Research Contribution 36

Social Science in Fuel Management: An Annotated Bibliography on Prescribed Fire

by

Yoshitaka Kumagai

Steven E. Daniels

January 2002

OREGON STATE UNIVERSITY
COLLEGE OF FORESTRY

Forest Research Laboratory

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Abstract

Kumagai, Yoshitaka, and Steven E. Daniels. 2001. Social science in fuel management: An annotated bibliography on prescribed fire. Research Contribution 36, Forest Research Laboratory, Oregon State University, Corvallis.

This annotated bibliography is collected from professional journals in natural resource management and sociology, conference proceedings, and technical reports. It is categorized into thirteen sections: acceptability, fire in wilderness, general, history, institutions, media, policy, public attitude toward wildfire, public involvement, public perception of prescribed burning, risk perception, social psychology, and wildland-urban interface.

Contents

Preface

This annotated bibliography was prepared for managers to help them understand the significance of sociological aspects of fuel management. The practice of fire management has changed greatly over the past 30 years, as the fire exclusion or "put all fires out immediately" philosophy evolved into a more complex approach to managing fire as part of the natural disturbance ecology. In the future, governmental agencies' ability to undertake innovative projects will largely depend on their ability to avoid a number of social and political landmines.

As is often observed, managers are likely to assume that fire (both natural and ignited) is an ecologically sound and cost-effective tool, and therefore, it should be used for forest management. However, the use of prescribed burning inevitably confronts political and/or emotional hurdles. Managers may "understand" prescribed burning within a highly technical and/or intellectual domain. Affected residents, however, may "feel" prescribed burning in a different realm; they may think prescribed burning is dangerous and potentially uncontrollable. In addition, prescribed burning may degrade—at least from an aesthetic point of view—the scenic quality of forested land. Prescribed burning may also degrade air quality, raising health concerns among residents. It is important to understand that managers and the public have different perceptions about the risks and benefits of fire.

This annotated bibliography is mainly collected from professional journals in natural resource management and sociology, conference proceedings, and technical reports. In order to make the project manageable, some boundaries on the search were necessary. Much of the literature deals with temperate rather than tropical or boreal forests. It also focuses on fire and modern industrialized societies; it does not address the use of fire by indigenous/aboriginal peoples (including Native American). The list also does not address the legal aspects of prescribed burning. The list is categorized into thirteen sections: acceptability, fire in wilderness, general, history, institutions, media, policy, public attitude toward wildfire, public in-

volvement, public perception of prescribed burning, risk perception, social psychology, and wildland-urban interface.

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Acceptability

Brunson, MW. 1993. "Socially acceptable" forestry: What does it imply for ecosystem management. *Western Journal of Applied Forestry* 8(4): 116–119.

The author points out that ecosystem management necessitates an understanding of socially acceptable management. However, the author argues that what is socially acceptable has not been identified. Seven propositions on socially acceptable ecosystem management are presented: (1) acceptability may apply not only to a condition, but also to a function of causes; (2) conditions arising as a result of natural causes are virtually always acceptable; (3) acceptability of a condition can only be questioned if there are feasible alternatives to that condition; (4) in the presence of feasible alternatives, acceptability is a function of the perceived desirability, equitability, and feasibility of those alternatives; (5) acceptability is a function of the perceived risk associated with a condition or practice; (6) acceptability is judged within a geographic context; and (7) acceptability is judged within the social context. The author finally contends that two basic conclusions can be drawn from the seven propositions: (1) people try to discern meaning within their environment, and (2) ecosystem management will be judged relative to its perceived alternatives.

Brunson, MW. 1996. The social context of ecosystem management: unanswered questions and unresolved issues, pp. 113–126 in *Defining Social Acceptability in Ecosystem Management: A Workshop Proceedings, Kelso, WA, June 1992,* MW Brunson, LE Kruger, CB Tyler, and SA Schroeder, ed. General Technical Report PNW-369, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

The author raises questions associated with the social context of ecosystem management in the following areas: (1) ecosystem management as an idea, (2) implementability of ecosystem management, and (3) specific aspects of ecosystem management practices and conditions. The author discusses these questions, along with those raised by national forest stakeholders. According to the author, a key element of that discussion, and a theme that reverberates through this problem analysis, is the issue of scientific uncertainty and risks, which was the overriding public and professional concern identified during this research.

Brunson, MW, LE Kruger, CB Tyler, and SA Schroeder. 1996. Disciplinary roots of social acceptability: a bibliography, pp. 127–142 in *Defining Social Acceptability in Ecosystem Management: A Workshop Proceedings, Kelso, WA, June 1992.* General Technical Report PNW-369, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Brunson, MW, GA Rasmussen, K Richardson, and NE West. 1996. Acceptability of range practices and policies among general and ranching publics, pp. 72–73 in *Proceedings of the Fifth International Rangeland Congress*, Salt Lake City, Utah, NE West, ed. Department of Rangeland Resources, Utah State University, Logan.

The authors suggest that management and policy for public rangelands in North America must be socially acceptable, as well as ecologically sustainable. The authors present results of public surveys in Utah. The results demonstrate that range practices are more acceptable to the general public if they are based on grazing and fire, rather than on mechanical or chemical methods. The results also reveal that attitudes toward range practices are more positive among rural and ranching publics. Attitudes towards ecosystem management itself are generally positive, but are less so among large landowners.

Brunson, MW, B Shindler, and B Steel. 1997. Consensus and dissension among rural and urban publics concerning forest management in the Pacific Northwest, in *Public Lands Management in the West: Citizens, Interest Groups, and Values.* B Steel, ed. Greenwood Publishing, Westport, CT.

Hansis, R. 1996. Social acceptability in anthropology and geography, in *Defining Social Acceptability in Ecosystem Management: A Workshop Proceedings*, *Kelso, WA, June 23–25, 1992*, MW Brunson, LE Kruger, CB Tyler, and SA Schroeder, ed. General Technical Report PNW-369, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

The author points out that little explicit discussion of social acceptability has taken place in anthropology and geography. The author synthesizes literature from these two disciplines to examine values and their relationship to acceptability. The synthesis provides both frameworks and examples of how anthropologists can contribute to an understanding of social acceptability. The author argues that context often plays an important role in determining social acceptability.

Stankey, GH. 1996. Defining the social acceptability of forest management practice and conditions: integrating science and social choice, in *Defining Social Acceptability in Ecosystem Management: A Workshop Proceedings, Kelso, WA, June 23–25, 1992*, MW Brunson, LE Kruger, CB Tyler, and SA Schroeder, ed. General Technical Report PNW-369, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

The author quotes a remark made at the 1993 Forests Conference in Portland, Oregon, by Ted Strong, representing Native American interests: "We must understand that status quo management is completely unacceptable." The author notes that the remark highlights the necessity of a search for acceptable alternatives. The author raises several questions: 1) "What is there about the current situation that makes it unacceptable?" 2) "Unacceptable to whom?" 3) "What would characterize an acceptable alternative?" 4) "Is an acceptable alternative one that is supported by a majority?" and 5) "If so, what is the relationship between such an alternative and long-term ecological sustainability?" The author suggests that social choice must reflect technical/scientific dimensions, as well as the values and beliefs of the wider community.

Fire in Wilderness

Hurd, EJ, Jr. 1995. Fire in wilderness and parks: political issues, in *Proceedings, Symposium on Fire in Wilderness and Park Management, Missoula Montana, March 30–April 1, 1993.* JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author points out that agencies and special interest groups raise questions regarding the natural role of fire in wilderness and park areas. The author argues that politically generated realities may impede opportunities to manage fire in ecosystems as a natural event. The author stresses that political planning is key to fire management in parks and wilderness. Such planning should, according to the author, include factual recognition of political sensitivity, strategies for dealing with it, and honest and realistic expectations for ecosystem management.

Jolly, DF. 1995. Challenge address: fire in wilderness and park management, in *Proceedings, Symposium on Fire in Wilderness and Park Management, Missoula, Montana, March 30–April 1, 1993,* JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author points out that the challenge for resource managers is to understand and appreciate the wilderness resource. The author stresses that we should appreciate a philosophy that allows natural fire to play its natural role within social and political realties. The author points out that agencies must be accountable to the public for current fire management, and agencies must have enough funds budgeted in order to manage wilderness fires.

Kilgore, BM. 1985. What is "natural" in wilderness fire management? in *Proceedings, Symposium and Workshop on Wilderness Fire, Missoula, MT, November 15–18, 1983*, JM Lotan, BM Kilgore, WC Fischer, and RW Mutch, ed. General Technical Report INT-182, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The author defines "natural" fire for any ecosystem as one that (1) burns within the range (and frequency distributions) of fire intensities, frequencies, seasons, and sizes found in that ecosystem before the arrival of Europeans and (2) yields the range of fire effects found in that ecosystem before the arrival of Europeans. The author argues that park and wilderness land managers should decide whether they want to focus primarily on natural fire processes or natural fire effects. The author finally emphasizes that managers and scientists must work together to assure the maximum possible role for natural fires in wilderness—based on specific fire history data for particular ecosystems and geographic areas (including information on the role of aboriginal burning and knowledge of past fire intensities)—while still giving reasonable consideration to safety of human life and property.

Mackay, S. 1987. Prescribed fire and wilderness recreation: guidelines for coordinated management. *Western Wildlands* 13(1): 24–27.

The author argues that prescribed fire management for wilderness should consider recreation enhancement as an aim and should thus plan ignitions that both simulate natural patterns and help educate the public. With this combination, wildlands can retain their wild qualities, while providing satisfactory recreational experiences.

McCool, SF, and GH Stankey. 1985. *Visitor Attitudes Toward Wilderness Fire Management Policy: 1971–84.* Research Report INT-357, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The authors conducted a survey of visitors to the Selway-Bitterroot Wilderness, Montana, to investigate knowledge of fire effects and attitudes toward fire management in a wilderness setting. Visitors were more knowledgeable about fire effects and were more supportive of fire management, rather than fire suppression, than were respondents to a similar study in 1971. The results also demonstrate that about 50% of the visitors felt that manager-ignited fires would be beneficial to wilderness, about 16% felt these fires would be detrimental, and about 33% were unsure.

