8

The Effects of Risk Perception and Adaptation on Health and Safety Interventions

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Human habitation has made significant intrusions into forested lands, particularly in the western United States, but in other parts of the world as well. At the interface of the natural and built environments, known as the wildland-urban interface (WUI), communities and property owners are exposed to the potential ravages of wildland fire. Efforts to manage these threats have led to outreach programs in which communities and homeowners can participate to protect themselves and their property from loss. Likewise, in the United States, a national fuel management effort has sought to reduce the burden of volatile fuels on national forests and has as one of its motivations the reduction of fire-related risk in the WUI. Both outreach programs and the national fuel program can be viewed as offering the public options for self-protection, and members of the public living in the WUI engage in self-protection when they abide by the behavioral recommendations of outreach programs and provide support to fuel management efforts.

Even casual observation reveals, however, that people who are exposed to the risks of wildland fire do not always abide by the recommendations and guidelines offered by fire management authorities to protect their homes and property by undertaking voluntary self-protective actions, such as providing a defensible space around dwellings and removing flammable materials from near buildings. Likewise, the public at large (including those exposed to the risks of wildland fire) is not consistently and uniformly supportive of hazardous fuel management programs that have as a prime objective the reduction of wildland fire risk. How can human behavior with respect to wildland fire risk be understood? What factors influence how those exposed to this risk

translate that exposure into voluntary self-protective behaviors? From an agency perspective, these questions are central to determining the potential success or failure of interventions intended to yield a public response that is consistent with the risks as analyzed by the agency. From a public perspective, they provide opportunities for insights into the factors that motivate voluntary self-protection in general and shed light on how risk-reducing interventions influence the people they are intended to benefit.

The Concept of Interventions

The concept of interventions is central to behavior change in a host of social contexts, particularly in the realm of health and safety. To intervene means to come in between one thing and another, such as a health service provider and its patients or a federal agency charged with protecting citizens' safety and the citizens themselves. Interventions can be thought of as intrusions into what might otherwise be a natural process of human response (or lack of response) to events or circumstances that pose the potential for harm, with the intention of altering one or more aspects of their knowledge, attitudes, or behavior in a beneficial way, at least as perceived by the developer of the intervention. A central assumption of most if not all interventions is that the economic or social cost of intervening is lower than that of not intervening and leaving people to adapt to potentially hazardous circumstances on their own. For example, we could allow people to learn through experience the potential risks and costs of exposure to wildland fire in the WUI, or we could decide to intervene in ways that promote risk-reducing behavior.

Interventions of various types share a set of common features. They are purposive, meaning they are developed based on a set of intentions, some of which are explicit (such as increasing homeowners' defensible space) and others of which may be implicit and more difficult to recognize (such as promoting public trust and confidence and fostering personal responsibility for outcomes). In some cases, interventions may be developed to impact directly one or more measurable objectives, generally having to do with knowledge, attitudes, or behavior in some targeted population of individuals, such as homeowners in the WUI. To the degree that clear objectives are part of an intervention, its efficiency and effectiveness can be evaluated or measured.

Interventions are often the result of a design process that takes into consideration a method or approach (media campaigns, town meetings, brochures, workshops) for impacting a population of interest and has some means of assessing or evaluating the strength of the implementation—how much intervention was achieved—and the effects of the intervention on outcomes of interest. The design process may be based on an analysis of risk or hazard, and to the degree that broad public knowledge of that risk or hazard is deemed important as part of the design process, the intervention may take on aspects

of risk communication. One of the most effective interventions ever developed for the fire community was the Smokey the Bear campaign to increase broad public awareness of wildland fire risks and promote public cooperation in reducing wildland fire potential, with its motto "Only you can prevent forest fires." It was so effective, in fact, that subsequent interventions to promote public awareness and acceptance of the positive value of fire in forest ecosystems may be attenuated in their effectiveness.

