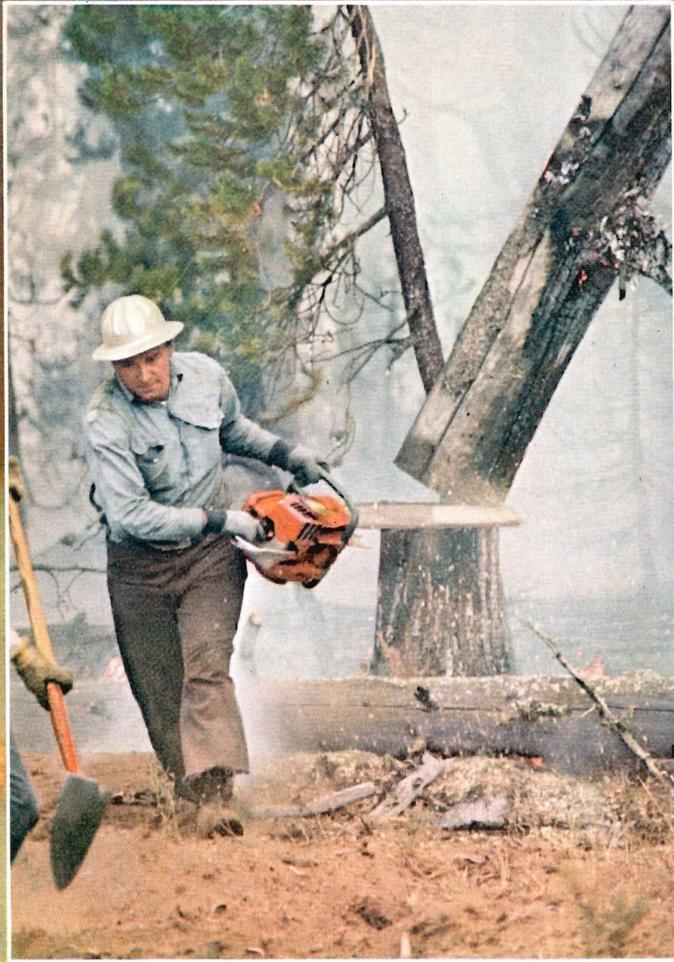




FOREST FIRE:



EKTACHROMES BY TED MAHIEU (ABOVE) AND BATES LITTLEHALES © N.G.S.

WIND-WHIPPED FLAMES, roaring like a squadron of jets, ravage 100-foot trees on a mountaintop fire line in Willamette National Forest, Oregon. Firebrands the size of pie plates shoot hundreds of feet into the air. Courageous woodsman, chain-sawing a burning snag, joins in a valiant but futile effort to halt the holocaust.

The Devil's Picnic

By STUART E. JONES and JAY JOHNSTON

National Geographic Staff



WE STOOD with the gray-haired ranger on a high ridge in Oregon overlooking a thousand square miles of forest. The night before, my *GEOGRAPHIC* colleague Jay Johnston and I had watched a particularly violent thunderstorm of the type that plagued the Northwest in the bad summer of 1967: a storm full of crackling lightning and rolling thunder—but no rain.

Now, miles away, we could see a dozen plumes marking new fires that lightning had set—igniting vegetation on the tinder-dry forest floor. Soon, if this summer's melancholy script was followed, these small fires would merge into big ones.

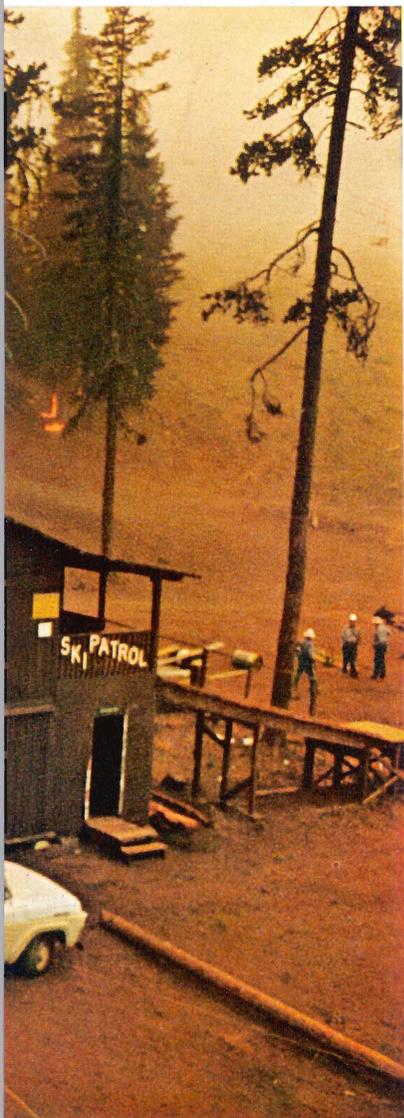
“Well,” said the ranger, “I see the devil went on a picnic again last night.”

Jay and I had come to the Northwest to write about forest fires and the ultramodern

methods by which the U. S. Forest Service seeks to control them. Virtually all parts of the United States suffer from fires each year. We chose the Northwest for our survey because it contains some of the Nation's major timber resources and has a long history of disastrous blazes. Soon we found ourselves not merely discussing fire control with experts, but actually feeling the heat and dodging the burning debris as we watched flames destroy great trees in Oregon, Washington, Idaho, and Montana (map, opposite).*

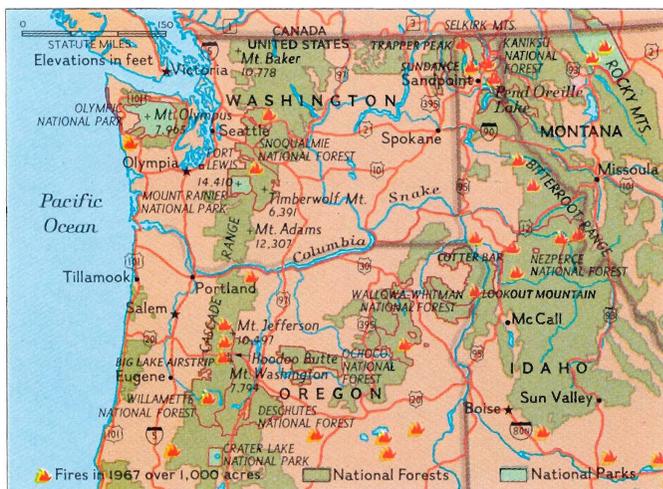
We began our on-the-spot coverage on—of all things—a ski lift. Jay and I, with photographers Bates Littlehales and Ted Mahieu, soared up the slope of Hoodoo Butte in the Cascade Range of west-central Oregon. Be-

*See “Our Green Treasury, the National Forests,” by Nathaniel T. Kenney, *GEOGRAPHIC*, September, 1956.



