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On the Cover:

Professional designers created a special image—partly replicated here—to promote the National Fire Plan's central purposes, including more funding for fire protection (see the related article by Michael Rains and Jim Hubbard 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 throughout 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.

Firefighter and public safety is our first priority.

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Short Features

Protecting Communities Through the National Fire Plan

Michael T. Rains and Jim Hubbard

In August 2000, the Administration directed the Secretaries of Agriculture and the Interior to prepare a report that would recommend how best to respond to the year's severe wildland fires, reduce the impacts of fires on rural communities, and ensure sufficient firefighting resources in the future. The Secretaries were also asked to list actions that Federal agencies, in cooperation with States and local communities, could take to reduce immediate hazards to communities in the wildland–urban interface and to ensure that fire management planning and firefighter personnel and resources are prepared for extreme fire conditions in the future.

National Fire Plan

The report, titled *Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President In Response to the Wildfires of 2000*, came to be known as the National Fire Plan (NFP).* It was approved in September 2000. Congress supported the NFP through its fiscal year 2001 (FY01) appropriation action, providing detailed guidance to the U.S. Departments of Agriculture and the Interior on implementing the plan. Today, the two departments are working closely together to put the plan into action.

Michael Rains is the Director of the Northeastern Research Station, USDA Forest Service, Newtown Square, PA; and Jim Hubbard is the State Forester of Colorado, Fort Collins, CO.

* For the executive summary of the National Fire Plan, see *Fire Management Today* 61(2): 9–11.

Strong local partnerships are essential for an adequate level of fire protection in the wildland–urban interface.

The NFP called for actions in five key areas:

1. ***Firefighting.*** Continue to fight fires safely and maintain a cost-effective level of preparedness in firefighting and prevention.
2. ***Rehabilitation and restoration.*** Rehabilitate fire-damaged wildlands and restore high-risk ecosystems.
3. ***Hazardous fuel reduction.*** Invest in projects to reduce fire risk.
4. ***Community assistance.*** Work directly with communities to reduce the risks of catastrophic fire.
5. ***Accountability.*** Maintain a high level of accountability, including oversight reviews, progress tracking, and performance monitoring.

Table 1 shows NFP funding for the USDA Forest Service, for FY01 through FY03 (proposed in the President's budget). The final FY02 funding level for the NFP reached about $2.3 billion. Table 2 shows the amounts needed, proposed, and enacted for the Forest Service.

Wildland–Urban Interface

The wildland–urban interface (W–UI) can be defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland. W–UI protection is important to the Federal Government because federally managed

Fire whirl on the Valley Complex Fire near Darby, MT. Extreme fire behavior was typical on many large fires in 2000, helping to build a consensus behind the National Fire Plan. USDA Forest Service, 2000.

National Fire Plan Long-Term Goals

- Reduce the threat of severe, destructive wildland fires.
- Create safer living conditions in rural areas and the wildland/urban interface.
- Conserve high-priority watersheds, species, and biodiversity.
- Restore fire-adapted ecosystems.
- Improve the health, resilience, and sustainability of forests and grasslands.
- Reduce overall wildland fire management costs.

lands are adjacent to or intermingled with State, county, and municipal lands. Within the W–UI, a critical responsibility for Federal land managers is the management of fuels to minimize risk to people, property, and natural resources. However, the Federal agencies cannot solve this problem alone. Cooperation among all levels of government and strong local partnerships are essential if an adequate level of fire protection is to be achieved.

News footage and media reports during the summer of 2000 provided the Nation with a more emotional definition of the W–UI, showing homes and communities threatened by wildland fire. Many people, their homes, and their dreams for the future are situated in a landscape thick with vegetation ready to burn. There are many management challenges in the Nation's public and private forests, woodlands, and rangelands; however, none is more critical than reducing the risk to lives, property, and resources in the W–UI.

The 2000 fire season demonstrated the seriousness of the problem, showing that the W–UI is not an isolated regional problem. Throughout the United States, a rapidly growing population of retirees, young professionals, and others is moving from the cities into the wildlands in search of a better quality of life. The 2000 census shows that out of the top 10 fastest growing States, 7 are in the West.

Table 1—Forest Service funding for the National Fire Plan, by fiscal year (FY).[a]

Programs	*FY01 (enacted)*	*FY02 (enacted)*	*FY03 (proposed)*	*Estimated needs*[b]
Fire preparedness	$611,143,000	$622,618,000	$626,528,000	$781,466,000
Emergency fire contingency	425,063,000	266,000,000	0	86,300,000
Fire plain easements	0	0	19,947,000	0
Fire suppression	319,325,000	255,321,000	443,361,000	357,000,000
Hazardous fuel reduction	205,158,000	209,010,000	234,673,000	492,000,000
State fire assistance	75,328,000	81,693,000	72,101,000	98,500,000
Volunteer fire assistance	13,251,000	13,315,000	13,286,000	15,531,000
Invasive species	11,974,000	11,974,000	12,107,000	12,100,000
Economic action programs	12,472,000	12,472,000	0	20,000,000
Community assistance	34,923,000	0	0	25,000,000
Rehabilitation and restoration	141,688,000	62,668,000	4,644,000	120,000,000
Facilities	43,903,000	20,376,000	0	78,440,000
New technology development[c]	15,965,000	35,265,000	29,761,000	36,800,000
Total	**$1,910,193,000**	**$1,590,712,000**	**$1,456,408,000**	**$2,123,137,000**

a. Does not include $1,035,125,000 in enacted funding for FY00.
b. Needed to fully implement the National Fire Plan, as described in "Technical Support Document for the Long-Term Strategy," March 19, 2001, revision 6.1.
c. Includes $8 million for the Joint Fire Science Program (JFSP) in FY02, FY03, and estimated needs. For FY01, funding for the JFSP is included in fire preparedness.

Many western forests and rangelands provide a backdrop for this population movement. Prior to European settlement, these areas frequently experienced low, slow-burning fires that thinned trees and cleared away accumulated grasses, shrubs, and debris—materials that might otherwise allow a wildland fire to climb into the forest canopy and become an explosive crown fire. The migration of people and introduction of structures into these forests, and the concomitant suppression of fire for their protection, heighten the fire risk in W–UI areas, creating dangerous places to live and play. The point is as simple as it is powerful: Increasing human populations in the West create more extensive areas of W–UI, making firefighting more difficult, complex, and expensive.

Sikorsky S–64 helicpoter silhouetted in a smoky sky near Hamilton, MT. Photo: USDA Forest Service, 2000.

Decades of aggressive fire suppression, combined with rural residential development, have drastically changed the look of western forests and rangelands and the way fires behave. Also, trees are invading grasslands, and cheat grass and other invasive species have increased the land's flammability. Where lower elevation stands of ponderosa pine once held 30 to 60 trees per acre (75–150 trees/ha), they now contain 300, 500, or even 1,000 trees per acre (750–2,500 trees/ha). The recent warming trend in the Interior West, coupled with single-digit humidity and persistent

Table 2—Forest Service funding for the National Fire Plan, FY01 and FY02.

		FY02		
Programs	***FY01***	***Needed*** [a]	***Proposed***	***Enacted***
Fire preparedness	$611,143,000	$639,500,000	$622,618,000	$622,618,000
Emergency fire contingency	425,063,000	150,000,000	0	266,000,000
Fire suppression	319,325,000	320,000,000	325,321,000	263,321,000
Hazardous fuel reduction	205,158,000	255,000,000	209,010,000	209,010,000
State fire assistance	75,328,000	84,441,000	75,693,000	81,693,000
Volunteer fire assistance	13,251,000	15,351,000	13,315,000	13,315,000
Invasive species	11,974,000	18,336,000	11,974,000	11,974,000
Economic action programs	12,472,000	28,086,000	12,472,000	12,472,000
Community assistance	34,923,000	35,623,000	0	0
Rehabilitation and restoration	141,688,000	146,375,000	3,668,000	62,668,000
Facilities	43,903,000	44,833,000	20,376,000	20,376,000
New technology development[b]	15,965,000	23,884,000	16,265,000	35,265,000
Total	**$1,910,193,000**	**$1,761,429,000**	**$1,310,712,000**	**$1,590,712,000**

a. Based on planning estimates in "Technical Support Document: for the Long-Term Strategy," March 19, 2001.
b. Includes $8 million for the Joint Fire Science Program (JFSP) in FY02. For FY01, funding for the JFSP is included in fire preparedness.

drought, has further increased the vulnerability of wildlands in the region to lightning strikes or careless human actions.

The National Fire Protection Association estimates that wildland fires destroyed more than 9,000 homes between 1985 and 1995. Officials further believe that wildland fires in the 1990s damaged six times more homes than during the previous decade. In 2000 alone, more than 1,000 homes were destroyed.

Homeowners in the W–UI accept a risk by choosing to build where they do. In addition, they often increase the risk by making poor landscaping and building-material choices. Shake shingle roofs, natural wood siding, thick grasses and shrubs, overhanging tree limbs, and nearby woodpiles contribute to the feel of a secluded sanctuary, but they also make it much easier for wildland fire to engulf a home and much more difficult for a firefighter to safely protect it. Land managers and firefighting personnel need to work with both landowners and communities to help them understand the positive, preventative steps they can take to protect themselves from fire. After all, household possessions treasured for the memories they hold cannot be replaced by an insurance check.

The W–UI is not limited to the West. The East, especially in the Southeastern States, is experiencing the same type of development that engenders high fire risk. Adequate protection in the W–UI is truly a national issue; that is the fundamental premise of the NFP.

Protection Capabilities

The presence of burnable vegetation around homes is only one of several complicated challenges firefighters face when combating a wildland fire in the W–UI. Safe and effective protection in these areas demands close coordination between local, State, and Federal firefighting resources. In the 2001 Federal Fire Policy, Federal agencies acknowledge that the primary burden for W–UI fire protection falls to property owners and State and local governments. Rural and volunteer fire departments provide the front line of defense (initial attack) on up to 90 percent of the high-risk and costly fires in the W–UI. Although they have a good record of rapidly suppressing traditional wildland fires, local resources often struggle to effectively address the complex demands of fighting fire in the W–UI.

> Many people, their homes, and their dreams for the future are situated in a landscape thick with vegetation ready to burn.

Local fire departments generally arrive at the scene of a fire trained and equipped to provide either structural or wildland fire protection, but not both. They often lack common communications equipment or a predetermined plan outlining protection responsibilities and where to go for backup. Placing people in a wildfire situation that is beyond their personal or resource capabilities seriously compromises firefighter safety.

County, State, and Federal agencies provide immediate backup to local fire departments when a W–UI fire moves beyond initial response capabilities. Extended attack often requires recruitment and coordination of people and equipment from a variety of sources. The acquisition of fast, accurate air support is often critical. Clear communication and interagency coordination are paramount.

Agreement over roles and responsibilities, the proper order of action and response, and methods of prioritizing deployment of resources further complicates joint structural and wildland fire activities. When lives and homes are at stake, fire suppression resources are often diverted to residential protection, leaving wildland portions of the fire to burn unchecked—a serious problem, given dry summer conditions. The keys to full and effective fire protection in the W–UI are:

- Safe home landscaping;
- Well-trained and -equipped fire departments; and
- A rapid local, county, and State response supported by, and in cooperation with, Federal agencies.

Reducing Risks

The problem of fires in the W–UI is multifaceted and will not be solved overnight. Nevertheless, there are a number of short-term actions that the Federal Government, in cooperation with State, tribal, and local governments, can take to reduce the future risk to communities and resources. Partnerships are key. Landowners and local, State, and Federal agency personnel need to understand each other's roles and responsibilities.

A top priority is to reduce fuels in forests and rangelands adjacent to and within communities. Particular emphasis should be placed on fuel

Increasing human populations in the West create more extensive areas of W–UI, making firefighting more difficult, complex, and expensive.

treatment projects that extend to adjoining State, private, or other non-Federal land to help protect them from catastrophic fires that develop on Federal lands. This can be accomplished through incentives and technical assistance for communities and private landowners to encourage the reduction of hazardous fuels around homes. Individual actions by homeowners will not only provide greater personal protection, but also increase the safety and effectiveness of firefighters. Large-scale fuel reductions around individual homes can protect an entire landscape or watershed.

Another priority is to ensure that State and local resources for initial and extended attack are trained, equipped, and prepared to address W–UI fires as effectively and safely as possible. The Forest Service's State and volunteer fire assistance programs provide technical and financial assistance to local firefighting resources to help promote an effective and coordinated interagency fire management response. In addition, local firefighters must be backed up by Federal agencies that are fully prepared to provide an array of incident management skills and leadership.

Optimal Firefighting Efficiency

The Forest Service uses models to help predict funding levels for overall firefighting efficiency. The National Fire Management Analysis System (NFMAS) is a tool to help determine the most efficient level (MEL) for the fire management program. The MEL captures the tradeoffs between dollars spent on fire preparedness and fire suppression, plus the change in value of natural resources before and after a fire—the Net Value Change (NVC). The NFMAS model optimizes the appropriated dollars spent on fire preparedness versus the costs of fire suppression plus NVC. The number of acres burned is also displayed at each appropriated funding level.

Appropriated funds for the fire management program are typically referred to as a percent of MEL. In FY99, for example, the Forest Service was funded at 75 percent of MEL, whereas in FY00 it was about 74 percent of MEL. The NFP set an FY01 funding target of 100 percent of MEL, the same level proposed for FY02.

Firefighters moving upslope to battle the Valley Complex Fire during the 2000 fire season. The National Fire Plan has helped bring preparedness levels for the Forest Service's wilaland fire organization up to the most efficient level for the first time in recent memory. Photo: USDA Forest Service, 2000.

However, the NFMAS process applies only to lands for which the Forest Service has direct fire protection responsibilities. Costs associated with protecting non-Federal lands, including the cost of protecting the W–UI from fires originating on national forest land, are not incorporated into the NFMAS model. Such costs can be significant in some areas.

This has profound implications for preparedness levels. If the Forest Service is expected to manage fires on non-Federal lands, including in the W–UI, then funding levels need to be planned accordingly. Funding at 100 percent of MEL, which does not include fire protection in the W–UI, almost guarantees that resources will be inadequate. Inefficiencies will result, ultimately leading to excessive costs.

Improved State fire assistance, including assistance to volunteer fire departments, is an effective way to reduce the overall involvement of the Federal Government in the W–UI adjacent to national forest lands. The Cooperative Fire Protection program within the Forest Service's State and Private Forestry mission area provides for a Federal role to help State and local governments become better trained and equipped to fight fires and meet their State responsibilities. The NFP begins to address the expanded Federal role that is needed. A higher level of funding for initial and extended attack on national forest lands, coupled with an expanded Federal role in State assistance—including more support for rural volunteer fire departments—would begin to effectively address the urgent need

to deal with wildland fire in America's W–UI.

Predictive modeling that includes effective fire protection for the W–UI is a must. Basically, an optimal level of firefighting efficiency is not possible on the Federal side without an optimal level of efficiency on the State and local side. A cohesive, long-term budget strategy that includes preparedness, emergency suppression, fuel management, and State fire assistance in order to implement an effective, cost-efficient fire management program is critical to ensuring adequate community protection in America. The NFP begins to address the need. However, more work is required to establish an adequate Federal role in community protection. The Office of Management and Budget has called for an update of efficiency prediction models.

Prevention Through Education

Fire education programs geared toward homeowners and communities should be implemented in recently burned areas as well as in high-risk W–UI areas. Programs should focus on the role that planning, zoning, landscaping, and requirements for firesafe building materials can play in reducing the loss of lives and property—as well as tremendous government expense—in the W–UI.

One very successful fire education program is Firewise, promoted by America's wildland fire agencies and the National Fire Protection Association since 1986. The Firewise program was developed to inform and encourage the rural homeowners to take prescribed precautions to make their homes more fire resistant and more easily defensible by local fire departments. The program is carried out through Firewise Workshops, which bring together the many partners who have a stake in preserving homes and making other improvements in the W–UI.*

> Adequate protection in the wildland–urban interface is truly a national issue; that is the fundamental premise of the NFP.

Firewise specifically helps people recognize W–UI fire hazards, design Firewise homes and landscapes, learn about fire, and incorporate Firewise planning into existing and developing areas of communities. Firewise is an important fire prevention tool and is supported, along with other high-priority fire prevention education programs, in the NFP.

NFP Programs for Community Protection

A number of programs included in the NFP specifically help address the Federal role in protecting communities. Table 3 lists the programs and shows NFP funding levels.

