

# The Evolution of Smokey Bear: Environmental Education About Wildfire for Youth

Heidi L. Ballard and Emily Evans

*University of California, Davis, Davis, California, USA*

Victoria E. Sturtevant

*Southern Oregon University, Ashland, Oregon, USA*

Pamela Jakes

*U.S.D.A. Forest Service, St. Paul, Minnesota, USA*

Many environmental education programs in the United States educate youth about the prevention of wildfire and its role in ecosystems. We reviewed 50 wildfire education programs for youth (WEY) in the U.S. through an Internet search and interviews with program providers. We investigated whether they reflect current wildfire science, environmental education (EE) instructional strategies, and place-based education (PBE) approaches. We found that while one-third of the programs focus exclusively on wildfire prevention, suppression, and safety topics, one-third focuses on fire ecology, management, and science, and one-third includes all these topics, mirroring evolving scientific approaches to wildfire. Also, while state and federal agencies design and disseminate much of the curricula used, 60% of WEY programs incorporate local social and ecological contexts, revealing the close relationship between WEY and PBE.

**Keywords** *hazards education, informal science education, natural resource education, place-based education, wildfire*

## PROBLEM STATEMENT

Catastrophic wildfires are increasing in frequency across U.S. landscapes, and among the many impacts of global climate change, this trend is predicted to continue (Westerling, Hidalgo, Cayan, & Swetnam, 2006; Flannigan, Logan, & Amiro, 2005; McKenzie, Gedalof, Peterson, & Mote, 2004). Considerable outreach and education efforts, and some research, have been conducted on adult-focused programs that aim to help the public understand, prepare for, and adapt to wildfires. However, there is no research on wildfire education programs for youth (we include programs that target children ages 5–10 and youth ages 10–20 but will abbreviate to “youth” hereafter). Wildfire education programs for youth (WEY) across the United States provide an opportunity

to investigate how current science, interdisciplinary instructional strategies, and place-based education (PBE) are operationalized in a specific environmental education field.

Wildfire is defined as “an unplanned, unwanted wildland fire (non-structure fire), including unauthorized human-caused fires . . . ” (National Wildfire Coordinating Group, 2011, p. 182). When wildfires occur at the interface with human communities, they can destroy homes, landscapes, and livelihoods. Early forest management practices, starting in 1910, focused only on fire suppression. Concurrently, outreach campaigns to minimize human-caused wildfire started in the 1940s and continued with the Smokey Bear program, the longest running wildfire education campaign in the United States (<http://www.smokeybear.com>). However, similar to the shift in ecology from a steady-state model to a non-equilibrium model of ecosystems, ecologists now know fire in wildland areas can play a beneficial and often necessary role in disturbance regimes to maintain healthy ecosystems and wildlife habitat (Donovan & Brown, 2007). This evolving role of fire as both friend and foe has led to a complex relationship between human and ecological communities and creates a challenging context for education about wildfire.

Furthermore, though widespread across the United States, wildfires are entirely local in their human and ecological causes and impacts. Given this, what can the emerging literature on place-based education, grounded in interdisciplinary learning and action in local places, lend to an investigation of youth wildfire education? Our research questions stemmed from these broader theoretical contexts:

1. *What* do WEY programs portray about fire, and what are the main social and environmental topics or messages?
2. *How* do WEY programs teach about wildfire, and how are typical environmental education strategies tailored to the wildfire topic?
3. To what extent are WEY programs place-based, *embedding* learning in the local social and ecological context?

## EXISTING RESEARCH ON WILDFIRE EDUCATION

The recent shift in science and management approaches has led to expanded adult education programs that promote the concept “living with fire,” although prevention and safety are still prominent messages. Smokey Bear is recognized as among the most powerful and enduring icons of public service advertising (Earle, 2000), and the recent campaign has shown important impacts on the public’s assumption of responsibility for preventing wildfires (Ad Council, 2010). However, education programs for adults also now focus on living with fire as well. For instance, the National Fire Protection Association’s “Firewise” program teaches homeowners the benefits of low-intensity fires and methods of preparing for fire through home and community-based practices, such as clearing low-growing vegetation to create a defensible space around homes, and teach the ecological benefits of low-intensity fires (<http://www.firewise.org>). Studies investigating adult wildfire education describe the methods and complex challenges of communicating the role of fire in an ecosystem and educating the public about management tools such as prescribed fire (Ingalsbee, Henry, Catranides, & Schulke, 2008; Jacobsen, Monroe, & Marynowski, 2001; Monroe & Nelson, 2004; Sturtevant & McCaffrey, 2006). Toman, Shindler, and Reed (2004) showed that providing concrete experiences, such as site visits to a fire-managed forest, can impact adults’ knowledge, awareness, and support of fire management practices. Similarly, hands-on

