide, starvation, disease epidemics, and collapses of societies. While all of those grim phenomena have been endemic to humanity throughout our history, their frequency increases with environmental degradation, population pressure, and the resulting poverty and political instability. (p. 498)

Although there is much sadness in Diamond's analysis, there is hope as well, for as the subtitle suggests, the author believes that societies can create the societal change necessary to solve environmental issues. He points the finger squarely at the public rather than at corporations directly responsible for environmental destruction, noting that political and economic change will come only when the public demands it.

Diamond suggests there are two critical choices we need to make if our Western society is to continue to exist. First, we need "the courage to practice long-term thinking, and to make bold, courageous, anticipatory decisions at a time when problems have become perceptible but before they have reached crisis proportions" (p. 522). Second, we need to make equally difficult choices about our societies' values. Some of our dearly held values can be maintained, but some may need to be jettisoned if we are to survive.

This is a major scholarly work, extremely thought-provoking, at times depressing, at times hopeful. Evocatively written for a wide audience, some of the biggest, most difficult questions faced by contemporary society are addressed in this mix of historical and contemporary analysis. Diamond forces us to consider how the continued degradation of our natural environment might lead to our own destruction, and challenges us to make the difficult but necessary societal changes needed to maintain Western societies.

Reviewed by JOHN SHULTIS who is the book editor for *IJW*

Rewilding North America: A Vision for Conservation in the 21st Century

by Dave Foreman. 2004. Island Press, Washington, DC. 297 pp., \$25.00 (paper).

The Earth needs another human on it like I need a hole in the head. This is the general feeling the sympathetic reader is left with after completing Dave Foreman's new book *Rewilding North America*. The book has three distinct yet interconnected sections. Section one consists of a history of how humans have wounded the Earth. Extensive lists of damaged ecological systems along with the mechanisms through which humans are responsible for causing the wounds are provided. The first section has two objectives. The first is to drive the point

home that “mass extinction is our [humans’] legacy as a species so far. No other moral challenge is so great as controlling our destructive power over nature” (p. 60). The second is that “if you do not know how the present came to be, you stand in a nihilistic void and your words and actions lack coherence” (p. 6).

The second section presents a rationalization for rewilding as a land management practice. Forman uses conservation biology to explain how the wounds discussed in the first section can be healed through rewilding. *Rewilding* is defined as the scientific argument for restoring big wilderness based on the regulatory roles of large

predators. The three key points of rewilding as a conservation strategy are (1) healthy ecosystems need large carnivores, (2) large carnivores need big, wild roadless areas, and (3) most roadless areas are small and thus need to be linked. A strategy and map are provided that describe the four Continental MegaLinkages needed to provide secure core habitat for key predators.

The third section of the text, aptly titled “Taking Action,” describes “the real work of selecting, designating, restoring, and protecting a North American Wildlands Network” (p. 177). A list of specific actions is provided, along with a rationale of why each is necessary to effectively implement a rewilding strategy.

This book is written as an instruction manual for the rewilding advocate or those involved in land conservation. The first and second sections are an excellent introduction for the aspiring conservationist who is unaware of the major issues and history of conservation. The third section provides a blueprint for action and a framework for directing rewilding efforts at both large and small scales. The book does suffer from an overabundance and repetition of lists. The prolific lists may have two consequences: the reader may lose focus or gloss over what he/she is less interested in and key in on others. The format and objectives of the text are clear and the progression of logic is easy to follow. Rewilding North America should be required reading to get nongovernmental organization new-hires up to speed and may work as a supplementary text in a general ecology or conservation class.

Reviewed by RUDY M. SCHUSTER, assistant professor, Recreation Resource Management, SUNY College of Environmental Science and Forestry, Syracuse, New York. Email: rschuster@esf.edu.

The Action Not Taken

Denis Davis

National Park Service

August 2005

(With inspiration from Robert Frost’s “The Road Not Taken”)

The choices diverged in a pristine wood,
And sorry I could not select both
And being one wilderness manager, long I stood
And pondered one as far as I could
Imagining chainsaws and helicopters in the undergrowth.

Then took the other, being just as fair,
And having perhaps the quieter claim,
Because it didn’t need motors to tear;
Though as for the project ending there
Had results that were really about the same.

And both that morning equally lay
In documented pages white and black.
Oh, I chose the first for another day!
Decision leads on to decision along the way,
I doubted I should ever need to hear the motors whack.

I shall be telling this from on peak high
Somewhere along trails and trails hence:
Two choices diverged in a pristine wood, and I—
I made the decision with no motors or need to fly,
And that has made the wilderness character difference.