McDowell, H. 1985. Fire management policies and programs: an industry view, pp. 53–54 in *Proceedings, Symposium and Workshop on Wilderness Fire*, *Missoula, MT, November 15–18, 1983,* JM Lotam, BM Kilgore, WC Fischer, and RW Mutch, ed. General Technical Report INT-182, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The author points out that the recreation industry may be most influenced by wilderness fire activities. This industry includes guides, packers, and outfitters. Current wilderness fire management programs and policies do not seriously affect forest industries, miners, and grazers. However, according to the author, many of these industries are also involved as wilderness users and will maintain their interest in their management on a personal basis.

Reeves, S, FT Cole, and J Savery. 1997. Fire management challenges and opportunities for land managers: using Okefenokee and Pocosin Lakes National Wildlife Refuge as examples, in *Conference Proceedings, Environmental Regulation and Prescribed Fire: Legal and Social Challenges, Tampa Airport Hilton, Tampa, FL, March 14–17, 1995,* DC Bryan, ed. Center for Professional Development, Florida State University, Tallahassee.

The authors point out that managers of wilderness or conservation areas often face dilemmas concerning fire. Fire performs a natural role in rejuvenating ecosystems; however, implementing a professionally developed prescribed fire program often means confronting various regulations, stewardship responsibilities, and social liabilities. The authors contend that the above barriers all become more complex as the wildland-urban interface increases and as the number of habitat classifications increases. The authors

emphasize that fire management policy must be developed according to both the above regulations and conservation of fire-dependent habitats.

Stankey, GH. 1976. *Wilderness Fire Policy: An Investigation of Visitor Knowledge and Beliefs,* Research Paper INT-180, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The author conducted a research survey of visitors to the Selway-Bitterroot Wilderness in Idaho and Montana to investigate knowledge and beliefs about wilderness fire policies. The survey indicates that while the majority favored fire suppression, a substantial minority (34%) supported the more natural role of fire. The results also demonstrate that most respondents had a fairly low degree of understanding regarding the role of fire in forests, but as their level of knowledge increased, so did the likelihood that they would support the more natural role of fire. Several management actions are recommended that would enhance public support for a modification of wilderness fire suppression policies.

Stankey, GH, and SF McCool. 1995. Evolving conceptions of wilderness: implications for management of fire, in *Proceedings, Symposium on Fire in Wilderness and Park Management, Missoula, Montana, March 30–April 1, 1993*, JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320. USDA Forest Service, Intermountain Research Station, Ogden, UT.

The authors point out that we view wilderness as a sometimes ugly and dangerous place where natural processes dominate the landscape. Such an attitude toward wilderness influences methods of fire management because the appropriateness of fire management is determined by social definitions of the resource and how to protect it. The authors suggest that an interactive approach to decision making should be used, wherein fire managers work with the public to determine appropriate and effective management programs.

Stine, SE. 1987. User attitudes toward fire policy in wilderness areas. *Fire Management Notes* (2): 16–17.

The author conducted a survey to investigate wilderness visitors' perception about prescribed fire. The results demonstrate that wilderness users support prescribed fire if fires are ignited by natural causes rather than through an agency's intervention. The results also show that wilderness users support putting out fires that were caused by humans. The wilderness users also support prescribed burning in seldom-used areas. Based upon the survey, it appears that user perceptions may conflict with current fire management policies and purposes. The author suggests that further educational programs about prescribed burning are needed.

Taylor, JG, and RW Mutch. 1986. Fire in wilderness: public knowledge, acceptance, and perceptions, in *Proceedings, National Wilderness Research Conference Current Research, Fort Collins, CO, July 23–26, 1985.* General Technical Report INT-212, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The authors point out that the public is more knowledgeable and more willing to accept new wilderness fire management now than 10 years ago. Perceptual reactions to scenic quality and recreational acceptability, however, do not necessarily correlate with changes in knowledge and attitude. The authors suggest that research in this area can improve public understanding of wilderness fire policies and managers' understanding of the general public's response to wilderness fire.

Van Wagener, CE. 1985. Does nature really care who starts the fire? in *Proceedings, Symposium and Workshop on Wilderness Fire, Missoula, MT, November 15–18, 1983,* JM Lotan, BM Kilgore, WC Fischer, RW Mutch, ed. General Technical Report INT-182, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The author raises the question, "Does nature really care who starts the fire?" The shortest answer to this question is that a fire's effect is independent from its mode of origin. The author argues, then, that rather than recreating the original fire regime per se, it might be more feasible to aim for recreating the vegetation a natural fire regime would create. Finally, the author points out that arranging the necessary fires is a practical rather than a philosophical problem.

General

Pyne, SJ, PL Andrews, and RD Laven. 1996. *Introduction to Wildland Fire*. Second Edition, Wiley and Sons, New York.

The authors describe various functions of fire, the cultural and institutional framework of fire management, planning procedures of fire management, fire suppression strategies, prescribed fires, and the application of prescribed fire to natural resource management.

History

Pyne, SJ. 1995. *Fire on the Rim: A Firefighter's Season at the Grand Canyon*. University of Washington Press, Seattle.

The author illustrates a world of firefighters, the complex geography of the North Rim of the Grand Canyon, and the techniques and changing philosophy of fire management.

Pyne, SJ. 1995. *World Fire: The Culture of Fire on Earth*. Holt, New York.

The author illustrates how fire and humans have coevolved throughout history. The author points out that the prevalence of humans is largely attributable to their control over fire, and that the distribution and characteristics of fire have become deeply dependent on humans. The author argues that humans and fire are inseparable, and that they have repeatedly played a critical role in shaping the landscape. The author also contends that there is less fire on earth today than in the time of Columbus, contrary to popular belief. The author argues that eliminating fire will not save the planet from destruction, but will only eradicate the regenerative powers it once implemented.

Pyne, SJ. 1997. *America's Fires: Management on Wildlands and Forests*. Issues Series, Forest History Society, Durham, NC.

The author describes the history of fire management in the United States. The author also illustrates how fire agencies transform their fire policies from control to management.

Pyne, SJ. 1997. *Fire in America: A Cultural History of Wildland and Rural Fire*. University of Washington Press, Seattle.

The author describes the fire-associated history of America, from fire exclusion policies to present-day fire management. The author also explores the efforts of successive American cultures to master wildfire and use it to manage the natural resources of America.

Pyne, SJ. 1997. *Vestal Fire: An Environmental History, Told Through Fire, of Europe and Europe's Encounter with the World*. Weyerhaeuser Cycle of Fire Series, University of Washington Press, Seattle.

The author examines how humans struggle to control the natural force of fire. The author also describes a history of fire usage and its various roles on the European continent.

Institutions

Cook, S. 1995. *Wildfire at the Wildland/Urban Interface: A Survey of Meso-Level Decision-makers and Their Support of Wildfire Hazard Mitigation Measures*. MS thesis, Geography Department, University of Florida, Gainesville.

The natural hazard of wildfire at the wildland/urban interface is investigated. The author points out that lack of action on this hazard is derived from poor coordination and understanding among government officials at three levels—federal, state and county—who administer the areas involved. Federal and state officials tend to be similar in background, hold similar beliefs, and exhibit similar behavior. County officials are more uniform than either of their peer groups in the same categories; however, the individu-

als working at the county level are very different from individuals at the other two levels of government. To investigate why counties with similar wildfire histories differ in their responses to the problem, the Kingdon "Garbage Can" model of decision making was applied to responses from individuals lin the involved counties. The author found that officials in counties that have not developed wildfire hazard mitigation plans are less likely to recognize a problem, less likely to recognize solutions, and less likely to have people available to work on the issue than are officials from counties that have developed wildfire hazard mitigation plans.

Lee, RG. 1977. Institutional change and fire management, in *Proceedings of the Symposium on the Environmental Consequences of Fire and Fuel Management in Mediterranean Ecosystems, Palo Alto, CA, August 1–5, 1977,* HA Mooney and CE Conrad, ed. General Technical Services Report, WO; 3, USDA Forest Service, Washington, DC.

The author examines the development of wildfire control by social organization. The author describes three types of institutions: local volunteers, fire control bureaucracies, and possible new organizations that integrate fire, fuel, and land management.

Lee, RG. 1979. *Organizational Adaptation and Wildfire Control*, Association Paper 027 *Rural Sociological Society (RSS)*,

The author examines organized efforts to control wildfire in the United States by using methods for studying social history. Records and documents reveal that fire-control practices developed and changed in response to institutionalized actions in the larger society. The author points out that informal community organizations had institutionalized control over fire by using it as a tool for clearing land and protecting valued resources and improvements before government assumed jurisdiction over wildfires. The nationalization of forest-management policy that accompanied the Progressive Era led to the formation of formal social organizations that institutionalized the exclusion of fire from the forest environment. This commitment to fire exclusion persisted despite scientific evidence and experience showing that fire was beneficial as well as destructive to valued resources. Organizations periodically re-legitimized their commitment to fire exclusion by reenacting traditional heroic myths of control over fire, which was symbolized as a demonic power. Rationalization of the institutional environment associated with the emergence of an advanced-industrial society caused fire control organizations to reconstitute legitimacy through adopting new practices and enacting myths of rationality that empower professional agents to pursue multipurpose fire management. Results from this analysis support the theory that organizations adapt to changing environmental conditions by ceremonially enacting practices institutionalized in their social environment.

Schuster EG, DA Cleaves, and EF Bell. 1997. *Analysis of USDA Forest Service Fire-Related Expenditures 1970-1995.* Research Paper PSW-230, USDA Forest Service, Pacific Southwest Research Station, Berkeley, CA.

The authors analyze the expenditures for fire pre-suppression and suppression activities of the Forest Service. The analysis shows that expenditures increased from $61 million in fiscal year (FY) 1970 to $951 million in FY 1994. Yet, real (net after inflation) expenditures have not increased significantly since FY 1970, if FY 1994 expenditures are excluded. The analysis also demonstrates that during any given year, 56% of suppression expenditures are spent on supplies and services, including aircraft and food, and 32% on salaries and wages. Weather, access, and firefighter availability and skills were key contributors to suppression costs. Real expenditures for fuel treatments have declined over the past 25 years, but are currently rising because of renewed interest in prescribed burning. The future challenge for fire managers is reducing fire-related expenditures in light of how fire is dealt with in ecosystem management.

MEDIA

Apsey, MT. 1988. Fire management in the media age, in *Fire Management in a Climate of Change: Proceedings from 1988 Northwest Fire Council Annual Meeting, Dunsmuir Lodge, Victoria, BC, November 14–15, 1988,* BD Lawson, BC Hawkes, and GN Dalrymple, ed. Northwest Fire Council, Victoria, BC.

