Fire Management *notes*

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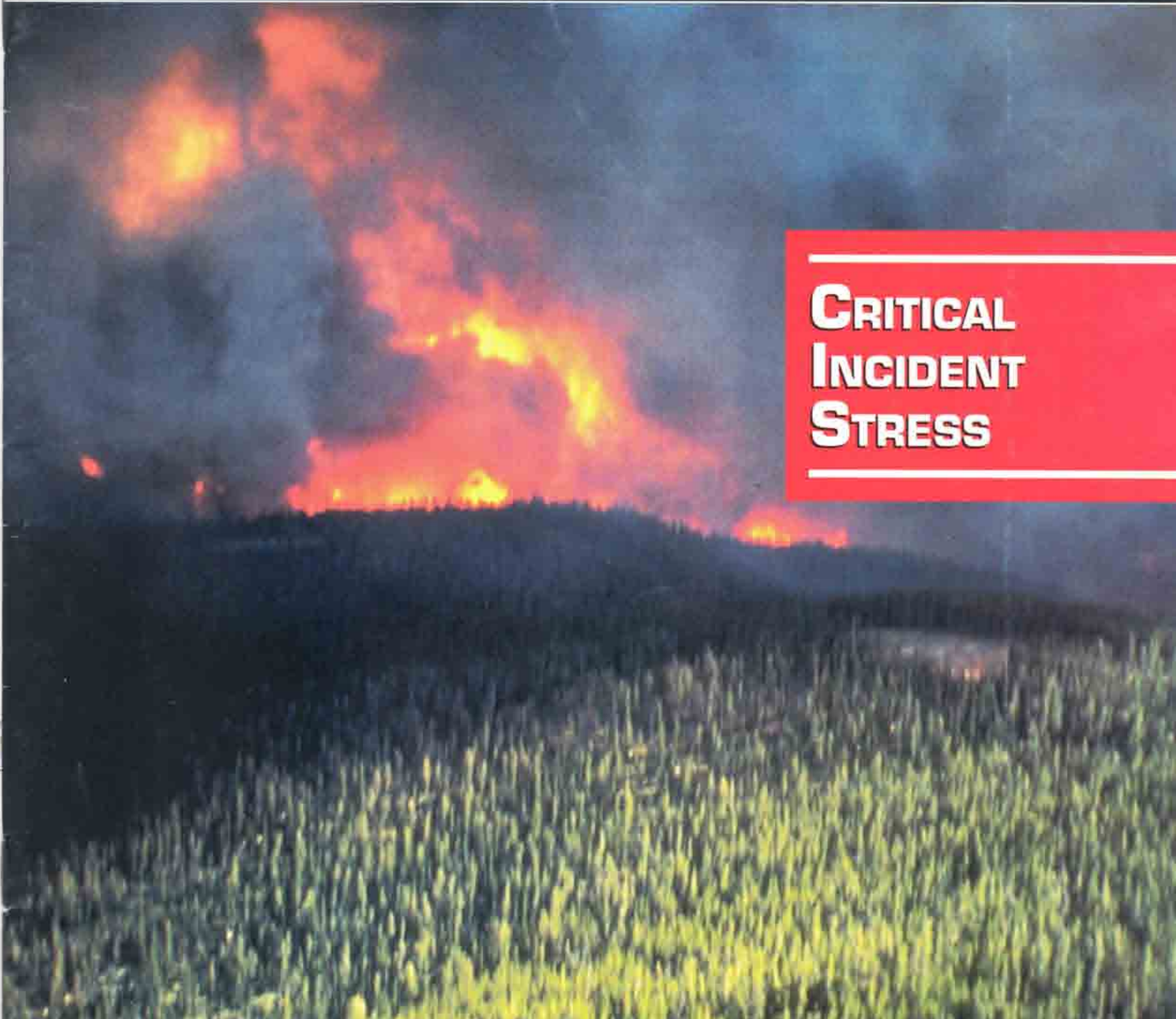

Critical Incident Stress

United States Department of Agriculture
Forest Service

Congratulations to Telecommunity for Internet Access Project

Albert Gore

Editor's Note: *With this letter, which is available on the World Wide Web, Vice-President Al Gore congratulated the La Plaza de Taos Telecommunity for its use of the Information Superhighway.* *See related article on page 22.*

Mr. Patrick Finn
La Plaza TeleCommunity Foundation
224 Cruz Alta Road
Taos, New Mexico 87571

Dear Mr. Finn:

Congratulations on the launch of La Plaza's Internet access project. You are doing the citizens of New Mexico an important service by providing them with an "on ramp" to the information superhighway.

The Clinton Administration is committed to encouraging the development of a National Information Infrastructure (NII)—a communications network that will forever change the way we live, work, and learn. The development of the NII is a critical step to ensure the future competitiveness of our country and the long-term growth of our economy. The opportunities to harness this technology for life-long learning, health care, manufacturing, the delivery of government services, and many other applications are limited only by our imagination. Today's Internet is a working prototype for tomorrow's National and Global Information Infrastructures; it has already revolutionized the way we share information with each other here in the United States and around the world.

In a speech in Los Angeles in January, I asked members of the communications industry to help make sure that all Americans—rich and poor, urban and rural—have access to the benefits of the NII. I challenged them to connect every classroom, library, hospital and clinic to the NII by the year 2000. I believe we can and must meet this challenge. As a nation we cannot tolerate—nor in the long run can we afford—a society in which some children become fully educated and others do not, in which some patients benefit from shared medical expertise and others do not, in which some people have access to lifetime learning and job training and others do not. President Clinton and I are committed to making sure the goal of universal access is met so that all Americans can benefit from the communications revolution. Today you are making an important contribution to achieving that goal.

As the citizens of northern New Mexico explore the Internet, I encourage them to try out the new "Welcome to the White House" service. This interactive citizens' handbook allows users to easily access information from all the executive branch agencies and to communicate via e-mail with President Clinton and myself. For systems with free Mosaic or Lynx software, the service can be accessed on the Internet at http://www.whitehouse.gov

Vice-President Al Gore says that all citizens should have an "on ramp" to the Information Superhighway. Photo: U.S. Department of Agriculture, Forest Service, 1993.

Once again, congratulations on your achievement, and I offer you my best wishes for your continued success in the future.

Sincerely,

Al Gore

Al Gore is the Vice-President of the United States, Washington, DC.

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Fire Management notes

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On the Cover:

After a severe wildland fire such as the Butte Fire on the Salmon National Forest in 1985, there may be individuals who need critical stress debriefing. While 73 firefighters were in fire shelters from 1 to 2 hours, no significant physical injuries were reported. Emotional "injuries" also need consideration, as James Stone explains in his article beginning on page 4. Photo: Lloyd Duncan, USDA Forest Service, Intermountain Region, Ogden, UT, 1985.

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Short Features

Use the Connections—No One Is an Island

James E. Stone

"No man is an island, entire of itself; every man is a piece of the continent, a part of the main; if a clod be washed away by the sea, Europe is the less . . . any man's death diminishes me because I am involved in mankind; And therefore never send to know for whom the bell tolls; it tolls for thee."—John Donne, English poet, 1573-1631 (modernized version).

Because no one gets through life without problems and these problems can affect job performance, the USDA Forest Service has an Employee Assistance Program to help in finding a resolution. Not recognizing or dealing with problems can make them more serious and difficult to solve.

I'm neither a health care professional nor a sociologist, but I value the insights of those who uncover the truths that make us tick—including poets like John Donne, whose words about our dependence on one another are often quoted—even centuries after he wrote them.

Kathryn Stroh, a conflict management consultant, says that when an event happens to us, we compare it to our beliefs, generate emotions, and form our behavior. If we experience all of that step by step, I think it must occur at the speed of light and subconsciously! I believe that feelings are as much a part of a person as the heart. Like one's heartbeat, feelings are not usually affected by willpower. Feelings aren't arrived at rationally, and they often don't make sense—even to the person having the feelings.

Stroh adds that feelings are a prime motivation to action—they make up the entire 50 percent of the human experience not filled by thinking. Furthermore, she says that unexpressed feelings can be toxic.

James Stone is an audiovisual production specialist for the USDA Forest Service, Intermountain Region, Information Systems and Technology, Ogden, UT.

Critical Incident Stress

Grief is a natural human reaction to a loss, any loss. Recovery occurs when a person goes through a number of stages. Critical Incident Stress Debriefing Teams can assist the grieving through these stages—so they don't get "stuck." In the USDA Forest Service, such teams can be ordered through regular dispatch mobilization channels to report at the scene of a traumatic incident. On the scene, team members—all professionals in counseling—provide aid to all those requesting it, including families, affected colleagues, and community members.

Generally, Forest Service employees can ask for critical incident stress debriefing through their home unit's Employee Assistance Program. When the trauma-causing event affects job performance, help is available at no cost to the employee. Employees who are preoccupied with their pain—but still report to work regularly—are not working at prime efficiency; they need help.

