# Fire Management notes

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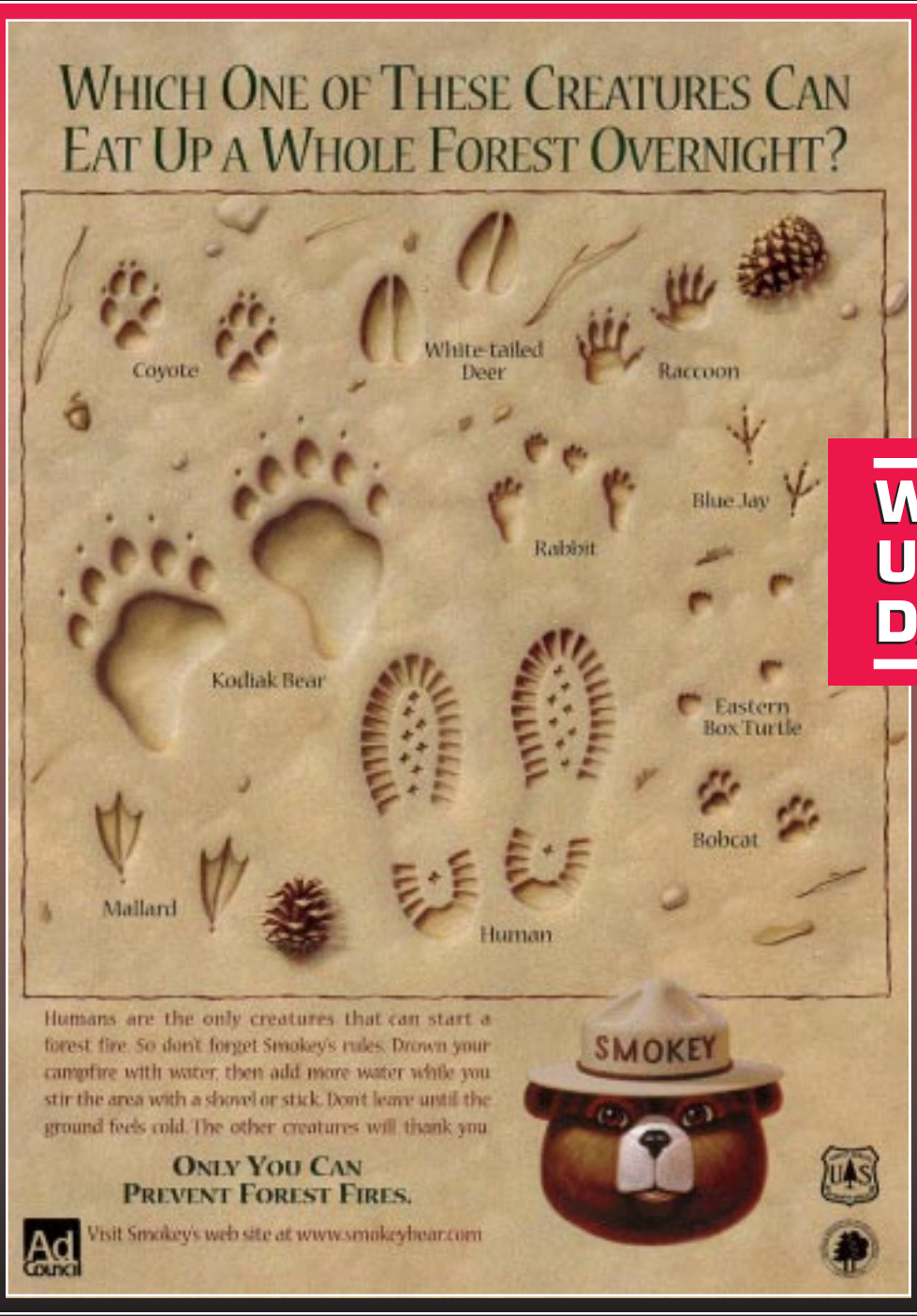


## WHAT'S SMOKEY UP TO THESE DAYS?

United States Department of Agriculture
Forest Service

## Correction

The photo on the left shows a P3–A Orion airtanker dropping retardant on the Buick Fire, south of Phoenix, AZ, on June 27, 1993. The photo was mistakenly credited in *Fire Management Notes* volume 58, number 4, page 9. The correct photo credit is: *Courtesy of Tom Story, Tempe, AZ, ©1993.*

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## On the Cover:

*This public service announcement was recently developed for The Advertising Council by the advertising agency of Foote, Cone & Belding, which has worked with the USDA Forest Service since 1945 to shape the familiar image of Smokey Bear. Smokey's fire prevention message is as important today as ever. Begun in 1944 by The Advertising Council in collaboration with the Forest Service, the Forest Fire Prevention campaign has enjoyed remarkable success over the years in reducing the number of human-caused wildland fires. Today, the campaign continues (see related article by Cristina Capello beginning on page 4).*

*The FIRE 21 symbol (shown below and on the cover) stands for the safe and effective use of wildland fire, now and in the 21st century. Its shape represents the fire triangle (oxygen, heat, and fuel). The three outer red triangles represent the basic functions of wildland fire organizations (planning, operations, and aviation management), and the three critical aspects of wildland fire management (prevention, suppression, and prescription). The black interior represents land affected by fire; the emerging green points symbolize the growth, restoration, and sustainability associated with fire-adapted ecosystems. The flame represents fire itself as an ever-present force in nature. For more information on FIRE 21 and the science, research, and innovative thinking behind it, contact Mike Apicello, National Interagency Fire Center, 208-387-5460.*

FIRE 21

**Firefighter and public safety is our first priority.**

## Contents



## Short Features

# And Remember, "Only You Can Prevent Forest Fires!"

Cristina Capello

Today, after decades of wildland fire prevention and suppression, it is hard to imagine how extensive wildland fires once were. As late as 1941, more than 208,000 fires burned nearly 30 million acres (12 million ha) of U.S. forest- and rangeland during a single fire season. People caused 9 out of 10 of these fires.

However, it was not until World War II, when the threat of enemy shelling as a probable cause of wildland fires emerged, that a public service campaign to prevent wildland fires began. In 1944, the USDA Forest Service and The Advertising Council teamed up to create a campaign that would educate the public about its role in preventing wildland fires.

## Origins of Smokey Bear

The Ad Council turned to the advertising agency of Foote, Cone & Belding for help. In 1945, Albert Staehl, an agency employee, drafted the first image of Smokey Bear at a studio in Los Angeles, CA. Two years later, the bear's famous message—"Remember, Only You Can Prevent Forest Fires!"—emerged from the agency's creative department.

More than 50 years later, Smokey Bear's words are still worth heeding. In the summer of 1998, the United States faced its worst outbreak of wildland fires since 1993. Fires destroyed more than 484,000 acres (196,000 ha) of forest, palmetto scrub, and swampland in Florida alone. Texas was also affected by a series of drought-fueled fires that burned more than 143,000 acres (58,000 ha). In northern New Mexico, wildfires threatened 400 homes. Damages from the 1998 fire season could amount to hundreds of millions of dollars. In areas where drought and fuel buildups triggered uncharacteristically intense wildfires, it might take many decades for the land to repair itself.

> As much as ever, the public needs to hear Smokey's message on preventing wildland fires caused by human carelessness.

Today, human negligence causes half of all wildland fires. Campfires left unattended, trash left to burn on windy days, smoking materials carelessly discarded, and equipment operated without spark arresters are the most common sources of these fires. Unlike wildland fires started by lightning, human-caused wildland fires can be prevented. We cannot control natural ignitions, but we can certainly strive to prevent fires caused by human carelessness. Now, as much as ever, the public needs to hear Smokey Bear's message.

## Today's Fire Prevention Campaign

The current Forest Fire Prevention campaign reminds both adults and children that Smokey Bear depends on their help to prevent wildland fire catastrophes. It also educates the public about the beneficial role of wildland fire in the ecosystem.

To accomplish these goals, Foote, Cone & Belding have created new advertising materials for the Forest Service and the Ad Council. "Otter," a public service announcement for children that features Smokey Bear and his animated woodland friends singing the rules of wildland fire safety, has generated much success (fig. 1). Thanks in part to the Forest Fire Prevention campaign, the number of wildland fires caused by children has dropped from 7 percent to 1 percent since 1984.

In 1997, the agency introduced two adult-targeted public service announcements: "On the Fire Line," versions A and B. New outdoor materials produced in 1998 have also made an impact on the public. The most striking billboard features Smokey Bear on

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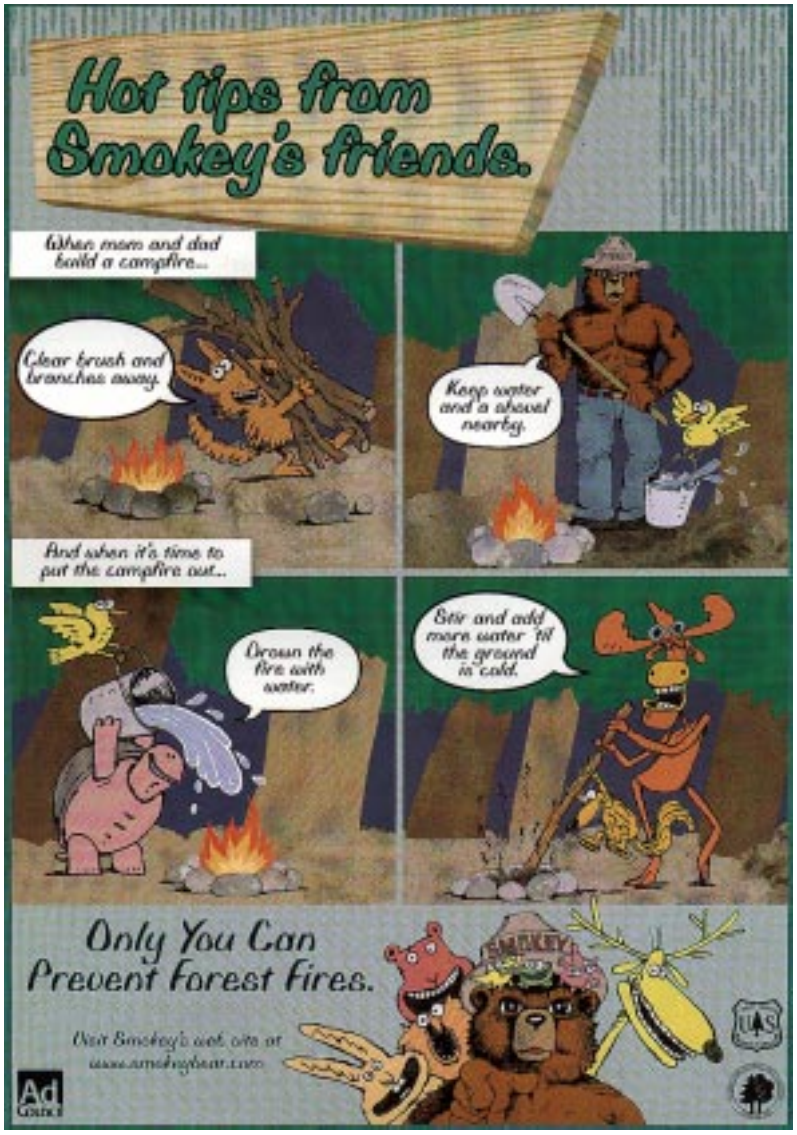


**Figure 1**—*Public service announcements like this are part of the recent "Otter" series aimed at children.*

a red and orange background humorously reminding people to roast marshmallows, not trees (fig. 2).

The media have responded generously to the Ad Council's new public service announcements. In 1997, the Forest Fire Prevention campaign received more than $26 million in donated time and space from television, radio, newspaper, and outdoor outlets all over the United States.

To this day, Smokey Bear is recognized by millions of people the world over. Among fictional characters, Smokey enjoys a level of public recognition second only to that of Santa Claus. Although Smokey's message is well known worldwide, wildland fires still plague the world. For our Nation to overcome the ongoing threat posed by human-caused wildland fire, the public needs to understand its role in preventing wildland fire and to make a concerted effort to avoid the careless use of fire in America's wildlands. ■

Thanks to the Forest Fire Prevention campaign, the number of wildland fires caused by children has dropped dramatically since 1984.


**Figure 2**—*This billboard uses humor to communicate Smokey's fire prevention message to adults.*

# Smokey and the Myth of Nature

Hutch Brown

Smokey Bear's critics do not mince words. "Smokey, like Pooh, is a bear of very little brain," writes the naturalist Ted Williams (1995) in an article titled "Only You Can Postpone Forest Fires." Williams and other critics blame potentially catastrophic fuel buildups in the Nation's wildlands on a policy of fire exclusion promoted by Smokey Bear. "Smokey never stopped swinging his shovel long enough," declares Williams, "to perceive that, along with flames, he was extinguishing ecosystems—Michigan's jack pines, for example, can't reproduce without fire, and Kirtland's warblers can't reproduce without jack pines."

