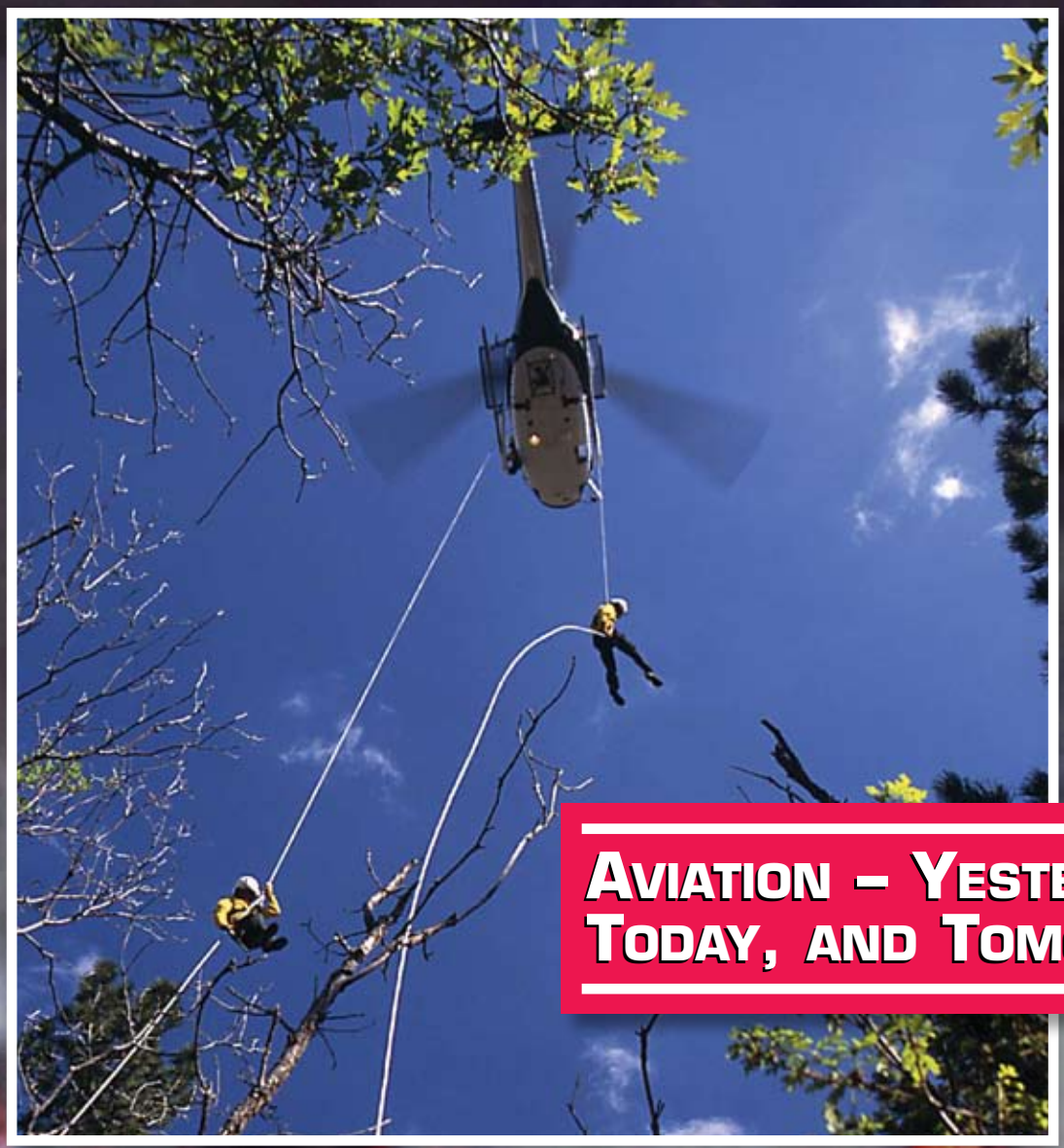
Fire Management today

Volume 67 • No. 2 • Summer 2007



Aviation – Yesterday, Today, and Tomorrow

United States Department of Agriculture
Forest Service

Dear Reader...

As you may have noticed, we did not publish a spring issue of Fire Management Today *this year. Due to budget constraints and to correct our publication schedule, we have decided to omit the Spring issue. Please accept our apologies.If you have an annual subscription, another issue of* Fire Management Today *will be added beyond your current expiration date.*

Coming Next...

The fall issue will feature an insightful discussion around a simple question with a difficult answer: How much fuel is acceptable? Other articles will explore how we are identifying high-atmospheric ozone potential days to better plan our prescribed burning ignitions, and how our researchers are now inviting architects, insurance underwriters, and other professionals to help reduce wildfire property losses.

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On the Cover:

On the Cover: *Monument Helitack rappellers let down into their typical incident terrain on a training mission in the Pike-San Isabel National Forests near Monument, CO. This photo earned second place honors in the "aerial resources" category in* Fire Management Today's *2006 photo contest. It was taken by Kari Greer, National Interagency Fire Center, Boise, ID, 2005. The exterior border photo is of a running crown fire in the Okanogan National Forest's Pasayten Wilderness. Photo: Eli Lehmann, Mount Baker-Snoqualmie National Forest, 2003.*

For more information and insights on the various aspects of aviation and wildland fire, see the articles beginning on page 6.

The Forest Service's Fire and Aviation Management Staff has adopted a logo reflecting three central principles of wildland fire management:

- *Innovation:* We will respect and value thinking minds, voices, and thoughts of those that challenge the status quo while focusing on the greater good.
- *Execution:* We will do what we say we will do. Achieving program objectives, improving diversity, and accomplishing targets are essential to our credibility.
- *Discipline:* What we do, we will do well. Fiscal, managerial, and operational discipline are at the core of our ability to fulfill our mission.

Firefighter and public safety is our first priority.

Contents

Short Features

Anchor Point

by Tom Harbor
Director, Fire and Aviation Management
Forest Service

(Editor's Note: With this issue of Fire Management Today*, we introduce a new column, "Anchor Point," penned by Tom Harbour, Director of Fire and Aviation Management, Forest Service.)*

Our Challenge: Being a True High-Reliability Organization

(Editor's Note: The following is excerpted from Tom Harbour's keynote address to the Third Workshop on High-Reliability Organizing – Managing the Unexpected in Wildland Fire Operations, held in Missoula, MT, May 22–25, 2006, sponsored by the Wildland Fire Lessons Learned Center and the Northern Rockies Coordinating Group. This column was written prior to southern California's Esperanza Fire that claimed the lives of five more Forest Service firefighters: Mark Loutzenhiser, Jess McLean, Jason McKay, Daniel Hoover-Najera, and Pablo Cerda.)

High Reliability Organizations (HROs) are built on integrity, nurtured by culture, and refined in the fire of performance. HROs are also clear on the value of public trust.

As we in fire and aviation management strive to be an HRO, we carry the knowledge of how our past has shaped us, how our present situation impacts us, and how our future will challenge us.

Are we mindful of the trends that describe our future as an agency and in our performance as fire and aviation management professionals?

We must all recognize a new trend—a *new* "fire triangle"—that is confronting us today. We have increasing people and development in the wildland/urban interface (WUI), we have climate changes that indicate warmer temperatures (a weather trend), and we have continuing growth of wood fiber, or biomass. Thus, our new fire triangle is WUI, Weather, and Wood.

These three trends—along with our desire to light more fire, to allow more fire use events, and to suppress fires—intersect in our profession.

Visible Results

These three trends—WUI, Weather, and Wood—along with our desire to light more fire, to allow more fire use events, and to suppress fires—intersect in our profession.

Periodically, these influences of fire and WUI, Weather, and Wood collide—with very visible results. We see that clearly in our fire management and suppression work as we spend more time and money protecting structures in the WUI, endure lasting bouts of hot weather with low humidity, and see long-duration fires in heavy fuels on the land.

In our efforts to use fire to deal with the latter, we must manage the risk of the weather and the smoke and inconvenience to those living in the WUI. We must increase our commitment to being a true HRO through these challenges with respectful interaction, feedback, full disclosure, and a desire to learn.

If we don't, we will fail. It is imperative that we do this to ensure that WUI, Weather, and Wood don't cripple our fire organization.

Focus on Doctrine

Life in fire and aviation management these days is life in a fish bowl. You're going to be poked and prodded and asked questions about your successes *and* your failures. It's manifested by our focus on doctrine, on principles, on After Action Reviews, and on Lessons Learned.

We learn about becoming an HRO and incorporate foundational doctrine because our failures threaten who we are. We are about protection and management. When our wildfires, prescribed fires, or our fire use events fail, they threaten our friends, our work, the public trust, and the very goals that we espouse.

What could be more compelling than mitigating that threat?

(More information on this "Managing the Unexpected" workshop series is available on the

Wildland Fire Lessons Learned Center's Web site <http://www.wildfirelessons.net>.)

Extraordinarily Proud

I attended the funerals in August for Mike Lewis and Monica Zajanc, our Payette National Forest's Krassel Helitack crew members who perished in that tragic helicopter crash.

Both funerals were very well attended by friends, coworkers, Regional Forester Jack Troyer, and forest supervisors from the Payette, Boise, and Caribou-Targhee National Forests.

The Forest Service Honor Guard made me proud that day, as they also did at the National Fallen Firefighters memorial ceremony in Emmitsburg, MD, in October when we honored the volunteer, State, and contract firefighters who perished in the line of duty. Our Forest Service Honor Guard is recognized more and more and I always appreciate this support from our Pacific Southwest Regional Forester Bernie Weingardt. The Honor Guard members are an excellent comfort to the families. They represent the best of the agency.

Payette National Forest Supervisor Suzanne Rainville and Krassel District Ranger Quinn Carver spoke wonderfully and assumed key roles at these two funerals. Our neighboring Northern Region was also represented. At both services, the Forest Service flag stood proudly beside the American Stars and Stripes.

Wonderful Folks

The families of both Mike and Monica were complimentary of the agency and the Wildland Firefighter Foundation. Monica's father, Larry Zajanc, told me, personally, that he was extraordinarily proud of the way the agency had responded to this tragedy in his family.

For me, once again, I was struck by the majesty of our people in responding to crises. On that day I saw them grieve the loss and laugh at shared memories of these two fine young people. We are blessed with some really wonderful folks.

At Monica's funeral, person after person shared stories about how her wildland firefighting jobs on the Boise and Payette National Forests brought meaning to her young life. Monica's little sister got up at the end of the funeral and said she was going to be a firefighter also—although Dad (Larry) said no. Larry also told me how proud he was that the Chief had called and talked to him.

Larry emceed his daughter's funeral service in a pretty amazing display of strength. He needed to gain his composure a few times, but Merrill Saleen, former Payette National Forest administrative officer, was there by his side. Nikki Saleen, Merrill's wife who works for us in fire on the Fire Program Analysis project, was the strength and brains behind most of the organization of Monica's funeral. I gave her a big hug for the Chief and thanked her for being the kind of person who brings such honor to the agency.

Never Forget

I also had a chance to spend a few minutes talking to the father of Quinn Stone, the contract pilot who was killed in the helicopter crash. This father, an elderly gentleman, kept expressing his sorrow. He looked into my eyes and asked if the Forest Service would have some people at his son's funeral the next week in Emmett, ID. He cried when I told him we were already planning on it.

We will also never forget Lillian Patten, the fourth helicopter crash victim. Lillian was a temporary employee who worked as the Williams Peak Lookout on the Krassel Ranger District for the last six fire seasons.

Only a few—now including Regional Forester Jack Troyer and the Chief—have a full understanding of the heroism and professionalism of the folks who were immediately on scene after that helicopter crash. I hope they are getting continued support from their family and friends to work through the lasting impact such a scene must have made on their minds and hearts.

The National Fallen Firefighters annual memorial in Emmitsburg is a moving event. I participate with a mixture of sorrow *and* pride. My mind's eye recalls our family losses—like our Krassel folks—plus the contract aviators who serve such an integral part of protecting the public as well as our country's natural resources. I also see the relatives of the everyday folks who serve with us as volunteer firefighters and died in that service to their neighbors.

One is too many.

In our high-reliability business, we must always remember that our utmost priority is to come back home from work *every* day. ■

(Editor's Note: An additional tribute to Monica Zajanc appears in the Little Venus Fire Shelter Deployment Peer Review Report available on the Wildland Fire Lessons Learned Center's Web site. Monica was one of the 10 firefighters who survived that entrapment. Just 26 days later, she would perish in the helicopter crash.)

The Humble Beginnings of Aircraft in the Forest Service

Melissa Frey

Just 16 years after Wilbur and Orville Wright's historic first flight at Kitty Hawk, the Forest Service pioneered the use of aircraft in forestry. At this time, shortly after World War I, firefighting took to the air when the Forest Service initiated the use of aircraft to patrol for wildfires.

> *"Foresters, in their effort to administer wild lands more efficiently, have been continually envious of and wishful for the ability of the bird: to travel swiftly, to see rough terrain at close range, but in perspective; to hover and to alight in small spaces.*
>
> *Who wouldn't want to make more useful use of time, avoid leg weariness, and bypass the discomfort of an ill-fitting saddle and a bum horse? In none of the activities of a forester does this need assume greater significance than in the field of fire control."*
>
> Frank J. Jefferson
> Assistant Regional Forester
> Region 5 (Pacific Southwest Region)
> From his article
> "The Helicopter – A New Factor in Fire Control"
> in the January 1948 (9-1) *Fire Control Notes*,
> forerunner of *Fire Management Today*.

1919 to 1927 – Fire Detection

In 1919, the Forest Service recognized the important role that aircraft could perform in protecting and managing forested areas. The U.S. Army provided airplanes (DH-4Bs) and pilots for initial detection of fires and monitoring the spread of ongoing fires.

In June of that year, the Forest Service alerted the Nation to the fact that Army airplanes and "captive" (hot air) balloons would soon be flying over portions of the country's national forests in the West.

The agency's widely circulated news release informed: *"This will be the beginning of experimental work in which the adaptability of aircraft to forest patrol work is to be thoroughly tried out. If the tests should prove successful, it is expected that the airplane patrols will be extended and that airplanes will become a permanent feature of the ceaseless battle against fires in the national forests. Warnings of fires will be transmitted by means of parachute messages dropped over a town, the finder to telephone or convey them to the Forest Service."*

> *"Airplanes will become a permanent feature of the ceaseless battle against fires in the national forests."*
>
> – 1919 Forest Service news release

1927 – Parachutes Drop Supplies

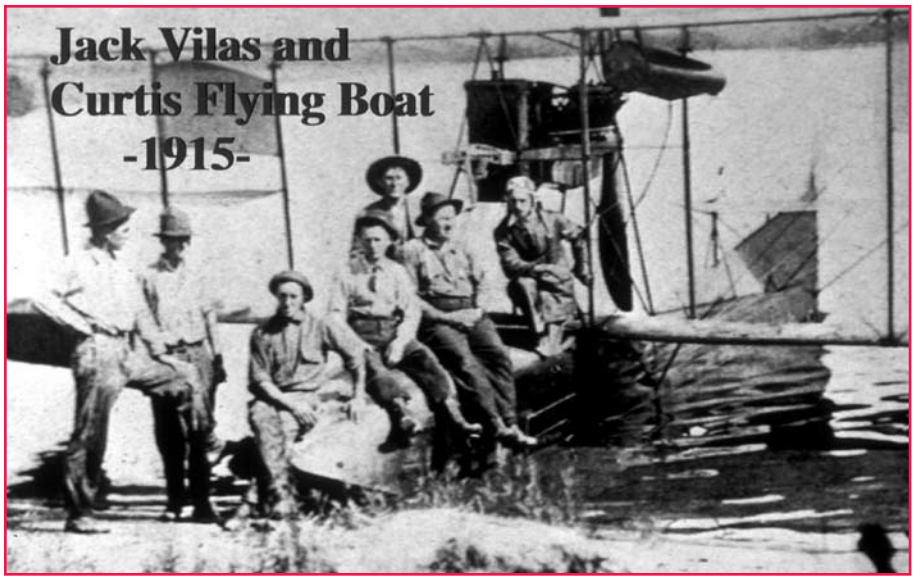
Due to budget restraints—8 years after this introduction of aircraft above the national forests—the Army could no longer provide aircraft and pilots for these assignments. Aircraft were then contracted by the Forest Service with private individuals for fire detection—*and* for dropping cargo.