activities in public workshops improved adults' content knowledge about fire and attitude toward fire management practices (Parkinson, Force, & Smith, 2003). In contrast, Jacobson et al. (2001) found that previous experience with wildfire did not impact knowledge or attitude; however, previous experiences with prescribed fire did. Based on these results, the authors came to the conclusion that simplistic messages in fire prevention campaigns are not sufficient and need to address the differences in audience experiences (Jacobson et al., 2001). Monroe and Nelson (2004) found that, before implementing a public education campaign about wildfire preparedness, it is crucial to assess the perceptions about fire held by a community rather than assume that the threat of fire will motivate behavioral change. Perceptions and attitudes about wildfire can be divergent even within a community; the topic of how to manage land with respect to wildfire reveals a diversity of opinions about the use of logging to reduce fuel loads, the use of prescribed burning to prevent wildfires, and even when wildfires should or should not be suppressed (McCaffrey, 2006). In sum, research on wildfire education for adults stresses the importance of the local social context and hands-on, concrete experiences for learning about wildfire (Sturtevant & McCaffrey, 2006), and provides a glimpse of the complexity of the topic.

Published research on wildfire education for youth is limited to two studies of one program, FireWorks, and we found no published research on impacts of Smokey Bear youth education programs. The FireWorks program, developed by the USDA Forest Service Rocky Mountain Research Station for grades 1–10, involves crates or “trunks” of educational materials about fire science, plant ecology, and the scientific method distributed to classroom teachers. Thomas, Walsh, and Smith (2000), and Smith and McMurray (2004), in separate studies, evaluated the effectiveness of FireWorks; both found the program increased students' and adults' understanding of wildfire. While these evaluative studies are useful to develop effective WEY practices, we hope to add to the research on the broader ways that WEY may influence and be influenced by environmental education theory and practice. By investigating this relationship, we may better understand the ways environmental education can help youth and adults adapt to, thrive in, and sustain their local ecosystems.

## WILDFIRE EDUCATION IN ENVIRONMENTAL EDUCATION RESEARCH

How the public perceives wildfire, as something to be prevented and suppressed or something to be understood and managed, may depend on whether they perceive wildfire as natural or unnatural. Youth perceptions of nature and the environment are complex and characterized by a need to dichotomize natural and human-influenced systems (Kahn, 2002; Bonnett & Williams, 1998; Wilhelm & Schneider, 2005; Loughland, Reid, & Petocz, 2002). When asked to make distinctions about nature and the environment, youth invariably reference some type of human influence as the dividing line. For example, Wilhelm and Schneider (2005) found that youths' description of the environment fell under key themes of nature such as flora, fauna, open space, and the like. What youth perceived as not a part of nature were tied to built, social, and human-influenced elements or systems. In general the youth in their study tended to think of nature as devoid of human interaction and separate from the social and built communities where they lived. Bonnett and Williams (1998) found a similar divide; youth in their study described the environment as either an object or a relation. Surprisingly, it was the students reporting more knowledge of environmental issues that described the environment as an object

and were less likely to make relational connections. The authors suggest that this may mean environmental concepts are taught in isolation instead of in their relationship to larger ecological systems.

Kahn (2002) investigated youth impressions of what “counts” as nature or natural using fire as a metric. He compared attitudes of youth toward a lightning-caused fire and one caused by humans. Youth in general thought of something as natural if it happens spontaneously and without human action; however, several youth were conflicted on the issue; one even described how she had to “contradict herself” because she described “natural” as something separate from humans but that humans are natural causes of fires (Kahn, 2002). These findings about youth perceptions of nature and the environment imply that WEY programs that focus on the relationship of wildfire to natural and social systems, with a “living with fire” approach, are more likely to promote a conception of wildfire as a process instead of an object or isolated element to be prevented or suppressed. Hence we were particularly interested in how WEY as a field portrays wildfire with respect to the dichotomy between “natural” and “human-influenced” systems.

We also sought to shed light on not only the content or “what” of environmental learning about wildfire for youth, but also the process or “how” the instruction occurs, as suggested by Rickinson (2006). We took a practitioner-oriented look at how WEY programs provide instruction, keeping in mind frameworks like the environmental education guidelines provided to practicing educators by the North American Association for Environmental Education (NAAEE, 2009) as well as the review of informal science education approaches and outcomes recently published by the National Research Council (2009). We used these resources to examine the predominant educational approaches employed by WEY programs, based on the information available, to see what environmental and science education instructional formats and strategies they use to teach about wildfire.

Finally, wildfire and its management are inherently functions and consequences of place. As such, a study of WEY is a way to examine the range of definitions of PBE in the scholarly literature and concrete examples of how environmental educators engage with local social and ecological contexts. Sobel (2004) defined PBE as the process of using the local community and environment to teach concepts and integrate disciplines. Similarly broad in scope, Woodhouse and Knapp (2000) identified the connection of place, self, and community as one of the essential characteristics of PBE. Another group of scholars (Theobald, 2006; Siskar & Theobald, 2008; Theobald & Curtiss, 2000) have further emphasized the primacy of community itself as the key component of place and, therefore, PBE. Further, Smith (2002) decided PBE must include “induction into community processes,” that is, drawing students into the “decision-making processes” of the community. Even more deeply examining the ways youth and communities can learn through PBE, Smith (2007) and Grunewald and Smith (2008) apply what Grunewald (2003) first called a critical pedagogy of place. Through this approach, PBE can be a mechanism for youth and communities to address social justice issues through inquiry, and critically re-examine what they’ve learned in school. The broad spectrum of PBE approaches, then, ranges from simply drawing on and embedding learning in the local social and ecological context on one end, to critically addressing issues of environmental justice in communities on the other end. PBE is therefore not a static standardized approach, but instead a contested notion that in some cases questions the goal and function of environmental education and even schooling itself. If wildfire and its management are inherently about place, then environmental education about wildfire may serve as a useful lens with which we can examine the spectrum of place-based education in practice.

