Managing Forest Disturbances and Community Responses: Lessons from the Kenai Peninsula, Alaska

Courtney G. Flint and Richard Haynes

ABSTRACT

Managing forest disturbances can be complicated by diverse human community responses. Interviews and quantitative analysis of mail surveys were used to assess risk perceptions and community actions in response to forest disturbance by spruce bark beetles. Despite high risk perception of immediate threats to personal safety and property, risk perceptions of broader threats to community and ecological well-being were found to be more likely to influence participation in community action. Results imply that increased dialogue between resource managers and local community residents contributes to broader risk assessment and prioritization of risk mitigation strategies. Identifying community risk perceptions, tapping into local capacities for action, and accepting controversy facilitate sound decisionmaking and give voice to local concerns regarding risk mitigation after forest disturbance.

Keywords: community action, community response, forest disturbance, risk perception, spruce bark beetles, natural resource management

Managing forest disturbances by insects can be challenging given the cascading nature of such events that often leads to further disturbances and related risks, particularly fire and falling trees (Dale et al. 2001), but human dimensions of forest disturbances exist as well and forest management is complicated further by the varying ways in which local human communities respond to changing landscapes and forest management approaches. These responses can either facilitate or impede agency strategies.

In Alaska, a massive spruce bark beetle outbreak swept across the Kenai Peninsula in the last 20 years killing spruce trees across over a million acres with up to 90% tree mortality (Ross et al. 2001). This forest disturbance dramatically changed the appearance of the landscape and affected the lives of local people. The communities on the Kenai Peninsula each responded in different ways to these changes, further complicating forest and natural resource management (Rapp 2005). This article will discuss the dynamics of the Kenai Peninsula community response to forest disturbance and strategies for natural resource managers.

The Kenai Peninsula Spruce Bark Beetle Outbreak

The spruce bark beetle (*Dendroctonus rufipennis*) is endemic to Kenai Peninsula forests, but the outbreak that emerged in the 1980s lasted 20 years and was unprecedented in terms of tree mortality and spatial extent (Ross et al. 2001). Summer temperatures have increased in South Central Alaska over the last 20 years, reducing beetle regeneration time and host tree resistance (Ross et al. 2001). The spruce bark beetles devastated area forests, especially in the southern half of the peninsula dominated by a near monoculture of white spruce (*Picea glauca*) or a hybrid Lutz spruce (*P.* x *lutzii*). Years of fire suppression and little timber harvesting left large, slow-growing trees, which are preferentially attacked by beetles (Holsten 1984, Ross et al. 2001). The biophysical impacts of massive tree mortality by beetles include changes in watershed dynamics, fish and wildlife habitat, and vegetative cover (Ross et al. 2001). A primary concern for forest management is the increased fuel load linked to an abundance of dead trees and rapid growth of invasive grasses, especially bluejoint reed grass (*Calamagrostis canadensis*; Ross et al. [2001]).

Forest management strategies from multiple agencies, including the Chugach National Forest, Alaska Division of Forestry, and the Kenai Peninsula Borough, focused on reducing fire hazard by removing dead trees. Community residents responded in very different ways to these efforts. In some communities, fire hazard mitigation was a high priority and people were frustrated by how slowly timber harvesting progressed. In other communities, residents saw the spruce bark beetle as a natural phenomenon and strongly opposed logging in the interest of letting nature run its course. Some residents questioned whether fire hazard was as high as forest managers suggested and some suggested that other concerns might be more important than fire hazard. This disparity eventually was seen as a problem by forest managers. The USDA Forest Service, including State and Private Forestry in Alaska and the Pacific Northwest Research Station, recognized the need to un-

derstand the nature of diverse community responses and their effect on forest management and funded a 3-year community study on the Kenai Peninsula.

Kenai Peninsula Community Research

The objectives of the Kenai Peninsula community research included assessing community perspectives on spruce beetle impacts and risks, attitudes about forest management, and factors influencing community action in response to forest-related risks (Flint 2004, in press). Management questions were framed at the community level of analysis. Thus, while the larger landscape scale of the Kenai Peninsula provided a contextual setting and individual attitudes and behaviors helped articulate important processes involved, study hypotheses and research design were oriented toward the community scale. This research also is framed in the context of rural sociology and as such it differs from a more individual-level analysis that might be undertaken with a social or environmental psychology framework.