1929 – Personnel Transport

As Montana's Half Moon Fire burned through the Flathead National Forest and Glacier National Park in 1929, the value of aircraft increased. To answer the call for help on this large—and moving—fire, it was decided that four firefighters would be flown from Albuquerque, NM, to Missoula, MT. While heavy smoke forced the flight to land in Butte, MT, the firefighters continued to their assignment by train.

A few days later, the Half Moon Fire blew up and Missoula wired for help again. A second planeload of firefighters took off from Albuquerque. Once again, due to heavy, smoke-filled skies, they had to land in Salt Lake City, UT—where the firefight-

Melissa Frey, coordinator for this special "aviation" issue of Fire Management Today, *is the Federal Excess Personal Property Program Officer and the General Manager of* Fire Management Today *for the Forest Service, Fire and Aviation Management, Washington, DC.*



Yesterday—This plane was used by the Wisconsin Department of Natural Resources, mainly for fire detection flights over northern Wisconsin. The plane was also intended to enable initial attack on fires by the pilot and co-pilot. They would land the plane on a nearby lake, taxi to shore, and then utilize "backcans" and hand tools to suppress the fire. Photo: courtesy Wisconsin Department of Natural Resources.

ers boarded a train for the last leg of their fire dispatch journey.

Three days later, a third flight of firefighters departed Albuquerque for Missoula yet again. This time, at the Half Moon Fire base camp, a ground crew dumped a barrel of gasoline along the edge of the runway and lit it. This maneuver successfully marked the landing spot for the pilot and the load of firefighters was delivered directly to the fire.

1930 – First Attempt to Drop Water From an Airplane

1937 – First Extensive Chemical Bomb Dropping Tests Held

1938 – Forest Service Purchases First Aircraft

The first Forest Service-owned aircraft, a Stinson Reliant SF–10 FM, was equipped with an adjustable pitch propeller for low flying and had special bomb sights for accuracy in dumping food and firefighting equipment by parachute.

The bottom of this airplane's fuselage contained a special floor with trap doors and a hatch opening through which containers of water—or *"fire-quenching"* chemicals—could be released.

1940 – First Professional Smokejumpers Hired

In 1939, the Forest Service's Assistant Chief for Fire Control, David Godwin, wanted to explore looking at using parachutes to deliver firefighters into remote and inaccessible fires.

On July 12, 1940, Rufus Robinson and Earl Cooley successfully parachuted onto the Nez Perce National Forest in Idaho. They are the country's first smokejumpers. (For more on the history of smokejumping, see article on page 18, *The Man Who Gave Smokejumping Its Name*.)

1946 – First Helicopter Use

In 1946, the first helicopter was used—in a limited way—by the Forest Service on the Castiac Fire on the Angeles National Forest. The next year, the helicopter became a major working tool on five Forest Service wildfires in California (Jefferson 1948).

In 1948, T.A. Bigelow, forest engineer and fire control officer on the Klamath National Forest, heralded the merits of the helicopter in an article for *Fire Control Notes* (Vol. 3; No. 2 and 3) (predecessor of *Fire Management Today*):

"After more than 25 years of fighting fire, I feel that I have, this summer, witnessed a machine that is destined to play a more important

> *"Warnings of fires will be transmitted by means of parachute messages dropped over a town, the finder to telephone or convey them to the Forest Service."*
>
> – 1919 Forest Service news release

> *"The handful of foresters who, over the long years of its developmental infancy, daringly envisioned and voiced their belief in the successful adaptation of the helicopter to forest fire control, steadfastly faced the skepticism of their coworkers."*
>
> **Frank J. Jefferson**
> **Assistant Regional Forester**
> **Region 5 (Pacific Southwest Region)**
> **1948**

role in fire suppression than any other piece of fire equipment that we have at our command. This equipment is the helicopter . . . I had the opportunity of riding in this machine on a reconnaissance flight and of observing some of its actions and performances under actual fire conditions . . . I actually saw more fire and fireline conditions in 16 minutes of flight time than I could have seen on ground travel (foot and auto) in a full daylight day. I knew after this short flight exactly what I was up against as night fire boss. This situation was not secondhand when I got it; it was my own observation. I had a clear picture of the entire fire."

These early visionaries also realized that aviation could assist far more than the Forest Service's firefighting efforts. In the January 1948 issue of *Fire Control Notes*, Frank J. Jefferson, assistant regional forester of Region 5 (Pacific Southwest Region) concluded:

"Foresters cannot afford to overlook the helicopter in any plans for forest management involving reconnaissance, transportation of personnel, equipment or supply, or special project service—whether they be concerned with fire suppression, timber survey, snow surveys, range reseeding, tussock moth control, or road and trail studies."

1947 – Forest Service Purchases 17 Aircraft

In 1947, a fleet of 17 aircraft were purchased by the Forest Service. All were equipped with two-way radios. The larger aircraft were equipped for parachuting people and cargo. With this new fleet of aircraft at its disposal, the Forest Service, once again, contracted with the U.S. Army Air Corps to test various types

The first Forest Service airplane was equipped with an adjustable pitch propeller for low flying and had special bomb sights for accuracy in dumping food and firefighting equipment by parachute.

Today—A Sikorsky Sky Crane, equipped with 2,000 gallon tank and special snorkel to make it a helitanker, drops a water and retardant mix on the Mount Hood National Forest's Bluegrass Fire last August. A nearby "helliwell" was set up to provide the water/retardant. The elaborate pump on this Sikorsky helicopter can fill its 2,000 gallon tank—via the snorkel—in 30 seconds. Photo: Doug Jones, permit specialist, Mt. Hood National Forest, 2006.

Wildland Fire Aviation Uses

- Fire command and control;
- Fire suppression;
- Fire detection and surveillance;
- Fire training;
- Fire administration;
- Prescribed burning projects; and
- Fire hazard, photo, and mapping projects.

Other incidental Forest Service aviation use includes:

- Intelligence gathering,
- Supply delivery,
- Personnel movement, and
- Search and rescue.

On July 12, 1940, Rufus Robinson and Earl Cooley, on Idaho's Nez Perce National Forest, become the country's first smokejumpers.

of aircraft with water and retardant bombs for dropping on wildfires.

It was determined that—with slight modification of the bomb racks—a Boeing B-29 could carry 165-gallon tanks to be used as water bombs, and that a Republic P-47 could carry one of these tanks under each wing for glide bombing. The tests, carried out on the Lolo National Forest in Montana, were successful.

1954 – Dropping of Chemical Retardants Begins

The 1954 "Operation Firestop" demonstrated conclusively that water and certain chemical retardants could be air-dropped onto wildfire and be effective in slowing fire spread. (For more on the history of the use and development of chemical retardants, see article on page 24, *The Latest on the Evolution of Chemical Fire Suppression – Water Enhancers Eyed For the Future*.)

1964 – The Development of Infrared

1971 – Modular Airborne Fire Fighting Systems (MAFFS) Techniques Developed

By now, aircraft have become an essential part of fighting fire.

1972 – Beginning of the Rappelling Program

In 1972, the Pacific Northwest Region's Redmond Smokejumpers launch the first study for exploring the feasibility of firefighters rappelling from helicopters. (For more on the history of the Forest Service's rappelling program, see article on page 10, *Meet the "Other" Airborne Wildland Firefighters*.)

Today, of course, a gamut of aerial resources continue to serve as an essential component of wildland fire suppression. We are forever indebted to the pioneering individuals in the last century who had the vision and wherewithal to encourage and advance the evolution of this vital suppression tool.

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Meet the "Other" Airborne Wildland Firefighters

Tim Lynch

Picture airborne—aerial-delivered—firefighters. Seeing smokejumpers? Think again.

Certainly, the Forest Service smokejumpers have been an effective and high-profile wildland firefighting force for more than 60 years. For upwards of 40 years, the U.S. Department of the Interior Bureau of Land Management (BLM) has also conducted smokejumper operations in the Great Basin and Alaska.

But did you know that the Forest Service also sponsors another group of airborne firefighters whose numbers roughly equal *all* of the smokejumpers in both the Forest Service and BLM combined?

Picture the helicopter rappellers.

While this "other" airborne wildland firefighter organization might be less well known, its burgeoning ranks are definitely keeping busy suppressing wildfire. Today, in an average year, more than 450 active Forest Service rappellers perform over 1,000 rappels on more than 300 fires across the Western United States. Each year, overall, Forest Service rappellers conduct 9,000 live helicopter rappels for training, proficiency, and fire.

Tim Lynch is the project leader for helicopter rappel equipment and procedures, Forest Service, Missoula Technology and Development Center, Missoula, MT. An advisor to the National Rappel Equipment and Procedures Committee and the National Rappel Working Group, he is a former Forest Service smokejumper and rappeller.

As a method for delivering firefighters into otherwise difficult-to-access backcountry fires, rappelling provided a practical alternative to parachuting.

These rappellers are typically deployed into areas in which terrain or vegetation precludes landing a helicopter. Rappellers—and cargo—can be precisely deployed into small spaces between trees. In a series of well-choreographed steps, it takes about 30 seconds for a Forest Service rappeller to exit a helicopter, rappel 250 feet (76 m) (maximum rope length) to the ground and disconnect.

Needless to say, it is an exhilarating experience to successfully complete a long rappel from a hovering helicopter into tall timber!

Smokejumpers vs Rappellers?

Comparisons between smokejumpers and rappellers are perhaps inevitable. Certainly, many of the tasks these two firefighting resources perform, and the environments in which they work, are the same.

The bread and butter of both these organizations is providing rapid initial attack on backcountry fires. However, for a multitude of reasons, trying to compare these two aerial-delivered firefighter groups is a classic "apples and oranges" impractical measurement scenario.

What Is Rappelling?

Rappelling—or *abseiling*, as it is sometimes known (derived from the German word for "descending at the end of a rope")—refers to wearing a harness attached to a friction device and sliding down a rope.

Early in the 20th century, European mountain climbers devised rappelling techniques to increase the speed of their descents. Although the equipment and methods have evolved over the years, rappelling is still widely practiced by climbers today.

Several professions utilize this unique capability. The special friction device and ropes used by the Forest Service rappel program since its inception were originally designed to be used by window washers to descend from tall buildings. Today, bridge inspectors, law enforcement, military, and others also utilize rappelling to accomplish special tasks.

The late Mike Lewis spots two Krassel Helitack rookies on the Payette National Forest during their first rappels prior to the 2005 fire season. In August 2006, Lewis and three others were killed in a helicopter crash during a transport—not a rappel—mission. (For more information, see Tom Harbour's Anchor Point column on page 5.) Photo: Gary Brian Munson, Payette National Forest, 2005.

Unlike the smokejumpers, a shared national resource, rappellers are classified as a "regional resource." Decisions to make a helitack base rappel capable—and how these rappel resources are to be used—are made at the regional and forest levels. Approximately half of the exclusive use Forest Service helitack bases in the United States are presently rappel capable.

The type of aircraft that is used—helicopter or fixed wing—affects the range and number of firefighters that can be delivered. Smokejumper fixed-wing aircraft have a much greater distance capability on a single fuel cycle, enabling them to initial attack fires over a range of several hundred miles. The rappellers' helicopters, on the other hand, have an effective 50- to 70-mile (80- to 113-km) initial attack range.

Dollar for dollar, therefore, fixed-wing smokejumper aircraft can deliver more firefighters and cargo over greater distances than rappel helicopters. But the extra capabilities that rappel helicopters provide, such as the ability to land nearly anywhere, to transport personnel to *and from* fires, to drop water and to longline cargo, make this a somewhat unfair comparison. Like I said, apples and oranges.

> "The jumpers took what they did and adapted it to the helicopter."
>
> – Ken Ross
> Helicopter Program Manager
> Pacific Northwest Region

Ironic Historical Fact

There's an interesting twist to the rappellers' story. Guess who was responsible for developing this country's first sanctioned wildland fire helicopter rappel program? Answer: The Forest Service smokejumpers.

In 1972, the Pacific Northwest Region's Redmond Smokejumpers were granted permission from the Forest Service Washington Office to study the feasibility of rappelling. They soon determined that not only was rappelling feasible, but, as a method for delivering firefighters into otherwise difficult-to-access backcountry fires, it provided a practical alternative to parachuting.

From 1973 to 1982, the Pacific Northwest Region conducted rappel operations using Bell 205 and 202 helicopters. Within a few years of receiving operational approval, additional helitack bases within the region also became rappel capable.

Ken Ross, today's helicopter program manager for the Pacific Northwest Region, is one of the only rappellers still on board the rappel program who started back in the pioneering 1970s rappel era. "I first got involved in 1977," Ross recalls. "A lot of rappelling was a direct offshoot of the jump program—the internal cargo, the cargo boxes, part of the training program, the ability to boost between bases. They used the same platform, the same anchors. The jumpers took what they did and adapted it to the helicopter. They even experimented with dropping paracargo from helicopters."

Although rappelling was judged to be an operational success, after 9 years, in 1983, the Pacific Northwest Region was forced to halt its rappel program—mainly because of reduced budgets and the rising costs associated with contracting medium helicopters.

Three years later, in 1986, the Southwest Region started experimenting with rappelling from Bell 206 L3 helicopters. This region's initial light helicopter rappel trials were pronounced a success and operational approval was granted later that year.

Soon afterward, both the Intermountain Region and Pacific Southwest Region began conducting rappel operations. At the same time, the Pacific Northwest Region revived its dormant rappel program. Since 2001, the Northern Region and Rocky Mountain Region have also joined the ranks of these rappel-using regions.

Throughout the 1990s, a major, national expansion of new rappel bases and even more rappellers occurred. Today, the Forest Service operates more than 45 rappel-capable helitack bases.

According to Kevin Brown, the Shenango Helibase base manager for the Northern Region's Gallatin National Forest, in the 1980s "there wasn't a lot of communication between different regions or programs… There was a lot of independent action going on in the different rappel programs—with different types of equipment being used and different procedures. Right now, I feel really good about

The Arroyo Grande Flight Crew of the Los Padres National Forest conducts rappel training on the "big gun" of rappel helicopters. Their Sikorsky S-61 is the only type 1 rappel helicopter currently in use by the Forest Service. This ship can deploy up to 18 rappellers at one time, plus all of the cargo needed to fight fire. Photo: Tom Plymale, Forest Service.

Needless to say, it is an exhilarating experience to successfully complete a long rappel from a hovering helicopter into tall timber.