## METHODS

For this study we conducted an inventory of WEY programs across the United States using Internet searches and brief phone interviews to determine the array and features of programs. We were interested in inventorying only educational programs implemented by an educator or facilitator, as opposed to curriculum available to download or order on a website. Among these programs, we sought to examine the array of programs available and analyze their content themes and instructional approach.

For the initial Internet search, using Google Internet browser, we searched for “wildfire education,” “wildland fire education,” adding “youth” and “students.” We quickly found that three of the main federal natural resource management agencies active in environmental education in the United States—the National Park Service, Bureau of Land Management, and USDA Forest Service—were the primary organizations offering WEY programs nationwide. We followed links attached to these programs (including links to attached curricula), thus following a snowball sampling approach to find additional programs. We recorded the program information, including geographic location, the sponsoring organizations and/or funders, specific content areas addressed by the program, grade level of the target audience, instructional approach (if could be determined), and whether the program was offered in or through schools or off-site (at a park or fair). When this information was not available on the website, we contacted listed coordinators or providers by telephone and followed up with new contacts provided by these conversations. These interviews included questions about educational goals, organizational partners, and key features of program delivery. For approximately 20 of the organizations involved, we contacted individuals for short interviews. After examining 50 programs, we were not able to find new themes or features and so due to limited time and resources we deemed our search complete. These 50 different programs met our criteria of youth-only programs that were provided through an educator/facilitator. To answer our research questions, we then analyzed this selection of programs for their fire-focused content and main instructional approach (including use of place-based approaches). We then determined the most predominant content areas (such as “prevention” and “wildfire ecology”), instructional formats (such as educational “kits” for teachers or project-based service learning programs), and whether programs embedded their instruction in the local social and ecological context. We answer each of the three main research questions in turn in the following text.

## RESULTS

### Wildfire-Focused Content

What do WEY programs portray about fire and what are the main social and environmental topics or messages? To answer this question we particularly wanted to know whether current youth wildfire education (WEY) programs accurately portray the current scientific understanding and management approaches incorporating wildfire as a natural, functional, and survivable process, along with wildfire prevention imperatives. Hence in our analysis of fire-focused content, we used a process of open coding to examine the available program descriptions and curriculum materials.

TABLE 1  
Key Content Areas Predominantly Found in Youth Wildfire Education Programs in the United States

<i>Fire-focused content area</i>	<i>Description/definition includes instruction about . . .</i>
Wildfire prevention	Preventing initial fire outbreak
Wildfire safety	How to stay safe in a fire event or by preventing a fire event
Wildfire suppression	How to put out a fire and emphasizes the reasons for fire suppression as a management approach
Wildfire ecology	The role and nature of fire in ecosystems
Wildfire science	The chemistry, physics, and ecology of how fire behaves, and why (e.g., the “fire triangle” = fire requires an ignition source, oxygen, and fuel), and how scientists study the effects of wildfire on ecosystems
Wildfire management	Natural resource management and use; Constraints, problems, and information related to decision making about fire or wildland environments or natural resources that are impacted by fire (e.g., prescribed burning)

We developed an extensive list of topics addressed in the WEYs. We then looked for overlapping themes in the coded content and developed the six distinct content areas that encompassed all of the content/subject areas that we found in the programs: wildfire prevention, wildfire safety, wildfire suppression, wildfire ecology, wildfire science, and wildfire management (Table 1). We clustered these content areas into two categories that reflected the historical versus contemporary approaches to wildfire management and adult education, described previously. One category focused on *prevention, safety, and suppression* aspects of wildfire (34 programs—68% of total). The control and prevention of wildfire was the central theme of these programs, and they generally target elementary-age youth (grades K–5), using topics that may be more developmentally appropriate for this age group. We found that in nearly half of the programs in this category (16), fire prevention, suppression, and safety were the *only* topics addressed. The other programs did touch on science, ecology, or natural resource management topics, but primarily as supporting the prevention and safety message. The most ubiquitous example of a program focused on prevention, safety, and suppression was the Smokey Bear program offered by local and regional natural resource agency field offices around the country to elementary classrooms. These presentations focused on fire safety—what to do in the event of a fire and “Smokey Bear’s 5 rules” about safety. An Idaho State agency fire education specialist explained that the national programs such as Smokey Bear serve as the foundation for the bulk of fire education programs in his state, often adapted at the local level.