State Fire Assistance. State fire assistance provides technical training, financial assistance, and equipment to States to ensure that Federal, State, and local agencies can deliver a uniform and coordinated suppression response to wildland fire. Activities include Firewise and other high-priority education programs, fuel reduction, and improved fire response in W–UI areas. Funds are allocated to States and communities using a targeted approach. Funding levels are based on amounts required to support the Federal role in concert with State contributions. Funding is on a planned basis of evenly shared costs between Federal and non-Federal partners.

Strong readiness capability at the State and local levels goes hand-in-hand with optimal efficiency at the Federal level. Federal funding is designed to raise the efficiency level for the States and local fire departments in targeted areas to complement the MEL proposed for the Forest Service's firefighting force.

Federal funding for hazardous fuel reduction on non-Federal lands is based on needs identified in forest stewardship plans and estimates of fuel treatment acres for cost-shared work. Estimates for the first year of the NFP included 395,000 acres (160,000 ha) of fuel treatment. Funding is on a planned basis of evenly shared costs between Federal and non-Federal partners.

State fire assistance under the NFP includes cost-share funds for the States to:

- Add additional State fire management specialists;
- Develop multistate fire compacts;
- Improve the State readiness capability to match the Federal readiness capability;
- Increase fire planning in high-risk areas;
- Emphasize and expand the Firewise program;
- Promote training under the Incident Command System to complement fire protection on Federal lands;

* For more on Firewise, see Cynthia Bailey, "Firewise Workshops Ignite Community Action," *Fire Management Today* 62(1): 4–6.

- Provide for modern, reliable communications equipment for more efficient action on incidents; and
- Reduce hazardous fuels and improve defensible space within communities and adjacent areas.

Volunteer Fire Assistance. Volunteer fire assistance provides technical and financial support to volunteer fire departments that protect communities with populations of less than 10,000. These local agencies are often the first line of defense for W–UI areas threatened by wildland fire. The value of their service is estimated to exceed $36 billion annually. Federal assistance to volunteer fire departments helps improve the effectiveness of fire protection on public lands, especially in W–UI areas adjacent to Federal lands. The NFP provides annual funding for about 4,000 volunteer fire departments with unmet training and equipment needs. Funds are cost-shared on a one-to-one basis between Federal and non-Federal partners. Under the NFP, volunteer fire departments receive funds to pay for many necessities, such as fire management training, protective fire clothing, and radio equipment.

Invasive Species Management. Funds for invasive species management support technical and financial assistance to Federal agencies, Tribal governments, and States in carrying out a coordinated nationwide program of detecting, monitoring, evaluating, preventing, and suppressing invasive forest insects and diseases, including noxious weeds. As forest health conditions improve and mortality decreases,

Table 3—Forest Service funding for community protection programs under the National Fire Plan, FY01 and FY02.

Programs	*FY01*	*FY02*		
		Needed[a]	*Proposed*	*Enacted*
State fire assistance:	**$75,328,000**	**$84,441,000**	**$75,693,000**	**$81,693,000**
State activities	35,638,000	51,451,000	45,203,000	51,203,000
Firewise	3,200,000	4,000,000	1,500,000	1,500,000
Hazard mitigation and prevention	28,990,000	28,990,000	28,990,000	28,990,000
Special projects (Kenai Peninsula Borough)	7,500,000	0	0	0
Volunteer fire assistance	**13,251,000**	**15,351,000**	**13,315,000**	**13,315,000**
Invasive species management	**11,974,000**	**18,336,000**	**11,974,000**	**11,974,000**
Economic action programs (EAPs):	**12,472,000**	**28,086,000**	**12,472,000**	**12,472,000**
Pilot projects	0	3,314,000	0	0
Market development and expansion	12,472,000	19,472,000	12,472,000	12,472,000
Improved wood utilization[b]	0	5,300,000	0	0
Community and private land fire assistance:	**34,923,000**	**35,623,000**	**0**	**0**
Fence reconstruction	8,980,000	0	0	0
Hazard mitigation	5,987,000	14,623,000	0	0
Multiresource planning	6,985,000	12,000,000	0	0
EAP pilot projects	7,982,000	0	0	0
Community protection planning	4,989,000	9,000,000	0	0
Total	**$147,948,000**	**$181,837,000**	**$113,454,000**	**$119,454,000**

a. Based on planning estimates in the "Technical Support Document: for the Long-Term Strategy," March 19, 2001.
b. For a center at the Forest Service's Forest Products Laboratory in Madison, WI.

susceptibility to fire diminishes. Funds are used for the management and control of invasive species spread resulting from fire. Funding amounts are based on estimates of detection, evaluation, and high-priority treatments in areas most severely damaged by fires.

Economic Action Programs (EAPs). EAPs support long-term rural health by providing communities with technical and financial assistance in diversifying uses of forest resources. Supported enterprises utilize resources such as wood, recreation, wildlife, cultural and heritage resources, minerals, nontimber forest products, and scenic quality. Funding for technical assistance and grants to help develop businesses is partly based on needs identified for economic expansion prior to fires. EAP components include rural community assistance, forest products conservation and recycling, and market development and expansion. Funds are cost-shared on a one-to-one basis between Federal and non-Federal partners.

Funds are used to develop and expand markets for traditionally underutilized wood as an incentive for removing hazardous fuels. It is essential to maintain existing markets and create new markets for the small-diameter materials that need to be removed. Otherwise, the potential market value of the wood is lost and value-added opportunities for jobs and new businesses are forgone. Funds are targeted for:

Rural and volunteer fire departments provide the front line of defense on up to 90 percent of the high-risk and costly fires in the wildland–urban interface.

- Technical assistance;
- Training;
- Business plan development;
- Feasibility studies;
- Seed funds for selected capital investments;
- Marketing strategies;
- Identification of value-added, income-producing opportunities; and
- Applied research, specifically for the utilization of small-diameter materials.

Allocation of funds is based on the evaluation of projects designed specifically to create jobs, markets, and income from hazardous fuel removals. EAPs have a history of success, typically producing a benefit-to-cost ratio of more than five to one.

Community and Private Land Fire Assistance. Community and private land fire assistance supports the non-Federal entities most affected by fire using all existing authorities under the Forest Service's State and Private Forestry appropriation. For the first year of the NFP, funding was included for:

- Restoring fire-damaged fences;
- Hazardous fuel reduction on non-Federal lands;
- Stewardship planning to ensure effective fuel reduction, with strong consideration for all land conditions;
- EAP pilot projects; and
- Strategic development and planned growth for communities at high risk from wildland fire.

Funds in FY01 were intended to augment activities within community protection programs (see sidebar). Typically, funds are cost-shared on a one-to-one basis between Federal and non-Federal partners.

Meeting the Challenge

Our Nation faces the tremendous challenge of reducing the growing risk to lives, property, and natural resources from uncharacteristically severe wildland fires in the W–UI. No single agency is capable of rising to the challenge alone. The only feasible solutions are through collective local, State, Tribal, and Federal action, often through private/public partnerships.

Through the NFP, we have begun to meet the challenge. The Forest Service's Cooperative Fire Protection programs provide a ready-made framework for NFP programs to assist local communities and help State and local governments become better trained and equipped to fight fires. Building on the Forest Service's cooperative traditions, we are working together to create safe, livable communities for the future. ■

Community Protection in 2001

In 2001, the National Fire Plan funded many projects designed to protect individual communities from the ravages of wildland fire. Examples include:

- The Anchorage Firewise Project, which provided State fire assistance funds for workshops, demonstrations, disaster exercises, and evacuation plans in Anchorage, AK.
- A spruce bark beetle project on Alaska's Kenai Peninsula, where 4 million acres (1.6 million ha) of dead and dying trees were treated to reduce fire hazards.
- A series of biomass utilization feasibility studies in the area around Lake Tahoe, CA, in conjunction with defensible space inspections and hazardous fuel reductions for homeowners.
- The purchase of shredders for fire agencies in Santa Barbara County, CA, to help reduce hazardous fuels.
- The use of funds in Mendocino County, CA, to hire a Firesafe project coordinator to work with local homeowners to assess and lower fire risks.
- The installation of a biomass-to-ethanol and electricity cogeneration project by a lumber company near Quincy, CA, to create a market for wood from removed hazardous fuels.
- A project using State fire assistance funds to construct an estimated 12 miles of fuelbreak near Quincy, CA, covering 435 acres (176 ha) and employing about 14 supervisors and about 60 youths between the ages of 14 and 21.
- An Oregon project using community assistance funds to reduce fuels around structures, with inmate crews providing labor. Local fire districts used rating systems to determine the feasibility of protecting homes from wildfire. After work was finished, a green rock was placed at the end of the homeowner's driveway.
- A memorandum of understanding between Idaho's Boise National Forest and Home Depot, Inc., to work together to educate rural communities on the dangers of wildland fire and the actions homeowners can take to fireproof their properties.
- A fire risk assessment by all 13 states in the Forest Service's Southern Region, to be made available to anyone and used for establishing treatment priorities.
- Firewise Communities Training in Texas, including 1-day training packages for providing information and education in high-risk areas, promoting Firewise practices at the homeowner and community level, and encouraging the reduction of combustible vegetation in the W–UI.
- Conversion of a closed lumber mill by two communities in the Forest Service's Southwestern Region into an electricity cogeneration facility using wood chips from removed hazardous fuels.
- A small business by a local entrepreneur in the Southeast selling wood chips from thinning projects for uses such as horse bedding, trail covering, and racetracks.
- A grant to the Grand Canyon Forests Foundation to develop, test, and demonstrate sound, economically sustainable, and socially acceptable approaches toward developing new uses, products, and markets associated with the harvesting and processing of small-diameter timber.

Flagstaff Interface Treatment Prescription: Results in the Wildland–Urban Interface

Allen Farnsworth and Paul Summerfelt

In Flagstaff, AZ, wildland fire is the number one fire threat to communities in or adjacent to the wildland–urban interface (W–UI). Yet, successfully treating these areas to reduce the risk of fire is complicated and costly.

During the past 5 years, fire managers in Flagstaff have developed a system of fuel reduction treatments to effectively reduce wildland fire hazards, improve the probability of successful initial attacks, maintain and enhance vegetative diversity, and improve overall ecosystem health in the W–UI. All stands or parcels are considered valuable ecosystem components.

The Flagstaff Interface Treatment Prescription considers forestry, fire science, and community input vital to successfully develop, implement, and maintain fuel reduction treatments. Since the program began, we have successfully treated several thousand acres and have had overwhelming public support.

Setting

Located in north-central Arizona at 7,000 feet (2,100 m), Flagstaff is a metropolitan area surrounded by a dense ponderosa pine forest. Annually, the city experiences more than 200 fires in the W–UI.

Allen Farnsworth is a zone prescribed fire specialist for the USDA Forest Service, Coconino National Forest, Peaks and Mormon Lake Districts, Flagstaff, AZ; and Paul Summerfelt is the fuel management officer for the Flagstaff Fire Department.

> In Flagstaff, it is not a question of whether a wildland fire will occur, but when and where, and how much damage it will cause.

In the early 1990s, the USDA Forest Service began treating at-risk areas adjacent to and within Flagstaff. After the severe 1996 fire season, the Flagstaff Fire Department began a fuel management program. Additionally, a consortium of fire departments and land management agencies from the greater Flagstaff area—the Ponderosa Fire Advisory Council—initiated fuel reduction projects.

Fuel treatments complement the area's effective suppression system. Six lookout towers oversee the north end of the Coconino National Forest, including the area around Flagstaff, making early wildland fire detection possible. After a fire is located, the forest musters the initial-attack units, which travel over an extensive road system and arrive at the fire within 15 to 30 minutes.

Before the 1860s, the forest had open stands of large-diameter ponderosa pine trees that were arranged in small groups. A savanna grassland, with 30 to 50 trees per acre (74–124 trees/ha), dominated the landscape. Fires were low intensity and frequent—occurring every 2 to 7 years.

By the 1880s, the forest was experiencing intense livestock grazing and timber harvesting. The removal of most of the grass, coupled with wet weather and an exceptional cone crop in 1919, resulted in many new seedlings. For most of the 20th century, active fire suppression was practiced.

Today, many pine stands are overstocked with small to medium-size second-growth trees. Tree density ranges from several hundred to a few thousand per acre. Canopy closure varies from 50 to 70 percent, but often approaches 100 percent. An occasional juniper, pinyon pine, Douglas-fir, white fir, Gambel oak, limber pine, or aspen grows among the ponderosa pine stands. Insect and disease problems include dwarf mistletoe and periodic infestations by various bark beetles.

The fuel reduction treatment sites are closed-canopy pine stands, with needle understory. In the few open areas, the ground cover is a mix of grasses and forbs. Heavy logging slash from the early 1900s contributes to the fire hazard and laddering potential.

Looking east from Mars Hill, Flagstaff, AZ, in about 1900 (above) and 2000 (below). In the 20th century, Flagstaff grew from a rural settlement into a major metropolitan center. Photos: Lowell Observatory, Flagstaff, AZ, circa 1900 (above); Allen Farnsworth, USDA Forest Service, Coconino National Forest, Flagstaff, AZ, 2000 (below).

Silvicultural Prescription

The prescription is a moderate-to-heavy modification of the existing stand—50 to 75 percent of the mostly small-diameter trees are removed. We prefer selective thinning, focusing on over-topped pines. Our target number of trees on mistletoe-free sites is about 75 to 100 per acre (185–250/ha). If possible, we leave trees in a clumped pattern rather than evenly spaced to benefit wildlife species and avoid a plantation appearance.

We remove trees that:

- Could create a ladder into the overstory canopy;
- Are suppressed and debilitated;
- Are suppressing healthy trees;
- Exhibit reduced vigor; or
- Are damaged or deformed and contribute to fire potential.

Stands heavily infested with dwarf mistletoe are thinned to reduce crowning potential. Small, isolated pockets of mistletoe—less than one-quarter acre (0.1 ha)—are either removed or isolated from noninfected trees to reduce parasite spread through a 50-foot (15-m) barrier.

Removing thickets of young trees from around the bases of old-growth and large-diameter ponderosa pines showcases these favored trees. Removing some or all of the encroaching pines highlights oaks and other preferred species; selective removal of young pines enhances unique features, such as geologic protrusions, scenic vistas, or uncommon ground vegetation. We avoid cutting old-growth, large-diameter ponderosa pines or standing snags, unless the trees are threatening public safety or improvements.

Designating Trees

Guidelines issued, either verbally or in writing, by the project manager to the crew are effective for selecting trees to be cut. Where possible, a cutter selection method is preferred; a sample cut is designated and reviewed by the thinning crew, if needed.

When trees are designated with paint, we prefer a cut-tree mark instead of a leave-tree mark so no visible marks remain. However, in areas scheduled for followup underburning, we often place a mark as close to the ground as possible on trees we want to leave so that the scorch from the underburn will hide or eliminate the paint.

When designating trees for removal, personnel must assess the fire behavior alignments, such as the prevailing wind direction, shade, slope, fuel arrangement and continuity, and potential fireline locations. Crews also consider the type of fuel model conversion that

may result from treatment. Converting to an open pine stand with a grassy understory may be appropriate if the stand is adjacent to a control feature such as a road, trail, or natural barrier.

Cutting Techniques

A traditional harvesting operation might not be suitable in some W–UI areas, whereas in others it might be preferred. Occasionally, we use traditional timber-harvesting equipment, but we prefer a microharvesting approach.

Trees are cut using either hand crews and power saws or a Bobcat shear. We use all-terrain vehicles (ATVs) and a trailer to move the wood. Smaller equipment reduces soil compaction and disturbance, diminishing erosion and the amount of soil exposed to colonization by noxious weeds and other exotic plants. Crews cut stumps as low and level to the ground as possible to improve the posttreatment visual quality and allow for easier access for wood removal and subsequent fire management. We treat as much of the slash as possible daily.

Restricting hours of operation in response to local conditions is another consideration in the W–UI. For example, if an operation is adjacent to a neighborhood, we confine activity to hours when most people are not home.

Free Wood

We remove and use as much wood produced from the thinning operations as possible. Occasionally, some material may be left onsite for wildlife cover. Although current commercial markets are limited for many of our products, designating accessible areas for free-wood removal has been successful. Each fall, the Flagstaff Fire Department's free-wood Saturdays attract more than 200 people, who remove 100 cords of firewood in half a day. To facilitate removal, crews cut firewood into 2- to 3-foot (0.6–0.9-m) lengths and poles into 10-foot (3-m) lengths. Before we begin cutting, we discuss access through neighborhoods with the homeowners.

When there is no market for the wood products or when removal is not practical, the project manager must consider limiting the size and number of the trees designated for cutting on the site. More than one cutting cycle might be required for timely slash treatment.