Rappel Aircraft: Light and Medium Helicopters

The current rappel platforms (aircraft) are shared by light and medium helicopters, with one heavy (type 1) rappel helicopter. These helicopter platforms in use today include:

- The Bell 206 L4,
- The Bell 205,
- The Bell 212,
- The Aerospatiale/Eurocopter A-Star B-2 and B-3,
- The Sikorsky S-58T, and
- The Sikorsky S-61.

Within these currently used aircraft types, there are accepted variations in specific models regarding weight, seating configurations, doors, skids, flight steps, engines, rotor blades, and other areas that affect rappel equipment and helicopter performance.

The "big gun" of rappel platforms is the Sikorsky S-61, based at Arroyo Grande Helibase on the Pacific Southwest Region's Los Padres National Forest. This ship is capable of deploying up to 18 rappellers at one time, plus all of the cargo needed to fight fire. The S-61 is the only Forest Service rappel platform in use today that, should one engine fail, has the capability of maintaining flight.

Veteran rappeller Ted Mathiesen, Arroyo Grande base manager, reports that working with the S-61 "gives us a feeling of confidence. With 10 people and cargo on board, that's a pretty good payload, but we're certainly not at max gross. The S-61 is such a proven performer; things just don't go wrong with it. But even so, it's nice to have that in your back pocket, to know that—if one engine failed—you could fly away."

where we are standardization wise. We've come a long way since the early 1990s."

Remarkable Safety Record

After nearly three decades of sponsoring wildland fire helicopter rappel operations, the Forest Service rappel program possesses a remarkable safety record. Rappelling from helicopters has proven to be an effective method of deploying firefighters to otherwise hard-to-access areas. The rappel-related accident rate has been very infrequent—injuries have *never* been serious in nature.

Unfortunately, rappel-capable crews have not been immune to (nonrappelling) fire-related injuries and accidents.

In 1994, Grand Junction BLM rappellers Richard Tyler and Robert Browning were killed when the South Canyon Fire blew up. (Tyler and Browning had landed in a helicopter on the ridge above the fire to facilitate the crew shuttle and did not rappel on this occasion.)

In 2002, rappellers Jeff Allen and Shane Heath—from the Salmon-Challis National Forest, North Fork Ranger District's Indianola Helitack Base—died when fire overran the helispot they were constructing on the Cramer Fire.

The Payette National Forest's Krassel Heli-Rappellers Monica Zajanc and Mike Lewis were killed in August 2006 (along with the pilot and another passenger) when their helicopter crashed while on a "point-to-point" transport (nonrappel) mission on the Payette National Forest.

Other Wildland Fire Rappel Users

Although on a much smaller scale than the Forest Service, the Department of the Interior (DOI) also has a history of helicopter rappel capability in wildland fire operations. Both the Bureau of Land Management and National Park Service have sponsored rappel-capable crews. At present, Grand Canyon National Park and Yosemite National Park are the only DOI wildland fire users with rappel capability.

Other countries have also adopted rappelling from helicopters as a method of delivering firefighters. Australia, Canada, and Russia all sponsor rappel programs today. The Russians, with more than 4,000 rappellers, manage the largest rappelling program in the world.

After nearly three decades of sponsoring wildland fire helicopter rappel operations, the Forest Service rappel program possesses a remarkable safety record.

Helitack or Rappel?

Strictly speaking, the only real difference between standard helitack crews and rappel-capable helitack crews is that the rappel crews *also* rappel.

Rappel crewpersons do all of the same helicopter-related tasks as helitack crewpersons, they just have that additional method for disembarking from the helicopter. This rappelling capability, of course, increases the number of locations into which these helitack firefighters can be deployed.

The risk management process used by Forest Service rappellers dictates that—if all other safety factors are equal—*landing* near the fire is preferable to rappelling. While the percentage of landing or rappelling missions varies—based on mission circumstances—on most fires staffed by rappellers, they opt to *land* near the fire rather than rappel.

In addition to suppressing fires, crewmembers from Forest Service rappel bases also manage:

- Aerial ignition operations on prescribed burns,
- Helicopters for forest project work,
- Call-when-needed helicopters and crews on wildfires,
- Permanent and temporary helibases, and
- The creation and operation of helispots.

These rappellers also package and move cargo, transport firefighters, perform medivacs, and provide a myriad of other services to the wildland fire and aviation community.

When it comes to sizing-up fires and assessing risk, Dallas Vangorden, longtime rappeller and Tucson Helibase manager in the Southwestern Region, has some long-honed insights. "I do like to have the rappellers, especially the rappeller-in-charge, involved in that

fire size-up process," Vangorden explains. "To get their feedback right before we do actually put them (the rappellers) out on the ground . . . We always say that it's just trees burning—no sense getting somebody hurt over burning trees."

Rappel Training

For most helitack crewmembers, the act of rappelling from a tower or hovering helicopter poses a new and daunting experience. During that first initiation to rappel training, many new rappellers experience a significant degree of fear. Fear of heights is a constant challenge—sometimes, even for experienced rappellers.

Rappelling from helicopters has proven to be an effective method of deploying firefighters to otherwise hard-to-access areas.

By the end of a week of rappel training, rappellers are expected to consistently execute procedurally correct rappels at increasing heights—up to 250 feet (76 m) from a hovering helicopter into typical wildland fire terrain and vegetation. Each rappel requires numerous specific steps performed in the correct order and manner.

Before becoming certified as a rappel spotter, a rappeller must be a fully qualified "helicopter manager." Taking on this "spotter" role adds noteworthy additional responsibilities to a helicopter manager's duties. These rappel spotters are the individuals responsible for:

- Rigging and checking the rappel equipment on board the aircraft,
- Performing equipment checks on the rappellers prior to boarding,
- Sizing-up and determining risk factors associated with an individual mission,
- Communicating with the pilot to position the aircraft before and during the rappel,
- Directing the actions of the rappellers until they are on the ground,
- Disconnecting the ropes, and
- Delivering cargo to the rappellers.

Rappel spotters use a cargo letdown system to deploy tools, food, water, and other essentials. After establishing a stable hover over the deployment site, spotters use a 250-foot (76-m) length of nylon webbing—routed through a friction device attached to the rappel anchor—to lower an internal or external cargo package onto the ground. Once the load has landed, the spotter disconnects the remaining letdown line and container and drops it to the ground.

Many rappel crews attempt to minimize postdeployment helicopter support and frequently perform packouts with 80 to 110 pounds of gear. Crews who frequently pack out from fires often require crewmembers to prove that they are capable of a 3–5 mile packout

"I feel really good about where we are standardization-wise. We've come a long way since the early 1990s."

– Kevin Brown
Shenango Helibase Base Manager,
Gallatin National Forest

Rappellers must demonstrate correct rappel techniques through training mockups in helicopter prior to performing actual rappels. Photo: Tim Lynch, Missoula Technology and Development Center, Forest Service.

carrying a minimum of 85 pounds. Thus, out of necessity, some rappel crews have adopted physical training standards similar to smokejumper standards.

Extra Responsibilities

Compared to standard helitack operations, the extra responsibilities of being rappel capable create a significant extra workload for rappel base managers. For instance, they are expected to stay current on changes in rappel equipment and policy and to share vital rappel-related information with both rappel spotters and rappellers.

In addition, rappel base supervisors are required to keep their personnel proficient at all of the standard firefighting and helitack skills, in addition to:

- Providing annual rappel training,
- Conducting proficiency rappels throughout fire season,
- Maintaining rappel equipment,
- Keeping detailed rappel records, and
- Taking care of many other incidental rappel-related duties.

Out of necessity, some rappel crews have adopted physical training standards similar to smokejumper standards.

Scott Valley Helitack members rappel into typical terrain and vegetation on the Klamath National Forest. Photo: Joshua Faulkner, Forest Service.

For pilots, rappelling also provides challenges beyond those of regular helitack missions. Not all helicopter pilots have the skill to hold a steady two hundred fifty foot hover for minutes at a time at high elevations in mountainous terrain—often in high temperatures with a heavy loads.

Rappelling also differs from standard helitack missions because the pilot must share control of the helicopter *and* take directions from the spotter during rappel/cargo letdown missions. Rappel pilots must therefore possess a high level of trust with spotters, maintain excellent communication skills, and understand the mission terminology unique to rappelling.

The Future of Rappelling

As it stands today, wildland fire rappelling in the United States is likely to be around for the foreseeable future. Most fire and aviation managers who have a good feel for the program predict that the numbers of bases and rappellers will most likely stabilize near current levels.

Technology and development specialists continue to investigate new rappelling deployment systems, anchors, helicopters, and other critical aspects of the program. All in all, this "other" airborne firefighter organization appears to be on track for a bright future. ■

Rappelling With Helmet-Cam – Photo Feature

Ben Croft

Self Portrait—Ben Croft rapels with a camera attached to his helmet. Photo: Ben Croft.

Ben Croft Provides Us a Rare Rappeller's-Eye View

With his camera attached to his helmet, rappeller and photographer Ben Croft completes a training rappel on the Salmon Challis National Forest in Idaho.

The pilot is Len Paur, operating his Era Aviation A-Star Helicopter, No. N166EH.

The rappel spotter is Heath Hand. He is responsible for sizing-up and determining all risk factors associated with the mission—as well as communicating with the pilot to position the aircraft prior to and during the rappel.

The rappeller on the other side of the ship performing this training rappel with Croft is Russian exchange firefighter Leonid Zharkikh. ■

Ben Croft is currently an engine crew boss for Patrick Corporation, based in Redmond, OR. This photo sequence was taken when he was a rappeller with Moyer Helitack on the Salmon-Challis National Forest in 1999. For this training jump at the Moyer Helibase, Croft rigged his Nikon N90 with a 16mm fisheye lens to his flight helmet. Croft then took the photos by biting down on a remote cord in his mouth—to ensure he had both hands free to rappel.

1. Rappeller prepares to exit helicopter and move into ready position on left skid.

2. Spotter rechecks aircraft position over rappel site while rappellers are moving into prerappel position on skid.

3. Spotter signals rappellers to begin rappel.

4. Rappeller unlocks friction device on rappel rope, leans back, and "rotates" off skid until completely inverted.

5. To ensure a smooth transition off the skid, the rappeller continues to let rope out and turn completely upside down before feet lose contact with skid. Once contact with skid is terminated, rappeller will naturally "fall" into the head up/feet down rappel position and begin rappelling.

6. Mid rappel, rappellers look for knots in rope and safe landing site as they descend to ground. Heavy leather "heater gloves" protect the rappeller's hands and provide friction for braking.

The Man Who Gave Smokejumping Its Name

Ken Frederick and Doug Frederick

Walter E. Anderson—one of smokejumping's lesser known pioneers—was born in 1896 on his family's homestead in the Cascade Mountains near Easton, WA. After serving in the U.S. Navy during World War I and completing a 2-year college course in business administration, he joined the Forest Service.

It was the early 1920s and Walt signed on as a Forest Service casual firefighter. In 1924 he launched his formal Forest Service career as fire guard at an isolated guard station in the Washington Cascades.

Walt had grown up on the family farm taking care of stock, hunting, fishing, trapping, and hiking the woods. In the winter, he backcountry skied on his homemade skis (see sidebar). He was strong, "woods' wise," and savvy about everything outdoors. This hard worker quickly earned the respect of his Forest Service peers—and supervisors.

Walt was responsible for ensuring that the aerial fire control study would meet three primary objectives.

In no time, Walt worked his way up to a district ranger post on the Wenatchee National Forest. At 34, after a mere 6 years with the Forest Service, he was named that forest's fire control officer. In 6 more years, in 1936, Walt became chief of fire control for the Chelan (now Okanogan) National Forest.

Using Parachutes

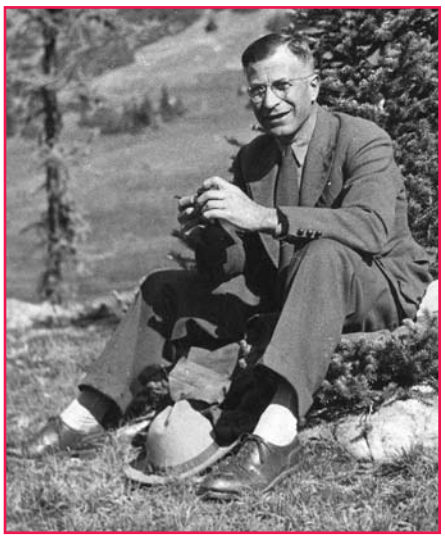
In the summer of 1939 the Forest Service announced it was relocating its Aerial Fire Control Experimental Project from California up to today's Pacific Northwest Region. While this special project's focus had been performing fire control experiments with water and chemical bombs, David Godwin, the Forest Service's assistant chief for fire control, now wanted a brand new program focus (National Smokejumper Association 2005).

He envisioned using parachutes to deliver firefighters into remote and inaccessible fires.*

Walt Anderson's Chelan National Forest encompassed miles and miles of rugged, isolated portions of the North Cascade Mountains. For several years, its managers had been tinkering with various techniques for parachuting supplies into firefighters in remote locales. The Chelan National Forest also owned an airport that was surrounded by forest lands known to be diverse in both vegetation and topography.

Because of its location and its already established "aerial-minded" mindset, this forest became the new research site for the Aerial Fire Control Experimental Project (Moody 2003).

Shortly before these aerial firefighting experiments were to begin,



Walt Anderson, chief of fire control for the Chelan National Forest in the early 1940s. Photo: courtesy of Hal Anderson.

Brothers Doug and Ken Frederick are both wildland fire management veterans, following in the footsteps of their great-uncle Walt Anderson—their article's subject. Ken started his career on the Wenatchee National Forest and worked in a variety of fire jobs before moving into public affairs. He has worked on the Coconino and Flathead National Forests and is currently a public affairs specialist with the U.S. Department of the Interior Bureau of Land Management, National Interagency Fire Center, Boise, ID. Doug also started his Forest Service career on the Wenatchee National Forest, serving on the Entiat Hotshot Crew as well as engine and hand crews. He also worked on the Mount Baker–Snoqualmie National Forest in fire and fuels. He is currently the assistant fire management officer at the U.S. Department of the Interior Fish and Wildlife Service's Turnbull National Wildlife Refuge, Cheney, WA.

* In 1934 the Forest Service's Intermountain Region had studied the idea of dropping firefighters into fires by parachute—even hiring a professional parachutist to do a few demonstration jumps. At that time, however, the agency concluded that this new concept was too risky.

however, Lage Wernstedt, the veteran Forest Service official assigned to oversee the project, was incapacitated by a medical condition. The region suddenly needed an experienced fire manager to assume these important duties.

Guess who got the nod for this important supervisory position?

Walt Anderson.

What To Name Them?

Walt was responsible for ensuring that the aerial fire control study would meet three primary objectives:

1. Determine the feasibility of landing "smokechasers" from airplanes by parachute into rough terrain at high altitudes and in timbered areas;
2. Develop and test protective clothing suitable for safe landings in timbered and rocky areas, steep slopes, and other hazardous jumping sites; and
3. Make preliminary investigations into the devices, procedures, and actual application of this new approach to firefighting, including communication, reaching the ground after being lodged in trees, retrieving parachutes, and personnel equipment (Moody 2003).

Among his various duties, Walt helped evaluate the parachutes and other equipment proposed for smokejumping. He also helped determine the final configurations of equipment and procedures to be used in this experimental fire suppression program.