The six Kenai Peninsula communities studied were Homer, Anchor Point, Ninilchik, Seldovia, Moose Pass, and Cooper Landing (Figures 1–5). They were selected for study using a criterion-based typological approach to assure that these communities broadly represented the array of local experiences with spruce bark beetles, land jurisdiction settings, the presence of Alaska Native associations and residents, and local governance structures.

This study used multiple methods to bridge theoretical and empirical approaches. Secondary data from the US Census, forestry reports, and local newspapers and histories were used to understand the context of the Kenai Peninsula communities and the ecology of the region. Interviews were conducted with 115 key informants or local residents who were representative of each study community (Krannich and Humphrey 1986). Key informants for interviews were selected from a wide range of categories to ensure representation from multiple perspectives within each community (Jackson et al. 2004). Interviews were tapped, transcribed, analyzed thematically, and reviewed by an impartial reader to ensure accurate interpretation (Dunn 2000). These interviews provided contextual understanding of the impacts of the spruce beetle at the local level and a sense of how communities responded.

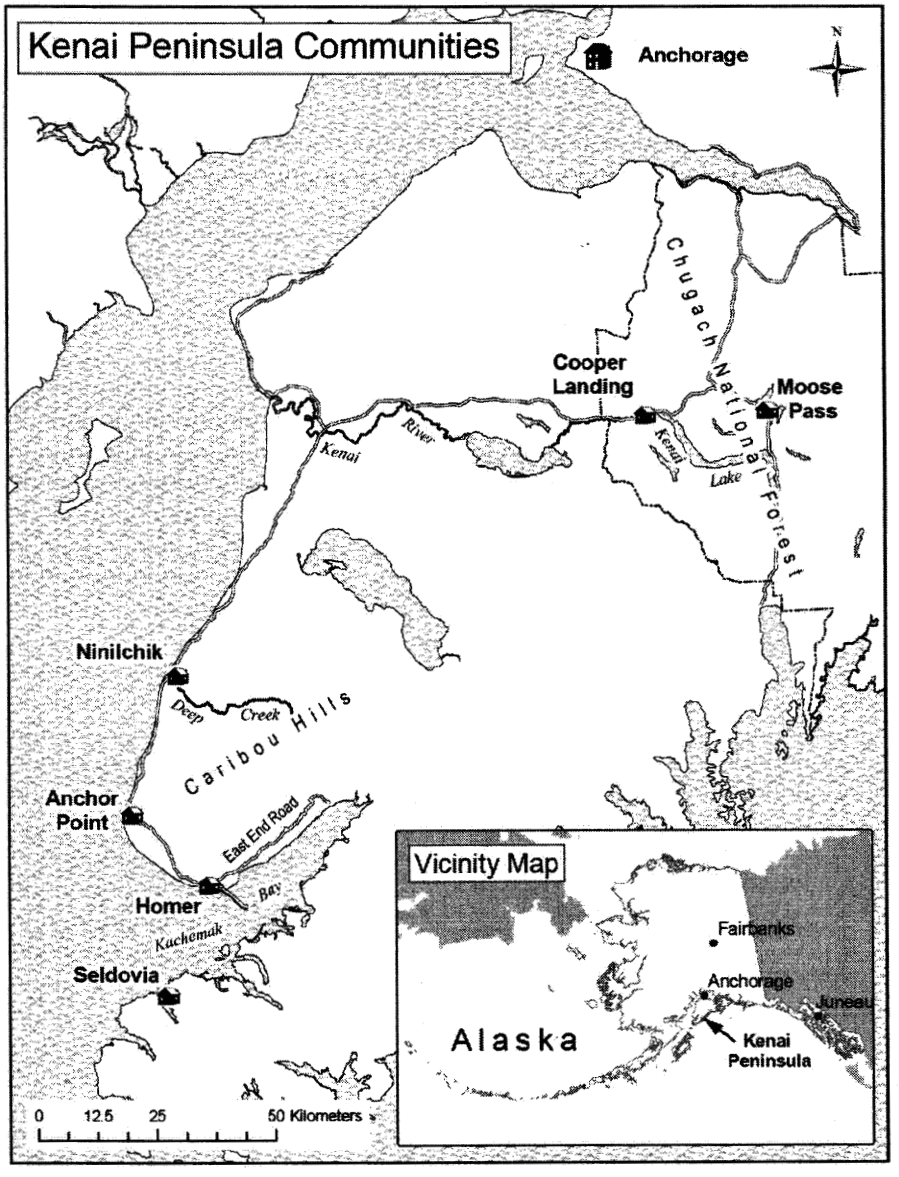

Figure 1. Kenai peninsula and study communities. (Figure by G. Greenberg.)