Slash Treatment

Hand Piles. This is the typical method of handling slash. Hand piles are teepee shaped and a minimum of 6 feet (2 m) tall and 6 feet (2 m) wide. We locate the piles in openings to avoid scorching remaining trees. We also avoid placing piles on top of old stumps or logs to reduce the smoke and the chance for creep when the piles are later burned. We have found that the public believes that a scorched tree is worse than a cut tree and that creep is an escaped controlled burn.

Machine Piles. This method is sometimes feasible in open areas. We have had the most success with the windrow-piling method, which requires directional falling into a windrow that a dozer can push into large piles in a single pass. Because the dozer is not constantly spinning and turning, it makes few ruts. Large piles result in fewer piles per acre, speeding production by an estimated 30 percent. Moreover, they can be ignited under snowier or wetter conditions than tradi-

The objective of the Flagstaff Interface Treatment Prescription is to reduce fuels in the wildland–urban interface, regardless of ownership or jurisdiction.

Guidelines for Successful Fuel Treatments

The Flagstaff Interface Treatment Prescription has developed the following guidelines based on experience and success with the fuel reduction treatment program:

- Involve those potentially affected from the project's beginning;
- After the project is started, complete it in a timely manner;
- Use signs, news releases, and other appropriate methods to update people on the status of the project;
- When mistakes happen, immediately notify each adjacent resident, explain what happened and why, and advise them of what is being done to correct the situation;
- Document and follow up on special concerns or details important to a concerned individual;
- Maintain professionalism, integrity, and credibility; and
- Stay focused on the objective of reducing the fire risk.

All-terrain vehicles are less disturbing than larger equipment to area residents and allow people to easily approach crews to learn about fuel reduction.

Free-wood collection on Mars Hill, Flagstaff, AZ. Firewood was removed by the public on a designated free-wood collection day following a thinning operation. Photo: Paul Summerfelt, Flagstaff Fire Department, Flagstaff, AZ, 2000.

tional hand piles. We also use whole-tree skidding.

Chip or Grind. This technique is expensive and the chips decompose slowly in Flagstaff's dry climate. If future underburning is anticipated for the site, the chips can add to smoke management problems. Alternatively, hauling chips to a disposal site is expensive. The material can, however, be used for mulch or decorative landscaping.

Lop-and-Scatter. This method is effective only if the amount of slash is light and the manager can complete a broadcast burn soon after cutting. However, we seldom use this method. Due to the increased fire hazard, we never leave dried lopped-and-scattered slash adjacent to homes.

Pile Burning

We burn piles to reduce scorch, minimize smoke issues, and lessen potential control problems when fuel consumption will be greater than 90 percent. Whether the material is hand or machine piled, the number one concern is quality—not acres treated per day.

Because we broadcast burn most of the sites we work on, crews often pile the dead and downed material that existed before treatment. We burn these piles at the same time as the slash piles from thinning, which helps to reduce smoke during the following broadcast burn. Usually, some material is left onsite for wildlife cover.

For burning hand piles, we usually wait for either a snow cover or an extended wet-weather episode. On burn day, the crew ignites a manageable number of piles. As they burn down, the crew goes back through the area and consolidates each pile two to three times to ensure complete, timely consumption. Our goal is to burn all piles by nightfall.

For burning machine piles, we wait for snow. As the piles are burned, a small dozer shapes the piles and landings. While the dozer is working, crews spread seed and work it into the ground for speedy site recovery, less likelihood of noxious weed establishment, and reduced visual impact.

Broadcast Burning

Treating ground fuels is a critical component of our stand enhancement and fuel reduction effort. After an area has been thinned and the slash has been treated, we broadcast burn the site. For any burning operation, we want to reduce 1- and 10-hour fuels by at least 60 percent and keep tree mortality to less than 5 percent of the existing stand.

In Flagstaff, the prevailing wind is from the southwest; therefore, burn blocks are ignited starting in the northeast and working toward the southwest. A fireline is constructed by hand or with a drag pulled by an ATV. We either hand line or exclude from the burn block standing dead trees, cultural and archeological sites, and other important features.

Once ignited, deep duff and needle accumulation at the base of large trees can smolder for days, baking the cambium layer and eventually killing the tree. To avoid such damage, crews rake the duff and

Leaving untreated slash—even for a few days—invites criticism from concerned residents.

Parcel at the Brannen Homes development, Flagstaff, AZ. The parcel was broadcast burned following selective thinning, pruning, and slash disposal. Photo: Larry McCoy, USDA Forest Service, Coconino National Forest, 1996.

needle material 1 foot (0.3 m) away from the boles of high-risk trees. We do the same for downed logs that we want to preserve for wildlife cover.

We try not to burn during the spring due to limited resource availability, training commitments, and escalating fire danger indices. However, if the planned burn is small, quick, and anchored to a recent burn or fuel break, spring burning is reasonably safe.

We prefer to broadcast burn during breaks in the summer monsoon season, the transition from the monsoon season to drier fall weather, or during the fall and early winter. Our goal is to complete most burns in the summer to recreate the historical fire regime. Broadcast burning in the summer is easier after a site has been thinned and pile burned to remove excessive fuel accumulations.

After we have completed the thinning, slash treatment, and first underburning, the treated area is an effective fuel break for at least the next 3 to 4 years. We follow up with thinning and maintenance burns to help reduce the long-term risk of destructive fire. Typically, thinning is rescheduled every 10 to 15 years, whereas broadcast burns are on a 3- to 7- year cycle. Smoke management concerns are significantly less during maintenance burns.

Community Involvement

Comprehensive public notification is an essential part of our burning program. We post signs announcing the proposed burn, issue news releases, and often make door-to-door contact throughout the nearby neighborhoods. We routinely ask for input from residents, consider their concerns and beliefs, and, when possible, incorporate their desires. We address any concerns raised by residents immediately, either by telephone or a personal visit. Followup visits are paid to people with questions or concerns. If necessary, a case officer is assigned so that residents work with the same person from the start of a project to the end.

Throughout the treatment operation, the project manager talks with potentially affected residents. If concerns surface on the day the site is being burned, the project manager or a crew member visits the person while the fire is still underway. We also conduct continuing education programs—speaking with civic groups, environmental organizations, and others—to inform the community of the importance and benefits of the program.

Our experience has shown that a previously notified neighborhood will tolerate smoke for a day; but after 2 to 3 days, patience wears thin. We may extinguish a particular log, stump, or site if it is a major concern to a nearby resident.

Our burns are designed for dispersal throughout the community to lessen the impact. The Flagstaff Fire Department has offered to relocate smoke-sensitive people temporarily—to date, no one has taken advantage of the offer. Neighborhood airsheds, indicated by diurnal smoke flows, are routinely mapped so we can plan future smoke management efforts.

We have also successfully involved local businesses in our thinning efforts. Before 1998, less than 10 contracts per year were issued to

Meeting with residents near a fuel reduction treatment. Project managers routinely communicate with neighbors before initiating such projects. Photo: Allen Farnsworth, USDA Forest Service, Coconino National Forest, Flagstaff, AZ, 1997.

local companies. Since 1998, we have issued approximately 60 contracts each year.

Although it takes considerable time and commitment, we believe community involvement is essential for the success of our program. Our efforts result in property owners who understand the benefits of wildland fire management and often want us to implement fuel reduction treatments on their land or other adjacent property.

Costs and Benefits

Individual project expenses vary tremendously from site to site based on ownership, size, complexity, and need. Comparing one site with another is difficult, especially when comparing initial-treatment with maintenance requirements. What we consider is the cost of doing nothing. We want to work with the residents before a wildland fire instead of during or after it.

We have experienced fires in several of our treated areas and have noticed:

- Improved access for firefighters and equipment,
- Increased ability to use barriers when locating and constructing line,
- Easier detection and suppression of spot fires,
- Decreased mopup time and effort,
- Reduced torching and mortality,
- More options for a modified suppression response, and
- Improved public safety.

In addition, we reduce trash accumulation by eliminating the cover necessary for transient camps and party spots, and we clean up existing trash during operations.

We have found that success breeds success. Many landowners who observed ongoing and completed treatments on adjacent lands have implemented similar treatments on their own land. For additional information, contact Paul Summerfelt, Flagstaff Fire Department, 211 Rust Aspen, Flagstaff, AZ, 86001, 928-779-7688 ext. 283 (voice), psummerfelt@ci.flagstaff.az.us (e-mail). ■

Mobile Fire-Mapping Units Support Wildland Fire Suppression

Rick Connell

In 1993, fire mapping on the Humboldt–Toiyabe National Forest often happened days or even weeks after firefighters had successfully extinguished the blaze. During the 1994 fire season, the inability to produce maps quickly hindered the forest's firefighting efforts.

Unit Development

John Burt, information systems manager for the Humboldt–Toiyabe National Forest, and I spent part of the winter of 1994–95 conceptualizing the use of a mobile trailer to develop incident action plan maps using geographical information systems (GISs) and global positioning system applications. Our idea was to develop a self-sufficient trailer that the forest could deploy to an incident command post, including all the components needed for map production and analysis.

The first fire-mapping trailer (fig. 1) was a converted 24-foot (7.3-m) camper trailer. We gutted the trailer's interior and added a new partition, desktop, counter, and storage. Additionally, we rewired the unit for electricity and added a local-area network connection.

The trailer went online in 1996 and saw active duty throughout the 2000 fire season. During this time, we used the unit for all type 1 and 2 incidents along the Sierra Front.

Rick Connell is the assistant fire management officer, USDA Forest Service, Shoshone National Forest, Cody, WY. When authoring this article, Rick was the forest analyst/geographic information systems coordinator, USDA Forest Service, Humboldt–Toiyabe National Forest, Sparks, NV.

On wildland fire incidents in the Great Basin, quick response and timely generation of products are critical to the fire suppression effort.

We used the mobile-mapping unit six times and successfully mapped 12 fires during the 2000 fire season.

New Trailer

In the winter of 1999, the forest funded a replacement fire-mapping trailer. The new trailer (fig. 2) is 18 feet (5.4 m) long and 108 inches (274 cm) wide, with an extra foot (0.3 m) of interior height. We customized the trailer to carry computers, printers, and plotters in specialized cabinets and desktops. We added an onboard generator and a large door for easy equipment loading.

Figure 1—*Interior (above) and exterior (below) of first mobile-mapping trailer. Note computers, printer, and global positioning system inside the trailer and the generator that functioned as a supplemental power supply outside the unit. We used the converted camper trailer to develop incident action plan maps using geographical information systems and global position system applications. Photo: Rick Connell, USDA Forest Service, Humboldt–Toiyabe National Forest, Sparks, NV, 1996.*

Currently, we can load and hook up the trailer in less than 1 hour. The length of time from incident arrival to generation of the first map depends on when we receive the perimeter information. However, once we know the perimeter data, we can usually generate a map in 30 minutes or less. We create the maps using current, "raw" GIS data versus scanned maps. We selected this process for the best clarity possible and to avoid using 20- to 50-year-old scanned map data.

Wide-Area Network

During the winter of 2001, we outfitted the trailer with a wide-area network with the capacity to cover 25 miles (40 km) between antennae. We tested the new feature in January 2001 using two segments. The first segment was from the supervisor's office to a repeater (back-to-back antennae), which was on a peak about 10 miles (16 km) away. The second segment was from the repeater to the trailer—a distance of about 5 miles (8 km). The data transmission rates met or exceeded T1 (1.54 megabits per second). We plan to use the new system for retrieving and transmitting data from GISs, the World Wide Web, and other sources.

For additional information on the mobile fire-mapping trailer, contact Rick Connell, USDA Forest Service, Shoshone National Forest, 808 Meadow Lane, Cody, WY 82414-4516, 307-326-1200 (voice), rconnell@.fs.fed.us (e-mail). ■

Figure 2—*Interior (above) and exterior (below) of the new mobile-mapping trailer. The large, customized trailer first saw action during the 2001 fire season. The unit can generate a fire map within 30 minutes or less from receipt of the perimeter information. Photo: Rick Connell, USDA Forest Service, Humboldt–Toiyabe National Forest, Sparks, NV, 2000.*

Trailer Features

The trailer used to make incident action plan maps has the following specifications and customized onboard mapping resources.

Specifications

- All-metal tubular construction, with walk-on roof.
- 18 feet (5.5 m) long by 8 feet (2.4 m) wide by 7 feet (2.1 m) interior height.
- Onboard 5,000-kilowatt generator, with 15-gallon (57-L) gas tank mounted under the trailer.
- Battery backup system (BBS).
- 10 ports for local-area network connection.
- Two telephone lines.
- Air conditioning unit, with separate power connection.
- Power split on each four-plug receptacle—two through the BBS, two from the source.

Resources

- One desktop personal computer, with ArcView, 3D Analyst, Spatial Analyst, FARSITE Fire Area Simulator, Behave, Pfinder, and typical office-support software installed.
- One laptop computer, with the same installed software as the desktop unit.
- One 30-gigabyte stand-alone network drive.
- One laser printer.
- One Inkjet plotter, with 36-inch-wide (91-cm-wide) capacity.
- One Trimble GeoExplorer III.
- Appropriate fireline equipment.
- Maintenance supplies for the above equipment.
- Data from a variety of sources at different scales.
- Coverage for Nevada and eastern California.

How Accurate Are Haines Index Forecasts on the University of Wisconsin Website?

Brian E. Potter, Thor Sawin, and Jonathan Martin

The Haines Index, initially called the Lower Atmospheric Severity Index (Haines 1988), uses late-afternoon lower atmospheric stability and dewpoint depression to produce an integer between 2 and 6. Fire managers know they probably don't need to worry when Index values are low. However, when they see higher values, they know they could be facing a dry, unstable atmosphere conducive to large wildland fires. Because the Haines Index can usually distinguish between average and rapid fire growth conditions, it has become a standard tool of many fire weather forecasters and fire managers.

Index Forecasts

In 1995, the North Central Research Station of the USDA Forest Service and the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin–Madison (UW–M) began producing 24- and 48-hour computer forecasts of the Haines Index for most of the United States. The exceptions are Alaska, Hawaii, and a small part of coastal California. The Website for the forecasts, which are updated every evening, is <http://mocha.meteor.wisc.edu/table.00z.html>. Figure 1 shows a typical forecast map. Such maps provide information to scientists and fire management personnel and are the only nationwide Haines Index forecasts available 48 hours in advance.

Brian Potter is a research meteorologist for the USDA Forest Service, North Central Research Station, East Lansing, MI; Thor Sawin is a computer clerk for the North Central Research Station and a student at Michigan State University, East Lansing, MI; and Jonathan Martin is an associate professor in the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin, Madison, WI.

Given a choice of a random, unbiased prediction, a persistence prediction, or the model, the model is the best and most accurate predictor of the Haines Index.

Having forecasts available is one thing, but it is also important to know how reliable the forecasts are. Do they miss frequently? Are they any better than a guess? Would it be just as accurate to speculate that tomorrow will be just like today? We raised these questions for the forecasts produced by the UW–M. What follows is a summary of our methods and findings.

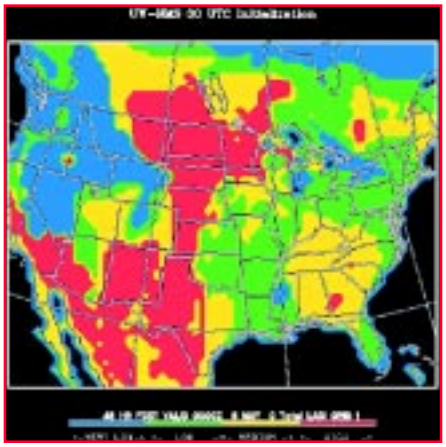

Figure 1—*Example of a map of the Haines Index generated by the University of Wisconsin Nonhydrostatic Modeling System. Blue indicates very low risk of a fire growing explosively due to atmospheric conditions, green indicates low risk, yellow indicates moderate risk, and red indicates high risk.*

Nature of the Data

Forecast data and observed conditions are available for most of 1999 and 2000. The largest single gap in the record comprises the months of October and November 1999, when the UW–M model was not running for various reasons. We compared forecast maps for 24 hours or 48 hours with the map of conditions observed at the appropriate time, recording all errors for each pair of maps. Rather than using the numerical Haines Index value of 2 to 6, we used the corresponding risk categories:

- 2 or 3 = very low risk;
- 4 = low risk;
- 5 = moderate risk; and
- 6 = high risk.

By comparing forecasted conditions to actual conditions, we determined whether the model accurately predicted the risk category (very low, low, moderate, or high).