When Individuals Need Help

John Donne said we are all connected. These connections have been proven in recent years as we have learned that critical stresses such as fatalities and major accidents affect more than friends and family. Rescuers, care-givers, emer-

James Stone reminds us that "walking casualties" can't get through the emotional pain they are experiencing. These individuals need help; we must make that help easy to obtain and confidential. Photo: Millie Otwell, USDA Forest Service, Intermountain Region, Ogden, UT, 1994.

gency site managers, and even employees far distant from the scene can be emotionally affected by a tragedy. Consider these real examples of people who were not at the crisis scene, but who were deeply affected:

- A Forest Service employee-father buries his son, a wildland fire fatality. A coworker gives the grieving father all the support he can, and this support continues for months and months. The supporting coworker becomes exhausted.
- Seeking to channel energy spent grieving about a firefighter's death into something productive, a fire behavior officer in the Forest Service requests a copy of the released investigation report. He wants to study the report at length, internalize the findings, and make absolutely sure he never makes a mistake costing lives. The main office tells him a single copy was sent to his unit. He asks for a personal copy. They say no. A healing experience is denied.
- A former crew leader, now working two States away at a different Forest Service job, learns that some of his former crew members burned in a wildfire. He fogs in mentally and remains numb a year later.
- A Forest Service line officer is shaken by the news of fatalities on her helicopter fire suppression crew. She is still trying to put things in perspective when she hears that the fatality investigation team has cited "insufficient administrative oversight" as a contributing factor. Investigation teams have no intention of placing "blame," but she thinks the words mean "this accident was preventable," and she blames herself for it.

The Forest Service Employee Assistance Program is for all of these employees. Because the agency understands that mentally healthy employees occasionally need support, it has disseminated information about the program's services through posters, pamphlets, and/or wallet cards.

Cumulative Effects of Emotional Pain

Even though help is readily available, those who most need the program's services are often paralyzed with pain. They can be so preoccupied with their own anguish that they **can't** ask for help. Making matters worse, pain not healed has cumulative effects. Consider these real-life examples of one firefighter and the cumulative effects that occurred because he didn't receive early counseling:

Effect Number One. In the 1970's after a weekend off duty, the firefighter was returning to his duty station after sundown. Driving on the Interstate through the forest, he came upon a burning, upside-down car. The gasoline had already burned off. He concentrated on cooling the hottest spot—the upholstery—with shovelsful of dirt. Within 45 minutes, the police, a wrecker, and a wildland fire engine arrived. The engine crew mopped up. Even though it was very dark, everyone available started looking for the driver.

Finally, he or she was found, still in the car. It was not upholstery the firefighter had been putting out. A quarter of a century ago, there was no critical incident stress debriefing available. The firefighter simply went back to work.

Effect Number Two. The same firefighter agreed to be a photographer for a fatality investigation team. There are no casual glances for photographers. Significant details must be selected and put into context—the leather gloves in the cab, the deployed fire shelter in relation to the vehicle, the pocket change and keys at some distance from the fire shelter, the hard hat and final resting place of the deceased at some distance from the change that had been in his pocket.

To this day, the firefighter/photographer carries plenty of vivid images from that experience, but the most haunting is one he did not see through the lens of the camera. It is the memory of crouching in the ashes and picking up boot eyelets. Almost instantly, he realized that he was **not** sifting through wildland fuel ashes. It hit him that just a few hours previously, the eyelets were holding boots to feet. Very quietly he said to a supervisor, "I think I need stress debriefing."

The response was, "You know how to get help, go get it." The words were correct. The flippant manner

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Employee Assistance Program

Ronald F. Wilson

The Forest Service Employee Assistance Program (CONCERN) is designed to assist employees who have problems that are affecting their job performance or conduct, such as alcoholism or other drug dependence, mental or physical illness, or financial, legal, or domestic difficulties. CONCERN counselors are available at no cost to employees. Employees of the agency should contact their local CONCERN coordinator for program details.

Ron Wilson is a Safety and Occupational Health manager for the USDA Forest Service, Washington, DC.

and lack of compassion in their delivery stopped the man from seeking counseling.

Effect Number Three. After a fatal helicopter crash, the same individual was asked to be the uniformed escort for the family of one of the victims of the accident. He went to an airport 150 miles from the crash to pick up the family members—the sister and brother of the deceased and his two teenaged sons. He talked with them about their brother and dad during the 3-hour journey back to the helibase. He took the family to pick up the deceased's belongings.

The uniformed escort sat beside the family in the front row at the memorial service. Afterwards, a banner in honor of his father was presented to the 16-year-old son.

The agency individual was available to the family members at any time during their visit. He was sensitive to their needs and provided some caring touches including introducing the family to the cook and waitresses at the restaurant where their brother/dad often had eaten—he was sorely missed by the staff. He arranged a tour of the helibase, explained the missions assigned to helicopters, and, at their request, showed them the type of helicopter involved in the crash.

With the family and alone, this individual shed lots of tears. No debriefing was suggested. He was in such an emotional state that he didn't realize he desperately needed to ask for help.

Effects Accumulated. During a relatively routine fire assignment a few days later, this same individual was not coping well. People who knew and cared about him realized he was talking almost incessantly about the helicopter incident. His coworkers found he didn't know if his feelings were normal and appropriate or not. They helped him realize his need for critical incident stress counseling, and they supported him when he made arrangements for treatment.

At the Counseling Session. With the professional counselor, the individual described above started his treatment by talking about the upside-down car, an accident that had occurred almost 25 years earlier. How do I know about these intimate and confidential problems of another individual? Perhaps you've already guessed, I am that man.

No Man or Woman Is an Island

While I am the first to admit that we are all responsible for ourselves and our own mental health, in my case, I'm very grateful for the intervention of my coworkers in helping me realize I needed to talk to a professional. They were sensitive to my needs, did **not** put me on the spot in front of others, asked me appropriate questions, and listened to what I said. After all, if a tree had fallen on me, they would not have expected me to walk to a first-aid station!

Those of us involved in fires and other emergency work find our responsibilities very rewarding. There is nothing so fulfilling as helping other human beings in their most urgent need or providing a team skill to help others optimize what they are doing. But we often pay a high price for our involvement, especially when injuries or fatalities occur.

The same traits that make us observant and compassionate in our work can become liabilities when the work is over—as Stroh said, "Feelings not expressed can be toxic." When the incident is finished, we need to look after each other.

Those of us in this line of work are healthy human beings. Usually we were not present when the tragic event occurred, but as "a piece of the continent, a part of the main," we become emotionally affected. We can all imagine the pain a photographer had when he was required to photograph burned cadavers in a morgue. When his colleagues later made light of his ordeal—"Heard you've been shooting pictures of crispy critters"—their insensitivity to his recent experience added to his emotional pain. This unbelievable situation actually happened to someone I know who recently said he'd never be the same. He is a human being, not an island.

Friends, supervisors, subordinates, coworkers—we all are involved in "humankind" and have a responsibility to those around us. Often a sincere, caring question is all it takes. "Are you okay?" "Would you like to talk?" "Do you need any help?" We must remember to ask this question at the right time—in a place where the individual can give a real answer. Sensitivity toward someone who has given aid and is now in emotional, even crippling pain is all important.

Your caring question and manner may guide others to the counseling they need. Whether it's through the Employee Assistance Program offered in the Forest Service, through another agency's counseling program, or through private counseling, we can be grateful that help is available. Let's make certain that those in need of support get the assistance necessary to go through the stages required to recover from their grief and loss. ■

Keetch-Byram Drought Index Revisited: Prescribed Fire Applications

Mike Melton

In volume 50, number 4, of *Fire Management Notes*, I contributed an article about the Keetch-Byram Drought Index (K-BDI), its relationship to fire suppression, and the problems that could be expected with suppression efforts at different levels of drought as measured by the index. Since that time, it has received many inquiries and comments appreciative of the practical information contained in the article. It has also been used as a training tool in a variety of fire management classes. I also learned that some wildland fire managers, especially in the Southeastern United States, have used the information found in the original article and applied it to prescribed burning. While the information contained in the original article is applicable to prescribed fire, there are some differences. With prescribed fire practitioners in mind, in this article I have expanded and addressed the K-BDI specifically from a prescribed fire perspective.

Keetch-Byram Drought Index (K-BDI) levels are calculated as part of the 1988 revisions of the National Fire-Danger Rating System (NFDRS) (Burgan 1988). Since the K-BDI calculations are simple, they are often made and kept by individuals or field offices that do not have access to NFDRS calculations or are not near an office that does.

Mike Melton is a district ranger, USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District, Whitley City, KY.

Drought indexes are not designed to measure fuel moistures, rather they indicate environmental conditions that affect fuel profiles.

To calculate the K-BDI values, users need a copy of the directions found in the original documentation (Keetch and Byram 1968) and a rain gauge. Then a simple mathematical process is necessary to determine the K-BDI value on a daily basis.

In the following discussions, I have addressed the index and effects on a drought scale difference of 200, which corresponds to the loss of 2 inches (5 cm) of water from the fuel and soil profile as the drought progresses from one stage to the next.

These following discussions are based on the fact that the seasonal variations in the index generally follow the southern seasonal temperature pattern. The index will be low in the winter and spring, increase during the summer and early fall, and taper off again in winter. In my conclusion, I discuss some of the variations found when the index departs from normal, some things to be expected from rising and falling indexes, and the days-since-rain concept.