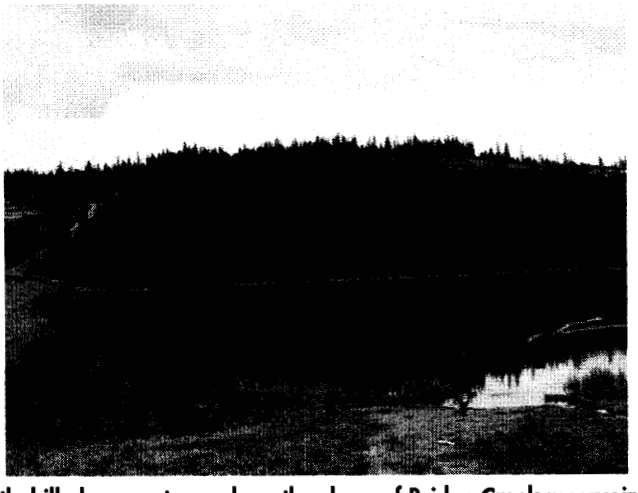

Figure 2. Beetle-killed spruce trees along the shore of Bridge Creek reservoir, which is the primary water supply for Homer, Alaska. (Photo by C. Flint.)

The qualitative analysis of these interviews was used to inform the construction of a mail survey to which 1,088 local residents responded (a 46% response rate). Survey results provided perspectives from larger community populations. Survey data were analyzed using descriptive statistics, factor analysis, and multivariate ordinary least squares (OLS) regression to evaluate factors influencing risk perception and community action in response to risks stemming from the spruce bark beetle.

Key Findings from Kenai Peninsula Community Research

Community risk perception and community action were two primary components of the community research. The concept of risk has evolved from a mathematical calculation of the probability of loss (Knight 1921) to a more subjective, vague term referring to the possibility of loss or a negative event, including uncertainty. Following Fitchen et al. (1987) and Wulfhorst and Krannich (1999), community risk perception was defined as collective expressions of anxiety, fear, or concern due to a commonly understood threat of loss or harm to residents, property, or values. In this case, risk perception was framed in the context of shared concerns about potential threats from the spruce bark beetle outbreak. Risk perceptions, or social constructions of risk, often are excluded from technical risk assessments (Cothern 1996) but, nevertheless, have important implications for how risk management strategies resonate with local residents and have the potential to influence the actions people will take to protect their community interests and values (Fitchen et al. 1987, Hannigan 1995).

Community action was interpreted as the mobilization of collective resources in direct response to the spruce bark beetle outbreak and forest management. Communities are more likely to take action when they feel threatened (Tilly 1973), but such action is not automatic and often depends on structural conditions and the interactional capacity to work together on community issues (Luloff and Swanson 1995, Flint and Luloff 2005).

Interactional Capacity. Interactional capacity is a concept derived from community theory about how community residents work together to mobilize collective resources in times of need or disturbance (Wilkinson 1991), but the concept is not at opposition with other efforts to assess community capacity (Kusel 1996) or resiliency (Harris et al. 2000) in forest-based communities. In this study interactional capacity was assessed through interviews to determine general levels of community activeness

Figure 3. Flooding in 2002 left beetle-killed trees lining the Anchor River and altered salmon habitat and river access. (Photo by C. Flint.)

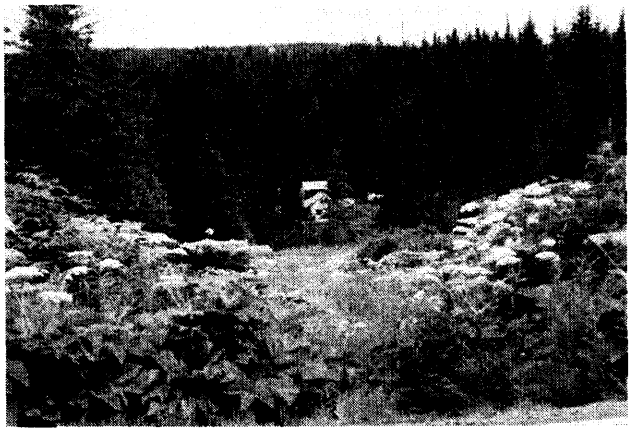

Figure 4. House between Homer and Anchor Point, Alaska surrounded by beetle-killed spruce trees. Many residents lamented the loss of privacy as trees fell or were harvested. (Photo by C. Flint.)

