

Identifying Indicators of Behavior Change: Insights From Wildfire Education Programs

Martha C. Monroe and Shruti Agrawal

University of Florida, Gainesville, Florida, USA

Pamela J. Jakes

U.S. Forest Service, St. Paul, Minnesota, USA

Linda E. Kruger

U.S. Forest Service, Juneau, Alaska, USA

Kristen C. Nelson

University of Minnesota, St. Paul, Minnesota, USA

Victoria Sturtevant

Southern Oregon University, Ashland, Oregon, USA

Environmental educators are challenged to document behavior changes, because change rarely depends solely on outcomes of education programs, but on many factors. An analysis of 15 communities in the United States that have increased their preparedness for wildfire allowed us to explore how education programs encouraged individual and community change. Agency-sponsored adult educational programs helped communities change their philosophy about firefighting, pass ordinances that restrict individual property rights, and empower residents to reduce their wildfire risk. This article explores several outcomes of these programs and offers suggested indicators of change that might be useful for education program evaluation.

Keywords *adult education, behavior change, indicators, program evaluation, wildfire*

INTRODUCTION

Environmental education helps prepare citizens to help resolve environmental problems (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 1978). Several decades of experience in program evaluation and research around the globe has contributed to our ability to design educational opportunities to affect knowledge, attitudes, and skills. Yet the ultimate

goal—solving problems or creating change—remains elusive (Saylan & Blumstein, 2011). While environmental education programs may intend to prepare learners for environmentally responsible behavior (Environmental Education and Training Partnership [EETAP], 2002; Hungerford & Volk, 1990), evaluators often find it difficult to document the ultimate impact. The problem may lie in the age of the learner, the funded program span, or in a host of complexities in operationalizing the goal and constructing an appropriate program to create impact (see Heimlich, 2010 for a thoughtful summary of these challenges). There have been notable efforts to measure environmental change as a result of educational programs (Duffin, Murphy, & Johnson, 2008; Short, 2009), and these programs are fairly specialized circumstances that require a significant period of time and community-based actions. Across a broader range of education and outreach activities, these impacts are less visible.

Others have explored this gap between preparing learners and achieving change and suggested that a focus on adult learners who choose to be active in community change (Andrews, Stevens, & Wise, 2002) or on participants developing their own plan of resolving issues (Monroe, Andrews, & Biedenweg, 2007) would enable educators to measure change due to the program. Another strategy, civic ecology education, is being explored at Cornell University to integrate social and ecological factors; such programs will ideally lead to measurable change (Krasny & Tidball, 2009, 2010). As government agencies at the federal, state, and local levels increase their accountability for improvements in environmental quality, it could benefit environmental educators to have a set of indicators of change that we could address through educational activities and track in a program evaluation.

To explore what those indicators might be, this article builds on a previously reported study on community preparedness for wildland fire. That project took a case study approach to explore how 15 communities in the United States reduced their risk of wildfire (Jakes, Kruger, Monroe, Nelson, & Sturtevant, 2007). Each community was selected because it was at risk of fire and had taken steps to improve their preparedness. The study revealed that each community used educational programs, but earlier reports did not explore their diversity or strategies. This article suggests that the educational strategies these communities used and the variety of outcomes they achieved can be summarized in a framework with three dimensions for developing adult education programs designed for change and offers potential indicators that could be used to plan, implement, and assess these environmental education programs.

LITERATURE REVIEW

Educational programs have long been used as one avenue to support social change by informing individuals of opportunities and consequences of their actions. Programs to increase voting, decrease drunk driving, and encourage the use of seat belts often employ graphic images, facts and figures, and celebrities to make the message more relevant and convincing (Jacobson, McDuff, & Monroe, 2006) with the hope that powerful information will affect attitudes and behavior. The target for most educational programs is the individual, since they are often responsible for and able to change some of their behavior (Ajzen, 1985; Petty & Priester, 1994; Rogers, 1995). Although information alone tends to motivate behavior change only when a lack of information is a barrier to behavior (Schultz, 2002), when information is provided with cues about community acceptance and successful examples it may resonate with other factors that play a role in behavior, such as social norms and perceived control (Ajzen, 1985; Heimlich & Ardoin, 2008; Monroe, 2003; Rogers, 1995).