For many types of risks to public health and safety, including wildland fire, the public's understanding and experience of risk is often based, either wholly or in part, on the information environment to which they are exposed. That information environment has a number of sources, many of which are interventions of one sort or another. In the case of wildland fire, risk-based media campaigns and news reports are part of the basis for public perception of risk. Likewise, community interventions designed for the purpose of promoting defensibility in the WUI also make a contribution to the information environment. From a practical perspective, the matter comes down to how the targeted population's response to an intervention compares with the response intended by its developers. In this chapter, we take the perspective that voluntary response to risk-related interventions occurs as part of a dynamic and adaptive process by which individual and social factors interact.

Intervention Influence Factors

Behavioral and social scientists have long been concerned with the determinants of and conditions for behavior change, particularly how to motivate and maintain self-protective behavior. Areas of principal concern have been health and safety, where much effort has been expended to reduce the personal and social burden of mortality, morbidity, and property loss through interventions designed to promote self-protection. Examples are motor vehicle operation, alcohol use, smoking, diet, and exercise. In the arena of health-related behavior change, a number of models have been developed and extensively researched with an eye to improving the quality and effectiveness of health and safety interventions. These include the Health Belief Model (Janz and Becker 1984), theory of planned behavior (Fishbein and Ajzen 1975), protection motivation theory (Rogers 1983), transpersonal theory (Prochaska and DiClemente 1983), and Cognitive-Social Health Information Processing (C-SHIP) Model (Miller and Diefenbach 1998).

Interventions intended to produce self-protective behavior are generally implemented in a complex social context characterized by individual and sociocultural factors that influence the potential for behavior change. In the case of behavior change interventions that are based on risk assessment, as is often the case, many of these factors are not directly or even indirectly incorporated as part of the assessment that has identified a need for risk

mitigation. In the case of wildland fire risk, the analyses that identify and support the need for social interventions are based largely on technical or scientific models of ecosystems and the impacts of fire behavior on those ecosystems, as well as other models that characterize fire occurrence intervals, rates of spread, effects of fuel treatments, and other features of fire that relate directly or indirectly to the risk it poses to individuals and their property. Absent from these models is a detailed explication of the social factors that influence behavior change with respect to wildland fire risk. Thus agency analyses that characterize wildland fire risk do not model the social context within which risk mitigation takes place. This characteristic of wildland fire risk assessment is shared by risk assessment applied to other health and safety concerns.

A general conceptualization of the relationship among wildland fire risk assessment, risk mitigation, and behavior change influence factors is shown in Figure 8-1. Wildland fire risk assessment, in its various forms, leads to a characterization of risk as well as to the identification of changes or interventions that would reduce that risk. For example, the various recommendations made to homeowners regarding defensible space and other self-protective measures constitute an intervention based on risk assessment. The public and community support sought by fuel-treatment programs is also an intervention, in that it seeks to produce (and is partly dependent upon) positive public attitudes for prescribed fire and other forms of wildland fire risk reduction, such as brush removal and community defensible space. Interventions are subject to a number of influence factors, however, including individual cognitive and affective influences, as well as sociocultural influences.

Cognitive influences come in the form of knowledge, attitudes, and perceptions that guide how individuals respond to behavior change interventions. Many of the models that describe how behavior change occurs assume that people hold beliefs about the potential for harm, and in the absence of these beliefs, behavior change cannot be expected to occur. These can include perceptions of susceptibility to harm and its severity (Janz and Becker 1984), as well as beliefs about the outcomes or effectiveness of behaviors individuals might undertake to reduce harm (Fishbein and Ajzen 1975). Regarding wildland fire risk interventions, this suggests that people must believe that they are personally at risk, the risk is significant and severe, and their efforts to reduce that risk would be effective.