Figure 5. Moose Pass, Alaska was found to be an active community, particularly regarding conflict over management of the nearby Chugach National Forest. (Photo by C. Flint.)

and in survey questions where respondents were asked about their participation in community events, public meetings, organizations, local issues or problems, and communication with local officials.

Interactional capacity was found in both the interview and the survey data to be highest in Homer, Moose Pass, and Cooper Landing and lower in Ninichik, Anchor Point, and Seldovia. In the statistical analysis of survey data in aggregate and by community, interactional capacity was found highly significant in its influence on participation in community action, specifically targeted to forest disturbance issues ($P < 0.001$ with varying levels of added explanatory power from 4 to 30% in multiple regression analyses depending on which community). In other words, in communities where residents were active participants in general, they were more likely to get involved in collective actions to address forest disturbance impacts and risks.

Community Risk Perceptions. Kenai Peninsula residents perceived a broader array of impacts and risks associated with the spruce bark beetle outbreak than typically identified in forestry literature on forest disturbances by insects (Flint, in press). Key informant interviews revealed eight consistent concerns about risks including forest and grass fire, falling trees, loss of watershed quality, fish and wildlife habitat deterioration, and future threats to community interests such as community identity, scenic and aesthetic quality, and economic resources. Fire hazard was a concern for many residents. In Anchor Point, where fire risk perception was high, one resident voiced a common concern:

> There is a huge anxiety now because there are so many dead trees that the risk of fire hazard is so high. That's a definite anxiety. People are worried. It's not if a big fire will come, it's when.

But in other communities, fire hazard was perceived as declining or not as serious as forest managers suggested. This quote from a Homer resident shows a different perception of fire risk:

> I think there is a fair amount of fear of forest fire. I'm not sure it's entirely justified. Typically, we're pretty damp here all the time. There are occasions when it gets dry enough that the risk of extensive destructive forest fire is real, but it's not very frequently that dry. Every year we've been warned to be prepared for the big burn. But, it hasn't come yet and hopefully it won't. Probably the period of greatest risk is past and it hasn't happened.

Table 1. Varimax rotated factor loadings for risk perception items.

Factors/items	Factor 1	Factor 2
Immediate threats to property and safety		
Concern about forest fire	0.136	0.880
Concern about grass fire	0.207	0.763
Concern about falling trees	0.248	0.729
Broader threats to community and ecological well-being		
Concern about decline in fish and wildlife habitat	0.786	0.167
Concern about increased erosion and runoff	0.774	0.229
Concern about loss of community identity	0.831	0.141
Concern about loss of forests as an economic resource	0.556	0.284
Concern about loss of scenic/aesthetic quality	0.782	0.166
n	1,046	1,008
Eigenvalue	2.951	2.095
Cumulative variance (%)	36.883	26.185
Cronbach's alpha	83	74

Risk perceptions beyond fire hazard concerns also were illuminated, including concerns about loss of privacy or quality of life and the potential for negative effects on watersheds, habitat, and local economic interests. An Anchor Point resident revealed concerns about privacy, water, and fish habitat, which were mentioned frequently across the communities (Figures 2-4):

> We're losing the trees—now you can see what your neighbor lives in. These trees don't grow that fast so our generation is going to continue to see into his neighbor's house. I'm also concerned about what it does to the absorption rate that the trees provided. Now, it leaches through the ground and floods. I do think that's an unknown. I do think there's gonna be an impact on our sport fishing and on our climate and things that we can't anticipate.

Risk perception information obtained through analysis of interview data was used to construct mail survey questions about the eight aforementioned risks. Responses to the eight risk-related survey questions ranged from "1" for "not concerned" to "5" for "extremely concerned."