During these pioneering experiments to basically invent a new airborne firefighter, Walt is also credited for coining the term "smokejumper."

Ski Jumping Leads to Smokejumping

What would entice a middle-aged, career Forest Service manager to try the relatively little-known practice of parachuting?

After all, parachuting in the United States in 1939 was barely removed from aviation's precarious barnstorming era. Back in those days, to jump from an airplane was still considered a daredevil, crackpot maneuver. (This, however, was not true in Europe. By the late 1930s, both Germany and Russia's armies already claimed highly organized paratroop units. According to the Forest Service's pioneer smokejumper Francis Lufkin, the agency's Aerial Fire Control Experimental project even used a translated Russian paratrooper manual as a guide.)

But maybe if a guy grew up ski jumping, airplane jumping wouldn't seem so outlandish?

As a dyed-in-the-wool Swede, Walt Anderson (whose Swedish parents had immigrated to the United States) had practically grown up with skis on his feet. He was an extraordinary ski jumper.

In his 20s, Walt won several ski jumping tournaments. During the 1920s and 1930s, he helped start—and then led—three ski clubs in Washington State. Starting in 1928, this Forest Service employee was the driving force behind the construction of the large ski jump in Leavenworth, WA (where ski jumper Torger Tokle would set a U.S. ski jumping record in 1941).

Perhaps the allure of floating through the air and executing a perfect landing on skis suggested to Walt that parachuting might offer a similar thrill. He certainly had enough grit to give it a try. So, at age 43, during the experimental smokejump program's feasibility study, Walt made three jumps himself.

Walt most likely applied his innovative thinking abilities to his Aerial Fire Control Experimental Project's smokejumping experiments. He was known for taking multiday, midwinter backcountry ski trips carrying only a 25-pound pack—he was well-versed in knowing how to get the most use from the most basic set of gear.

Through the 1930s, Walt also tinkered with skiing equipment and wrote newspaper articles on the subject. In addition, he wrote a fire equipment article that appeared in *Fire Control Notes* (forerunner of *Fire Management Today*) in 1941 (Anderson 1941).

credited for coining the term "smokejumper."

Pioneer smokejumper Francis Lufkin recalled how several of the project's men were huddled around a campfire waiting for coffee to boil (University of Washington 1974). As they mulled over what to call this new brand of firefighters, Walt spoke up. Because the term "smoke chaser" was used for ground firefighters, he proposed calling these new aerial-delivered firefighters "smokejumpers."

We all know the rest of that story. Walt's new word stuck.

Tremendous Utility

Walt Anderson wasn't the kind of manager who became a one-dimensional desk jockey. No sir.

During the program's feasibility study—at age 43—he made three parachute jumps himself. According to his son, Hal Anderson, on Walt's third jump he tried to land on his feet (Anderson 2005). But that landing didn't quite turn out as he'd hoped. Walt hit the ground—*hard*. He suffered a concussion for his trouble. But that knock on the head never diminished this man's vision for the tremendous utility of smokejumping in wildland fire suppression.

Smokejumping Pioneers—The Aerial Fire Control Experimental Project, held in the North Cascades on the Okanogan National Forest (then the Chelan National Forest) beginning in 1939, became the Forest Service's first concerted trial and testing campaign for using parachutes to deliver firefighters into remote and inaccessible fires. Walt Anderson (fourth from right), the forest's chief of fire control, was selected to be the project's supervisor. Photo: taken October 1939, provided by the authors.

Walt and the rest of the original smokejumping program advocates and experimenters succeeded in proving that this new airborne delivery system was a feasible method for rapidly getting firefighters into remote and isolated fires.

The next summer, in 1940, smokejumper programs were started at Winthrop, WA, and Missoula, MT. The first operational fire jump occurred July 12, 1940, on a fire on the Nez Perce National Forest.

Walt Anderson died in 1990 at the age of 94 in Missoula, MT. He fell a little short of his goal to live to the age of 101.

Today, the Forest Service and Bureau of Land Management smokejumper programs continue to be effective and heralded wildland firefighting forces. Walt Anderson—firefighter, district ranger, fire manager, *and* ski jumper—helped to get them off the ground.

Perhaps the allure of floating through the air and executing a perfect landing on skis suggested to Walt that parachuting might offer a similar thrill. He certainly had enough grit to give it a try.

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Cobra Attack Helicopters Retooled To Fight Fire

Stan Kubota

The wildland fire community has a brand new, high-tech work mate.

It's an innovative, specially designed helicopter that boasts everything from sophisticated lasers to real-time video and state-of-the-art remote sensing programs.

Called "Firewatch," two of these former U.S. Army Bell 209 AH-1 Cobra attack helicopters have been equipped for experimental use on fires in the Pacific Southwest Region. All of the helicopter's weapons systems have been removed and it has been rebuilt and rewired to support wildland fire incident management with:

- The ability to provide critical real-time video to fire managers on the ground;
- Powerful, high-resolution color cameras—capable of reading a license plate at more than half a mile;
- Specialized low-light cameras;
- Sophisticated lasers that, during flight, have georeferencing capability to points on the ground. The turret can hold the sensors on a specific geographic location and presents the location coordinates at the top of the video screen; and
- Special infrared capability that can see through smoke.

"The technology is amazing," said former Forest Service Chief Dale Bosworth, who watched a demonstration of Firewatch's capabilities last summer. Photo: courtesy Dan Megna.

Two of these former Army Cobra attack helicopters have been equipped for experimental use on fires in the Pacific Southwest Region.

"The technology is amazing," said former Forest Service Chief Dale Bosworth, who watched a demonstration of Firewatch's capabilities last summer. "I wish we would have had this when I was fighting fires. The big deal is the real-time information. Most of the time, you get somebody describing to you what's out there. But the only way you can see what's going on—especially with the smoke—is with something like this."

Bottom line: these enhanced capabilities are also simultaneously providing more cost-effective decision-making on wildland fire incidents.

Assist ATGS

These Firewatch helicopter systems assist the air tactical group supervisor (ATGS) in directing aircraft

Stan Kubota is the Firewatch Program Manager for the Forest Service, North Zone Air Unit, Redding, CA.

(Editor's Note: Many actual product names are noted in this article. As always, the use of trade, firm, or corporation names in Fire Management Today *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.*)*

over an incident as they gather and transmit real-time information to enhance operational efficiency and tactical decisionmaking for incident management.

This multifunctional platform (aircraft) is equipped with six aviation-rated radios (3 VHF FM and 3 VHF AM) that help support the ATGS mission of aerial supervision over incidents.

To enhance ATGS and pilot visibility, the Firewatch ship's cockpit windows have been "bubbled out" (see photo). The ATGS sits in the front seat with both horizontal—and vertical—views.

This Firewatch-transformed Cobra helicopter also provides enhanced performance due to the removal of about 1,000 lbs of weaponry and capstan wiring. Thus, because of its unique windows—not to mention video capabilities—and agility and maneuverability, this new helicopter platform is extremely proficient for the detailed viewing of fires.

A forward looking infrared (FLIR) Systems Star Safire 3 turret serves as the heart of this helicopter's remote sensing equipment. (This special infrared capability allows the image of a fire's perimeter to be viewed regardless of smoke.) This exceptional system includes:

- Infrared sensors,
- Sony digital low-light color camera,
- Georeferencing laser range finder,
- Long range spotter scope,
- Laser illuminator, and
- A geographically referencing inertial navigation system. (This system allows the turret to know its location in space at all times. It also instantly adjusts for the aircraft's pitch rolls and yaws—ensuring that the georeferencing laser always maintains split-second accuracy.)

Instant Referencing

Infrared sensors on the FLIR turret allow the system operator to see heat images as video displayed on the 15-inch (38-cm) monitor in the front seat. The pilot has a 9-inch (23-cm) display in the rear seat. To enhance pilot situational awareness over fires, a Max-Viz 3–5 micron wavelength sensor is also mounted above the pilot.

> This helicopter's enhanced capabilities provide more cost-effective decisionmaking on wildland fire incidents.

An Avalex moving map system allows the ATGS instant referencing to identify aircraft location. At the same time, other aviation traffic can be displayed on the map or GPS through information being fed through a Ryan Traffic Collision Avoidance Display (TCAD). The Avalex map system is capable of producing ESRI (geographic information system [GIS] and mapping software company) files by recording the aircraft flight path, or by tracing a perimeter with the FLIR Systems turret.

> Infrared sensors on the turret allow the system operator to see heat images as video displayed on the front seat monitor, regardless of smoke or haze.

Map files are delivered from this helicopter to GIS personnel at the incident base—by removable drive—for incident action plan maps and geographic area command center intelligence. The pilot has a Garmin 530 GPS as a flight planning and navigation system.

A specially equipped data recovery van/vehicle is the disseminator and projector of the aircraft's information. Video and cockpit audio can be transmitted to an incident base camp via a broadcast microwave downlink system. The transmission range to the data van is—line-of-sight—up to 25 miles (40 km).

A portable microwave receiver—with a 3-mile (5-km) range—is also carried on board the helicopter for delivery to people on the fireline. An Avalex DVD recorder can be used to record the FLIR images and cockpit audio. The DVD can then be delivered to the incident for analysis.

This helicopter's ability to operate locally and land in remote areas near an incident also provides the opportunity for aerial supervisors to meet directly with incident staff. Eye-to-eye discussion and delivery of intelligence can be an invaluable strategic asset.

More Cost Savings

One Bell Model 209 Cobra Firewatch helicopter gives the services normally provided to incidents by two or more aircraft—for the cost of one. Normally, an aerial supervisory aircraft is ordered for

Map files are delivered from the Firewatch helicopter to GIS personnel at the incident base by removable drive.

an incident and then more aircraft are ordered to provide remote sensing information—aircraft equipped with infrared sensor and mapping capability.

Even though intelligence gathering missions do not normally require the commitment of an aircraft for a full day, often times, full day costs are nonetheless incurred. Firewatch is staffed and operated by a fully qualified ATGS who can provide aerial supervisory relief coverage between intelligence gathering missions—consequently reducing the requirement for a relief ATGS.

Smoke inversion can limit fixed-wing aircraft operations on wildland fire while helicopter operations usually continue. Firewatch can further reduce incident costs by also fulfilling helicopter coordinator duties—with no aircraft availability costs charged to the incident. (Operational cost of the Firewatch aircraft to the incident is $1,350 per flight hour.)

The Cobra helicopter is also equipped with a factory "environmental control unit" for crew comfort and temperature regulation. The aircraft's typical fuel cycle flight time is 3 hours.

Maintenance, pilot, fuel support and data van operation services are primarily provided by Dallas, TX-based DynCorp International L.L.C.

After former Forest Service Chief Boswell viewed Firewatch's demonstration, he said he could envision other potential uses for this helicopter, including search and rescue operations, work on other disasters, and homeland security. ■

This former U.S. Army Bell 209 AH-1 helicopter—now known as "Firewatch"—has been specially equipped for experimental use on Pacific Southwest Region fires. This ship boasts everything from sophisticated lasers to real-time video and state-of-the-art remote sensing programs. Photo: courtesy Dan Megna.

The Latest on the Evolution of Chemical Fire Suppression – Water Enhancers Eyed for the Future

Lester Holsapple and Tory Henderson

The evolution of chemical fire suppression started with products that were added to water—beginning with Bentonite and Borate—and transitioned to today's long-term retardant products, class A foams, and water enhancers.

Of today's three main chemical suppression/application product groups—long-term retardants, foam fire suppressants, and water enhancers (see sidebar)—the water enhancer group has recently received the greatest interest from fire managers.

Although many people within the wildland fire community are familiar with long-term retardant and foams, water enhancers do not seem to be as familiar to all potential users.

These water enhancers are often referred to as "gel" products. Not all water enhancers, however, actually have this "gel" consistency. The most common physical enhancement that these products produce is a "thickened" water. This more viscous substance readily flows and disperses when outside of a container, hence the "gel" reference. Although this might seem extremely simple, this basic enhancement allows water to be used as a "barrier" and serves as a protective coating on fuels.

The water enhancer group has recently received the greatest interest from fire managers.

Because this thickening capability can be considerable, a thin layer of the highest approved mix ratios for these materials will even adhere to vertical surfaces. This attribute enables and serves as an excellent use for structure protection in wildland/urban interface areas.

The original intent of qualifying these products for use by the Federal wildland agencies was to provide a tool for structure protection that would be applied by ground-based equipment.

Use Is Expanding

The development and use of all of the wildland fire chemicals has been a cooperative effort among this country's Federal wildland

Helicopter drops retardant on the Florida Fire, Coronado National Forest, Tucson, AZ. Photo: Jayson Coil, Sedona Fire District, Sedona, AZ. This photo earned first place honors in the "Aerial Resources" category in Fire Management Today's *2006 photo contest.*

Les Holsapple is the Fire Program Leader, Wildland Fire Chemical Systems, Forest Service, Missoula Technology and Development Center, Missoula, MT; and Tory Henderson is the Fire Program Specialist, Equipment and Chemicals, Forest Service, Fire and Aviation Management, National Interagency Fire Center in Boise, ID.

Today's Three Chemical Product Groups

Three chemical product groups aid and enhance fire suppression efforts today.

1. **Long-Term Retardants:** This chemical group contains special retardant "salts"—typically fertilizers—that decrease fire intensity and help slow its advance. This can occur even after the retardant's water component has evaporated. The water in these long-term retardants functions to primarily aid in the chemical's uniform dispersal over the target area.
2. **Foam Fire Suppressants:** This fire suppression chemical group contains both foaming and wetting agents. The foaming agents affect the accuracy of the aerial drop, help determine how the water most effectively drains from the foam, and supports how this agent adheres to fuel surfaces. The wetting agent component increases the ability of the drained water to penetrate fuels.
3. **Water Enhancers:** Water enhancers contain ingredients designed to alter the physical characteristics of water to increase its suppression effectiveness, assist the accuracy of the aerial drop, and enhance the product's ability to adhere to fuels. These enhancers also increase water's ability to adhere to vertical and smooth surfaces.

(Editor's Note: Specific products under all of these groups must go through a qualification process to be listed on the "qualified products list" [QPL]. The QPL for each of these product groups can be found at the Wildland Fire Chemical Systems Program Web site <http://www.fs.fed.us/rm/fire/>.)

fire agencies, Canada, and the California Department of Forestry and Fire Protection (CDF).

As more is learned about the water enhancers, their use—and potential—are expanding. CDF used some of these water enhancer products—with good results—primarily for structure protection during the 2003 southern California fire siege. Selected task force groups of CDF engines—supported by water enhancer mixing equipment—pretreated numerous structures in advance of the approaching fire front.

In addition, beginning in 2004, CDF starting using these water enhancer suppression products on wildland fuels applied by helicopter buckets and, in some experimental applications, from fixed-wing air tankers. The tactical application of these products in aerial application is direct attack to suppress the fire while it is still small in size, as well as direct attack along the fire perimeter to support ground equipment and firefighters.

This basic enhancement allows water to be used as a "barrier" and serves as a protective coating on fuels.

Water enhancers do not seem to be as familiar to all potential users.

Drop Tests

In the fall of 2005, the Forest Service, in cooperation with CDF, did some controlled testing—known as "drop tests"—of several water enhancer products onto a test grid. The results indicated that these "thickened" type water enhancer products provide acceptable aerial drop characteristics.

Because the water enhancers are only effective as long as they retain water, fire managers realize that the use of these products should be limited to direct attack applications.