## Smokey and Fire Policy

For critics such as Williams, Smokey symbolizes the old fire control policy, known as the 10 A.M. Policy (Pyne 1982). Adopted in 1935, the 10 A.M. Policy declared the intent of the USDA Forest Service to control all fires by 10 a.m. on the day after they were reported. At about the same time, however, the Forest Service's Southern Research Station was promoting controlled burning in the southern pineries, a policy officially adopted by the agency in 1949. Following the 1964 Wilderness Act, the 10 A.M. Policy was reviewed and finally replaced in 1978 by a whole new policy that, according to the fire historian Stephen J. Pyne (1982), "encouraged a pluralistic approach to fire, a policy of fire by prescription."

Smokey's message has always been to discourage careless fire use by wildland visitors, not to exclude fire.


*Smokey Bear's familiar message against careless fire use, promoted in countless public service announcements such as this poster from 1985, remains as valid and important as ever. Photo: USDA Forest Service, 1993.*

*Hutch Brown is the editor of* Fire Management Notes, *Arlington, VA.*

Today, as interagency policymakers have declared (USDA/USDI 1995), "[w]ildland fire will…, as nearly as possible, be allowed to function in its natural ecological role." Fire exclusion is no longer part of Federal policy—and hasn't been for decades.

Moreover, as the wildland fire specialist Jimmye L. Turner (1997) has pointed out, Smokey never called for fire exclusion, not even under the old 10 A.M. Policy. Instead, his message has always been to discourage careless fire use by wildland visitors. Whether public lands are managed for timber, wildlife, recreation, wilderness, or other values, fires ignited by careless visitors are always potentially dangerous and destructive, undermining land management objectives. Smokey's prevention message should hardly stir controversy, particularly among those who profess a desire to reduce the human impact on the land.

## Historical Fire Uses

But a deeper issue is at stake. Williams and other critics see fire as part of the natural landscape and its suppression as a measure of nature's corruption. The solution, according to Williams, is simply "getting fires over with on a natural cycle."

Unfortunately, it's not that simple. The tradition of fire use by Native Americans, frontier settlers, and small farmers, hunters, and herdsmen is far older in North America than the tradition of systematic fire suppression. Fire use for thousands of years profoundly changed the ecology in many parts of North America long before the first forest reserves were

## The Romantic Myth of Nature

Underpinning some arguments against Smokey Bear are two conceptions about nature:

1. Nature is an original state corrupted by human activity. Fire is a part of the natural landscape and its suppression is a measure of nature's corruption.
2. The state of nature in North America was corrupted by human activity only after European settlement. Native Americans lived in harmony with nature.

The concept of nature as a blessed state corrupted by humanity is rooted in the biblical notion of the Garden of Eden and the story of the Fall, but also has precedents in Greek and Roman antiquity, when natural and bucolic landscapes were associated with virtue in contrast to urban decadence. In the 18th century, these traditions united in Germany to help produce a philosophy of nature sometimes known as Romanticism. Variants were later popularized in the United States by such 19th-century writers as Henry Wadsworth Longfellow.

In the Romantic view, nature offers freedom from social constraints and respite from social ills. The Romantic individual nurtures a spiritual relationship with nature that might be personally fulfilling, but often bears little semblance to ecological reality. For example, the English gardens that early Romantics idealized as oases of natural wildness were really highly artificial landscapes; and Germany's Harz Mountains, a Romantic-era Mecca cherished for its thick spruce forests, were originally dominated by oak–beech forest that had been replaced centuries earlier by German foresters eager to exploit the relatively fast-growing Norway spruce (which occurs naturally as climax forest only at the highest elevations in the Harz). By the 1700's, more than a millennium of agricultural reclamation and silvicultural manipulation had drastically altered ecosystems across northern Europe, rendering the Romantic search for an original state of nature futile from the beginning. Romanticism's own appeal soon caused some of Europe's last remaining wildlands to all but disappear: the Alps, for example, were soon laced with the infrastructure needed to support a comfortable tourist industry, including the now-famous Alpine ski facilities.

In North America, Romantics projected the Native American as a noble savage living in harmony with nature, a view that seemed to contradict the predominant perception of the Native American as a savage brute to be ruthlessly exterminated. However, both views shared and promoted an underlying belief that the Native American was incapable, morally or practically, of significantly altering his natural environment. Accordingly, Longfellow's Acadians in his *Evangeline* lived alongside a "forest primeval" in an original state of nature despite millennia of inhabitation by Native Americans.

Partly through Hollywood, the Romantic myth of nature as an ideal realm apart from and untouched by human activity continues to shape and distort public perceptions of the Nation's wildlands. Although the myth of a pristine nature can build public support for wildland protection, it can also promote a simplistic dichotomy between nature and culture that breeds skepticism toward efforts to manage our wildlands through the use and suppression of fire. Land managers face the difficult challenge of addressing this skepticism and turning it into public support. Pyne (1997) offers an excellent starting point for understanding the Romantic myth of nature and its implications for wildland fire management in his essay "Wilderness Fire: Vestal Fires and Virgin Lands."

set aside in 1891. In fact, lands in some regions were placed under Federal protection partly because—and only after—they had been ravaged by logging and human-caused burning. The "nature" that Williams appeals to is in some ways a Romantic-era myth (see sidebar on page 7).

**Fire Use Before European Settlement.** Native Americans set fires across North America for a wide range of uses, including agriculture, warfare, hunting, range management, and pest and disease control (Pyne 1982; MacCleery 1996). Their seasonal burns were widely observed and noted by European settlers and travelers (Day 1953; Whitney 1994; Olson 1996). Using fire, Native Americans entirely reshaped vast ecosystems. For example, they carved prairie from woodland as far east as Virginia and created landscape mosaics and parklike conditions not only in the West, but also in many parts of the eastern temperate forest (Whitney 1994; MacCleery 1996; Olson 1996). The biological communities that resulted depended for their survival on continued landscape burning. Parts of the Northeast and Southwest actually reverted to forest after frontier fire was finally suppressed (Pyne 1982; 1997).

**Fire Use After European Settlement.** European settlers originally adopted Native American fire practices, burning on the frontier for the same reasons that Native Americans did (Pyne 1982). In addition, Europeans brought their Old World fire practices with them. Across Europe, people had systematically turned forest- and grassland into crop- and pastureland with the help of fire, ax, and domesticated herbivores. In northern Europe, this process had three phases:

1. The forest was felled and the wood harvested;
2. The slash was fired to prepare the land for agriculture; and
3. In some areas, cropland was seasonally fired to clear stubble, and pastureland was burned to promote grass growth and help prevent succession to forest.

When Europeans applied these practices to parts of North America where fuel and climate conditions were different from those in Europe, catastrophic wildland fires resulted. In the Lake States, for example, loggers had clearcut the region's vast pineries by the 1870's. Farmers who settled the area—many of them schooled in Scandinavia's complex burning traditions (Pyne 1997)—routinely

*The Kirtland's warbler (above) is an endangered species that nests only in young jack pine forest (shown naturally regenerating below). Photos: Courtesy of Ron Austing, Dillsboro, IN, ©1995; and Phil Huber, USDA Forest Service, Huron–Manistee National Forest, Mio Ranger District, Mio, MI, 1992.*

fired the land to prepare it for agriculture. Their fires ignited the deep slash in the clearcuts, precipitating holocausts such as Wisconsin's notorious Peshtigo Fire of 1871, which cost an estimated 1,200 lives. Burned areas heavy with underbrush and downed fuels then reburned periodically across the region in a devastating cycle of fire that lasted almost 50 years (Pyne 1982). By the 1920's, the Lake States had reversed policy, ending the great fires by discouraging agriculture in the north woods in favor of industrial tree farming and systematic fire suppression. Federal and State governments assumed responsibility for protecting and managing much of the land.

**Fire Use and the Kirtland's Warbler.** In Michigan, where the endangered Kirtland's warbler breeds, jack pine benefited from the 50-year cycle of fire that followed logging and agricultural burning. "Without the great fires of previous years," wrote the forest researcher D.A. Zimmerman (1956), "the jack pine plains of this [lower Michigan] peninsula probably would not occupy so great an area as they do at present." Unlike the region's other major pine types (red pine and eastern white pine), which do best when intervals between stand-replacing fires exceed 150 years, the fire-dependent jack pine flourishes in a short-interval fire regime (USDA Forest Service 1995a). On sandy soils, frequent intense reburning from the 1870's until the 1910's favored jack pine over other pine types, expanding the young jack pine stands that the Kirtland's warbler needs for nesting.

Accordingly, Kirtland's warbler populations peaked in the 1880's and 1890's due to what the ornithologist Lawrence Walkinshaw (1983) has called a "much more extensive breeding range than in previous years." However, clearcutting also allowed the parasitic brown-headed cowbird to move from the central grasslands into the north woods, causing the Kirtland's warbler to begin its precipitous decline (Mayfield 1989). Ironically, logging and agricultural burning produced conditions that first increased nesting habitat for the Kirtland's warbler, then headed the bird toward extinction.

Conversely, a policy of fire exclusion on State and Federal lands from the 1920's until the 1960's permitted mature jack pine forest to develop, favoring a succession to the forest types that had originally occupied many sites and reducing nesting habitat for the Kirtland's warbler. Recognizing this, in 1964 the Forest Service began logging and burning jack pine sites in an effort to perpetuate stands of young-growth jack pine suitable for Kirtland's warbler nesting (Line 1964; USDA Forest Service 1995b). The Michigan Department of Natural Resources followed suit in the early 1970's, and programs to control the cowbird emerged (Wilson 1989; USDA Forest Service 1995c). Federal and State protection measures helped reverse the warbler's decline by the late 1980's (Radtke et al. 1989). However, some prescribed fires on Federal land escaped, turning into major conflagrations that burned tens of thousands of acres and showed the risks inherent in using fire to manage wildlife habitat (Pyne 1982).

*In 1980, a prescribed fire to promote Kirtland's warbler nesting habitat in young jack pine forest escaped to become the largest fire ever recorded on Michigan's Huron–Manistee National Forest. Known as the Mack Lake Fire, it burned 24,000 acres (9,700 ha), took 1 life, and destroyed 44 homes and buildings, highlighting the importance of safety and careful planning in prescribed fire use. Photo: Mike DeCapita, U.S. Fish and Wildlife Service, East Lansing, MI, 1980.*

## The Complexities of Fire Use

The history of fire use in the Lake States illustrates the complex issues facing today's land managers. Long before Federal and State governments stepped in to manage the Great Lakes pineries, fire use had radically altered the landscape. Native Americans were probably the first to use broadcast fire in the Great Lakes region, igniting the landscape to render it livable. By burning the forest to promote browse and reduce undergrowth, native hunters could attract game and more easily locate and stalk their prey.

The Native American impact on the land has profound implications for land management today. Ecosystems that existed before European settlement and depended on broadcast burning—such as the open oak forests of the midwestern uplands described by the botanist Steven D. Olson (1996)—might conceivably be restored by using prescribed burning in addition to natural wildland fire. First, land managers would need to discover exactly what the presettlement ecosystems were and how they depended on human-caused burning. Next, they would need to decide whether the land should be managed to restore presettlement ecosystems or whether it should be managed instead for the ecosystems that might exist without broadcast fire (the practice, by default, on most sites today). As Olson has pointed out, excluding fire is a management decision with "at least as many ramifications and potential pitfalls as the decision to burn."

Understanding postsettlement fire history is equally important for deciding how to manage a given site. Agricultural burning, logging, grazing, and other practices introduced by Europeans drastically altered the ecology in many parts of North America, replacing whole biological communities and establishing radically different fire regimes. The fire history of the Kirtland's warbler illustrates the ecological consequences of European settlement. Partly by using and then by suppressing fire, Michigan's inhabitants—quite unintentionally—first expanded Kirtland's warbler nesting habitat at the expense of the original, more "natural" Great Lakes pine forest ecosystem, then began to restore mature pine forest at the cost of reduced habitat for a bird species that was fast becoming extinct. Because we as a Nation have decided to protect endangered species such as the Kirtland's warbler, land managers are now reintroducing a short-interval fire regime into a region where, historically, it appears to require human help to thrive. Historical conditions and management priorities have thus rendered natural processes in the Great Lakes pineries to some degree irrelevant.

After millennia of human fire use, a strategy of "getting fires over with on a natural cycle" is neither viable nor particularly relevant.

