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# Fire Management Notes

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An international quarterly periodical devoted to forest fire management.

United States Department of Agriculture

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## Contents




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# New Jersey, April 1963: Can It Happen Again?[1]

**Joseph Hughes**

*Assistant State Firewarden, New Jersey Fire Service, Trenton, NJ*

Whenever New Jersey residents discuss large forest fires, the discussion invariably ends up with what happened in April 1963. As a boy of 14, I remember seeing the headlines and later while traveling to the shore that summer, viewing mile after mile of blackened woodland and burnt foundations.

After I came to work for the New Jersey forest fire service, I was fascinated by the horror stories—tales of a living hell with sheets of fire and houses bursting into flames from the radiated heat. And then there were the acts of heroism, such as the removal of a TV antenna from the tail of a forest fire drop plane that flew too low and the acts of folly, such as the dispatching of useless hook and ladder trucks from Philadelphia. Many of those present during the fires have said that they have never seen anything like it, either before or since. It must have seemed as if the whole world was on fire!

As a firewarden I worry what I would do and how I would react if ever faced with a similar situation, In the last few years, noticing all the development in the South Jersey area, I wonder what would the loss be in terms of human life and damage to improved property if a forest fire disaster of a similar magnitude happened today.

The purpose of this case study is to take a look at what actually happened during April 20-22, 1963. What were the preconditions leading up to the event. What was the damage, and finally what we might expect to happen if a similar series of fires occurred today.

**Weather Conditions**

New Jersey, along with most of the East, had experienced severe drought conditions prior to April 20, 1963. The spring had been exceptionally dry and windy, thus far. Only an average of 0.30 inch of rainfall had fallen in April, and the total since March 20 at the Lebanon Experimental Forest was only 0.57 inch. The precipitation deficit had been 3.00 inches for March. Precipitation for April was already 2.00 inches below normal when April 20 dawned bright, clear, and exceptionally dry. The Build-up Index (Cumulative Drying Factor) was recorded at 115, and the relative humidity was 23 percent at 10 a.m.

In addition to the dryness, wind conditions played a primary role in the havoc that followed. At 9 a.m., wind speeds in a wooded area near the ground were clocked at 12 miles per hour. However, in openings and above treetops velocities averaged 30 to 40 miles per hour with gusts of more than 50 miles per hour. Not only were velocities high, but the winds were extremely turbulent. Many small whirlwinds developed. Sand and dust storms were prevalent throughout the Delaware Valley wherever plowing or land clearing operations had left soil unprotected.

Prevailing wind directions during the day shifted from northwest to west, back to northwest, then finally shifting to almost north that night. Winds shifted as much as 90 percent within a few minutes.

The turbulent and high velocity winds were caused by the passage of a dry cold front. Later studies of weather records at the Philadelphia Weather Bureau indicated the presence of a low level jet wind over the

Figure 1—*Developers in previously wilderness areas of New Jersey often continue to ignore the potential for damage from wildfire.*

[1]Adapted from the magazine New Jersey Outdoors, Mercerville, NJ.

**Figure 2**—*Wildfire in wildland/urban interface area of the New Jersey Pine Barrens.*

Philadelphia and South Jersey area on April 20.

Dry and windy conditions combined to make the burning index at Apple Pie Hill Tower 200, highest ever recorded in New Jersey; fire weather conditions were the worst possible.

**Origin of the Fires**

Several of the fires that reached major proportions started as early as 9 a.m. The cause of the largest fire, which burned 76,000 acres, is well documented. Three fires started between Ongs Hat, Pemberton Road, and Lower Mill in Pemberton Township, Burlington County, between 9 a.m. and 1 p.m. as the result of local blueberry growers burning debris. Permits had been banned and announcements made in newspapers prohibiting burning. However, fires that had been held over in dry fields from the previous day rekindled. Strong winds removed a covering of sand and fanned the smoldering embers to life! The first of these fires broke out at 9:50 a.m. A strong suppression effort by ground crews, water tankers, and a drop plane operating out of Coyle Field held the fire in check. However, second and third fires broke out in the early afternoon from adjacent properties. These additional fires, combined with winds of 40 miles per hour and the fact that the plane had been pulled off to fight fires in the Hammonton area, were more than the few tankers and hand crews could handle.

By 8 p.m. the head fire hit the Jersey Central Railroad near Bullock, covering a distance of 9 miles in 6 hours, or a sustained average forward rate-of-speed of 1.5 miles per hour. However, ground crews and personnel at the scene reported short runs that may have approached 4.5 miles per hour.

As the day progressed numerous other fires began to break out throughout the State. Many of the fires burned into the night and through the next day without containment or control. Needless to say, State, county, and municipal firefighting forces were overwhelmed. Reports of large amounts of structural damage began to come in, and some deaths were reported.

Many outside communities, wanting to help in whatever way possible, sent all kinds of equipment and volunteers. As mentioned earlier, hook and ladder and street cleaning trucks came from Philadelphia. Unfortunately, these just added to the chaos and confusion. One volunteer fireman was killed when his truck ran into a State truck in the smoke of Route 72, near Coyle Field, on the 76,000-acre fire.

A total of 28 major fires (fires of more than 100 acres) burned on April 20 along with 51 smaller fires, making a total of 79 fires for the day. Damage figures were estimated at 183,000 acres burned, the single worst day for forest fires in New Jersey since record keeping began in 1906. Damage to improved property was estimated in the millions of dollars, but it would be months before the damage was completely assessed. Moreover, the worst fire disaster in the State's history did not end on April 20.

When April 21 dawned, all of South and Central Jersey was under a thick layer of smoke. Firefighters were tired, having worked throughout the night, but most fires were still burning out of control. The problem was compounded by fires continuing to break out. Twenty-six new fires occurred on April 21, including two major fires in Gloucester County—one in Monroe Township that began at 11:30 a.m. and burned 500 acres, and one in Milville Township that began at 2:05 p.m. and burned 160 acres.

Fires continued to burn throughout the second day. However, the wind finally abated. Crews began to make headway; several fires were contained or brought under contol.

On Monday, April 22, there were 22 new fires including a 400-acre

*Major fires in New Jersey on April 20, 1963*

| Location | Start time | Acres burned |
|---|---|---|
| **Division A—North Jersey** | | |
| 1. Lebanon Township, Hunterdon County | 9:00 am | 150 |
| 2. Warren Township, Somerset County | 9:30 am | 100 |
| **Division B—Central Jersey** | | |
| 1. Jackson Township, Ocean County | 9:54 am | 1,200 |
| 2. Berkeley Township, Ocean County | 10:00 am | 700 |
| 3. Jackson/Frenchhold Township, Monmouth & Ocean Counties | 10:28 am | 4,480 |
| 4. Brick Township, Ocean County | 10:45 am | 600 |
| 5. Old Bridge Township, Middlesex County | 12:13 pm | 275 |
| 6. Stafford Township, Ocean County | 12:30 pm | 190 |
| 7. Jackson Township, Ocean County | 12:30 pm | 14,000 |
| 8. Pemberton Township, Ocean County | 12:30 pm | 1,900 |
| 9. Pemberton, Woodland, Manchester, Lacey, Stafford & Barnegat Townships, Ocean & Burlington Counties | 12:45 pm | 74,475 |
| 10. Jackson Township, Ocean County | 1:08 pm | 11,300 |
| 11. Marlboro/Old Bridge Townships, Middlesex County | 2:15 pm | 2,000 |
| 12. Howell Township, Monmouth County | 2:38 pm | 800 |
| 13. Evesham/Medford Townships, Burlington County | 3:15 pm | 575 |
| **Division C—South Jersey** | | |
| 1. Clayton Township, Gloucester County | 9:00 am | 1,900 |
| 2. Mullica Township, Atlantic County | 9:20 am | 11,500 |
| 3. Franklin Township, Gloucester County | 9:45 am | 600 |
| 4. Buena Township, Atlantic County | 10:50 am | 12,600 |
| 5. Monroe Township, Gloucester County | 11:00 am | 2,700 |
| 6. Winslow Township, Camden County | 11:15 am | 2,215 |
| 7. Lindenwold/Gibbsboro Townships, Camden County | 12:10 pm | 260 |
| 8. Monroe Township, Gloucester County | 12:30 pm | 2,000 |
| 9. Alloway Township, Salem County | 12:30 pm | 1,000 |
| 10. Hamilton Township, Atlantic County | 1:00 pm | 4,160 |
| 11. Hamilton Township, Atlantic County | 1:15 pm | 15,000 |
| 12. Hamilton/Egg Harbor Townships, Atlantic County | 1:20 pm | 14,500 |
| 13. Egg Harbor Township, Atlantic County | 4:20 pm | 1,250 |