The other half of “prevention”-oriented programs did touch on science, ecology, or natural resource management topics, but primarily in support of the prevention and safety message. An example was offered by a Cooperative Extension educator in Oregon whose main program message was fire prevention, but also touched on the science of fire and fire behavior. She believed that her teachers requested her programs as a way to fill the void in students’ science curriculum left by lack of funding for field trips and reduced academic focus on science in elementary classes. Thus, although aspects of fire ecology may have surfaced in traditional programs, one Fire Management Officer explained that Smokey Bear programs are “a ‘don’t play with matches for kids’ (kind of program) in its purest form.”

The second category of programs focused on *science, ecology, and management* aspects of wildfire (16 programs—32% of total) (Table 1). These programs, primarily targeted middle and high school-aged youth (grades 6–12). An example of this type of program is FIRE Up (Field Inquiry Research Experience) in Idaho, a three-week summer course for high school students.

TABLE 2  
Descriptions of the Five Main Instructional Formats of Wildfire Education Programs for Youth With Examples From Reviewed Programs

<i>Instructional format</i>	<i>Description</i>	<i>Example program</i>
Classroom visits	Presentations in a school by agency staff or other outside educators with expertise in fire content, often including partnership with local fire departments; may include fire engines and firefighters; generally for elementary grades.	USDA Forest Service Fire Prevention specialist or other staff in nearly all National Forests presents fire safety and prevention information to local elementary school classrooms at request of teacher, often with another staff person in a Smokey Bear costume.
Kits/ trunks	Crates of materials, informational resources that teachers may order or borrow to deliver instruction about wildfire in their own classrooms, rather than by an outside educator. Often include hands-on activities and copies of video and other hard-to-find resources.	<i>Jackson/Josephine County Fire Ecology Kits</i> developed by the local Community Wildfire Protection Plan committee; multiple copies of the kit distributed to local fire departments, state and federal agencies; elementary and middle school teachers may then check out and use in classrooms. They include written info, videos, and materials for activities about the wildfire behavior, ecology, and management in southern Oregon. (See also FireWorks trunks.)
Camps/ field Trips	One-day or week-long field trips to fire-prone or fire-affected areas; students investigate fuel treatments or experience effects of previous fires on landscape. Camps were often the typical one-week outdoor education camp for middle school students in which a day was spent learning about wildfire.	High school students in Los Angeles, California, have a one-day field trip to nearby Santa Monica Mtns. National Recreation Area with their science class as part of the <i>National Park Labs: Studies of Wildland Fire Ecology program</i> . Students complete soil, water, and air-quality testing and learn the fire history of the area.
Project-based service learning	Primarily school-based, emphasizing a longer-term (over several weeks, months, years), sustained investigation or multi-staged project that contributed to local natural resource management and/or the community. May involve field trips but focus is on sustained service projects.	<i>Minnesota Firewise in the Classroom</i> , developed by MN Dept. of Natural Resources (DNR) for middle school classrooms, provides teacher workshops on use of GPS, aerial photos, survey methods for students to assess their community and homes for wildfire risk, and shares this information with the community and DNR to use in fire/emergency planning.
Free-choice interpretive booths/ nature centers	For families with youth, located at county/state fairs or museums and nature centers where families may choose to approach the booth or exhibit (free-choice refers to learning where the participant has substantial choice and control over how and what learning takes place (Falk, 2005)).	<i>Camp Smokey booths</i> at state fairs around the country, sponsored by federal and state agencies to teach families about wildfire, involve drawing and hands-on activities for children. <i>The Science Museum of Western Virginia</i> houses an exhibit on the dangers and ecological importance of natural wildfires, including computer simulations and experiments for visiting families.

Students developed scientific investigation and technology skills, including forest ecology field data collection and GPS, culminating in a written report to management agencies. These programs framed wildfire as a natural part of ecological and, to a lesser extent, social systems. In addition, a stated goal of several of these programs was confronting dominant portrayals of fire by the media. For example, one program publication for the National Park Service explained that, “the perception of fire and the influence of the media greatly affect [agency] management of the land

TABLE 3  
Environmental Education Instructional Strategies Tailored to Wildfire Education With Examples From Reviewed Programs