K-BDI Levels 0-200

Much of the understory prescribed fire work in the South is done at the 0 to 200 levels, which correspond to the early spring dormant season conditions following winter rains. Soil moisture levels are high, and fuel moistures in the 100- and 1,000-hour fuel classes are sufficiently high, so these larger fuel classes do not significantly contribute to prescribed fire intensity in most cases.

Fuel moistures in the 1- and 10-hour classes will vary daily with environmental conditions. On any particular day, prescribed fires should be planned based on the predicted levels of moisture within these two fuel classes in association with weather conditions. Prescribed fire planners should be aware that areas with heavy loadings of these two smaller fuel classes can exhibit intense behavior resulting from the amount of fuel to be consumed. Also, areas that are influenced by slope and aspect can experience erratic and intense fire behavior from the preheating effects. Southern aspects can produce intense fire behavior while northern aspects of the same unit may have difficulty carrying the fire.

At the 0 to 200 levels, nearly all soil organic matter, duff, and the associated lower litter layers are left intact. These layers, even though they may not be soaking

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wet, will be protected by the insulating properties of the moist layer below, will retain moisture levels close to extinction, and will resist ignition. Patches of unburned fuel can be expected with most fuel types. Burns conducted at this level can be expected to give the "mosaic" pattern of burned and unburned fuels over the burn unit, often a preferred result.

The typical burn patterns implemented at the 0 to 200 levels include a relatively fast head and strip-head fire or a backing fire that consumes the upper litter layers. Once the fire passes, remaining embers extinguish quickly. Within a few minutes, the area is completely extinguished and smoke free. Mopup efforts required on most burns are minimal. Burns that can be successfully implemented at this stage include those for fuel reduction, range improvement, or wildlife habitat, and any burn that does not require a deep burning, organic- and duff-reduction-type fire.

Smoke management concerns are primarily centered around the smoke generated during the burn and not from large smoldering materials following its completion.

Natural features such as creeks and drainages can be used as control lines. Most agencies and companies will use mechanized equipment to construct lines, but adequate lines can be constructed with hand tools. "Wet lines" can also be used in some fuel types.

A word of caution: While this part of the index represents the "wettest" part of the scale, it should not be taken as an indicator of fuel moisture (1-hour and 10-hour) in the upper layers of the fuel complex. These fuel moisture levels are totally dependent on fluctuations in daily weather variables. Dry air masses or frontal passages that pass over an area may have an insignificant effect on the K-BDI but can lower fuel moisture to critically low levels. Prescribed fire planners should ensure that acceptable fuel moisture measurements are accounted for prior to ignition, regardless of the K-BDI.

> Management should consider that the mid- to upper-600 range is the limit of acceptability for igniting prescribed fires of any type unless specific locality conditions dictate otherwise.

K-BDI Levels 200-400

In normal years, the 200 to 400 levels would represent conditions found in the late spring and early growing season. Rising temperatures, increased levels of transpiration within the plants, and normal water movement reduce moisture within the soil and fuel profile.

In these index levels, lower litter layers and duff begin to show signs of water loss and will begin to contribute to fire intensity. Humidity recovery at night will have some positive effect on moisture recovery in the fuel profile. Daily temperature and humidity variations under normal burning conditions will quickly reverse this recovery.

Fire practitioners should expect an increase in fuel consumption over the area as the index moves into the upper end of this range. The increase in fuel consumption and resulting intensity can result in heavier fuel classes becoming involved in the burn. Heavier dead fuels such as downed logs and snags will now become a part of the burn process. Fire planners should also expect that some of the live fuels such as low-level brush species and vines such as honeysuckle may now receive sufficient heat to burn actively and contribute to control problems if they are close to fire lines. Patches of unburned vegetation are still common, but these conditions tend to allow for more smoldering and creeping fires that may eventually consume most surface fuels.

Fire planners wanting to initiate a burn over a forested area to "black it out" should consider the 200 to 400 range on the index as conducive for that purpose. Sufficiently intense fires can be generated with most forest fuel types to carry across the area. These conditions also allow for an increased, although not complete, consumption of the lower litter layers and duff, which tend to ensure the fire carries across the unit. Under normal conditions, the majority of the duff and organic layer will still be intact following the burn. Soil exposure will be minimal.

Smoke management can become a real hazard, especially if there are significant larger fuel classes available for ignition. Downed logs, stumps, and similar material should be expected to ignite and smolder for a considerable period of time. Also expect smoldering and the resulting smoke to carry into and possibly through the night. Smoke-sensitive areas should be thoroughly screened, and mitigation measures should be implemented when necessary.

Hand lines constructed to hold the fire should be composed of mineral soil. Managers should thoroughly check natural features used for control lines for drifted debris that could allow fire to creep across. They will need to patrol mechanical lines and clear away any ignitable materials left following construction. Fire planners should seriously reconsider line standards under conditions in the upper levels of this range.

K-BDI Levels 400-600

Levels between 400 and 600 are typical of those encountered during the summer and early fall conditions in the South. They represent the upper range at which most normal understory type burning should be implemented. Very intense fires can be generated with burns ignited in this range of conditions. Under these levels, most of the duff and associated organic layers will be sufficiently dry to ignite and contribute to the fire intensity and will actively burn. The intensity can be expected to increase at an almost exponential rate from the lower to the upper ends of this range.

Fire planners should expect a considerable amount of soil to be left exposed following a burn. Much of the site preparation burning done across the Southern United States occurs under this set of conditions. Intensity of burns under these conditions is such that most fuel classes occurring on a unit will ignite and burn. Complete consumption of all but the largest dead fuels can be expected. Larger fuels not consumed may smolder for several days, creating smoke and potential control problems.

Within the burn, expect weathered stumps, downed logs, and most snags to be completely consumed over a period of time (possibly several days). A significant portion of the duff and organic layer will be consumed, resulting in large areas of exposed mineral soil. These areas may be susceptible to sheet erosion with the next heavy rain. This potential varies with soil types. Smoke management relating to sensitive areas is of critical importance due to the length of time smoke is likely to result from the burn area.

Under normal circumstances, fire planners should have a specific resource management objective that requires an intense fire before igniting understory fires in this range. The intense fire and deep burning that often result from these conditions can do serious damage to timber resources and present an opportunity for insect pests to create additional problems. Control problems resulting from spotting should be expected.

These 400 to 600 levels indicate two things are happening: 1) Deep drying resulting from water loss is occurring in the duff and organic material in the soil, and 2) lower live fuel moistures resulting from continued water loss in the soil and the natural physiological process within the plants make understory vegetation susceptible to ignition with a minimum of preheating. These two situations amount to an increase in the fuel available for consumption and consequently increase the fire's intensity. Fire planners should consider that the outputs from computer programs and nomograms relating to intensities are underpredicted and plan accordingly.

At these levels, fire planners should seriously begin to reevaluate the line construction and location standards necessary to contain the burn. Reduced runoff levels in some drainages can preclude their use as control lines or require that they receive some refurbishment treatments. Failure to pay attention to low water levels and debris that has drifted into creek channels can create potential control problems that will continue to escalate as the index levels increase because fires can creep across such materials. Where practical, use either major natural features or roads that are suitably located. All line construction should be of mineral soil. Since duff and organic material can provide an avenue for fire to burn across the line, it is imperative that it is removed from within constructed lines. Where practical, consider line locations that would otherwise be used for fire suppression; they can give an added "edge" in maintaining the security of the lines under intense conditions.

K-BDI Levels 600-800

The 600 to 800 range of the K-BDI represents the most severe drought conditions identified within the index and results from an extended period of little or no precipitation and high daytime temperatures.

There may be exceptional cases when specific management objectives for a given area justify prescribed fire ignitions within this range. Management should consider that the mid- to upper-600 range is the limit of acceptability for igniting prescribed fires of any type unless specific locality conditions dictate otherwise. These levels of the index are often associated

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with increased wildfire occurrence, and many States and municipalities will issue burning bans when the K-BDI is this high. Burning bans, of course, should preclude any management decision regarding prescribed fire. Such bans are an acknowledgement of the seriousness of the fire situation.

Prescribed fires ignited within this range will be characterized by intense, deep-burning fires. The potential for significant down-wind spotting should be considered the rule in planning. Live understory vegetation 2 to 3 inches (5 to 8 cm) in diameter at ground level should be considered part of the fuel complex because live fuel moistures will be sufficiently low and the vegetation will burn easily with a minimum of preheating. The majority of soil organic material subject to ignition will be consumed; stump roots and other subsurface organic material that ignite will probably be completely consumed. Once ignited, large fuel classes will burn intensely with almost total consumption. In brief, expect these fires to be very difficult to contain and control.

Possibly a year or more will pass before a layer of organic material will be replaced on the area. Resource managers should expect some amount of soil loss from erosion until the area replaces sufficient vegetative cover. The significance of the loss will be determined by the specific soil type and slopes on the area. Line construction standards should follow the previous discussion standards.