We looked at three qualities of the forecast errors in our discussion. First, how big are the errors in the forecasts—what is their magnitude, regardless of their sign? Second, is there a constant bias in the forecasts—are they usually positive or usually negative, or do they average out to zero? Third, how common or widespread are the errors—does the model make many little errors or a few big ones?

In addition to describing the errors, we looked at how the forecasts compared to random guesses or to a 1-day or 2-day persistence forecast that assumes current conditions will continue to the time for which one is trying to forecast (the target time). To make these comparisons, we used what is known as a skill score. Specifically, we used the so-called Hanssen–Kuipers discriminant (Hanssen and Kuipers 1965).

A simple explanation of the Hanssen–Kuipers discriminant is as follows: Under normal conditions, a coin lands heads-up half the time, tails-up the other half. Based on this knowledge, someone guessing how the coin will land would guess heads half the time and tails the other half. Imagine now a coin that lands heads-up two out of three times, and tails-up only one out of three. Those guessing how this coin will land would be correct more often if they guessed heads twice as often as they guessed tails. When the predictions are random but have the same odds as the phenomenon being predicted, we can call them random, unbiased predictions.

The Hanssen–Kuipers discriminant, K, compares the accuracy of a given set of forecasts (the forecast sample) to what one would expect from a set of random, unbiased predictions. If the forecasts are correct as often as the random predictions, then K = 0. If they are perfect forecasts (they are always correct), then K = 1. Values of K less than zero mean the forecast sample is worse than the random predictions, whereas K values between 0 and 1 mean the sample is more accurate than the random predictions, but not perfect.

Findings

Over the 2 years examined, the average magnitude of both the 24-hour and the 48-hour forecast errors was slightly less than one risk category. By and large, forecasts missed by one category (about 80 percent of all errors) more often than they missed by both two and three categories, combined. When we looked at the bias in the forecasts, we found that it was extremely small. The model appears just as likely to forecast too high as it is to forecast too low.

How common are these errors? Out of all the predictions examined (all days and all locations), the model missed 37 percent of the 24-hour forecasts and 40 percent of the 48-hour forecasts. There was no location on the map that was always wrong, nor was there any location that was always correct. There were, however, widespread areas of greater or lesser errors that appear to shift from month to month.

The skill scores, K, for the model forecasts were 0.48 for the 24-hour forecasts and 0.40 for the 48-hour forecasts. The persistence forecast K's were 0.37 for a 24-hour persistence forecast and 0.30 for a 48-hour persistence forecast. Figure 2 shows K for each month for model and persistence, 24- and 48-hour forecasts. The only time when persistence had a higher K than the model was May 1999 for both forecast periods; in February and September 2000, the 48-hour

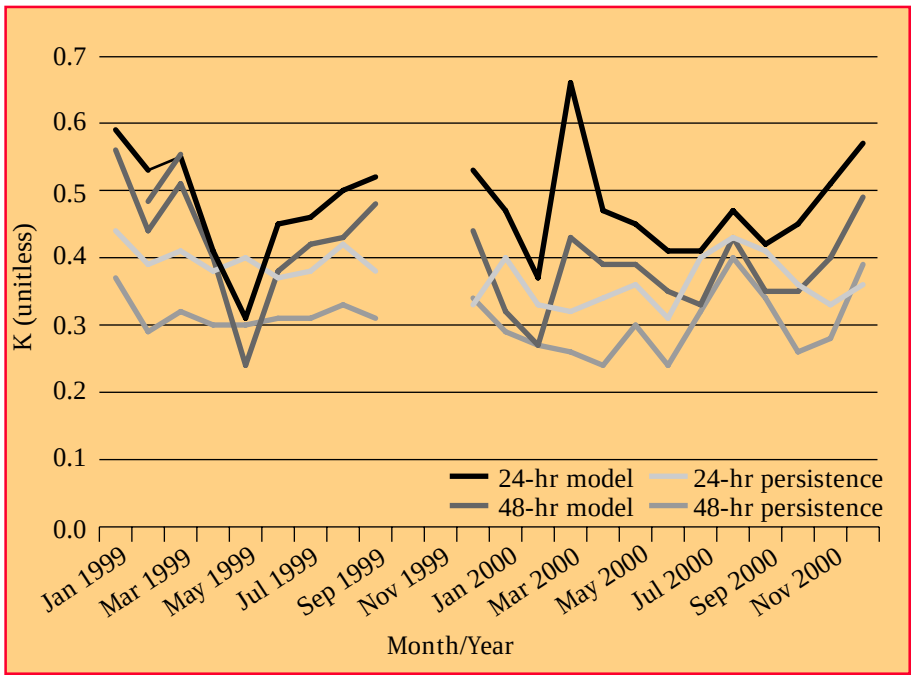

Figure 2—*Monthly model and persistence forecast skill scores for 24-hour and 48-hour forecasts. (The gap in October/November 1999 is when the model was not running). The short-term forecast model better predicts the Haines Index than a persistence forecast (speculation that tomorrow's conditions will be just like today's).*

persistence and model forecast K's were equal.

The data show that the UW–M model forecasts of the Haines Index are correct about 60 percent of the time; and when they do err, they err by only one risk category. The model forecasts had positive K scores, meaning they were more accurate than a random, unbiased prediction, but not perfect. Model forecast K was also greater than or equal to persistence forecast K in 15 out of 16 months and on an annual average. Given a choice of a random, unbiased prediction, a persistence prediction, or the model, the model is the best and most accurate predictor of the Haines Index.

For each of the measures we examined, there was only a small difference between the 24-hour and 48-hour forecasts. This difference suggests that any errors the model makes arise primarily in the first 24 hours of the forecast simulations, and only a small change occurs between 24 and 48 hours in the computer model.

Forecast Accuracy

This study is the first assessment of a short-term forecast model's ability to predict the Haines Index, and it shows that the model produces usable results. They are better than the random and persistence options, at the least. Our study gives some indication of the model's usefulness, even though it examines only 16 months of data, a relatively short time period for weather data. In the future, when more data are available, we plan to reexamine the UW–M forecasts.

This study is the first assessment of a short-term forecast model's ability to predict the Haines Index, and it shows that the model produces usable results.

We did not discuss the spatial patterns of the errors in this analysis. Different areas of the country might have different forecast errors, in terms of either timing or magnitude. We have currently begun an analysis that divides the forecast area into subregions so that we can better understand the model's weaknesses and strengths.

Finally, it is extremely important to recognize that this study does not look at how well the Haines Index predicts large fires, the accuracy of the Haines Index itself. This study looks only at the ability of one computer model to accurately predict the Haines Index 1 or 2 days in advance. The accuracy of the index itself has been discussed in Werth and Ochoa (1993) and Werth and Werth (1998). For the full study, contact Brian E. Potter, North Central Research Station, Michigan State University, 1407 South Harrison Road, East Lansing, MI 48823.

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1937 Blackwater Fire Investigation: Boost for Smokejumpers?*

Karl Brauneis

As a fire management officer on the Shoshone National Forest in Wyoming, I have studied the tragic Blackwater Fire of August 21, 1937, to learn more about local fire behavior variables and to train firefighters on all aspects of safety during potential blowup conditions. Fifteen firefighters died and another 38 were injured on the Blackwater Fire when a passing cold front turned the fire's head a full 90 degrees and trapped groups of firefighters on various parts of the fire.

Recently, we have been able to develop and present a fire training slide show on the Blackwater Fire to cover the elements of the training courses "Standards for Survival" (PMS 416) and "Look Up, Look Down, Look Around" (PMS 427). Still, there is a story on the investigation of this fire that needs to be told.

Godwin's Findings

The fire investigation was conducted by David P. Godwin, the Assistant Chief of Fire Control for the USDA Forest Service. Godwin's report is titled, "The Handling of the Blackwater Fire." In addition, A.A. Brown, head of the Division of Fire Control in the Forest Service's Rocky Mountain Region, assisted with a fire behavior study titled, "The Factors and Circumstances That Led to the Blackwater Fire Tragedy."**

A passing cold front turned the fire's head a full 90 degrees and trapped groups of firefighters.

Godwin concluded that the leadership on the fire was "intelligent and protective of the men." The Forest Service personnel who directed fire suppression on the Blackwater Fire used the standard techniques of the day. Still, I believe that Godwin struggled with this tragedy and worked within the Division of Fire Control to find ways to improve fire suppression techniques.

Godwin focused on response times to the Blackwater Fire from parties ranging from Forest Service personnel to Civilian Conservation Corps (CCC) crews. He charted call and arrival times, reporting that, in general, "response times were fair."

** The reports by Godwin and Brown were reprinted in the December 1937 issue of *Fire Control Notes*, pages 373–387.

Burnover site on the 1937 Blackwater Fire, Shoshone National Forest, WY. Nine firefighters who were entrapped here died. The site is now known as Clayton Gulch, after Ranger Alfred G. Clayton, a sector boss on the fire who died in the burnover. Photo: USDA Forest Service, 1937.

Karl Brauneis is a forester and fire management officer for the USDA Forest Service, Shoshone National Forest, Washakie Ranger District, Lander, WY.

* A version of this article was originally published in the July 1997 issue of *Static Line* (Volume 3(4)), a newsletter of the National Smokejumper Association.

"Not since 1910 have so many lives been lost on a single national forest fire..."

–David P. Godwin

Aftermath of the Blackwater Fire tragedy. The fallen firefighters were carried by horse to waiting trucks. Photo: USDA Forest Service, 1937.

Smokejumper making a training jump near Missoula, MT. The smokejumper program, initiated in 1939–40, was partly designed to reduce the time it took for crews to reach a wildland fire after incidents such as the 1937 Blackwater Fire. Photo: Paul S. Fieldhouse, USDA Forest Service, Missoula Smokejumper Base, Missoula, MT.

A delay in the arrival of the Tensleep CCC crew cost about 2 hours in effective control time on the fire. "If Post's crew had arrived at 10 a.m.," Godwin surmised, "they would have had sufficient time to complete the line job ahead of the 3:30 p.m. gale, which caused the blow-up." It was therefore a "logical speculation," in Godwin's view, that if Forest Service personnel could have had the crew onsite 2 hours earlier, the tragedy might have been averted.

In his fire behavior study, Brown corroborated Godwin's surmise. "Earlier arrival of the new crew," Brown wrote, "even by as little as a half hour, would have resulted in completing the new line. … This would have resulted in a different distribution of the crews and probably slight danger."

Link to Smokejumper Project?

Strong feelings about a traumatic incident are a "prime motivation for action," as James Stone (1996) has pointed out. It appears that Godwin was able to work through the Blackwater disaster and initiate positive actions to develop a new and faster way to put "smoke-chasers" on the line.

Stan Cohen (1983) noted that Godwin is "the man most instrumental in the initial development of the smokejumping concept." One can only imagine the effect that the Blackwater Fire had on him. However, the efforts he made to avert a future tragedy by improving fire response times are documented in forest history. All managers in firefighting agencies should use Godwin's investigation report and the actions he took as a model for an effective management response to an incident.

The original smokejumper project was developed in 1939–40 in Washington at Winthrop and in Montana at Seeley Lake and Moose Creek. Recognized pioneers of the parachute project include Frank, Virgil, and Chet Derry; Francis Lufkin; Glen Smith; Earl Cooley; and Rufus Robinson. Still, I believe that the smokejumpers were born through David Godwin's response to tragedy on Blackwater Creek in August 1937.

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Blackwater Fire Investigation Report

Editor's note: The 1937 Blackwater Fire on the Shoshone National Forest, WY, was one of the worst firefighting tragedies in U.S. history. Fifteen firefighters lost their lives in a wildfire blowup caused by a passing cold front. David P. Godwin, the Assistant Chief of Fire Control for the USDA Forest Service, wrote the main investigation report. The "Summary," excerpted below, gives the flavor and gist of Godwin's report.

After careful review of all the circumstances and acts I find no reason for criticism or organizational change. In reaching this conclusion, full weight and consideration were given to certain things which might have been done differently and better: the communication system was not the best; the local cooperators failed to turn out as per fire plan; the probability of a night wind Friday night* was not a part of the calculation; failure of the Tensleep crew to arrive earlier on Saturday probably contributed to the disaster; there was a lack of written messages and time notations; some unburned fuel was left above the line.

On the other hand, it is clearly evident that this fire was handled in a manner reflecting sound experience and knowledge. … Continuous hard work and intelligent action and courage show up through the entire four-day period. …

Regrettable as it is, it must be recognized that in man's control of forest fires some accidents will occur—just as in city fire protection—without fault or failure on the part of anyone. Here was brought about a peculiar combination of circumstances rare in forest-fire history. It is reassuring to know that such occurrences are infrequent. ■

** The Friday night wind caused a slopover. In response, fire crews built control lines that placed them above an unnoticed spot fire, contributing to the fatal blowup the following afternoon.*

Fire camp on the Blackwater Fire. The investigation report found that "camp management and feeding were efficient." Photo: USDA Forest Service, 1937.

Fire Orders: Do You Know Their Original Intent?

Karl Brauneis

For several years, I have presented what I call the "Original-Intent Ten Orders." Fellow firefighters have asked me to put the talk in writing. The original Ten Standard Firefighting Orders were revised in the 1980s to spell out the word FIREORDERS. By learning the original intent of these orders, we can develop a better firefighting foundation.

By learning the original intent of the Fire Orders, we can develop a better firefighting foundation.

Lost Intent

I believe that the revised Fire Orders, as they appear in today's literature, have lost some of the original intent envisioned by the developers. The revised formulation was done to make it easier to memorize the Fire Orders (see sidebar on page 29). I believe that for the Fire Orders to make sense, one must know that the orders were originally designed to follow the engagement and disengagement process. The Fire Orders are, in fact, rules of engagement for crew bosses and their crews.

A task force commissioned by USDA Forest Service Chief Richard E. McArdle in 1957 developed the Ten Standard Firefighting Orders. The task force reviewed the records of 16 tragedy fires that occurred from 1937 to 1956. Both the Blackwater Fire of 1937 on the Shoshone National Forest in Wyoming and the Mann Gulch Fire of 1949 on what is now the Gates of the Mountains Wilderness in Montana contributed to the wisdom contained in the Fire Orders. The orders were based in part on the successful General Orders used by America's Armed Forces.

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Rules of Engagement

I have slightly restructured and reformulated the original Fire Orders to better fit the concepts of engagement and disengagement that I was taught early in my career. I believe that my change in the order structure complements the original intent of the authors. Remember, the orders were designed to be followed up and down in sequence during the engagement and disengagement process. For firefighters, this will make sense based on personal on-the-ground experience.

1. *Know what your FIRE is doing at all times.* This is the foundation for all the other orders. It frames the fire in three dimensions. The reason why we all like initial attack is because it addresses the unknown. What is the fire doing? What is it burning in? Soon, the unknown becomes known as you complete your sizeup.
2. *Base all actions on current and expected BEHAVIOR of the FIRE.* The fire moves through the fourth dimension of time. It is not static; it will constantly move and grow until it is controlled. After you have fixed your fire through sizeup, you must begin to anticipate its movements through time. Knowing current and expected fire behavior will help you do this.
3. *Keep informed on FIRE WEATHER conditions and forecasts.* This is the second leg of your prediction matrix. In the Rocky Mountains, weather will usually dictate where and how your fire will move.
4. *Post a LOOKOUT when there is possible danger.* You are almost ready to engage the fire with firefighters, but first you must ensure that the first three orders are not compromised. A lookout will be able to tell you what the fire is doing. The lookout can also take weather readings to help you predict where the fire will go.
5. *Have ESCAPE ROUTES for everyone and make sure they are known (safety zones).* This is the final order before firefighters can become engaged. If the fire situation deteriorates, you can use this order to disengage until the situation becomes clear.
6. *Be ALERT, keep CALM, THINK clearly, and ACT decisively.* The last five orders deal with people. You must first be clear

and calm in your own mind before you can lead others. If you are confused, use the fifth Fire Order to disengage until the situation becomes clear. Remember that all of us, no matter how experienced, will at times be confused and unsure of ourselves on the fireline. There are often just too many variables changing too fast for our minds to process. If you are confused, then disengage to your safety zone to watch and learn.

7. *Maintain CONTROL of personnel at all times.* Now you are moving out of your own presence and out to others. This order goes directly back to smokejumper foreman Wagner Dodge and his crew at Mann Gulch. If the crew had only listened to their foreman and joined him inside his escape fire, we might not have those 13 "Stations of the Cross" on that Missouri hillside today. All of us have doubts and uncertainties at times. The leadership on the fire must understand the situation and make sure that it is communicated in a calm and orderly manner.
8. *Give clear INSTRUCTIONS and be sure they are understood.* If the crew is unsure, then take the time to reevaluate and bring everyone up to speed. When in doubt, ask the firefighters to repeat the instructions until you are all on the same page.
9. *Maintain prompt COMMUNICATION with crewmembers, boss, and adjoining forces.* As professional firefighters, we must demand nothing less then the best possible communication. If communication lines are broken, then start the disengagement process until the lines are fixed.