<i>Instructional strategy</i>	<i>Description</i>	<i>Example program</i>
Inquiry-based/data collection activities	Students collect and test soils to determine how long ago a fire burned on the site, <i>or</i> design and conduct a survey of local community members on attitudes and values about wildfire planning.	At <i>FIRE Up</i> in Idaho, a field inquiry/research summer program, high school students worked with agency representatives to collect data on vegetation and fuel loading and assess fire hazards in neighborhoods.
Role-play activities	Students assume roles for different stakeholders in a fire event or forest management scenario, then debate and defend positions and natural resource management decisions, <i>or</i> role-play scenarios for fire prevention such as putting out campfires, playing with matches.	During the <i>Resources and People Camp</i> in a rural and fire-prone area of northern California, students were assigned roles as different resource professionals, then designed and presented a forest management plan for the real professionals.
Lecture/presentation	Students received Smokey Bear presentations, fire engine visits to schools.	At the <i>Hightower Education Forest</i> in Georgia, K–2nd graders hear Smokey’s message that everyone can be responsible stewards of the forest.
Engage with outdoor landscape	Students take a field trip to fire-affected or other forested site, visit an outdoor area near the school or nature center, <i>or</i> participate in outdoor education camps that have a day of wildfire content.	During the <i>6th Grade Forestry Tour</i> in Douglas County, Oregon, sponsored by the BLM Learning Landscapes program, youth visit a nearby forest and are introduced to local forest management, forest products, tree identification, wildlife, fisheries, fire, and archaeology
Engage with local community members	Students give presentations to community members on their school-based wildfire projects, <i>or</i> conduct surveys of community members on wildfire issues, <i>or</i> perform restoration projects on the land (clearing brush, planting trees)	High school students in <i>Lost Coast Life Lab</i> program in California, an after-school program designed and then implemented a survey of community members perspectives on wildfire and wildfire management as their capstone project. For the <i>Big Bear Discovery Center, Born to Burn</i> program in California students re-planted a post-wildfire site and discussed fire ecology in the area.
Hands-on activities (e.g., use of manipulatives)	Students participate in demonstrations of fire behavior by burning different fuels on a table of sand, <i>or</i> draw or make models to learn about forest and wildfire ecology.	During an <i>Oregon Cooperative Extension</i> presentation in classrooms, elementary students used gumdrops and toothpicks in a learning exercise about the fire triangle and wore colored bandanas to play a Project Learning Tree game about fire behavior.

and decisions made in the event of wildfire.” In over half of ecology-focused programs (11/18 or 61% of these programs), wildfire was just one of the topics covered in a broader ecology and resource management curriculum; yet these were often rich and intense units of study. For example, the Resources and People Camp serving high school students in Oregon and Northern California provided a two-hour session on wildfire management as part of a week-long camp that also covered topics such as hydrology, wildlife, fisheries, recreation, rangeland resources, botany, ecology, and cultural diversity. The fire management session, led by agency representatives from the Bureau of Land Management (BLM) and the USFS, began with an introduction to fire ecology, then used a sand table to demonstrate fire behavior. An agency fire tanker crew demonstrated their equipment. Finally, students were assigned to roles in order to develop a management plan, using what they had learned about different natural resource issues (including fire), presenting their plan at a public meeting of parents and resource agency staff on the final day. Agency educators hoped that students experienced firsthand the difficulty of managing resources in a community where stakeholder interests and public opinions vary.

### Instructional Formats and Environmental Education Strategies

How do WEY programs teach youth about wildfire, and how are typical environmental education strategies tailored to the wildfire topic? In answering this question, we found five instructional formats that reflect either common environmental education (NAAEE, 2009) and/or informal science education approaches (NRC, 2009) developed from the data under which all our WEY programs could be classified: classroom visitor presentations, camp/field trip, project-based service learning, educational kits or trunks, and free-choice interpretive booths/ nature centers (Table 2).<sup>1</sup> While these formats were not entirely mutually exclusive (e.g., project-based service programs may have included a field trip), each program focused primarily on one of these five as their main pedagogical approach to wildfire education.

We also found that WEY programs used a variety of instructional strategies recommended in environmental education, and that in fact, these were often particularly tailored to wildfire topics in unique ways (Table 3).

### Place-Based Approaches

*To what extent are WEY programs place-based, embedding learning in the local social and ecological context?* In answering this question we found that the majority of programs reviewed (30 programs—60% of total programs) incorporated some aspect of local place to teach concepts or integrate disciplines in their program materials (for example, including issues such as fire tolerance among local native plant species in regional biomes and the economic value of forests to the local community) or by visiting local areas previously affected by wildfire. These programs seem to lie at one end of the spectrum of PBE by treating place as a context for learning, but may not particularly critically engage youth in more complex issues within the community. However, several programs did include more in-depth critique and self-examination of community-based problems and solutions as espoused by Grunewald and Smith. For example, educators with the Lost Coast Life Lab, an after-school middle school program in a rural and fire-prone area of northern California, assigned students’ roles as local community stakeholders

TABLE 4  
Comparison of Programs by Wildfire Content and Local Social and Ecological Contexts, or Place

<i>Program content</i>	<i>Stated use of local social and ecological context (n = 30)</i>	<i>No evident use of local social and ecological context (n = 20)</i>
Prevention, safety, suppression only (n = 16)	7	9
Science, ecology, management only (n = 18)	13	5
Both content categories (n = 16)	10	6

concerned about wildfire preparedness. Then, using a sand table to create a wildfire simulation, students acted out their assigned role while responding to the simulated fire incident. Following their role-play experience, students designed and administered a survey on adult perceptions of wildfire to members of their community. Results of the survey were disseminated to parents and participants in the survey, leading to discussions locally about addressing wildfire mitigation problems.