Doom appears imminent for frame buildings at the Hoodoo Ski Bowl near Santiam Pass in Oregon. Leaping from tree to tree, flames race along the lower slopes of Hoodoo Butte. Chain-saw crews and bulldozer operators frantically fell pines ringing the main lodge and these smaller structures. Their herculean work saved the resort for the hordes of skiers who flock here each winter. Oregon's fiercest fire in the summer of 1967, the Big Lake Airstrip blaze, as it was called, destroyed 7,700 acres of magnificent timber—ponderosa pine, alpine fir, Engelmann's spruce, western red cedar, and western white pine.

Worst fire season in recent history saw Northwest forests plagued by more than 5,000 blazes last summer. Fortunately, fire fighters confined 94 percent of the fires to ten acres or less, employing the most modern techniques—smoke-jumping, aerial chemical drops, helicopter supply flights. But some fires raged out of control for days (map, below). The largest, Sundance in Idaho, swept 55,910 acres and defied an army of 2,000. Extreme fire danger in four states—Oregon, Washington, Idaho, and Montana—caused partial or complete closing of many national forests.



EXTACHROME BY PAUL BEAVER; MAP BY GEOGRAPHIC ART DIVISION © N.G.S.

low us, and just beyond the edges of the clearing where steel towers supported the cableway, fire swept with savage fury through magnificent stands of Douglas fir, hemlock, alpine fir, and lodgepole pine.

Exploding Trees Hurl Fiery Darts

As we glided upward, our eyes began to smart. Smoke obscured the crowns of the forest giants, masked the sun, and turned the sapphire sky a cheerless gray. We could hear the popping and crackling of burning underbrush and the odd whistling sound, like Paul Bunyan's teakettle, of fire consuming billions of pine needles.

Occasionally the intense heat caused a pine to explode with a report like the crack of a rifle. Needles and bark flew through the air like flaming darts. Ted Mahieu frantically

brushed a smoldering ember from his hair.

The holocaust we were watching was threatening 1,665,979-acre Willamette National Forest, more than twice as big as Rhode Island and producer of more timber than any other national forest (pages 100-101). The Hoodoo Ski Bowl chair lift was designed for skiers and sightseers—giving them splendid views of Mount Washington, Mount Jefferson, and other peaks. But right now the chairs were carrying fire fighters—and us—to the burning summit of Hoodoo, a 5,702-foot mountain near Santiam Pass.

It was our baptism in fire fighting, and the midpoint of a long, dry season that saw a fierce epidemic of fires. In the Northwest alone more than 150,000 acres of federal timber land, plus another 91,000 in state and private hands, would be destroyed.



NATURE STRIKES HER MATCHES: *The sky blazes in fury, the earth trembles. Torrential rains spared timber from fiery death when these lightning bolts stabbed Snoqualmie National Forest in Washington's Cascades. But two weeks later a "dry" storm touched off dozens of fires. A ranger-station lookout made this 15-second time exposure from Timberwolf Mountain. Pole holds weather instruments.*



But at the same time it was an ideal opportunity to study new techniques. Men must still attack forest blazes with shovels and axes, earth and water, but science is making their job easier and quicker with a host of new tools, some of them surprising. Among those we were to see:

- **Air power.** Pilots and observers in light aircraft, supplementing men in lookout towers, spot fires early. Airborne infrared scanners provide instant maps of burning areas. Planes drop chemical retardants and parachuting shock troops; others speed crack fire-fighting crews thousands of miles to scenes of crisis. Helicopters place men and tools in

spots formerly denied even to pack mules.

- **High-speed communication.** Compact radio networks, including walkie-talkies, link fire-control commanders with crews miles away.
- **Mechanization.** In minutes, bulldozers do jobs that once meant many man-hours of labor with shovels and mattocks. Chain saws replace axes. Four-wheel-drive vehicles conquer all but the roughest terrain.

Using such advanced techniques, federal and state agencies in the past quarter century have cut the Nation's annual fire loss—in federal, state, and privately owned forests—from 30 million acres to less than five million.

One day soon computers will join the battle.

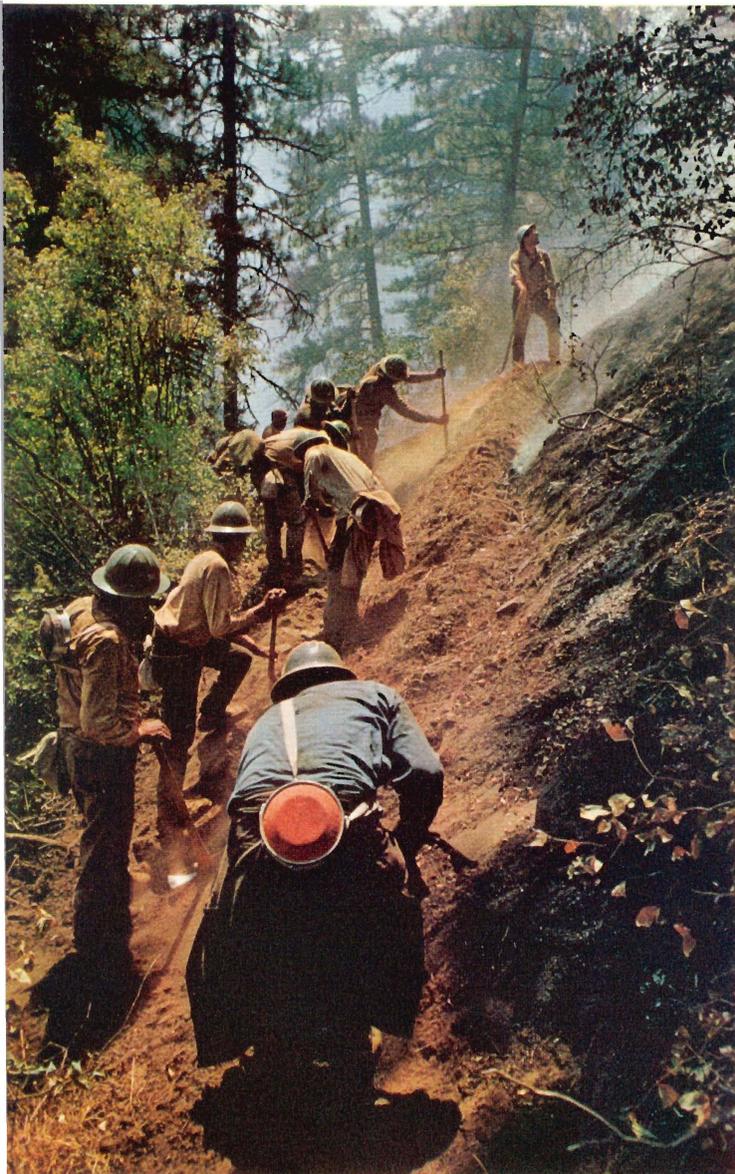
Fed data on fuel characteristics, winds, humidity, and the like, these machines will tell fire-fighting commanders when and where to deploy forces.