The Fire Orders were originally designed to follow the engagement and disengagement process.

10. *Fight fire aggressively but provide for SAFETY first.* You want to fight fire aggressively. You want to see the dirt fly. You want to move your crew around the fire's head and cut the fire off. But you know from experience that before you can fully engage, you must first comply with the Fire Orders. If a safety problem arises at any point during engagement, then you must start disengaging. Safety pervades all 10 Fire Orders. I

Firefighter using a chain saw to fell a dangerous snag. Safety is the overarching purpose of the Ten Standard Firefighting Orders. Photo: Paul S. Fieldhouse, USDA Forest Service, Missoula Smokejumper Base, Missoula, MT.

The Fire Orders should be used as originally intended, not as a perfunctory list of items to be memorized by our firefighters.

believe that the 10th order was written to emphasize disengagement, not the engagement process. Even when things are going great (the crew is engaged and the dirt is flying), be ready to disengage at a moment's notice.

Be Safe!

It is my hope that the Ten Standard Firefighting Orders will be used as they were intended and not become just a list of items to be memorized by our firefighters. I am no saint. In my early years, I tended to rush through the orders so I could aggressively engage. However, age and experience change us all. The Ten Standard Firefighting Orders are the basic building blocks of our fire culture. I hope every firefighter will commit them to heart, mind, and soul. Be safe out there! ■

Fire Orders—Original and Current

The Ten Standard Firefighting Orders were formulated in the 1950s to follow up and down in sequence during engagement and disengagement on a fire. The orders were revised after the 1987 fire season to make them easier to remember by using the first letters to spell out the word FIREORDERS.* For a comparison, the original and current Fire Orders are shown below; following each current order is the number of the corresponding original order in brackets.

Original

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times—observe personally, use scouts.
3. Base all actions on current and expected fire behavior.
4. Have escape routes for everyone and make them known.
5. Post a lookout when there is possible danger.
6. Be alert, keep calm, think clearly, act decisively.
7. Maintain prompt communications with your crew, your boss, and adjoining forces.
8. Give clear instructions and be sure they are understood.
9. Maintain control of your crew at all times.
10. Fight fire aggressively but provide for safety first.

Current

1. Fight fire aggressively but provide for safety first. [10]
2. Initiate all action based on current and expected fire behavior. [3]
3. Recognize current weather conditions and obtain forecasts. [1]
4. Ensure instructions are given and understood. [8]
5. Obtain current information on fire status. [2]
6. Remain in communication with crew members, your supervisor, and adjoining forces. [7]
7. Determine safety zones and escape routes. [4]
8. Establish lookouts in potentially hazardous situations. [5]
9. Retain control at all times. [9]
10. Stay alert, keep calm, think clearly, act decisively. [6]

* See "Standards for Survival," *Fire Management Notes* 49(3) [Spring 1988]: 30–31.

About the Way We Fight Fires*

Mike Benefield

In early 2001, a seasonal firefighter made a stir in the wildland fire community with an opinion piece critical of wildland fire management (Brown 2001). Having served 24 years in the Federal wildland fire service, I applaud many of the points she made (see sidebar). There is no excuse for squandering the Nation's wealth upon wasteful tactics. I will always welcome the fresh views of our firefighters on the ground. I believe that the public should always be involved in the workings of their Government.

Having said that, I believe that it is important to shed a little light upon the context in which this business of wildland fire management is conducted. In this article, I attempt to add context to some of the complaints made by Brown (2001). I am afraid that some of her comments, if taken out of context, might be misleading. My purpose is, in some small way, to help fire managers respond to similar complaints in the future by setting the record straight.

Idle Firefighters

Complaint: Most of what firefighters do is to sit around waiting for something to happen. That's wasteful.

It can often be safer and more cost-effective to idle a fire crew than to deploy that crew time after time in the wrong place.

Wildland fire suppression is conducted in an environment that is much the same as warfare. A wildland fire tactician with any experience at all is going to demand a thorough reconnaissance before he or she commits firefighters to any tactical situation. At the microlevel, it can often be safer and more cost-effective to idle a fire crew than to deploy that crew time after time in the wrong place.

Simply put, one does not jerk a crew around just to keep it occupied. This applies to the macrolevel as well. If conditions warrant, resources need to be moved up and staged—even if that means that crews are dispatched across the country, only to sit and wait for a deployment. The trick is to catch fires while they are small. Then the landscape can be treated in a controlled manner through a future prescribed fire.

Wasteful Mopup

Complaint: Mopup is sometimes done just to put on a show of protecting the homes of the rich and famous. Sometimes it is done in the rain, when it isn't needed. Either way, it's wasteful.

Valid Points About Waste

In an opinion piece published in the *Washington Post* (Brown 2001), the author makes some valid points about wasteful fire management practices:

- For some firefighters, the relatively high pay associated with the hazardous work of firefighting can be an incentive to "milk" fires, a practice that is wasteful and dangerous.
- Fires are sometimes suppressed when an alternative management strategy under an approved fire management plan might be preferable. As fire management plans are updated to conform to changes in Federal policy (NWCG 1995, 2001), alternative management strategies can be used more often.
- Resources such as aircraft are sometimes unnecessarily used on large fires, contributing to skyrocketing fire suppression costs.*

* See Richard J. Mangan, "Issues in Reducing Costs on Large Wildland Fires," *Fire Management Today* 61(3): 6–10.

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* This article is based on a message sent by the author through the e-mail network FireNet on May 1, 2001, in response to an opinion piece criticizing wildland fire suppression practices (Emma Brown, "What Burns Me About the Way We Fight Wildfires," *Washington Post*, April 29, 2001).

Even under the best of conditions, mopup is a filthy, laborious business. Firefighters can hardly be blamed for complaining about having to mop up an extinguished fire just to make a show of protecting the nearby homes of celebrities. I fully support the notion of weighing the costs and benefits of suppression actions. Yes, I have seen many situations where resources were deployed for show.

However, one person's "show" is another person's critical presence. As a fire manager, all I can do is to offer my professional advice, based upon my experience and judgment, whether resources should be deployed or not. For my part, I will continue to err on the side of safety. If a local community demands the presence of my resources, I will offer my advice. In the end, I will be bound by the direction that I receive from the public that I serve.

Complaints of having to mop up in the rain always bring a smile to my face. I wish I had a dollar for every time I mopped up in the rain. Unless the rain was a season-ending event (usually by October in the West), it would always stop and the smokes would pop up within an hour or so after fuels dried out. In the end, it's better to complete the job than to be redeployed later, under worse conditions.

Hazard Pay

Complaint: Firefighters sometimes earn hazard pay for doing nothing or for doing work that isn't hazardous.

When I started fighting fire, I was paid $2.57 per hour. That wasn't much, even back then. I received few benefits and worked hard. I climbed up and down 60-percent slopes, and most of the time I didn't whine. In the winter, I found other work.

> Something much deeper than money motivates a person to manage fire upon the landscape for a living.

Firefighting is still hard work. Firefighters still climb steep slopes. They still spend hours or days at a time performing mind-numbing, back-breaking labor. Many still have to find off-season work; their firefighter pay, which still isn't a whole lot, hardly carries them through the year.

Firefighting is also dangerous work. Even if every minute isn't life threatening, the danger is always there. That's why the first common denominator of fire behavior on tragedy fires is their size: small, sometimes even in the mopup stage (NWCG 1996). Underestimating a fire can be lethal, as the four fatalities on the Thirtymile Fire in 2001 showed yet again (Investigation Team 2001). Acquiring situational awareness takes many years of training and experience; maintaining it at all times takes enormous concentration and discipline.

Firefighters deserve every penny they get for doing difficult, stressful work under miserable conditions while putting their lives at risk. They deserve it for protecting the lives and communities of others. They deserve it for protecting the wildland resources that Americans treasure. I don't think we should begrudge them the moments of idleness, the occasional freedom from danger away from the fireline.

Lavish Supplies

Complaint: Firefighters are showered with unlimited fire camp luxuries, including lavish meals.

Firefighters awaiting deployment. It is often safer and more cost-effective to idle a fire crew for a time than to deploy the crew in the wrong place. Photo: USDA Forest Service, 1994.

This Nation needs experienced, well-trained, and well-equipped firefighters and fire managers.

Napoleon once said that an army marches on its stomach. The same goes for firefighters. Firefighters perform tremendous feats under conditions that are usually difficult and monotonous. They need to replenish their physical, mental, and spiritual energy. That takes, above all, lots of good food; it also takes decent accommodations for shelter, refreshment, and sleep. Fire camp provides that. Supplies available in fire camp—things like lip balm, sunscreen, and moleskin to combat blisters—are hardly luxuries. They are part and parcel of what firefighters need in order to do their job safely and well.

I remember many times in my career when we didn't have those supplies, when we slept in the dirt with only the clothes on our backs. I remember those unsavory times when the food never arrived, when we ran out of hot drinking water, and when the fire jumped our firelines faster than we could construct new ones. Let's not begrudge our firefighters a well-deserved respite in fire camp from danger and misery on the fireline. They deserve it and need it to do their job, just as soldiers need and deserve periods of rest and recreation away from the battlefield.

Perverse Incentives

Complaint: Most firefighters go to fires just for the money. The rest are often forced to go, which implies that their normal work isn't important.

The complaint that firefighters are in it just for the money explains rather vividly the context in which many firefighters have operated in recent years. If one is involved in the wildland fire organization simply for the money, then there is indeed no reason to extinguish a wildfire. Why ignite prescribed fires if wildfires are so much more lucrative?

Firefighters in a food line. Firefighters need and deserve ample supplies, including generous portions of good food. Photo: USDA Forest Service, 1992.

I believe that career Federal wildland firefighters are in the profession for reasons that go well beyond money. Money alone will not sustain firefighters when they are cold or hot, soaking wet, or bored to tears. Something much deeper in the human spirit sustains a person when times are hard. Something much deeper motivates a person to manage fire upon the landscape for a living.

When motivated career firefighters have been in short supply, other employees in the Federal agencies responsible for natural resource management have been called upon to fill the gap. Some do complain that they are sent without choice. If this is true, it is unfortunate, for no firefighter should be on the fireline unless he or she wants to be.

However, going on fire detail does not imply that one's normal job is less important than firefighting. It is simply a matter of urgency. If a fire threatens your neighbor's home, surely you can drop whatever you're doing and rush to help. Similarly, if a fire threatens homes or critical habitat anywhere in the country, then those of us charged with protecting our Nation's natural resources can surely afford to give up some time to help fight it, even if it means that our own work has to wait during our absence. It's all part of caring for the land and serving people.

Our Choice

We all want efficient, cost-effective Government. In the end, it is the duty of all citizens to oversee their Government in all its endeavors,

just as it is the duty of all civil servants to discharge their duties honestly. However, in our efforts to eradicate Government waste, we should be careful not to eliminate cost-effective resources.

History shows that Government can succeed. In retrospect, Federal wildland firefighting agencies have succeeded in altering ecosystems on millions of acres within 80 years. They succeeded in a mission that the American people charged them with, following the conventional wisdom of the times. If we succeeded then, perhaps we can succeed now in restoring the land to health, partly by restoring fire to the ecosystem.

Was it costly in the past? Yes. Is it costly now? Yes. Will it be costly in the future? Yes. Can we do a better job of controlling costs? Yes. None of us knows the whole story.

But I do know one thing for certain: This Nation needs experienced, well-trained, and well-equipped firefighters and fire managers. We need dedicated people who understand how fire interacts with the landscape. We will not be able to effectively restore fire-dependent landscapes without this expertise. Besides, experienced fire managers do a better job of managing costs. Experience provides a good grasp of sound fireline economics because experienced fire managers understand the capabilities of the resources that they manage.

Blindly slashing fire budgets would result in bigger wildfires, and bigger wildfires are more expensive to manage. In the end, taxpayers save money when wildfires are kept small and prescribed fires, including natural fires for wildland fire use, are made as large as possible. The choice is ours.

In the end, taxpayers save money when wildfires are kept small and prescribed fires are large where possible.

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Websites on Fire*

National Fire Plan

This Website is an important resource for those interested in learning about how the Federal Government and its State partners manage wildland fire. The site outlines the cooperative, long-term efforts of the USDA Forest Service, U.S. Department of the Interior, and National Association of State Foresters to prepare for wildland fires and to reduce adverse fire effects on people and natural resources. The site contains the founding documents for the National Fire Plan, along with detailed descriptions of the plan's five key points and information on what is being accomplished in each area. Users can find a long list of success stories and a breakdown of projects under the plan for their home State. Communities at risk can find opportunities for assistance, and contractors can use the site to find projects that need support. Rounding out the site are links to related Websites, such as the Firewise program for supporting homeowners in the wildland–urban interface.

Found at **<http://www.fireplan.gov>**

* Occasionally, *Fire Management Today* 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 managing editor, Hutch Brown, at USDA Forest Service, Office of Communication, Mail Stop 1111, 1400 Independence Ave., SW, Washington, DC 20250-1111, 202-205-1028 (tel.), 202-205-0885 (fax), hutchbrown@fs.fed.us (e-mail).

Coming Soon: Gum-Thickened Fire Retardants

Charles W. George

Fire retardants contain ammonium phosphates, ammonium polyphosphates, ammonium sulfates, or combinations thereof—chemicals commonly used as agricultural fertilizers. Retardant coats and reduces the flammability of fuels and inhibits burning even after the water content in the retardant has evaporated. Often, USDA Forest Service fire and aviation personnel either do not know or misunderstand the technical advantages of and reasons for using gum-thickened fire retardant. Nevertheless, it is important that personnel recognize the advantages of their use, because this type of retardant formulation will soon be the only one used by the Forest Service (Cruz 2000).

By the 2004 fire season, the Forest Service will use only gum-thickened retardant formulations, so it's important for wildland firefighters to understand them now.

In the Beginning

Although solutions containing ammonium phosphates and ammonium sulfates successfully retarded wildland fires, preventing the solution from evaporating and keeping it from drifting away from the target have always been a challenge. In the late 1950s and early 1960s, fire management agencies and industry designed economically viable fire retardant formulations by adding substances such as algin gel, swelling clays, pectin, and guar gum to reduce evaporation and drift. The addition of guar gum significantly improved drop characteristics by reducing retardant evaporation and drift.

Although researchers had observed and measured the ability of gum-thickened retardants to reduce evaporation and drift, they did not understand why it produced this effect. The Forest Service contracted for studies (Andersen and others 1974; Anderson and Wong 1978; Swanson 1973; Swanson and Helvig 1973) to explain the relationship between retardant drop deformation, breakup, cloud formation, and properties achieved with the addition of guar gum. Relationships between gum concentrations, retardant viscosity and elasticity, and retardant resistance to evaporation and drift were established (Anderson and others 1976). The interaction of these properties, and their relationships, determine the effective viscosity and elasticity of the retardant and the size of droplets that form the retardant cloud.

Advantages of Gum-Thickened Retardant

Subsequent studies (George 1975; Swanson and Luedeke 1978) have shown that gum-thickened retardant can reduce retardant evaporation and drift by 25 to 40 percent. This percentage is sometimes higher, depending on wind, temperature, humidity, drop height, speed of aircraft, retardant volume, and release characteristics. Since retardants are used most frequently when wildland fires are severe, the benefits of gum-thickened retardants are significant. Likewise, under less severe wildland fire conditions and less complex drop situations, the advantages of and need for gum-thickened retardant decrease.

Increased safety for aircraft and ground personnel and greater retardant penetration and retention are other advantages of using gum-thickened retardants. Because gum-thickened retardant is effective even when dropped from great heights, pilots benefit from a greater safety margin; and injury to ground personnel from trees, brush, or dislodged debris is reduced. Additionally, when gum-thickened retardant is dropped from greater heights, the larger, higher velocity droplets successfully penetrate the fire plume and survive updrafts. Another advantage is that in some fuel types, the canopy retains the gum-thickened retardant longer, and after the initial drop the retardant continues to significantly extinguish understory fires.

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Recent improvements in helicopter and fixed-wing aerial delivery systems provide greater flexibility and control of retardant release (George and Fuchs 1991). These systems drop large volumes of retardant at high flow rates to achieve higher coverage levels. Additionally, the new constant-flow systems control retardant volume and flow rate to produce prescribed coverage. At reduced and controlled flow rates, the significance of using gum-thickened retardants increases (see sidebar).