*Damage to improved property caused by fires in New Jersey on April 20, 1963*

| | | |
|---|---|---|
| 186 Houses damaged or destroyed | 3 Churches | 3 Hunting club buildings |
| 191 Outbuildings (sheds, barns, garages, chicken coops) | 2 Sawmills | 23 Vehicles |
| 12 House trailers | 1 Bar/restaurant | 2 Blueberry fields |
| 5 Camp buildings destroyed, 1 damaged | 1 Government office building | 45 Acres of cranberries |
| | 1 Laundromat | $70,000 Pulpwood value |
| | 1 Gas station | |

one in Franklin Township, Gloucester County, and a large jumpover from the 13,000-acre fire burning in Buena Township, Atlantic County, which consumed an additional 5,500 acres and threatened the town of Mixpah before being brought under control.

On Monday night, rain began to fall. The worst was over. Only two new fires occurred on April 23.

During the 3-day period, there were a total of 127 forest fires, 31 of which reached major status. The acreage burned was 190,300 acres. Nearly 4 percent of the entire land area of the State was burned during the 3-day ordeal. Twenty-eight percent of the entire forest acreage burned in the Northeastern States in 1963 occurred in New Jersey.

It was several months before all the damage estimates were in. As the figures came in a grim total emerged. Damage estimates ranged from 1.5 to 9.5 million dollars! A total of 404 structures had been damaged or destroyed. Worst of all, seven persons had been killed including a family in Jackson Township, and the fireman previously mentioned.

**Prognosis for the Future**

It's now been 24 years since April 1963. What has happened in that span of time? The woods have grown back in places. People have built new homes where the previous ones burned down, much as people will return and build on a barrier island right after a hurricane has leveled everything. In addition to what was there originally, there has been major development in the Central and South Jersey areas previously burned and in adjacent, equally hazardous areas. Many residents have forgotten about 1963 and those new to the area may be unaware that such a disaster ever occurred.

What would happen if a similar fire occurred in the South and Central Jersey area today? Just taking inflation into account would increase the damage to improved property to $60 million. A new home that sold for $12,000 to $15,000 in 1963 costs at least $85,000 today. In addition, the $5,000 summer cottages of years ago have been replaced by year-round $100,000 estates.

None of this takes into account the increases in development or population. It was estimated by a former section warden, now division firewarden, that if a fire similar to the one that burned 14,500 acres in Hamilton and Egg Harbor Townships in 1963 and destroyed 12 houses then broke out today, 100 homes would be lost. If a similar multiplier is applied across the board, the loss would approach 1,500 homes with a total estimated value of over $112 million.

It should be emphasized that estimates are just that . . . estimates! It is impossible to tell what would happen with any degree of accuracy because there are so many variables and so many things have changed. However, I think it can be said with some degree of certainty that if a similar disaster occurred today it would be much worse, and damage estimates would be considerably higher than in 1963.

The stage is set. Two of the three critical factors are already present:

- Highly hazardous wildland fuel.
- Numerous human ignition sources.

Weather is the third critical variable. Conditions need only be similar to those on April 20, 1963, for a major wildland fire to occur. ■

**Figure 3**—*Wildland firefighter at work.*

# Forest Service Property on Loan

**Francis R. Russ**

*Property management specialist, USDA Forest Service, Fire and Aviation Management, Washington, DC*

For over 30 years the USDA Forest Service has loaned Federal property to the State Foresters for fire protection on State and private lands. Most of the property obtained by the Forest Service is excess to the needs of other Federal agencies, primarily the military services. Because the property has been obtained from excess property channels, it is usually called excess property, although that term is technically incorrect. Technically, it is Forest Service property on loan; however, using the term Federal Excess Personal Property (FEPP) is a hard habit to break.

**Authorization**

Congress has determined that there is a national role in the protection of State and private lands from wildfire. The loan of Federal (excess) personal property to the State Foresters partially redeems that responsibility. The Federal Property and Administrative Services Act of 1949, as amended, and the Cooperative Forestry Assistance Act of 1978 authorize and encourage the loan of Federal property to our fire cooperators. The Act of 1949 specifically states that the Forest Service must keep title (ownership) to the property. One of the advantages of Forest Service ownership of the property is that the State Foresters do not have to pay the required 25 percent of the acquisition cost of the property to effect the transfer.

There is a cooperative agreement with the 50 States and the territories of Puerto Rico, the Virgin Islands, Guam, the Northern Mariana Islands, in order that this unique relationship between the Forest Service and the individual State Foresters is understood by all parties. This agreement spells out the terms and conditions of the loan of Forest Service property. One of the conditions is that the property must be managed and accounted for like any other Forest Service property. Rarely does this stipulation cause any problems.

However, there have been several misunderstandings about this arrangement by people outside the program over the past 30 years. One such misunderstanding is the confusion over the terms surplus and excess. Excess is property that is no longer needed by the owning Federal agency, whereas surplus is property that is no longer needed by the *entire* Federal Government. Property in this program is excess and continues to be owned by the Federal Government and is used to perform a Federal role, the fire protection of State and private lands. People may see the State Foresters using Federal property and assume the property has been given or donated to the State (surplus), whereas it is actually on loan (excess).

**What the Forest Service Loans**

Most of the property loaned to the State Foresters is obtained from the military and with a little modification is ready for fire protection. Most popular are all-wheel-drive cargo trucks. These vary from 1/4-ton jeeps to 5-ton, 6- and 8-wheel-drive vehicles. The Department of Defense is now purchasing fewer military-type vehicles in favor of more standard, commercial vehicles. The commercial vehicles are not as sturdy, but more economical to maintain.

There are many modification plans for vehicles available. Some of the best and most popular plans come from the Roscommon Equipment Center (REC) in Roscommon, MI. This facility is funded by the 20 Northeastern State Foresters, primarily for the development of designs for "excess property." The REC is staffed by Michigan Department of Natural Resource Personnel at their forest fire experiment station.

Currently, there are detailed modification plans for all major models of military trucks. These plans are available for use from your State Forester. State Foresters in need of REC modification plans may contact their Coopertive Fire Protection person in the Forest Service regional or area office.

Some of the items acquired through the excess property program in addition to vehicles and aircraft themselves are parts and specialized tools. The Forest Service acquires rope, chain, plate, bar and channel steel. The metals are especially important for making tanks and for reinforcing vehicles to make brush busters. Metalworking machinery, such as lathes, drill presses, grinders and welding equipment, are needed as are nuts, bolts, welding rod, files, and a host of other items.

Radios, protective clothing, medical supplies, hose, canvas, bulldozers, generators, compressors, and pumps are some of the items needed to keep a good fire organization operational. In short, there are not many items that Federal agencies dispose of that cannot be used in State fire protection programs.

Trucks are very important to fire protection; so too are aircraft. There are currently over 200 aircraft on loan to State forestry agencies. Most are small, single-engine, fixed-wing planes used for aerial detection. There are some larger twin-engine planes that have been modified to serve as air tankers; some are used for hauling cargo. There are also a number of helicopters for transporting firefighters or for use with helicopter buckets. Many of these aircraft came from the military, some from the Forest Service, and a few from other civilian government agencies. Another source of supply for aircraft is confiscation and seizures made by the Drug Enforcement Agency, Customs Service, and other regulatory agencies in the Departments of Justice and Treasury. Confiscated boats, trucks, automobiles, and other items are also available through the seized property program.