Wildfire education and communication strategies often heavily rely on providing information about risk and risk reduction with brochures and media messages to maximize coverage (Jacobson, Monroe, & Marynowski, 2001; McCaffrey, 2004; Monroe & Nelson, 2004; Toman, Shindler, & Brunson, 2006). Two-way and interactive strategies, however, should be more effective at encouraging people to adopt a new behavior (Rogers, 1995) and can help educators tailor information to answer learner's questions and concerns (Monroe, Pennisi, McCaffrey, & Mileti, 2006; Oxarart & Monroe, 2012). Most interactive wildfire educational strategies have more impact than one-way strategies (Toman et al., 2006).

The 15 communities that increased their preparedness for wildfire used a variety of media to help residents understand their risk of fire and how to reduce their risk. Information was provided that addressed individual changes (e.g., trimming vegetation) as well as community changes (e.g., ordinances for emergency vehicle access, budget increase for equipment) (Firewise, 2001; Nelson, Monroe, Fingerman Johnson, & Bowers, 2004). The selected communities were at high risk of wildfire or had experienced wildfire within five years, were taking steps to increase their preparedness, were located across three regions of the nation (five each in the Southeast, Northwest, and Northeast), and exhibited both high and low degrees of social capital (Jakes et al., 2007).

Social capital was selected as an initial characteristic of interest because it is a vital ingredient that strengthens and enhances a community. Social capital plays an important role in fostering social networks that are needed to take collective action (Putnam, 2000). It includes the social bonds and norms that bind communities together (Pretty, 2003; Pretty & Smith, 2004) and is usually revealed through extensive networks and high levels of trust and reciprocity. And in the context of our interest in social capital, it has been described as the ability of a group to solve problems successfully due to the quality of relationships they share (Adler & Kwon, 2002; Agrawal & Monroe, 2006). One would suspect that in communities with large stocks of social capital, people would be more willing to invest in collective action, participate in community activities, and solve problems they face together. Indeed, several authors suggest that social cohesion is an important factor in disaster preparedness (Mathbor, 2007; McGee & Russell, 2003). Research findings have associated higher levels of education with increased social capital (Coleman, 1988; Israel, Beaulieu, & Hartless, 2001; Pretty, 2003) but only a few suggest that educational strategies may be useful to enhance social capital (Krasny & Tidball, 2009; Wilson, 1997). Since social capital could be a necessary ingredient for community preparedness, the set of 15 communities purposely included large and small populations, older and newer communities, and compact and dispersed settlement patterns to increase the likelihood of varying degrees of social capital.

The study found four key factors help communities that are more prepared: *landscape* (both attachment to place and fire risk), *government* (in the form of leadership, financial assistance, and continuity), *citizens* (widespread involvement helped generate visible change and gave people choices in how they could be involved), and *community* (neighborhood groups and partnerships assisted in planning, informing, and supporting change) (Jakes et al., 2007). The role of the education programs was not explored in the original study, but could potentially affect all four key factors by increasing awareness and knowledge, building skills, and providing opportunities for action. These 15 documented cases of prepared communities represent environmental changes brought about by many factors. By understanding what types of educational strategies were used in achieving the goal of community preparedness, the secondary analysis offered in the present study identifies six lessons and suggests they could be used by other educators

who wish to nudge adults toward different behaviors and measure progress toward those impacts.

METHODS

The at-risk communities selected for case study investigation were chosen after consulting with forestry and fire department officials in each of the three regions and conducting initial interviews with community leaders. The communities represented variations in ecosystems, population size, social capital, and perceived risk of wildfire. All had some level of educational activity related to wildfire preparedness.

Researchers worked in each community to develop a case study, from which analysis was developed (Yin, 2003). The case study approach helped specify the contextual conditions that were important in understanding a community's ability to improve wildfire preparedness. In each community, 10 to 20 interviews were conducted with people responsible for wildfire preparedness, including the federal lands fire management officer, the state forest agency fire staff, county emergency preparedness officials, residents, and local fire chief. These key informant interviews (Patton, 1990) provided information on steps taken by the community to increase wildfire preparedness and the resources that were necessary to implement these steps, such as the educational programs. Interviews lasted from one to two hours and followed a common guide with a series of topics that were explored in each community: natural resource issues, wildfire preparedness, networks and interactions, resources for preparedness, perceived keys to preparedness, next steps to improve preparedness, and suggestions for other communities. The eight interviewers worked together to ask similar interview questions, collect the same data, and analyze data similarly (Sturtevant & Jakes, 2008).