Now an army of some 20,000 was unlimbering every weapon in its arsenal to subdue the enemy in the four northwestern states. And we were soon to learn that even with the best of equipment, fire fighters must sometimes lose battles—and lives—before they win the war.

At the top of the butte we hopped off the chair lift and walked into a scene of organized chaos. A brisk southwest wind was blowing, and sheets of flame engulfed the tall trees while 20 fire fighters worked

Motorized muscleman of the line, a bulldozer operator carves a 12-foot-wide firebreak near Hoodoo Butte with the blade of his ponderous yellow "Cat." Employed in normal times by logging companies to cut truck roads, the cat skimmers, as they are called, risk their lives to combat fires. Roaring up and down sheer slopes, they must be ever alert for burned-through snags that crash to earth without warning.

Ankle-deep in duff, eyes watering from acrid smoke, a 25-man crew widens a line in an attempt to halt advancing flames of last summer's Cotter Bar fire in Nez-perce National Forest, Idaho.







FIGHTING FIRE, like waging war, demands a battle plan. While part of the army mops up in the burned area, the main forces of men and equipment carve 8- to 20-foot-wide fire lines. When the legions join lines in the path of the fire—over the crest of the mountain—they will contain the flames.

Smokejumpers parachute to fight spot fires in inaccessible areas.

Helicopter dumps water on snags in the burned area and spot fires outside the lines.

Fighters quench smoldering spots with water from a creek.

Shovelers smother persistent wisps of flame with dirt and ashes.

STAFF ARTIST ROBERT W. NICHOLSON
GEOGRAPHIC ART DIVISION
© NATIONAL GEOGRAPHIC SOCIETY

perilously close to them. The men, in fire-resistant orange shirts and hard hats of gleaming aluminum or plastic, feverishly shoveled earth onto burning brush.

Hours earlier, a bulldozer had scraped out a fire line—a 12-foot-wide swath a few inches deep (preceding page). In theory, with the strip cleared to bare earth, the fire's advance would halt. But the rising wind blew flames and sparks across the strip onto tinder-dry undergrowth, and here the men hurled smothering shovelfuls of earth to cool the fire and keep it on the ground.

They labored in vain. The fire was “crowning” or “topping out”—leaping from treetop

to treetop. Burning brands blew across the line faster than the men could extinguish them.

Crew boss Ward Monroe of the Forest Service, red-eyed and unshaven, looked worried. “What’s happened to that retardant drop we called for?” he asked. “We need it!”

No sooner had he spoken than we heard the drone of a single-engine airplane, saw it flash overhead, and then heard the full-throated roar of a much larger craft. A converted B-17 Flying Fortress, following the spotter plane, swooped in. From its open bomb bay—now holding four 500-gallon tanks instead of explosives—gushed a red cloud of chemical retardant, blossoming out



Low-flying plane drops chemical retardant on a section of forest ahead of the flames.

"Spike camp," an advance depot, provides food, bedding, and tools to the line crews.

Line boss directs operations by radio from a reconnaissance helicopter.

Crewmen with hand tools widen the fire line while lookouts keep watch for spot fires.

Sawyers cut burning trees on the line to fall toward the fire.

Flatbed transports a bulldozer along a forest access road from base camp to the far fire line.

WIND DIRECTION

R. V. Nicholson

like an exotic flower in the B-17's slipstream. What the bomber dropped was a paintlike mixture of ammonium sulphate (a common fertilizer) and water, with a red dye added for visibility. Clinging to trees and undergrowth, it remains wet for hours, slowing or halting any flame that may reach it. Globbs of the slurry splattered around us. Ward Monroe took stock again. "Not quite on target," he said. "I wish he had hit it square." We sensed that Monroe, who patrols and directs repair of the trails of Willamette in normal days, felt a keen personal loss as each wooded acre succumbed to the flames. Now

he decided it was time to leave Hoodoo's summit. A spot fire broke out on the north slope beneath the chair lift, which had kept running all the while, its empty chairs gliding sedately on a ride to nowhere. Bulldozer operator Bill Paetsch yelled and ran to his machine. Burning needles had ignited the seat cushion. Bill hastily beat out the flames.

Ski Trail Becomes an Escape Route

Ward Monroe yelled to his crew: "We're going to evacuate while there's still a trail open! Follow me! We'll have to run for it!" A signpost atop the butte pointed to three



Water away! With pinpoint accuracy, the pilot-bombardier of a helicopter douses a spot fire touched off by the big Trapper Peak blaze in northern Idaho. Moments earlier he had hovered over a lofty lake, lowered the drum, and filled it with 250 gallons of water. The month-long Trapper Peak fire, fought by 2,000 men, burned 16,600 acres. KODACHROME BY TED MAHIEU © N.G.S.

ski runs: Devil's Dive, Mambo Alley, and Giant Jawbone. We half ran, half slid down snowless Devil's Dive. The bulldozer clanked along behind us. Looking back, we could see Hoodoo's crest wearing a gray shroud patterned with streaks of flame.

At fire-control headquarters in the ski lodge at the foot of the butte, Fire Boss Gale Ontko told us the Big Lake Air-strip blaze, which included Hoodoo Butte, now covered 4,500 acres. He had 550 men fighting it, and flames roaring through the valley between Hoodoo and neighboring Hayrick Butte threatened the ski lodge itself. Bulldozers and chain saws toppled trees near some outlying buildings (pages 102-3).

Hot, Dry Summer Brings Disaster

But in the lodge kitchen, and in another under canvas outside, cooks calmly prepared dinner for the fire-fighting army: steak, potatoes, string beans, carrots. Heightening the resemblance to a military operation, there were also Spam sandwiches.

In a jeep we jounced up a dusty, steep six-mile road to the Forest Service's wooden lookout tower atop nearby Cache Mountain, in Deschutes National Forest. From its wind-swept platform we watched the fire moving closer. A twin-engine Douglas Invader whistled in behind a spotter plane and dropped retardant near Four O'Clock Lake. To the south, spot fires were popping out on the lower slopes of Mount Washington.