Factor analysis of aggregate data revealed that risk perceptions fell into two distinct factors: (1) immediate threats to personal safety or property (including forest fire, grass fire, and falling trees) and (2) broader, longer-term threats to ecological and community well-being (including increased erosion and runoff, loss of habitat, loss of forest as an economic resource, loss of scenic and aesthetic quality, and loss of community identity). The terminology distinction is not meant to imply that fire does not have broader impacts in addition to the immediate hazard. Table 1 shows the results of the factor analysis using varimax rotation and principle components extraction (Kim and Mueller 1978). The two resulting risk perception factors were correlated, but not collinear. Cronbach's alpha-reliability coefficients for the two factors were 0.74 for immediate threats to property and safety ($\bar{x}$ = 3.77; SD = 1.02) and 0.83 for broader threats to well-being ($\bar{x}$ = 3.24; SD = 0.91). Immediate threats to property and safety were of greater concern than broader threats in all communities. Both categories of risk perception were found to be highest in Anchor Point and Ninilchik, followed closely by Homer, revealing a somewhat higher risk perception than found in Homer interviews.

Risk Perception and Community Action. Heimer (1988) wrote that situational contexts frame risk-decision behavior and that uniformity in action should not be expected. Research findings from the Kenai Peninsula experience with spruce bark beetles support this position. In Homer, Moose Pass, and Cooper Landing, Alaska, community actions were commonplace as residents worked together to learn more about forest disturbance, mitigate risks, and assert their position regarding forest management decisions and strategies. A Homer resident described local beetle-related activities:

> There's lots of co-ops where people are cooperating together to bring a logger in to clear their land and minimize fire risk and facility risk. That's just people working together at the neighborhood level. Many organizations have sponsored information panels and forums—the chamber is one of them, the land trust, the fire department. Lots of local groups have sponsored speakers and informational panels.

In Ninilchik, Seldovia, and Anchor Point, although individuals often took action on their own property, there was less participation in community actions. A Ninilchik res-

ident described the more individual scope of activities:

> I wrote letters to the borough and to the mayor and different people telling them that the private individuals needed help down here and we got nothing. So what did I do? I hired contractors to come in on my little piece of property here. I paid about $7,000 at least to clean it up. Each individual has his own little grove of trees and that's it. What goes on a quarter of a mile from there, they don't care about.

The community-related actions illuminated in key informant interviews were included as questions in the mail survey. Respondents were asked if they had participated in any of the following community actions: (1) participation in a neighborhood or community effort to clear trees, (2) participation in community cone or seed gathering, (3) attendance at an informational meeting, (4) attendance at meetings or other actions to oppose timber sales on borough or state land, (5) attendance at meetings or other actions to support timber sales on borough or state land, (6) clearing public trails, (7) consulting with public officials or foresters, and (8) participation in efforts to preserve natural forests. Factor analysis of actions taken revealed that all eight types of community actions held together reliably as one factor (alpha-reliability coefficient = 0.63). Responses to these eight questions were summed for a composite community action score with values ranging from 0 to 8 ($\bar{x}$ = 1.49; SD = 1.59). Survey data on community actions in response to forest disturbance revealed that Cooper Landing and Moose Pass had the highest levels of action, followed by Homer (Figure 5). Community action in Seldovia, Anchor Point, and Ninilchik were lowest. These results mirror the qualitative findings from the interviews.

The bivariate relationship between the two risk perception factors and the community action composite index was evaluated for the aggregate data from all six Kenai Peninsula communities (n = 1,046). While risk perceptions of immediate threats to personal safety and property ($\bar{x}$ = 3.78; SD = 1.02) were higher on average than broader threats to ecological and community well-being ($\bar{x}$ = 3.22; SD = 0.91), risk perception of broader threats was positive and significant in its influence on participation in community action (r = 0.09; $P < 0.01$). Risk perception of immediate threats was not significant in its influence on community action. This relationship between risk perception and community action was the same using aggregate data in an OLS multiple regression analysis that included additional variables regarding socioeconomic characteristics, experience with emergencies, and interactional capacity (Flint 2004). These results suggest that, in general, although local residents were seriously concerned about fire and other immediate risks, what motivated them to participate in collective actions was related to broader environmental and community values.