Adoption Pending

Just as the benefits of using drift-control agents to improve the survivability of agricultural chemicals are known and accepted, firefighting personnel are beginning to understand the advantages of using gum-thickened fire retardant. By the 2004 fire season, all Forest Service Fire and Aviation Management personnel will be using gum-thickened fire retardants, and the differences in the delivery performance of fire retardants will be less significant.

Gum-Thickened Retardant Works Well in Improved Delivery Systems

The importance and effect of using gum-thickened retardants in constant-flow systems increases as the drop volume and flow rate decreases. George and others (1977) demonstrated this with the Modular Airborne Fire Fighting Systems (MAFFSs) and with the improved constant-flow systems (George 1984, 1992). Although important to both systems, the properties of gum-thickened retardants are more valuable in MAFFSs. These systems provide a pressurized controlled flow rate and aerate the retardant at the nozzle. This action minimizes any advantage provided by the cascading fire retardant.

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Fire retardant drop on a wildland fire. By the 2004 fire season, the Forest Service will use only gum-thickened fire retardants, less prone to evaporation and drift. Photo: USDA Forest Service.

Hub Helps Prepare for Fire Season

Moira Finn

The National Fire Danger Rating System, which focuses on the environmental factors that control the moisture content of fuels, requires timely, accurate weather data. Nearly 1,400 weather stations throughout the United States collect readings about air temperature, relative humidity, windspeed and direction, and solar radiation. The data are entered into the Weather Information Management System (WIMS)—a collaborative interagency data base sponsored by the USDA Forest Service—to create a comprehensive characterization of the wildland fire risk. However, with hundreds of weather stations at disparate sites across the United States, keeping this vital source of information current is a logistical challenge.

Organizations in the wildland fire community—the USDI Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service; the USDA Forest Service; State forestry agencies; and the U.S. Department of Commerce, National Weather Service—rely on the WIMS data base to determine the wildland fire danger in their management areas. Knowing the risk of wildland fire helps managers to plan forest closures and campfire bans and allocate firefighting crews, smokejumpers, helicopters, and airtankers.

Moira Finn is the communications manager for Remsoft Inc., Fredericton, New Brunswick, Canada.

Determining the risk of wildland fire involves more than just checking the local weather forecast.

Weather Station Hub

To encourage weather station operators to collect and transmit data daily to WIMS, the Forest Service collaborated with the Canadian software developer Remsoft Inc.* to establish a weather station data collection hub. The hub is a specially designed software configuration that automatically collects and stores weather records from diverse sources. A series of weather stations and a unique computer network help ensure that firefighting agencies have timely, accurate weather data for determining the risk of wildland fire in their area.

Installed on two computers at the National Information Technology Center in Kansas City, MO, the hub application calls 175 weather stations at 1 p.m. local time to retrieve 24 hours of weather data and transmit the data to the WIMS data base. The entire process occurs automatically every day without human intervention.

Ugo Feunekes, vice president of research and development at Remsoft, designed and implemented the WIMS hub. "The Forest Service hosts this hub as a service to the other agencies, and I think that the cooperative approach has been a success," said Feunekes.

The Forest Service contracted with Remsoft to develop the hub based on the success of Remsoft's existing weather data management software. WeatherPro3, the backbone of the data collection and analysis system, connects different makes and models of weather stations in the Remote Automated Weather Station (RAWS) network.

Ugo Feunekes of Remsoft Inc., designer of the Weather Information Management System hub. "The Forest Service hosts this hub as a service to the other agencies. I think that the cooperative approach has been a success." Photo: Moira Finn, Remsoft™ Inc., Fredericton, New Brunswick, Canada, 2000.

* The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement of any product or service by the U.S. Department of Agriculture. Individual authors are responsible for the technical accuracy of the material presented in *Fire Management Today*.

"We needed to connect to Handar, a weather station owned by the Finnish company Vaisala; Forest Technology Systems, which is manufactured by a Canadian company; and Campbell Scientific Instruments weather stations. The system had to be compatible with everything, and gives us the freedom to buy other hardware in the future," said Kolleen Shelley, Forest Service RAWS coordinator.

Hub Hailed As a Success

Although weather station operators must still process their data, the hub reduces their workload by automatically collecting and retrieving their daily weather records. Operators that are not connected to WIMS via telephone telemetry must gather, compete for dial-up time, and send their data to WIMS—hopefully, once every 24 hours. Those using the hub reduce their workload by about an hour per day—a significant time and money savings when compounded across the entire system.

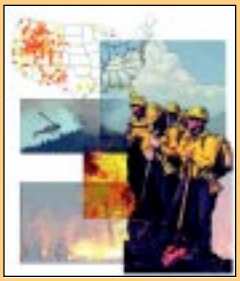
The hub is a simple solution. "Because the hub is a subset of WIMS, the mainframe didn't need a lot of modification, which would have taken much longer than the 6 months that it took to develop this system," Shelley said. Additionally, WeatherPro software makes gathering and sharing data simple for a diverse range of users.

A centralized weather data base helps the National Fire Danger Rating System maintain current information. Using the information, Federal and State land management agencies and commercial organizations can obtain weather forecasts and fire danger indexes to help them quickly determine their region's wildland fire danger.

For more information, contact Andrea Fuenekes, Remsoft Inc., 332 Brunswick Street, Fredericton, New Brunswick, Canada E3B 1H1, 800-792-9468 (voice), 506-459-7290 (fax), moira@remsoft.com (e-mail); or visit <www.remsoft.com>. ■

WeatherPro3: Key to Success

WeatherPro3 is software for collecting, analyzing, and sharing weather data. Used by hundreds of wildland fire managers and hydrologists in Canada, New Zealand, and the United States for more than a decade, the Windows software program offers users the ability to read and store data from almost any source.



National Fire Plan at Work*

Rural Fire Department Engine Saves Home

A fire engine purchased with National Fire Plan monies saved a home in an Oregon subdivision in June 2001. "A day after the foam unit was put into service, it was used," said Bob Sherman, a captain with the Cloverdale Rural Fire Protection District (RFPD) in Deschutes County, OR. A National Fire Plan grant provided $20,000 toward the purchase of two foam-equipped engines for the district.

Foam helps water penetrate surfaces, soak burning structures, and smother flames. The Cloverdale RFPD placed the two new foam-dispensing engines in service on June 18, 2001. The next afternoon, alerted by a 9-1-1 call, one of the new engines arrived at a burning home in the Sun Mountain subdivision. Firefighters found flames engulfing a second-floor kitchen, extending onto a deck, and coming back through an open window into the living room. The foam unit allowed firefighters to quickly extinguish the blaze with less than 300 gallons (1,130 L) of water, thereby limiting water damage to the home.

Cloverdale RFPD Chief Chuck Cable said that structural damage was between $35,000 and $40,000, but could have exceeded $200,000 if initial attack had been less successful. Cable said the Volunteer Fire Assistance matching-funds grants through the National Fire Plan give priority to districts that demonstrate the greatest need. ■

* Occasionally, *Fire Management Today* tells a success story or describes an exemplary project under the National Fire Plan. Readers can find many more such accounts on the Website for the National Fire Plan at <http://www.fireplan.gov>.

Accelerated Aviation Training

Erich J. Schwab

The United States faces a serious shortage of air operations branch directors, air support group supervisors, and helicopter managers. The aviation training and qualifications system has been unable to keep pace with a wave of retirements in recent years. To meet the challenge, the USDA Forest Service's Pacific Southwest Region is offering fast-track training and qualification through a Training Experience Aviation Mentoring (TEAM) Program under the leadership of Dennis Hulbert, regional aviation officer for the Forest Service.

Fast-Track Qualification

Founded in April 2001 under the name FAST TRACK, the TEAM Program offers training and experience in a condensed timeframe. Instead of one training course per year, TEAM members get four to five courses within a few weeks (see sidebar). For followup trainee assignments, TEAM members are organized into crews of five or six for accelerated dispatch to type 2 or larger incidents. Accelerated assignments allow TEAM members to complete task books and reach qualification sooner. Despite the accelerated schedule, all TEAM training meets the requirements of the National Wildfire Coordinating Group's Wildland Qualifications Guide 310–1 and Forest Service Handbook 5109.

TEAM crews are mobilized and managed by TEAM training coordinators (TTCs), who maintain program quality, integrity, and consistency and provide regional oversight and direction. A TTC accompanies each crew to an incident, acting as its liaison with geographic area coordination centers, forest aviation officers, incident management teams, and training specialists. TTCs mentor the trainees and ensure that their training and qualifications are properly documented.

Benefits

Is the program working? You bet. During the 2001 fire season, 39 TEAM members qualified for various aviation positions:

- Air tactical group supervisor (one);
- Helicopter coordinator (one);
- Air support group supervisor (one);
- Type 1 helibase manager (one);
- Type 2 helibase manager (two);
- Helicopter manager (seven);
- Deck coordinator (three);
- Takeoff/landing coordinator (five);
- Air base radio operator (six);
- Helicopter crew member (five);
- Mixmaster (one);
- Ramp manager (one); and
- Fixed-wing parking tender (four).

The TEAM program not only benefits trainees, but also mobilizes critical resources for incident management. "We often fill gaps by providing qualified members to critical positions that the incidents were unable to fill," said one TTC. Beyond the TEAM program, TTCs also help out on incidents by providing training, initiating task books, and organizing meetings with training specialists. Feedback from dispatchers, forest aviation officers, incident commanders, training specialists, and air operations personnel at all levels has been very positive.

The TEAM program's success has inspired an offshoot model, the Training Experience Mentoring Program, which can be used to fill vacant positions in all areas under the Incident Command System. For more information on the TEAM program, contact Dennis Hulbert, the Forest Service's aviation officer for the Pacific Southwest Region, at 916-364-2833 (voice) or dhulbert@fs.fed.us (e-mail). ■

Erich Schwab is a helitack squad leader for the Big Hill Flight Crew on the Eldorado National Forest, Placerville, CA.

Accelerated Coursework

The TEAM program got started in April 2001. Twenty-six trainees entered the program at different levels, based on past training and experience. Four weeks of intensive training at the Vadenberg Interagency Training Center in Lompoc, CA, included five courses:

- Interagency Helicopter Training (S–217);
- Helicopter Manager (S–317);
- Helibase Manager (S–371);
- Air Support Group Supervisor (J–375); and
- Air Tanker Base Manager.

Courses scheduled for 2002 include:

- Aviation Conference and Education;
- Air Tactical Group Supervisor (S–378); and
- Air Operations Branch Director (I–470).

So You Want To Be a Firefighter

Judith K. Kissinger

Perhaps you've imagined how exciting it would be to fight a forest or range fire—hacking away with special tools and dousing a raging inferno with a hose attached to a pumper truck. But a host of other tasks, perhaps a bit less thrilling, support firefighting efforts—talking to the media, ordering food, operating a helibase radio, timekeeping, checking in firefighting personnel, fueling equipment and vehicles, and more.

Required Courses

For many jobs, especially for jobs on the fireline, you must first take four basic training courses:

- Introduction to the Incident Command System (I–100). This course takes a few hours to complete and is self-directed—studying and testing are done at the student's convenience.
- Basic Incident Command System (I–200). This course is 8 hours long and gives students a thorough basic knowledge of the Incident Command System.
- Introduction to Wildland Fire Behavior (S–190). This course teaches the basic principles of wildland fire behavior, including the common denominators of fire behavior on tragedy and near-miss fires.
- Basic Firefighter Training (S–130). This course teaches the principles of safe wildland fire suppression, including how to deploy a fire shelter. It includes a day of field training. The course is often offered in conjunction with S–190 during a 3-day session.

Whether you're building a fireline or fueling equipment, training is needed to qualify for fire duty.

Depending on the kind of work you want to do on a fire, you might have to take additional courses. For example, if you want to work in the incident information center, Introduction to Incident Information (S–203) is required for USDA Forest Service employees before you raise your hand for your first fire assignment (see sidebar on page 40). Other agencies have different policies, so employees should check their agency handbook.

Requirements for each position are listed in USDA Forest Service Handbook 5109.17, available to Forest Service employees on the internal Forest Service Website at <http://fsweb.wo.fs.fed.us/directives/fsh/5109.17/5109.17,20.rtf>. Required courses are offered at various times by State and Federal agencies nationwide. You might have to search a bit to find the right course offerings for you. A good place to start is the fire training Website maintained by the USDI National Park Service at <http: www.nationalfiretraining.net>.

Fitness Test

All personnel on a fireline must pass a fitness test. How difficult the test is depends on whether you will be wielding a pulaski or handling a telephone. Fitness tests for firefighting measure aerobic capacity, muscular strength, and endurance.

Firefighters often work under stressful conditions, such as heavy smoke and intense heat; sometimes they get very little sleep, and frequently they find themselves in steep, rocky terrain. They endure these conditions while carrying packs and equipment that could weigh up to 120 pounds (54 kg). Individuals who are physically fit improve the situation for the entire crew, particularly under highly stressful conditions.

There are three levels of the fitness test: arduous (pack test), moderate (field test), and light (walk test). Arduous duty calls for above-average endurance and superior conditioning. To pass this test, you must complete a 3-mile (4.8-km) hike in 45 minutes while carrying a 45-pound (20-kg) pack. All firefighters must perform arduous duty.

Judy Kissinger is a public affairs specialist (retired) for the USDA Forest Service, Office of Communication, Washington Office, Washington DC. Before retirement, she was also a national instructor for fire prevention/education workshops.

Moderate duty calls for considerable walking and standing. To pass this test, you must take a 2-mile (3.2-km) hike in 30 minutes while carrying a 25-pound (11-kg) pack. Examples of positions requiring moderate duty include safety officer and fire behavior analyst.

Light duty is mainly for work in an office setting, with occasional outdoor activity. To pass this test, you must take a 1-mile (1.6-km) hike in 16 minutes without a pack. Examples include staging-area manager and helibase manager.

If you plan to take a fitness test, consult your physician first. This is especially important if you have a heart condition or a joint or bone problem, or are more than 40 years old and have been inactive. Medical clearance policy may differ from agency to agency.

All firefighters must perform arduous duty, and fitness testing is important for the safety of firefighters and their crews.

Once your physician has cleared you, get your boots on and start training! It is advisable to train for several weeks before taking your fitness test. It is even better to maintain year-round fitness. You'll need several items for your training regimen:

- Boots that cover your ankles;
- Comfortable clothes;
- A pack, if you plan to take the arduous or moderate test, that weighs 25 or 45 pounds (11 or 20 kg), depending on the test you'll be taking; and
- A safe, level training course that's about the same length as required for the test you're planning to take.

Even for the light test, you must bring boots that cover your ankles.

Example: Requirements for an Incident Information Officer

The following is an example of training and other requirements for an incident information officer (IOF). Like many other positions in the Incident Command System, IOFs might be called for duty on incidents other than fires, such as an oilspill or an emergency evacuation. Position requirements are listed in USDA Forest Service Handbook 5109.17, available to Forest Service employees at <http://fsweb.wo.fs.fed.us/directives/fsh/5109.17/5109.17,20.rtf>. Other agencies have different policies, so employees should check their agency handbook.

Requirements for a red card and an entry-level rating of IOF3 trainee include:

- Introduction to Incident Command System (I–100);
- Basic Incident Command System (I–200);
- Basic Firefighter Training (S–130);
- Introduction to Wildland Fire Behavior (S–190); and
- Introduction to Incident Information (S–203).

Requirements for a rating of IOF3 include all of the above and:

- Organizational ability and communication skills with external individuals and groups;
- Satisfactory position performance as an IOF3; and
- For level 2, Supervisory Concepts and Techniques (S–201).

Requirements for a rating of IOF2 include all of the above and:

- Satisfactory position performance as an IOF2; and
- For level 1—
  - Command and General Staff (S–420),
  - Intermediate Incident Command System (I–300), and
  - Advanced Incident Command System (I–400).
- For level 2—
  - Information Officer (S–403), and
  - Leadership and Organizational Development Techniques (S–301).

Requirements for a rating of IOF1 include all of the above and:

- Satisfactory position performance as an IOF1; and
- Advanced Incident Management Techniques (S–520).

IOFs are not required to pass a fitness test unless they intend to be on the fireline (for example, to escort media), in which case they need to pass the light (walk) test.

Valuable and continuing field instruction helps to ensure that individuals and crews work safely and smart.

If your test requires a pack, you'll be given a standard firefighter pack unless you bring your own. Either way, your pack will be weighed before and after the test. The test is walking only—no running or jogging is allowed. There are no in-between test scores—you either pass or fail.