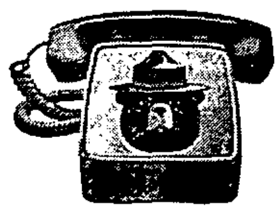
**Rural Fire Departments**

Forest Service property on loan to the States can be used by the State or the State may assign vehicles and other fire accessories to fire departments having rural or wildland fire responsibilities. Before a piece of equipment is assigned to an RFD (rural fire department) a cooperative agreement detailing the terms of conditions of assignment must be implemented. The agreement will address such items as license tags, liability insurance, required training modification restrictions and timetables, painting, decals, and conditions of use. Some States modify the vehicles for fire use and paint them before assigning them to an RFD. Other States require the RFD to prepare the vehicle for service. Both arrangements can work quite well.

In some communities, a FEPP vehicle is the only fire protection available. The vehicle modification and fire house are funded by local fundraising activities such as bake sales and pancake breakfasts. The local gas station owner may also be the fire chief and own the only welding equipment in town, and, with help, will repair the truck, mount a tank and pump, paint it, and direct training and fire operations. ■

*Army cargo truck modified for fire use, on loan to Texas State Forester from USDA Forest Service.*





# Satellites Sense Rangeland Wildfire Hazard

**Donald Westover and Frank Sadowski**
*Respectively, fire coordinator, Nebraska Forest Service, Lincoln, NE, and contractor from TGS Technology, Inc., working for U.S. Geological Survey*

Each day, one or more National Oceanic and Atmospheric Administration (NOAA) satellites, passing over Nebraska, beam back to receiving stations on earth an enormous amount of information about what they sense below. The Nebraska Forest Service has been investigating the possible use of some of this information to evaluate the fire danger on range and grasslands in the State. Dryness of grasses and other vegetation has an obvious effect on how easily wildfires can start and how fast they spread. Dryness, in turn, is related to the greenness of the vegetation. It is this greenness factor that can be calculated from satellite measurements.

The satellites that gather and transmit this information are polar-orbiting weather satellites operated by NOAA. The advanced very high resolution radiometer (AV HRR) sensor on board these satellites acquires data by measuring the Earth's reflectance from units of ground that are called pixels. Pixels directly beneath the satellite cover a ground area of 1.1 kilometers (about 2/3 mile) square. The satellites make north-south passes on a daily basis and scan a path about 1,500 miles wide from an orbital altitude of 517 miles. This means that not only Nebraska, but also the entire Great Plains region from Canada to Mexico is covered on a single daily overpass.

Digital values for each pixel (Nebraska is represented by about 173,000 pixels) are transmitted from the satellite to ground receiving stations and assembled into image format, with each pixel properly located within the image. These values can then be mathematically transformed to values that relate to the relative greenness of vegetation. State and county lines can also be superimposed on the image. These images then become maps that show the greenness of vegetation in each county (fig. 1).

A joint study has been conducted by the Nebraska Forest Service and the U.S. Geological Survey's Earth Resources Observation Systems (EROS) data center (EDC), located in Sioux Falls, SD. The purpose of the study was to determine just how effective satellite imagery can be for assessing fire danger on Nebraska's grasslands. The data transformation and image making was handled by EDC. As a part of the procedure, scientists removed some unwanted data from the images. These data were associated with clouds and the shadows they cast on the earth's surface. The presence of such features in the data would have altered the greenness values of the terrain. For this reason all pixels associated with these unwanted influences were removed from the study maps. Because the study was designed to assess the greenness of natural range and grassland, row-crop farming regions were excluded from the data. Center-pivot irrigation fields, interspersed throughout much of Nebraska's grassland, were also removed from the data. Previous satellite imagery of higher resolution had been used by The

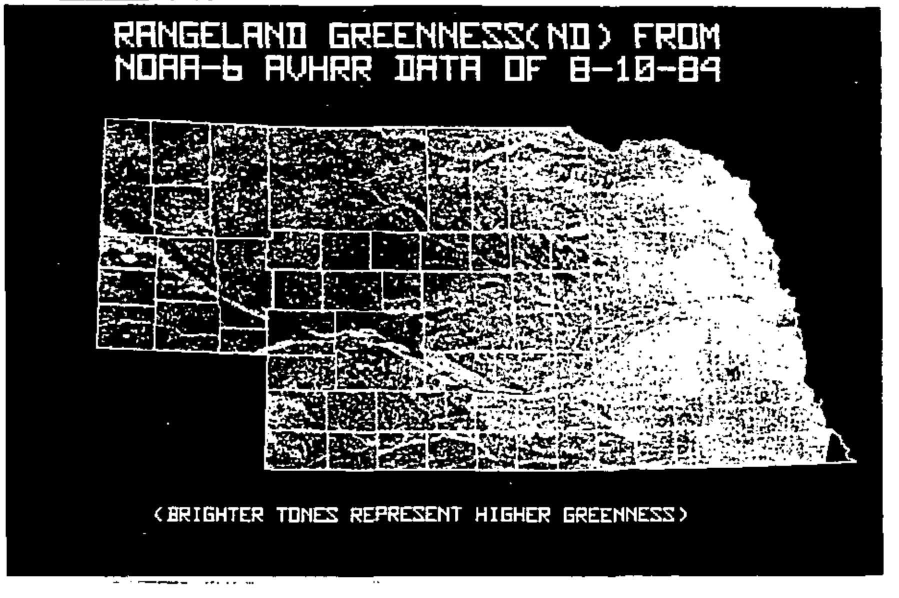



**Figure 1**—*AVHRR greenness conditions for the State of Nebraska on August 10, 1984. The varying levels of brightness in this image serve to differentiate areas of actively growing green vegetation (brighter tones represent higher greenness). The brightest tones correspond to the very green agricultural regions. Note the relatively low greenness of the rangelands in central and western Nebraska at this time of year.*

University of Nebraska to map the location of these center-pivots. Therefore scientists at the EROS data center were able to easily remove the pixels containing center-pivots from study maps. Finally, water bodies and urban areas were removed from the data. What remained in the study maps were large expanses of grassland varying only in the greenness of the vegetation.

While acquiring data from the satellites during the 1984 growing season, researchers traveled to many areas across the State and made ground observations of the greenness of the vegetation. Field data were compared with satellite data from overpasses that occurred at the same time as the field visits. Findings showed a high correlation between satellite greenness values and the actual greenness observed from the ground at specific locations.

To Nebraskans these observations could mean a significant improvement in the fire danger warning system currently in use in the State. Presently the National Weather Service office in Omaha calculates, for the Nebraska Forest Service, a daily fire danger category for the various regions of the State. This fire danger is based on vegetation greenness and four forecasted weather factors: temperature, relative humidity, cloud cover, and windspeed. When the fire danger forecast is in the "very high" or "extreme" categories this information goes out over the wire service for use by radio stations and civil defense offices. Thus farmers, ranchers, and travelers hear the messages and, presumably, are extra cautious on those days when fire danger is critical.

Past research had shown that the present fire danger rating system, using ground determined greenness, performed very well when compared with the actual wildfire history in Nebraska. That is to say, on days when the fire danger was rated "extreme," more fires really did occur, and "very high," "high," "moderate," and "low" categories had correspondingly fewer and fewer wildfires. Information on historical wildfire occurrence was readily available as the Nebraska Forest Service is the State agency responsible for collecting wildfire data from all local fire departments in Nebraska. Data about each wildfire reported since 1970 is stored in a computer and can be retrieved easily for study.

The real test for satellite-determined greenness would be to use those observations to replace the ground-determined greenness component of the present fire danger rating system. During the next phase of the study, researchers computed average satellite greenness values for specific regions in the State for several time periods in the years 1981 and 1984. They then gathered historical weather data for the same time periods and, using the historical satellite greenness values, recalculated the fire danger on each day in each region. Fire dangers were calculated for each of 270 test days in the 2-year period. The number of days that fell into each of the five fire-danger categories was then determined, as were the number of fires that actually occurred on those days. When the number of wildfires per category-day were compared for the two methods of computation, the results showed similarly increasing rates of fire occurrence for fire-danger categories of greater severity.