The author points out that fire management today not only requires technological improvement, but also entails communication with the media. That is because wildfire is often televised as a dramatic event, attracting the public's criticism. The public's perception of the way firefighters deal with wildfire may be modified by the way in which the media televise it. Therefore, establishing regular contact with the media may help to eliminate unnecessary misconceptions and misunderstandings of fire management. The author insists that it is no longer enough to simply do the job well. In many cases, public confidence in the fire management profession depends on public understanding of what the job is all about.

Smith, C. 1995. Fire issues and communication by the media, in *Proceedings, Symposium on Fire in Wilderness and Park Management*, *Missoula, Montana, March 30–April 1, 1993,* JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author examines 320 stories about wildfire published since 1988. The author points out that journalists did not learn from the mistakes they made in reporting the Yellowstone fires. The conventions of journalism, which value drama over explanation, suggest that wildfire and other natural catastrophes will often be reported in apocalyptic terms, rather than as the predictable outcomes of natural forces. Studies of how journalists reported five major stories suggest five factors that determine how wildfires are reported: (1) source enterprise, (2) cultural resonance, (3) issue salience, (4) newness, and (5) the

degree to which the setting is rural or urban. Because of these criteria, news organizations sometimes do a poor job of providing the kinds of information needed by news consumers to reach intelligent conclusions about how public lands should be managed.

Policy

Agee, JK. 1989. Wildfire in the Pacific West: A brief history and implications for the future, in *Proceedings of the Symposium on Fire and Watershed Management*, Sacramento, CA, October 26–28, 1988, NH Berg, ed. General Technical Report PSW-109, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The author points out that wildfire is a natural component of forested land. Its frequency, severity, and effects vary depending on the specific environment, type of fire, and adaptation of the forest biota to fire. The author argues that the socio-political environment in which these forests exist has had a much more significant impact on public and private policy towards fire than has the physical-biological environment. Although ecological criteria are important in technical planning, they will be overshadowed by socio-political criteria in problem definition and solutions for the future.

Apicella, M. 1996. *Federal Wildland Fire Management Policy and Program Review Implementation Action Plan Report*. Federal Wildland Fire Policy, USDA Forest Service, Washington, DC.

The report describes the background of current fire management policies of various federal agencies. The report presents several issues of fire management with which federal agencies currently are confronted. The report concludes that interagency cooperation is necessary in order to deal with various issues in fire management.

Bradley, J. 1995. Political considerations of park and wilderness management, in *Proceedings, Symposium on Fire in Wilderness and Park Management, Missoula, Montana, March 30–April 1, 1993,* JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The authors discuss the basis for subcommittee and congressional support of a natural fire policy and its implementation. The authors argue that the natural fire program is critical for quality land management. Natural fire is important because it is based on correct science, which must underlie land management policy, and because we cannot have true wilderness without natural fire.

Chambers, JW. 1987. The evolution of wildland fire management and policy. *Fire Management Notes* 48(2): 5–8.

The author describes the evolution of wildland fire management and its policy in the United States. The first fire policy was generated because of the "cut and run" timber harvest practices on private lands in the Lake States during the late 1800s and early 1900s. The policy was control oriented and was carried out by the U.S. Army. The "10 a.m. policy" was dominant from the 1930s to the early 1970s. World War II led to the age of mechanization in fire control, as the development and surplus of war equipment provided suitable equipment. The age of specialization began in the 1970s. The FIRESCOPE program was initiated in 1970 as a result of wildland-urban interface fire suppression. Expenditures for fire suppression skyrocketed in the mid 1970s. The passage of the Forest and Rangeland Renewable Resource Planning Act of 1974 changed fire policy in the U.S. The Act demands that both the use of prescribed fire and the control of wildfire be integral parts of the Forest Service land management planning process. The National Wildfire Coordination group was established in 1976.

Christensen, NL, Jr. 1991. Keynote address: Variable fire regimes on complex landscapes: ecological consequences, policy implications, and management strategies, in *Fire and the Environment, Ecological and Cultural Perspectives: Proceedings of an International Symposium, Knoxville, TN, March 20–24, 1990,* SC Nodvin and TA Waldrop, ed. General Technical Report SE-69, USDA Forest Service, Southeastern Forest Experiment Station, Ashville, NC.

The author points out that we now recognize the significance of the role of disturbance caused by a variety of ecosystem processes; however, articulating operational policies and management strategies for wilderness preserves has proven to be an overwhelming task. The author suggests that successful policies must have three characteristics: (1) clearly stated operational goals, (2) identification of potential constraints, and (3) recognition of the variability and complexity of the succession process. The author presents three potential research needs in the future: (1) understanding the causes and consequences of variability in fire regimes, (2) understanding the relationship between variation in the spatial-temporal scale of fire events and their specification and mechanisms, and (3) understanding the ecological consequences of departures from "normal" fire regimes.

Cook, S. 1997. Wildfire adapted ecosystems meet man's development. *Australian Journal of Emergency Management* 12(2): 24–31.

The author points out that population pressures of the twentieth century have pushed humans into fire-prone areas. This trend necessitates the identification of potential wildfire hazards by trained observers, followed by communication to homeowners in the affected areas. Although efforts to reduce the wildfire hazard have increased, threats to wildland/urban communities have not been addressed because of the inability of agencies to cooperate, poor decision-making processes, low priority accorded to such threats, and the unavailability of sufficient funds to deal with these threats.

Daniel, TC. 1990. Social/political obstacles and opportunities in prescribed fire management, in *Proceedings: Effects of Fire Management of Southwestern Natural Resources, Tucson, AZ, November 15–17, 1988,* JS Krammes, ed. General Technical Report RM-191, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The author describes several obstacles to implementing prescribed fire management. The obstacles include misunderstanding of fire in forest ecosystems; concern about risks to life and property; and overestimation of adverse effects on scenic impact and recreational safety. The author points out that the above concerns might stem from several factors: (1) some resource management policies and practices are not sufficiently sensitive to the value that the public places on nature; (2) the public is not always well informed about the natural processes that they want protected; (3) management of the forest tends to be viewed as in direct conflict with the desire to be near nature and to live in a pristine environment; and (4) earlier fire prevention campaigns were very successful, in part because they were very simple—forest fires are bad and should be prevented. The author suggests that environmental education would be helpful if public acceptance of prescribed burning stems from the lack of adequate understanding of the role of fire in forest ecosystems.

Donoghue, LR. 1983. *The American Legal System and its Relations to the USDA Forest Service and Human-Caused Wildfires*. MS thesis, Michigan State University, East Lansing.

The author points out that information and education programs have helped reduce the occurrence of human-caused wildfires, but that agencies should also offer law enforcement education programs, which could significantly reduce fire ignitions. The author argues that whether law enforcement is beneficial depends in part on what managers know about the legal system and how they use it to prevent human-caused wildfires. The author examines the American legal system, defining and describing its major components and interactions. The study results illustrate several findings: (1) increasing a state's legal efforts against wildfire violations decreases that state's wildfires; (2) law enforcement efforts differ significantly in the North and South; (3) legal efforts have a greater impact on incendiary and debris-burning fires than on other fire causes; (4) compared to the South, legal efforts in the North have a greater impact on combined incendiary and debris-burning fires; and (5) law enforcement in both regions affects the occurrence of incendiary fires more than it affects debris-burning fires.

Gardner, PD, HJ Cortner, and JA Bridges. 1985. Wildfire: managing the hazard in urbanizing areas. *Journal of Soil and Water Conservation* 40(4): 318–321.

The authors argue that although a number of policy responses have been suggested to reduce the impacts of wildland fires on the physical environment and human activities, how acceptable they are to the general public is another question. This is because the

wildland fire hazard depends not only on the physical environment, but on human interactions with the physical environment as well. The authors present five classes of mitigation: (1) reducing the intensity, frequency, or magnitude of the hazardous event by physically changing the environment; (2) limiting exposure to the hazard through local and state land-use regulations; (3) reducing the vulnerability of structures and people; (4) increasing homeowners' awareness of the wildland fire through education; and (5) taking care of individuals who are negatively impacted by wildland fire. The authors suggest that the implementation of any policy option depends not only on the expertise of the natural resource manager or local planner, but also on the public's receptivity.

Lee, RG. 1987. Community fragmentation: implications for future wildfire management, in *Proceedings of Symposium on Wildland Fire 2000, South Lake Tahoe, CA, April 27–30, 1987,* JB Davis and RE Martin, ed. General Technical Report PSW-101, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The author points out that modern fire management is an alternative to conventional fire management, which assumes that all fires must be put out. The author argues that modern fire management conflicts with conventional fire control because the two are based upon different assumptions: "all fire is bad" versus "fire is an integral component of natural ecosystems."

Lee, RG, and TM Bonnicksen. 1978. *Brushland Watershed Fire Management Policy in Southern California: Biosocial Consideration.* Water Resources Center, University of California, Davis.

The authors present a biosocial system model that can be useful for analysis on brushland fire management policy. The author addresses two advantages of this model. First, the biosocial system model enhances examination of fire management policy from various disciplines. The authors argue that environmental policy should be tested within different perspectives. The biosocial system model provides systematic models for understanding various environmental issues. Second, the model permits managers and researchers to anticipate how a fire control agency will adjust to possible changes in its social environment. This model also makes it possible to anticipate organizational responses to major changes in the biophysical environment. The author describes the actual application of this model to San Diego County's brushland fire management.

Lichtman, P. 1998. The politics of wildfire: lessons from Yellowstone. *Journal of Forestry* 96(5): 4–9.

The author points out that land managers and ecologists generally agree that the 1988 fires in the Greater Yellowstone Ecosystem were an ecologically important part of a natural disturbance pattern, and that little could have been done to stop them. For policymakers, however, the fires were a major public relations failure. The author argues that forest managers and decision makers must understand how the public and politi-

cians perceive fire. The author suggests that it is not sufficient for managers to just consider the technological and ecological dimensions of fire in natural resource management. The author emphasizes that interaction between the public and elected officials is indispensable for gaining support for natural fire.