Examining data at the community level, the aforementioned relationships between the two risk perception factors and community action held for Homer, Cooper Landing, Moose Pass, and Seldovia, but not for Anchor Point or Ninilchik. In fact, for Anchor Point, the reverse was found to be the case and immediate threats were positive and significantly related to community action, while broader threats were not. This highlights that attention to community differences in response to ecological disturbance even within the same landscape is important.

Implications of Kenai Peninsula Research Findings for Forest Disturbance Management

The multidimensional aspects of risk perception and community action found on the Kenai Peninsula have implications for broader forest management and policy related to forest disturbances. Because risk assessments typically do not attempt to illuminate or measure risk perceptions, an exclusive focus on more acute threats to personal property and safety may miss broader risks perceived by local residents. Despite the perception by forest managers that fire hazards would or should motivate residents, broader risk perceptions were shown in the Kenai Peninsula research to be more likely to galvanize local action. Engaging local residents and giving them an opportunity to raise concerns about risks related to forest disturbance contributes to broader, more inclusive risk assessments.

One of the primary management concerns with forest disturbance by insect infestations, especially in the western United States, is the risk of fire. But as the Kenai Peninsula study shows, other risk dimensions regarding broader threats to community and ecological well-being should be incorporated into policies and decisionmaking frameworks. An exclusive focus on reducing risk of catastrophic wildfire, as in the Healthy Forest Restoration Act of 2003, may exclude other critically important risks inherent in forest management from the forefront of forest policy. One-size-fits-all policies are unlikely to restore or maintain the integrity of ecosystems (Quigley and Bigler Cole 1997).

Supporting the role of public involvement in forest management ensures that broader risks are articulated and addressed in environmental decisionmaking. Listening to community residents highlights their sense of real issues, conditions, and concerns (Fitchen 1990). Although open dialogue generally improves community-agency relationships, a more specific benefit of such communication relates directly to managing forest disturbances. Including community risk perceptions in risk assessments identifies high priority areas of agreement regarding risk mitigation as well as areas and issues of potential conflict where more sensitivity may be needed before the expenditure of considerable time and resources.

Although many residents from the six Kenai Peninsula study communities articulated concerns, impacts, and risks associated with the spruce bark beetle, research showed that not all communities had the same capacity to act collectively. Community action in response to a particular threat is not automatic. It emerges and builds on existing interactional capacities among residents to effectively mobilize resources in the name of community interests and values (Luloff and Swanson 1995). Community action is often facilitated by the presence of local groups or key leaders that link people together as a whole community (Wilkinson 1991). Leadership often is exercised in different ways in different communities. Local advisory planning commissions or influential local leaders often act as representatives of diverse community interests and provide a bridge between government or resource management agencies and local community residents. Where interactional capacity in communities is high and these types of bridging groups are present, natural resource managers may find it useful to tap into this local energy to facilitate the transfer of information and encourage public involvement in forest management. Often, these local groups and influential leaders help facilitate the involvement and commitment of disparate parties to face a common problem such

as a large-scale forest disturbance (Wondolleck and Yaffee 2000).

A couple of cautions are necessary related to community activism. Active communities such as Homer, Moose Pass, and Cooper Landing, Alaska, are able to mobilize resources and draw attention to local concerns and vulnerabilities by collectively waving hands high to say, "We're at risk and we're willing to work together to protect our interests!" The flip side of this, however, is that other communities, Anchor Point, Ninilchik, and Seldovia, Alaska, lacked the interactional capacity to coordinate efforts regarding their concerns despite high risk perceptions and technically assessed risks. Relying on visible local collective actions to identify community risk perceptions may mask critical needs of communities that are unable to work together. Residents in these seemingly quiet or unorganized communities may have similar or higher vulnerabilities and risk perceptions but may be collectively less able to articulate and act on them. It also should be kept in mind that the actions taken in the name of a community might not be truly representative of the population as a whole. In Homer, Alaska, local efforts to resist timber harvesting by blocking state and borough timber sales represented a position that did not reflect the views of a more silent segment of the population with greater faith in the forest industry. It is imperative to understand the motivations and degree of consensus behind local actions to ensure that voices are not being marginalized.