These results suggest that satellite-determined greenness can be directly used in computing fire-danger categories in the future. It appears that people concerned with wildfire prevention will no longer need to be limited by grassland greenness information obtained on the ground. By utilizing AVHRR data from NOAA satellites much more information will be available statewide for monitoring greenness conditions (fig. 2) at regional, county, or even more local levels of jurisdiction without the high cost of time and travel associated with data acquisition on the ground.

Some work still needs to be done to allow for faster turnaround of data coming in from the satellites. Today's satellite data are not available for instant use because it takes time to get the digital data from the earth receiving stations and then to transform the data into usable form. Greenness data needs to be fairly current (less than 5 days old) during the spring and fall when greenness of the grass is rapidly changing. For this reason real-time or near real-time data will be important for accurate fire-danger warnings to the public. Experts believe that the timeliness problem will be easy to overcome when the decision is made to use satellite data on a regular basis. There is even greater potential for other users to share data for various uses. Having a group of users would also reduce the cost of data acquisition to each user because some of the costs could be shared. Sometime in the near future you may hear a wildfire-danger warning that was built, in part, from data gathered by a satellite and beamed back to earth users below. ■

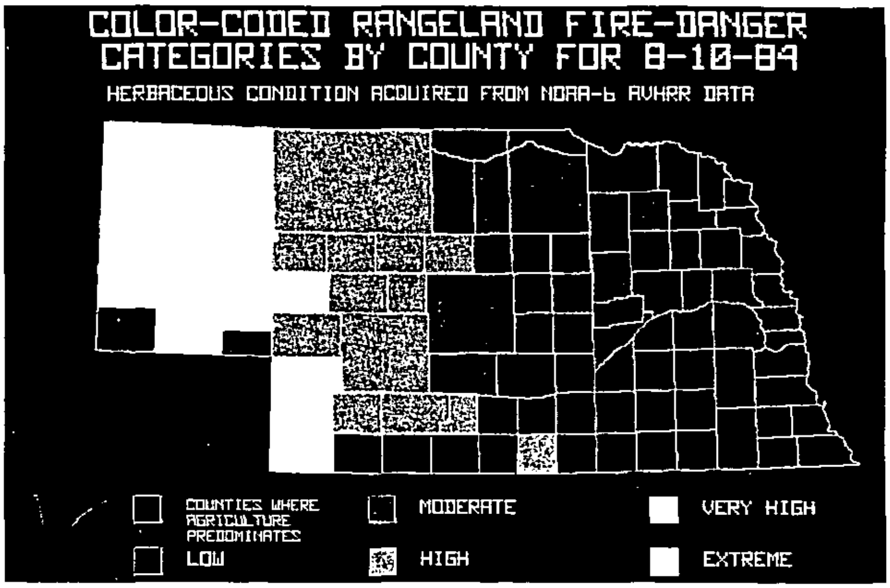



**Figure 2**—*Example of fire-danger categories computed at the county level from range land greenness conditions that existed on August 10, 1984.*

# Wisconsin's Smokey Bear

**Daniel J. Heath**

*Forester-ranger, Wisconsin Department of Natural Resources, Mercer, WI*

In August 1950, William S. Carow, district ranger at Mercer, WI, had been requested to enter a float in the Fireman's Convention Parade to be held in Hurley, WI. He wanted something different. After some discussion, it was decided to create Smokey Bear on a float in a praying position. However, Carow was unable to find a mounted bear that adequately depicted Smokey's friendly nature. The decision was made to construct a Smokey for the float.

Frank Brunner, a conservation aid at Mercer, was given the job of making the bear. Frank constructed a wood frame that was covered with a bear hide and a head carved out of a cedar post. This praying Smokey was placed on the float in front of other stuffed animals under a sign that carried the words, "And please make people careful. Amen." The float and the message resembled the Smokey Bear poster of 1948.

After the parade, Bernard Klugow, fire control dispatcher at Mercer, suggested that a Smokey costume be constructed. Klugow supervised the construction of the Smokey costume with the help of Neil Long, taxidermist, Ada Hart, secretary at Mercer, and Frank Brunner. Smokey's first appearance was in Wausau, WI, on September 28, 1950, in the Logging Congress parade. After that parade, the costume was used at schools, county fairs, and other gatherings to promote fire control.

The first Smokey costume had some features that needed

**Figure 1**—*Smokey Bear head created in Wisconsin in 1950.*

improvement. To start with, the costume was constructed without the traditional ranger hat, and the head was small. New Smokey costumes were constructed with various improvements, and after some time the old suit went out of use.

As Smokey's 40th birthday approached in 1984, Dave Sleight, fire control assistant at Mercer, felt that something special should be done in Wisconsin. Dave started contacting some of the older fire control employees trying to track down the original costume. He finally found it in the fire control central warehouse in Tomahawk.

The costume was returned to Mercer where Sleight and John Bernier designed a display case that was constructed with the help of the Mercer High School vocational class. After the display was completed, the first Smokey costume made the rounds again, still spreading the word on fire prevention.

Today, when the display is not on the road making appearances at schools, shopping centers, and county fairs, it's once again at home in the Mercer Ranger Station. ■


**Figure 2**—*Current Smokey Bear costume.*

# Is the Skidgine the Suppression Tool of the Future?

**Howard Roose**
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Huson, MT*

The skidgine[1] is a rubber tired skidder with a removable, pump-operated, 278-gallon water tank and a 6-way angle blade (fig. 1). During the 1986 fire season, the skidgine was tested by the Lolo National Forest for effectiveness on several wildfire incidents. The skidgine was contracted for on an Equipment Rental Agreement; it was felt that the initial price could be lower on the next agreement. The following is the rate paid for the skidgine and lowboy:

1. Skidgine $95.00/hour (includes operator)
   $70.00/hour Standby
   $560.00/day Minimum daily guarantee
2. Lowboy $50.00/hour (includes operator)
   $35.00/hour Standby
   $280.00/day Minimum daily guarantee

Figure 1—*The skidgine with the 6-way angle blade attached and the operator working the live reel.*

The skidgine was developed by Felco Manufacturing, a Montana-based company that has applied for a patent on the machine.[2] The machine is proving to be a highly versatile fire suppression tool. It provides greater capability and more mobility than 4-wheel-drive engines and results in less harm to the environment than conventional dozers, particularly on steeper slopes.

The water tank is designed to fit between the rear fenders (wheel wells) of the skidder and is pulled up tight to the back of the machine by the mainline (fig. 2, 3). Once in place, the tank is secured on top with a short piece of cable and on the bottom with two safety chains, one on either side. Because the tank

Figure 2—*The water tank mounted on the skidder. Note safety chain located at the bottom right corner of the tank. The hose that feeds the live reel has been modified since this picture was taken.*

[1]Name provided by the author to describe a rubber-tired skidder with tank and blade.
[2]Patent applied for by Harlin Ockler, Huson, MT.

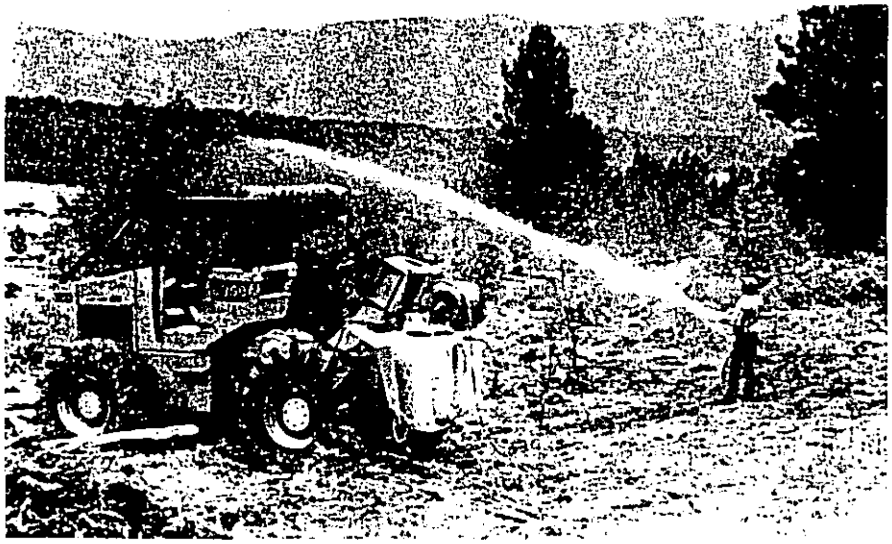

Figure 3—*The water tank fits up against the arch to stabilize weight distribution and prevent side-to-side movement.*

In addition to the internal pump, the tank is fitted with a mounting bracket for an external pump.[3] The external pump is designed to fit on top of the tank. Also located on top of the tank is an additional 3- to 6-inch fill port.