Detailed notes, observations, and transcripts were analyzed from each interview, coded individually by a researcher and then reviewed by other team members to arrive at a list of common elements by community. Final data analysis included comparing elements across all communities, identifying patterns, and reaching a consensus on common keys to wildfire preparedness (reported previously). Case summaries were written for each community and can be accessed by searching for "community preparedness case studies" at <http://nrs.fs.fed.us/units/socialscience/focus/disturbances/wildfire/>.

For this article, evidence of educational strategies was gathered and reviewed from the cases, notes, and transcriptions. Concepts were condensed into six themes based on their purpose or audience. These themes and purposes were ultimately collapsed into three goals or categories based on outcomes. The results enable us to suggest a variety of indicators that could be useful in an evaluation of educational programs intended to lead to change.

RESULTS

Although educational activities were a component of the initiatives used by every community to improve community preparedness for wildfire, they varied in the purposes and outcomes they were designed to achieve. We purposely excluded from this analysis examples of educational programs that provided background information on fire ecology or management, focusing instead

on programs that target behavior changes. Six basic themes of program purposes and audiences are described as follows.

Sharing Information About Risk and Risk Reduction

Most typically, education was used to inform citizens of their risk of wildfire and the ways they can reduce their risk (e.g., obtaining hoses to reach the roof, reducing vegetation, using less flammable vegetation, screening crawlspace under the structure, adding sprinklers to the roof). A huge variety of strategies was used to get the word out and make it memorable. In some communities the source of the message was a key factor in making it more acceptable or more effectively disseminated. Along the Gunflint Trail in northern Minnesota, for example, existing networks of residents, such as the lakeshore homeowner associations, were recruited to spread the word and invite people to community activities to increase wildfire awareness, such as picnics and contests.

In Berkeley Township, New Jersey, retirement housing projects have strong neighborhood associations that performed an important role in communicating risk through newsletters and flyers. Similarly, in Florida, a Firewise committee used the homeowner's association materials and events to increase awareness about the risk of fire and provide a constant reminder of the need to reduce their risk:

We try to have a [Firewise] article in every month's newsletter on some kind of ideas that people can think about. . . . We try to always be involved wherever we can; whenever there is going to be something [like the community golf tournament], we try to be there. (President of a local Firewise committee)

It is more difficult to educate residents in rural regions that do not have homeowner associations or where people irregularly vacation in second homes. For example, after a major storm in northern Wisconsin resulted in significant blow-down, a state forestry staff member visited every dwelling to provide information on defensible space and emergency vehicle access. Local convenience stores became prime locations for information distribution, as these are often a vacationer's first stop for supplies and licenses.

Some of these activities may have led to other outcomes, such as increased membership in associations or sales of chainsaws, but the main purpose of the activity was informing people of the risk of wildfire and the strategies they could use to reduce their risk.

Training Staff to Promote a New Way of Thinking

Major change is difficult to orchestrate, but some communities took advantage of training programs to help staff gain new skills or apply existing skills in new ways. Volunteer fire fighters in Texas, for example, originally trained to fight structural fires, attended the Wildfire Academy organized by the Texas Forest Service to learn about fighting wildland fire. Variations in protective gear, equipment, extent, communication, leadership structure, and philosophy make training essential for fire fighters who are expected to work in both types of fire.

In Palm Coast, Florida, where two major wildfires within 15 years destroyed more than 200 homes, the County Director of Emergency Services dramatically changed how fires are fought through training, education, and communication:

In Flagler County we don't wait for a problem. We are proactive. We are out there with equipment. We hire volunteers during peak periods and we train all county staff to assist in emergencies. (Director of County Emergency Services)

The new plan calls for school bus drivers to be pressed into evacuation shuttle service and library volunteers to answer telephones in his "all hands on deck" approach to community firefighting. This new philosophy of firefighting was introduced and reinforced through monthly meetings with county department heads, staff training, and special meetings. Educational tools, such as the county website and a county Fire Summit, communicate this philosophy to the public:

We organize an annual Fire Summit and invite all county department heads, schools, chamber of commerce, water department, and discuss any changes that have happened to improve public safety and emergency response. . . . We have a Media Day where public information officers meet their counterparts and know who they are talking to. (Director of County Emergency Services)

In this county, educational programs became a key training strategy to bringing about change in the way fires are fought, in who fights a fire, and in how the role of firefighting is conceived.