Next day, back at Willamette National Forest headquarters in Eugene, Oregon, Jay and I learned that the lookout tower had narrowly escaped the flames. (If it had been destroyed, it probably would not have been rebuilt; finding aerial reconnaissance better for fire detection, the Forest Service and state forestry departments are reducing the

Commandos of the fire-fighting forces, smokejumpers parachute to the Big Lake Airstrip blaze. Spotter in the DC-3 (below) points out the preferred upwind landing site. Wire-mesh mask on the helmet protects the jumper's eyes if he lands in a tree. Trained at the famed Smokejumper Center in Missoula, Montana, the fighters function as advance attackers.



EKTACHROME (ABOVE) BY DAVID L. ARNOLD;
KODACHROME BY BATES LITTLEHALES © N.G.S.

number of manned towers.) Still later, we heard that the Big Lake Airstrip fire had at last been controlled—but only after devastating 7,700 acres.

The time was late August. People of the Northwest hopefully awaited the rains that would end one of the most disastrous summers in the region's history. Clouds of smoke billowed over some of the Nation's most spectacular scenery, and the smell of burning wood was strong.

National and state forests were closed to camping, hunting, fishing, hiking, and logging. Travel, for the most part, was restricted to main highways through the woodlands. Older inhabitants uneasily recalled the great Tillamook Burn of 1933, when fire swept





EKTACOLOR (ABOVE) BY JAMES W. HUGHES.

Veteran of wartime bombing raids, a Douglas Invader spews chemical retardant on a small fire in Ochoco National Forest, Oregon. Dyed red for visibility, the slurry quenches flames and soaks trees and undergrowth in the path of the fire. The 25-year-old plane

267,000 acres along the Oregon coast, destroying more than 13 billion board feet of timber and raining debris on ships 500 miles at sea.

Fire in 1967 had a powerful ally: severe drought. Thanks to the Northwest's rich water resources and elaborate irrigation systems, farm crops did not suffer unduly. But people and forests did. Portland, which usually enjoys pleasantly cool summers, experienced 71 consecutive rainless days while sweltering in temperatures ranging up to 105° F.

Remarkably enough, considering the thousands of men committed to the hard, dangerous job of suppressing the fires, only three lives were lost during the season. But by the

time the last blaze was under control, the cost in timber was reckoned in many millions of dollars. With the forests closed, some mills shut down, and loggers, truckers, and other workers faced lean days.

Incalculable damage was done to watersheds, wildlife habitats, and recreational and scenic areas. Fishing lodges and dude ranches suffered from canceled reservations. The fiercest fires destroyed even the organic matter in the topsoil, and left the land prey to erosion. Ashy debris rolled down the steep slopes into streams and lakes, polluting the haunts of the Northwest's famous steelhead trout and salmon.



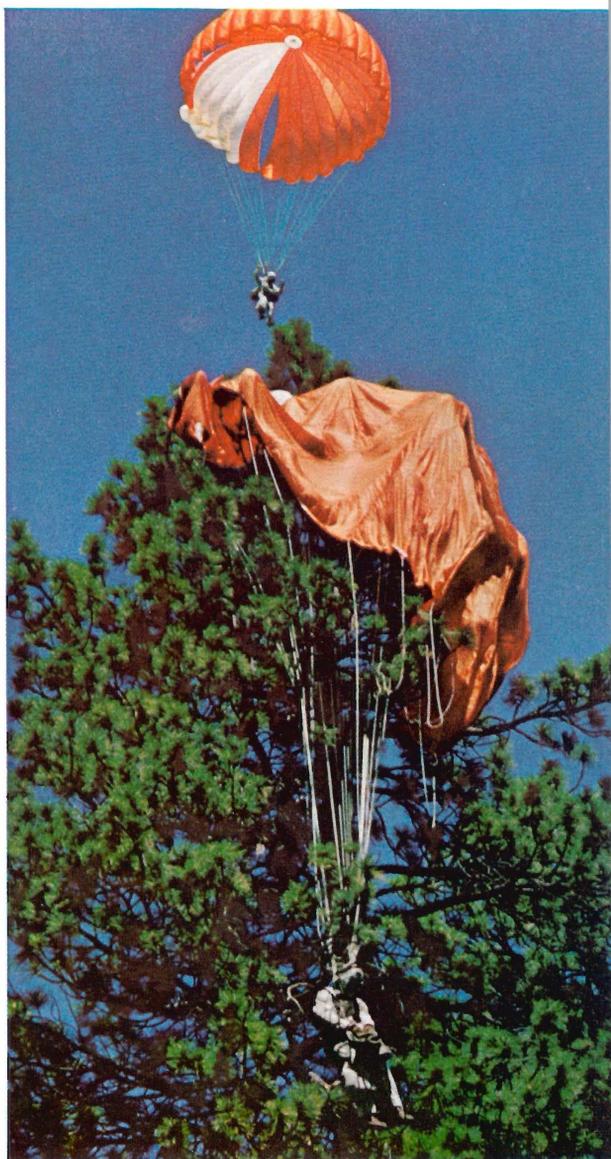
U. S. FOREST SERVICE; KODACHROME BY JAMES C. VINCENT © N.G.S.

holds 1,000 gallons of the fluid and usually unloads it in two spraying runs. Small spotter planes frequently lead tankers to their targets.

Nature, of course, in its own good time will repair the ruin visited in a single summer upon an environment that had been hundreds of years in the making. But the process of healing and regrowth is slow, and scars of the destruction Jay and I saw in Oregon's Cascades, Idaho's Bitterroot Range, and elsewhere will remain for generations.

Flames Driven by 60-mile Winds

At Willamette headquarters, we heard that a stubborn fire in northern Idaho had advanced into Kaniksu National Forest. Jay got there in time to see the largest and deadliest of the Northwest blazes. Born of lightning,



Temporarily up a tree—a 120-foot ponderosa pine—a smokejumper will rappel down a line he carries for such emergencies.