The external pumping capability allows for greater versatility in delivery of a water supply. The tank can be dropped off and operated independently while the machine is operating elsewhere on the project. This feature provides an added dimension of flexibility and extends the cost effectiveness of the machine.

From initial observations of the machine at work, several modifica-

is attached at the top with a short piece of cable, the operator is free to use either the mainline or the winch should the need arise. The tank has an internal baffle system that prevents water movement and maintains stability over uneven terrain. The tank is also fitted with an internal pump that supplies water to the live reel or to a separate 1.5-inch gated wye. The gated wye allows the system to accommodate the need for additional hoselays. The pump is powered by the hydraulic system on the skidder. Located at the rear of the tank is a suction hose fitting that allows the tank to be filled from a local or remote water source.

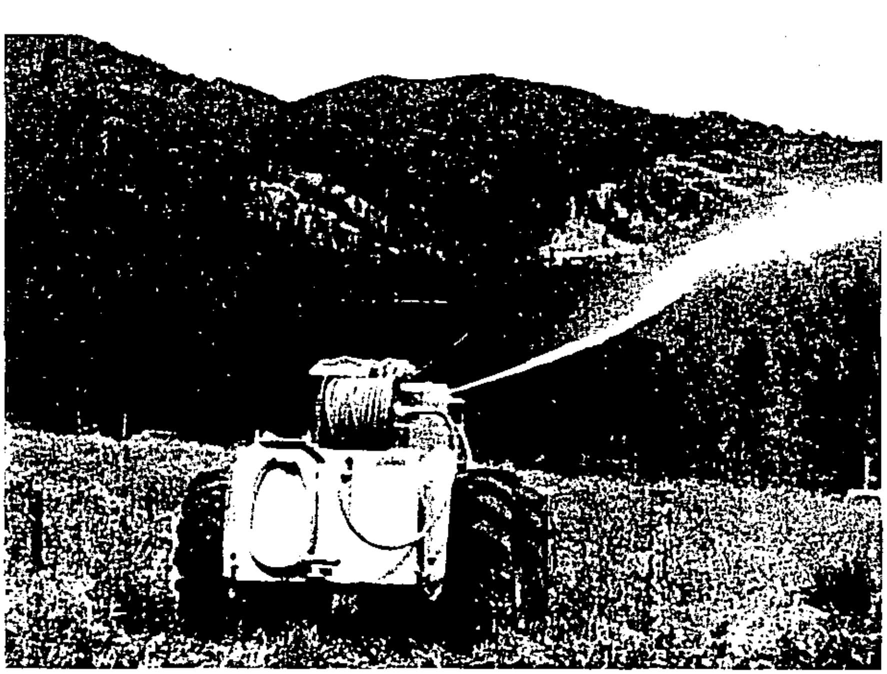

Figure 4—*Note the coiled suction hose on the back left side of the tank; the external suction port is located in the bottom middle of the tank.*

[3]Current design is for a Wajax Pacific Mark III.

tions were made that further improved overall performance:

1. The line that supplies water to the live reel was rerouted so that it is better protected.

2. A backup warning device has been installed to provide warning to those working around the machine.

3. A power rewind for the live reel was added, using the hydraulic system of the skidder.

It is important to note that the 6-way angle blade adds a great deal of capability to the machine's effectiveness on steep slopes. Without the 6-way angle blade the machine is inherently light on the front end and is limited to slopes of less than 35 percent. With the 6-way angle blade attached, however, the machine's effectiveness extends to 55-percent slopes.

On incidents during the 1986 fire season, the machine proved to be a very effective tool for mop-up. It reduced the number of personnel needed and freed up engines so they could be available elsewhere for initial attack assignments. Due to its mobility the skidgine could move quickly from one hot spot to another. The increased mobility eliminated the need for hoselays that are often costly to retrieve and refurbish.

The author feels this machine can be very effective in a wide variety of situations. With other attachments (such as the McKee Foot[4]) the machine could be successfully operated in a variety of fuel types. The machine can be further adapted to accommodate many needs. The water handling capability of this machine, in conjunction with its ability to construct fire line, move quickly, and manuever with little impact, promises to provide a safe, cost-effective suppression tool for the future. ■

[4] An attachment for building fire line that fits on the bottom edge of a dozer blade.

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# New Technology Highlights Another Busy Fire Season for BIFC

**Arnold F. Hartigan**

*Public affairs officer, Bureau of Land Management, Boise Interagency Fire Center, Boise, ID*

The 1985 fire season set a number of new logistical support records for the Boise Interagency Fire Center (BIFC), which then proceeded to break some of those records during 1986's extremely severe fire season. To cite just one example, the Bureau of Land Management (BLM) equipment maintenance section at BIFC repaired or refurbished more than 40,000 hand tools, double the number in 1985.

**How the Season Went**

The 1986 fire season began with the Southeast and parts of the Southwest suffering severe drought. By March 840,000 acres had already burned in the Southeast. April saw a 100,000-acre increase in fire activity and a corresponding increase in requests for assistance through BIFC; more than 500 firefighters and 10 aircraft with assorted other resources were dispatched. Fire activity moderated in the Southeast and Southwest in May and June, but by late June it had picked up substantially in the interior of Alaska. Lightning ignited fires that burned hundreds of thousands of acres in Alaska, and BIFC dispatched 37 large air transport flights, carrying more than 700 firefighting personnel and support equipment, including remote automated weather stations and satellite communications systems.

July was a relatively quiet month, but in early August a storm front, moving across Oregon and Idaho, ignited hundreds of lightning fires in those States. During this month the West experienced 916,805 lightning strikes, nearly half of which were dry lightning. One such lightning storm on August 10 ignited more than 500 fires in southeastern, southwestern, and central Idaho. Northern California, Nevada, Utah, and Montana were all hit with lightning fires, but Oregon and Idaho suffered the most damage from this lightning onslaught. During August, more than 750,000 acres of forest and rangeland burned in the Pacific Northwest. Major fire complexes burned for more than 3 weeks on the Wallowa-Whitman National Forest in eastern Oregon and the Boise National Forest in southwest Idaho before wetting rains fell over most of the area in early September. The second week of October saw a flurry of activity as strong easterly winds east of the Cascades pushed several slash fires into escaped status: BIFC dispatched 800 firefighting personnel and 5 aircraft to the Pacific Northwest Region to provide assistance.

Overall, in 1986 there were 85,740 fires reported to BIFC for a total of 2,718,823 acres burned nationwide. In 1985, 82,591 fires were reported and 2,896,147 acres burned. An indication of the severity of the past two fire seasons comes from noting the 1980-84 5-year average. The annual average for this period was 18,171 fires reported to BIFC for 1,046,051 acres burned.

**The August Push**

Although considerable fire support activity occurred nationwide throughout the fire season, the major demand for resource support occurred in the Pacific Northwest during August. In 1985, BIFC set a record by moving more people over a broader geographic region in a shorter time than ever before—close to 17,000 firefighters in less than 2 weeks. BIFC broke that record in 1986 by moving more than 14,000 firefighters from throughout the United States to the Pacific Northwest in less than a week! More than 20,000 hand tools were refurbished in August alone—more than in all of 1985. A total of 9,000 firefighters were processed through BIFC, with 2,500 being housed overnight or longer (fig. 1).