Mills, TJ, and FW Bratten. 1988. *Economic Efficiency and Risk Character of Fire Management Programs, Northern Rocky Mountains*, Research Paper PSW-192, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The authors used the Fire Economics Evaluation System (FEES) to test three hypotheses about fire system performance on selected public lands in the northern Rocky Mountains. The hypotheses were as follows: (1) Economic efficiency is affected by the size of the fire management budget and the mix or emphasis of the fire management inputs purchased with the budget; (2) risk in the fire management system decreases with increasing fire management funding; and (3) the most efficient funding for a risk-averse manager is higher than for a risk-neutral manager. The study results indicate that efficiency is strongly affected by the program level, but the effect of the fire management mix or emphasis on efficiency was relatively minor. The most economically efficient initial attack program level was the lowest of those tested, 75% below the base level funding for the study period. The decrease in risk with increase in funding was relatively minor. Furthermore, the conclusions of the study were not affected by realistic changes in two major model inputs: fire prevention and large-fire suppression effectiveness, and resource management objectives.

Mutch, RW. 1976. Fire management and land use planning today: tradition and change in the Forest Service. *Western Wildlands* 3(1): 13–19.

The author discusses the necessity of changing from fire control to fire management, in which fire management is integrated with fire ecology principles and land-use planning requirements. The author presents traditional approaches and current trends by using a survey of fire management personnel, which shows that managers are interested in natural fire management, while also aiming to improve suppression ability. The author points out that wildland fire should be regarded as an ecological process as well as a management tool. The author also argues that successful fire management may be achieved by informing the public, applying research results, and increasing understanding of the role of both fire prevention and prescribed burning in total fire management.

Phillips, CB, and CW George. 1991. Wildland fire in the 1990s: problems, solutions, and priorities as seen by fire managers. *Fire Management Notes* 52(1): 3–10.

The authors discuss problems associated with fire suppression. These problems are (1) inefficient communication among firefighters and agencies, (2) lack of standardization in training and equipping firefighters, (3) inefficient incident command systems, (4) lack of alternatives in tactics and strategies for fire suppression, (5) inadequate management for information and data flow, (6) barrier of laws and policies for cooperation

among different agencies, (7) lack of new tools, techniques, and staffing standards, and (8) growing fire suppression in the wildland-urban interface. The authors suggest recommendations for solving each problem.

Veto JL. 1995. A vision for the future of fire in wilderness, in *Proceedings*, *Symposium on Fire in Wilderness and Park Management, Missoula, Montana, March 30–April 1, 1993*, JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author argues that suppression of fire in wilderness areas is expensive. Therefore, prescribed burning is a good tool for forest management. However, prescribed burning policy often confronts criticisms expressed by elected officials, who must be expected to reflect their constituents' views. Public education is key to implementing prescribed burning. An effective educational program for the public may necessitate different types of expertise. If three agencies (USFS, BLM, and NPS) cooperate, such a program can be generated.

Wakimoto, RH. 1989. National fire management policy: A look at the need for change. *Western Wildlands* 15(2): 35–39.

The fire management policy review team was established in order to review the fire policy for the Yellowstone fire in 1988. The review team conducted several hearings to get input from the public in the vicinity of Yellowstone National Park. Seven issues were raised through the sessions: (1) The objectives of prescribed natural fire programs in national parks and wilderness are sound, but the policies need to be refined, strengthened, and reaffirmed. These policies permit fires to burn under predetermined conditions. (2) Many current fire management plans do not meet current policies; the prescriptions in them are inadequate, and decision making needs to be tightened. (3) There are risks inherent in trying to manage fire, but they can be reduced by careful planning and preparation. Planned burning and other efforts to reduce fuel hazards near high-value structures, along with the creation of fuel breaks along boundaries, can help reduce risks from both prescribed natural fires and wildfire. (4) The ecological effects of prescribed natural fire support resource objectives, but the social and economic effects may be unacceptable in some cases. Prescribed natural fires may affect uses of parks and wilderness, and may impact outside areas through smoke and stream sedimentation. (5) Dissemination of information before and during prescribed natural fires must be improved. There should be more public participation in the development of fire management plans. (6) Internal management processes, such as training more personnel, developing uniform terminology, and utilizing similar budget structures, would significantly improve fire management. (7) Claims were heard that some managers support naturalness above all else, allowing fires to burn outside of prescription requirements without taking appropriate action to suppress them.

Williams, JT. 1995. Managing risk in wilderness fire management, pp. 22–23 in *Proceedings, Symposium on Fire in Wilderness and Park Management*, *Missoula, Montana, March*

30–April 1, 1993, JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author presents four criteria by which prescribed natural burning may be implemented in wilderness settings: (1) fuel treatment measures taken outside of wilderness are not sufficient to mitigate the risks within wilderness; (2) the potential for lightning-caused fires represents too great a risk; (3) the public is involved in discussions leading to the decision; and (4) an interdisciplinary team has reached consensus on the management ignition option. The author also raises the question, "How do we sustain the fire-adapted ecosystem within acceptable limits of risks?" The author points out that we need creative new techniques that will enable us to implement fire policies.

Public Attitude toward Wildfire

Barro, SC, and MJ Manfredo. 1991. Understanding publics: The relationship between what they say and what they do, pp. 187–193 in *Proceedings of Society of American Foresters National Convention,* Society of American Foresters, Bethesda, MD.

The authors argue that resource management goals emphasize the importance of integrating public opinion into the decision-making process. The authors present the results of attitude surveys that offer useful approaches for obtaining information about various publics. Attitudinal information can help managers understand many sides of an issue, determine public support for management practices, predict demand, and understand current and new user groups. One problem of attitude measurement, according to the authors, is that there are sometimes inconsistencies between what people say and what they do. When these inconsistencies appear, however, it may be due to a poor understanding of the theory and methodology of attitude measurement on the part of researchers. Good prediction of behavior from attitudes can be achieved if researchers understand how attitudes are formed, accessed, and influenced. The authors introduce four basic considerations in conducting and understanding studies that examine the relationship between attitudes and behaviors. Given the growing sophistication of social surveying and social psychological theory, there is an increasing need for a social perspective in natural decision making.

Bright, AD, and MJ Manfredo. 1995. The quality of attitudinal information regarding natural resource issues: the role of attitude-strength, importance, and information. *Society and Natural Resources* 8(5): 399–414.

The authors point out that the decision-making process in natural resource management occurs within a technical dimension. However, as the public becomes more knowledgeable about and active regarding natural resource issues, the integration of social

science into the natural resource decision-making process becomes essential. One prominent method of social dimension inquiry is the assessment of public attitudes toward natural resource issues. A concern of natural resource managers and researchers, however, is the quality of the attitudinal information obtained. The authors suggest that one way of assessing the quality of attitudinal information is to examine the predictive validity of attitudes, that is, their ability to predict behavior regarding natural resource issues. The authors incorporate the strength of attitudes toward management strategies, the personal importance of natural resource issues, and the availability of information on the issue into a model of the ability of attitude to predict support for specific management strategies. The model also incorporates the individual effects of the study variables on the predictive validity of attitudes. The results suggest the importance of considering multiple measures of attitude-strength, the salience of an issue to the public, and the need to provide the public with information about an issue. The authors argue that these results demonstrate the need for enhancing the quality of attitudinal information, thereby ensuring effective communication between managers and the public, and they give directions for future research.

Bright, AD, and MJ Manfredo. 1997. The influence of balanced information on attitudes toward natural resource issues. Society and Natural Resources 10(5): 469–483.

The authors point out that influencing behavior or increasing public knowledge about natural resource issues requires an understanding of the effects of communication on public attitudes. The authors describe a study that examined the effects of balanced, two-sided information about a natural resource issue on the general public's attitude toward management strategies related to an old-growth forests issue. According to the authors, information affects attitudes by affecting the nature of cognitions that are elicited. This effect, however, depends in part on how relevant the public perceives the natural resource issue to be. The authors suggest that, while information about important issues had little influence on the direction of attitudes, it influenced the strength with which attitudes were held, which in turn was moderated by the personal relevance of the issue. Resource managers must understand the nature of attitude of the target public, as well as that public's perception of the importance of the natural resource issue when developing a communication program designed to increase knowledge and influence attitudes or behaviors.

Cortner, HJ, PD Gardner, JG Taylor, EH Carpenter, MJ Zwolinski, TC Daniel, and KJ Stenberg. 1984. Uses of public opinion surveys in resource planning. *Environmental Professional* (6): 265–275.

The authors discuss three independently conducted surveys used to measure public attitudes toward fire management issues and the role of the surveys as a public involvement tool. These surveys provide useful information on the source, nature, and intensity of public support or opposition to plans from those who are not likely to participate in traditional public involvement. The authors point out that while public opinion

surveys can accomplish some objectives that other forms of public involvement cannot, such surveys also have limits. The authors suggest that carefully designed survey research can elicit reliable information and can involve the public in decision making for natural resource planning and management.

Cortner, HJ, MJ Zwolinski, EH Carpenter, and JG Taylor. 1984. Public support for fire management policies. *Journal of Forestry* 82(6): 359–361.

The authors conducted a telephone survey to investigate the public's perception and acceptance of prescribed fire policy in the Tucson, AZ, metropolitan area. The survey showed that the public recognized that forest fires could be beneficial as well as harmful. Public acceptance and understanding of the purposes and benefits of fire management were high. The authors suggest that the public was generally well-informed, and that entirely new approaches to fire education were not necessary, although modifications (pertaining to local knowledge and conditions) are recommended. Finally, the authors recommend that public education focus on local forest conditions as well as on local knowledge and acceptance of fire management.

Cortner, HJ, PD Gardner, and JG Taylor. 1990. Fire hazards at the urban-wildland interface: what the public expects. *Environmental Management.* 14(1): 57–62.

The authors point out that wildland-urban interface issues have become problematic for forest managers. The authors conducted surveys on how public knowledge and perceptions of fire policies and fire hazards change over time, what kind of policy responses homeowners prefer as a way of preventing fire hazards at the urban-wildland interface, and how citizens view their own obligations as participants in interface issues. The authors present data from the surveys and discuss some findings and implications of their results. The data show that public attitudes toward fire have changed significantly over the past two decades, and that educating the public about fire and managers' use of fire can have positive effects on behavior. Yet, when attempting to modify individuals' behavior concerning interface fire risks, managers must also consider important issues of incentives, distribution of costs, and unanticipated policy impacts.

Gardner, PD, HJ Cortner, KF Widaman, and KJ Stenberg. 1985. Forest-user attitudes toward alternative fire management policies. *Environmental Management* 9(4): 303–311.

The authors point out that the formulation and implementation of new fire policies in the national forests depend upon public acceptance. A national survey of organized groups of forest users indicates that, contrary to the concern of many forest managers, considerable support exists for flexible fire suppression policies. Forest users are also willing to accept the risk associated with the manager's use of prescribed fire. However, survey results demonstrate intergroup differences on the acceptability of prescribed fire management. The authors discuss this variation in relation to a number of socioeconomic variables, general fire knowledge, specific knowledge about the effects of low-intensity fires, and risk preference levels.