Perceptions of susceptibility may be influenced by the seasonality of fire and the low probability of its occurrence in a given location. Even if the annual probability of wildland fire is aggregated over time, the likelihood that a given homeowner would experience an immediately threatening fire is relatively low. The presence of other risk-mitigating factors, such as fire protection provided by local, state, and federal agencies, can reduce the perception of susceptibility even further.
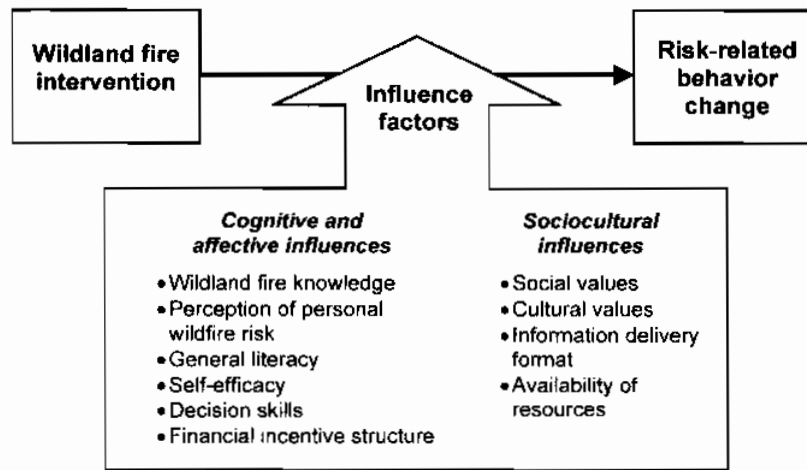
FIGURE 8-1. Model of Influence Factors That Affect the Impact of Wildland Fire Interventions on Risk-Related Behavior Change

For homeowners to take steps to improve their safety, they must first recognize the need to do so. Unfortunately, the general tendency with regard to health and safety risks is overoptimism, with people tending to evaluate themselves as less likely to suffer the consequences of a hazard than others. This tendency toward unrealistic optimism regarding one's personal chances of harm compared with that of one's peers has been the subject of much research across a range of health and safety hazards (e.g., Svenson et al. 1985; Weinstein 1989; Weinstein and Klein 1996).

Sociocultural Influences

In recent years, research on risk has become oriented toward the influence of social and cultural processes. The desire to take greater account of the cultural context within which risk is experienced has resulted from a growing realization that risk means different things to different people and that culture plays a role in how the concept of risk is understood by the general public. This strain was already evident in early cross-cultural risk perception work done in the psychometric paradigm (e.g., Englander et al. 1986; Goszczynska et al. 1991; Kleinhesselink and Rosa 1991).

Even though risk perceptions may bear a similar general structure among cultures, specific hazards can be viewed very differently, with significant implications for risk acceptance and management. For example, Karpowicz-Lazreg and Mullet (1993) found that risk perceptions of the French public generally matched those of the American public except for a few specific hazards,

among the most notable of which was nuclear power. Subsequent research has revealed that the generally greater acceptance of nuclear technologies on the part of the French is due in part to a greater public acceptance and trust in risk management and a greater need in France to rely on non–fossil fuel energy sources (see Slovic et al. 1996). Thus differences in cultural context can dramatically influence how risks are perceived, as well as the prospects for successful risk regulation and management.

More recent work has cast cultural factors in terms of worldview and orienting predispositions that are related to underlying values and beliefs. This line of research, based on cultural theory, has emphasized risk as reflective of what is important to people vis-à-vis the social institutions they create (e.g., Douglas and Wildavsky 1982; Perri 6 2005; Wildavsky 1988). Research on worldviews has highlighted simplifying strategies that predispose people toward different outlooks that have an influence over their judgments about complex risk issues, even though on the surface these worldviews appear to have little or no relation to risk (Buss et al. 1986; Cotgrove 1982; Dake 1991; Jasper 1990; Peters and Slovic 1996; Slovic and Peters 1998). Some of the more important worldviews identified to date include fatalism (e.g., "I feel I have very little control over risks to my safety"), hierarchist (e.g., "Decisions about safety risks should be left to the experts"), egalitarianism (e.g., "If people were treated more equally, we would have fewer problems"), and individualism (e.g., "In a fair system, people with more ability should earn more").

Cultural effects on risk perception can also extend to ethnicity groups and gender roles. For example, Flynn et al. (1994) studied the differential risk perceptions of males versus females as well as whites versus nonwhites. They found that white males consistently exhibited lower perceptions of risk across a wide range of societal hazards and concluded that the contribution of sociopolitical factors to the loss of personal control exacerbate perceptions of risk.