## How Natural Is Fire's Ecological Role?

Protection for wilderness and wildlife is sometimes associated with what Pyne (1997) has called a "naive philosophy" that "require[s] only the restoration of a natural process to a natural landscape." However noble its motives, this philosophy is fundamentally flawed. Since the arrival of humans, the North American landscape has never been in a state of nature. Instead, as MacCleery (1996) and Pyne (1997) have pointed out, it has always been a mosaic of changing ecologies resulting from a constant negotiation among climate, soil, biota, and peoples with their fire practices. Because humans have played a key role in establishing North America's fire regimes, the idea that natural fire plays a distinct ecological role apart from human influence does not stand up under scrutiny without considerable qualification.

After millennia of human fire use across North America, a strategy of "getting fires over with on a natural cycle" is therefore neither viable nor particularly relevant on many or even most sites. Fire can and should be allowed to function in its natural ecological role, but only—as Federal interagency policymakers have acknowledged—"as nearly as possible" (USDI/USDA 1995). Like their pre-Columbian predecessors, today's land managers have little choice but to actively manage wildland fire. Even the decision to manage for potential natural vegetation—that is, for the ecosystems that might occupy a site without human-caused disturbances—can require active fire and timber management. On Idaho's Boise National Forest, for example, decades of fire suppression have

Fire is best regarded as a land management tool, not as part of a mythical pristine wilderness in need of protection.

left hundreds of thousands of acres of once healthy ponderosa pine forest dominated by dense stands of small-diameter Douglas-fir and other fire-sensitive species (Burton et al. 1999). When wildland fire occurs in these altered fire regimes, the resulting intense crown fires can turn large areas of forestland into long-term grass- and shrubland. Restoration of healthy ponderosa pine ecosystems seems hopeless without interventions such as fire suppression, selective thinning, and prescribed burning.

Land managers today, in search of a role for fire that is desirable, ecologically sound, and socially acceptable, are selectively applying the full range of technology-assisted fire management techniques—from prescribed fire to full suppression. Whether used or suppressed, fire is best regarded as a tool for achieving land management objectives, not as part of a mythical pristine wilderness in need of protection. Moreover, on Michigan's jack pine plains and elsewhere, Smokey Bear has never destroyed habitat for an endangered species by "postponing fire" that is somehow "natural." Instead, his campaign against careless fire use is as valid today as ever.

## Acknowledgments

The author wishes to thank Susan Conard, a fire biologist for the USDA Forest Service, Washington Office, Vegetation Management and Protection Research Staff, Washington, DC; and Joe Petulla, the former director of the Graduate Program in Environmental Studies and Environmental Management, University of San Francisco, San Francisco, CA, for reviewing this article and offering valuable comments and criticisms. The author also owes thanks to Phil Huber, a biologist for the USDA Forest Service, Huron–Manistee National Forest, Mio Ranger District, Mio, MI, for furnishing the photographs for this article.

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# Courage, Dedication, Sacrifice: A Monument to Wildland Firefighters

Jack Ward Thomas

Looking back at my time as Chief of the USDA Forest Service, I vividly remember the summer of 1994. We lost 34 friends and coworkers—and many others were injured—during efforts to contain wildland fires. I spent agonizing days trying, as best I could, to console families, deal with survivors, attend services, and work to see that such tragedies were less likely to repeat themselves. My nights are still interrupted with flashbacks to that awful summer.

As a result, I am working with the National Fish and Wildlife Foundation to rally support for a monument to honor the men and women who fight wildland fires—who "chase smoke," swing pulaskis, throw dirt, spray water, rip stumps, set backfires, and otherwise engage fires in our Nation's wildlands; who fly planes and drop from the sky by parachute and from helicopters; who struggle against the spectacular forest and range fires that fill television screens at news time; and who parachute or hike for miles to dig control lines around the "little fires"—the thousands of fires that no one hears about because these brave women and men were there. As Chuck Johnson, the President of Era Aviation, put it, "It's our way of saying 'thank you' to the brave people who fight wildland fires. It's a tribute well deserved."

*Jack Ward Thomas, Chief of the USDA Forest Service from 1993 to 1996, is Boone and Crockett Professor of Wildlife Conservation at the University of Montana, Missoula, MT.*

Since 1910, more than 700 wildland firefighters have died in the line of duty. These young lives should not be forgotten.

The Wildland Firefighters Monument will occupy a half-acre (0.2-ha) site on the grounds of the National Interagency Fire Center (NIFC) in Boise, ID. NIFC oversees the mobilization of more than 60,000 wildland firefighters each year.

The site will reflect the firefighters' environment, including native plants, boulders, and more than

*The sculptor Lawrence Nowlan, Jr., poses with a larger-than-life statue of a wildland firefighter, which will grace the Wildland Firefighters Monument. A model for another statue stands to Nowlan's left.*


*The Wildland Firefighters Monument at the National Interagency Fire Center in Boise, ID, will reflect the firefighters' environment, including native plants and boulders. A path resembling a memorial ribbon will lead through the half-acre (0.2-ha) site past a picnic area and waterfall.*

200 trees and shrubs. A path resembling a memorial ribbon will lead through the site past a picnic area and waterfall. Three larger-than-life statues of firefighters in action will be erected off a ridge-line connected to the waterfall. Displays along the way will help visitors learn more about wildland fire protection, how fires are fought, and fire's often positive role in nature.

We can be thankful that no one died fighting wildland fires in 1998. But 66,196 fires occurred and 2,856,959 acres (1,156,211 ha) were burned. Since 1910, the year of the first great fire complexes faced by the fledgling Forest Service, more than 700 wildland firefighters have died in the line of duty. Losing a friend or acquaintance is wrenching, and having a colleague die in the line of duty is even more difficult to accept.

When I stood on the still smoldering slopes of Storm King Mountain in 1994, where 14 wildland firefighters had perished the day before, I swore that, somehow, we would not let these vibrant young lives be forgotten. The Wildland Firefighters Monument will be a place for people to rest, reflect, remember—and, perhaps, appreciate.

For more information on the Wildland Firefighters Monument and how you can support it, contact Cinda Jones, National Fish and Wildlife Foundation, 1120 Connecticut Avenue, NW, Suite 900, Washington, DC 20036, tel. 202-857-0166. ■

# Vehicle Maintenance—A Matter of Life and Death

April J. Baily

In the second of a two-part series concerning wildland fire fatalities published in *Wildfire News & Notes*, Richard Mangan (1998) cites the maintenance of Federal Excess Personal Property (FEPP) vehicles as a possible contributing factor in the deaths of volunteer firefighters. FEPP vehicles are largely trucks declared excess by the U.S. Department of Defense and turned over to the USDA Forest Service for rehabilitation and retrofitting to perform firefighting duties. They are on loan from the Forest Service to the State Foresters in 50 States and 6 Territories. An estimated 70 percent are subloaned to local fire departments or fire districts. Many FEPP vehicles are at least 10 years old and housed in a wide variety of facilities, depending on the needs of local fire districts. Maintenance varies from intensive and comprehensive to haphazard, depending again on local circumstances.

In one case where vehicle maintenance might have contributed to fatalities, two volunteer firefighters were unable to escape a wildfire blowup on the 1995 Point Fire in Nevada when their FEPP truck stalled and could not be restarted.

*April J. Baily is the Federal Excess Personal Property program officer for the USDA Forest Service, Fire and Aviation Management, Washington, DC; and the general manager of* Fire Management Notes.

Forest Service FEPP managers should encourage their State partners to work with local fire departments in maintaining FEPP vehicles.

The subsequent investigation (USDA Forest Service 1995) revealed that many factors contributed to this tragedy, including poor communication, and the cause of the stall is undetermined. However, we should do the best we can to prevent firefighter death or injury due to poor FEPP vehicle maintenance.

To that end, Forest Service FEPP managers should encourage their State partners to work with local fire departments in maintaining FEPP vehicles. Mutual aid and cooperative agreements between State and local entities should address the need for accurate maintenance records and regular inspections. In addition, as noted in the 1995 Point Fire accident investigation, any vehicle that experiences mechanical difficulties during an incident should be examined by qualified personnel and certified to be in working order before it is placed into service again. Any vehicle with a history of mechanical failure should not be used in wildland fire suppression efforts unless corrective steps have been taken.

A good training aid for the maintenance of the two-and-one-half-ton military trucks that make up much of the FEPP fleet is a videotape available from the State of Colorado for a nominal charge. For additional information, contact Richard L. Homann, Fire Division Supervisor, Colorado State Forest Service, by e-mail at rhomann@lamar.colostate.edu or by telephone at 970-491-7538.

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# A Look at Wildland Fires in Mexico*

Dante Arturo Rodríguez-Trejo

The worst fire season in Mexican history was in 1998. Drought conditions precipitated by a strong El Niño led to unusual fire activity, including crown fires, fire whirls, and rapid spread rates. A total of 14,302 fires burned 2,099,412 acres (849,632 ha)—3.6 times the annual average. Even worse, 60 people died fighting fire.

## Impact of the 1998 Fires

As the 1998 fire season progressed, firefighting costs soared. The President of Mexico allowed two emergency budget increases, bringing Federal firefighting costs to $33.3 million (not counting substantial additional spending by State governments). Many people were evacuated from their homes when wildland fires endangered rural and suburban areas. Satellite images showed a huge, unprecedented smoke plume over Mexican territory. The smoke caused severe pollution problems in urban areas such as Mexico City and even reached the United States. Tropical areas with exceptional biodiversity were damaged or threatened by the fires and smoke.

Sixty people died fighting fires in Mexico during the 1998 fire season, the worst in modern Mexican history.

The Mexican people were united in confronting the flames. All Federal and State fire agencies, along with the Mexican Army and citizens from across the nation, fought the flames with heroism. More than 6,000 firefighters, 139,000 soldiers, and thousands of volunteers joined the effort, supported by 57 aircraft from Mexico, Canada, and the United States. Industrialists donated money to rent aerial equipment, and the common people donated tools and fought the fires. The United States provided generous financial and technical assistance, and Canadian aircraft were extremely useful in combating the flames.

The role played by Mexico's northern neighbors in fighting Mexico's fires points to the growing internationalization of wildland fire management and the rich history of cooperation in the North American wildland fire community. This article builds on that tradition. Its purpose is to present aspects of the fire history, ecology, and management of Mexico's wildlands to the international wildland fire community. Its goal is to help, in some small way, integrate the activities of wildland fire management agencies, researchers, and landowners for the protection and preservation of Mexican forest ecosystems.

## Fire in Mexican Ecosystems

Natural disturbances can be distinguished by origin as atmospheric, geologic, spatial, and biological. Historically in Mexico, all four types can result in wildland fires, although with greatly varying frequency. The most common source of natural ignition, particularly in northeastern and northwestern Mexico, is lightning. A less common natural fire source is lava, the result of a geologic disturbance. An even less common natural source of wildland fire are meteorites from outer space. Although biological disturbances on land usually increase the fire danger by producing dead biomass and increased fuel loads (such as trees killed by disease), probably very few start fires. According to Pyne et al. (1996), however, in certain situations microbial activity can raise temperatures to 158 ºF (70 ºC). This initial heating, coupled with processes such as chemical oxidation, can lead to spontaneous combustion in piles of organic matter.

Fire is an important ecological factor in many Mexican ecosys-

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* This article is based on the author's book *Incendios Forestales* [*Forest Fires*], published in 1996 by Mundi Prensa Mexico, Mexico City, Mexico. Written in Spanish, the book compiles most information available through 1995 on wildland fires in Mexico.

tems. There are three basic fire regimes:

1. High-frequency, low-intensity (surface) fire;
2. Low-frequency, high-intensity (crown) fire; and
3. High-frequency, high-intensity fire.

The low-intensity fire regime is by far the most widespread in Mexico and the one about which the most information is available. Except in shrublands (as in northern Mexico), in most years wildland fires are usually surface fires.

Frequent surface fires are typical in Mexico's pine forests (fig. 1), such as its forests of Rudis pine* (*Pinus rudis*) and its high-mountain forests of Hartweg pine (*P. hartwegii*), which grows at elevations up to 13,000 feet (4,000 m). The fire return period varies; in Sonora, for example, fire occurs on average every 3.8 years in stands of Apache pine (*P. engelmannii*) and Durango pine (*P. durangensis*) (Dieterich 1983), whereas in the pine–oak forests of Durango, fire occurs every 3.8 to 5 years (Fulé and Covington 1996), in both cases under human influence. Pines show several fire adaptations, including basal resprout in juvenile Hartweg pine, grass stage in Montezuma pine (*P. montezumae*), and serotinous cones in Mexican weeping pine (*P. patula*). Species such as Aztec pine (*P. teocote*) (Rodríguez-Aguilar 1991) and Mexican weeping pine regenerate very well on burned sites. Several grasslands and savannas are also adapted to frequent low-intensity fire.