Hough, JL. 1993. Why burn the bush? Social approaches to bush-fire management in West African national parks. *Biological Conservation* 65(1): 23–28.

The author presents social research into local residents' perceptions of the effects of fire in northern Benin. The results indicate that local residents' perceptions correspond to scientific understanding. The author predicts that the establishment and protection of national parks will increase the incidence of human-caused bush-fires.

Smith, D, and L Clark. 1994. Hot views on hot topics: national survey gauges public views on forests, wildfire, and management. *American Forests* 100 (November/December): 3.

The authors conducted a national survey regarding the public's view on forests, wildfire, and management. The results reveal that 49% of the American people favored prescribed burning, while 42% opposed it. The survey also demonstrates that 52% of Americans support managing forests, as opposed to letting nature take its course (40%).

Tarrant, MA, C Overdevest, AD Bright, HK Cordell, and DBK English. 1997. The effect of persuasive communication strategies on rural resident attitudes toward ecosystem management. *Society and Natural Resources* 10(6): 537–550.

The authors examined ways of generating favorable public attitudes toward ecosystem management (EM). They conducted a telephone survey in the Chattooga River Basin (CRB). The survey results showed that (1) CRB residents had a very low knowledge of EM, and (2) the most favorable attitudes were associated with messages containing strong arguments. The results also showed that respondents favored three-way interaction (personal relevance by knowledge by argument strength). The authors discuss explanations for this three-way interaction, as well as the theoretical and applied implications of the study findings.

Vaske, JJ, and WR Williams. 1982. *Attitudes, Beliefs and Values Associated with the Smokey the Bear Media Campaign.* Association Paper 030, Rural Sociological Society (RSS).

The authors point out that although managers, who are trained in ecology and forestry, understand roles of fire in the ecosystem and the need for the fire management programs, the general public—which has been indoctrinated with only the negative aspects of fire—may not share such beliefs. The authors indicate that individuals have come to believe that all fire is bad and that all smoke is pollution, because of media campaigns such as "Smokey the Bear," and "most fires kill wildlife." According to social-psychological research, attitudes toward fire are differentiated into an emotional dimension involving feelings (affect) and a cognitive aspect, based on facts (beliefs). Both affect and beliefs are derived from values and organized into horizontal and vertical structures. Results of this theoretical analysis indicate that existing attitudes toward fire control are strongly linked to basic values (e.g., safety). The authors suggest that future efforts to change attitudes should recognize these linkages in order to develop an effective program.

Wittaker, D. 1988. Public perception of fire management, pp 30–31 in *Fire Management in a Climate of Change: Proceedings from 1988 Northwest Fire Council Annual Meeting, Dunsmuir Lodge, Victoria BC, November 14–15, 1988,7* BD Lawson, BC Hawkes, and GN Dalrymple, ed. Northwest Fire Council, Victoria, BC.

The author (who is the mayor of Penticion, BC) argues that a law allowing municipal government to regulate zoning is imperative for fire prevention. The author also points out that the development of forest lands must be carefully considered by the Ministry of Forests, municipal government, and the public.

Public Involvement

Carroll, MS, AJ Findley, KA Blatner, SR Mendez, SE Daniels, and GB Walker. 2000. *Social Assesment for the Wenatchee National Forest Wildfires of 1994: Targeted Analysis for the Leavenworth, Entiat, and Chelan Ranger District.*USDA Forest Service, General Technical Report, PNW-479.

The authors conducted a social assessment to explore local residents' reaction to the Wenatchee Complex Fires in 1994. A primary purpose of the study was to identify local residents' various beliefs and values about wildfire and forest management. The study results were presented based on five social entities: political coalition, stakeholder groups, residency tenure distinctions, geographical divisions, or ethnic communities. The authors concluded that improving public involvement processes was crucial in the wake of natural disaster.

Chambers, V. 1992. Public involvement in fire management. *Fire Management Notes* 53–54(2): 8–9.

The author points out that fire management is now scrutinized by a well-educated and sophisticated public. The public often expresses concerns about the economic efficiency of fire suppression, air quality, and other environmental issues resulting from fire management; therefore, fire managers must shift from the public information end of the spectrum to true public involvement, where the public is engaged in open dialogue on various issues. According to the author, trust may be established between managers and the public through public involvement, which will enhance public support for fire management policies.

Magill, Arthur W. 1992–1993. People, fire managers must talk with them. *Fire Management Notes* 53–54(2): 3–7.

The author points out that fire managers know that wildland-urban interface fire problems are "people problems" and they recognize that such problems are not all the same. Managers have repeatedly warned about the risk of building structures with flammable

materials in landscapes with fire-prone vegetation. Yet, they are continually frustrated because residents do not heed these warnings. The author describes several factors that may prevent managers from achieving their fire management goals. First, people not only respond poorly to warnings, but tend to be oblivious to events that can disastrously influence their property and lives. Second, the building trade builds to satisfy people's desire to live in the wildland-urban interface. Third, community plans frequently do not address the wildland-urban interface fire issue. Finally, local governments have been unwilling to enact ordinances that control construction. The author argues that these situations may be changed if fire managers overcome their reluctance to public involvement and become leaders in two-way communication with the people they wish to influence. These goals may be achieved if fire managers will seek training in social sciences that emphasizes interpersonal relations, multicultural relations, and communication strategies.

Murphy, EM. 1995. Public involvement in wilderness fire planning and decision making, in *Proceedings, Symposium on Fire in Wilderness and Park Management, Missoula, Montana, March 30–April 1, 1993*. JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author points out that public involvement is crucial to the success of any prescribed natural fire program; however, according to the author, it is a job that few fire managers are comfortable doing. The author describes some of the attitudes that keep agencies from public involvement, such as the "it's not my job syndrome", "we know best belief", and "doing things right versus doing the right things". The author demonstrates some key approaches for developing a public involvement plan: (1) deciding the goals of public involvement, (2) identifying potentially affected interests, (3) considering available tools, and (4) implementing.

Public Perception of Prescribed Burning

Bright, AD. 1997. Influencing public attitudes toward prescribed fire policies, in *Proceedings of the Environmental Regulation and Prescribed Fire Conference: Legal and Social Challenges, Tampa, FL, March 14–17, 1995*, DC Bryan, ed. Center for Professional Development, Florida State University, Tallahassee.

The author describes public attitudes toward prescribed fire polices and discusses the application of advancements in *persuasion theory* to communication programs. The author points out that there is a growing trend toward integrating a human dimension of resource management with biological information. A prominent method of addressing

this dimension is to measure public attitudes toward resource management strategies. Research conducted immediately after the summer of 1988 fires showed that about half of the national public supported prescribed fire policies. Studies conducted five and six years later demonstrated little change in public attitudes toward prescribed fire policies. It has been found that the more knowledge individuals have about wildfires, the more likely they are to support prescribed fire polices. With the public becoming increasingly involved in the management of natural resources, managers must improve their communication about the rationale for prescribed fire policies. Results of improved communication include informed public involvement and greater understanding and support of prescribed fire policies. The author suggests that natural resource managers consider specific conclusions from persuasion theory in order to develop more effective information programs about prescribed fire policies.

Bright, AD, MJ Manfredo, M Fishbein, and A Bath. 1993. Application of the theory of reasoned action to the National Park Service's controlled burn policy. *Journal of Leisure Research* 25(3): 263–280.

The authors examine the theory of reasoned action as a model of attitude and behavior change based on public perceptions of the National Park Service's controlled burn policy. The authors also investigate the effects of belief-targeted messages on beliefs in the outcomes of a controlled burn policy. The study results support the framework of the theory as a model that explains attitude and behavior change. The authors suggest four management implications regarding controlled burn policy: (1) managers should target salient beliefs regarding a policy through persuasive communication in order to effectively change attitudes and behaviors; (2) managers should develop the structure of the message so that the arguments based upon the elicited beliefs are supported by factual evidence; (3) managers should consider the specific characteristics of their audience, and (4) managers should take into account the potential influence of unexpected messages on changing the attitudes and behaviors of the public.

Carpenter, EH, JG Taylor, HJ Cortner, PD Gardner, MJ Zwolinski, and TC Daniel. 1986. Target audiences and content for forest fire information programs. *Journal of Environmental Education* 17(3): 33–42.

The authors present data from three independent surveys on the public attitude toward prescribed burning policy. The survey results indicate a high level of support for fire management practices initiated and controlled by the manager. The results also show that the public can differentiate between situations that result in beneficial effects and those that have harmful effects, suggesting a sophisticated understanding of fire management. Additional analysis reveals the extent to which socio-demographic characteristics and beliefs about the effects of fire in forest environments can predict public approval. The authors suggest that the content of fire information programs should be directed toward a broad, cross-section of adults, and should directly address factors such as fire size, intensity, and impact upon animals, which can cause emotional concern.

The authors also recommend that fire information programs clearly describe situations where fire should be suppressed, as well as where fire can be used to achieve beneficial management objectives; public acceptance of fires increases as more information is given and as control is specified. Finally, the authors suggest that fire information programs include discussions on the beneficial effects that can be realized from wildfires and from prescribed burning, and on the responsibilities, as well as risks, of prescribed fire.

Manfredo, MJ, M Fishbein, GE Haas, and AE Watson. 1990. Attitudes toward prescribed fire policies. *Journal of Forestry* 88(7): 19–23.

The authors argue that although biological information may provide support for prescribed fire policy, that alone is not sufficient justification for its implementation. Fire policy has societal and political components, and the fact that people appear poorly informed about the consequences of fire policy and the effects of fire adds controversy to the issue. Two telephone surveys were conducted to investigate attitudes towards the "let-burn" prescribed fire policy used during the Yellowstone fires of 1988. The results indicate slightly positive overall support for the prescribed burn policy, whereas the national sample was evenly divided. The authors discuss beliefs about outcomes of the prescribed fire policy and knowledge about wildfire in relation to attitudes (positive or negative) about the policy in the two survey groups. The results suggested no clear direction for managers and policy makers for meeting public preferences, but highlighted the difficulty of making decisions about prescribed fire policies that would be approved by a large majority of citizens.

Martin, RE. 1997. Prescribed fire as social issue, in *Conference Proceedings: Environmental Regulation and Prescribed Fire: Legal and Social Challenges, Tampa Airport Hilton, Tampa, FL, March 14–17, 1995,* DC Bryan, ed. Center for Professional Development, Florida State University, Tallahassee.