Rising and Falling Indexes

This discussion primarily addresses the effects on the larger dead component fuel associated with a given fuel model and has its basis in the timelag concept associated with 100-, 1,000-, and 10,000-hour fuel classes. Indexes that have been low and begin the normal seasonal rise are characterized by the larger fuel classes being damp deep inside. Typically, a large piece of woody material will be saturated in the interior and therefore be difficult to ignite and sustain combustion. As time progresses, the exterior dries, but interior fuel moistures still remain high. For example, smoldering logs are sometimes ignited by fire intensities high enough to overcome the surface moisture levels but later go out due to the high interior moisture levels, precluding further combustion. When this occurs, there may be some concern about smoke from the smoldering debris and mop up. Dealing with this situation is relatively easy because humidity recovery at night can help extinguish this type of ignition. However, a falling index can cause an opposite reaction.

The larger fuel classes have experienced deep drying from a sustained period of little or no precipitation. The exterior surface may have a relatively high fuel moisture level from recent rain while the interior of the fuel will have lower moistures due to the longer equilibrium timelag. Prescribed fire ignited under these conditions may develop sufficient intensities to break through this outer layer of high fuel moisture. Once this happens, the fire encounters a reservoir of material with comparatively low fuel moisture levels and can be expected to burn for an extended period of time. This could go on for several days within the area and result in a large amount of smoldering material and smoke management problems, depending on the type and amount of fuels on the area. Experience has shown that this material will continue to smolder until it is consumed, mopped up, or another precipitation event raises moistures to a level of extinction. The resulting smoke problems can be compounded by fluctuations in wind direction over several days. Mop-up operations can be lengthy and expensive.

Fuels that have high moisture levels on the outside and are dry on the inside should be expected for indexes that have been in the 600+ range and have rapidly fallen into the 200 to 300 range. This could have resulted from one precipitation event, and while the 1- and 10-hour classes of fuel are immediately affected, the other fuel classes are slower to react. This is just one example of the subtleties noted from actual field experience in dealing with the index values.

Days Since Rain

Finer fuel classes are immediately affected by precipitation of any type. Since fires originate and spread within these classes, we can use this characteristic to accomplish prescribed fire objectives during what might normally be unacceptable drought conditions.

During the first few days following precipitation, the surface fuels will have been saturated and begun to dry out. The lower fuel layers and possibly even the organic layer may still have moisture-of-extinction levels. Resource objectives can be accomplished by timing the burn to occur during this period even though the drought index levels may still be high. Timing of the prescribed burn may be critical and fire planners should be fully aware of the conditions they are dealing with. Most burns should be accomplished during the first 2 or 3 days following precipitation. From a prescribed fire standpoint, the effects of precipitation will have disappeared after about 4 days of continuous drying.

Prescribed fire personnel should be especially careful in monitoring the amount of precipitation that has occurred. Once fuels have experienced deep drying, there must be a significant amount of rainfall to dampen conditions to the point where they are reasonably safe for burning. In most cases, precipitation amounts in the 1/2-inch (1.3-cm) range should be considered minimal. The prescribed burning of dry, fine fuels affected by small amounts of precipitation reflect the type of conditions and burning done in the summer growing season throughout much of the Southeast. These burns can be accomplished by careful planning and following these general guidelines.

Index Readings That Depart from Seasonal Norms

Fluctuations in weather patterns, temperatures, and precipitation levels can all coincide to create a departure from the normal yearly index pattern. An abnormally dry fall and winter season could lead into an early spring season with drought index readings in the 500 to 600 range. For example, in 1987, the Southern United States experienced a severe fall fire season and carried K-BDI readings of 600 into January and February 1988, when the normal reading would be expected to be less than 100. Since that time, other localized drought events have occurred, resulting in similar fire seasons.

Prescribed fire planners must recognize departures from normal readings in planning burns for their particular location. A burn conducted under index levels of 100 in the springtime is not the same as a burn conducted under levels of 500. Extreme caution should be used in implementing any burn under this set of conditions; they are primed for a potential escape situation.

> The ideal time for understory prescribed burning in the South is within the first 2 or 3 days after precipitation.

Closing Thoughts

Through the previous discussion, I have attempted to qualify and quantify the effects of the K-BDI as it relates to the application of prescribed fire. The variables within this application are many and their interactions complex.

Prescribed fire personnel should always remember that the K-BDI is a measure of meteorological drought; it reflects water gain or loss within the soil. It does not measure fuel moisture. Prescribed fire application is almost totally dependent on the moisture levels in the 1- and 10-hour classes, which must be measured by other means for an accurate assessment of fuel moisture, regardless of the drought index readings. Prescribed fire managers must also be aware that dry vegetation due to reduced soil moisture will create additional fuels available for fire consumption in the mid and upper ranges of the index. This condition is not accounted for in current computer technology such as BEHAVE (Andrews 1986).

The K-BDI levels discussed here and the resulting effects on prescribed fires should not be considered hard-and-fast rules but rather a reflection of my career experiences in dealing with both wildfires and prescribed fires and the levels of the K-BDI. Readers are invited to develop their own guidelines and apply this information to their particular situations. Variations in fuel types, topography and aspect, geographic location, moisture and temperature regimes, and soil types may dictate a variety of effects within the levels of the K-BDI. After all, that is why we describe the implementation of prescribed fire as an art rather than a process.

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National Prescribed Fire Awards Recognize Excellence

David L. Bunnell

Fire is a significant ecological process as a disturbance element in nearly all forest and range ecosystems. Its effect can be dramatic, and its use or exclusion can be critical. When fire is excluded in some ecosystems for too long, understory builds up and the scene is set for a catastrophic fire. A prescribed fire at the right time can ward off disastrous wildfires and contribute to ecosystem health.

To pay tribute to those in the USDA Forest Service who have attained "Excellence in Prescribed Fire in Support of Ecosystem Management," the Fire and Aviation Management Staff, under the leadership of Director Mary Jo Lavin, Ph.D., has established a new national award. It recognizes agency individuals, groups, or units that have moved forward the science, art, and/or acceptance of the use of prescribed fire to support the health of ecosystems.

The 1995 awards were presented to Joseph P. Ferguson, Barbara L. Cook, Guy Anglin, Rhonda L. Kimbrough, Mark A. Warren, and Whit Lerer (retired) from the National Forests of Florida and Deirdre M. Dether and Leon F. Neuenschwander, Ph.D. (contractor from the University of Idaho), from the Boise National Forest.

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

Teams from the National Forests of Florida and the Boise National Forest were inaugural winners of the "Excellence in Prescribed Fire in Support of Ecosystem Management" awards for having "moved forward the science, art, and/or acceptance of the use of prescribed fire to support the health of ecosystems."

These inaugural winners have been selected by a group of their peers from nominations made through regional Fire and Aviation Management directors.

National Forests of Florida Award

"For planning and implementing a wilderness fire management program on the National Forests of Florida that sets national precedence for prescribed fire application" is the inscription on the plaque that accompanies the award. The hardwood plaque includes a laser-engraved prescribed fire scene with a distinctive silver-drip torch emblem.

The National Forests in Florida have a unique wilderness fire program that has evolved over the last decade. The program began with approval of the Bradwell Bay Wilderness Fire Plan in 1986. Management-ignited prescribed fire was initiated in Bradwell Bay in 1987 and has continued annually.

In 1991, a plan for management-ignited prescribed fire for fuel reduction in the Big Gum Swamp Wilderness was approved. It has re-

Holding their plaques for their "Excellence in Prescribed Fire" are National Forests of Florida team members (from left) Mark Warren, Minerals, Engineering, Recreation, and Lands staff officer; Guy Anglin, forest botanist; Barbara Cook, wilderness program manager; Joe Ferguson, fire management officer; and Rhonda Kimbrough, forest archeologist. Photo: Vernita Alexander, USDA Forest Service, National Forests of Florida, Tallahassee, FL, 1996.

turned prescribed fire to the wilderness annually since 1992. Soon after, another plan for management ignition for fuel reduction in Billies Bay Wilderness was approved, and some burning was conducted in Billies Bay in 1993 and 1994. At that time, the National Forests of Florida decided to look at all seven wilderness areas together instead of individually. In addition to prescribing management ignitions for fuel reduction, management also decided to address lightning and management ignitions to restore natural processes. (Using prescribed burns in this way involved an exception from the Chief of the Forest Service.) To date, over 20 management-ignited prescribed burns have been completed in wilderness and wilderness study areas on National Forests in Florida.

Deirdre Dether (center background), forest fuels planner for the Boise National Forest, talks with Forest Service retirees at Pine Creek near the Bannock Creek Research Natural Area. Here she discusses how ponderosa pine forests have changed because fire has been excluded and demonstrates how wildfire can be lethal to ponderosa pine because of ladder fuels. Photo: Lynette Berriochoa, USDA Forest Service, Boise National Forest, Boise, ID, 1995.

Dr. Leon Neuenschwander (right foreground) of the University of Idaho points out conditions in the Boise National Forest and explains the need to restore fire using prescribed burning. Photo: Karen Wattenmaker, USDA Forest Service, Boise National Forest, Boise, ID, 1993.

Boise National Forest Award

The plaque inscription reads "For planning and development of the Boise National Forest approach to landscape level prescribed fire application which incorporates the best of fire experience and fire research results."