The Kenai Peninsula community research also made clear that community action was not always based on consensus. There was clearly a role for conflict. A Cooper Landing, Alaska, resident said, "You have to have controversy to get people to show up at meetings." Conflict is an inherent and inevitable element in community relations and does not preclude the capacity to mobilize local resources (Luloff and Swanson 1995). This has important implications for natural resource management. Using a consensus-based format for integrating multiple interests and risk perceptions into decisionmaking reinforces the likelihood of broad-based support and ownership of strategies (Wondolleck and Yaffee 2000), but this consensus-oriented framework may leave controversial and important issues and risk perceptions unarticulated and unaddressed. Conflict is to be expected in natural resource and forest disturbance management when multiple values and interpretations of the environment are common and threatened. Addressing controversial issues in environmental decisionmaking may be necessary to engender local engagement in resource management and risk mitigation.

Conclusion

On the Kenai Peninsula, Alaska, local community residents watched their forests die. They lost privacy, forest-based identity, scenic integrity, and jobs—all tied to the trees killed by spruce bark beetles. They worried about fire in the spring before grasses greened up and about falling trees in winter storms when loss of power presented critical problems. Some were concerned about the effect of logging and its effect on rivers and salmon and wildlife habitat, all so important to their economies, identities, and quality of life. Some were worried about the same risks if trees were *not* cleared away. From either perspective, local residents were afraid that their forests would never recover. As one Anchor Point resident said, "There's all kinds of kickback from one little beetle."

Given the diversity of response possible by communities across changing landscapes, coordinating decisionmaking with local communities allows greater public input and a way to link community action regarding forest issues with resource management in sustainable ways to help restore ecological and social well-being. Acknowledging and incorporating diverse community perspectives informs natural resource management. The conundrum of balancing community contexts with landscape-scale disturbances is not likely to be addressed easily. But working with communities early on can avoid costly problems later in the resource management and risk mitigation process after a forest disturbance.

The findings from the Kenai Peninsula and their implications for forest management lead to three strategies for forest managers dealing with diverse community response across disturbed forest landscapes:

1. Listen. Sound environmental decisionmaking and risk mitigation depends on including local risk perceptions in risk assessments. Risk perceptions often are shared within communities and can motivate local action to facilitate or impede forest management strategies.
2. Identify local action capacities. Determine whether or not communities have the capacity to take action. Build relationships with local community groups and influential leaders or foster their development where interactional capacity is found to be lacking.
3. Accept controversy. Allowing room for conflicting interests promotes broader articulation of critical issues and risks and motivates local participation in natural resource–related decisions.

Acknowledging and incorporating public participation in forest disturbance management provides better information on which to base decisions and promotes progress toward sustainable forest management and vibrant forest communities. Giving voice to the multiple perspectives of those who live, work, and play in forests, increases the odds of understanding and mitigating risks associated with forest disturbances.

Literature Cited

COTHERN, C.R. 1996. *Handbook for environmental risk decision making: Values, perceptions, and ethics.* CRC Press, Boca Raton, FL.

DALE, V.H., L.A. JOYCE, S. MCNULTY, R.P. NEILSON, M.P. AYRES, M.D. FLANNIGAN, P.J. HANSON, L.C. IRLAND, A.E. LUGO, C.J. PETERSON, D. SIMBERLOFF, F.J. SWANSON, B.J. STOCKS, AND M. WOTTON. 2001. Climate change and forest disturbance. *Bioscience* 51(9):723–734.

DUNN, K. 2000. Interviewing. P. 50–82 in *Qualitative research methods in human geography,* Hay, I. (ed.). Oxford University Press, New York.

FITCHEN, J.M. 1990. How do you know what to ask if you haven't listened first? Using anthropological methods to prepare for survey research. *Rural Sociol.* 10(2):15–22.

FITCHEN, J.M., J.S. HEATH, AND J. FESSENDEN-RADEN. 1987. Risk perception in community context: A case study. P. 31–54 in *The social and cultural construction of risk,* Johnson, B.B. et al. (eds.). D. Reidel, Boston, MA.

FLINT, C.G. 2004. *Community response to forest disturbance on Alaska's Kenai Peninsula.* PhD dissertation, The Pennsylvania State University, University Park, PA. 297 p.

FLINT, C.G. Community perspectives on spruce bark beetle impacts on the Kenai Peninsula, Alaska. *For. Ecol. Manage.* (in press).

FLINT, C.G., AND A.E. LULOFF. 2005. Natural resource-based communities, risk, and disaster: An intersection of theories. *Soc. Nat. Resourc.* 18(5):399–412.