*Is there any relationship between the fire-related content of WEY programs and their use of place?* Although the use of place was consistent across all program types, those programs with a focus on science, ecology and management highlighted local ecological and social issues much more frequently than those programs that exclusively focused on prevention, safety, and suppression (Table 4). For example, in the middle school program developed by the National Park Service for Carlsbad Caverns National Park in New Mexico, the curriculum used local data on the history of fire occurrence in the area to introduce the idea of fire as a natural part of an ecosystem. Through an activity on dendrochronology students were shown that fire has always been an active force in their ecosystem. Teachers were encouraged to contact their local extension agent or NPS site for more local information. In the Minnesota Firewise in the Classroom program, students were provided aerial photos of their neighborhoods, asked to find their house and/or a group of houses, and rated the fire danger for each property using a home assessment guide adapted by the Minnesota Department of Natural Resources from Firewise Communities USA.

The few prevention-oriented programs that did incorporate place into their teaching did so not necessarily by using local place as the context for learning but rather by modifying the learning materials to accommodate the specific characteristics of the local population or environment. For example, one program coordinator in a rural area where even young children had experience burning brush piles at home modified the *Smokey Bear* program and its corresponding message of “don’t play with matches” to a more locally-appropriate message encouraging proper techniques for using matches and the restricted use of accelerants.

## DISCUSSION

This research, examining what and how we are teaching youth about wildfire, demonstrates there is no simple pedagogical approach to this complex topic. As a genre of environmental education, we found that WEY educators want children and their families to understand basic elements

of preventing and suppressing wildfire for their safety, but also need to understand wildfire ecology and management if they are to successfully live where wildfire is a regular occurrence. These findings are consistent with studies of adult wildfire education (Jacobson et al., 2001; Sturtevant & McCaffrey, 2006). The majority of our reviewed WEY programs that focused on prevention/safety/suppression targeted young children in the elementary grades, with wildfire messages similar to basic safety messages about home fires. This focus is not surprising given the resources that have supported programs such as Smokey Bear, one of the most recognized icons in the United States, and the emphasis of the media on the destructive aspects of wildfire. Programs built around science/ecology/management were generally aimed at an older student audience, likely due to the foundational knowledge necessary to understand ecological processes and the more nuanced messages explaining both the positive and negative impacts of wildfire. An interesting question is whether these programs focused on wildfire as a natural part of the ecosystem affect youth's understanding and attitudes about nature and what should be considered "natural" (Kahn, 2002). There may be some debate about whether the programs focusing only on safety and prevention are missing an important opportunity to incorporate science and ecology into younger children's education. While it may be developmentally appropriate to simplify the message to prevention for young children, basic ecological concepts are introduced in many EE programs at a young age (e.g., Project WILD), and arguably offer children a more holistic understanding of wildfire and forests and a chance to learn applied scientific concepts early.

With regard to instructional approaches and strategies in environmental education, the WEY programs we examined exhibited a range of approaches to facilitating environmental learning described by Scott and Gough (2003): *instruction of learners* through demonstrations and hands-on activities; *engagement of learners* through engaging with the outdoor landscape and community members; and *facilitation of learning* through role-play activities, intensive engagement with community members and conducting scientific investigations. Some are in informal settings, such as camps and museums, while others are integrated into science curriculum in classrooms that address state standards. While the predominant strategy was at the level of *instruction* (primarily Smokey Bear presentations), several WEY programs engaged intensively with local communities and resource professionals. These latter programs hold promise for significantly impacting youth learning about the complex issues surrounding wildfire, and may serve as a model for learning about other environmental and natural resource issues. The question remains as to the effectiveness of these instructional strategies for teaching youth about the different dimensions of wildfire and whether these lessons are carried home. A logical next step for research in this area would be evaluating the effectiveness of these instructional strategies in WEY programs in educating youth and adults in the community.

Regarding the ways that WEY engages with theories of place-based education, the use of place as a focus of instruction among WEY programs was one of the more consistent findings that emerged from our analysis, echoing the increasing focus on place-based education in environmental and outdoor education (Woodhouse & Knapp, 2000). Regardless of wildfire topic focus or instructional strategies, most programs incorporated some aspect of place, such as local plants' adaptations to fire, or the economic value of forests to the local community. The prevention-oriented programs had a more limited use of place in their topics and delivery than ecology-oriented programs; this may be related to the use of "canned" or scripted materials for the delivery of prevention messages such as the Smokey Bear program. One fire management officer stated that when this prevention-oriented program is requested, "... you shake the trees

and see whatever firefighter falls out and you put him in a Smokey suit.” This very scripted nature of the program makes it convenient to have untrained educators deliver the message, however it may limit the providers’ ability to incorporate aspects of the local context and place-based issues.