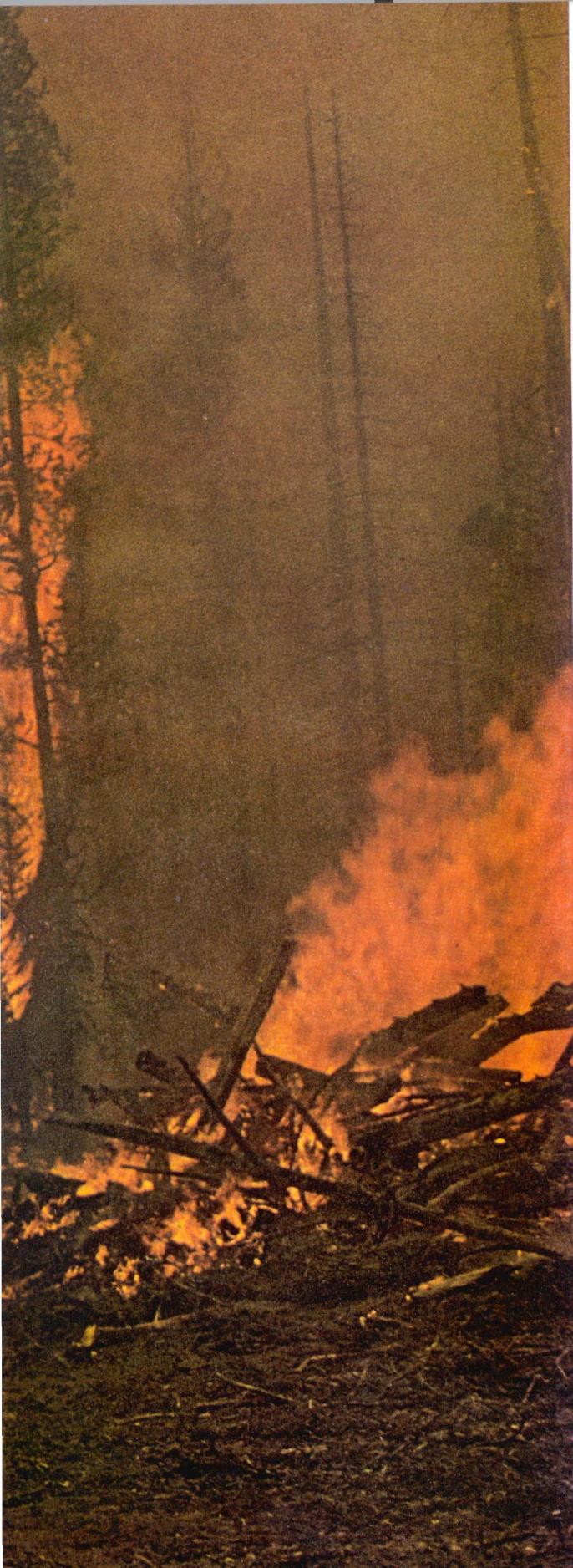
it was only a 1,000-acre fire on the flank of 6,375-foot Sundance Mountain until the afternoon of September 1. Then, fanned by winds up to 60 miles an hour, flames roared across 50,000 acres in less than 12 hours. In one 30-minute period the fire advanced four miles.

By Labor Day, September 4, the Sundance fire stretched roughly 25 miles in length, and had a perimeter of 90 miles.

"We've got 2,000 men on the lines," Rolland Saylor, of the Forest Service, told Jay, "and we've built 21 miles of fire line. Yet you couldn't call the fire contained, and it certainly isn't controlled."

Man power on the Sundance blaze included





Army and National Guard units, state forest workers, employees of the Soil Conservation Service, U. S. Forest Service "hotshot crews" from California, and youths from Job Corps camps. The Bureau of Land Management had flown in Eskimos from Alaska, and veteran Indian fire fighters arrived from Arizona and New Mexico. There were student volunteers, striking copper miners from Montana, and recruits from the skid rows of Seattle and Spokane.

Young Lookout Survives an Inferno

Meanwhile, from 6,270-foot Trapper Peak, about 30 miles north of Sundance Mountain, fire was sweeping an area of 16,600 acres. Forest Service officials were holding their breath for fear the winds would merge the two great fires into a single colossal blaze. Toiling on the Trapper Peak lines were 2,000 men.

Sundance had already claimed two lives. When the high winds whipped the fire out of control, a Forest Service sector boss and a bulldozer operator found themselves trapped in a blazing ring. Bodies of the men, suffocated, were found under the machine.

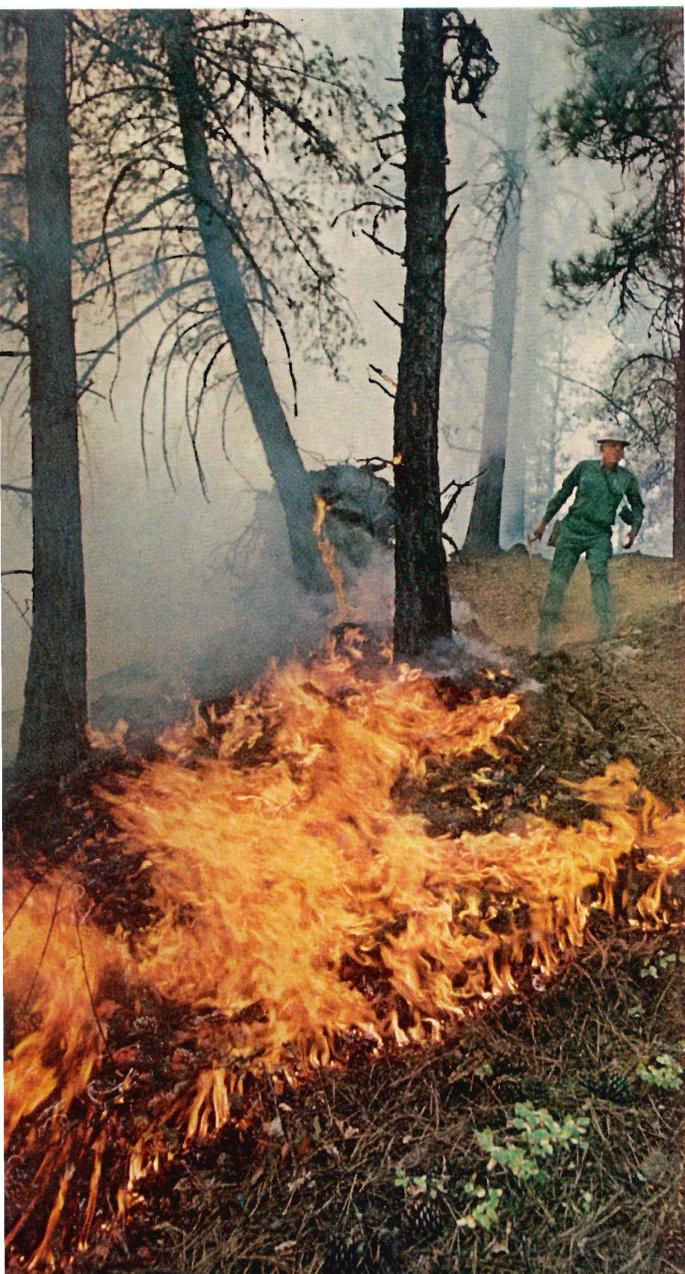
Death came uncomfortably close to 18-year-old Forest Service lookout Randy Langston, who was on the tower atop 7,264-foot Roman Nose when the Sundance blaze mushroomed. It was his first summer on the job, and he had spent it keeping his eyes on a 360-degree sweep of lordly forests and emerald lakes high in the Selkirk Mountains. He reported daily by radio to Gene Napier, a fire-control officer at Kaniksu headquarters in Sandpoint. Every two weeks he received supplies by pack mule.