* English common name unknown. For the purposes of this article, the author derives the common name from the Latin cognomen. Many Mexican pine species are not found in the United States and therefore not named in Little (1979). English common names in this article for most species are from Richardson and Rundel (1998).

**Figure 1**—*A just-controlled surface fire in central Mexico in an open pine stand associated with grasses. Several types of Mexican pine forests are adapted to frequent low-intensity fire. Photo: Dante Arturo Rodríguez-Trejo, Chapingo, Mexico, 1987.*

The low-frequency stand-replacing fire regime corresponds to true fir (*Abies*) forests. Frequent high-intensity fires are common in Mexico's shrublands, especially in the northwest, where shrubland is particularly widespread and represents climax vegetation. In central Mexico, shrublands are less abundant, and some represent a successional stage replaced over time by pine forest unless frequent disturbances occur. Shrub regeneration after fire is normally rapid; species of manzanita (*Arctostaphylos*) and oak (*Quercus*) quickly resprout after fire. For example, 3 months after a fire in central Mexico's shrublands, dwarf oak (*Quercus frutex*) typically has 607,050 rhizome resprouts per acre (1.5 million per ha) (fig. 2).

In addition to natural fire regimes, anthropogenic (human-caused) fire maintains many Mexican forest ecosystems, unless applied with great frequency. Excessive human burning can degrade ecosystems, contributing to deforestation. Perry (1991) cites numerous endangered Mexican pine species, including six that are threatened by fire, alone or in combination with another factor such as grazing: Potosí pinyon pine (*P. culminicola*), Martínez pine (*P. maximartinezii*), Rzedowsky pinyon pine (*P. rzedowskii*), Laguna pine* (*P. lagunae*), Jalisco pine (*P. jaliscana*), and Nelson pine (*P. nelsoni*).

## Wildland Fire in Mexican History

**Fire Culture.** Anthropogenic fire began in central Mexico about 24,000 years ago, when the first settlers arrived. Over millennia, the gradual rise in human population increased the frequency of fire in Mexico's various ecosystems. Ancient Mexican mythology includes the god of fire, Xiuhtecuhtli, who was worshipped by

* English common name unknown. For the purposes of this article, the author derives the common name from the Latin cognomen.

the Aztec, Teotihuacan, and other civilizations. According to Villaseñor (1980), forest stewardship was part of the government philosophy of the Chichimec and Texcocan civilizations, and the former practiced wildland fire prevention.

Mexico's ancient civilizations widely used fire. The Olmecs, for example, practiced slash-and-burn cultivation 3,500 years ago, and fire practices similar to those of the ancient Mayans continue in Chiapas today (fig. 3). When rotation periods are several decades or more in length, slash-and-burn agriculture is efficient on shallow, rocky tropical soils on hills, where key nutrients such as phosphorus are stored in the living biomass rather than mainly in the soil.

After the Spanish conquest, the use of natural resources changed. Agriculture increased, as did forest exploitation due to new or growing charcoal production, mining, animal husbandry, and fuelwood collection (Gutiérrez-Palacio 1989). Fire use associated with these activities increased anthropogenic wildland fire. According to Pyne (1997), settlers from pastoral economies such as Spain's were familiar with broadcast fire for range improvement, and the rapid deforestation of Mexico was more a repetition of Spanish experience than a cruel innovation.

After Mexico gained independence, the Government created a forest service in 1861 (Verduzco-Gutiérrez 1959). The 20th century gave birth to formal fire management programs and saw them gradually strengthen. Today, fire management in Mexico, as elsewhere, is still in evolution.

Nine of the past 13 years have seen the highest numbers of wildland fires in modern Mexican history; and 6 of the past 13 years have seen the highest numbers of acres burned.

**Figure 2**—*Abundant dwarf oak (Quercus frutex) rhizome sprouts 3 months after a stand-replacing fire in the State of Mexico (central Mexico). Photo: Dante Arturo Rodríguez-Trejo, Chapingo, Mexico, 1992.*

**Figure 3**—*An open landscape in Chiapas, southern Mexico, created by slash-and-burn cultivation. This fire practice is thousands of years old, dating at least to ancient Mayan civilization. Photo: Dante Arturo Rodríguez-Trejo, Chapingo, Mexico, 1992.*

**Fire Frequency.** Figure 4 shows the historic trend of wildland fires since 1968, demonstrating a steady increase in the past three decades in wildland fire numbers and acres burned. People are by far the most common cause of wildland fires in Mexico. According to SARH (1993), only 7 percent of wildland fires in Mexico are historically due to natural and unknown causes, whereas 93 percent have human causes. The main causes of wildland fires are agrarian activities with deep historical and socioeconomic roots (poverty), such as burning to improve cattle pasturage, burning to dispose of agricultural residues, and slash-and-burn cultivation. In Mexico State and the Federal District, the former two causes account for 80 percent of all wildland fires.

**Fire Impacts.** Fire has ecological, political, economic, social, and management impacts that affect different social sectors differently. For instance, when rural cattle raisers start fires in the mountains around Mexico City, they benefit from increased forage for their cattle during the dry season, but urban inhabitants suffer from the resulting poor air quality and the loss of forest products and benefits when wildland fires result.

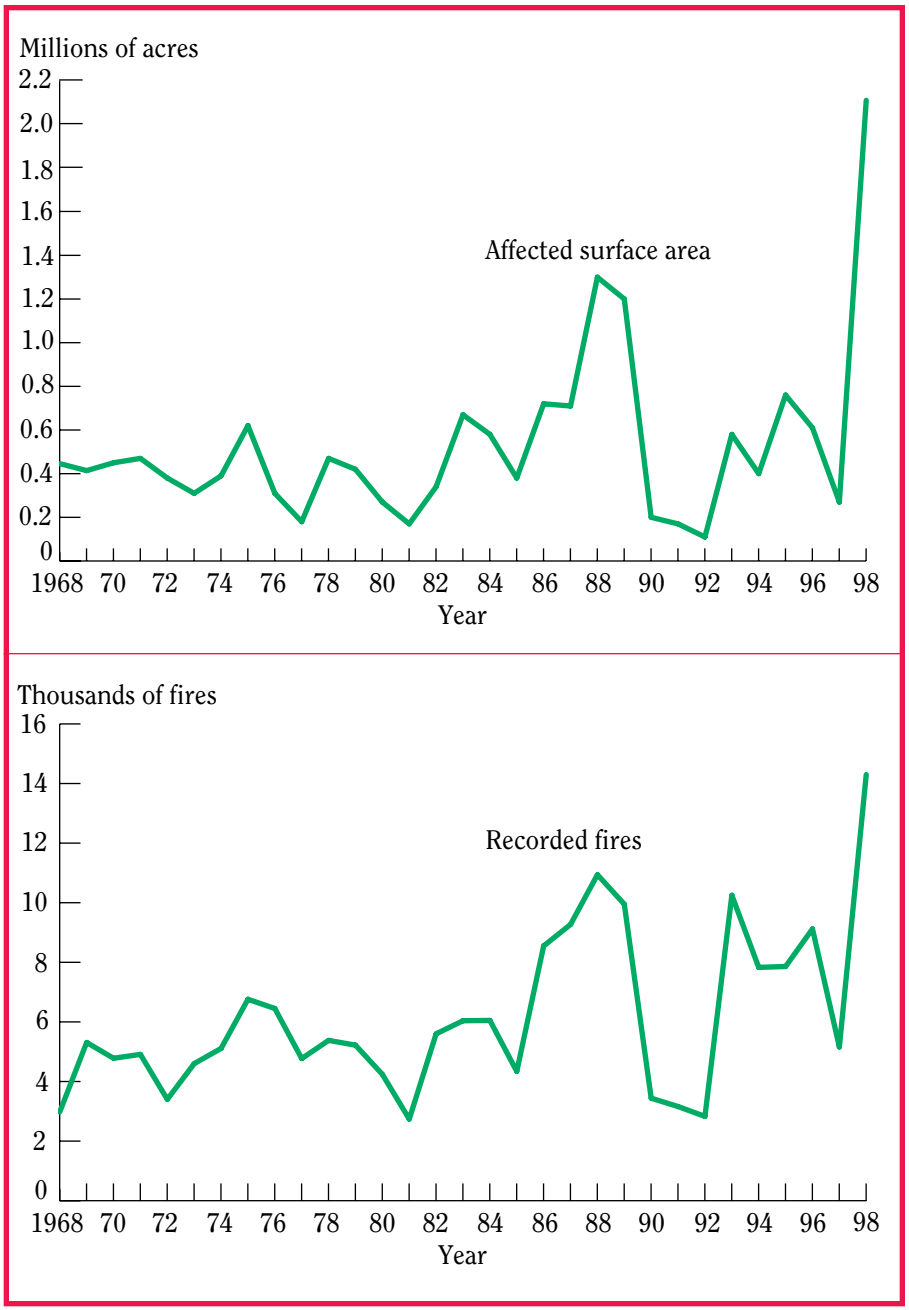


**Figure 4**—*Historic trends for forest fires in Mexico (SARH 1994; SEMARNAP 1998, 1999).*

**Factors Affecting Fire Behavior.** Mexico lies in tropical and subtropical areas, but because of mountain systems in eastern, western, southern, and central Mexico, the climate in many areas is temperate due to the adiabatic gradient (the gradual reduction in temperature with rising elevation, 1.2 ºF (0.66 ºC) on average for every 328-foot (100-m) rise in elevation). In most of Mexico, the fire season occurs in winter and spring (from January to June). In Baja California, however, with its Mediterranean climate, the fire season occurs in summer and fall (about the same time as in southern California). After devastating hurricanes such as Janet (in the 1950's) and Gilberto (in 1988), a huge accumulation of fuels increased the fire danger in southeastern Mexico, resulting in large wildland fires by 1989. El Niño has also noticeably influenced fire weather, particularly in 1998.

The topography of Mexico is quite irregular, ranging from sea level to more than 16,400 feet (5,000 m). Even the highest peaks are often covered with vegetation. Regionally, the range of elevations is smaller; in central Mexico, for

## Statistics on Wildland Fires in Mexico

| | |
|---|---|
| Regular fire season | January–June* |
| Average annual number of wildland fires | 7,000 |
| Largest number of wildland fires in one fire season (1998) | 14,302 |
| Smallest number of wildland fires in one fire season (1992) | 2,829 |
| Average annual area burned | 589,523 acres (238,580 ha) |
| Largest area burned in one fire season (1998) | 2,099,412 acres (849,623 ha) |
| Smallest area burned in one fire season (1992) | 109,713 acres (44,401 ha) |
| Largest average fire area in one fire season (1998) | 146 acres (59 ha) |
| Smallest average fire area in one fire season (1992) | 40 acres (16 ha) |
| Wildland fires with natural or unknown causes | 7 percent** |
| Wildland fires with human causes | 93 percent** |

Sources: SARH (1993; 1994); SEMARNAP (1998, 1999).
*Except in northwestern Mexico, where the regular fire season occurs in summer and fall.
**Historically (SARH 1993).

example, elevations reach from 7,200 to 13,000 feet (2,200–4,000 m) on a terrain that is deeply dissected by many streams, with slopes sometimes greater than 100 percent in inclination. Bare, irregular volcanic rock covers large parts of Mexico City's forests, with forest cover on a soil that is still in formation. Fuels accumulate in subterranean corridors formed by the rock fractures, making the control of subterranean fires difficult.

Mexico has rich vegetation, including many forest types and forest fuel complexes. In central Mexico, average surface fuel loads range from 3.23 tons per acre (7.98 t/ha) in grasslands to 24.39 tons per acre (60.26 t/ha) on fir forest sanitation and salvage clearcuts. Table 1 shows sample fuel inventories in central Mexico. Table 2 shows a sample of fire behavior during a prescribed burn.

## Wildland Fire Management in Mexico

**Firefighting.** The main Federal firefighting organization is the Ministry for Environment, Natural Resources, and Fishery (SEMARNAP). In addition, several other Federal agencies and every State government contribute greatly. Other important actors are farmers' organizations and the Civil Protection Agency. The Mexican Army provides extraordinary support, as demonstrated during the 1998 fires. Volunteer groups also deserve mention.

In the 1930's, commercial airplanes were used for the first time to detect forest fires. In 1964, six helicopters were bought specifically for use in fire detection (Garduño and Verduzco 1964). By 1985, rented airtankers supported firefighting efforts in several States (Galeote-Rivera 1987). Cedeño-Sánchez (1994) provides a detailed description of airplanes and helicopters used in Mexican firefighting since the mid-1980's.