The potential expansion of using water enhancers moves the Forest Service into the final step for fully qualifying these products for use from fixed-wing aircraft. Field evaluations are now in the works to gather the data and performance information necessary for future use by all of the agencies.

Currently, these water enhancer products are uncolored. Therefore, prior to the full use of these suppression applications—to maintain and ensure that safety is always recognized and maintained—the education of both air operations and ground personnel is critical.

Because these products have traditionally been used from ground operations, applying them through fixed-wing aircraft leads to different tactics and the ground forces' ability to manage a fire. Without a visible colorant in these products, training and understanding where the product will be dropped—as well as its influence on a fire—is essential.

The specification for water enhancers and their qualification process will provide all entities with one more important tool for assisting the protection of property and enhancing wildland fire suppression. The ones listed on the "Qualified Products List" are all qualified for use from ground operations or helicopter bucket. The field evaluation from the fixed-wing aircraft will then make them fully qualified for delivery from that method as well. In the future, the specification—that is currently being worked on—will also have an option for a colorant. ■

The California Department of Forestry and Fire Protection used these water enhancer products—with good results—for structure protection during the 2003 southern California fire siege.

FIRESTOP Program Introduces Chemicals to Fire Suppression

The FIRESTOP Program was one of the first research and development projects aimed at providing aerial attack resources and chemical products to aid in fire suppression. It was formed in the 1950s at the Forest Service Riverside Laboratory in Riverside, CA.

During the 1960s, a portion of the FIRESTOP Program moved to what was then known as the Northern Forest Fire Laboratory—forerunner of today's Wildland Fire Chemicals System (WFCS)—in Missoula, MT.

Research into air tankers—known as "aerial application tools"—and chemical products to enhance and aid in both ground and air fire suppression occurred at this laboratory under the National Wildfire Suppression Technology Program.

In the late 1990s, the WFCS moved from its fire laboratory location to the Missoula Technology and Development Center.

Helicopter drops retardant on the Florida Fire, Coronado National Forest, Tucson, AZ. Photo: Jayson Coil, Sedona Fire District, Sedona, AZ, 2005. (This photo earned first place honors in the "Aerial Resources" category in Fire Management Today's *2006 Photo Contest.)*

747 Jet 'Supertanker' Hopes To See Suppression Action

Evergreen International Aviation, Inc., headquartered in McMinnville, OR, has combined its 40 years of aerial firefighting with more than 500,000 flight hours of experience as owner and operator of 747 aircraft to develop its new "Supertanker" program.

The Supertanker is a 747 jet that has been transitioned and retailored into a "super" large airtanker designed to suppress wildland fire. It can cruise at mach .86—or close to 600 miles-per-hour and deliver up to 17,000 gallons of product.

> The system can disperse water, foam, retardant, and gels under high pressure—or at the speed of falling rain—depending on mission requirements.

At this time, the Forest Service does not have Evergreen's 747 "Supertanker" under contract.

The new Evergreen 747 "Supertanker"—shown here in a demonstration flight and retardant drop—can cruise at 600 miles-per-hour and deliver up to 17,000 gallons of product. At this time, the Forest Service does not have this company's 747 under contract. Photo: courtesy Evergreen International Aviation, Inc.

(Editor's Note: Sam White, a senior vice president for Evergreen International Aviation in Washington, DC, provided Fire Management Today *with the original information for this article.)*

Committed to Working With All Potential Vendors

Larry Brosnan

The Forest Service appreciates the many new ideas and products that we receive from private individuals and firms such as Evergreen International Aviation, Inc. We are always interested in new aircraft and technology.

Firefighting subjects all aircraft, including the 747 and DC-10 aircraft, to more strenuous loads and stresses than commercial passenger/transport category aircraft are designed to withstand. Reducing this risk of structural failure is one of the many issues that we work with owners, manufacturers, and the Federal Aviation Administration to resolve.

We are committed to working together with all potential vendors so as not to endanger the public or our firefighters.

We also encourage competition when offering contracts and award them based on the best value to the government. At this time, the Forest Service does not have Evergreen's 747 "Supertanker" under contract.

We hope that Evergreen—as well as the many other potential aircraft operators—will compete for future airtanker contracts and remain successful partners in the wildland firefighting community.

Larry Brosnan is the Assistant Director, Aviation Management, Fire and Aviation Management, Forest Service, Washington Office, Washington, DC.

Application System

The 747 Supertanker's application system consists of a series of pressurized tanks installed on the aircraft's passenger deck.

The tanking system is mounted on cargo pallets that can be rolled on and off the aircraft. Four 16-inch (41-c) nozzles protrude from the bottom of the fuselage just aft of the main wing box.

The system can disperse water, foam, retardant, and gels under high pressure—or at the speed of falling rain—depending on mission requirements. Drop intensity is controlled by varying nozzle valve and pressure settings.

Evergreen is currently in the process of receiving Federal Aviation Administration certification and Interagency Air Tanker Board approval to use this new 747 Supertanker for firefighting. ■

One of the unexpected surprises on the field study of the Okefenokee Ecosystem Fire Management Program. Photo by Tom Iraci, Pacific Northwest Region.

Managing the Unexpected

How can we better manage—and be prepared for—unexpected events in the wildland fire arena?

"Managing the Unexpected—The Second Workshop on High Reliability Organizing" was part of a continuing organized effort to help improve this country's prescribed fire, fire use, and wildland fire suppression programs. Coordinated by the Wildland Fire Lessons Learned Center, the workshop's special focus was a field study of the Okefenokee Ecosystem Fire Management Program.

The complete DVD of this learning event that includes discussions of High Reliability Organizing principles and how they can be incorporated back on home units is now available. To order this unique organizational learning tool, contact the Lessons Learned Center at <http://www.wildfirelessons.net>. ■

Tribute to a Family Member: Mike Ward, Helicopter Pilot, 1949–2004

Riva Duncan

Sitting in the back seat of the helicopter, I vomit into the empty blue canvas bag used to hold the Ping-Pong balls. Mike Ward, the pilot, comes over the radio. "You okay back there, Riva?"

I wipe my mouth with the back of my glove and pull my flight helmet microphone back down over my mouth. I push the button to transmit.

"Yeah, I feel a little better," I say, as a big bead of sweat slides down the side of my face. "I'll get you up into some fresh air for bit," Mike says as he pivots the helicopter up and away from the smoke.

We are on the Long Bay Fire. It is May 2000. I'm working on the Apalachicola National Forest in Florida. Lightning started this fire in a large, roadless area. Already a few thousand acres and growing, we decide to do a massive burnout operation by using the helicopter to drop these small, plastic spheres—that look just like Ping-Pong balls.

Burst Into Flame

A machine inside the helicopter injects the balls with anti-freeze, causing a chemical reaction with the powder inside. When the balls hit the ground, they burst into flame, igniting the unburned vegetation. I run the machine, Mike Ward is the pilot, and Mike Dueitt, our fire management officer, directs the operation from up in the front seat next to Mike Ward.

The late Mike Ward fills his bucket while working on Georgia's Chattahoochee-Oconee National Forest. Photo: Thomas H. Anderson, Chattahoochee-Oconee National Forest.

We are dropping balls into the fire's interior to intentionally burn the green vegetation—depriving the main fire of anything left to burn. As we do the burn-out, we can see the firefighters below us. Matt Keyes and Buddy Kelley are driving ATVs with torches mounted on the back to light from the roads. The Asheville Hotshots are scattered along the roads looking for spot fires.

> I trust him with my life, but not always with my stomach.

The job of running this machine can be fun; but I also seem to find it stressful. You have to keep emptying balls from the big canvas bags into the hopper while stirring them to avoid a jam. And you have to keep looking down at the chute that hangs outside the helicopter to make sure the balls are clearing the machine.

The combination of flying in smoke, the helicopter's tight turns, having to constantly look down, and the blast of noxious jet fumes, sometimes does me in. Like today.

Best Pilot Around

Everyone knows that Mike Ward is one of the best pilots around. He's been flying on our forest for years, both for wildfires and prescribed burns. I trust him with my life, but not always with my stomach.

"How you feelin' now, Riva?" Mike Duiett asks on the radio. "You ready to get back at it?"

We still have quite a few balls to drop to get this fire successfully

Riva Duncan is the Deputy Forest Fire Management Officer for the Forest Service, Klamath National Forest, Yreka, CA.

burned out. Although there is no hint of impatience in his voice, I understand the importance of finishing the job—*soon*. Surprisingly, I do feel better.

"I'm ready." I slide over to the open door and hang my right leg out of the ship.

Vietnam War Vet

That day wouldn't be the last time that I vomit in Mike Ward's helicopter.

I would fly many times with him, on many thousands of acres of prescribed burns as well as several recon flights. Mike was a great pilot and a lot of fun. A U.S. Army Vietnam War veteran, he could fly a helicopter like no one else. And his joy of flying—and fighting fire—was contagious.

We always knew that when Mike flew for us, the job would be done extremely well. He knew the country and he knew fire behavior. On prescribed burns, whoever rode up front with Mike was supposed to determine the firing location and pattern. But Mike had done so many burns with us, he needed little direction.

When you asked Mike to go size-up a wildfire, you could count on an accurate assessment. But, of course, he did have a tendency to sometimes exaggerate. His famous line was: *"It's got potential!"*

I would fly many times with Mike Ward, on many thousands of acres of prescribed burns as well as several recon flights.

We eagerly awaited that observation on nearly every wildfire that he flew. As we heard Mike's three familiar words—once again—come over our radios, we would always look at each other and smile.

"Walkin' the Doggie"

Once, on a wildfire that was cooking pretty well, we had Mike take his helicopter up for a size-up. When the incident commander got him on the radio and asked him how the fire looked, Mike—with pure glee in his voice—answered, "It's walkin' the doggie! Want me to go get my bucket?"

We had countless fires in which Mike—working his bucket—cooled the flames for us to allow everyone to safely get firelines around them. We all knew that Mike Ward often made the difference between us catching the fire or losing it.

Though he actually worked for the contractor who owned the helicopters, Mike Ward truly became a part of our Forest Service family. When he wasn't fighting fires in Florida, he lived in Georgia. During some of the more active fire seasons, we actually saw Mike more than our own spouses.

We all knew that Mike Ward often made the difference between us catching the fire or losing it.

Mike always kept a 60-pound dumbbell with him. During down time, sitting at the work center, he would do curls with it. Mike explained that—in case things went bad—he needed a strong arm to work the helicopter's "collective" pitch stick control.

Mike had gusto for everything in life. Like all good Southerners, he loved to eat and was constantly fretting over his weight. Every winter and spring when he showed up with his helicopter, we never knew what size he would be. But we always knew there'd be a hug or a handshake along with that perpetual, broad smile.

If we were lucky, we'd even get to work with Mike on fires out West. During the summer, he and his helicopter went wherever they were needed.

Helicopter Crash

In 2003, I moved from Florida to work in fuels management for the Uinta and Wasatch-Cache National Forests in Utah. In the summer of 2004, I got a call from my friend Karen Brent, an assistant fire management officer in Georgia. I could tell by the tone of her voice that something is wrong.

"Riva," Karen said, "I have some bad news. We just heard from one of our guys on the fires out West. Mike's helicopter crashed." Karen pauses for a second or two. "He's dead."

I could barely get out any words. I told myself it might be a mistake. Mike might be injured. Or it could be some other pilot.

I called Mike Dueitt, my fire management officer back in Florida. He would know, or could find out for confirmation. I got his voicemail and left a message, trying to keep the tears out of the sound of my voice—as if, somehow, my false confidence could change the outcome.

After I left that message, I didn't know what to do with myself. I couldn't stop thinking about Mike Ward. I couldn't concentrate on my work. I kept wondering what could have possibly gone wrong. I decided that it had to be mechanical; Mike was just too good of a pilot.

He's Gone

A couple of hours later, my phone finally rang. It was Mike Dueitt in Florida. "Oh, Mike, please don't tell me that it's true."

"It is, Riva. He's gone."

I started to cry. I wanted—and needed—more details. Mike said he was sorry, but he doesn't have any details. I know this had to be very difficult for him, too. Mike Ward was now the second good friend that this man had lost to wildfires.

His joy of flying—and fighting fire—was contagious.

Never Read the Report

Mike was using a long line to drop supplies into a small clearing. He'd already made several trips. The smokejumpers on the ground said he was aware of the tight fit. They'd communicated with him many times about his tail rotor clearance.

On that last trip, they could see that his head was turned, looking toward the back, when his helicopter suddenly lurched slightly and the tail rotor hit a large, dead tree. The helicopter fell, roaring down into the opening, crashing through branches and trees.

The helicopter fell, roaring down into the opening, crashing through branches and trees.

I never read the official report. I don't want to know if the helicopter caught on fire after it fell. I don't want to think—*cannot think*—about Mike still alive as his ship burned. The smokejumpers tried to save him, but Mike was dead.

I still tell myself that he must have had a heart attack—or *something*—to make him lose his concentration. I'll never fully believe that it was entirely Mike's fault. If I did that, I feel I would be disrespecting him.

A Georgia native, Mike was a prominent resident of the small community of Nicholson, GA. He leaves behind three children.

I always keep a picture of Mike Ward by my desk at work. He's got that great, broad grin and the ever-present cap on his head. When people ask me who he is, I just tell them that he's a really good friend. Then I'll smile and say:

"Did I ever tell you about the time I threw up three times on one helicopter flight?" ■

Understanding, Validating, and Implementing Doctrine

Tom Harbour

First Step: Understanding Doctrine

Over the past several months, vigorous discussions have surrounded our newly introduced operating philosophy called "doctrine."* In late January 2006, the Fire Suppression Foundational Doctrine was accepted by the Chief of the Forest Service and introduced to employees and the public. As with any proposal for sweeping change, apprehension surfaces and questions abound.

Understanding this doctrine is therefore the first step to successfully implementing this new approach to action. Doctrine is multifaceted and provides a collection of principles that touch *every* level of the agency.

These principles range from defining the operational environment—in this case, the aggressive management of risk in a wildland fire situation—to how we engage our partners in fire management and suppression activities.

Also included in these principles are tenets that guide our everyday decisions, conduct, and performance as Forest Service employees.

Tom Harbour is the Director of Fire and Aviation Management, Forest Service, Washington Office, Washington, DC.

*For more information on the concept and creation of fire and aviation Forest Service doctrine, see the package of articles on the First Pulaski Conference (*Fire Management Today* 66(2): 6–16).

Members of the first Pulaski Conference in 2005 helped generate the first draft iteration of fire suppression foundational doctrine. The conference's attendees included wildland fire professionals from every Forest Service region—technicians, program managers, line officers, two regional foresters, research station employees—as well as safety and occupational health professionals. Photo: Gary C. Chancey, Forest Service, Black Hills National Forest, Custer, SD, 2005.

As with any proposal for sweeping change, apprehension surfaces and questions abound.

Lighting the Path

Our Fire Suppression Doctrine is rooted in common sense and intuitiveness gained through job experience. Also meshed with Forest Service manuals and handbooks, this doctrine lights the path to how we think and act in:

- Wildland fire situations,
- All-hazard assignments, and
- Our every-day work routines.

Turning doctrine into practice requires three distinct phases: 1) understanding, 2) validating, and 3) implementing. During this initial understanding phase, we will all be teachers and students as we share the personal and professional understanding of a "principles-based" environment—an environment that successfully aligns our actions with our mission in a more creative and decisive way.