Promoting or Enforcing New Ordinances or Policies

Several communities created ordinances to help reduce the risk of wildfire for all residents. In Wedgfield near Orlando, Florida, the codes and covenants committee studied the issue of access and passed a new ordinance for minimum driveway clearances. Both the process of learning about emergency access and the process of explaining the new ordinance with residents were opportunities for education, which was achieved with articles in the neighborhood newsletter and meetings to communicate the importance of this new ordinance to residents.

After the second devastating wildfire, the city of Palm Coast, Florida, passed a vegetation reduction ordinance that directs city staff to identify hazardous lots with dense understory and inform the lot owners to reduce the hazard by managing vegetation themselves. The lot owners can ask the city to do so for a reasonable fee. If owners refuse to act, the city will perform the service for the fee plus a fine. If lot owners do not pay the fine, the city will place a lien on the property.

An ordinance with this much power is more likely to be approved if an educational program has demonstrated the need and benefits it will provide. In the case of Palm Coast, this information was provided by educational presentations from the state forest agency specialists and extension agents to community leaders and citizens. Once an ordinance is in place, city officials must continue to educate lot owners about the importance of managing vegetation to reduce hazards:

The ordinance passed by Palm Coast is for reducing smaller fuels and not for clearing trees. This ordinance took two years to pass. When they started working on the ordinance first, the concept was that pine trees are bad. . . . Then Division of Forestry came in said that it is the [understory] vegetation that is a problem. City Council lacked the fundamental understanding of this concept. (Wildfire Mitigation Specialist for State Division of Forestry)

Here an educational effort takes an indirect route to reduce risk by helping to create support for a policy that promises to directly target and reduce risk. In both communities, on-going educational efforts are often needed to maintain community awareness about the new policies and inform newcomers.

Raising Awareness With Group Activities

In some cases, awareness-raising educational activities are designed to reach a broader audience than individual homeowners. The Wedgefield Firewise committee, for example, created a demonstration landscape in the Lowe's Home Improvement store parking lot and used a regular radio program to discuss firewise landscaping:

The Lowe's gardeners went around and marked all the plants that we had on our list with little flags, so if you are going out to buy you know which ones are firewise. And they helped bring the plants out and do the demonstration. We landscaped Smokey's house with a good side and a bad side and then talked to shoppers about what we did. And the Extension Service [Radio] Gardening Program that morning included one of our committee members talking about firewise landscaping and our demonstration that day. (President of a local Firewise committee)

The educational value for Lowe's staff was considerable and a good investment for future interactions with the public. By creating a public event, shoppers could observe others learning, asking questions, and improving their understanding of fire behavior and landscaping principles.

Changing a Social Norm With Group Activities

Some communities used a different set of educational tools to create a new social norm—one that informs but also incorporates defensible space and firewise activities into residents' lives as comfortably as crime prevention or hurricane preparedness. Nearby demonstration areas, such as forest thinning projects initiated by the state and federal agencies in South Dakota's Black Hills; the creation of a shaded fuel break around the town of Roslyn, Washington; or home landscaping projects in a subdivision in Bastrop, Texas, were designed to engage a number of people in their construction. Through their labor and camaraderie, these neighbors gained ownership and pride from their investment in a new concept for their landscape.

The completed demonstration sites typically hosted educational signs that informed others what they are, why they are here, and what benefits they provide. When other neighbors see the final outcome they might more easily accept the landscape change. If they witnessed the transformation of a dense woodlot to a firewise landscape, for example, the reality of the final version could be more acceptable than their initially imagined "clearing." When residents have an opportunity to live with the new landscape for a season they may come to prefer it over the dense undergrowth they previously enjoyed:

People have commented how much they like the "parked out" look. People like to walk through it now; they see much more wildlife and more birds than they ever saw before. In fact I saw about 10 wild turkeys bedded down in a pile of wood chips one day. (County fire technician)

The MulchFest in Bastrop, Texas, and the FireFree neighborhood cleanup days in Bend, Oregon, engaged people in trimming lower limbs, clearing undergrowth, and picking up branches on the day that the chipper will be in their neighborhood. The success of these community activities is often measured in how much vegetation is chipped, but even that type of success can be a problem:

We came up with the idea of the first MulchFest in the fall of 1999. We asked people to bring their brush to the tennis courts. We told them that they could deposit their slash a week in advance and then

take back mulch after it is done. . . . The MulchFest was a huge success except for two problems: some people wanted more mulch than their slash made, and we had too much to chip and had to haul some away.