Under the leadership of Deirdre Dether and Dr. Leon Neuenschwander, the Boise National Forest has gone from a "no-natural-fuels program" to a "landscape prescribed-fire program" that emphasizes restoring fire through a frequent, nonlethal fire regime. During 1995 (the year of the award), the forest accomplished 3,000 acres (1,200 ha) of prescribed burning and readied an additional 5,000 acres (2,000 ha) for future management ignitions.

The efforts of this team in communication, education, and coordination—both with internal and external audiences—have opened a dialogue among resource specialists on their forest and with other agencies as well as with the public. They have helped forest management to reach consensus to restore fire by using prescribed fire on a landscape level. In addition, this team has helped the public understand the critical role of fire in some ecosystems and the consequences of not restoring fire where it had historically been frequent.

Two geographic information system (GIS)-based models were developed for prioritizing and planning where to focus the efforts of the forest for ecosystem restoration in a frequent fire regime. The success of the Boise National Forest's program can be a template for others to develop landscape prescribed burning programs.

Future Prescribed Burning Awards

Nominations for the annual "Excellence in Prescribed Fire in Support of Ecosystem Management" awards are due each April. In addition to the distinctive plaque, this award includes a monetary stipend. Individuals may receive up to $1,000 and groups or units up to $2,500.

Those wishing to nominate Forest Service individuals or groups who deserve recognition for their work in fostering the use of prescribed fire can get specific details from their regional director or Dave Bunnell, National Interagency Fire Center, tel. 208-387-5218. ■

An Evaluation of Michigan's Burn Permit Moratorium

DNR

Donald Johnson

A major barrier to planning fire prevention programs is the lack of objective data to show their effectiveness in the past (Schaenman et al. 1990). One of the reasons for this data gap seems to be that few involved with fire prevention objectively evaluate their programs. Most evaluations appear to rely upon simple trends in fire occurrence alone, without making a systematic attempt to factor out weather influences (Doolittle and Donoghue 1991).

After 3 years of an intensive effort to reduce the number of wildfires caused by debris burning, fire managers in Michigan wanted to know whether or not their efforts had succeeded in meeting their objectives. An evaluation of the program was undertaken using statistical process control techniques as a way to normalize weather influences.

Background

The majority of Michigan wildfires (95 percent) are caused by people; debris burning causes one-third of all wildfires in the State. Debris-burning fires are of concern because they predominantly occur during the height of Michigan's spring fire season, when fire danger is typically at its peak, and they occur in close proximity to homes, placing lives and property at great risk.

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> After 3 years of an intensive effort to reduce the number of wildfires caused by debris burning, fire managers in Michigan wanted to know if their efforts had been successful.

The Department of Natural Resources (DNR) regulates outdoor burning under the authority of the State Forest Fire Law (Part 515, Prevention and Suppression of Forest Fires, of the Natural Resource and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, being Sections 324.101 to 324.90106 of the Michigan Compiled Laws Annotated). Part 515 requires a burn permit for any outdoor burning when the ground is not covered with snow, with two notable exceptions: 1) A burn permit is not required for burning on lands devoted to agriculture; and 2) a burn permit is not required when burning is for domestic purposes—defined as burning in an approved debris burner (a metal or masonry container with a metal lid having holes no larger than 3/4 inch [2 cm]), campfires, or fires within a building. The act specifically provides that the director of the DNR shall set the times of day and the conditions under which burning shall take place.

In early 1993, there was a great deal of concern that resource shortages would make it impossible to respond to more than one large wildfire at any given time. The Stephan Bridge Road Fire of 1990 had shown that wildland fire suppression forces were vulnerable to resource shortages when responding to multiple fire starts in a single county. Since most spring wildfires are caused by debris burning, it was decided to focus prevention efforts on this cause to reduce the probability of experiencing resource shortages.

A 4-week moratorium on the issuance of burning permits was proposed as a means of addressing the problem. We felt that the moratorium would not only generate the necessary media attention to put our prevention message before the public, but it would also alert those individuals who avoid interaction with wildfire personnel by not obtaining burning permits.

A mid-April through mid-May period was chosen for the moratorium, since an analysis of historic fire occurrence patterns showed that most wildfires occur during the last 2 weeks of April and the first 2 weeks of May. Note on figure 1 that these are the 16th through 19th weeks of the calendar year. This period also proved to be when most large—100 acres (40 ha) or more—wildfires occur (fig. 2).

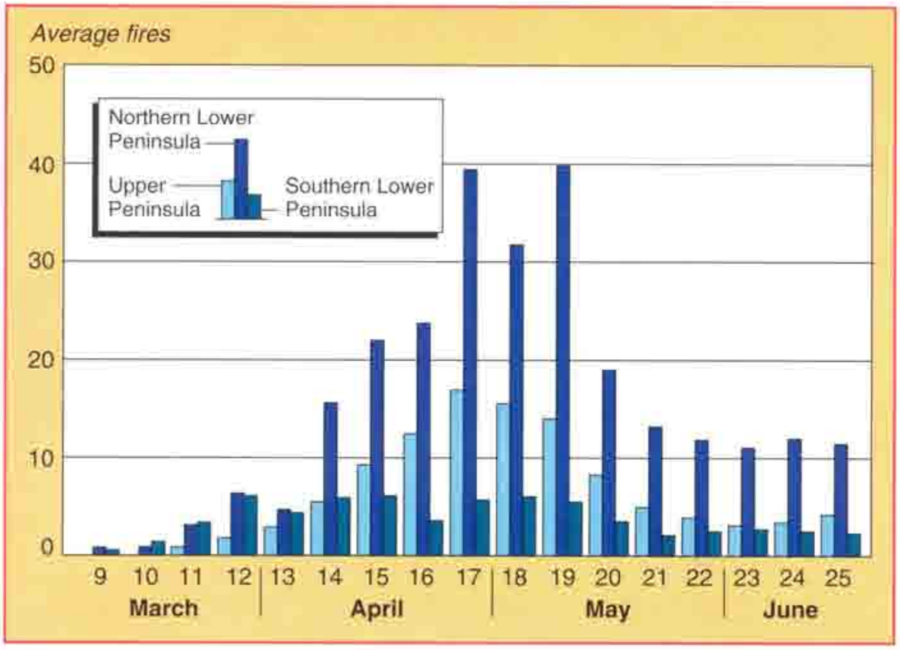

Figure 1—*Fire occurrence patterns from 1981 through 1992 in Michigan show that most wildfires occur during the last 2 weeks of April through the first 2 weeks of May.*

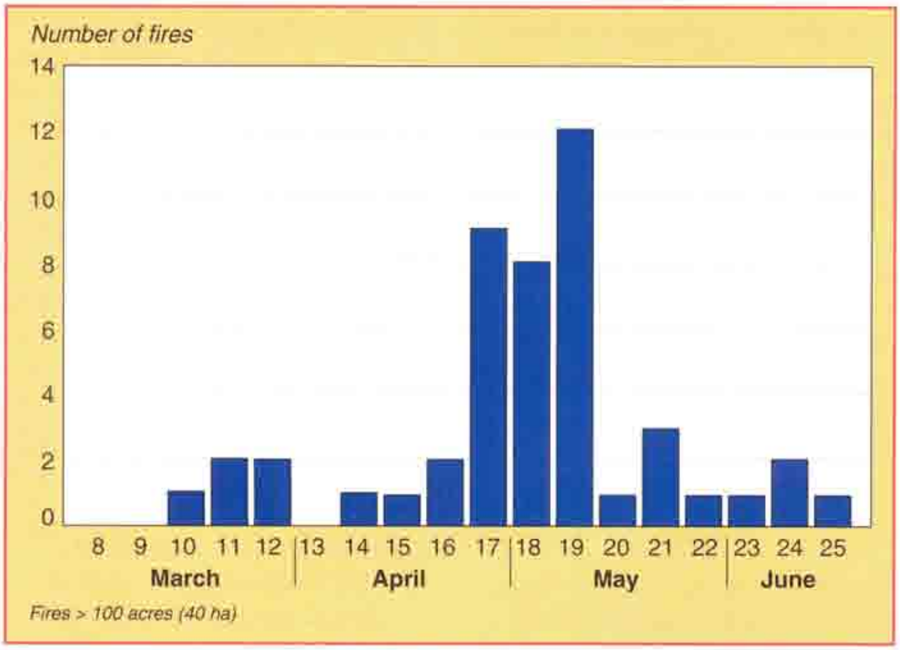

Figure 2—*From 1981 through 1992, most large wildfires occurred in Michigan from mid-April through mid-May.*

Objectives

Our primary objective was to reduce the number of debris-burning fires during the time when large wildfires were most likely to occur. We felt this would reduce the likelihood of large wildfires and the subsequent shortage of suppression resources.

Statistical Process Control To Evaluate Prevention Efforts

Fire prevention can be thought of as a system in which weather, human activity, fuels, and our fire prevention efforts are the major inputs and fire occurrence the major output. These factors all interact, with some of the interactions understood well (such as weather), and others understood poorly, if at all (such as the effect of our prevention efforts). Because human activity is a part of the system, we know that fire occurrence is a probabilistic (chance) phenomenon.