Starting the Journey

An array of information—written by both scholars and practitioners—is available that speaks to this concept of doctrine. Employees can start the journey of understanding doctrine by reading these materials and—even more importantly—by discussing the doctrinal concepts with others.

I think the best way to begin this education process is to visit our doctrine Web site at <http://www.fs.fed.us/fire/doctrine/index.html> and browse through the source materials. For a concise overview of doctrine, review the document entitled *Foundational Doctrine Guiding Fire Suppression in the USDA Forest Service*. And, for a more detailed discussion on doctrine, the June 2005 video *Fire Suppression Foundational Doctrine* is also available at <http://www. fs.fed.us/fire/doctrine/implementation/presentations/video.htm>.

As you view these materials, keep in mind that the doctrinal principles are fluid and will be refined over time. Many questions have already been received from firefighters, line officers, and our public affairs people. We have welcomed these questions and encourage more—all in our unified effort to share and encourage an overall understanding of doctrine.

Second Step: Validating Doctrine

After the initial efforts at understanding doctrine, the second phase of the Fire Suppression Doctrine is validating its principles. We must ensure that the principles outlined in the doctrine mesh with the overarching rules and regulations currently in place for Forest Service firefighting activities.

This critical analysis will actually set the stage for implementing an operational change in how we approach decisionmaking.

During the initial phase of this validation process, subject matter experts from firefighting, training, aviation, and safety are comparing doctrinal principles with the language in the Forest Service manuals, handbooks—including the *Fireline Handbook*, and other fire program and incident management guidelines.

Our Fire Suppression Doctrine is rooted in common sense and intuitiveness gained through job experience.

A major consideration in this overall process is how the Forest Service Fire Suppression Doctrine will affect our partner firefighting agencies. The examination and needed revision of the agency guidance documents is a huge task that is currently underway.

Validation Effort

The second validation effort is a demonstration project currently underway in the Northern Region, Southwestern Region, Intermountain Region, and Pacific Southwest Region. This undertaking includes:

- Developing a regional-level doctrine statement,
- Establishing and using a peer review process,
- Revising and testing key fire training courses, and
- Implementing fire and aviation systems risk assessment projects.

It is important to remember that validating and later implementing Foundational Doctrine does not mean throwing away the rulebook or backing away from effective interagency coordination in firefighting. The goal of this validation work is to identify ways to alter the current, heavily process-oriented environment and to release our employees' individual creativity in achieving leaders' intent.

Making Changes

Future implementation of the operational doctrinal principles includes revising or supplementing the manuals, handbooks, and other firefighting guidelines, as well as updating training courses. Some of these changes might be underway; others will take more time.

At the end of the implementation phase, the doctrinal principles should dovetail with the time-tested precepts such as the 10 Standard Fire Orders. Fully incorporating the doctrinal principles on-the-ground,

Your Opportunity To Improve a Rule

Do you know of a particular regulation or rule in the Forest Service firefighting arena that just gets in the way of doing good work, or limits your decision space too much?

Then, you, too, can be a part of validating our doctrine.

Please send your thoughts and questions about the doctrine to Ron Hanks or Larry Sutton with the Forest Service Risk Management and Human Performance Team at <rhanks@fs.fed.us> or <lsutton@fs.fed.us>. Fire Suppression Doctrine information is available at <http://www.fs.fed.us/fire/doctrine/index.html>.

from initial decision to after-action consideration, is expected to occur by spring 2008.

Third Step: Implementing Doctrine

The most significant phase of demonstrating the Fire Suppression Doctrine is practicing the principles *on the ground*. This implementation of doctrine includes abiding by the updated manuals and handbooks that will reflect doctrinal principles.

The "how to" of implementing doctrine is evolving as we learn and includes room for adjustments. Implementing doctrine has no fixed date and will use a variety of learning methods.

The four regions participating in pilot implementation have formed teams that are currently drafting their own doctrinal statements to further determine doctrine's validity when put into practice. Ultimately, these statements/principles are intended to change the mindset and behavior of fire operations personnel, reduce operational errors, and serve to reduce the risk in the firefighting arena.

The peer review process is a critical piece for implementing doctrine. The peer review on the 2006 Little Venus Wildland Fire Use shelter deployment is a great example (<http://www.fs.fed.us/r2/fire2/>). These reviews will become standard practice in discovering subtle indicators of positive and negative human performance as a catalyst for change. This approach also helps to segregate human error from intentional disregard of rules. It also identifies positive behaviors and decisions—even when a bad outcome occurs.

The best way to begin the doctrine education process is to visit our doctrine Web site at <http://www.fs.fed.us/fire/doctrine/index.html>

Units, as well as individuals, might request peer reviews of their organization or personal performance. Line officers might use it for their annual review of type 3, 4, and 5 fires. We continue to encourage all employees to be avid students of the principles of the Fire Suppression Doctrine and to examine the findings of these peer reviews.

You can read more about this peer review process on our doctrine Web site under the "Performance Management" column.

Discussion and Debate

The essence of moving toward an operational environment founded on doctrinal principles is to engage in vigorous discussion and debate about the realities and challenges of wildland fire—infused with the brutal facts and direct questions from the field.

These discussions need to occur at every level of the Forest Service and also with our interagency fire management partners. You might have seen the newsletter "Doctrine Dialogue" in your inbox from time to time. Use this to think about—and to discuss—these principles and operational changes with the folks you work with.

The results of the peer reviews, discussion guides, and manual/handbook revisions will be incorporated into new classroom and Web-based training materials designed to implement the Fire Suppression Doctrine nationally.

This revised training curriculum to be included in the existing fire and aviation management courses will happen after the revisions to the manuals and handbooks—all likely to surface in 2008. Future updates in the curriculum will reflect the completion of reviews and the lessons learned through a doctrinal approach to risk management.

These doctrinal principles are fluid and will be refined over time.

There is absolutely no question that to enhance our ability to reduce firefighting risks is right for all of us. To achieve a safer environment, we all have a vital part in ensuring the successful implementation of doctrine. ■

Linking Intense Western Wildfires With Weather Patterns and Conditions

David A. Prevedel

The history and lore of the Federal land management agencies is embossed with the names and legends of large wildfires. The Big Burn (Montana 1910), Tillamook (Oregon 1933), Sleeping Child (Montana 1961), Sundance (Montana 1966), and Yellowstone (Wyoming 1988) are among these historic events.

For many years, the occurrence of these large western wildfires has been associated with conjecture regarding fuels, terrain, weather, and ignition types. Historically, we know that most western vegetation communities developed under the influence of wildfire. But today, with changing land use, fire prevention, and urban growth, these burns can now pose significant risks to human life and property.

Within the last two decades, fires have burned with uncharacteristically high severity. Our observations show that many large wildfire occurrences seem to follow specific—*often predictable*—weather patterns. During times of extreme fire behavior, this predictability is significant to firefighter and public safety, as well as to the allocation of personnel and equipment.

We studied and reviewed large wildfires from 2000 through 2004 in the Western United States and

David Prevedel is recently retired as the GIS and remote sensing group leader for the Forest Service, Intermountain Region, Ogden, UT.

Our observations show that many large wildfire occurrences seem to follow specific—often predictable—weather patterns.

attempted to correlate weather patterns and events that were present during extreme fire behavior. Images were obtained from the visual spectrum of the Advanced Very High Resolution Radiometer (AVHRR) Tyros satellite series that is operated by the National Oceanic and Atmospheric Administration (NOAA).

During our study period, the satellite receiving station was operated by the Forest Service's

We attempted to correlate weather patterns and events that were present during extreme fire behavior.

Intermountain Region in Ogden, UT. From 1994 to 2004, the AVHRR receiver was used here to map wildfires on a daily basis (Prevedel 1994).

Each afternoon during our 4-year study period AVHRR satellites were monitored, including NOAA-17, NOAA-16, NOAA-14, and NOAA-12. All of these satellites are in polar orbits at an altitude of approximately 517 miles (833 km). Pixel resolution with these satellites is approximately 1,000 meters (3,281 feet).

During the last 3 years of our study, Web-based NOAA Geostationary Operational Environmental Satellites ("GOES") water vapor images were also used as an ancillary source to the polar-orbiting satellites. (See <http://www.goes.noaa.gov>.)

Study Observations

While mapping wildfires, we noticed that some of the major fire events occurred in cloud-free "zones" on the west and northwest sides of large high pressure systems that were typically centered over the Great Basin and "Four Corners" area.

When these high pressure systems build, a clear weather surface thermal trough will frequently form ahead—or on the upper left side—of the high pressure. When the ridge breaks down and shifts east, this thermal trough intensifies and also shifts east. The ridge breakdown and eastward shift is often associated with a weak westward flow of very dry air that brings

upper-level cooling while allowing the lower levels to remain hot. This phenomenon increases fire intensity (see fig. 1).

These westward flows can be observed on the GOES water vapor images as a "tongue" of very dry air that results in low relative humidity at the ground surface (see fig. 2).

Much more active fire behavior occurs with the thermal trough overhead. Fires located outside the trough to the north and west might be active, but this activity is more diminished. In addition, smoke from these fires appears "lazy" and unconsolidated—in contrast to the consolidated, intense, and linear smoke from fires associated with the trough.

> During times of extreme fire behavior, this predictability is significant to firefighter and public safety.

The summer high pressure systems over the Great Basin and Four Corners areas are generally dominated by clouds and even summer thunderstorms. These observations of high pressures systems are critical because they could move or shift several hundred miles in a single day.

We also found that with the NOAA AVHRR satellites, the high pressure systems and accompanying surface thermal troughs could be observed and monitored several times daily.

In meteorological terms, this frequently observed fire weather pattern is known as the "breakdown of the upper level ridge" as described by Chris Maier of the National Weather Service in Salt Lake City, UT.

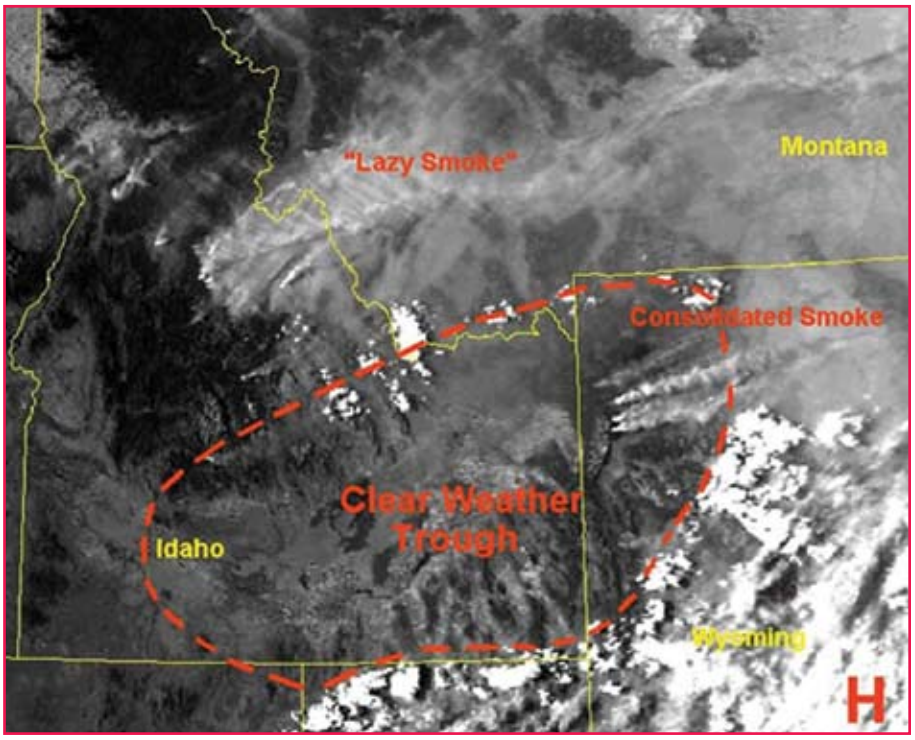


Figure 1 is an illustration of the weather phenomenon observed over northwestern Wyoming on August 16, 2000.

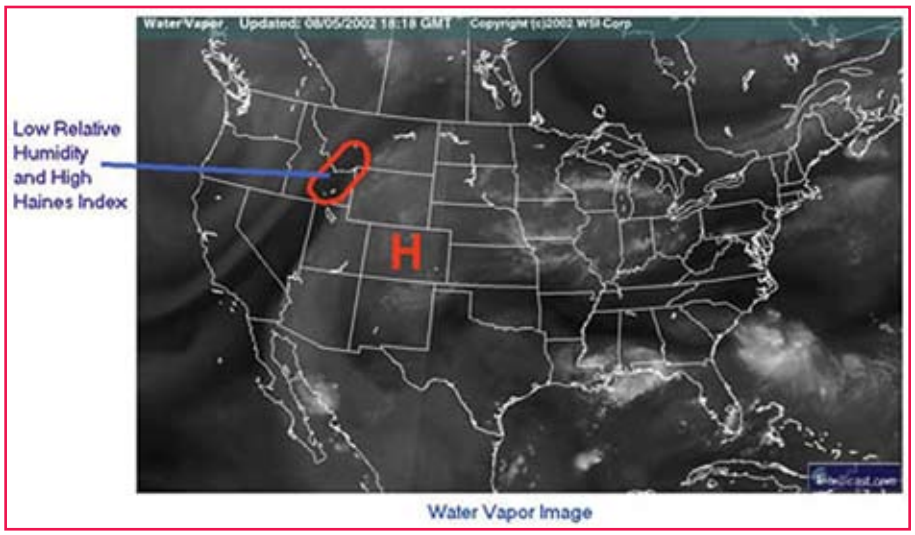


Figure 2 shows a water vapor image from August 8, 2002. Note the dry air "tongue."