**Fire Behavior Modeling.** Alvarado-Celestino (1986) was the first in Mexico to experiment with Rothermel's (1972) model for predicting fire spread, in a Montezuma pine (*P. montezumae*) forest in Puebla. He also obtained probabilistic models to estimate fire behavior. By the end of the 1980's, Armijo and Sierra-Pineda (1988) and their teams had devised a system called Technical Expert in Generalized Forest Fires (EXTINGE), a computerized program using artificial intelligence. The technical directorate of the Mexico City government's Coordinating Commission for Rural Development promptly started using EXTINGE on Mexico City's forests, drawing on advice from the developers of the Fire Behavior Prediction and Fuel

**Table 1**—*Surface fuel loads for several vegetation types in the Federal District and part of Mexico State, Mexico (Rodríguez-Trejo and Sierra-Pineda 1995).*

| *Type* | *Average load (ton/acre (t/ha))* | *Maximum load (ton/acre (t/ha))* | *VC*[a] *(%)* |
|---|---|---|---|
| Grassland | 3.23 (7.98) | 4.19 (10.36) | 42.1 |
| Xerophytic shrubland | 4.61 (11.40) | 5.95 (14.71) | 20.5 |
| Broadleaf forest | 5.40 (13.34) | 7.67 (18.95) | 54.4 |
| Pine or pine–broadleaf forest | 9.44 (23.32) | 30.92 (76.40) | 71.0 |
| Fir or fir–pine forest | 11.02 (27.22) | 44.49 (109.94) | 60.8 |
| Fir–pine or fir–broadleaf forest[b] | 12.52 (30.94) | 20.68 (51.11) | 63.9 |
| Fir forest[b] | 26.01 (64.26) | 66.25 (163.70) | 92.7 |

[a] VC = Variation coefficient (as a measure of variation due to different disturbance levels by forest type).
[b] Under salvage harvest.

**Table 2**—*Fire behavior during a prescribed burn in a low-density pine forest associated with grassland, Mexico City municipal forests, April 4, 1989 (based on Rodríguez et al. 1989). The average fuel load was 4.9 tons per acre (12 t/ha).*

| Time | Wind | | Relative humidity (%) | Light fuels humidity (%) | Slope (%) | Speed of fire spread | | Length of flame (ft (m)) |
|---|---|---|---|---|---|---|---|---|
| | Direction | Speed (mi/h (km/h)) | | | | Frontal fire (ft/min (m/min)) | Backfire (ft/min (m/min)) | |
| 0831 | NE | 4 (6) | 32 | 9 | 16 | 16 (5) | 1.6 (0.5) | 4.9–10 (1.5–3) |
| 0917 | N | 8–10 (13–16) | 32 | 8 | 9 | 66 (20) | 6.6 (2) | 3–13 (1–4) |
| 1002 | NE | 10–12 (16–20) | 30 | 8 | 15 | 75 (23) | 5.2 (1.6) | 6–16 (2–5) |
| 1030 | E | 6–9 (10–14) | 22 | 5 | 10 | — | 13 (4) | 8.2 (2.5) |
| 1100 | NE | 6–12 (10–20) | 18 | 4 | 15 | 120 (36.5) | — | 8.2–16 (2.5–5) |

Modeling System (BEHAVE). EXTINGE had three basic purposes:

1. To support firefighting by making recommendations for fire control;
2. To provide a training tool by simulating a dialog with an expert that explains the reasons for the fire control recommendations; and
3. To integrate and process information on fire seasons, identifying statistical trends for wildland fires and for the relative efficiency of firefighting efforts.

The system was composed of three modules: consulting an expert, developing and maintaining a data base, and constructing a simulation tool based on Rothermel's model. The Mexico City government also used EXTINGE to elaborate on fire prescriptions and to develop danger maps based on risk and weather factors. By the end of the 1980's, the Subdirectorate for Forest Fires in Mexico (the Federal wildland fire management agency within SEMARNAP) began to use the excellent American program BEHAVE.

**Fire Danger Indices.** Researchers and fire managers have taken several approaches to the problem of fire danger indices (see sidebar). In 1999, SEMARNAP began using the prototype Forest Fires Information System, generated in agreement with the Canadian Forest Service. Among many other features, this system provides maps of meteoroloogical danger indices for all of Mexico.

**Prescribed Burns.** Prescribed burning is conducted in Mexico for various purposes, including:

- Seedbed preparation;
- Succession and vegetation control;
- Rangeland management;
- Wildland fire prevention and preparedness;
- Training;
- Education and research (fig. 5); and
- Harvest slash disposal.

The effectiveness of prescribed burning to promote forage varies. In Coahuila, Luna et al. (1985)

## Fire Danger Assessment in Mexico

Researchers and fire managers have developed various approaches to the problem of assessing fire danger in Mexico at the local, State, and regional level. Examples follow.

- Magaña-Torres (1983) developed the following probabilistic model for part of Puebla:

$$Y = -0.0016863(P30) + 0.0236204(E7) + 0.01278057(V15) - 0.7409428$$

  where
  $Y$ = fire probability,
  $P30$ = cumulative precipitation in 30 days,
  $E7$ = cumulative evaporation, and
  $V15$ = cumulative wind in 15 days (according to Wild's scale).
- Melgar (1986) defined fire risk in part of Michoacan based on slope, depth of forest fuels, number of months with drought, fire duration, and affected surface, among other variables.
- Martínez et al. (1990) and Benavides and Flores (1993) defined indicators of fire danger for the Sierra de Manatlán, Jalisco. They discovered that fine fuels, vegetation type, and slope were the most important factors.
- Knockaert et al. (1991) defined protection priorities for the areas affected by large fires in the State of Quintana Roo (where topography is flat) in terms of three types of factors:
  – *Fire risk factors* included, among other variables, human population density, frequency of fires, and cumulative occurrence of fires.
  – *Fire danger factors* focused on fuels, emphasizing control resistance of fuel types (based on local firefighters' experience) and the presence of lithosols (because fires in fuels on these soils are difficult to control).
  – *Potential fire damage factors* included the economic value of each vegetation type, the relative ecological value (for example, natural protected areas have high value), and the presence of archeological sites.

  The priority for protection was computed as the pondered mean of normalized values for each main factor type. Eventually, Nolasco (1993) developed similar indices for all of Quintana Roo.

**Figure 5**—*Small experimental prescribed burn in Puebla, central Mexico. Photo: Dante Arturo Rodríguez-Trejo, Chapingo, Mexico, 1995.*

found for Tobosa grass (*Hilaria mutica*) that forage production after fire is influenced by the quantity of annual precipitation. During years with good precipitation, forage production was 1.27 tons per acre (3.15 t/ha) in burned areas and 0.51 tons per acre (1.26 t/ha) in control areas. During dry years, forage production was 0.28 tons per acre (0.7 t/ha) in burned areas and 0.43 tons per acre (1.07 t/ha) in control areas.

Several types of pines respond well on burned sites, although it is relatively common to see bark beetles affecting trees in burned areas. In Chihuahua pine (*P. leiophylla*) and Montezuma pine (*P. montezumae*) stands in the State of Mexico, Espinosa and Muñoz (1988) found a direct correlation between the land area affected by wildland fires during one year and the degree of tree infection by Mexican bark beetle (*Dendroctonus mexicanus*) during the next year. In central and northern Mexico, the wood decay fungus (*Phellinus pini* (*Fomes pini*)) affects pine (*Pinus*), fir (*Abies*), and Douglas-fir (*Pseudotsuga*), entering the trees through fire wounds or broken branches (Méndez-Montiel 1993).

## Future Trends

In Mexico, the number of wildland fires and acres burned, despite huge fluctuations, is steadily increasing overall, partly due to Mexico's population growth. Despite the rising efficiency of fire detection and suppression each year, this development signals two future trends for wildland fire management in Mexico:

- Anthropogenic fire, which is far more extensive in Mexico than natural wildland fire, will continue to be one of several factors contributing to Mexico's deforestation rate, which currently stands at 741,290 acres (300,000 ha) per year. Adverse effects from fire include rising greenhouse gases, air pollution, and erosion.
- Natural wildland fire, anthropogenic fire, and prescribed burning will continue to help, at least in some cases, to maintain Mexico's wildland ecosystems, including many pine forests, oak forests, shrublands, grasslands, and savannas.

It is vitally important to define the appropriate fire regime for every ecosystem and to tailor wildland fire prevention activities to socioeconomic conditions. For example, a campesino who burns grasses to improve forage for his cattle usually has no other choice. Reducing this type of activity is possible only if those who depend on it for a living have other options. Alternative agropecuarian techniques, such as agroforesty systems, may play an important role in providing other options. Other key areas to emphasize include the evaluation of fire effects and increased support for research into fire management practices, such as firefighting activities and firefighter safety.

To meet these challenges, better communication among researchers, fire managers, government officials, and landowners is required. In particular, more basic and applied research is needed to build a state-of-the-art wildland fire management and science in Mexico as a point of departure for innovation and change. Now is the time. The extreme severity of the 1998 fire season has sharpened awareness of wildland fire issues among researchers, fire managers, government officials, and citizens in general throughout Mexico. By stimulating interest among international researchers in the rich research opportunities Mexico presents, this article will perhaps contribute to raising awareness of the need to preserve and protect Mexico's forest ecosystems through sound wildland fire management.

The main causes of wildland fires are agricultural and cattle-raising activities with deep historic and socioeconomic roots.

For more information on wildland fire in Mexico or for information on how to obtain the author's book and other resources, contact Dante Arturo Rodríguez-Trejo, School of Forest Resources and Conservation, University of Florida, 226 Newins-Ziegler Hall, P.O. Box 110410, Gainesville, FL 32611-0410, tel. 352-846-5556, fax 352-846-1277, e-mail dante@ufl.edu.

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# Strategic Planning for 21st-Century Wildland Fire Management

Tim Murphy and Michael DeGrosky

The arrival of a new century inspires a frenzy of planning in government agencies, including wildland fire management organizations—and rightly so. In our world today, change is as relentless as the tides. But tides are predictable over time. Change, on the other hand, is unpredictable and occurs at an accelerating rate. We can cope with change only by planning for it.

> Through strategic planning, organizations can anticipate the inevitable changes in their operating environments, charting a course that will position them well in an uncertain future.

## The Accelerating Pace of Change

As Alvin Toffler (1970) observed in his book *Future Shock*, it isn't change itself that is so difficult for us to cope with, but rather the acceleration of change. If we were to plot the occurrence of change over time, we would map a curve that begins with a nearly horizontal line and gradually slopes upward through the centuries, steepening markedly over the past 100 years. We have likely experienced more change in our lifetimes than all of human experience before us. In 1903, for example, the Wright Brothers made their first tentative flight on a beach in Kitty Hawk, NC; by 1969, just 66 years later, Neil Armstrong was walking on the moon; and by the 1990's, a machine was rolling on the surface of Mars, sending images and data back to Earth.

What does this have to do with wildland fire management? Our business, too, is changing at an ever-increasing rate. North American wildland fire organizations operate in chaotic, turbulent workplaces and face dramatic change in their physical, social, political, economic, organizational, and technological environments. In 1996, the Montana Department of Natural Resources and Conservation (DNRC) completed a strategic planning initiative to address the rapidly changing circumstances facing wildland fire managers today (see sidebar).

In the last 10 years alone, for example, we have seen an explosion of technology. On almost every desktop, we now have computers more powerful than the mainframe computers of the 1960's. Think of the communications technology available today that wasn't around just a few short years ago: we now have instantaneous communications all over the world using wireless technology, cellular phones, satellite links, and the World Wide Web. Without question, advances in technology have indelibly altered our wildland fire management capabilities. The question is whether we are adequately prepared to use this exploding technology in thoughtful and productive ways, because technology costs can be enormous and benefits elusive.

## Planning for Change in the 21st Century

Turbulent workplace environments might seem chaotic, but they often provide the impetus for positive organizational change. Through an invaluable tool known as strategic planning, organizations can anticipate the inevitable changes in their operating environments, charting a course that will position them well in an uncertain future.

Formal strategic planning was first introduced to business organizations in the mid-1950's. Through the early 1980's, planning increasingly took the form of lengthy, abstract, and expensive exercises conducted by small, elite groups using top-down management models. Today, progressive organizations have rediscovered the value of strategic planning. Through

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Successful organizations think and plan strategically, choosing the strategy that best accomplishes the goals and objectives that fulfill their mission and realize their vision.

## Montana's Strategic Planning for Wildland Fire Management in the 21st Century

The coming of the 21st century is serving as a catalyst for strategic planning by wildland fire organizations to cope with today's accelerating pace of change. Recently, the Montana Department of Natural Resources and Conservation (DNRC) used a participatory, inclusive strategic planning process to define the mission and strategic direction for our fire and aviation program. A task force chartered by the DNRC in July 1994 held 10 meetings around the State (many with stakeholders), concluding its work in July 1996 with the completion of a strategic plan. Published in September 1996, the DNRC's Fire and Aviation Strategic Plan has three primary purposes:

- To document and communicate our long-range focus,
- To provide a foundation for future tactical work planning, and
- To promote unity and teamwork among the DNRC's internal and external stakeholders.