In addition, we saw examples of the broad spectrum of PBE in the WEY programs we reviewed. Some programs draw on the local social and environmental features to teach about wildfire in a manner similar to what Sobel (2004) describes as PBE (for example, National Park Labs: Studies of Wildland Fire Ecology in California, Table 2, and FIRE Up in Idaho, Table 3). At the other end of the spectrum, some programs are critically addressing the local issues of land management decision making through community surveys (Lost Coast Life Lab in California, Table 3), and emergency planning through youth-conducted wildfire risk assessments (Minnesota Firewise in the Classroom, Table 2). By examining and engaging with social and ecological community-based problems regarding wildfire risk and management, these programs may be approaching Gruenewald’s (2003). critical pedagogy of place. WEY could certainly engage even further in this kind of critical place-based education, considering that many rural wildfire-prone communities are among the poorest in the country, experiencing high rates of unemployment and high school dropouts, some alongside high-income second-home communities (Danks & Jungwirth, 1998). Place-based education about wildfire in this context becomes a way to teach youth about their cultural and ecological heritage, about the intimate ways that their lives are bound up with the landscape economically and socially, and about the creative ways their communities are adapting to, managing for, and thriving in the midst of wildfires. In this light, youth wildfire education has important potential as a vehicle for “situated investigations of one’s own and others embodied environmental experience (that are) required to reveal how we practically live and construct our problematic environmental relationship with various local places and global spaces” (Payne, 2006, p. 28).

There are important implications of WEY programs for roles they could play in creating communities adapted to wildfires and eventually resilient social and ecological systems (Krasny, Lundholm, & Plummer, 2010). *Let our children teach us!*, a United Nations International Strategy for Disaster Reduction report (Wisner, 2006), reviews the role of youth education and knowledge in disaster risk reduction, and builds on work that recognizes youth, families, schools, and other community organizations as agents for promoting community resilience to natural hazards (Ronan & Johnston, 2005). Youth educated about wildfire may directly impact community preparedness through discussions with parents and service projects and presentations, or indirectly as the homeowners and land managers of tomorrow. Hence we hope these results will contribute to a framework for analyzing WEY programs’ contribution to communities working to adapt to and live with wildfire.

## SUMMARY

In conclusion, we found that many WEY programs (a) emphasize the current scientific and management approach to wildfire; (b) utilize a diverse array of tailored environmental education strategies and formal and informal instructional formats; and (c) engage with the local community members and ecology of local places across a spectrum of place-based education approaches. In many ways, however, youth wildfire education still has untapped potential as environmental education that is highly interdisciplinary, highly imbedded in community needs and assets,

addressing a concrete social and environmental issue in which youth can authentically participate in problem solving through scientific and community-based inquiry.

## ACKNOWLEDGMENTS

This research was funded by the National Fire Plan through the USDA Forest Service, Northern Research Station, St. Paul, Minnesota, and by the authors' home institutions. We thank John Teeple for his assistance in the early stages of this project.

## NOTE

1. Because we were reviewing the types of programs rather than the number of field offices offering, for example, the traditional Smokey Bear program (of which there are hundreds around the country), we don't quantify here the number of each type of program found in the United States.

## REFERENCES

- Ad Council. (2010). *Wildfire prevention holistic evaluation 2010. Presentation on Ad Council Wildfire Prevention Tracking Study*. Washington, DC: Author.
- Bonnett, M., & Williams, J. (1998). Environmental education and primary children's attitudes towards nature and the environment. *Cambridge Journal of Education*, 28, 159–174.
- Danks, C., & Jungwirth, J. (1998). Community-based socioeconomic assessment and monitoring. *Journal of Environmental Science and Management*, 1(2), 1–18.
- Donovan, G., & Brown, T. (2007). Be careful what you wish for: The legacy of Smokey Bear. *Frontiers in Ecology and the Environment*, 5(2), 73–79.
- Earle, R. (2000). *The art of cause marketing: How to use advertising to change personal behavior and public policy*. New York, NY: McGraw-Hill.
- Falk, J. H. (2005). Free-choice environmental learning: Framing the discussion. *Environmental Education Research*, 11, 265–280.
- Flannigan, M., Logan K., & Amiro, B. (2005). Future area burned in Canada. *Climatic Change*, 72, 1–16.
- Gruenewald, D. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, 32(4), 3–12.
- Gruenewald, D., & Smith, G. (Eds.). (2008). *Place-based education in the global age: Local diversity*. New York, NY: Lawrence Erlbaum Associates.
- Ingalsbee, T., Henry, D., Catranides, O., & Schulke, T. (2008). *The role of nongovernmental organizations in fire education, fuels reduction, and forest restoration: A call for collaboration*. USDA Forest Service General Technical Report, PSW-GTR-189.
- Jacobson, K., Monroe, M., & Marynowski, S. (2001). Fire at the wildland interface: The influence of experience and mass media on public knowledge, attitudes, and behavioral intentions. *Wildlife Society Bulletin*, 29, 929–937.
- Kahn, P. (2002). Children's affiliations with nature: Structure development, and the problem of environmental generational amnesia. In P. Kahn & S. Kellert, *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 29–63). Boston, MA: MIT Press.
- Krasny, M., Lundholm, C., & Plummer, R. (2010). Resilience in social-ecological systems: The role of learning and education. *Environmental Education Research*, 16, 463–474.
- Loughland, T., Reid, A., & Petocz, P. (2002). Young people's conception of environment: A phenomenographic analysis. *Environmental Education Research*, 8, 187–197.
- McCaffrey, S. (Ed.). (2006). *The public and wildland fire management: Social science findings for managers* (No. NRS-1). Newton Square, PA: USDA Forest Service, Northern Research Station.