That Friday afternoon Randy noted rising winds and saw smoke and ashes blow past the tower. Soon, after making calculations with map and alidade—an instrument for determining direction

Like Roman candles, evergreens explode as flames sweep upward through dry needles in Willamette National Forest. Fire fighters do not attempt the impossible; they know that a grove "topping out" cannot be saved. Man with a hand torch will start backfires in an effort to make the blaze burn in upon itself and thereby spare other threatened trees.



EKTACHROME (BELOW) BY BATES LITTLEHALES; KODACHROME BY DAVID L. ARNOLD © N.G.S.



—he reported, “The fire is about six miles away.”

Napier immediately ordered Randy to pack his light personal gear and a portable radio and start hiking down the mountain. A truck was dispatched to meet Randy on a jeep trail a few miles from the tower. He never reached it.

“About a mile and a half down,” Randy said later, “I saw the first flames. I called Gene on the radio. He asked if I thought I could make Pothole Lake, a few miles from the base of Roman Nose.

“I told him no, I didn’t think so, so he told me to go back to the mountaintop and get out on a big rockslide near the tower. I climbed the tower and carried down some of my heavier gear and dragged it out on the rocks. The flames were so close to the tower that I couldn’t stay there any longer.

“The rock shelf had an overhang, and I wedged back under it as far as I could. Flames began roaring over it. I saw blazing branches as long as my arm fly past the overhang and down into the forests around the Roman Nose Lakes. They set a couple of dozen spot fires.”

Every 15 minutes Napier called Randy on the radio. About midnight he looked up and back over the rock overhang and reported to Napier that the whole east side of the mountain had burned. Miraculously, the tower still stood on its concrete base. Next morning a helicopter plucked Randy, unharmed, from the summit of Roman Nose.

The Sundance fire shattered the usual tranquillity of Sandpoint, a

Flames gnaw at the heart of a majestic 150-foot western white pine in Idaho’s Selkirk Mountains. A sector boss on the Sundance fire makes a cautious inspection. Minutes later, he posted signs warning that the giant would soon crash.

Ravenous red tide devours tinder-dry underbrush in Nezperce National Forest. Shovel in hand, radio on hip, a shouting crew boss orders his men to smother the ground fire before it ignites the trees.

lumbering town of 5,000 beside Pend Oreille Lake. On Labor Day weekend, Jay Johnston found it in turmoil. Fort Lewis, Washington, had sent 375 Army troops in 55 trucks, six ambulances, and five mobile kitchens to camp at the fairgrounds. Military police wrestled with giant traffic snarls.

Alaska Eskimos Lend a Hand

Tables were at a premium in Connie's Cafe. A sign behind the counter advertised "Motorcycle Races, Rain or Shine." Scrawled blackly across it was "Canceled Due to Fire."

By 5 p.m. Monday the Sundance fighters had hacked a line all around the fire except for four miles on the eastern side. Near Hellroaring Creek five 24-man crews of short, dark fire fighters labored to close that gap—sawing, chopping, digging, shoveling. They strongly resembled American Indians, but they were not. They were Eskimos from

Chevak, a tiny riverside fishing village near the Bering Sea (below).

A dozen such crews had flown from Alaska to help fight the fires. For most of the Eskimos, it was their first trip "outside," their first look at horses and cows.

Frank Ulroan, the Chevak crew leader, spoke good English.

"The first question everyone asks us," he said, "is 'How do you like it here in the Lower Forty-Eight?' We tell them, 'It's too hot.'"

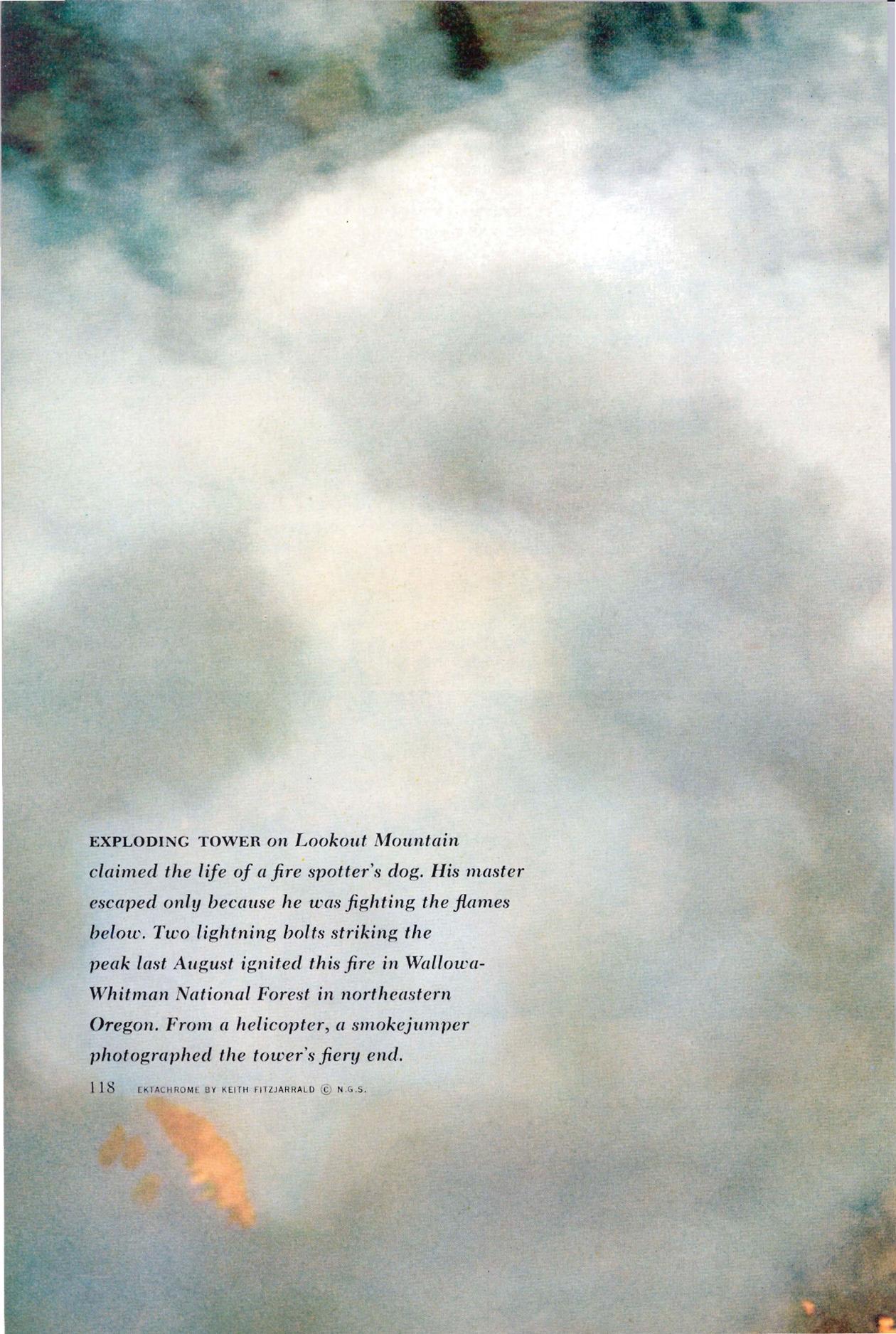
"You know what really fascinates these men?" asked Brian Weatherford, their non-Eskimo liaison officer. "Ants. They never saw any in Alaska, and every free moment they have they go out in the fields and watch ants at work."