Broadly speaking, the object of statistical control is to get the assurance that the current observations from a system occur according to the past system's process. By assuming the same set of causal factors will continue to operate in the future, it is possible to make a prediction of the expected behavior of the process. Then, if a change occurs in the cause system that produced the past variation, this fact should be quickly apparent through a change in the variation of current observations (Nickey 1990). Statistical control can be used in two ways: 1) It can detect unusual occurrences so that fire prevention efforts can be modified, and 2) it can look for changes in fire occurrence after a known modification to prevention efforts has been made.

In this instance, a known change was introduced into the system with the implementation of the burn permit moratorium. Control charts were used to determine if the change resulted in a variation outside of the stable pattern of fire occurrence that had been observed from 1981 through 1992.

Burn Permit Moratorium Evaluation

Fire Occurrence Analysis. We evaluated the burn permit moratorium on a regional basis to have a large enough sample for analysis

Continued on page 16

and to provide a sensible match between fire occurrence and observed weather during the 3 years with a moratorium period. While both the Upper Peninsula and northern Lower Peninsula of Michigan were evaluated in this study, I will report only the results for the northern Lower Peninsula here. No evaluation was done of the southern Lower Peninsula because an adequate sample of both fire occurrence and fire weather observations was not available for that part of the State.

An analysis of human-caused fire occurrence statewide shows a significant difference in fire starts during the moratorium period between the historical period of 1981 through 1992 and the moratorium period of 1993 through 1995. We used the Kruskal-Wallis test to examine the hypothesis that fire occurrence during the historical period and the moratorium period were the same (Siegel 1956). This test showed that the probability of the hypothesis being correct was less than 1 in 10,000; therefore the two periods of time are statistically different. This suggests that the burn permit moratorium was effective in reducing the number of wildfires during the moratorium period.

Figure 3 shows a control chart of the fire occurrence in the northern Lower Peninsula during the moratorium period. In the years 1981 through 1992, there was an average of 29 fires per week during the moratorium period, represented by the dark line. The upper and lower confidence limits (UC and LC) represent 95 percent of all expected fire occurrence.

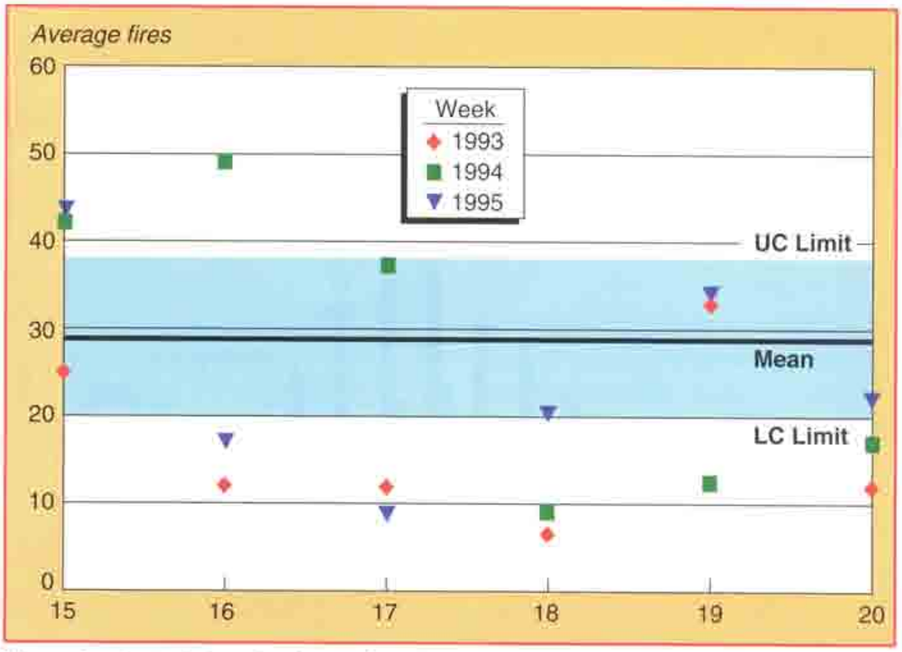

Figure 3—*Control chart for the northern Lower Peninsula of Michigan showing fire occurrence during the mid-April through mid-May burn permit moratorium period from 1993 through 1995 (UC=upper confidence limit and LC=lower confidence limit).*

During most week-year combinations, fire occurrence was below average, and in roughly two thirds of the week-year combinations, the fire occurrence was below the lower confidence limit. Very likely, the high occurrence in week 15 is the result of fires that occurred before the moratorium actually started (the moratorium period began part way through the week). A chi-square analysis of the data shows that the moratorium period is statistically different ($p<.001$) from the 12-year historical period.

A cursory examination of the fire occurrence data over the past 3 years suggests that an unusually high number of fires might be occurring just prior to the moratorium period, especially in 1994 and 1995. It appears that people were rushing to get their "spring burning" done before the moratorium and were burning under marginal conditions. Historically, the northern Lower Peninsula experiences an average of 5 fires per week during weeks 10 through 14; however, from 1993 through 1995, there were as many as 41 fires in some weeks during this period.

Figure 4 shows a control chart for the period immediately before the moratorium in northern Lower Michigan. Here we see several weeks where fire occurrence was above average and also above the 95-percent confidence limit.

Fire Weather Analysis. Weather is an important contributing factor when control charts are used to evaluate changes in fire occurrence. A whole range of weather conditions is assumed to be represented in the historical period, and this range of weather is a factor in producing the observed range of historical fire occurrence. Therefore, an analysis of weather conditions needs only to test the hypothesis that the weather conditions observed during the 3 years of the burn permit moratorium were also represented in the 12-year historical base period (1981 through 1992).

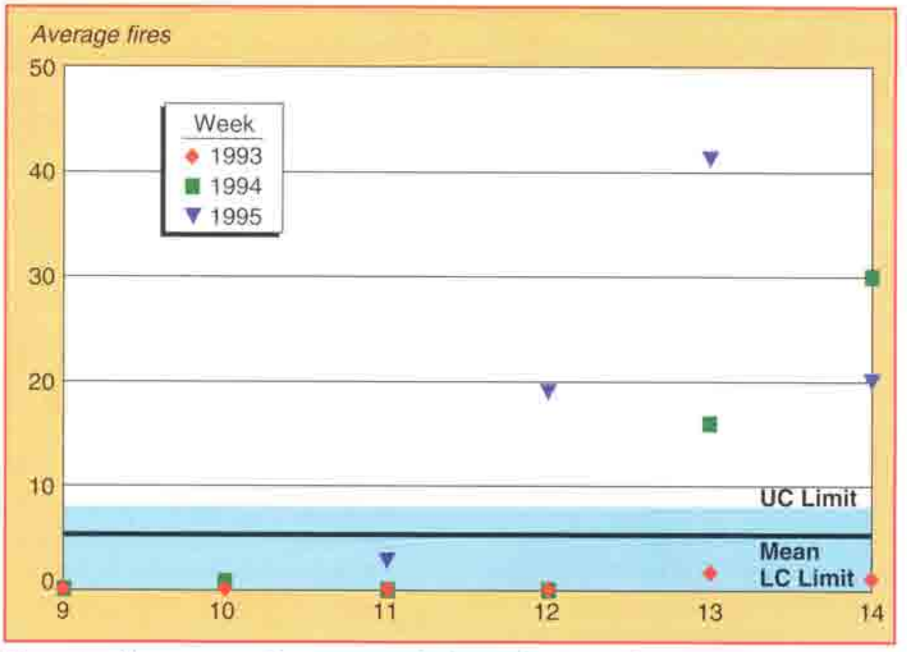

Figure 4—*Above-average fire occurrence in the weeks prior to the moratorium period in Michigan's northern Lower Peninsula from 1993 through 1995 (UC=upper confidence limit).*

The average weekly Ignition Component (IC) was used as an indicator variable to examine weather conditions. Since the prevention effort being evaluated was aimed at reducing ignitions, the IC appeared to be a more appropriate measure than the Burn Index (BI), which is influenced by wind and spread rates. It was also felt that the BI could give a falsely high reading on windy, wet days where the chance of an ignition was actually fairly low.

A T-test was used to examine the previously stated hypothesis that weather was the same during the moratorium years and the historical base period (Snedecor and Cochran 1967). Weather observations were taken from USDA Forest Service stations at Mio and Baldwin. The test of northern Lower Peninsula observations showed a high probability (39 percent) that the differences observed between the historical period and the moratorium period would occur by chance alone. Thus, these two periods cannot be considered to be statistically different, and the hypothesis that these two periods are the same holds true. A look at the average weekly IC for the region in table 1 shows that average IC's as low as or lower than 1993 can be found from 1981 through 1992.

Conclusions and Discussion

The analysis of fire occurrence shows conclusively that there were fewer fires during late April and early May from 1993 through 1995 as compared to the same period in 1981 through 1992, and this difference was not due to chance. The analysis of the average weekly IC showed that weather during this time was essentially the same in 1993 through 1995 as compared to 1981 through 1992. The moratorium achieved its objective of reducing the number of debris-burning fires during the last 2 weeks of April and the first 2 weeks of May.