**Space-Age Fire Communications**

A new switch was added to wildfire communications in 1986—the operational use of computers tied together by satellite earth stations. Computers facilitated faster and more accurate transmission of data between remote incident command posts and agency dispatch operations. Two different satellite earth station systems were used. In one, the satellite earth stations were both uplinks and downlinks, in the other, the remote fire camp uplink fed a permanent satellite dish in Denver, CO. The satellite data were then fed

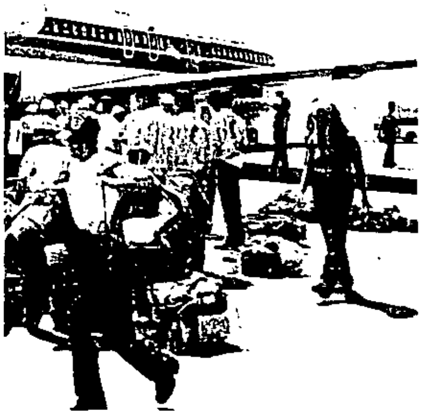


**Figure 1**—*A few of the thousands of firefighters who were processed through BIFC during the 1986 fire season.*

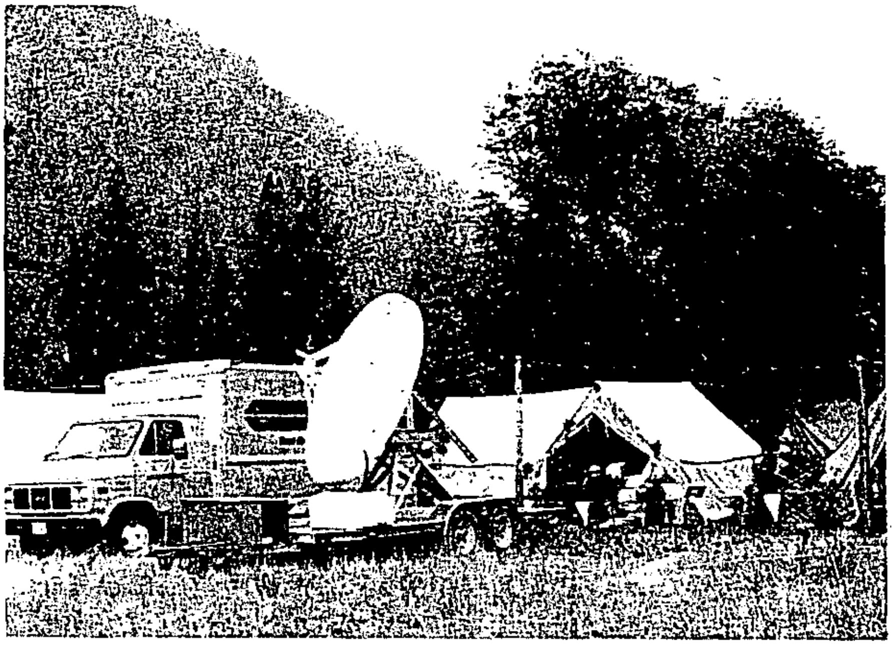


**Figure 2**—*Satellite dishes in fire camp increase the speed and accuracy of communication.*

via landline to the dispatch office in Boise, ID. The new satellite earth stations can feed voice and information simultaneously, ensuring far more rapid and accurate resource ordering than was possible before (fig. 2).

**More Resources Ordered Than Ever Before**

In addition to the 40,000 hand tools mentioned in the beginning of this article, BIFC's warehouse dispatched more than 3,500,000 pounds of supplies to fires nationwide, as well as processing 3,400,000 pounds of returns. Fire support services provided more than 25,000 meals to firefighters being staged through Boise, and the BLM transportation section at BIFC drove its fleet of buses and trucks more than 237,000 miles, carrying firefighters and supplies to and from the six States surrounding Idaho. Close to 400 all-terrain fire engines were dispatched through the BIFC, along with 112 air tankers. The aircraft desk dispatched 152 helicopters and BIFC-assigned aircraft transported 650,000 pounds of supplies. More than 40,000 firefighting personnel were transported on large air transports dispatched by BIFC; the BLM's contract Boeing 727 flew more than 207,000 miles in 1986, the equivalent of 64 transcontinental flights. ■

**Figure 3** — *Computers were used to transmit data quickly and accurately.*

# Fire Management Training in International Forestry

**James H. Perkins and George A. Roby**
*USDA Forest Service, respectively, district timber management officer, Six Rivers National Forest, Orleans, CA, and National Forest System liaison officer, Washington, DC*

United States fire management agencies have been involved internationally in fire management for many years. The United States and Canada have a bilateral "mutual aid" agreement for the suppression of fires on or near the international border. In 1986 the Chief of the Forest Service signed a bilateral agreement with Mexico for interchanging training opportunities and technology.

In recent years there has been an increase in participation by the United States in fire suppression requests from countries with whom we do not share mutual borders. These requests have included assistance on fires in the Dominican Republic, the Galapagos Islands in Ecuador, and Costa Rica. Reports from these international fire assignments have consistently indicated a need and desire for fire suppression training.

There have been other types of fire management interchanges with Australia, Portugal, Spain, Chile, some African nations, and the Soviet Union. The United States has reciprocated and sponsored visitors from numerous countries. There is a continuing demand from other countries to learn what works effectively in the United States and to find out what we can do to assist them in developing or enhancing their own fire management programs. The training programs for Latin America may be the most effective assistance programs that the USDA Forest Service and the U.S. Agency for International Development (USAID) have been involved in.

**International Wildfire Suppression Course**

The international wildfire suppression course offered at the National Advanced Resource Technology Center (NARTC). In Marana, AZ, in October 1983 was the first of its kind in the world. The course came into being as a result of a request for a team to assist in the suppression of a fire in the Dominican Republic in February 1983. In lieu of a fire team, George Roby, of the Fire and Aviation Management staff of the USDA Forest Service, Washington, DC, was sent as an advisor. During the post-fire review between Roby and Dominican Republic officials, a course for training in fire organization and suppression was requested. This request was carried back to Washington. It was immediately realized that it would not be cost effective to train only a few people, and the idea was put forth to offer training to other developing nations that had similar needs.

The trip to the Dominican Republic was the seed that germinated into the international wildfire suppression course that ultimately trained 60 participants from 20 countries. The 3-week course was designed and developed by six Forest Service people with foreign experience. The course was assembled in 6 months with the help of 16 instructors and conducted entirely in Spanish! The course was sponsored by the USDA Forest Service and USAID. The National Park Service donated an instructor as did NOAA, sending an instructor from the fire weather service in Boise. Three instructors from the Chilean Forest Service also participated. This course was followed by two additional international courses—Marana, AZ, in 1984 and Santiago, Chile, in 1985. Much interest and enthusiasm has been generated through these courses, and several countries have requested support for courses in their own countries that could focus on their particular needs.

**Fire Management Course in Argentina**

The international wildfire suppression course has met the general needs of countries whose fire management programs are either nonexistent or struggling. Some countries discovered that the course, though advanced, was too general and that they required training more specific to their needs. Courses have been offered in Ecuador, Argentina, and Venezuela. Because a tremendous amount of the initial lesson plan development was written for the first international course, subsequent courses have required a minimal amount of developmental time. A course offered in Buenos Aires, Argentina, in the fall of 1986 is an example of what is required of an international course (fig. 1).

The fire management course for Argentina was born from a fire management program evaluation performed by two fire management specialists in the United States in spring of 1985. A need for a fire management training course that would focus on the needs of Argentina was identified, and the report recommended that a course be developed. Through this report and subsequent communications with the Argentine Forest Service, IFONA, basic training needs were identified. The idea for a course was supported by USAID and the USDA Forest Service. A team of U.S. training specialists with Latin American experience was assembled in Marana, AZ, in August 1986. The course agenda was developed and training assignments were made. Because the Argentines were unable to send a representative to the Marana meeting, a U.S. representative was sent to Buenos Aires to coordinate instructor assignments, help select a training site, confirm the training schedule, and select a tentative controlled burn site.

At the Marana meeting a tentative instructor cadre was developed. In developing the cadre two very important criteria were used—strive for an international cadre and use as many trained Argentine instructors as possible. Experience has shown that the use of instructors from participating countries adds credibility to the courses even though all of the involved U.S. instructors can communicate in Spanish very well. The cadre eventually consisted of four instructors from the United States, two from Chile, and seven from Argentina (fig. 2).