Next year the fire chief said that he would take four fire crews and four chippers, let the homeowners leave the pile outside their homes and chip it there, working up and down the roads. But there were problems with this, too. . . . The mitigation activity was so successful that MulchFest was a disaster. (Homeowners Association Leader)

The firebreak was not initiated because it would raise awareness and create acceptance of a different landscape, but because it would reduce risk. Yet because of this activity, residents learned and gained a new perspective. An individual home demonstration area, on the other hand, may not reduce the community's risk, but is an educational tool to encourage others to follow suit. Both examples are physical risk reduction activities and educational strategies. The MulchFest even incorporated additional educational components, such as presentations about foam applications and fire behavior.

Empowering Residents

In addition to raising awareness, informing others, and changing norms, educational activities were used to engage citizens, build leadership, and empower residents. The FireCAP program (Fire Citizens' Advisory Panel) in Bastrop, Texas, was originally established to raise awareness and increase citizen support for rural volunteer fire departments. It has evolved into an organization that identifies and coordinates projects to reduce the risk of fire:

It is really empowering, in my judgment. The local folks do whatever they can see, what they want to do, and can do. Whatever is going to happen, it is going to build local capacity. (Director of City Waste and Wastewater Department)

In Oregon's Applegate Valley, the Applegate Partnership received National Fire Plan funding to create a Fire Plan. The process of creating the plan involved community residents and 24 federal, state, and county agencies. Newsletters, meetings, potlucks, and field trips were used to educate residents about the issue and to inform agency staff about wildfire-related concerns. These steps created a more informed and motivated citizenry, but also helped achieve important steps in the planning process. The wide participation, while challenging to manage, helped strengthen the plan, engage citizens, and empower the community to reduce their risk of fire:

I think the most important thing is—well, a number of things. One, it has helped to raise community awareness about the issues, and they have a responsibility and ability to guide their own destiny. (Project Coordinator—Local Fire Plan)

Once the plan was developed it continued to be an educational tool for those who were not involved in its development:

A biggest strength in the Plan itself is the resources. If a person is interested in doing something, it's there. Information about different fuel methods, how we got to where we are. It's a great education tool. (State Department of Forestry Fire Planner)

It is clear that a variety of activities were undertaken in these communities to achieve many objectives. While they all disseminated information through one-way communication channels

(e.g., newsletter and radio), they also used interactive two-way channels to reach the public (e.g., meetings, festivals, exhibits). Training opportunities were used to change philosophical approaches and build skills. Group activities engaged people in risk-reducing actions (e.g., MulchFest and home defensible space). Other presentations targeted policy makers with relevant information. All of these strategies resulted in people learning and ultimately, in communities becoming more prepared for wildfire. All of these strategies could be used by educators in other contexts to encourage and support behavior change.

DISCUSSION

These examples indicate that community education programs can enhance community preparedness, and therefore behavior change, in at least these six different contexts. The six purposes and audiences can be reorganized into three broad and somewhat overlapping goals that reflect the procedure and intended outcomes of these educational programs. Each are described below with examples taken from these case studies (also see Table 1) and supported by literature. This synthesis leads to a more generic set of indicators that can be generalized to situations other than wildfire preparedness (see Table 2).

Clearly, people need information, whether they are policy makers or homeowners. Information can be shared through interactions with individuals as well as groups. Goal A reflects this basic activity of educational programs:

Goal A: Provide background on the issue and procedural information about how to solve the problem in order to change attitudes, behaviors, or policies.

Our case communities accomplished this goal through one-way channels with mass media, such as signs, community newsletters and brochures, through workshops for residents and presentations to community leaders, and through group events that made learning new ideas easier and more acceptable.

The typical communication program generates interest and awareness through media campaigns, attractive brochures, radio spots, and billboards. Educational programs often complement these efforts with workshops, presentations, field trips, and group events. These efforts help bring attention to the importance of enhanced community preparedness and creates a common understanding of the situation. Such efforts are often necessary for any successful program, but most would agree they are not likely to be sufficient to create community change (McKenzie-Mohr & Smith, 1999; Schultz, 2002). Educators using activities in Goal A could measure change in knowledge, attitudes, perceptions of risk, perceptions of importance of these activities, beliefs about their ability to conduct these actions (efficacy or competence), and beliefs that these actions will make a difference (outcome expectancy) (Table 2).