The author points out that prescribed fire is a social issue, and it automatically becomes an ecological, political, and economic issue. The author argues that a century-long fire exclusion program has worsened the health of wildlands. Therefore fire must be used as the most economically and ecologically sound tool to improve natural ecosystems. However, the public views prescribed fire suspiciously because the public often pays attention to problematic fires. Thus, although prescribed fire in wildlands faces strong opposition, it must be used in conjunction with other tools to properly manage those lands. The author stresses that the issues of prescribed fire must be addressed through education and public involvement, and studied in context with the total "ecologic-socio-politico-economic" picture.

McConnell, DW II, and SB Baldwin. 1991. Private, non-industrial forest owner's perceptions of controlled burning influencing forest management, in *Fire and the Environment, Ecological and Cultural Perspectives: Proceedings of an International Symposium, Knoxville, TN, March 20–24, 1990,* SC Nodvin, and TA Waldrop, ed. General Techni-

cal Report SE-69, USDA Forest Service, Southeastern Forest Experiment Station, Ashville, NC.

The authors point out that perceptions of controlled burning by private and non-industrial forest (PNIF) owners provide insight into forest management behavior of these owners. The authors conducted personal interview of randomly selected forest owners in the Wiregrass Region of Alabama in order to determine relationships between their perceptions, ownership objectives, and forest management activities. The interviews reveal that more than 66% of owners felt that controlled burning was a useful forest management practice on their land, although only 25% were currently using controlled burning. Both positive and negative perceptions of controlled burning are presented. The authors emphasize the relationship of these perceptions to owners' forest management behavior and the subsequent importance of this information to professional foresters who work with owners.

Schmoyer-Weber, J. 1995. Public information on actively burning prescribed natural fires, in *Proceedings, Symposium on Fire in Wilderness and Park Management*, *Missoula, Montana, March 30–April 1, 1993,* JK Brown, RW Mutch, CW Spoon, and RH Wakimoto, ed. General Technical Report INT-320, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author presents three phases of public information on prescribed burning. Conflicting emotions are stirred in wilderness users and neighbors when an agency monitors fire rather than suppressing it. The author emphasizes that members of the public who will be affected by a fire should be informed so they will know what is going on and what action they should take.

Shelby, B, and RW Speaker. 1990. Public attitudes and perceptions about prescribed burning, pp. 253–260 in *Natural and Prescribed Fire in Pacific Northwest Forests*, JD Walstad, SR Radosevich, and DV Sandberg, ed. Oregon State University Press, Corvallis.

The authors point out that public perceptions of fire management mainly depend on public knowledge and understanding about fire. The authors argue that despite increasing support for fire management from the public, there are also often concerns about air quality and water pollution induced by fire management. The authors suggest that further implementation of prescribed burning will necessitate a consensus about the use and effects of fire, as well as a long-term effort to provide information to the public about fire management, and a willingness to adequately and scientifically address specific concerns.

Shindler, B, and M Reed. 1996. *Forest Management in the Blue Mountains: Public Perspectives on Prescribed Fire and Mechanical Thinning*. Department of Forest Resources, Oregon State University Press, Corvallis.

The authors conducted research on residents' perceptions of prescribed fire and mechanical thinning. Samples were drawn from the residents of the Blue Mountains in

Oregon. This study demonstrates that most respondents are receptive, and that many strongly support the use of both prescribed fire and mechanical thinning. The authors point out that although very vocal interest groups often attract agencies' attention, they do not necessarily represent the general public's view of prescribed fire and mechanical thinning. The authors also present several factors that contribute to public acceptance of prescribed fire and mechanical thinning: (1) how a decision influences the local economy, (2) how a practice detracts or contributes to people's understanding of sustainable forestry, (3) the visual quality aspects of management, and (4) how the final management decisions are made. The authors present five factors that are key to understanding the public's acceptance of these practices: (1) people need to see things with their own eyes; (2) people want both natural conditions and forest products; (3) credible information is essential; (4) paying attention to agency/public barriers is important; and (5) people will only support what they understand.

Taylor, JG. 1990. Playing with fire: effects of fire in management of southwestern recreation resources, in *Effects of Fire Management of Southwestern Natural Resources: Proceedings of the Symposium, Tucson, AZ, November 15–17, 1988,* JS Krammes, ed. General Technical Report RM-191, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The author summarizes previous studies about fire management and public attitudes toward it. Growing acceptance and sophistication characterize the public's attitude toward current fire management. Prescribed burning is generally well accepted, but fires started by human carelessness or by lightning are not. As the nature and degree of control of fire are better understood, people tend to be more accepting of prescribed burning. It is important to note, however, that the public is not likely to accept lightning-caused fire. The average person's ability to correctly understand fire management is increasing. However, knowledge remains low about the average size of forest fires before suppression activities began, the number of animals killed in forest fires, the lightning origin of most fires in western regions, and the effects of suppression on wildfire intensity and animal habitat. The relationship between knowledge levels and factors that determine acceptance of fire management practices should be considered. Understanding the beneficial effects of fire on forest ecosystems is important in accepting various types of fire. Knowing that lightning is the usual cause of forest fires in many western forest types also is significant in peoples' acceptance of a variety of fires, but this knowledge is not widespread. Knowing that most fires in forest ecosystems are small and that most animals are able to escape from wildfires is important to the public's acceptance of fires that are not specifically designated, set, and controlled by managers. The author points out that four factors are essential for successful information and education programs about fire management for the public: (1) a long-term effort to inform the public about the natural role of fire in undisturbed ecosystems; (2) a strong consensus among managers and concerned people about the correct use and beneficial effects of prescribed fire; (3) public perception that the information is scientifically

sound and does not stem from an interest group with a biased position; and (4) adequate treatment of specific public concerns related to the use of fire, including the risks of prescribed burning getting out of control, smoke, intrusion into populated areas and related effects on public health, potential health hazards of burning chemically treated sites, and aesthetic impacts. The author suggests that mangers should consider two important axioms for public information programs: (1) information exchange is only effective as a two-way process and (2) educating the public will not necessarily cause them to believe as you do.

Taylor, JG, and TC Daniel. 1984. Prescribed fire: public education and perception. *Journal of Forestry* 82(6): 361–365.

The author conducted a survey to investigate the public's acceptability of prescribed burning. The survey respondents were residents in Tucson, Arizona, who rated slides of forest scenes. The respondents also read brochures about fire effects and took a post test that measured both knowledge and attitudes about fire. The survey results showed that ratings of scenic quality were improved by light fires, but were diminished by severe burns. Acceptability ratings for recreation depended on what type of activity people engaged in. For instance, campers expressed the greatest sensitivity to fire effects. The survey also showed that reading the brochures increased respondents' knowledge and tolerance of fire, but did not affect their ratings of scenic or recreational quality. Overall, the results indicated that the respondents support prescribed burning.

Taylor, JG, and TC Daniel. 1985. Perceived scenic and recreational quality of forest burn areas, pp. 398–406 in *Proceedings, Symposium and Workshop on Wilderness Fire*, *Missoula, MT, November 15–18, 1883,* JM Lotan, BM Kilgore, WC Fischer, and RW Mutch, ed. Research Paper INT-182, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

The authors conducted a study to compare (1) public perception of scenic quality after both severe and light fires and (2) effects of both types of fires on perceptions of recreational acceptability. The study also aimed to construct and test documents for educating and informing the public about effects of fire, and to test the effects of fire information levels on attitudes toward fire. The results showed that the public's perception of recreational acceptability was more adversely affected by severe fire than by light fire. However, the study also demonstrates that perceptions of the effect of fire vary, depending upon types of recreation activities. Overall, the public supports prescribed burning. The authors point out that prescribed fires (light) should enhance perceived scenic quality for three or more years, but they may have some adverse effects on camping. Severe forest fires should be expected to cause significant deterioration in scenic quality and recreational acceptability for a prolonged time; camping and picnicking are essentially precluded in burned areas.

Turpin, JC. 1988. Changes in public attitudes to prescribed fire, pp. 49–52 in *Fire Management in a Climate of Change: Proceedings from 1988 Northwest Fire Council Annual*

Meeting, Dunamuir Lodge, Victoria, BC, November 14–15, 1988, BD Lawson, BC Hawkes, and GN Dalrymple, ed. Northwest Fire Council, Victoria, BC.

The author (a representative of the Washington Environmental Council) presents several concerns about prescribed burning. The author points out that agencies should not ignore or dismiss concerns expressed by environmental organizations and citizens, otherwise suspicions and negative perceptions about prescribed burning may be amplified. The author recommends that agencies keep communication lines open and provide credible information from independent sources. According to the author, these efforts can influence opinion leaders, both from the general public and within environmental organizations.

Risk Perception

Abt, RC, MK Kuypers, and JB Whitson 1991. Perception of fire danger and wildland/urban policies after wildfire, pp. 257–59 in *Fire and the Environment, Ecological and Cultural Perspectives: Proceedings of an International Symposium, Knoxville, TN, March 20–24, 1990*, SC Nodvin, TA Waldrop, ed. General Technical Report SE-69, USDA Forest Service, Southeastern Forest Experiment Station, Ashville, NC.

The authors present the results of a quantitative analysis conducted after the May 1985 Palm Coast fire in Florida. The authors identified several residential characteristics that influenced their vulnerability to wildfire. As a follow up to that analysis, homeowners were surveyed to determine their perceptions of fire danger and their views on mitigation measures they have undertaken, as well as their views on government mitigation policies. The survey results demonstrate that homeowners perceive wildfire as a serious threat to their safety and property. Homeowners were receptive to a wide variety of government policy options, including restrictive planning, zoning, and building requirements. Older homeowners were more likely to have taken mitigation measures and were more receptive to government intervention.

Beebe, GS, and PN Omi. 1993. Wildland burning: The perception of risk. *Journal of Forestry* 91(9): 19–24.

The authors discuss the risks of natural and technological hazards, and how public perception of risk is shaped, in relation to the implications of wildfire in public lands and at the urban/wildland interface. The authors point out that fire managers have to simultaneously protect public safety and use fire as a tool of management. The authors indicate that the media plays a critical role in forming public perceptions of fire risks; media reports are often distorted, resulting in public misconceptions about forest fire. The authors insist that public participation is a key to implementing the current fire management policy.