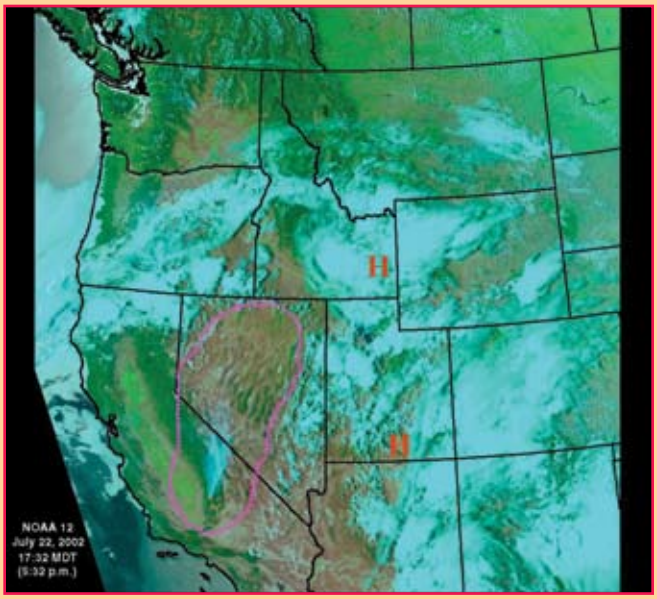
What To Watch For

Typical ground weather conditions over "fire blowups" associated with the upper level breakdown include:

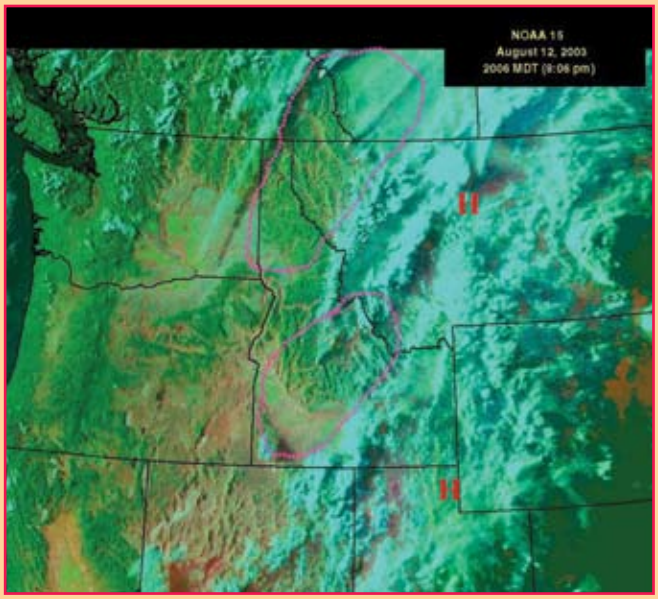
1. Very clear weather. These clear weather surface troughs appear as voids in the atmosphere when viewed on the satellite image.
2. Strong winds that develop from the southwest or west within the late afternoon, generally from 1500 to 1800 hours.
3. Rapidly falling relative humidity.
4. Smoke plumes and fire progression that travel in a northeastern or eastern direction.
5. A large high pressure system

How Weather Patterns Affect Fire

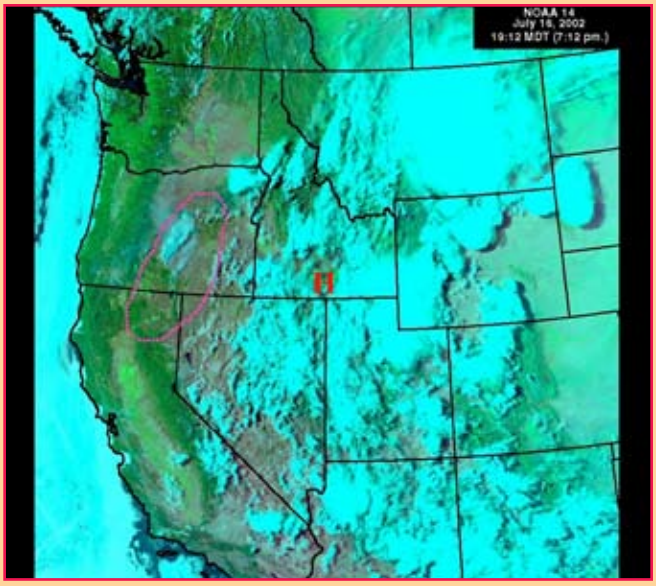
An example of some of the satellite images from our study that illustrate how the weather patterns and conditions affect wildland fire.



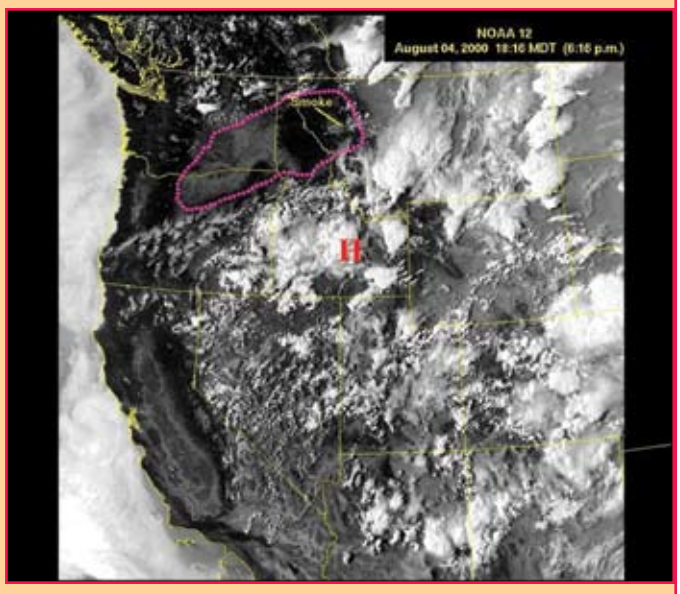
Note fire activity and direction of smoke with this large weather trough over Nevada and southern California; July 22, 2002.



This image reveals fire activity in two troughs over Idaho; August 12, 2003.



On July 16, 2002, high pressure has moved into the Pacific Northwest. Note the activity of the Oregon fires.



Note location of the high pressure system as fires burn in northwest Montana; August 4, 2000.

Visual satellite images of smoke and high pressure systems can be augmented with water vapor images to form a clearer picture for understanding the implications of weather and fire.

(often associated with clouds) immediately to the south or east.

Ancillary meteorological data and patterns that trigger five "watch outs" for fire blow-up conditions:

1. A short wave in the isobars (preferably weak) indicating a drop in barometric pressure is approaching—followed by the breakdown, or eastward shift, of the upper ridge.
2. Often, a subtropical jet stream.
3. A clear air trough on the northwest edge of the subtropical high pressure system. This high pressure will have a clockwise rotation and will contain clouds of subtropical moisture. Puffy cumulous clouds will often develop around the edge of the trough. The clear air trough will often be 40 to 60 miles (64 to 97 km) or more across at the narrowest point, and 100 to 300 miles (161 to 483 km) in length. The clear air trough will often distort and form a "dimple" in the high pressure system.
4. Moderate to high Haines Index (5–6).
5. On the NOAA "GOES" water vapor images a "tongue" of very dry air will wrap around the leading edge of the high pressure ridge and flow into the clear weather trough. This results in low relative humidity at the surface. These dry air patterns on the water vapor image appear as dark areas.

These observations of high pressure systems are critical because they could move or shift several hundred miles in a single day.

Conclusions

The observations summarized in this article provide insight into the complexities of fire activity and weather. With further study and documentation, this analysis could be applied as an important tool in the future of wildfire suppression and management.

Visual satellite images of smoke and high pressure systems can be augmented with water vapor images to form a clearer picture for understanding the implications of weather and fire.

Acknowledgment

The author thanks Dave Thomas, recently retired as the Intermountain Region's fuels specialist, for his support in reviewing and helping prepare this article for publication.

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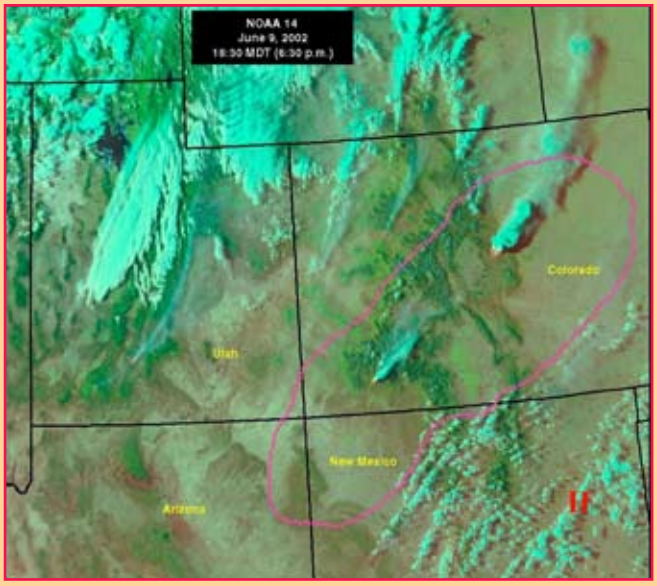
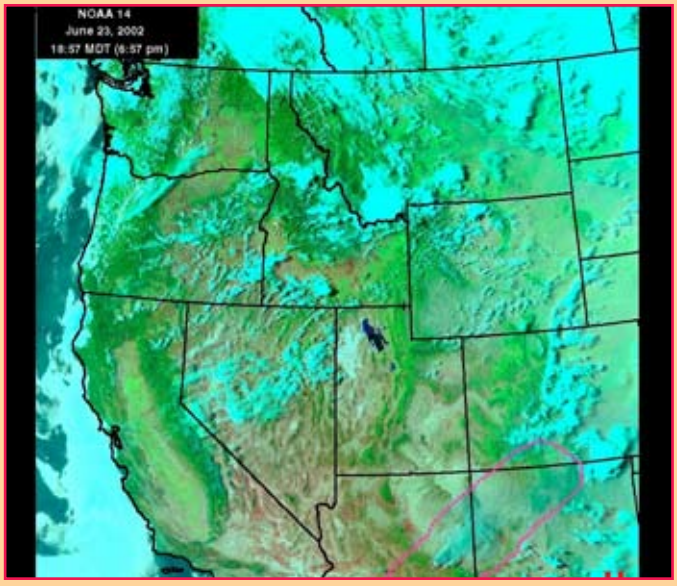


Colorado fires exhibit extreme fire behavior on June 9, 2002.



The large Arizona and New Mexico fires are active on the afternoon of June 23, 2003. Note the clear air in the trough.

We Need a New Age of Forestry

Jack Ward Thomas

A new age of forestry is needed in the United States. Recent dramatic declines in forest management have brought some undesirable consequences for forest health and wildlife.

Public concerns over retention of biodiversity (such as compliance with the intent of the Endangered Species Act) have thrust concerns for wildlife front and center in forest management debates. Where those debates lead remains to be seen.

A total preservationist approach to management—standing back and letting nature take its course—has become increasingly prevalent. While appealing on the surface, this is not tenable in the long term because it will not protect forests, retain biodiversity, and provide some wood products over time.

A return to a totally economic-driven forestry is also not viable. Public reaction to past forest management practices—such as the visual impacts of clear-cutting—precludes harvesting at "economic maturity" from being the dominant factor in forest management decisions.

Public backlash to forestry practices of 1950 through 1975 resulted in a plethora of Federal and State laws and regulations that set forest management on course toward sustainability. Unfortunately, the pendulum of attitudes toward forest management has swung too far to the side of constraint.

Jack Ward Thomas was Chief of the Forest Service from 1993 to 1996. He is currently the Boone and Crockett Professor of Wildlife Conservation in the School of Forestry at the University of Montana, Missoula, MT.

Thomas originally wrote this article for the California Forest Products Commission. It appeared in the Sacramento Bee newspaper on July 11, 2006, and is reprinted here with permission from the author.

The key to overall biodiversity will be creating and maintaining both younger early successional and late-successional forest stands.

Wood Consumption

Today, most old-growth stands on public lands are protected and provisions exist for recruiting additional old growth over the next decades and centuries. Many stands are in, or are moving into, mid-successional forest conditions—the least productive stage for enhancing biodiversity. The key to overall biodiversity, therefore, will be creating and maintaining both younger early-successional and late-successional forest stands.

A return to a totally economic-driven forestry is also not viable.

Adding to the challenge of establishing the full spectrum of forest conditions essential to supporting the full spectrum of biodiversity is unprecedented wood consumption in the United States. Our per-capita wood consumption rate is the highest in the world—and rising.

Increasingly, we depend on places beyond our borders to provide our wood. Places with far less resources and knowledge for how to manage forests responsibly. When we import wood products, we export not only environmental consequences but jobs and dollars.

Currently, the creation of younger-forest conditions is increasingly dependent upon stand-replacing fire, insects and disease, and blowdown.

Timber harvesting could play a similar role. The choice, to a large degree, is up to us.

The idea of "letting nature take its course" is seductive in its simplicity. But it has significant downsides. First, the timing, extent, and results of stand-replacing events are only marginally under human control. With human populations increasingly ensconced in forested areas, forest health already degraded, and the ability to use controlled burns limited, "hands off" management—even for public lands—seems untenable in the long run.

Additionally, increasingly depending on "elsewhere" for our wood is morally bankrupt, economically unfeasible, and wasteful.

Clearly, there is work to be done in our forests. However, using taxpayer dollars for habitat alterations to provide for biodiversity associated

with early-succession forests and to protect structures in the wildland/urban interface against large-scale fires will prove cost prohibitive. And, once such actions are begun, they must be maintained with ever-mounting costs and not offsetting returns.

A Truly New Forestry

It seems the perfect time for a new forestry. Not a simple reinstitution of what has gone before, but a new approach—one in which the environmental benefits are as significant as the wood produced. We have the know-how, technology, and trained professionals to do the job. Certainly the need is ever more apparent.

Our per-capita wood consumption rate is the highest in the world—and rising.

This new forestry must focus on the landscape and accept the need to provide myriad values from our forests, including biodiversity, wood products, clean air and water, and recreation. By doing so, and harvesting more trees from its private forestlands, our Nation can enhance biodiversity and lessen the impact of our consumption on forests around the world.

If the most fertile lands (usually in private ownership) were intelligently managed more intensely for wood production, pressure could be relieved on less productive lands. Those lands then could be managed with more emphasis on such things as biodiversity, scenic values, and watershed integrity.

The answer to what some consider past management sins is not prohibition. Rather, it is a change in approach to forest management—a *new* forestry. The old forestry is largely dead. But, we have learned much—enough to institute new approaches that will be more acceptable and more sustainable.

Like all species, humans must exploit the environment in order to live. There is no question of that. The question is how such will be acc le, and socially acceptable, fashion. ■

When we import wood products, we export not only environmental consequences but jobs and dollars.

The 2003 Cedar Fire claimed the lives of 13 wildland/urban interface residents and 1 firefighter. This photo was taken from a San Diego County Sheriff's Department helicopters as the fire burned toward Alpine, CA. Photo courtesy Dan of Megna, 2003.

FACES: The Story of the Victims of Southern California's 2003 Fire Siege.

What Can They Tell Us?
Why Have We Forgotten Them?

For more information on this new, comprehensive "lessons learned" report authored by Bob Mutch, visit the Wildland Fire Lessons Learned Center Web site: <http://www.wildfirelessons.net>. ■

Two Receive Golden Smokey Bear Awards for Exceptional Contributions

Lewis F. Southard

In the world of wildfire prevention there is no greater honor than to receive the Golden Smokey Bear Award. This special award is reserved for people or organizations who provide sustained outstanding national service—with significant national program impact—in the fire prevention arena.

Honorees must exceed the expectations of their jobs and demonstrate innovation, creativity, commitment, and passion for fire prevention. A maximum of three Golden Smokey Awards are presented each year.

The Golden Smokey nomination process is rigorous. The selection committee is comprised by members of the Cooperative Forest Fire Prevention Program with representatives from the National Association of State Foresters, the Forest Service, and the national Advertising Council. The committee critically studies all of the nominations. This achievement—with its golden statue—has been referred to as the "Oscar" of fire prevention.

In 2005, the National Cooperative Forest Fire Prevention Committee honored two people with the prestigious Golden Smokey Bear Awards for their sustained, outstanding contributions to wildland fire prevention:

In the world of wildfire prevention there is no bigger honor than to receive the Golden Smokey Award.

- Peter Martin, who recently retired from the U.S. Department of the Interior, Bureau of Land Management's Prineville District in Oregon, and
- Joan O'Hara Wehner, business manager for the National Association of State Foresters.

Both Martin and O'Hara Wehner were recognized by their peers with top honors when they received their Golden Smokey statues. Both were also caught by surprise when they were presented their awards—in separate ceremonies.

Absolutely Shocked

Peter Martin was presented with his award during the 2005 Pacific Northwest Coordination Group and Oregon Fire Marshals Association Fire Prevention Workshop in Gleneden Beach, OR. Dewey Tate, fire prevention specialist for the Pacific Northwest Region, presented Martin with his coveted Golden Smokey Award.