Finding and developing quality training sites in a country unaccustomed to training in the fashion that the U.S. does is difficult. Argentina was no exception. Having adequate numbers of wall outlets with plugs to match was no small task. Trying to get a video machine that could be utilized without a "specially trained technician" to push the buttons and load the machine was impossible. Great efforts were made to have compatible (VHS) video cassettes. Our undoing was that the screen configuration in Argentina turned out to be different from that in the United States.

Figure 2—*Raul Molina, instructor from Chile, shows students the proper way to use a device designed to detect wildfires.*


Figure 1—*Students and faculty who participated in the international fire suppression course held in Argentina in the fall of 1986.*

In addition to facilities, customs and habits need to be considered. One of the more difficult problems to overcome is the eating schedule of the host country and how to successfully incorporate it into the training schedule. Whereas we in the United States are accustomed to a 30-minute lunch, the one-hour lunch programmed into the schedule was not considered adequate. The most difficult barrier, however, was the duration of the day. Very few participants were accustomed to training in the first place, much less to as rigorous a training course as the one offered. Obtaining and then holding the attention of course participants for 8 or 9 hours per day was a major challenge.

**Course Objectives**

Objectives for a course of this nature depend on one's point of view. For the United States it was to encourage cooperative efforts between Argentine natural resource agencies and to support a training course that was unique to Argentina's situation. The Argentines, on the other hand, were hoping to use the course as a crucial first step in qualifying personnel for various fire management activities (fig. 3). They also wanted to use it to focus attention on a very serious fire problem that had received very little attention.

The results were gratifying. Argentina had the satisfaction of having sponsored a course and successfully completing it with few major problems. They gained an important ally at the Minister level from the Secretary of Science and Technology, which could prove to have lasting benefits. They have also initiated a process that could change the way they presently do business. There are now trained personnel throughout the country that can begin the slow, tedious process of rewriting wildfire related legislation, implementing training programs, and advancing the development of fire management programs at the national, provincial, and local level.

Figure 3—*Students receiving field instruction in the use of fire tools and the construction of fire line.*

The U.S. participants also accomplished their objective. More important perhaps are the intangible benefits gained from an international course. The U.S. has gained respect for the work that it is doing internationally in fire management. It is looked to as a leader in this field. For those involved in international training, this recognition is very satisfying. There is renewed interest in cooperation between countries where before there was little or none. One of the greatest benefits is the very large support network on an international level. Fire management people are trading training, experience, and technology through contacts initiated at the various international courses.

**Training Results**

Results of wildfire suppression training have created a "ripple effect" in Latin America. There have been new initiatives for additional training sponsored by Latin American organizations, and disaster management cooperation has been strengthened among countries. Key accomplishments of this training have included:

- Chileans and Argentines have shared each other's instructors for in-country training programs.
- Representatives from Mexican firefighting agencies have returned home and conducted similar training for large numbers of students.
- Chile has provided assistance to Argentina during a wildfire emergency.
- Participants have returned home and prepared mutual aid agreements involving a variety of emergency management agencies and organizations.

The future looks especially promising as plans are underway that will continue to foster improved levels of international cooperation through the catalyst of wildfire training. ■

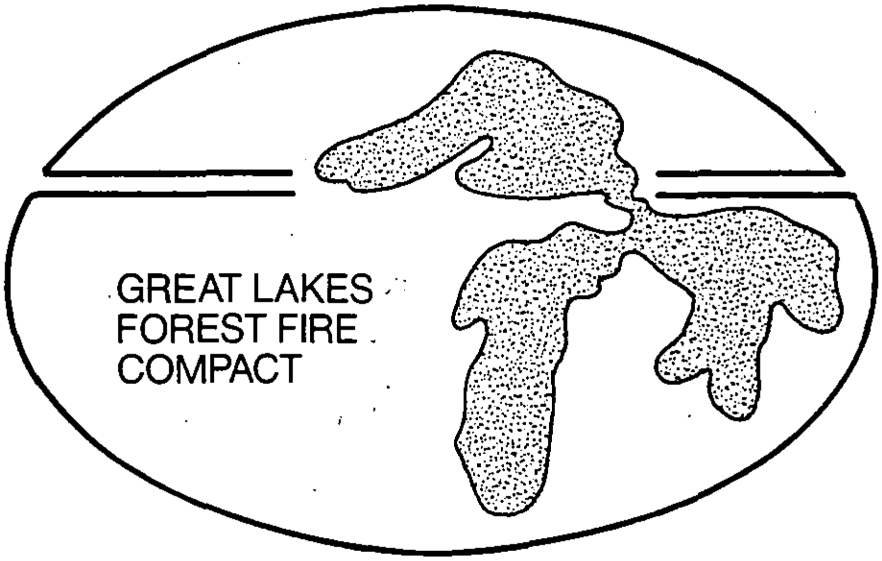
# Great Lakes Forest Fire Compact

**Don Grant and Art Sutton**

*Respectively, State fire supervisor and State fire prevention specialist, Michigan Department of Natural Resources, Lansing, MI*

On October 10, 1983, fire managers from Minnesota, Michigan, and Wisconsin met in Wakefield, MI, to review the need for a Great Lakes Forest Fire Compact. The conclusion reached at this session was to support the organization of a compact. The State Foresters strongly supported the fire managers and agreed on the need for a Great Lakes Forest Fire Compact.

The State fire managers requested the support of USDA Forest Service State and Private Forestry in working through the development of an agreement. Strong and effective support was given and continues to be provided.




At the first meeting, the State fire managers felt that it would be very beneficial to the compact if Ontario were a member. The chairperson of the fledgling compact made contact with Ontario managers and found a keen interest. At the next annual meeting, held in Minnesota, Ontario sent two representatives to observe and review the objectives of the compact. A strong commitment was made by Ontario. Once joint Federal legislation has been completed they will be able to sign as full members. The Ontario representatives have been very effective participants and have provided assistance in the development of the compact and in work with committees.

At Sault Ste. Marie, Ontario, in September 1985, Michigan, Wisconsin, and Minnesota signed the agreement, and the Great Lakes Forest Fire Compact was officially established. The purpose of the compact is to provide for the effective prevention, presuppression, and control of wildfires in the Great Lakes region. The cooperative agreement provides for mutual assistance in the prevention, presuppression, and suppression of wildfires. Sharing of resources, technology, and ideas has already proven very beneficial.

Three areas that have been of most value are shared training, shared prevention materials and efforts, and shared fire research. The operation plan is still being developed for shared resources of personnel and equipment on fire suppression.

An interesting program that has been established is the exchange of fire managers among the States and the Province. The purpose is to integrate, at the field level, the fire managers so they can become aware of how other agencies deal with like problems and then return to share this information with their home State or Province.

The Great Lakes Forest Fire Compact is rapidly becoming a very important force in the protection of the natural resources of this region, and should become even stronger, with time. ■

# Excess Fire Truck Shipped to Marshall Islands

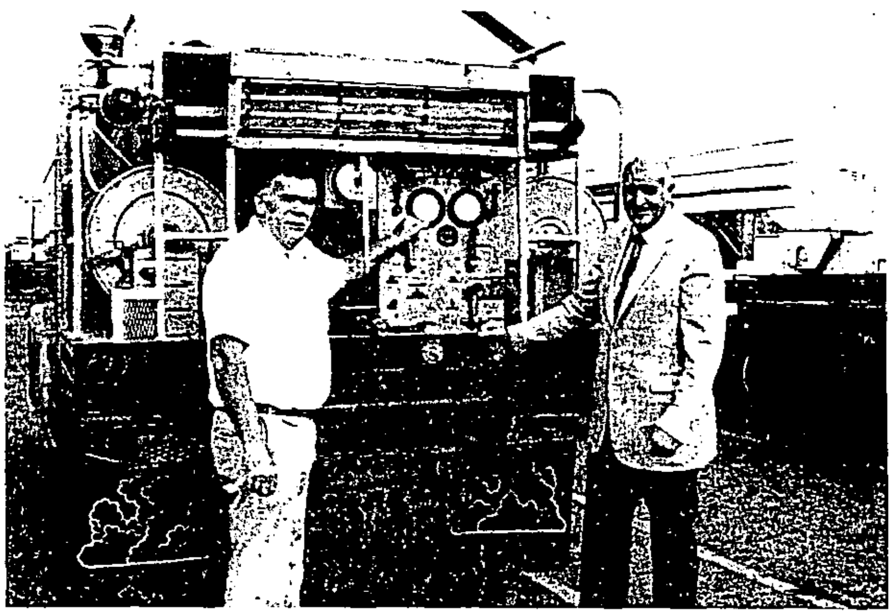
**Ben Beall**

*Leader, Cooperative Fire Protection, Pacific Southwest Region, USDA Forest Service, San Francisco, CA*

A USDA Forest Service excess fire engine was recently shipped to the island of Ebeye in the Marshall Islands. This fire engine was loaned to the island through a joint effort of the Forest Service, the Federal Emergency Management Agency, (FEMA) and the USDI Trust Territories of the Pacific Islands.