Bunnell, D. 1997. Prescribed fire considerations and the Wilderness Act, in *Proceedings: The Environmental Regulation and Prescribed Fire Conference: Legal and Social Challenges, Tampa, FL, March 14–17,* 1995, DC Bryan, ed. Center for Professional Development, Florida State University, Tallahassee.

The author points out that Wilderness Act of 1964 defines wilderness as a large land area that is primarily affected by natural forces. The purpose of the Act is to assure that these lands are preserved in their natural condition. The author argues that fire must be part of the natural elements in wilderness in order to meet the purpose of the Act. However, full implementation of the Wilderness Act will require trade-offs of social values as well as considerations for other legislative acts involving air, water, and threatened and endangered species. Where fire is a natural occurrence in wilderness, issues associated with acceptance of this natural process tend to focus on fire implementation and associated risk. Risk is generally qualitative and difficult for land managers to measure. Without quantification, risk comparisons become difficult for decision makers. According to the author, risk can be subjectively quantified by identifying resource goals and objectives associated with wilderness and wilderness management. Therefore, defining these goals and objectives through comprehensive prescribed fire plans can be the key to fire risk comparison and quantification.

Cortner, HJ, JG Taylor, EH Carpenter, and DA Cleaves. 1990. Factors influencing Forest Service fire managers' risk behavior. *Forest Science* 36(3): 531–548.

The authors conducted a series of surveys to investigate factors that influenced managers' fire-risk behavior. The results show that safety, the resources at risk, public opinion, and the reliability of information play an important role in shaping managers' decisions. Local or regional policy changes and personal considerations have less influence. The survey results also illustrate that fire-risk behavior varies from one geographic region to another and from one fire-decision context to another. The study demonstrates that managers' decisions shift along the risk-avoidance/risk-taking continuum, depending on the kinds of risks they perceive.

Gardner, PD, HJ Cortner, and K Widaman. 1987. The risk perceptions and policy response toward wildland fire hazards by urban home-owners. *Landscape and Urban Planning* 14: 163–172.

The authors point out that expanding urban areas have brought an increasing number of people into the wildland-urban interface, creating a fire hazard. Public officials in southern California, for example, have suggested programs for protecting urban residents. However, the programs have not gained attention from residents in the wildland-urban interface. The authors investigate why the urban public has not been receptive to adopting these programs. Their results indicate that urban residents have a low initial awareness of fire severity, assign low probabilities to occurrences, and prefer policy strategies that shift the hazard management responsibility to public resource managers.

Saveland, JM. 1985. Risk in fire management, pp. 85–97 in *Fire Management: The Challenge of Protection and Use, Proceedings of a Symposium, Logan, UT, April 17–19, 1985,* JN Long, ed. Department of Forest Resources, Utah State University, Logan.

The author points out that the amount of wildfire protection and prescribed fire use is determined by an individual decision maker's propensity for accepting risk. Risk assessment consists of risk identification, risk estimation, and risk evaluation. The major risk that concerns fire management is identified as the threat of catastrophic fire. The author indicates that estimation of risk consists of determining the probability of occurrence and the magnitude of various events. According to the author, decision theory and utility theory are useful tools for risk estimation. Risk averse, risk neutral, and risk taker profiles are shown by using a utility function. Cost effectiveness and cost-benefit models are presented as means to evaluate how much risk reduction, if any, is necessary. The author presents the cost effectiveness model to show the tradeoff between the costs of risk reduction and the amount of risk reduced. A decrease in funding implies an increase in risk. The author concludes that a combination of prescribed fire use and wildfire protection will achieve a cost-effective level of risk and associated benefits that are optimum.

Taylor, JG, EH Carpenter, HJ Cortner, and DA Cleaves. 1988. Risk perception and behavioral context: US Forest Service fire management professionals. *Society and Natural Resources* 1(3): 253–268.

The authors investigated factors that most strongly influenced fire-risk decisions of fire managers in the Forest Service. They found that safety, the resources at risk, public opinion, and the reliability of information had the greatest influences on decisions. The study directly compared fire managers' perceptions of factor importance with how managers' fire-risk decisions changed in response to those factors. These risk decisions were highly responsive to changes in context (an escaped wildfire decision versus a prescribed burning decision), as well as to changing factors. The results demonstrate the usefulness of scenarios for risk research and the vital importance of context in studying risk-taking behavior. Research that attempts to remove risk decisions from managers' real-world context may well distort the nature of risk-taking behavior.

Winter, Greg, and Fried, Jeremy. 2000. Homeowner Perspectives on Fire Hazard, Responsibility, and Management Strategies at the Wildland Urban Interface. *Society and Natural Resources* 13: 33-49.

The authors conducted focus group discussions with subset of survey participants to investigate how forest homeowners, who lived in wildland-urban interface in Michigan, perceived wildfire hazard, allocation of fire protection responsibility, and their preferred fire management strategies. Study results show that participants tended to regard forest fire as an uncontrollable natural event, and forest fire damage as random. Due to these attributes the participants were lees likely to support investing firefighting infra-

structure, take all possible fire preventive actions for their home, and resolute in their emphasis on solutions that reduce the number of fire ignitions. The authors argue that participants' negative perception of prescribed burning may be a barrier to using it as fuel treatment in wildland-urban interface in Michigan.

Social Psychology

Daniel, TC, M Meitner, and E Weidemann. 1997. Human desires and fears in ecologically rational wildland fire management, in *Fire effects in Southwestern Forests: Proceedings of the Second LaMesa Fire Symposium, Los Alamos, NM, March 29–31, 1994,* CD Allen, ed. General Technical Report RM-286, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The authors point out that while natural areas are generally perceived as safe places by city dwellers, the potential danger of fire is not always fully recognized. City dwellers may correctly perceive the risks, but may be unwilling to compromise their perceptions of natural beauty, because environmental fears and desires are based largely on emotions rather than logic. That is, human desires and fears may have relatively little to do with "understanding", as environmental perception research has shown. It may be too ambitious for manicagers to assume that people understand the risks associated with a technical dimension. In fact, past studies show that people's risk perceptions are often not consistent with such technical assessments. The authors argue that words do not elicit realistic emotional responses, such as fears and desires. To understand people's actions (and inaction) regarding fire hazards, the processes by which those actions are determined must be taken into account. The authors suggest that computer visualization technology may be more effective than words in motivating a realistic response to fire danger in the wildland-urban interface.

Daniels, SE. 1997. Human reactions to large-scale wildfires: contrasting the response of U.S. Forest Service personnel and the general public to the 1994 Wenatchee fires. Unpublished paper, Steven E. Daniels, Director, Western Rural Development Center, Utah State University, Logan.

The author conducted qualitative research on human reactions to Wenatchee fires in 1994. The primary focus of the research was to investigate the response of Forest Service personnel and the general public to the fire. The study found that Forest Service personnel's reactions to the fire were cognitive and intellectual, whereas the general public's reaction to the fire was affective. The author points out that this difference may interfere with smooth communication between the Forest Service and the general public. The author's recommendations to Forest Service personnel are as follows: (1) they should not belittle the public's affective response to fire or be dismissive toward them, (2) they should recognize the legitimacy of the public's grief and assist with the process,

(3) they should shift out of the crisis-team mind-set after the fire is controlled and allow people more opportunities for reflection and discussion, and (4) they should acknowledge that the agency may have lost trustworthiness in the eyes of the public.

Yoshitaka Kumagai. 2001. "Causal Reasoning of Wildfire Damage." Oregon State University. Ph.D. dissertation.

The author conducted research to investigate how people in wildfire hazard zones who had experiencied wildfire perceived the cause of wildfire damage. A pre-fire mail survey, real-time filed interviews, and a follow-up mail survey were conducted on the western slope of the Sierra Nevada in 1999. Survey results revealed that people who had experienced wildfire attributed the cause of damage to other people's actions more than did those who had not experienced wildfire. Field interview data suggest that whether residents incurred damage, maintained a sense of control in their situation, or had personal relationships with firefighters influenced the way in which they attributed the cause of damage.

Results also indicated that people without past wildfire experience tended to attribute the cause of wildfire to a simplistic schema such as cigarette, while people with past wildfire experience tended to attribute the cause of wildfire to more specific notions and factors associated with firefighters, such as out-of-control prescribed burning or inadequate past fuel treatment.

WILDLAND-URBAN INTERFACE

Bailey, DW. 1991. The wildland-urban interface: social and political implications in the 1990's. *Fire Management Notes* 52(1): 11–18.

The author points out that better communication, transportation, and technological improvements have made remote areas more accessible than ever before. Consequently, more people reside in forested lands, creating wildland-urban interfaces. These interfaces have introduced many fire management issues. As these interface areas grow in size and number, the probability of more fires and greater losses increases. This, in turn, increases the challenges for firefighters, land managers, and resource specialists. Several strategies should be considered for addressing these problems: First, laws and/or regulations that set limits for building houses in a wildland-urban interface are necessary. Second, public education and strong communication with the public are also necessary. Third, enhancing cooperation among various agencies is critical because fires do not respect political boundaries.

Bradshaw, TD. 1987. The intrusion of human population into forest and range lands of California, in *Proceedings of the Symposium on Wildland Fire 2000, South Lake Tahoe, CA, April 27–30, 1987,* JB Davis and RE Martin, ed. General Technical Report PSW-

101, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The author argues that demographic and economic growth are pushing deeper into California's forest and range lands, making effective fire protection and traditional industrial uses of the land more difficult. The author addresses several factors that will increase the difficulties for natural resource management in the future. They are (1) increasing urban population pressures, (2) selective migration, (3) low-priced housing, (4) inadequate infrastructure, (5) decentralized development, and (6) government inadequacies. On the other hand, there are some compensating trends which will tend to restrict growth and minimize problems. These are: (1) near-term weakening of the rural economy, (2) few major planned developments, (3) growth opposition, more integrated recreation uses, (4) zoning for larger parcel sizes, and (5) stabilization of tax benefits such as the Timber Production Zone.

Butler, CP. 1976. The urban/wildland fire interface. *California Fire Prevention Notes* 10: 14.

The author describes the problems of protecting houses in suburban or semi-rural situations on the wildland-urban interface in California. The author presents some examples of recent destructive fires near Los Angeles and other cities in California. Finally, the author proposes several strategies and measures to prevent or mitigate such fires.

Cortner, HJ. 1991. Interface policy offers opportunities and challenges: USDA Forest Service strategies and constraints. *Journal of Forestry* 89(6): 31–34.