Only two ridges removed from Hellroaring Creek, where the Eskimos toiled, lay the Pack River watershed. Two days earlier the Sundance fire had raced through this area of

Strong arms of an Eskimo fire fighter hurl dirt on charred woodland to prevent a flare-up of the Sundance blaze. Flown in by jet, 12 Eskimo crews from Alaska helped battle the Northwest fires. In Idaho many of them saw their first horses, cows, and ants.

KODACHROME BY DAVID L. ARNOLD, NATIONAL GEOGRAPHIC STAFF © N.G.S.





EXPLODING TOWER on *Lookout Mountain* claimed the life of a fire spotter's dog. His master escaped only because he was fighting the flames below. Two lightning bolts striking the peak last August ignited this fire in *Wallowa-Whitman National Forest* in northeastern Oregon. From a helicopter, a smokejumper photographed the tower's fiery end.



majestic trees and immense ferns. People who had visited the scene told Jay the devastation was incredible, so he went to see for himself (pages 124-5).

“Everything I had heard was understatement,” Jay reported. “As our jeep wound down into the Pack River Valley, I looked out on the nearest thing to total ruin I have ever seen. On both sides of the narrow stream, as far as I could see through the smoke, there was only gray-black death.”

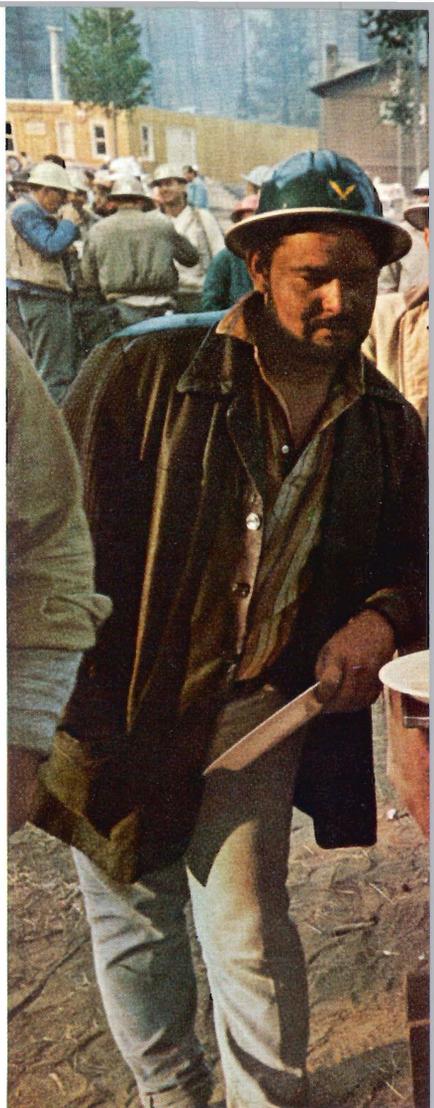
Here the blaze had burned so fiercely that it created a rare phenomenon—the combination of intense heat and winds called a fire storm. Awesome winds, generated within the storm’s micro-climate, snapped the trunks of 30-inch trees. Tall cedars were uprooted and piled one atop the other like jackstraws (painting, pages 122-3).

Indians Rank as Fire-fighting Elite

On several of the fire lines, Jay and I encountered crews of sturdy, bronzed men laboring swiftly and efficiently with shovels, saws, and axes. Each group wore distinctive tribal designs on their hard hats. Among the most highly respected of fire fighters, these were Indians of the western United States.

Their insignia identified them as representatives of the Jemez, Zia, Santo Domingo, Taos, and Zuñi pueblos in New Mexico and of the Hopi, Navajo, and Papago reservations in Arizona. There were also Sioux from South Dakota, Flathead from Montana, Nez Percé from Idaho, and others.

What makes the Indians—especially those from the Southwest—such superb fire fighters? Veteran foresters cite a combination of factors: They are physically and mentally conditioned for rigorous outdoor work; they know how to fight fires without water because they come





EKTACHROME (ABOVE) BY TED MAHIEU; EKTACHROME (BELOW) AND KODACHROME BY PAUL BEAVER © N.G.S.



Breakfast at dawn brings respite from a long night's battle. Open-air kitchen at the Hoodoo Ski Bowl feeds a Mexican-American crew from the Snake River Valley.

Second helping of steak revitalizes a be-grimed fire fighter. Crews generally spend 10 to 12 hours on the line, but at crucial times they may labor for 18 hours at a stretch. Such grueling work demands good food and plenty of it. Where possible, mobile kitchens prepare the meals, but crews far from base camp often must subsist on canned rations flown in by helicopter.

Rare moment of rest finds a fighter stretched out on his paper sleeping bag. The new type of bedding offers advantages: It is lightweight, waterproof, and cheap enough to be expendable. But it provides little warmth against chill nights in the forests.

from arid country; confident in their own teamwork and hereditary knowledge of forest ways, they do not panic in tight spots.

Subject to call anywhere in the West, the Indians must be prepared to fly fast and light. Urgent evening calls to New Mexico and Arizona have landed Indians in Wyoming and Montana before daylight. A call to Albuquerque at 5 p.m. can bring crews to a fire in California by midnight.

During the 1967 fire crisis, the airports and small airstrips scattered throughout the Northwest were busy around the clock. Air power has become a mighty weapon in the war against forest fires.

122 Besides dropping retardant, planes fly

parachuting smokejumpers to fires that cannot be reached in any other way, transport fire-fighting crews, map fires with special infrared and electronic equipment, and haul all manner of tools and supplies.