Cultural beliefs and values can lead to behaviors that directly clash with the behavior change objectives of health and safety interventions. For example, among some Pacific Island cultures, particularly native Hawaiians, the high cultural priority given to social and group values can lead to health-related behaviors, such as poor diet and insufficient exercise, that conflict with interventions emphasizing the need for individual behavior change (Mau et al. 2001). To be effective, behavior change interventions need to take account of cultural factors that conflict with their objectives.

Self-Protective Decisionmaking

For humans, many forms of self-protective behavior are instinctual and result from adaptive responses to environmental contingencies that have evolved over many successive generations (e.g., Wasserman et al. 2004). Not all forms of self-protection are so well encoded in our innate behavioral repertoire that they

have become second nature, however; indeed, some have argued that evolutionary mechanisms of adaptation have been outstripped by the rapidly developing industrial and technological world in which we live (e.g., Tooby and Cosmides 1990), leaving us adaptively deficient in ways that we may not fully understand. In essence, the world around us is changing at a pace that is more rapid than our species can evolve to meet the adaptive demands placed upon it.

Although humans have a natural aversion to fire and the damage it can do, fire has played a major role in the development of human societies. Historically, human societies have both feared fire as a natural, destructive force and used it to social and technological ends. The harnessing of fire by human societies represents one of the most profound changes in the ability of humans to achieve mastery and dominance over the natural world, increasing their safety and well-being. This dual nature of fire leads to its being a subject for decisionmaking (MacGregor 2006). Indeed, many members of the public encounter fire-related decisionmaking directly through plans for the use of prescribed fire as part of fuel management programs.

Interventions seeking to engage homeowners and community members in protective behavior carry with them both explicit and implicit decisions. Decisions are explicit when general guidance or direction is provided but the individual homeowners carry the responsibility for translating the intent of the intervention into the specifics of their unique circumstances. For example, an intervention that focuses on the concept of defensible space may provide a prototypical plan for clearing trees and brush around homes and for appropriate storage of flammable materials. These intervention components essentially provide design criteria by which decisions about self-protection can be made. To the degree that those targeted by the intervention are able to directly translate such design advice into decision alternatives with clear and evaluable outcomes, the intervention may be more successful in achieving its objectives.

Decisions about self-protection are implicit when they involve factors, considerations, or criteria beyond the apparent scope of the intervention; frame the intervention (and its associated self-protection) as an alternative to other actions or protections that could be undertaken; or both. For example, fire-related self-protection decisions implicitly involve an expenditure of homeowners' resources (time and money), though these factors may not be explicitly addressed in the intervention through compensations or other incentives, such as personal recognition. A mismatch between the incentive structure for self-protection as conceptualized by those fielding the intervention (agencies) and one that would be accepted by those targeted by the intervention (homeowners) can degrade the performance of an intervention, particularly when time and monetary resources take on sufficient weight to dominate long-term fire risk in the process of evaluating decision alternatives (e.g., Kahneman and Tversky 2000).

A second source of implicit decisions relating to self-protection arises from competing interventions that can lead to metadecisions about which of a number

of interventions to address. In these conditions, individuals may be faced with a resource allocation problem, in which a number of interventions may have to compete for homeowners' resources. This category of implicit decisions can be made more complex by interventions that involve conflicts and trade-offs with other interventions that call upon members of the public to either self-protect or engage in risk management along other lines. For example, Monroe et al. (2003) examined a range of social interventions targeting Florida households. They found multiple entities simultaneously fielding interventions relating to wildfire risk reduction, wildland habitat enhancement, and energy, water, and soil conservation. Although all of the interventions involved the reduction or mitigation of risk, adherence to some interventions conflicted with the goals of others. For example, energy conservation interventions emphasized planting trees near residences to provide summer shade, while wildland habitat enhancement interventions called for layering native plants near houses. Water conservation interventions promoted lowering water use, while soil conservation interventions called for increasing vegetative cover. The means proposed by all of these interventions potentially conflict with some of the steps that wildland fire interventions call upon homeowners to take. Such a situation can lead homeowners to frame social interventions relating to the natural environment as a decision problem concerning which of a number of interventions to address, particularly if the interventions do not provide guidance on how to resolve the conflicts inherent in their proposals. Given the long history of research on human judgment and decisionmaking, which has identified the central role of problem simplification in how people reconstruct and reorder complex decision environments, it is likely that those targeted by a range of competing and seemingly conflicting interventions will either ignore all of the interventions or choose a subset of actions that are the easiest or least costly things to do.