Getting Assigned

Geographic area coordinating centers (GACCs) keep track of qualified incident personnel. Contact your GACC to add your name to their roster, and let them know after you've passed required courses and met any other requirements, such as a fitness test. They will issue you a red card, which is your passport to fire duty. Keep them informed about your availability; if they know you are qualified and available, they will give your name to dispatch offices for assignment to incidents.

If you're interested in actual smokechasing, you'll need to contact your local agency to learn what assignments are available. Federal and State land management agencies, working through their local job services, hire firefighters for the fire season. Because the fire season begins as early as January in some areas of the United States, hiring usually occurs between December and February.

Agencies that hire firefighters include the:

- USDA Forest Service,
- USDI National Park Service,
- USDI Bureau of Land Management,
- USDI Fish and Wildlife Service, and
- National Association of State Foresters.

Preparing for Fire Duty

During fire season, you will be on call. If you are assigned to an incident, the dispatch office will make all your travel arrangements (see the related article by Judy Kissinger beginning on page 43). However, you will have to leave within hours after you are notified. Your call might come in the middle of the night, so you should be packed and ready to go.

Although most assignments are for 2 weeks, you might be away from home for 3 weeks at a time. If you are a firefighter, you will face strenuous conditions. Even in other positions, you might find that showers and hot meals are not available every day. During emergencies, your days off might be canceled. You might be working 12 hours or more per shift.

Prepare accordingly. You must bring the proper equipment and clothing (see sidebar on page 42), including leather boots at least 8 inches (20 cm) high, with a lug sole. No steel toes are allowed. Even though some items might be available in fire camp, you should bring all necessities with you.

You must be able to carry everything you bring. If you are transported by helicopter, there might be a weight limit of 35 pounds and perhaps even a bulk limit. Due to its bulk, you should not use a pack with an external frame, and you should use tags or markings to identify your gear.

When you report for work, you will be issued any personal protective equipment you don't already have, such as Nomex shirts and pants, and any work tools you might need. It's your responsibility to keep the tools and other equipment in good working condition during a fire.

Great Rewards

Fire duty can be one of the most rewarding assignments in the career of a natural resource management professional. It does take careful preparation, including training and physical fitness, to make your work safe and effective. But there's nothing like the smiles and waves of thanks from the people you will help protect from wildland fire. It will be worth it!

For more on training for wildland fire management, contact Thiery Curtis, Program Manager for Policy, Planning and Liaison, Office of Communication, Forest Service, 2CEN Yates, P.O. Box 96090, Washington, DC 20090-6090, 202-205-8521 (voice), 202-205-0885 (fax), thierycurtis@fs.fed.us (e-mail). ■

Fire Pack Sample Items

Your fire pack should contain at least some of the following items (based on a checklist distributed during Basic Firefighter Training [S–130] in April 2001 in Arlington, VA). For more suggestions, see the article by Judy Kissinger starting on page 43.

Item	*Type 2 firefighter*	*Overhead specialist*
Ten Standard Fire Orders	√	—
Fireline Handbook	—	√
Task book	O	O
Books for reading	O	O
Phone card	O	O
Packsack	√	√
Small packsack for fireline	√	√*
Hardhat with chin strap, shroud, goggles	√	√*
Headlight with batteries	√	√*
Leather gloves	√	√*
Fire shelter	√	√*
First aid kit	√	√*
Snakebite kit	√	√*
1-gallon canteen	√	—
1-quart canteen	O	√*
Sleeping bag	√	√
Tent	√	√
Work boots	√	√
Heavy-duty socks (six pair)	√	√
Jackets (one light, one heavy)	√	√
Work pants, no cuff (two pair)	√	√
Work pants, flame-resistant (two pair)	√	√*
Work shirts, flame-resistant (two)	√	√*
Work shirts, regular (two)	√	√
T-shirts (four)	√	√
Nonsynthetic underwear (four pair)	√	√
Handkerchief(s)	O	O
Towel, washcloth	√	√
Soap, shampoo	√	√
Toothbrush, toothpaste	√	√
Chapstick	√	√*
Sunscreen	√	√*
Moleskin or other blister treatment	√	√*
Sunglasses	√	√*
Headache tablets	√	√
Compass with mirror	O	O
Toilet paper	O	O
Plastic bags (for laundry, etc.)	O	O
Flashlight with batteries	√	√

Notes: O = optional; √* = optional for nonline overhead.

MOBILIZED!

Judith K. Kissinger

My telephone rang at 3 a.m. beside my bed in Roanoke, VA. Groggily, I picked it up. A man said, "We've got a fire in California. Can you be there by tonight?"

I knew it was normal for them to want me onsite immediately. When I said yes, the man said he'd make airline reservations for me and call me back.

Fortunately, I was ready to go: I was all packed, waiting for such a call. I had my work supervisor's approval to go on a fire assignment, and I had the necessary training for what they wanted me to do. I had already made arrangements for who would feed my dog, pick up my mail, and water my plants.

The geographic area coordination center called me back shortly with flight times. The man also gave me directions on how to get to fire camp, and whom I should report to. Since I had to drive to fire camp, he also reserved a car for me.

Items To Bring

When I arrived at fire camp several hours later, I was relieved that I had brought my own sleeping bag and small tent, because the camp was so big and so busy that some supplies and equipment would not be available for days. I was also glad that I had brought a self-inflating mat for comfort and insulation from the cold ground. It rolls up as small as my sleeping bag and fits into my rolling duffel bag, along with my little tent, hardhat, gloves, and fire shelter.

Judy Kissinger is a public affairs specialist (retired) for the USDA Forest Service, Office of Communication, Washington Office, Washington DC. Before retirement, she was also a national instructor for fire prevention/education workshops.

I was relieved to have brought my own sleeping bag and tent, because some supplies in fire camp would not be available for days.

Besides the rolling duffel bag, I pack what's called a "red bag," provided by the Federal Supply Service, with six or seven T-shirts and sets of underwear, socks, and Nomex clothing. Most fire camps have laundry service of some sort, even if it's do-it-yourself.

My personal items include a towel and washcloth, soap, shampoo, and lotion. Flipflops are handy when you're using showers that several dozen other people are using. Here's a hint: Take your shower in the middle of the day, if possible, while the fire crews are out, because the showers are very crowded in the morning and evening. And if you watch for when the cleaning crew gets done, you'll have a nice, clean place to shower! But keep in mind that you might not get a shower every day.

Other handy items to bring include wet wipes and liquid waterless hand sanitizer. It's dirty in fire camp! If you can get hold of small boxes, you can stack them on their sides in your tent and make a little cupboard. I wear contacts, so I take an extra pair, along with glasses. Eye drops or rewetting drops are helpful because of eye irritation caused by smoke. And don't forget your vitamins, especially some extra vitamin C tablets to help avoid illness. It's awful to be sick in fire camp. Be sure to take headache tablets and indigestion liquid or tablets, too.

A flashlight is essential. Tie some fluorescent orange or yellow flagging on it so you can find it easily. Don't forget to take a hat; that way, when you go to a briefing at 4:30 a.m., you don't have to comb your hair first.

In a small, hard-sided attache-type case, I carry things such as my task book, if I am training for a higher level position. Since I work right in fire camp, I also find it a good idea to take pencils, tablets, sticky notes, and tape, because supplies are sometimes hard to come by. My cell phone cannot always be counted on for coverage in some remote areas, but I take it anyway.

Little Things

Little things brighten your day when you're in fire camp. A newspaper. A bottle of soda pop. Chewing gum. Pizza. We operate on a bartering system: If I have chewing gum, it's a good trading item for your newspaper.

It's essential to take care of yourself in fire camp. Try to eat right and sleep right, and especially to drink lots of fluids. Dehydration is a common problem on fires; it could even land you in the hospital.

You have to put up with some hardships in fire camp, but it's worth it for the satisfaction of working in a crisis environment, where you're part of a team that is saving our natural resources. ■

Smokey Awards Presented for 2000 and 2001*

Dianne Daley Laursen

The national Cooperative Forest Fire Prevention (CFFP) program presented 10 Smokey Bear Awards in 2000 and 5 awards in 2001 to honor sustained, outstanding contributions to wildland fire prevention. All the awards recognize outstanding service in wildland fire prevention in at least 2 years of efforts beyond the scope of each nominee's job. Award winners received Smokey Bear statuettes presented by the National Association of State Foresters (NASF), the USDA Forest Service, and The Advertising Council at ceremonies across the Nation. Other worthy projects, particularly those with future award potential, were recognized through certificates.

Smokey Bear statuettes are presented annually to those who make exemplary contributions to wildland fire prevention efforts.

Golden Smokey Awards

The Golden Smokey Award is presented for a proven record of service in wildland fire prevention on a national level. The three winners for 2000 are Foote Cone and Belding/Southern California, Jeannette Hartog, and SAFECO Corporation. In 2001, a Golden Smokey statuette was presented to the Border Agency Fire Council of San Diego.

Foot, Cone and Belding/Southern California (FCB), an advertising agency in Los Angeles, CA, volunteered to work with The Advertising Council, NASF, and the Forest Service to develop forest fire prevention public service advertisements. Since 1942, FCB has distributed more than 20,000 memorable and effective public service announcements via television, radio, print, and the Internet. The advertisements have aired nationally and have received tremendous media support, including more than $20 million in the first half of 2000. FCB provides its services and expertise pro bono. In the past 5 years, more than 30 FCB employees have devoted approximately 25 percent of their time to the company's fire prevention campaign. Fifty-eight years ago, FCB's advertisements launched Smokey Bear as the national symbol for forest fire prevention with the slogan, "Only You Can Prevent Forest Fires." In the spring of 2000, after FCB conducted extensive research, the new Smokey Bear slogan, "Wildfires are caused by people you'd least expect—people like you," was born.

Jeannette Hartog, a fire prevention specialist for the Forest Service, Intermountain Region, Ogden, UT, has been working with interagency Wildland Fire Prevention and

Proudly receiving the 2000 Golden Smokey Award on behalf of Foot, Cone and Belding/Southern California (FCB) are Maggie Arambula (center left) and David Heise (center right). Presenting the award is Art DuFault (far right), former chair of the Cooperative Forestry Fire Prevention Committee. Also present is Wendy Moniz (far left) of The Advertising Council, which nominated FCB for the award. Photo: Woody Allshouse, California Department of Forestry and Fire Protection, Sacramento, CA, 2001.

Dianne Daley Laursen is the national symbols operation manager for the USDA Forest Service, St. Paul, MN.

* The 2000 Smokey Awards were presented on the old fall schedule, whereas the 2001 awards were presented on the new spring schedule. The scheduling change provided only a few months between the two award determinations. *FMT* has decided to report both the 2000 and 2001 Smokey Award recipients in this issue.

Education (FPE) Teams since 1996. Her leadership and dedication to the FPE team concept have contributed to its incorporation into the wildland fire management community nationwide. As an FPE champion, Hartog plays many roles. She is the steering committee chair for the National Wildland FPE team-training course; has served as the national FPE team leader on assignments in the Southwestern United States and the States of Texas, Minnesota, and Utah; and is the contact point for requesting deployment of national teams. Hartog mobilizes interagency teams with the necessary skills to successfully complete the specific FPE assignment. She also supports teams on assignment by providing them with creative ideas, information, and material. The teams have shown dramatic results in the reduction of human-caused ignitions during periods of extreme fire severity.* Hartog's passion and ability to tailor teams to particular situations provide fire managers with the ability to successfully launch and maintain early fire prevention programs.

SAFECO Corporation, an insurance company in Seattle, WA, is pioneering a prevention campaign—FireFree! Get in the Zone—designed to educate the public about wildland fire safety and promote behavior and attitudes that create defensible space around homes. SAFECO developed this campaign in partnership with the Bend, OR, fire department (see Bronze Smokey Awards, Gary Marshall and the City of Bend Fire Department), the Deschutes County Rural Fire Protection District No. 2, the Bend City Planning Department, and Oregon's Deschutes National Forest. SAFECO's initial funding of more than $200,000 covered a 3-year pilot program that concluded in 2000; the program's success encouraged the company to continue funding through 2001. SAFECO designed the pilot program for easy adaptability in other areas; it has been successfully implemented in Flagstaff, AZ. Additionally, the program now includes a video that demonstrates native combustible vegetation throughout the United States and a brochure that discusses 10 steps that homeowners can complete to increase their defensible space.

Jeanette Hartog, USDA Forest Service, accepts her 2000 Golden Smokey Award from Art DuFault, former chair of the Cooperative Forestry Fire Prevention Committee. Photo: Jim Shell, USDA Forest Service, Intermountain Region, Ogden, UT, 2001.

Border Agency Fire Council of San Diego (BAFC), in El Cajon, CA, was formed during the 1996 fire season in response to the dramatic increase in wildland fire activity in southern San Diego County. BAFC's goal is to save lives, property, and natural resources along the border between the United States and Mexico. Twenty-three organizations—representing fire protection, law enforcement, legislators, health care workers, natural resource managers, and elected officials—combine resources, funds, and expertise to enhance communication and coordination in the region. Traditional fire prevention messages have been creatively revised through BAFC projects to reach undocumented immigrants. BAFC produced a warning video, in Spanish and English, that addresses the many threats to human safety in the area and a Natural Resources Protection Guidebook for firefighters who work in the environmentally sensitive border region. Additionally, BAFC provides basic fire behavior and safety training for border patrol officers. The activities of BACF have helped to reduce the number of escaped illegal campfires, acres burned, suppression costs, and loss of life in the unique border region.

Silver Smokey Awards

The Silver Smokey Award is presented for a proven record of service in wildland fire prevention in a regional (multistate) area. For 2000, Silver Smokeys were awarded to Karen Bergethon, the Northwest Fire Prevention Interagency Workshop Committee, and Richard D. Reitz.

Karen Bergethon, a fire prevention specialist for the Forest Service, Rocky Mountain Region, Denver, CO, has been a leader in cooperative wildland fire prevention since 1994. Making interagency cooperation a key component of all fire prevention and education efforts in the

* See Judith W. Kissinger, "Interagency Teams Prevent Fires From Alaska to Florida," *Fire Management Today* 59(4): 13–17.

Posing with their 2000 Golden Smokey Award are Ruthann Miller (far left), Jenice Silva (center right), and Kent Berkstedt (far right) of SAFECO Corporation. Gary Marshall (center left), the fire marshal in Bend, OR, designed the fire prevention program funded by SAFECO and was instrumental to its success. Photo: Jim Shell, USDA Forest Service, Intermountain Region, Ogden, UT, 2001.

region, Bergethon works with partners in activities that were previously accomplished by a single entity. She facilitates Firewise workshops throughout the United States and is an advocate for Wildland Fire Prevention and Education Teams in the Forest Service's Rocky Mountain Region. Bergethon encourages volunteer fire departments to participate in fire prevention planning, training, and activities and ensures that Smokey Bear is used appropriately. Under her guidance, the Pikes Peak Wildfire Prevention Partners have developed Firewise Communities, and all five States in the region have incorporated fire prevention into their cooperative fire agreements.

The **Northwest Fire Prevention Interagency Workshop Committee**, in Prineville, OR, celebrated its 13th consecutive year of providing high-quality, low-cost fire prevention educational experiences to interagency fire personnel. Committee members, some serving since 1988, include representatives from city, county, State, and Federal firefighting organizations. In the past, fire prevention workshops in the Northwestern United States were expensive and of variable quality. The Northwest Fire Prevention Interagency Workshop Committee charges a nominal attendance fee and has developed an agenda that supports fire prevention cooperatives, provides educational skills, and presents current local and national issues. The consistently high-quality workshops are attended by those living locally, regionally, and in Canada—current workshop participation has grown to an average of 160 students.

Richard Reitz, a fuels management specialist for the Forest Service, Southwestern Region, Albuquerque, NM, recognized the importance of collaborating with other fire prevention agencies to successfully prevent wildland fire. In 1998, he created the Fire Prevention Work Group (FPWG), with members from the Forest Service; USDI Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service; and the States of Arizona, New Mexico, and Texas. Under Reitz's leadership, FPWG produced a video that successfully reduced the public's apprehension about using prescribed fire. FPWG generated a comprehensive report about fire in the wildland–urban interface for New Mexico's Forestry Division and developed a fire protection assessment across all land ownerships in Arizona and New Mexico. Reitz prepares a fire prevention team proposal annually, which defines the organization's needs, discusses their assignments, and estimates the cost of various scenarios, to highlight the team's important role and to solicit interagency funding.