A slightly different strategy was conducted in several communities—to first change the environment (where “environment” includes both landscape and expectations for job performance) and then provide information:

Goal B: Use training and management projects to directly change the environment and enhance this effort with educational resources to change individuals’ perceptions and skills.

TABLE 1
Summary of Strategies, Evidence, and Goals for Wildfire Education Lessons

<i>Strategy</i>	<i>Evidence</i>	<i>Educational program goal</i>
1. Community-wide education programs contributed to preparedness by sharing information about risk and risk reduction		
Newsletter articles, brochures and flyers, media, tables at events	"We have an article in every newsletter . . . "	A. Provide necessary information
2. Training programs promoted a new way of thinking about wildfire preparedness and response among staff		
Professional development, meetings, workshops, seminars	"We organize an annual Fire Summit and . . . discuss any changes."	A. Provide necessary information B. Change the conditions
3. Community education efforts supported the development and enforcement of ordinances or policies to increase preparedness		
Presentations to decision makers, media and information to residents	"Then DOF came in said that . . . is the problem. City Council lacked . . . understanding."	A. Provide necessary information
4. Education efforts raised awareness through group programs		
Sharing information in a group setting; through neighborhood association meetings, at festivals, creating events	"We landscaped Smokey's house with a good side and a bad side and then talked to shoppers about what we did."	A. Provide necessary information C. Build community
5. Education efforts helped change social norms by bringing the community together to participate in preparedness actions		
Work days, festivals, projects that people plan together to change the environment	"People have commented how much they like the 'parked out' look."	B. Change the conditions C. Build community
6. Education efforts contributed to community preparedness by empowering local citizens		
Developing a plan, organizing committee,	"Whatever is going to happen, it is going to build local capacity."	C. Build community

In our cases, communities trained staff to adopt new procedures and developed demonstration areas (community fire breaks and defensible homes) to alter perceptions of the requested change.

Research on cognitive dissonance makes clear that creating a change can prompt people to seek information and adopt supportive attitudes as they make internal adjustments to create harmonious cognitions (Aronson, 1997). Strategies in Goal B first change the workplace or landscape, and then offer informational materials and training sessions to prompt long-term attitude change and action. Of course these changes were created with the blessing of the landowner or were perceived as necessary because of the impending emergency. Educators using these strategies might measure the criteria measured in Goal A, plus level of discomfort with new information or change, acceptance or willingness to change landscape and actions, attractiveness of the change, degree to which others' impressions have been shared or role models have been available, and perceptions of what others believe is appropriate.

TABLE 2
Potential Indicators of Change

<i>Educational program goal</i>	<i>Potential indicators of program success</i>
A. Provide necessary information	• Number of program participants • Increase in anecdotal statements demonstrating awareness of problem and its importance • Increase in participants' knowledge of consequences of action and inaction • Increase in willingness to change behavior, as measured by commitment or intention • Increase in belief that actions will matter • Increase in evidence of or observed change
B. Change the conditions	All of the above, plus: • Increase in belief about personal ability to conduct action • Increase in procedural knowledge of action • Changes in perceived conflict, discomfort with or desirability of new action or change • Increase in similarity of perceptions of the problem and solutions, such as the development of a shared understanding
C. Build community	All of the above, plus: • Increase in the number of others respondents can name who are conducting the desired behavior • Increase in statements of hopefulness and ideas about other successes • Reduction in perceptions of barriers to change • Increase in trust of agencies and neighbors • Enhanced personal and working relationships • Increase in willingness to work with neighbors to achieve change

The third broad category includes all the strategies that seek to engage people in doing something together. In addition to providing information and perhaps changing the landscape, these strategies also work to alter the social norm to make behavior change more acceptable and include the possibility of developing or strengthening social capital:

Goal C: Provide opportunities and experiences to work together.

Our communities used group events to share information, engaged citizens in designing and creating demonstration areas, and involved residents in leadership roles that served their community with events and activities.

Educational programs that incorporate community approval; increase perceptions of competence or efficacy; and use success stories, examples, and strategies to reduce barriers to change can encourage people to take actions that they understand to be important and appropriate (Ajzen, 1985; Kaplan & Kaplan, 2009; Monroe et al., 2006; Rogers, 1995; Schultz, 2002). In this context, a successful education program could build community approval through community activities and festivals, provide information through community networks and association meetings, and build leaders with small activities that grow into larger successes. These strategies help change the social environment that may make future programs more acceptable and ultimate change more

likely. Educators can measure all of the attributes in the previous two categories, plus interest or willingness to work together, trust in the process and people, relationships with neighbors, energy and excitement for change, and interest in joining efforts or serving on committees.