"I was absolutely shocked to receive the Golden Smokey," said Martin, who retired from the Bureau of Land Management's Prineville District in 2004.

He spent most of his career in fire prevention, beginning on the Mount Hood National Forest's Bear Springs Ranger District in the early 1970s. Peter made many stops along the way, including working at the Forest Service's

Golden Smokey Bear Award winner Peter Martin (far right) is joined by his wife Kathleen Martin during the presentation ceremony in which Dewey Tate (far left), the Pacific Northwest Region's fire prevention specialist, presented Martin with his award. Photo: Forest Service.

Lewis Southard is the Assistant Director of Fire and Aviation Management Partnerships, Forest Service, Washington Office, Washington, DC.

2005 Silver and Bronze Smokey Bear Award Winners

Silver Award Winners (regionwide)

Gwen Beavans
Forest Service Southern Region
Regional Fire Education Specialist

Cathy Scofield
Forest Service Northern Rockies Region
Assistant Director for Cooperative Fire and Prevention

Great Lakes Fire Compact Prevention Committee

Norma Griffin
Ministry of Natural Resources
Fire Prevention and Education Program Officer

Jim Martinuk
Manitoba Conservation
Fire Control Officer

George Meadows
Minnesota Department of Natural Resources
Fire Prevention Specialist (retired)

Tom Proulx
Michigan Department of Natural Resources
Forest Fire Officer

Catherine Regan
Wisconsin Department of Natural Resources
Wildfire Prevention Specialist

Dave Schuller
Minnesota Department of Natural Resources
Firewise Communities Specialist

Adele Smith
Minnesota Department of Natural Resources
Information and Education Supervisor

Mike Warnke
Wisconsin Department of Natural Resources
Forest Ranger

Bronze Award Winners (statewide)

Kelly Cardoza
Boise National Forest
Fire Prevention Specialist

Eliseo "Chito" Garcia
U.S. Fish and Wildlife Service
Fire Prevention Officer

Gerry J. LaCavera
Florida Division of Forestry
Mitigation Specialist

Teresa Mizuhara
California Department of Forestry and Fire Prevention
Fire Prevention Specialist

Okeechobee Fire Prevention Committee

Louis Aguilar
Glades County
Forest Ranger

Brandon Davidson
Martin County
Forest Ranger

Joe deBree
Highlands County
Fire Prevention Chair

John Deleon
Martin County
Forest Ranger

Robert Doer
Indian River County
Forest Ranger

Mike Mohorek
St. Lucie County
Forest Ranger

John Phillips
Okeechobee County
Forest Ranger

Jim Rath
Okeechobee District
District Manager

Ed Ward
Martin/Okeechobee Counties
Forest Area Supervisor

Melissa Yunas
Florida Division of Forestry
Mitigation Specialist

Pacific Northwest Regional Office, before finishing his noteworthy career with the Bureau of Land Management.

During the decades that spanned his career, Martin:

- Played a key role in the regional and national effort to celebrate Smokey's 50th birthday;
- Was instrumental in the development of National Fire Prevention and Education Teams;
- Served as chair of the Pacific Northwest Fire Prevention Workshop for nearly 20 years; and
- Received two Silver Smokey Awards in 1994 and 2000. (These tributes go to people or organizations who have provided outstanding regional service in fire prevention.)

This achievement—with its golden statue—has been referred to as the "Oscar" of fire prevention.

Despite retiring, Peter continues to support fire prevention efforts locally, regionally, and nationally by serving as a lead instructor in fire prevention training courses and through his recent work creating an interagency fire prevention sign guide.

Great Protector

Joan O'Hara Wehner received her Golden Smokey Award at the National Association of State Foresters' meeting in Madison, WI, in October 2005. Joan was specifically honored for her leadership and determination to hold Smokey's message to the highest standards.

After spending much of her career in nonprofit management, Wehner started working as the business manager for the National Association of State Foresters 10 years ago. Focusing on fire prevention the past 8 years, her work has affected many fire prevention successes across the Nation.

The Golden Smokey nomination process is rigorous.

Honorees must exceed the expectations of their jobs and demonstrate innovation, creativity, commitment, and passion for fire prevention.

Smokey Bear Award Nominations

Nominations for the Smokey Bear Awards are due each year by the end of January. Anyone wishing to submit a nomination should complete a nomination form and attach supporting materials (such as news clippings and photographs).

Additional information and the nomination form are available at <http://www.symbols.gov/smokey/smokeybear-awards/index.shtml> or by contacting Lew Southard via e-mail at: lsouthard@fs.fed.us.

Each nominee must meet three minimum selection criteria:

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

"There is no greater protector of Smokey in the entire Nation than Joan," said Bill Sweet, a program manager for the Forest Service's Southern Region and a 2004 Golden Smokey Award recipient.

Wehner was instrumental in revamping the <smokeybear.com> Web site. She also worked tirelessly to ensure that the highest quality Web site was developed with strong, accurate content.

Her current efforts in fire prevention include coordinating the Radio Disney events scheduled across the Nation. These events, made possible by a partnership between Disney and the National Cooperative Forest Fire Prevention Program, take Smokey Bear to urban areas where kids and adults have had virtually no prior contact with Smokey or Smokey's fire prevention message. ■

Clyde Nilles: From Jelly Roller to Controlled Burn Crewman

Tristan Scott

Clyde J. Nilles worked out of the Powell Ranger Station much of his life, doing jobs as varied as a jelly roller, bull cook, and bunkhouse keeper.

No job description in the world could have pigeonholed Clyde J. Nilles.

Working out of the Powell Ranger Station on Clearwater National Forest much of his life, Clyde was a jelly roller and a bull cook, a bunkhouse keeper, and a controlled burn crewman. He planted trees, cut trail, herded sheep and baked countless batches of his famous cinnamon rolls. His secret ingredient—sour cream. (Incidentally, Clyde's special seasoning in scrambled eggs was, rather infamously, cigarette ash in the place of pepper.)

And while he never married or had a brood of his own, Clyde saw to the future while skirting the steep hillsides of the Selway–Bitterroot Wilderness. With a 60-pound pack of saplings slung around his waist, Clyde was three paces ahead of crewmates 30 years his junior.

"I was always impressed with him," said Dave Thomas, Clyde's surrogate son and lifelong friend. "He was always a hard worker. When I met him, he was already in his late 50s, but he'd still go out on those steep hillsides to plant trees."

Tristan Scott is a reporter for the Missoulian newspaper in Missoula, MT., where this article first appeared. It is reprinted here with the newspaper's permission.

Birthday Boy—Clyde Nilles, at a spry 92, gets a birthday hug from one of his many admirers, Donna Bonzagni, GIS/database coordinator, Powell Ranger District, Clearwater National Forest, Lolo, MT. Forest Service photo, 2005.

When Clyde died January 11, 2006, he was 92 years old—a feat he accomplished by working hard his entire life and never marrying, he explained to friends and family.

Of course, the trees he planted will outlast the man for generations, and his painted portrait on the backside of the Oxford Bar will loom over downtown Missoula for years to come.

Clyde's Goodwill

But most steadfast of all are the friends who will remember Clyde's goodwill.

"I can't imagine the hundreds, even thousands of young people who knew him," Thomas said. "Every year, there were at least 50 people on the crew. He just was naturally kind and warm. He was just the bunkhouse keeper, and yet everyone gravitated to him to talk."

Clyde was a jelly roller and a bull cook, a bunkhouse keeper, and a controlled burn crewman.

Thomas lives in Utah now, and only recently retired from the Forest Service. He came to Missoula in the early 1970s to attend college and took a job at the ranger station. Clyde practically adopted him as a son. Throughout the years, the two men stayed in close contact.

"At the time, Powell (Ranger Station) had two or three bunkhouses," Thomas said. "That's where the men stayed, and Clyde kept them clean. But he also went on trail crews, cut trail, planted trees, cooked and jelly-rolled." A "jelly roller" is someone who wraps the roots of saplings in burlap so the trees don't dry out before they're planted.

"I've never met a kinder person, and the people who knew him

Clyde's special seasoning in scrambled eggs was, rather infamously, cigarette ash in the place of pepper.

would say that too," Thomas said. "He would do anything for people."

Clyde only went to school through the sixth grade, Thomas said, but he never missed a political convention on television or radio. After Clyde retired from the Forest Service in 1984, he moved to Lolo where he gardened, drank beer at the Lolo Tavern, talked politics and danced.

But after a car accident in 1997, Clyde moved back to Missoula, where he lived independently until 2004. "He drove around a little cart and would cruise down the streets over to the Oxford Bar to see his friends," said Cheryl Noell, Clyde's great-niece.

"I think he had nine lives, because he kept getting really bad and almost dying, and then he'd bounce back," Noell said. "That maybe happened 20 times in the last four years, but he had such a strong will to live."

With a 60-pound pack of saplings slung around his waist, Clyde was three paces ahead of crewmates 30 years his junior.

Close friend and longtime Powell Ranger District employee Donna Bonzagni recalls Clyde facing a particularly risky surgery years ago. The doctor asked whether he wanted to be on life support if something went wrong.

"He said, 'Oh yeah, I've got my garden to plant,' " she said. "He always bounced back. He had an amazing desire and will to live."

The trees he planted will outlast the man for generations.

Clyde died of Alzheimer's disease, emphysema, and congestive heart failure.

Bonzagni, who still works at the Powell Ranger Station, remembers Clyde as her first boss. "I used to go to work a half-hour early every day just to talk to Clyde," she said. "He had a coffee pot on 24 hours a day and you could always talk to him."

Even (former) Forest Service Chief Dale Bosworth knew Clyde, and when visiting the Powell Ranger Station—just over the Idaho border on the Clearwater National Forest—years ago, the Chief heard someone mention his name.

"He knew Clyde from way back and couldn't believe that he was still alive," Thomas said. "Clyde claimed to have taught Dale Bosworth everything he knew." ■

Web Sites on Fire*

Wildland Fire Chemical Systems

If you ever had a question regarding wildland fire chemicals, the Forest Service has a helpful, informative Web site that is intended to provide technical support relating to fire chemical products for the agency's fire and aviation management programs—as well as information for firefighters and the public.

These fire chemical products discussed at the "Wildland Fire Chemical Systems" Web site include long-term retardants, class A foam fire suppressants, and water enhancers.

Information spans from how to determine what type of chemical product you have to whether or not it is on the "qualified products list" of fire chemical products that have been evaluated and meet Forest Service requirements.

Among its other resources, the Web site also provides technical product information for firefighters and the public on wildland fire chemical products, including supplier contacts and updates, airtanker base information and updates, environmental guidelines, and human health risk assessments.

Found at **<http://www.fs.fed.us/rm/fire/wfcs/index.htm>.**

* Occasionally, *Fire Management Today* briefly describes Web sites 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 Forest Service. To have a Web site described, contact the managing editor, Cindy White at 360-436-1155, ext. 231, cwhite@fs.fed.us (e-mail).

On Doing a Dirty Job

The following bit of advice for Forest Service fire employees was part of an article by C. H. Coulter, State Forester, Florida Forest Service, that appeared in the January 1940 (4[1]) *Fire Control Notes* (forerunner of *Fire Management Today*). The article was entitled "Making Contacts and Establishing Goodwill."

(Editor's Note: This excerpt from the 1940 article has been reprinted verbatim and therefore reflects the style and usage of the time.)

Personal Appearance

"Much of the success obtained in meeting the public will depend upon your personal appearance. It is not necessary that you be a 'white collar dude' or that you appear in formal dress. Just remember to do the best with what you have. No one likes to hold a conversation with a ragged and unclean person. It has often been said that 'Cleanliness is next to Godliness.'

The occasion may arise when out of necessity you will be forced to talk with persons or strangers immediately after fighting a bad fire or doing a dirty job. Your appearance on this occasion may be explained, and the person you are talking with will understand the circumstances and make allowances for it.

The occasion may arise when you will be forced to talk with persons or strangers immediately after fighting a bad fire or doing a dirty job.

He will not, however, overlook your dirty appearance if you are in that state every time he meets you."

Reference

Coulter, C.H.1948. Making contacts and establishing goodwill. Fire Control Notes. 4(1): 32–37. ■

2007 Photo Contest Announcement

Fire Management Today (*FMT*) invites you to submit your best fire-related images to be judged in our photo competition. Entries must be received by close of business on Friday, October 5, 2007.

Awards

All contestants will receive a CD with the images and captions (as submitted) remaining after technical and safety reviews. Winning images will appear in a future issue of *Fire Management Today* and may be publicly displayed at the Forest Service's national office in Washington, DC.

Winners in each category will receive:

- 1st place – A 20- by 24-inch framed copy of your image.
- 2nd place – A 16- by 20-inch framed copy of your image.
- 3rd place – A 11- by 14-inch framed copy of your image.
- Honorable Mention – A 8- by 10- inch framed copy of your image.

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 taken at any time. No photos judged in previous FMT contests may be entered.
- You must have the right to grant the Forest Service unlimited use of the image, and you must agree that the image will go into the public domain. Moreover, the image must not have been previously published in any publication.
- We prefer original slides or negatives; however, we will accept duplicate slides or high-quality prints (for example, those with good focus, contrast level, and depth of field). *Note:* Slides, negatives, and prints will not be returned.
- We will also accept digital images if the image was shot at the highest resolution using a setting with at least 3.2 mega pixels. If a print or slide is scanned, use a setting of at least 300 lines per inch with a minimum output size of 5 x 7 inches. Digital image files should be TIFFs or highest quality JPGs. Note: Photos that are date stamped will be eliminated from the competition.
- You must indicate only one competition category per image. To ensure fair evaluation, we reserve the right to change the competition category for your image.
- You must provide a detailed caption for each image. Example: *A Sikorsky S-64 Skycrane delivers retardant on the 1996 Clark Peak Fire, Coronado National Forest, AZ.*
- You must include the following information with your photo: your name, professional affiliation, town, State, and year that image was captured.
- You must complete and sign the Release Statement form (below) granting the Forest Service rights to use your image(s).

Disclaimer

- A panel of judges—with significant photography and publishing experience—determines the winners. The judges' decision is final.
- Photos depicting safety violations—as determined by the panel of judges—will be disqualified.
- Life or property cannot be jeopardized to obtain photos.
- The Forest Service does not encourage or support deviation from firefighting responsibilities to capture photos.
- Photos will be eliminated from the competition if they are obtained by illegal or unauthorized access to restricted areas, show unsafe firefighting practices (unless that is their expressed purpose), or are of low technical quality. (For example, have soft focus or camera movement.)
- You must complete and sign the Release Statement form (below) that grants the Forest Service the rights to use your image(s).

Mail your completed release with your entry or fax it to 970-295-6799 at the same time you e-mail your digital image files.

Mail entries to:

Forest Service
Fire Management Today Photo Contest
Karen Mora
2150 Centre Avenue
Building E, Suite 008
Fort Collins, CO 80526
or
e-mail images and captions to:
<kmora@fs.fed.us> and
fax signed release form to
970-295-6799 (attn: Karen Mora)

2007 *Fire Management Today* Photo Contest Release Statement and Contact Information

Enclosed is/are _____ (*number*) slide(s)/print(s)/digital image(s) for publication by the Forest Service. For each image 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 image(s) and am aware that, if used, it/they will be in the public domain and appear on the World Wide Web.

Contact information:

Name (Printed) _____ (Signature) _____

Institution affiliation, if any _____

Home or business address _____

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