HANNIGAN, J.A. 1995. *Environmental sociology: A social constructionist perspective.* Routledge, New York. 248 p.

HARRIS, C., W. MCLAUGHLIN, G. BROWN, AND D.R. BECKER. 2000. *Rural communities in the Inland Northwest.* USDA For. Serv. Gen. Tech. Rep. PNW-GTR-477, Pacific Northwest Research Station, Portland, OR. 123 p.

HEIMER, C.A. 1988. Social structure, psychology, and the estimation of risk. *Annu. Rev. Sociol.* 14:491–519.

HOLSTEN, E.H. 1984. Factors of susceptibility in spruce beetle attack on white spruce in Alaska. *J. Entomol. Soc. Br. Columbia* 81:39–45.

JACKSON, J.E., R.G. LEE, AND P. SOMMERS. 2004. Monitoring the community impacts of the Northwest Forest Plan: An alternative to social indicators. *Soc. Nat. Resourc.* 17(3):223–233.

KIM, J., AND C.W. MUELLER. 1978. *Factor analysis: Statistical methods and practical issues.* Sage, Beverly Hills, CA. 88 p.

KNIGHT, F.H. 1921. *Risk, uncertainty, and profit.* Hart, Schaffner & Marx, New York. 381 p.

KRANNICH, R.S., AND C.R. HUMPHREY. 1986. Using key informant data in comparative community research. *Sociol. Methods Res.* 14(4):473–493.

KUSEL, J. 1996. Well-being in forest dependent communities, part I: A new approach. P. 361–373 in *Sierra Nevada Ecosystem Project: Final report to congress, Vol. II, Assessment and scientific basis for management options.* Wildland Resources Center, Davis, CA.

LULOFF, A.E., AND L.E. SWANSON. 1995. Community agency and disaffection: Enhancing collective resources. P. 351–372 in *Investing in people: The human capital needs of rural Amer-ica,* Beaulieu, L.J. et al. (eds.). Westview Press, Boulder, CO.

QUIGLEY, T.M., AND H. BIGLER COLE. 1997. *Highlighted scientific findings of the Interior Columbia Basin Ecosystem Project.* USDA For. Serv. Gen. Tech. Rep. PNW-GTR-404, Pacific Northwest Research Station, Portland, OR. 47 p.

RAPP, V. 2005. *The Kenai experience: Communities and forest health.* Science Update 10. USDA For. Serv., Pacific Northwest Research Station, Portland, OR. 12 p.

ROSS, D.W., G.E. DATERMAN, J.L. BOUGHTON, AND T.M. QUIGLEY. 2001. *Forest health restoration in South-Central Alaska: A problem analysis.* USDA For. Serv. Gen. Tech. Rep. PNW-GTR-523, Pacific Northwest Research Station, Portland, OR. 38 p.

TILLY, C. 1973. Do communities act? *Sociol. Inq.* 43(3–4):209–240.

WILKINSON, K.P. 1991. *The community in rural America.* Greenwood Press, Westport, CT. 132 p.

WONDOLLECK, J.M., AND S.L. YAFFEE. 2000. *Making collaboration work: Lessons from innovation in natural resource management.* Island Press, Washington, DC.

WULFHORST, J.D., AND R.S. KRANNICH. 1999. Effects on collective morale from technological risk. *Soc. Nat. Resourc.* 12(1):1–18.

Courtney G. Flint (cflint@uiuc.edu) is assistant professor, Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana–Champaign, 1023 Plant Sciences Laboratory, 1201 South Dorner Drive, Urbana, IL 61801-4778. Richard Haynes (rhaynes@fs.fed.us) is program manager, Human and Natural Resources Interactions Program, US Department of Agriculture, Forest Service, Pacific Northwest Research Station, 620 Southwest Main, Suite 400, PO Box 3890, Portland, OR 97208. *This research was supported by the USDA Forest Service, Pacific Northwest Research Station (Project PNW 03-CA-11261975) and by the Pennsylvania Agricultural Experiment Station (Project 3870). The authors thank Al Luloff for his contributions to this research, Gary Greenberg from the Kenai Peninsula Borough Spruce Bark Beetle Mitigation Program for the map, and the journal editors and anonymous reviewers for their helpful comments.*