One result of the strategic planning process was formulation of a mission statement. By answering the question, "What is our mission?", the DNRC clearly stated what our fire and aviation program does, whom it serves, what our customers get, and why they get it.

As a large part of its work, the task force identified and prioritized strategic goals, a central component of the strategic plan. Goals are specific, measurable results that we intend to accomplish over 4 years. They provide the central focus that guides the DNRC's decisions about the nature, scope, and priority of the agency's projects and activities. Everything the DNRC does is intended to help us move toward attaining one or more of our strategic goals. For example, in 1998 we brought all private land in Montana—some 45 million acres—under wildland fire protection, a key strategic goal; and in 1997, we helped pass the Montana Master Mutual Aid Act to promote wildland fire management partnerships. By achieving its strategic goals, the Montana DNRC will simultaneously accomplish its mission and move confidently toward realizing its vision for the future.

processes that are more democratic than in the past, we are tapping the knowledge, experience, and talents of people throughout an organization and among its stakeholders.

Successful organizations think and plan strategically. They generate alternative strategies, then choose the strategy that best accomplishes the goals and objectives that fulfill the organization's mission and realize its vision. Strategic planning allows an organization to:

- Address emerging issues that have perhaps been ignored;
- Correct longstanding weaknesses in its programs;
- Build on established strengths; and
- Exploit waiting opportunities.

In essence, strategic planning means charting a course to an uncertain future. There is no magic in planning, and no single method will guarantee success. Planning is basically just hard but necessary work. By thinking and planning strategically, we make thoughtful assumptions about the future and then plan how to position our organization for success in the presumed future environment. Many people wrongly believe that strategic planning means making tomorrow's decisions today or deciding what to do in the future. Instead, a strategic plan describes what should be done today to achieve a desired future.

## Preparatory Steps for Strategic Planning

Before beginning the strategic planning process, an organization should take two key steps:

- *Develop commitment and support from the leadership.* The key to commitment is involvement. Strive for participation. If you want people to be committed to your mission, vision, or strategic plan, you must involve them in developing those products.
- *Decide whom to involve, and include anyone who can ensure viability and success.* Depending on your situation, you might include:
  - Interagency partners. Your partners, regardless of their relationship to your organization, might be your primary stakeholders and should play an important contributing role in your planning effort. Organizations that cooperate with, aid, or support other organizations should include those organizations in their strategic planning to establish a common vision.
  - The people responsible for executing the plan and doing the work. In his book *The Seven Habits of Highly Effective People*, Stephen R. Covey (1989) remarks that "[o]ne of the fundamental problems in organizations…is that people are not committed to the determinations of other people….You must involve your staff if you expect them to commit to carrying out the plan." Obviously, not everyone can participate in every aspect of your planning process. For example, you should not try to conduct a retreat meeting with more than 12 to 15 participants. However, you should look for and create opportunities for broad involvement. When deciding whom to involve, think about including stakeholders (see sidebar).

In addition, if you have the resources, you should consider using an outside facilitator for your strategic planning process. A qualified, neutral coach from outside your organization will aid your planning process in many ways, including:

- Helping to design the overall planning process your organization will use.
- Assisting with meeting planning and agendas for completing the planning process.
- Helping to identify people who should participate, both from within and from outside the organization.
- Facilitating the group process in a retreat atmosphere that allows the leadership and employees to focus on issues rather than process.
- Encouraging participation, collaboration, and consensus while taking individual needs into account.
- Preparing a summary report, including the first draft of your strategic plan.
- Heightening credibility for your planning effort.

## Essential Elements of Strategic Planning

**Mission Statement.** A mission statement is a short, distinctive statement that sets forth the organization's purpose, specifies the fundamental reason(s) for its existence, establishes its scope, and identifies its unique characteristics. An organization's leadership,

### What Is a Stakeholder?

We often speak of the need to involve stakeholders in agency decisionmaking. If stakeholders are more than our constituents, our workforce, our leadership, and our partners, then exactly who are they?

A stakeholder can be a single person, a group of individuals, another organization, or an institution. Stakeholder definitions vary. Useful definitions include:

- Anyone who has the power to influence your organization or who is strongly influenced by your organization.
- Anyone who has a self-interest in a given situation and whose vote or opinion will affect the outcome by blocking or supporting your decisions.
- Anyone who has a significant interest in the mission or accomplishments of your organization and can contribute to or interfere with your success.

A wildland fire management organization's stakeholders might include staff employees; agency leaders; private contractors; agencies with related missions; agency critics and detractors; fire prevention foundations and associations; landowners and other citizens served by the organization; and interagency cooperators as well as political representatives at the local, State, and Federal levels.

employees, and strategic partners must all work with a clear and concise mission statement for the organization, one that they understand and accept. Otherwise, each party will have a different perception of the organization's mission and will try to lead in a different direction.

**Guiding Principles.** An organization's guiding principles perform two important business functions:

1. They identify the philosophical guidelines for all of an organization's activities. In this capacity, they should address the needs and expectations of the organization's customers, partners, contributors, leadership, employees, and other constituents, capturing the essence of the organization's philosophy. They should capture the few critical core values that must guide the day-to-day behavior of everyone in the organization if it is to fulfill its mission.
2. They provide the framework within which a workforce can flexibly and creatively realize the organization's strategic vision.

**Vision Statement.** An effective organization's vision statement answers the question, "Where do we want to go?" The vision statement provides direction for the organization as a navigational aid or roadmap to a desired future condition. An organizational vision is a realistic, credible conception of the future you want for your organization. Visionary organizations strive to realize a future in which their organization is more successful than it is now.

There is nothing tough or mysterious about the concept of vision. Your vision statement simply describes what you want your organization to be or look like in the future. A vision is not a mission; your mission describes your organization's purpose, whereas your vision describes its direction.

**Goals.** Goals describe how you plan to fulfill your mission and realize your vision. Goals are the specific and measurable accomplishments that the organization seeks to achieve within a specified timeframe.

**Objectives.** Objectives are the means and tactics you will use to achieve your goals. Your objectives, including the work assignments, personal goals, and daily activities of the workforce, must support the mission, vision, and goals of your organization. They will concretize and clarify your goals, forming a basis for your implementation plan and for your subsequent work-planning documents and individual performance measures.

**Implementation Plan.** Your implementation plan allocates resources, assigns responsibilities, and sets completion deadlines. An effective implementation plan is essential for producing strategic direction, implementing that direction, and achieving results—your ultimate purpose. An implementation plan should accompany any strategic plan.

**Monitoring and Evaluation Methods.** The chief executive of your organization must monitor your implementation plan and update the governing body on how well the organization is achieving its strategic goals. The monitoring function is critically important for accomplishing your goals, alerting you to the need to make midcourse adjustments to your objectives and implementation plan to ensure success. Successful monitoring by the organization requires careful, periodic evaluation of the actions taken and the measurable results of those actions. Your plan should establish monitoring milestones at practical intervals. These milestones should be actual calendar dates for review, and they should be known to those responsible for accomplishing objectives.

## Enhancing Organizational Effectiveness

The Montana DNRC's strategic planning initiative provided a valuable opportunity for learning and reflection. We offer the following suggestions to leaders in wildland fire organizations on how to become more effective by taking some time to work on your business rather than in it.

- *Be visionary*. Don't try to lead by looking in the rearview mirror. A historical perspective is important, but it's better to turn on the headlights. Identify the visionaries in your organization and use them. They are innovative and creative and can point you in the right direction, helping you realize your vision for the future. But be discerning; visionaries often have goofy ideas as well as brilliant ones, and often they don't know the difference.
- *Use agents for change*. These are the folks who might not come up with the innovative ideas, but

Identify the visionaries
in your organization and use them.
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will embrace them and energetically lead the effort to implement them. Let them help you overcome the resistance to change inherent in all our organizations. Many valuable long-time employees are set in their ways and opposed to change. However, their wisdom and experience must be blended with the creativity and innovation of your visionaries. Your change agents can help you bridge the gap between the two.

- *Be alert to new technology*. It might be the missing link that will enable you to meet your goals effectively. In the United States, much of our new technology originates in our defense and security industry. For example, the intelligence community has long had a satellite imagery capability that is just now becoming available commercially. This year, a company is planning to launch a commercial satellite with the capability to provide imagery down to a 3-foot (1-m) resolution. This opens up a whole new range of possibilities for combining real-time imagery with geographic, historical, and derived data bases to do landscape-level risk and hazard planning or prescribed-fire planning. Other new possibilities include remote-controlled drones for reconnaissance (used in the Persian Gulf War) and a satellite-based fire detection system for which a group in Spain has been looking for partners.

If leaders in the field of wildland fire management are to meet the challenges they face, they must ensure that our organizations are ready and able to operate in the rapidly changing environment of the early 21st century. That will require a common vision for rural fire management and the leadership skills to realize it. To be successful, we must:

- Think "outside of the box," escaping the traps of paradigm, custom, habit, and tradition;
- Have the courage to make often unpopular decisions without absolute certainty that we are right;
- Be willing to take political risks;
- Be accountable and hold others accountable;
- Be able to inspire others to action; and
- Celebrate and reward successes and learn from our mistakes.

Success in the next century will not come easily, because the challenges will be so great. Only one thing is clear: wildland fire organizations will not be able to answer tomorrow's questions with yesterday's answers.

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# Arizona's Strategic Planning for the Wildland–Urban Interface

Mickey Coonrod

*Editor's note: Since this article was written, Mickey Coonrod has transferred from the Apache–Sitgreaves National Forest. She can now be contacted at Northeastern Area—S&PF, 5 Radnor Corporate Center, Suite 200, 100 Matsonford Road, Radnor, PA 19087, tel. 610-975-4122, fax 610-975-4150, e-mail: mcoonrod/na@fs.fed.us.*

Using a broad-based strategic planning process, you can identify areas at risk in the wildland–urban interface and set priorities for fuels reduction treatments.

If you were asked how many acres of wildland–urban interface (W–UI) in your area were at risk from wildfire, would you have an answer? A local fire manager might know, but how about fire managers at the forest, State, or national level?

This very question, among others, was asked of my supervisors on the Apache–Sitgreaves National Forest. It was right after the Cottonwood Fire in 1996, which burned about 1,400 acres (570 ha) on the Apache–Sitgreaves National Forest and came within a quarter mile (0.4 km) of a subdivision. Forest Supervisor John Bedell and Fire Management Officer Gary Loving were meeting with the Arizona Natural Resource Group to discuss the fire season. The group includes local sportsmen and representatives from political groups, Arizona Game and Fish, and other influential local organizations. Its mission is to gauge public opinion in Arizona on natural resource issues of interest and importance and to provide a forum for their discussion.

The USDA Forest Service representatives began explaining how critical the fire danger was, when suddenly they were asked, "We understand all this. We need to know about the urban interface. How big is the problem, where is it, and how much money will it take to fix?" Caught off guard, the Forest Service representatives left the meeting, promising to study the problem and get back to the group.

## Identifying W–UI Areas at Risk

That was the beginning of Arizona's W–UI strategic planning process. We started by having each local fire manager on the Apache–Sitgreaves National Forest identify W–UI areas on a forest map. For each W–UI area, we then specified:

- Areas (in acres) where past fuels reduction treatments continued to reduce wildfire risk;
- Areas (in acres) that needed treatment, given sufficient opportunity and funds;
- Recommended treatments for areas that needed them; and
- Estimated cost of treatments.

After identifying W–UI areas at risk, we developed a strategy to evaluate the potential for loss of life in each area if there was a fire. We rated areas in terms of five criteria:

1. Population density,
2. Probability of fire escaping initial attack,
3. Potential for loss of life or property,
4. Community support for fuels reduction treatments, and
5. Community fire-safe efforts.

Based on these criteria, we set project priorities.

## A Statewide Strategy

After we realized the value of the data we'd collected, and knowing that our neighboring forests faced similar W–UI hazards, we organized the Arizona Forest Urban Interface Working Group, which includes representatives from all of Arizona's national forests. Group representatives from each forest met with their local fire managers to collect the same type of data we'd gathered for the Apache–Sitgreaves National Forest. Then each forest forwarded its data to me for compilation and develop-

*Mickey Coonrod is a spokesperson for the Forest Fire Prevention campaign, USDA Forest Service, Fire and Aviation Management, Apache–Sitgreaves National Forest, Springerville, AZ. (See editor's note above.)*

ment of a statewide map of W–UI areas at risk.

To publicize the statewide W–UI situation and our strategy for addressing it, we distributed a brochure called *Arizona's Wildland Urban Interface—National Forest Fuels Reduction Treatment Proposals*. The brochure describes, for each forest, a demonstration fuels reduction project that each forest supervisor committed to implementing during the fiscal year. Information includes treatment area (in acres), treatment plan, estimated cost, partnerships involved, and community support and interest.