Many of our case study communities used several activities listed in Goal C to increase preparedness. The act of learning and working together (often called social learning) helps to raise awareness and increase knowledge while at the same time appears to increase willingness to participate and change the way people view their neighborhood or landscape. These group learning opportunities can also build social capital.

When some of the interviewees described the factors that they believed helped their community become prepared for wildfire, they used characteristics associated with social capital, such as the existing relationships between homeowners and agencies, long-term residents' sense of place, an existing social norm for active community participation, people who know each other, and a feeling of camaraderie because the community was isolated at the end of the road (Jakes et al., 2007). A community rich in social capital may more easily create and implement successful education or community preparedness programs since they are generally better at solving problems and taking action (McGee & Russell, 2003; Putnam, 2000). Conversely, an education program that generates interaction among neighbors may help improve communication, trust, and relationships—thus strengthening social capital. In our 15 communities it was not possible to discern which came first, the education program or the social capital. We only know that many prepared communities had both and respondents commented that both helped improve community preparedness. In keeping with this article's theme, measuring social capital before and after a long-term program might also be an opportunity to infer educational program success.

Finally, the Goal C activities also speak to the three dimensions in the Reasonable Person Model (Kaplan & Kaplan, 2008, 2009), which describes components of programs that can enable people to take steps toward change. Each of the components speaks to the central role that information plays in enabling people to function in an uncertain environment. Learners need to understand the issue, believe they can be effective, and have possibilities available to them for making a difference. This combination of appropriate information, efficacy, and access to relevant change is powerful. That power can fuel a community group to continue to work on preparedness plans, vegetation reduction, or restrictive ordinances. These three components can also provide intermediate indicators of purposeful movement in an intended direction and are included in Table 2.

CONCLUSION

This study explored the experiences of 15 communities that improved their preparedness for wildfire. Educational strategies were common to many of their efforts and were used to achieve several different objectives.

These case studies suggest a variety of strategies can be used to increase learning and bring about change. In some cases, slight alterations in the implementation of an educational strategy probably increased effectiveness and broadened its value. For example, informative brochures can be mailed to residents or attached to doorknobs, but in these case studies, community leaders distributed materials through existing homeowner associations and group events. Indicators of success, in addition to the number of brochures distributed and retention of facts provided in the brochure, could include knowledge of what others think about the issue, perceptions of

neighbors' reactions to the information, and sense of community approval for making change. Engaging others in the educational process can have a number of complementary benefits.

Educational programs can accomplish multiple goals when implemented across the fabric of a community. Educational programs can be designed to bring people together to learn about common problems and actively create new solutions, such as the efforts of FireCAP to enhance volunteer fire departments' status in the community and build capacity. Interacting with neighbors during a MulchFest can lead to achieving several important goals at the same time: reducing fuel loads, meeting neighbors, becoming familiar with firewise principles, exchanging ideas and visions for the community, and enjoying an adventure with the family. These educational programs have the potential to directly affect preparedness by reducing vegetation and indirectly affect community preparedness by enhancing the connections among people in a community, i.e., social capital.

Educational activities that enhance both information exchange and social capital can be efficient mechanisms for achieving change at the community level and enable educators to measure a number of indicators that may help evaluate programs other than change in attitude and knowledge, such as participation, membership, trust, relationships, networks, and shared understanding. Activities designed to provide information about the issue, build skills to help participants believe they can be effective, and create opportunities to meaningful involvement in decision making may be particularly effective because they create a foundation for participation and action (Kaplan & Kaplan, 2009). To better understand the value of these activities, it will be useful to assess them in a variety of contexts (e.g., water conservation, transition towns, and community forestry) and with controlled experiments that link indicators to impacts. This type of research will help move environmental education research from the traditional context of measuring individual gains to measuring community impacts and could build useful ties to work underway with social capital, social learning, and resilience.

Agency staff in forestry, emergency response, and biodiversity conservation, for example, may be able to use environmental education programs designed with these strategies to move adults toward change and the resolution of local concerns. By designing programs that are likely to alter the indicators listed in Table 2, funders may be convinced that educational programs can measure specific change that will increase the likelihood of environmental impacts. Long-term evaluation of those programs may provide us with greater insights into using educational programs to achieve community change.

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