The author points out that problems of wildland-urban interface are becoming major forestry issues that offer both opportunities and problems for participants. New directions and organizational emphases are needed to respond to the realities of current management situations. The author indicates that many issues in wildland-urban interface are social-institutional, not technical. By being active in decisions that affect the type and intensity of development at the forest edge or on intermingled lands, managers can increase opportunities to mitigate or avoid potential ecological costs. If managers understand the values, preferences, and attitudes of the residents in the wildland-urban interface, they will be better able to demonstrate their roles and responsibilities in wildland-urban interface issues. The author finally emphasizes that managers with people skills can deal more effectively with the social political forces that have been buffeting resource agencies.

Cortner, HJ, RM Swinford, and MR Williams. 1990. Wildland-urban interface emergency responses: what influences them? *Fire Management Notes* 51(4): 3–8.

The authors point out that as the number of residents and tourists in a wildland-urban interface increases, the job of a wildland firefighter must adjust to that trend. For example, wildland firefighters may need to tackle structural fires, with which they are not familiar. The Forest Service is often a key agency involved in wildland-urban interface

fire fighting. The authors present five factors that may influence the type and level of an agency's response to fire: presence of an organization, public expectations, agreement, suppression priorities, and national mobilization.

Davis, JB. 1990. The Wildland-urban interface: paradise or battleground? *Journal of Forestry* 88(1): 26–31.

The author discusses problems of fire protection and suppression in a wildland-urban interface. The author points out that the wildland-interface area can be divided into (1) the classical interface, (2) the intermix, and (3) the isolated interface. Knowledge, characteristics, and motivation of the residents in these interfaces may vary from one area to another. Numerous efforts have been undertaken by the Forest Service to inform the public about possible risks of living in the interface and possible strategies to minimize the risk of forest fire. However, according to the author, those commitments were unsuccessful. The author indicates that lack of systematic study and understanding of factors, such as residents' perception of fire and motivation to participate in risk prevention programs offered by the Forest Service, may make many programs unsuccessful.

Fried, Jeremy S., Winter, Greg and Gilless, Keith. 1999. Assessing the Benefits of Reducing Fire Risk in the Wildland-Urban Interface: A Contingent Valuation Approach. *International Journal of Wildland Fire* 9, no. 1: 9-21.

The authors interviewed residents in Michigan in order to investigate whether the residents were willing to pay for incremental reduction in the risk of losing their property to wildfire. Results obtained from interviews show that most interviewees were willing to pay for reducing the risk of their property by wildfire. Results also indicated that those interviewees were characterized by tolerance for property tax, recognition of wildfire risk, perception of other risks relating to wildfire, and realization of existing wildfire risks. Income and property values appear to be correlated with their willingness to pay as well. Those interviewees also expressed that non-market and unreimbursed losses were substantial when they experienced property loss by wildfire.

Gebauer, SB. 1997. Changes in prescribed burning policies and public perception in New York State, in *Proceedings: The Environmental Regulation and Prescribed Fire Conference, Legal and Social Challenges, Tampa FL, March 14–17, 1995,* DC Bryan, ed. Center for Professional Development, Florida State University, Tallahassee.

The author describes how prescribed burning was prohibited in forested lands in Adirondack and Catskill mountains and throughout the remainder of New York State until 1988, when a special law was passed that allowed fire management activities in the pine barrens of the Albany Pine Bush Preserve. However, the author points out that the effort to educate the public about prescribed fire lags behind. The author suggests that public education and trust play an essential role in ensuring the long-term success of prescribed burning programs.

Greenlee, JM. 1992. Oakland, California faces the beast—again. *International Bulletin Wildland Fire* 1(1): 8–10.

The author points out that although some citizens and administrators have learned lifelong lessons from the Oakland fire, many others will forget about it. The author argues that fire hazard preparation will not be improved because urban developers resist installing the expensive fire-safety measures needed in the wildland-urban interface. City governments do not want to lose tax bases, however, and will not press developers to make compromises. In the meantime, citizens respond negatively toward inadequate fire suppression systems of the government. The author argues that we must learn from the past, otherwise we will face the same type of catastrophic fire repeatedly in the future.

Gripp, C, and J Stumpf. 1985. Urban interface fire management problems, pp. 133–138 in *Proceedings: Fire management: The Challenge of Protection and Use, Tampa, FL, March 14–17, 1995,* JN Long, ed. Center for Professional Development, Florida State University, Tallahassee.

The authors point out that problems associated with fire hazards in the wildland-urban interface have become common in southern California. Many residents in the wildland-urban interface are not aware of the potential risk of wildfire. On the other hand, prescribed burning is being used because agencies realize that it is cost effective. However, the authors stress that prescribed burning should be attempted only when formal agreements are made. For example, states might follow the example of California in the passage of legislation that encourages property owners to become involved in burning programs on a cost-sharing basis. Provision for liability coverage might ease the fears of many residents, property owners, and managers. The authors suggest that fire agencies may have to be flexible and willing to try new approaches for dealing with issues in the wildland-urban interface.

Hirsch KG, MM Pinedo, and JM Greenlee. 1996. An international collection of wildland-urban interface resource materials, in *Information Report, Northern Forestry Research Centre (Canada), Northern Canadian Forestry Service, Edmonton, Alberta.*

The collection consists of a bibliographic listing of about 2200 wildland-urban interface resource materials. Most items in this collection were produced prior to 1993 and pertain to the United States, Australia, and Canada. They provide information on a diverse spectrum of topics related to fire management in the wildland-urban interface, ranging from building materials and hazard reduction techniques to disaster management, politics, and sociological issues. The citations have been categorized into more than 50 subjects and grouped according to three large categories: general and technical materials, newspaper articles, and public education materials.

Irwin, RL. 1987. Local planning considerations for the wildland-structural intermix in the year 2000, pp. 38–46 in *Proceedings of the Symposium on Wildland Fire 2000*, *South Lake Tahoe, CA, April 27–30, 1987,* JB Davis and RE Martin, ed. General Technical

Report PSW-101, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The author points out that California's foothill counties are being developed rapidly. All types of construction in former wildlands is creating a wildland-structures-wildland that is different from the traditional wildland-urban interface. The author describes the issues relating to fire in seven counties in California and fire statistics from 1970 to 1985. The author also discusses the potential fire situation for the year 2000, and reviews California planning law in relation to development. Local government and fire services have underutilized existing authorities in describing and mitigating fire impacts in the intermix. The author suggests that a stronger planning-related partnership between fire service and local government is needed. Finally, the author recommends the improvement of legislation, applied research, and strategic fire pre-planning.

Lavin, MJ. 1997. Managing fire risk to people, structures, and the environment. *Fire Management Notes* 57(4): 4–6.

The author points out that the wildland-urban interface fire problem has recently received increased national attention. The author insists that the risk of fire can be managed. However, it can be reduced only when landowners and residents cooperate with state and/or local agencies. The author suggests that managing fire risk in the wildland-urban interface is a shared responsibility. Federal, state, and local fire agencies are realizing that without homeowners' involvement little can be done to reverse the trend of fire losses from the wildland-urban interface. Thus, the wildland-urban interface is a political minefield.

Perry, DG. 1985. Wildland fires in the wildland/urban interface: evaluating the problem, in *Fire Management: The Challenge of Protection and Use: Proceedings of a Symposium, Logan, UT, April 17–19, 1985,* JN Long, ed. Department of Forest Resources, Utah State University, Logan.

The author indicates that the encroachment of people into the wildlands has created problems for municipal fire agencies. The major wildland-urban interface fire is common and almost an annual occurrence in southern California. Fire suppression in the wildland-urban interface is complicated by (1) poor access to structures, (2) poor road access, (3) poor addressing, (4) little or no fuel management activity in new construction areas, (5) steep slopes, (6) little or no past wildland fire history, (7) large wooden structures, (8) poor water systems, and (9) long response times. The author suggests that systematic fuel management is imperative in the wildland-urban interface. The author recommends the following actions: (1) educating property owners, (2) evaluating the fuel beds involved, (3) educating residents about prescribed burning, (4) developing a pamphlet on green belts and low flammability vegetation for property owners, (5) developing a master fuel management plan and maintenance schedule, (6) developing a budget for fuel management, (7) training fire personnel to conduct prescribed burning, and (8) holding a public forum to show that fuel management does not mean loss of aesthetics or degradation of the environment.

Rice CL, and JB Davis. 1991. Land-use planning may reduce fire damage in the urban-wildland intermix. General Technical Report PSW-127, USDA Forest Service, Pacific Southwest Research Station, Berkeley, CA.

The authors conducted a study of fire damage after a wildfire, along with general plans, local planning regulations, and the real estate development process in three counties in California. Their studies support the idea that good fire-safe planning protects homes threatened by fire, and that loss occurs in the absence of good planning.

Sommers, WT. 1988. Fire management in the wildland/urban interface—a challenge for research and management, in *Protecting People and Homes from Wildfire in the Interior West*: *Proceedings of the Symposium and Workshop, Missoula, MT, October 6–8, 1987.* General Technical Report INT-251, USDA Forest Service, Intermountain Research Station, Ogden, UT.

The author points out that although fire management issues in the wildland-urban interface have received increased attention, there is little information on the magnitude or significance of the problem. The author stresses that managers and researchers should define, describe, and quantify the wildland-urban interface from a fire management perspective. The behavioral sciences represent the area most critically deficient in knowledge about wildland-urban interface fire problems. Fire managers need to know how to work effectively with local governing bodies in implementing fire safety and risk-reduction programs. Finally, incentives that influence the residents' behavior must be understood.

Walt, HR. 1989. Current and future wildland fire protection impacts of the wildland-urban interface, pp. 3–7 in *Proceedings of the Symposium on Fire and Watershed Management*, *Sacramento, CA, October 26–28, 1988*, NH Berg, ed. General Technical Report PSW-109, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

The author points out that the wildland-urban interface has become a major fire issue in California. California Department of Forestry and Fire Protection (CDF) functions as a *de facto* rural fire organization that provides service not directly related to wildfire protection. People also expect emergency service for heart attacks or hazardous material spills and public assistance calls. The author predicts that the human population in the wildland-urban interface will continue to grow and that the local people will continue to expect services. The author suggests four imperative considerations for dealing with the above trends and situations: (1) make rural residents aware of the threat of wildfire, (2) have more thorough local planning for the effects of development related to wildfire, (3) address badly designed development patterns that give firefighters narrow access roads, unsigned structures, and no reserve water supplies, and (4) establish a centralized data base.

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