Decisionmaking Capabilities and Skills

Decisionmaking capabilities are an important determinant of whether those targeted by an intervention are able to put it into action as intended by its designers. Although people routinely make decisions as part of everyday life, research on the quality of their decisionmaking performance suggests that in many contexts, their choices may be suboptimal, take too little account of important information, and be overly influenced by emotional factors. In some circumstances, individuals may put themselves at serious health and safety risk because they lack an appropriate decision model of their situation. For example, potential victims of "date rape" often do not see possible compromising situations as a series of decision points with alternatives and tend to accept the outcome of a dangerous situation as an inevitable sequence of events. Providing individuals potentially exposed to such situations with a decisionmaking

problem model has been found to promote greater awareness of self-protective behaviors (e.g., Downs et al. 2004). Likewise, some homeowners may perceive wildfire risk as an inevitable aspect of their decision to live in the WUI and need similar prompting to stimulate self-protective decisionmaking.

Research has identified a number of criteria for decision competence, including the ability to understand and remember relevant information, structure a decision's dimensions and alternatives, appreciate the personal significance of information, temper impulsivity, and rationally integrate information and reason about it (Applebaum and Grisso 1988; Finucane et al. 2002; Rosenfeld and Turkeheimer 1995).

For wildland fire risk interventions, the concept of decision competence signals some important considerations. Interventions are often developed and fielded with little attention to how they interact with the decisionmaking skills of the targeted population. Although language factors such as readability are often addressed, other important decision components, such as an information integration model, are lacking in intervention design. As a result, interventions tend to focus on desirable behavior, such as clearing away vegetation, but give little attention to the decisionmaking elements of the behavior: How much is enough? Which should I do first? Second, the decision competence concept emphasizes individual variability and differences in decisionmaking. Whereas people vary in their decision competencies according to age, experience, sociocultural circumstances, and education, interventions tend to be designed as "one size fits all." Third, the notion of decision competence implies that decisionmaking is skill-based and deficiencies can be remediated by careful intervention design and training. For example, information interventions could pose decisionmaking scenarios relevant to some common dilemmas that targeted populations face, such as how to decide among alternative steps homeowners could take to reduce the risk of wildland fire damage, assuming that they do not have the resources—time, money, physical ability—to do everything possible.

The Social Amplification of Risk Framework and Risk Adaptation

Over the past three decades or so, a great deal of research has been dedicated to the topic of risk, including its perception, communication, and management. One of the primary motivations for research interest in this general area is the disparity that exists between risk as defined and assessed by technical experts and analysis and risk as perceived and reacted to by the general public. In particular, technological risks that have been gauged as relatively low by technical standards, such as nuclear power and industrial chemicals, have met with a disproportionately large reaction from nonscientists (e.g., Slovic 2003). Laypersons tend to perceive these risks as much greater than would be

expected based on quantitative risk measures such as expected loss or annual fatalities. Explanations for this disparity generally have been based on qualities of risks and hazards that are associated with their social context (for example, familiarity, voluntariness, or equitability), including the role and nature of media reporting (Flynn et al. 2001) and institutional factors associated with risk management (Freudenberg 2003).

A conceptual framework that captures the richness of social response to risk is the Social Amplification of Risk Framework (SARF) (Pidgeon et al. 2003). SARF uses the metaphor of a physical "amplifier" to characterize how various stages of individual and social processing act to interpret and magnify risk events, thereby giving them meaning, and leading to impacts that spread outward from individuals initially affected by the event (the victims) to higher level organizations such as government agencies or companies, and perhaps ultimately to larger social enterprises such as land and fire management in general. Within the framework (see Figure 8-2), a dynamic process of interaction takes place between factors associated with individuals (personal experience, perceptions, evaluation processes, and so on) and social agents, such as media or social groups. The process is influenced as well by perceptions and attitudes that society holds for agencies and organizations associated with the risk management process, including the trust and confidence people have in the organization, the perceived quality of past experience of the organization in managing risks, and the ability of the organization to cooperatively address public issues.