Word of our project spread through Arizona—well, like wildfire. We briefed the U.S. Department of the Interior's Bureau of Land Management and the Arizona State Land Department. Both agencies were soon collecting similar information and using it to coordinate fuels reduction treatment projects with local landowners and neighboring national forests. A representative from the Arizona State Land Department and I gave a presentation to the Arizona Emergency Management Conference. We told participants about projects under way and what they could do in their respective areas to support the W–UI initiative.

News of our initiative even spread across State lines. The national forests of New Mexico began using similar methods to gather the same type of information on W–UI areas. By pooling our data, we now have a regional overview of W–UI areas at risk.

## Potential Advantages

What can our strategy for addressing the W–UI wildfire hazard do for you? Our success in rapidly responding to public inquiries through a broad-based strategic planning process has generated enormous organizational and public interest. Moreover, our project has been a catalyst for involving other agencies, organizations, and individuals in addressing the W–UI problem. Of course, our procedures and criteria are to some degree subjective, so there are differences in how forests and agencies apply them. Still, our project has given us a way to measure and quantify the W–UI problem, allowing us for the first time to gauge its magnitude and to explore its complexities while actively involving many different people in finding a solution.

For more information on Arizona's W–UI strategic planning process, contact Mickey Coonrod, USDA Forest Service (see editor's note on page 29). ■

*Mickey Coonrod (kneeling) uses forest maps to show the Apache–Sitgreaves National Forest Leadership Team the wildland–urban interface areas that are at risk. Photo: Robert Dyson, USDA Forest Service, Apache–Sitgreaves National Forest, Springerville, AZ, 1998.*

# Three National Prescribed Fire Awards Presented for 1997

David L. Bunnell

The national awards for prescribed fire management, established in 1995 by the USDA Forest Service Chief's Office under leadership from the director for Fire and Aviation Management, are designed to recognize units, groups, and individuals in the Forest Service who have advanced the science, art, and/or acceptance of using prescribed fire for ecosystem health.* Individual awardees may receive up to $1,000 and groups or units up to $2,500. Award winners also receive an oak plaque that is laser engraved with a uniquely designed prescribed fire scene overlaid with a silver drip torch emblem.

The award winners are selected by a group of their peers based on nominations made through the regional Fire and Aviation Management directors. The 1997 awards were presented to:

- **Unit Award—**National Forests in Alabama, Conecuh Ranger District, Andalusia, AL;
- **Group Operations Award—**Sheila M. Braun, George A. Curtis (retired), Ronald J. Hvisdak, and Neil W. Nelson, Kootenai National Forest, Rexford Ranger District, Eureka, MT; and
- **Individual Accomplishment Award**—Morris Huffman, Boise National Forest, Emmett Ranger District, Emmett, ID.

The National Prescribed Fire Awards are bestowed annually in recognition of extraordinary contributions to the advancement of using prescribed fire for ecosystem health.

## Unit Award

The employees of the Conecuh Ranger District on the National Forests in Alabama, winners of the 1997 National Prescribed Fire Award for unit excellence, have developed and implemented a fuels treatment program that includes the annual use of prescribed fire to maintain and restore forest health in longleaf pine ecosystems. The longleaf pine forest on the district was planted by the Civilian Conservation Corps in the 1930's. In the 1960's, the district began to use prescribed fire to maintain forest health. Public education on the benefits of prescribed fire, starting in grade school and culminating in the activities of local special interest groups, has helped paved the way for program success. Management actions have been based on the best available science and supported by academia, notably the outdoor learning center at Auburn University in Auburn, AL. The dormant-season burning practiced in the early decades of the program is now giving way to prescribed burns during the growing season, which were practiced historically in the area and have found growing public acceptance. Resource benefits include:

- Conversion of understory vegetation from a dense tangle of hardwoods into more open forest with increased herbaceous cover and pine regeneration;
- Better habitat for turkey, deer, and red-cockaded woodpecker (wildlife species with historically thriving populations in the area); and
- Fuel reductions from recent hurricane damage.

Every employee on the district has directly participated in the prescribed fire program, working to ensure its success through well-planned operations and public education and involvement. The fuels treatment program on the Conecuh Ranger District is a prime example of how to involve all available personnel in achieving forest health through sound land management.

## Group Operations Award

Sheila Braun, George Curtis, Ron Hvisdak, and Neil Nelson, the

*Dave Bunnell is the national fuel management specialist, USDA Forest Service, National Interagency Fire Center, Boise, ID.*

* The basis for the national prescribed fire awards was reported in 1996 in *Fire Management Notes*, volume 56, number 4.

*Employees of the USDA Forest Service, National Forests in Alabama, Conecuh Ranger District, Andalusia, AL, display their 1997 National Prescribed Fire Award for unit excellence, held by District Ranger Gary Taylor. The award was presented by Janice McDougle (second row, fifth from left), associate deputy chief for the USDA Forest Service, State and Private Forestry, Washington, DC. Standing with the awardees are John Yancy (second row, seventh from left), forest supervisor; Ron Herbster (last row, third from left), fire management officer; and Kent Davenport (last row, fifth from left), unit leader for ecosystem technical support, National Forests in Alabama, Montgomery, AL. Photo: Mary Gaines, USDA Forest Service, National Forests in Alabama, Montgomery, AL, 1998.*

winners of the 1997 National Prescribed Fire Award for group operations, are from a ranger district with a long and unique tradition of successful fire management. In the dry pine types on the Kootenai National Forest's Rexford Ranger District in Montana, ponderosa pine was historically the dominant species, maintained by frequent, low-intensity fires that did not kill overstory trees. However, past management practices largely excluded fire and reduced overstory stocking levels. In the absence of fire, Douglas-fir and associated species invaded the district, dramatically changing the historic fire regime. When fire now occurred, it resulted in huge conflagrations with lethal effects on overstory species.

George Curtis (retired), the fire management officer on the Rexford Ranger District, identified the changing fire regime and its effects more than 20 years ago. It was he who set the stage for aggressive forest health restoration through the periodic use of prescribed fire and timber harvest. In recent years, Fire Management Officer Ron Hvisdak and his primary staff have refined and expanded the program launched by George, using three main techniques:

- Ecosystem restoration and maintenance burns to reestablish the historical processes and functions of dry pine ecosystems;
- Wildland–urban interface burns to reduce risk and loss to private property from wildland fire; and
- Hazard fuel reductions to reduce wildland fire damage to resources.

In the past decade, more than 95,000 acres (38,000 ha) of prescribed fire applications and mechanical fuel treatments have dramatically improved conditions on the district. One measure of the program's success is the documented control achieved over the intensity and direction of three separate wildfires in 1994—the Webb, North Fork, and Douglas Hill Fires—due to previous prescribed fire applications in the areas of fire spread. Although the program operates under intense local scrutiny and must deal with complex cultural and interagency issues, its success continues to grow due to outstanding leadership from the key individuals honored by the National Prescribed Fire Award.

## Individual Accomplishment Award

Morris Huffman, district ranger for the Emmett Ranger District on Idaho's Boise National Forest and winner of the 1997 National Prescribed Fire Award for individual accomplishment, long ago recognized the need for a combination of thinning and prescribed fire applications on a landscape scale to restore and maintain forest health in ponderosa pine and Douglas-fir ecosystems. Over the past decade, Morris has guided prescribed fire and thinning programs on the Emmett Ranger District with great enthusiasm and personal commitment. As a result, the district's burning program has increased from 2,000 to 20,000 acres (800–8,000 ha) per year and is scheduled to reach 30,000 acres (12,000 ha) per year by the millennium.

The Emmett Ranger District's success with prescribed fire has reinvigorated the entire Boise National Forest prescribed fire

program. Through Morris's demonstrated leadership, local concerns that prescribed fire might threaten communities and property in the wildland–urban interface have been largely resolved. In face-to-face meetings, in the print media, and in on-camera interviews at both the local and national levels, Morris has helped build understanding, acceptance, and support for ecosystem restoration and maintenance using prescribed fire. Morris's enthusiasm for and commitment to the landscape-level prescribed fire program have proved contagious, drawing support and admiration from many influential individuals, from key members of special interest groups to cabinet-level politicians. Morris has told and sold the prescribed fire story so well that other districts and agencies, as well as the forest, will benefit for years to come.

## Future Prescribed Fire Program Awards

Nominations for the National Prescribed Fire Award are due each year on January 31. For nomination forms and information on how to nominate units, groups, or individuals for excellence in prescribed fire management, contact your regional director for Fire and Aviation Management or Dave Bunnell, National Interagency Fire Center, 3833 S. Development Avenue, Boise, ID 83705-5354; Internet e-mail: dbunnell/wo_nifc@fs.fed.us; IBM e-mail: dbunnell/wo,nifc; tel. 208-387-5218; fax 208-387-5398. ■

*Posing with drip torches and their 1997 National Prescribed Fire Award for outstanding group operations are (from left) Ron Hvisdak, Sheila Braun, Neil Nelson, and George Curtis, USDA Forest Service, Kootenai National Forest, Rexford Ranger District, Eureka, MT. Photo: Eric Heyn, USDA Forest Service, 1998.*

*Morris Huffman (left), district ranger for the Boise National Forest, Emmett Ranger District, Emmett, ID, receives the 1997 National Prescribed Fire Award for individual accomplishment from David Rittenhouse, forest supervisor for the Boise National Forest, Boise, ID. Photo: Jennifer Jones, USDA Forest Service, Boise National Forest, Boise, ID, 1998.*

# Fire: A Resource Management Tool

Tim Benedict

When my son was a young child, he would walk in the yard with his hammer collecting lumber scraps. He found nails and began pounding them into pieces of wood. He learned that with the hammer as a tool, he could make various things. But one day he discovered the saw and found that by using it, he could fit more pieces together and construct more designs. Then he discovered wood glue and made a pencil box. Each time he discovered a new tool, he became more creative and made more practical designs.

The same principle applies to natural resource management: the more tools we resource managers use, the more likely we are to achieve our desired outcomes for the resources we manage. In resource management, every site is unique, like a scrap of wood with its own unique shape, size, and characteristics. We need to use the right tools to mold the sites we manage in ways that meet our stewardship goals.

*Tim Benedict is a timber staff specialist, USDA Forest Service, Pike and San Isabel National Forests, Supervisor's Office, Salida, CO.*

The tools in a resource manager's toolbox can be many:

- With the tool of salability, we can plan a project with the prospective customer in mind.
- Using the tool of landscape management, we can work with the aesthetics and community types of the landscape.
- We can use the restoration tool to restore forest health.
- We can apply the tools of research and new management approaches to discover and develop new types of tools.

One tool stands out because it affects the use of so many other tools: wildland fire management. Fire has the power to reshape the landscape and redistribute biological communities, affecting salability, aesthetics, ecosystem health, and other resource values. The tool of wildland fire management is not limited to wildfire suppression. We can use it, for example, to apply prescribed fire or thinning to reduce high fuel loading and stand density, thereby promoting public and firefighter safety; improving forest health; and enhancing timber, wildlife, and recreation.

A combination of many tools—including wildland fire management—works best when used by an integrated resource team to build a landscape management plan. More than a century ago, the director of the Federal Patent Office thought the office should be closed because there would be no more important inventions. As resource managers, we know better. Although we face difficult challenges, such as balancing competing public interests and securing the funding needed to manage the Nation's wildland resources in accordance with agency goals, if we collectively use the many tools we have available, we will find a better design or management needed to achieve our multiple objectives. All it takes is a child's innocent attitude toward discovering that next new tool. ■

# Websites on Fire*

## USDA Forest Service, Fire Effects Information System

An important resource for wildland managers and researchers, this Website outlines the fire ecology of many North American plant species, animal species, and Kuchler potential natural vegetation types. Descriptions include extensive literature citations valuable to researchers. For example, the discussion of oak–hickory forest includes a reference list with 112 entries.

*Found at* **<http://www.fs.fed.us/database/feis>**

## Roscommon Equipment Center

The Roscommon Equipment Center (REC), sponsored by the Northeast Forest Fire Supervisors and Michigan's Forest Fire Experiment Station in Roscommon, MI, has opened a Website for information sharing, primarily with rural fire departments. The Website includes a news page on current projects and activities, a listing of past projects and publications, and sections focusing on REC's primary mission of providing technical assistance to agencies and fire departments that are modifying Federal Excess Personal Property or other vehicles into wildland fire engines.

*Found at* <**http://www.dnr.state.mi.us/www/fmd/ffes/rechome.html**>

## Wildfire News

This commercial Website links to various fire-related sites for "one-stop shopping" on the Internet. Links include the Situation Report and National Fire News from the National Interagency Fire Center in Boise, ID; the Fire Weather Forecast from the U.S. Department of Commerce, National Weather Service; and various fire-related stories and information for firefighters (such as the Ten Standard Fire Orders).