The island of Ebeye is located about 3 miles north of the island of Kwajalein, a Pacific atoll. There are approximately 8,500 people on the island of Ebeye, which is about 75 acres. The population density is among the highest in the world. And, unfortunately, most of the shelters for the families on the island are constructed of flammable materials.

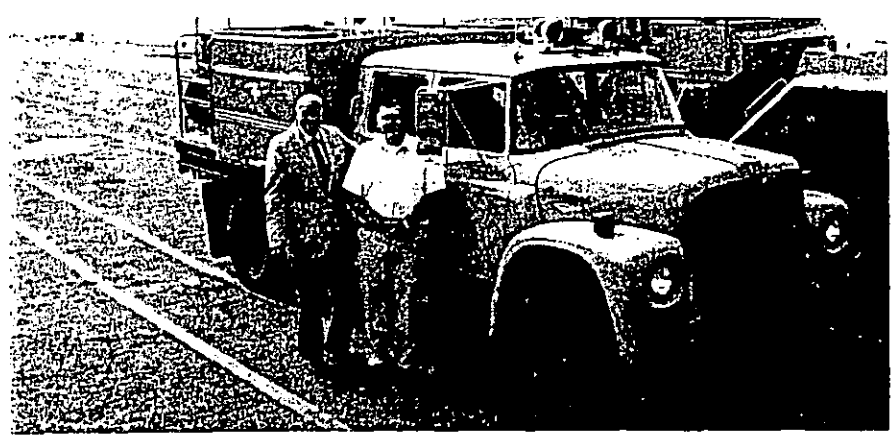
Until the excess fire truck arrived on the island, there was no fire truck or other apparatus used for suppressing the frequent fires that occurred. Mr. William Patterson, the Region IX Fire Administration Advisor of FEMA, recognized that something could be done to help the islanders. He was familiar with the Federal Excess Personal Property program administered by the Forest Service. Knowing that the Trust Territory Administrators were looking for a solution to the fire problem, Patterson got the Forest Service to talk with the Trust Territory people, and the loan was initiated.



*Fire truck shipped to one of the Marshall Islands through the Federal Excess Property Program.*

The fire engine that was shipped to the island is a Forest Service Model 51, two-wheel drive vehicle. It has two live reels, 300 gallon capacity, with an auxiliary pump capable of 70 gallons per minute at 200 psi. The Pacific Southwest Region of the Forest Service provided the vehicle through its normal replacement cycle with the Federal Excess Property Program. With some tender loving care the vehicle should provide several years of fire protection for the islanders.

Expanding the benefits of the Federal Excess Personal Property program to other islands is one of the high priorities for the fire services within the region. Several Islands and governments have expressed a desire to participate in this program. The three Federal agencies are now working to accommodate those islands based on need and potential for greatest loss to fire. ■



# Author Index—Volume 47

# Subject Index—Volume 47

## A Multilingual Glossary

A glossary of forest fire terms entitled "Wildland Fire Management Terminology" is now available. The publication contains about 1,500 terms, each with a definition in English and the equivalent term in French, German, Italian, and Spanish. This glossary was a project of the Food and Agricultural Organization of the United Nations.

The purpose of this publication is to present and define the terms most frequently used in forest fire management, as well as terms that do not appear in current dictionaries. The glossary also contains terms used in related fields such as meteorology, aviation, and structural fire protection. The glossary is 257 pages and designated FAO Technical Paper M-99, 15BN 92-5-002420-7. It costs $11.90 per copy and may be ordered from:

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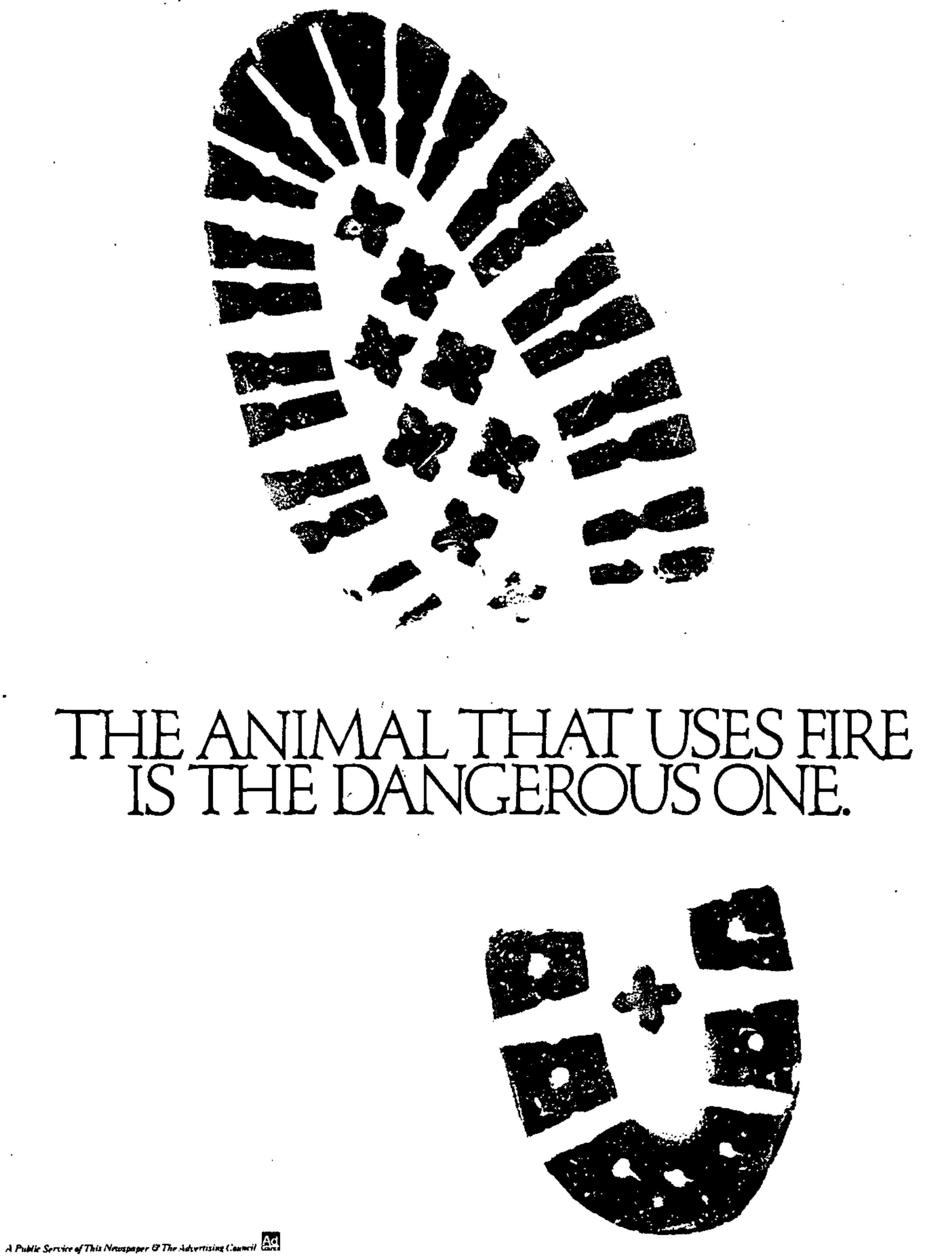
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