Through processes akin to a social network, these interactions serve to impose meaning on a risk event and to modulate individual and social responses, often with the general result of amplifying its impact through "ripple effects" analogous to "dropping a stone into a pond" (Pidgeon et al. 2003, *16*). The framework has been used to account for risk events that have drawn stronger social reactions than seem warranted based on technical criteria such as lives
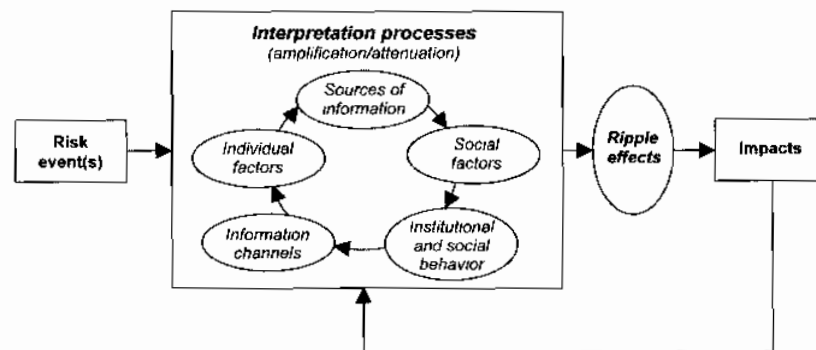

FIGURE 8-2. Major Components of the Social Amplification of Risk Framework

lost, for example, health-related food risks (e.g., Finucane and Holup 2005; Frewer et al. 2002) and the stigmatizing effects of risk-related events on private property values (Flynn et al. 1998).

A less-studied aspect of SARF is its potential explanatory power for understanding the role that adaptive processes play in attenuating individual and social responses to risk. We can think of these responses as self-management of risk, which are adaptive in the sense that they occur in response to environmental contingencies (events and circumstances) and lead to the subjective experience of stability in the individual (Piaget 1952; Wasserman et al. 2004). The essence of adaptation is in the nature of response to change or variability, and in the case of risk-related events, that change comes about as part of the interpretive aspects of SARF and its associated ripple effects. These effects or impacts provide a stimulus for adaptive response, which may take the form of either assimilation or accommodation. Assimilation occurs when a risk-related event is interpreted and integrated within the individual in terms of preexisting cognitive or emotional structures, such as associations to previous experiences or evocation of familiar emotional responses. Recent research has identified the central role played by emotional and affective processing in the experience of risk (e.g., Loewenstein et al. 2001; Slovic et al. 2004), suggesting that not only cognitive but also emotional familiarity is part of risk adaptation.

Accommodation occurs when a risky event leads to either modification or reorganization of risk-related attitudes and perceptions, or to changes in behavioral regimes that influence risk perception. For example, the various dimensions associated with the "psychometric paradigm" of Slovic and colleagues have been widely researched as a general framework for risk perception, including controllability of exposure, familiarity, and predictability (e.g., Slovic 2003). These same dimensions can also be viewed, at least in part, as a framework for adaptation through accommodation: individuals are motivated, through behavior, to make the less controllable more controllable (as by reducing exposure), the less predictable more predictable (as by attending to information), and the less familiar more familiar (as by gaining experience). In the case of wildland fire, Loomis et al. (2001) found that Florida residents who became more knowledgeable about prescribed fire also became more tolerant of prescribed-fire risks, suggesting that educational interventions can increase familiarity and decrease risk perceptions.

Risk Adaptation and Y2K

An example of risk adaptation can be seen in the public response to the Y2K phenomenon. As the world approached the change of the millennium, intense public interest became focused on the possible consequences of potential failures in computer technologies expected to arise from the mechanism for storing and calculating dates. Much effort was expended by government

and industry to ensure that critical computer systems had been properly "debugged." Although technical experts generally predicted that problems were likely to be either nonexistent or minor, they could not conclude with certainty that no problems would occur. Thus the broad public, exposed to an array of press reports concerning Y2K and its possible consequences for their lives, could only conclude that the problem was not completely understood and sure solutions had not been achieved.