A side benefit was the reduction in workload for detection pilots. Since "permit" fires were not allowed, detection pilots knew that all fires were either illegal or were wildfires. One detection pilot who operates in the most hazardous part of the State reported a noticeable reduction in the number of

Continued on page 18

Table 1—*The average weekly Ignition Component in the northern Lower Peninsula shows that the weather was similar during the moratorium years and the historical base period.*

Year	Week 15	16	17	18	19	20
81	2.14	5.14	0.64	7.07	5.07	10.57
82	4.00	3.14	16.71	13.80	8.83	4.71
83	0.79	9.29	12.25	4.08	10.00	6.00
84	9.57	4.93	8.36	2.64	4.33	6.93
85	3.86	7.14	6.29	8.64	8.07	4.79
86	7.54	5.00	12.50	13.10	11.36	0.00
87	8.64	6.57	7.93	15.93	10.07	5.14
88	6.23	10.64	3.58	13.57	5.07	6.93
89	1.73	10.36	7.79	6.71	10.38	5.14
90	6.38	—	—	7.40	8.08	1.54
91	1.75	7.00	8.80	3.62	3.33	13.44
92	3.83	0.00	4.58	8.00	14.14	14.00
93	4.90	3.30	4.92	1.09	12.85	4.22
94	4.36	15.50	6.71	6.43	8.71	8.23
95	9.00	3.92	4.88	8.36	7.56	11.00

"smokes" he had to look at during the moratorium period.

At the same time, it must be realized that there was also an increase in the number of debris-burning fires immediately prior to the moratorium period in 1993 through 1995. Implied in the decision to implement the moratorium during late April and early May is the idea that fires that occur before or after that time are not likely to cause control problems. However, there may be some years where this will not be the case. Managers need to understand that the burn permit moratorium may cause problems in these unusual years, and they will need to take steps to mitigate the increased risk.

Michigan wildfire agencies looked at a number of options before implementing this burn permit moratorium. The moratorium was chosen because it was one of the few options available, given the legal framework in Michigan. Managers from each agency must go through a similar process before deciding upon a prevention strategy for addressing the wildfire problems they face. Whatever solution an agency chooses for addressing wildfire problems, it is important to evaluate the outcomes to see if the agencies' objectives were met. This article suggests one way of evaluating a prevention program.

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Guidelines for Contributors

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

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

Submission Guidelines

Authors are asked to type or word-process their articles on white paper (double-spaced) on one side. Try to keep titles concise and descriptive; subheadings and bulleted material are useful and help readability. As a general rule of clear writing, use the active voice (e.g., Fire managers know . . . not, It is known . . .).

Submit articles to either the general manager or the editor. Complete details to reach them follow:

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Figures, illustrations, slides (original transparency preferable), and clear photographs (preferably glossy prints) are often essential to the understanding of articles. On the back, please label carefully (Figure 1, Figure 2; photograph A, B, C, etc.); include your complete name and address if you wish your material returned, and indicate the "top." Clear, thorough captions (see recent issues) should be labeled to correspond with these designations. Include the name of the photographer and year when photo was taken.

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Anaphylaxis: The Danger of Stinging Insects*

Family Physicians — Central Washington Hospital

Paul T. Flanagan and Michael J. Fadich

Wildland firefighters and others who regularly work outdoors should know that stings from yellowjackets, honeybees, hornets, fire ants, bumblebees, and wasps (hymenoptera) constitute the second most common cause of anaphylaxis in the United States (following antibiotic hypersensitivity). About 1 percent of the general population is allergic to insect venom. While 90 percent of stings occur in patients under age 20, 93 percent of deaths occur in patients older than 20 (Zull 1992). Early recognition and rapid treatment of anaphylaxis are important in preventing death.

Anaphylaxis—What Is It?

Anaphylaxis is an acute, life-threatening systemic reaction manifested by hives, swelling of mouth and throat tissues (angioedema), upper airway obstruction, coughing, chest tightness, low blood pressure (hypotension), and gastrointestinal disturbances. The term "anaphylaxis" implies hypersensitivity or allergy to any particular substance, of which hymenoptera venom is just one example. It is to be distinguished from localized inflammation arising from nearly all stings at the site on the skin where they occur. The latter reaction is nonspecific, implies no allergy, and is due merely to injury and noxious substances in the venom. Anaphylaxis, on the other hand, depends upon specificity of the victim's immune system and its ability to "remember" an offending substance (e.g., venom). Only a certain number of individuals stung by an insect will develop a true allergy (hypersensitivity) to insect venom. It is difficult to predict who will develop hypersensitivity. Frequent intermittent exposure increases the possibility of sensitization. In some cases, no prior exposure can be identified. Once hypersensitivity is developed, it will be a life-long condition likely to increase in intensity. Hypersensitivity to one substance (e.g., venom) does not seem to predict increased likelihood of hypersensitivity to another substance (e.g., peanuts).

> Immediate recognition and response to the dangerous reactions to hymenoptera stings can save lives.

In classic anaphylaxis, previous sensitization has occurred, i.e., the immune system has been "primed" at some point in the past. When a susceptible individual is exposed to

Continued on page 20

The most convenient location for an epinephrine injection is the upper arm or thigh. Autoinjectors will penetrate one layer of clothing, as shown here. Photo: James Hadfield, USDA Forest Service, Wenatchee National Forest, Wenatchee, WA, 1996.

Paul Flanagan is an entomologist with the Wenatchee Field Office, USDA Forest Service, Wenatchee, WA, and Michael Fadich is a family physician with Central Washington Hospital, Wenatchee, WA.

*The views expressed in this article are those of the authors. Readers should not construe them to be advice from the U.S. Department of Agriculture (USDA) or the Forest Service. Those individuals who anticipate being close to hymenoptera should seek advice from their physician. In addition, the naming of products is for the convenience of the reader and should not be misconstrued as an official endorsement by the USDA or the Forest Service.

a foreign substance (antigen), certain white blood cells called lymphocytes produce antibody proteins specifically targeted to the antigen. For allergic sensitization to occur, a sufficient quantity of a particular class of antibody called IgE must be specifically targeted to the antigen. IgE activates a biochemical chain reaction involving histamine and many other chemicals, resulting in dilation and increased permeability of the blood vessels. The resultant tissue swelling and hypotension are prime clinical elements in anaphylaxis.

Table 1—*Medical terms, symptoms, and signs for reactions of anaphylaxis that should be treated promptly*

Medical term for reaction	Symptoms	Signs
Urticaria	Itching, flushing	Hives that change location
Angioedema	Tingling sensation	Swelling of mouth and throat tissues
Laryngeal edema	Hoarseness, difficulty swallowing, airway obstruction, drooling	Noisy inhalations, blueness of mouth tissues, lips, and tongue swelling
Bronchospasm	Cough, difficulty breathing, chest tightness	Wheezing, high respiratory rate
Hypotension	Dizziness, brief loss of consciousness, confusion	Low blood pressure, rapid heartbeat, shock
Rhinitis	Nasal congestion, itching, sneezing	Swelling of mucous membranes
Conjunctivitis	Tearing, itching	Eyelid swelling
Gastroenteritis	Cramping, diarrhea, vomiting	Vomiting, obvious discomfort

Recognizing and Treating Anaphylaxis

It is very important to recognize the symptoms of anaphylaxis promptly. Symptoms of anaphylaxis usually begin within 30 minutes of exposure to venom, peak in several minutes, and last from 30 minutes to over 24 hours. Although in 90 percent of cases, angioedema, hives, or both are present, a combination of signs and symptoms of anaphylaxis may occur (table 1). Minor initial reactions may delay diagnosis and treatment; an individual may be lulled into a false sense of security and miss a multisystem reaction in progress. For example, nausea and vomiting alone could herald the onset of life-threatening shock. One may find a victim who feels the danger has passed because of temporary resolution (e.g., hives disappeared), when a two-phase reaction may be in process. A two-phase reaction has apparent resolution of the initial symptoms in the first phase, followed by a second phase that is typically less severe but may last many hours. Such an individual is "not out of the woods" yet, and needs treatment and medical evaluation. If you find an unconscious victim, with no other symptoms (e.g., hives), it is wise to suspect the presence of anaphylaxis.

Proper treatment depends upon the condition of the victim. We will assume for this discussion that a coworker has been stung and you are both a safe distance from the irritated insect(s). Flick the stinger(s) off if any remain—speed of removal is more important than method of removal. If the victim has labored breathing, swelling inside the mouth or throat, or loss of consciousness, the first priority is to maintain an airway. If the primary problem is breathing difficulty, raise the victim to a head-forward position (where victim is looking straight ahead). If the primary problem is delirium or unconsciousness, the victim's head should be lower than the body (Trendelenburg position). CPR skills are needed in this situation.

Early administration of epinephrine saves lives. If the victim is known to be allergic to stings or has airway obstruction, hives, or other signs of anaphylaxis, a subcutaneous or intramuscular injection of epinephrine should be given. We recommend the use of an autoinjector to administer epinephrine. An example is Epi-Pen®, which delivers a premeasured dosage via a spring-loaded, precocked syringe (fig. 1). The price is around $45, and the instructions are included with each kit. We urge you to read these instructions immediately after you purchase a kit.