*Found at* <**http://www.wildfirenews.com**>

* Occasionally, *Fire Management Notes* briefly describes Websites brought to our attention by the wildland fire community. Readers should not construe the description of these sites as in any way exhaustive or as an official endorsement by the USDA Forest Service. To have a Website described, contact the editor, Hutch Brown, at 4814 North 3rd Street, Arlington, VA 22203, tel. 703-525-5951, fax 703-525-0162, e-mail: hutchbrown@erols.com.

## Contributors Wanted

We need your fire-related articles and photographs for *Fire Management Notes*! Feature articles should be about 1,500 to 2,000 words in length. We also need short items of about 100 to 200 words. Subjects of articles published in *Fire Management Notes* include:

Aviation
Communication
Cooperation
Ecosystem Management
Education
Equipment and Technology
Fire Behavior
Fire Ecology
Fire Effects
Fire History
Fire Use (including Prescribed Fire)
Fuels Management
Firefighting Experiences
Incident Management
Information Management (including Systems)
Personnel
Planning (including Budgeting)
Preparedness
Prevention
Safety
Suppression
Training
Weather
Wildland–Urban Interface

To help prepare your submission, see "Guidelines for Contributors" in this issue.

# Students Learn on the Job About Wildland Fire

Sarah Gallup, Jolie Pollet, and Rosalind Wu

The Rocky Mountain Region of the USDA Forest Service has a cooperative education program designed to diversify the fire management workforce by investing in the education of future professional fire managers (see related article by Glenn Snyder). From 1996 to 1998, the Student Career Experience Program (SCEP), formerly known as the "Co-op," sponsored three fire trainees on Colorado's national forests. We would like to share our unique but similar training experiences.

## Diverse Backgrounds

We came to Colorado and to the fire program from very different backgrounds, although each of us already had experience in work that required negotiation and public input. Before coming to the Forest Service, Sarah Gallup served as an intern in Washington, DC, for Ralph Nader and on Capitol Hill; worked for Connecticut's welfare department; and spent 8 years working for the city of Pasadena, CA. She was detailed to the Supervisor's Office on the Arapaho–Roosevelt National Forest, Fort Collins, CO.

Jolie Pollet, a geographer by training, worked in public outreach for the Louisiana Society for the Prevention of Cruelty to Animals in New Orleans, LA, before joining the SCEP. She also served as a Federal grant coordinator at Tulane University, New Orleans, LA. She completed her SCEP training on the Dillon Ranger District of the White River National Forest, Silverthorne, CO.

Rosalind Wu's experience before becoming a fire trainee included working in a biology lab studying the photosynthetic process in blue-green algae. She also served as a Peace Corps agroforestry extensionist in Kenya. She was detailed to the Pagosa Springs District of the San Juan–Rio Grande National Forest, Pagosa Springs, CO.

> Perhaps most importantly, we learned just how critical safety is in everything firefighters do.

During our SCEP assignments, all three of us were working toward our master's degrees in forest sciences at Colorado State University, Fort Collins, CO. Our coursework focused on fire and ecology. We designed our academic programs to equip us with analytic and broad-based approaches and new ideas to bring to the Forest Service.

*Graduate students (from left) Sarah Gallup, Jolie Pollet, and Rosalind Wu, who participated in the USDA Forest Service Rocky Mountain Region's Student Career Experience Program, designed to build workforce diversity by training future wildland fire managers. Photo: Courtesy of John Sanderson, Colorado State University, Fort Collins, CO, ©1998.*

*Sarah Gallup, Jolie Pollet, and Ros Wu were graduate students in forest sciences at Colorado State University, Fort Collins, CO; and fire management trainees in the Student Career Experience Program, USDA Forest Service, Rocky Mountain Region, Lakewood, CO.*

# Building Workforce Diversity: The Student Career Experience Program

Glenn Snyder

Achieving workforce diversity is part of the USDA Forest Service's goal of ensuring organizational effectiveness (USDA Forest Service 1996). Since 1990, the Forest Service's Fire and Aviation Management (F&AM) staff has set aside annual funding for special projects to recruit and retain women and minorities for the workforce. Regions bid for shares of the funding by submitting proposals.

The Rocky Mountain Region submitted one of the first winning proposals, a project to add cooperative education positions to its F&AM unit. Designed to promote long-term change rather than to achieve short-term objectives, the Rocky Mountain Region's Student Career Experience Program (SCEP) actively recruits, trains, and educates future professional fire program managers. Colorado State University has cooperated with the Region in overseeing academic progress for six students (graduate and undergraduate) since the program began.

University students selected for the program are employed part time during the schoolyear and full time during the summer for hands-on training in wildland fire management. Students are introduced to Forest Service and interagency programs at all levels, from the local community and ranger district to national interagency and interregional groups. Forests and districts in the Rocky Mountain Region host the students, working closely with fire managers, universities, and research stations to give the students practical experience in addition to a well-rounded fire skills background and education.

Past participants in the program have joined the ranks of fire management and administration, helping to provide the workforce diversity that the program was designed to accomplish. As the latest SCEP graduates, Sarah Gallup, Jolie Pollet, and Ros Wu are about to follow suit. Like their predecessors in the program, they will provide valuable leadership and skills to the interagency wildland fire management workforce in a way that helps to reflect the full diversity of the American people. Their achievements confirm that the SCEP goal is attainable, and we hope to continue the program into the foreseeable future.

For more information on SCEP, contact Glenn Snyder, USDA Forest Service, State and Private Forestry, Cooperative Fire Protection and Program Planning, Rocky Mountain Region, P.O. Box 25127, 740 Simms Street, Lakewood CO, 80225, tel. 303-275-5748.

*Glenn Snyder is the branch chief for Cooperative Fire Protection and Program Planning, USDA Forest Service, State and Private Forestry, Rocky Mountain Region, Lakewood, CO.*

## Literature Cited

USDA Forest Service. 1996. The Forest Service ethics and course to the future. FS–567. Washington, DC: USDA Forest Service. 10 p. ■

We were all conducting primary field research for our master's theses. Ros was documenting fire history and forest structure in the mixed-conifer forests of the San Juan Mountains in Colorado. Jolie was investigating the effects of thinning on wildfire severity in ponderosa pine across the West. Sarah was studying the effects of two prescribed fires in low-elevation ponderosa pine forests, looking for changes in understory composition and tree mortality. Our graduate projects forced us to consider landscape dynamics at different scales and their implications for forest planning.

## Field Experience

Our SCEP training offered us basic, on-the-ground experience, some directly related to fire. In addition to skills in planning, fire control, computing, and public outreach, we gained an understanding of the Forest Service. We discovered that most people in the Forest Service wear many hats. Even as fire trainees, we were exposed to a variety of disciplines. For example, while working on the White River National Forest in the summer of 1997, Jolie carried a cell phone in her backpack to help track the recreation fee demonstra-

We relied on feedback from a cadre of Forest Service professionals to guide our training, and they made us feel like part of the agency.

tion project she was supervising, one of Colorado's first.

We also had training assignments that emphasized planning. The research Ros was doing applied directly to the San Juan–Rio Grande National Forest's forthcoming forest plan revision; Sarah crunched numbers for a revision of the National Fire Management Analysis System; and Jolie took the lead in developing her district's first fire management plan. We stayed in close contact with one another, often discussing our individual projects and thereby learning from each other about new ways of doing things.

Planning tends to be poor unless planners understand the work on the ground. None of us had been near a wildland fire before, and our SCEP training gave us invaluable hands-on experience with both wildfire and prescribed fire. We each spent time on a fire crew, learning about helitack, hotshots, and engines. We felt the frustration of waiting around for fires that just don't seem to happen, killed time playing hacky-sack, and experienced both troublesome and effective crew dynamics. We slept outside without a sleeping bag, took pride in a sharp pulaski, helped prepare incident action plans, and completed more than 20 fire courses among the three of us. We felt the fear and fascination of a big wildfire and the thrill of dropping a tree or lighting up a hillside with a drip torch. Perhaps most importantly, we learned just how critical safety is in everything firefighters do.

## Honing Fire Management Skills

Despite our field training, our strength as agency employees will likely never be as ground pounders. Although there is no substitute for ground experience and a hands-on perspective, we can probably make our greatest contributions in support of wildland fire management and planning. For example, the need for computing skills in wildland fire management will likely only increase, and one doesn't get through graduate school these days without spending endless hours glued to a computer. We each became familiar with the basics of ARCView® and ARCInfo®, programs for using geographic information systems (GIS's). In developing the design for her thesis research, Ros' GIS manipulations became complex enough to stump her professor.

Acculturation within the Forest Service, hands-on fire experience, planning, and GIS's were the highlights of our SCEP training. In addition, each of us continued to hone our previously developed public outreach skills. Jolie's fire planning involved extensive community participation. The Mixed Conifer Project, patterned after the highly publicized Pines Project in southwestern Colorado, included Ros' research. We learned that storytelling and fire occasionally go together, building public understanding and acceptance of the role of fire in wildlands. Sarah's work included cohosting community meetings before prescribed burns. At one meeting that threatened to become contentious, a community spokesperson stood up and pointedly asked whether the Forest Service planned to burn a steep slope thick with beetle-killed Douglas-fir. Thinking that the question implied hostility to prescribed burning, officials felt relieved to be able to answer, "No." To their surprise, the speaker responded, "Why not?" Such episodes show that painstaking public outreach can help turn local opinion in favor of using prescribed fire.

The training, coaching, and opportunities we received as fire trainees reflect an enormous commitment from many people. The time our supervisors, mentors, and teachers devoted to us represented not only the lion's share of the Forest Service's contribution to our study programs, but also the primary benefit we received. We relied on feedback from a cadre of Forest Service professionals to guide our training, and they made us feel like part of the agency.

We feel very fortunate to have been selected for such an outstanding program. The Rocky Mountain Region's SCEP presented us with exciting and unique career development opportunities and challenges, and we wish to express our thanks. ■

# Guide to Africanized Honey Bees Available

Hutch Brown

Africanized honey bees pose a growing threat to wildland firefighters (see *Fire Management Notes* 55(4): 25–30). This type of bee, a hybrid cross between the familiar European honey bee and a strain from Africa, exhibits highly defensive behavior. When a colony is disturbed, thousands of bees might respond within minutes, swarming over the perceived attacker. Such episodes can be life threatening to firefighters who are dangerously allergic to bee venom or who cannot flee (for example, if injured). Fire shelters can offer emergency protection (see *Fire Management Notes* 58(3): 21–26).

Adapted to life in tropical ecosystems, Africanized honey bees are rapidly spreading northward from Mexico throughout their potential range in parts of the Southwestern and Southern United States, despite barriers such as mountain ranges. For example, they are already well established in Tucson, AZ, where about 1,000 colonies of Africanized honey bees per year are removed from utility meter boxes alone. Since 1994, Africanized honey bees have caused several deaths in the United States.

Partly to help firefighters understand the threat, the USDA Agricultural Research Service has posted an article by research entomologist Eric Erickson on the Internet. The article describes protective clothing, wetting agents for killing bees, victim rescue techniques, and sting removal methods. Readers can easily access the article at <**http://gears.tucson.ars.ag.gov**>. ■

*Hutch Brown is the editor of* Fire Management Notes, *Arlington, VA.*

# Guidelines for Contributors

## Editorial Policy

*Fire Management Notes* (*FMN*) is an international quarterly magazine for the wildland fire community. *FMN* welcomes unsolicited manuscripts from readers on any subject related to fire management. (See the subject index of the first issue of each volume for a list of topics covered in the past.)

Because space is a consideration, long manuscripts are subject to publication delay and editorial cutting; *FMN* does print short pieces of interest to readers.

## Submission Guidelines

Submit manuscripts to either the general manager or the editor at:

USDA Forest Service
Attn: April J. Baily, F&AM Staff
P.O. Box 96090
Washington, DC 20090-6090
tel. 202-205-0891, fax 202-205-1272
Internet e-mail: abaily/wo@fs.fed.us

Hutch Brown, Editor
Fire Management Notes
4814 North 3rd Street
Arlington, VA 22203
tel. 703-525-5951, fax 703-525-0162
e-mail: hutchbrown@erols.com

If you have questions about a submission, please contact the editor, Hutch Brown.

**Paper Copy.** Type or word-process the manuscript on white paper (double-spaced) on one side. Include the complete name(s), title(s), affiliation(s), and address(es) of the author(s), as well as telephone and fax numbers and e-mail information. If the same or a similar manuscript is being submitted elsewhere, include that information also. Authors who are affiliated should submit a camera-ready logo for their agency, institution, or organization.

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