A series of national-level survey studies conducted in 1998 and 1999 examined the time course of public reaction to the Y2K phenomenon (MacGregor 2003). The results showed that as respondents became more aware of the Y2K issue and its potential meaning for their personal lives, they became less concerned and tended to see the problems occurring from Y2K as of lesser duration. In addition, with greater awareness of the Y2K issue, they also were more likely to undertake greater self-management to decrease (ostensibly) its potential impact on their personal lives. Thus the more media attention was paid to the Y2K issue, the more concerns about it were translated into adaptive responses to the potential risk in the form of personal protective actions, such as avoiding air travel, stockpiling food and water, and withdrawing cash from the bank. The change in public concern over the course of the two years leading up to Y2K may reflect an attenuation of risk through mechanisms of self-protective, adaptive response. Thus concern is transformed through, for example, the "work of worry" (e.g., Janis 1958; MacGregor 1991) into a productive risk management strategy that is itself an adaptive response to a risk issue.

Risk Interventions and Risk Adaptation

For many categories of risk, public awareness becomes enhanced through risk-related interventions. These interventions can take many forms, including media events, brochures, and community programs, undertaken to promote awareness and understanding of a risk issue and sometimes behavior change. One can also view interventions in the context of SARF and consider them to be a form of risk event, by which the general public and other social institutions become aware of a risk and subsequently engage in a process of interpretation and translation that leads to some sort of change, in knowledge, attitudes, or behavior. The dynamic character of SARF as a model of social risk response states that these changes themselves feedback and influence the interpretation and translation processes on which the response is based. Thus perceptions of a risk targeted by an intervention are themselves modulated and potentially attenuated by the adaptive behavior the intervention is designed to provoke, leading to a stability or equilibrium of risk-related response to an intervention.

In the case of wildland fire interventions, particularly those designed to promote behavior change, this suggests that as individual homeowners undertake

protective actions in response to an intervention, perceptions of wildland fire risk will decrease, thereby decreasing the potential for further or additional protective actions. It is conceivable that nonlinearities also exist with respect to the effect of taking any protective actions on perceptions of wildland fire risk. For example, homeowners who take one protective action from a suite of possible protective actions may attenuate their risk perceptions sufficiently to reduce the potential for further actions. Interventions need to be studied carefully as part of evaluation to determine their ultimate impact on behavior change and to determine as well the relationship of incremental behavior change to the attenuation or amplification of wildland fire risk perception.

Conclusions

In this chapter, we have detailed the multitude of factors that influence how people manage the risks and hazards of daily life. The heart of the matter lies very much in the idiosyncratic nature of humans, their society, and their culture. People are not the same everywhere, and the differing individual and social values they hold exert strong influences over how and when they engage in self-protective behavior. To complicate the picture, behavior change interventions can overreach in terms of what they hope to achieve. This may be particularly so in the case of wildland fire management, where years of intervening may be required to observe a demonstrable change in human behavior, and even longer to affirm (or disaffirm) that such changes bear a relationship to outcomes such as property losses or fire management costs. If a policy lesson is to be learned here, it is that interventions to change public attitudes and behavior concerning wildland fire should be long-term and specific to targeted populations. Based on the diverse research outlined in this chapter, the likelihood of success is increased to the degree that research is applied to understanding better the people, the problem, and the interaction of the two.

Although we believe that education is a tool for improving public awareness and understanding of wildland fire as a risk problem that individuals need to address according to their specific exposure circumstances, education alone is not enough. Ultimately, the myriad decisions people make as part of their daily lives will take appropriate account of wildland fire risk only if their decision-making skills are sufficient and the behaviors they undertake are done with a realizable expectation that they will be effective in terms that are meaningful to them. Risk-related behavior is adaptive, dynamic, and highly sensitive to social context. The challenge is to develop potent interventions that emphasize the maintenance of change through ongoing intervention and the involvement of community leaders.

Acknowledgments

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