The most convenient location for an injection is the outside of the upper arm or the thigh, but not below a tourniquet. Autoinjectors will penetrate a shirt or jeans, but should not be applied through more than one layer of clothing. Do not inject into the neck, chest,

Figure 1—*An Epi-pen® autoinjector that administers epinephrine to counteract anaphylaxis, surrounded by yellowjackets. Photo: James Hadfield, USDA Forest Service, Wenatchee National Forest, Wenatchee, WA, 1996.*

or over a vein or artery: only a physician or an emergency medical team should consider these injection sites. The elderly or those with a history of cardiac problems may be justifiably reluctant to use epinephrine because it is a powerful cardiac stimulant. However, in the case of impending death from an allergic reaction, it's wiser to treat the acute problem with epinephrine and then administer CPR if necessary. If a person is stung in an extremity, apply a loose tourniquet between the sting site and the trunk of the body. A cold pack should be applied directly on the area(s) stung. If the victim has no history of allergic reactions to stings, an antihistamine such as Benadryl[R] should be taken orally. The victim should be monitored for 24 hours to ensure that there are no delayed reactions.

Recommendations

- Anyone who has hives, breathing difficulty, or other symptoms of anaphylaxis should go to an emergency room or see his or her family physician as soon as possible, regardless of severity of symptoms.
- Early administration of epinephrine following stings whenever there is any doubt of anaphylaxis is highly recommended.
- Anyone with a history of suspected anaphylaxis should carry an autoinjector and wear a Medic-Alert bracelet.
- If you are on antihypertensive medication such as beta blockers or angiotensin converting enzyme (ACE) inhibitors, be extra cautious; these medications increase the likelihood and severity of anaphylaxis from a hymenopteran sting. Consult a physician at once if you are on either medication and sustain a sting or have a history of severe reactions to stings.

Literature Cited

Zull, D.N. 1992. Anaphylaxis. In: Schwartz, G.R.; Cayten, C.G.; Mangelsen, M.A.; Mayer, T.A.; Hanke, B.K., eds. Principles and practice of emergency medicine, volume II. 3rd ed. Malvern, PA: Lea and Febiger: 1920-1928. ■

Free Fire Equipment Catalog Available

National Fire Fighter Corporation's newest catalog (cover shown here) is available for the asking. Published in conjunction with the company's 47th anniversary, the 106-page catalog features wildland and industrial firefighting equipment and suppression systems.

To receive a free copy, write National Fire Fighter Corp., 2511 West 5th Street, Eugene, OR 97402 or telephone 1-800-423-8347. The e-mail address is natlfire@forestnet.com.

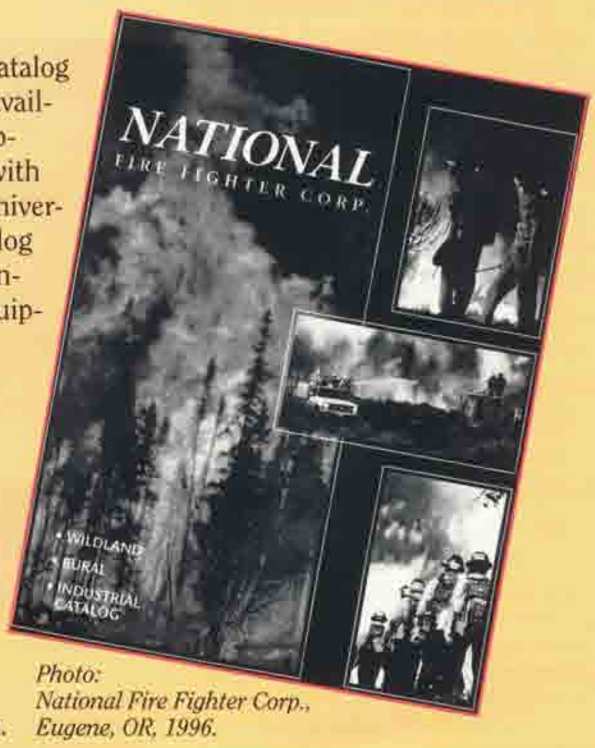

Photo: National Fire Fighter Corp., Eugene, OR, 1996.

Hondo Fire Emergency on the Information Superhighway

James E. Stone

Within hours after the Hondo Fire started on May 5, 1996, near San Cristobal and Taos, NM, the neighboring town of Lama was burned through. Some structures remained, but many were destroyed. Families in nearby Red River and portions of the town of Questa were evacuated. Before this incident was over, about 2,000 individuals were displaced or evacuated from their homes, and portions of some highways were closed to all but local residents and fire traffic.

Once the Nation's media learned about the devastation, it wasn't long before the entire country was aware of the Hondo Fire. Information officers from various agencies, stationed in the supervisor's office on the Carson National Forest in Taos, were accessible to the media and the community. The national, interagency incident command (IC) team, located near the Hondo Fire, held daily briefings for the community and escorted media representatives to the fireline. In addition, the IC team organized tours for and provided information to a variety of people including Jim Lyons, the Under Secretary of Agriculture for Natural Resources and the Environment, and New Mexico's Governor Gary Johnson, Congressman Bill Richardson, Senator Jeff Bingaman, and Senator Pete Domenici's staff.

James Stone is an audiovisual production specialist for the USDA Forest Service, Intermountain Region, Information Systems and Technology, Ogden, UT. For the Hondo Fire described here, he was one of the interagency fire information officers.

Now, and in the future, the Information Superhighway can be used to send and receive important communications during wildland fires.

Of course, there was no one more interested in the events than the evacuees themselves and their friends and neighbors. No matter how much information was reported, they seemed always to want more details about this multifaceted incident.

Enter the World Wide Web

Less than 24 hours after the fire began, the La Plaza de Taos Telecommunity (an intra-community network in Taos, NM, that shares information of local interest via the World Wide Web) received an electronic message asking why their "Web site" carried nothing about the wildfire in the area. In 45 minutes, the La Plaza Telecommunity responded by establishing the "Hondo Fire Emergency Information Web Site."

Managing Director Patrick J. Finn and his 14-member telecommunity staff quickly contacted their neighbors—the fire information officers—who were nearby (across a parking lot). While the information

Forest Supervisor Leonard Lucero of the Carson National Forest briefs Jim Lyons (left), Under Secretary of Agriculture for Natural Resources and Environment, and Sarah McCourt, Lyon's special assistant for communications, at the Hondo Fire near Taos, New Mexico. Photo: Lester Swindle; State of New Mexico; Energy, Minerals, and Natural Resources Department; Santa Fe, NM, 1996.

officers provided a great deal of pertinent material, the La Plaza Telecommunity did not stop with just one source of information. Soon they had established various "pages" on their Web site such as "Breaking News from KTAO Radio, Taos," "Forest Service Fire Report Updates," "Road Information," "National News Reports," and "Support and Assistance Information."

Finn explains, "We strongly believe in collaborating with public agencies to disseminate emergency and disaster information." The first day online, the Telecommunity's "assistance information" included the fact that a local bank had already received $1,700 in the just-established Hondo Fire Fund. Also the page could alert the global community of evacuees' requirements in messages such as the following: "Sandwiches, diapers, baby food, boxes, packing tape, and ice are needed, but enough clothing has already been received, thank you."

Various community people used the Web site's message page to post informative notices as well as requests for information—sometimes these users were searching for specific individuals who couldn't be located.

By close of business May 9, the Web site had received over 5,000 "hits" (number of times various users accessed the page). People owning property in the vicinity—including those who were on vacation or on business halfway around the world—thanked the Web site for providing information they would not have received otherwise. Property owners who at the time of the fire were in Japan and England said, "If it had not been for the Web site, I would not have known my home was threatened."

Web Use—Now and in the Future

Fire suppression efforts began early and earnestly after the Hondo Fire was discovered about noon on Sunday, May 5, 1996. Incident Commander Gary Loving from the Apache-Sitgreaves National Forest and his national incident management team were quickly on the scene to oversee what eventually became a total of 30 fire crews. They also supervised a variety of aircraft that moved people and cargo, delivered fire retardant, or made strategic observations.

As the accompanying article makes clear, the day after the fire began, people around the world could get specific information about individuals and property involved in any way with this disaster. It is apparent that in the future, the Information Superhighway can play an important communication role during wildland fire disasters.

Emergency Communication Services Evolve

Most of us know that in the past when conventional communication lines have been severed, other kinds of communication links evolve. For instance, during the 1964 Alaska earthquake, amateur radio operators provided the communication link and secured "ham" radio's emergency information niche in the world.

By providing the Web site for crucial information during the Hondo Fire near Taos, NM, the La Plaza Telecommunity has no doubt secured Internet's role for the future.

Welcome to the Information Superhighway

La Plaza started from "scratch" on this disaster. Because of a pressing need, they set up a Web site that was invaluable to the community. They are now maintaining a skeleton "disaster web" for future use. Pages will include a list of public service contacts. Finn says, "The La Plaza Telecommunity will continue to collaborate with public agencies such as the Federal Emergency Management Agency and the National Weather Service to disseminate information—depending upon the nature of the disaster." For more information on setting up a disaster home page, contact Patrick J. Finn at (505) 758-1836, or La Plaza's home page at http://www.laplaza.org.

The Forest Service's home page at the national office in Washington, D.C., has a fire section, where general information on those fires significant to a national audience is posted. That Internet address is http://www.fs.fed.us.

For additional information from the author of this article, contact him via his e-mail address—jstone@konnections.com. ■

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