- McKenzie, D., Gedalof, Z., Peterson, D., & Mote, P. (2004). Climatic change, wildfire, and conservation. *Conservation Biology*, 18, 890–902.
- Monroe, M., & Nelson, K. (2004). The value of assessing public perceptions: Wildland fire and defensible space. *Applied Environmental Education and Communication*, 3, 109–117.
- National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. P. Bell, B. Lewenstein, A. W. Shouse, & M. A. Feder, (Eds.) Committee on Learning Science in Informal Environments. Board on Science Education, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- National Wildfire Coordinating Group (NWCWG). (2011). *Glossary of wildland fire terminology*. National Wildfire Coordination Group. Retrieved from <http://www.nwcwg.gov/pms/pubs/glossary/w.htm>
- North American Association for Environmental Education (NAAEE). (2009). *Environmental education materials: Guidelines for excellence*. Washington, DC: Author. Retrieved from <http://www.naaee.org>
- Parkinson, T., Force, J., & Smith, J. (2003). Hands-on learning: Its effectiveness in teaching the public about wildland fire. *Journal of Forestry*, 101(7), 21–26.
- Payne, P. (2006). Environmental education and curriculum theory. *The Journal of Environmental Education*, 37(2), 25–35.
- Rickinson, M. (2006). Researching and understanding environmental learning: Hopes for the next 10 years. *Environmental Education Research*, 12, 445–457.
- Ronan, K. R., & Johnston, D. M. (2005). *Promoting community resilience in disasters: The role for schools, youth and families*. New York, NY: Springer.
- Scott, W., & Gough, S. (2003). *Sustainable development and learning: Framing the issues*. London, UK: RoutledgeFalmer.
- Siskar, J., & Theobald, P. (2008). The meaning of place and community in contemporary educational discourse. *Journal of Inquiry and Action in Education*, 1(2), 58–78.
- Smith, G. (2002). Place-based education: Learning to be where we are. *Phi Delta Kappan*, 83, 584–594.
- Smith, G. (2007). Place-based education: Breaking through the constraining regularities of public school. *Environmental Education Research*, 13, 189–207.
- Smith, J., & McMurray, N. (2004). FireWorks educational program and its effectiveness. In R. T. Engstrom, K. E. M. Galley, & W. J. de Groot (Eds.), *Proceedings of the Tall Timbers Fire Ecology Conference: Fire in Temperate, Boreal, and Montane Ecosystems* (pp. 231–235). Tallahassee, FL: Tall Timbers Research Station.
- Sobel, D. (2004). *Place-based education: Connecting classrooms and communities*. Great Barrington, MA: The Orion Society.
- Sturtevant, V., & McCaffrey, S. (2006). Encouraging wildland fire preparedness: Lessons learned from three wildfire education programs. In S. McCaffrey, S. (Ed.), *The public and wildland fire management: Social science findings for managers* (No. NRS-1, pp. 125–136). Newton Square, PA: U.S.D.A. Forest Service, Northern Research Station.
- Theobald, P. (2006). A case for inserting community into public school curriculum. *American Journal of Education*, 112, 315–334.
- Theobald, P., & Curtiss, J. (2000). Communities as curricula. *Forum for Applied Research and Public Policy*, 15(1), 106–111.
- Toman, E., Shindler, B., & Reed, M. (2004). Prescribed fire: The influence of site visits on citizen attitudes. *The Journal of Environmental Education*, 35(3), 13–17.
- Thomas, L., Walsh, J., & Smith, J. (2000). Behavioral and cognitive evaluation of FireWorks trunks. In H. Y. Smith (Ed.), *The Bitterroot Ecosystem Management Research Project: What we have learned—Symposium proceedings, 1999 May 18–20, Missoula, MT* (Proceedings RMRS-P-17). Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Westerling, A., Hidalgo, H., Cayan, D., & Swetnam, T. (2006). Warming and earlier spring increase western U.S. forest wildfire activity. *Science*, 313, 940–943.
- Wilhelm, S. A., & Schneider, I. E. (2005). Diverse urban youth's nature: Implications for environmental education. *Applied Environmental Education and Communication*, 4(2), 103–113.
- Wisner, B. (2006). *Let our children teach us! A review of the role of education and knowledge in disaster risk reduction*. Retrieved from <http://www.unisdr.org/eng/task%20force/working%20groups/knowledge-education/docs/Let-our-Children-Teach-Us.pdf>
- Woodhouse, J., & Knapp, C. (2000). *Place-based curriculum and instruction: Outdoor and environmental education approaches*. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools. (ERIC Document Reproduction Service No. ED 448012.)