Bronze Smokey Awards

The Bronze Smokey Award is presented for outstanding contributions to statewide wildland fire prevention efforts. The 2000 award winners are Denise Germann, Mary K. Hicks, Gary Marshall and the City of Bend Fire Department, and the Pikes Peak Wildfire Prevention Partners. The 2001 award winners are the Fire Safe Council of Nevada County, Tracy Hensley and Radio Station WKYT, John Mingus, and Roxanne Provaznik.

Denise Germann, a public affairs specialist for the Forest Service, Medicine Bow/Routt National Forest, Steamboat Springs, CO, has shown exceptional commitment to the agency's fire prevention and education effort since 1993. As a key member of the Routt County Wildland Fire Council, which includes 11 agencies and organizations, Germann has helped to tailor fire prevention messages to the needs of property owners, businesses, and visitors. She has en-

couraged fire prevention professionals on other western forests to use partnerships to accomplish mutual goals and has expanded the forest's limited Smokey Bear campaign into a full-fledged cooperative fire prevention and education program. As a member of the forest's management team, Germann incorporates public affairs, interpretation, fire prevention and education, and partnership coordination into the forest's overall management strategy.

Mary K. Hicks, a fire prevention specialist for the Texas Forest Service in Waco, TX, has helped to create proactive, innovative approaches to wildland fire prevention in Texas since 1998. Deployed to Abilene, TX, as a unit leader for the first fully staffed Wildland Fire Prevention and Education Team, Hicks played a key role in implementing assessment basics, increasing media awareness, and promoting a ban on burning to help reduce fire starts. The team reduced fire starts from 84 to 18 per week in more than 31 Texas counties. Since 1998, Hicks has served as a team leader and branch manger on prevention teams in many Texas cities. She successfully obtained an interview with singer Willie Nelson for a celebrity video and audio public service announcement about fire prevention. The enormous success and accomplishments of the prevention teams during the 2000 summer deployment were largely due to Hick's dedication and leadership.

Gary Marshall and the City of Bend Fire Department began working with SAFECO Corporation (see Golden Smokey Awards, SAFECO) in 1996 to address fire in the wildland–urban interface (W–UI). SAFECO offered to purchase new fire equipment for the city of Bend, OR, but Marshall, the Bend fire marshal, recognized that more equipment was not the solution. He convinced SAFECO to fund a W–UI community education program—FireFree! Get in the Zone—to help residents help themselves mitigate losses from wildland fire. In Bend, 10 at-risk subdivisions in the W–UI were chosen and public education meetings were conducted with homeowner groups and neighborhood associations. Free dumping of yard debris on two spring weekends was initiated. The city experienced a steady increase in the cubic yards of debris dumped in each year of the 3-year program. Additionally, a survey revealed that many residents increased the defensible space around their homes by cleaning pine needles from roofs and property, removing brush and low-hanging limbs, and moving firewood stacks away from their homes.

Pikes Peak Wildfire Prevention Partners (PPWPP) in Colorado Springs, CO, treats the growing threat of loss of life and property from wildland fire in the wildland–urban interface very seriously. Before 1993, only scattered prevention efforts, with limited staffing and funding, occurred in Colorado's Douglas, El Paso, and Teller Counties. With the inception of the nonprofit corporation PPWPP, interagency members combined their talent, time, and energy effectively reduce the threat of wildland fire to life and property in the tricounty area. From accomplishing a risk/hazard/value assessment, to participating in interagency prescribed burns, to establishing a Firewise training program, member commitment and dedication are high and agency strengths are balanced.

Fire Safe Council of Nevada County (FSCNC), in Nevada City, CA, grew from a small group of citizens and agency representatives creating a successful Fire Safe Council to a countywide council working to prevent wildland fires in Nevada County. Since 1998, FSCNC volunteers have conducted educational outreach programs, initiated successful fuels reduction programs, and published booklets that give county residents information about defensible space, emergency preparedness, and plant selection for firesafe landscaping. FSCNC publishes a column in the local newspaper focusing on fire prevention activities, and members make frequent appearances on the local television station and radio talk shows. From January to June 2000, FSCNC made an estimated 176,000 outreach contacts. Through an extensive partnership network, FSCNC has generated tremendous community involvement and support for fire prevention activities in Nevada County.

Tracy Hensley and Radio Station WKYT, in Hazard, KY, have significantly contributed to the distribution of wildland fire prevention information to the State's eastern and southeastern regions. For many years, Hensley and WKYT have provided extensive coverage about wildland fire situations, outdoor burning restrictions and precautions, and defensible space. Citizens depend on Hensley and WKYT to provide them with current, accurate information about the area's wildland fire issues and prevention activities. Hensley and WKYT have partnered with the Kentucky Division of Forestry, Kentucky Department of Emergency Management Services, and Forest Service to help reduce and prevent the number of fires in their coverage

area by educating and informing listeners.

John Mingus, the president of the Keep Oregon Green (KOG) Association in Salem, OR, joined the nonprofit organization in 1980. During his 20-year tenure, Mingus has established himself and KOG as the premier fire prevention entity in the State of Oregon. As the only full-time employee of KOG, Mingus has developed an exceptionally strong and multifaceted fire prevention delivery mechanism and is responsible for development of many statewide and local fire prevention campaigns. From sponsorship of the annual Smokey Bear Days to organization of an annual public fire education workshop, Mingus exhibits a unique ability to leverage scarce resources into major delivery opportunities. In partnership with the governor's and fire marshal's offices and local fire departments, Mingus designed a campaign to increase the fire prevention awareness of residents in Oregon's wildland–urban interface.

Roxanne Provaznik, a fire prevention specialist for the California Department of Forestry and Fire Protection (CDF) in El Cajon, CA, leads a team of volunteers who travel to three cities in Imperial County teaching preschool and kindergarten children about the danger of fire. Since 1990, the group has performed six puppet shows a day for 5 consecutive days in January. Using puppets based on environmental children's movies, a hand-painted stage, and special-effects props—all designed by Provaznik—the children learn about Smokey's Five Rules of Match Safety and watch as Mr. Ranger quickly extinguishes Freddy Fire. At the end of the show, Smokey Bear makes a surprise appearance.

Working closely with the Imperial County Office of Education Child Development Service, Provaznik's team has successfully presented their fire prevention message to thousands of children. Other CDF units have used the program, and various State and Federal agencies have requested scripts.

Nominations

Nominations for Smokey Bear Awards are due each year in the spring. Anyone wishing to submit a nomination should complete a nomination form and attach supporting materials such as news clippings and photographs. All award materials are available at <http://www.symbols.gov/sbaw.html>. Each nominee must meet three minimum selection criteria:

- At least 2 years of activities must be complete and not in the planning or development stage;
- Activities must demonstrate success in the geographical area for which nominated (nationwide for the Golden Smokey, regionwide for the Silver Smokey, and statewide for the Bronze Smokey); and
- Service must be beyond the normal scope of the nominee's job.

Nominees who meet the minimum selection criteria are evaluated based on additional factors (see sidebar). The completed forms and supporting documentation should be submitted to regional CFFP coordinators. For more information, contact Wanda Hawman, National Symbols Operation Manager, Forest Service, ATTN: Conservation Education (1C), MS1147, 1400 Independence Ave., SW, Washington, DC 20250, 202-401-4067 (voice). ■

What Factors Help Determine Smokey Award Decisions?

Representatives from the National Association of State Foresters, the USDA Forest Service, and The Advertising Council jointly select Smokey Award winners from a pool of candidates who meet the minimum selection criteria (at least 2 years of completed, successful activities beyond the scope of the nominee's job). What follows is a partial list of factors considered by evaluators in selecting award winners from the pool of eligible candidates.

- Is there a specific project that made a tangible contribution to wildland fire prevention?
- Is the nominee a volunteer or did the project use volunteers?
- Was the project interagency?
- Was the project creative, innovative, and community based or supported?
- Was the project self-initiated?
- Was the project a model of success and replicated elsewhere?
- Did the project incorporate multicultural concerns?
- Did the project have a multiplier effect?
- Has the work received agency or community recognition?
- Was the media involved in the project?
- Did the project involve more than one contact with the targeted audience?
- Is the nominee an inspiration to others, a catalyst for other activity?
- Does the nominee exhibit leadership among peers?

Wild Fire

Allison Walker

The war starts with just an angry spark
Attacking a crowd of crisp leaves
Lashing out everywhere
Burning edges of the leaves shrivel and fold
Heat seeps in toward the shriveling center
Eating through everything in its path
Then the flames begin to die
Leaves lie as black shadows of their former selves
One hot ember is all that remains of the fierce battle
Nestled deep in the ashes of death
It waits there for a breath of wind and a body of wood

Suddenly a breeze flows through the forest
It grows and grows till a strong wind takes its place
Near the ember a dead tree groans
The wind pushes it violently
It falls to the ground with a crash
Throwing ashes into the air
Wind carries them away in a swirl of black
The ember lies exposed to the wind and wood
Fed with oxygen from the air
The ember jumps into flame
And turns hungrily to the log
It charges into the unprotected wood
Tearing and slashing at the sides
Panicked air rushes from the log with a pop
Charred sides glow with heat
The fire turns from the blackened log
Flames rush into the undergrowth
Bushes and trees fall in its path
Animals flee from the war
Tearing through the forest the flames give chase
Wind feeds it and pushes it on

But wind also brings storms
Rain splashes down to the flames
Fire hisses in anger as it is demolished by rain
After a long battle the flames die
But the rain continues to pelt the embers with no mercy
Soon after the embers are no more
A blackened battleground is all that marks the fire's flight
Ashes are scattered throughout the scar
But wind and rain wash them away
And life begins again
Plants grow green and tall
Animals play in the sun
Life turns peaceful once again
Until an angry spark finds a crowd of leaves.

Allison Walker attends high school in Colorado Springs, CO.

Guidelines for Contributors

Editorial Policy
Fire Management Today (*FMT*) is an international quarterly magazine for the wildland fire community. *FMT* welcomes unsolicited manuscripts from readers on any subject related to fire management. Because space is a consideration, long manuscripts might be abridged by the editor, subject to approval by the author; *FMT* does print short pieces of interest to readers.

Submission Guidelines
Submit manuscripts to either the general manager or the managing editor at:

USDA Forest Service
Attn: April J. Baily, F&AM Staff
Mail Stop 1107
1400 Independence Avenue, SW
Washington, DC 20250-1107
tel. 202-205-0891, fax 202-205-1272
e-mail: abaily@fs.fed.us

USDA Forest Service
Attn: Hutch Brown, Office of Communication
Mail Stop 1111
1400 Independence Avenue, SW
Washington, DC 20250-1111
tel. 202-205-1028, fax 202-205-0885
e-mail: hutchbrown@fs.fed.us

Mailing Disks. Do not mail disks with electronic files to the above addresses, because mail will be irradiated and the disks could be rendered inoperable. Send electronic files by e-mail or by courier service to:

USDA Forest Service
Attn: Hutch Brown, 2CEN Yates
201 14th Street, SW
Washington, DC 20024

If you have questions about a submission, please contact the managing 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.

Style. Authors are responsible for using wildland fire terminology that conforms to the latest standards set by the National Wildfire Coordinating Group under the National Interagency Incident Management System. *FMT* uses the spelling, capitalization, hyphenation, and other styles recommended in the *United States Government Printing Office Style Manual*, as required by the U.S. Department of Agriculture. Authors should use the U.S. system of weight and measure, with equivalent values in the metric system. Try to keep titles concise and descriptive; subheadings and bulleted material are useful and help readability. As a general rule of clear writing, use the active voice (e.g., write, "Fire managers know…" and not, "It is known…"). Provide spellouts for all abbreviations. Consult recent issues (on the World Wide Web at <http://www.fs.fed.us/fire/planning/firenote.htm>) for placement of the author's name, title, agency affiliation, and location, as well as for style of paragraph headings and references.

Tables. Tables should be logical and understandable without reading the text. Include tables at the end of the manuscript.

Photos and Illustrations. Figures, illustrations, overhead transparencies (originals are preferable), and clear photographs (color slides or glossy color prints are preferable) are often essential to the understanding of articles. Clearly label all photos and illustrations (figure 1, 2, 3, etc.; photograph A, B, C, etc.). At the end of the manuscript, include clear, thorough figure and photo captions labeled in the same way as the corresponding material (figure 1, 2, 3; photograph A, B, C; etc.). Captions should make photos and illustrations understandable without reading the text. For photos, indicate the name and affiliation of the photographer and the year the photo was taken.

Electronic Files. See special mailing instructions above. Please label all disks carefully with name(s) of file(s) and system(s) used. If the manuscript is word-processed, please submit a 3-1/2 inch, IBM-compatible disk together with the paper copy (see above) as an electronic file in one of these formats: WordPerfect 5.1 for DOS; WordPerfect 7.0 or earlier for Windows 95; Microsoft Word 6.0 or earlier for Windows 95; Rich Text format; or ASCII. Digital photos may be submitted but must be at least 300 dpi and accompanied by a high-resolution (preferably laser) printout for editorial review and quality control during the printing process. Do not embed illustrations (such as maps, charts, and graphs) in the electronic file for the manuscript. Instead, submit each illustration at 1,200 dpi in a separate file using a standard interchange format such as EPS, TIFF, or JPEG, accompanied by a high-resolution (preferably laser) printout. For charts and graphs, include the data needed to reconstruct them.

Release Authorization. Non-Federal Government authors must sign a release to allow their work to be in the public domain and on the World Wide Web. In addition, all photos and illustrations require a written release by the photographer or illustrator. The author, photo, and illustration release forms are available from General Manager April Baily.

Contributors Wanted

We need your fire-related articles and photographs for *Fire Management Today*! Feature articles should be up to about 2,000 words in length. We also accept short items of a few hundred words or less. Subjects of articles published in *Fire Management Today* include:

- Aviation
- Communication
- Cooperation
- Ecosystem management
- Equipment/Technology
- Fire behavior
- Fire ecology
- Fire effects
- Fire history
- Fire science
- Fire use (including prescribed fire)
- Fuels management
- Firefighting experiences
- Incident management
- Information management (including systems)
- Personnel
- Planning (including budgeting)
- Preparedness
- Prevention/Education
- Safety
- Suppression
- Training
- Weather
- Wildland–urban interface

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

Annual Photo Contest

Fire Management Today invites you to submit your best fire-related photos to be judged in our annual competition. Judging begins after the first Friday in March of each year.

Awards

All contestants will receive a CD–ROM with all photos not eliminated from competition. Winning photos will appear in a future issue of *Fire Management Today*. In addition, winners in each category will receive:

- 1st place—Camera equipment worth $300 and a 16- by 20-inch framed copy of your photo.
- 2nd place—An 11- by 14-inch framed copy of your photo.
- 3rd place—An 8- by 10-inch framed copy of your photo.

Categories

- Wildland fire
- Prescribed fire
- Wildland-urban interface fire
- Aerial resources
- Ground resources
- Miscellaneous (fire effects; fire weather; fire-dependent communities or species; etc.)

Rules

- The contest is open to everyone. You may submit an unlimited number of entries from any place or time; but for each photo, you must indicate only one competition category. To ensure fair evaluation, we reserve the right to change the competition category for your photo.
- Each photo must be an ***original color slide*** or ***print***. We are not responsible for photos lost or damaged, and photos submitted will not be returned (so make a duplicate before submission). ***Digital photos will not be accepted*** because of difficulty reproducing them in print.
- You must own the rights to the photo, and the photo must not have been published prior to submission.
- For every photo you submit, you must give a detailed caption (including, for example, name, location, and date of the fire; names of any people and/or their job descriptions; and descriptions of any vegetation and/or wildlife).
- You must complete and sign a statement granting rights to use your photo(s) to the USDA Forest Service (see sample statement below). Include your full name, agency or institutional affiliation (if any), address, and telephone number.
- Photos are be eliminated from competition if they have date stamps; show unsafe firefighting practices (unless that is their express purpose); or are of low technical quality (for example, have soft focus or show camera movement). (Duplicates—including most overlays and other composites—have soft focus and will be eliminated.)
- Photos are judged by a photography professional whose decision is final.

Postmark Deadline

First Friday in March

Send submissions to:

USDA Forest Service
Fire Management Today
Photo Contest
Attn: Hutch Brown, Office of Communication
Mail Stop 1111
1400 Independence Avenue, SW
Washington, DC 20250-1111

Sample Photo Release Statement

(You may copy and use this statement. It ***must be signed.***)

Enclosed is/are _____ (*number*) slide(s) for publication by the USDA Forest Service. For each slide submitted, the contest category is indicated and a detailed caption is enclosed. I have the authority to give permission to the Forest Service to publish the enclosed photograph(s) and am aware that, if used, it or they will be in the public domain and appear on the World Wide Web.

Signature_____ Date _____

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