Smokejumpers' Rule: "Hit Hard and Fast"

Helicopters can reach otherwise inaccessible places. Several times we saw them hover over steep slopes and lower tools on lines to crews, and, once, hoist an injured man for a quick trip to a hospital. Helicopters also drop retardant, and some are equipped to lower huge buckets to lakes or streams, haul up as much as 900 gallons of water, and swiftly fly it to hot spots (page 110).

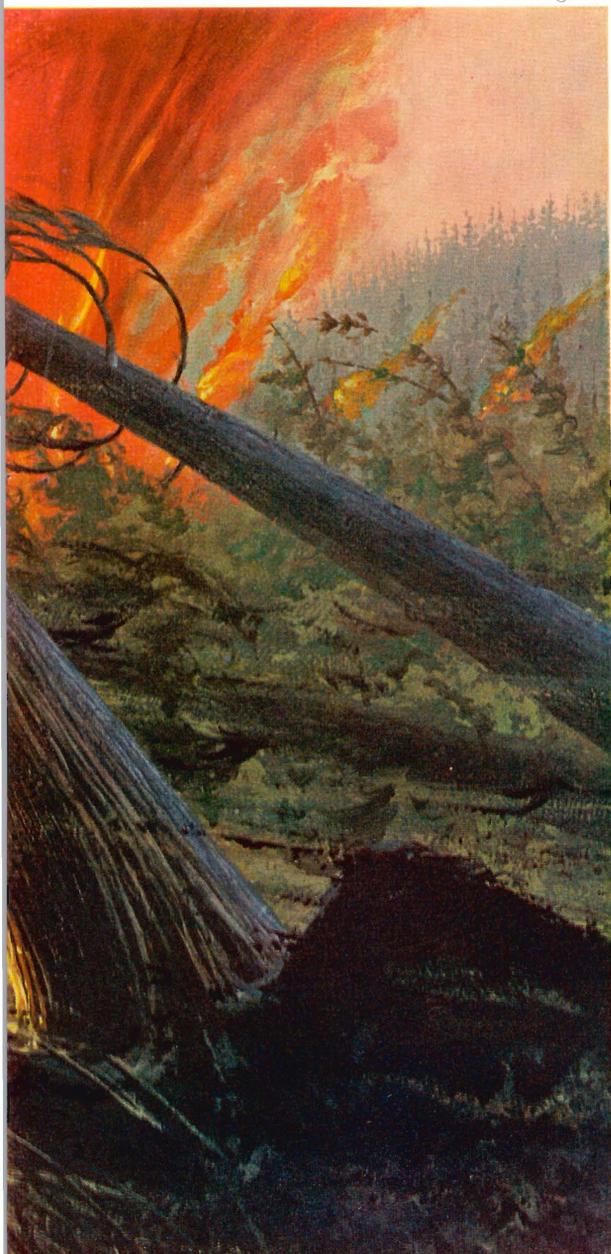


Perhaps the busiest airport of all was the one at Missoula, Montana, site of the Forest Service's northern regional headquarters, its Smokejumper Center, and its Northern Forest Fire Laboratory.

A large array of aircraft crowded the hangar area, and none of them bore the sleek look of modern jets. Besides dozens of light planes, they included heavy and medium bombers of World War II vintage.

Except during fire season, these larger craft stand idle, maintained for emergency use only. The smaller planes usually perform such jobs as crop-dusting and charter flights. Now all were being used in retardant-dropping and other fire-fighting missions.

PAINTING BY NATIONAL GEOGRAPHIC STAFF ARTIST WILLIAM H. BOND © N.G.S.



Near a hangar, young Dave Robinson was slashing bags open and pouring retardant into a hopper to be mixed with water. The resulting slurry would be loaded into the planes and rushed to the front (pages 112-13).

A knee injury had prevented Dave from going on the flights that had been dispatched daily from Missoula for the previous two weeks. A college student in the winter, Dave had graduated from the smokejumpers school the year before and had made many fire jumps.

To qualify for smokejumpers school, an applicant must be less than 28 years old, in top physical condition, and have had at least a year's experience fighting forest fires. From as many as 500 applicants a year—mostly teachers and college students—only about 80 are selected. Nearly all complete the four-week course in parachute jumping and fire fighting, which teaches the behavior of large blazes and the tactical and logistical problems of fire control.

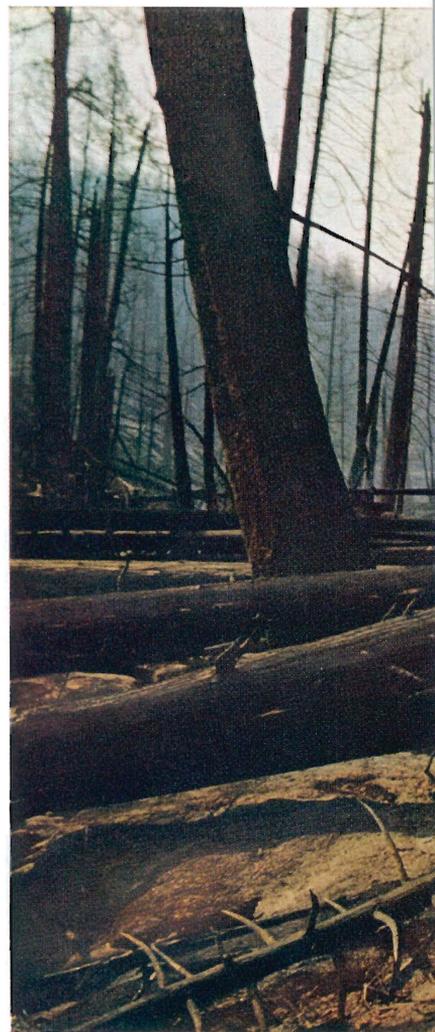
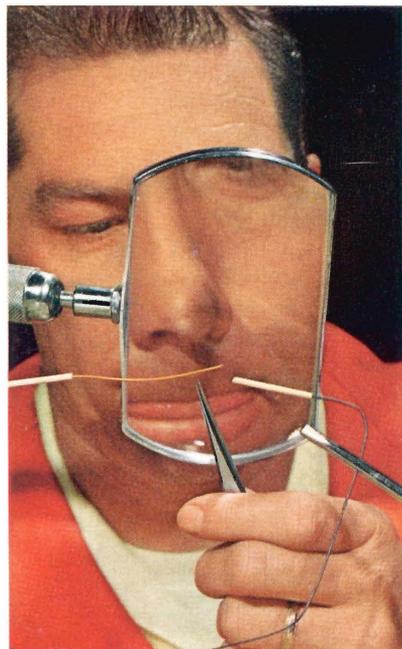
The course requires seven parachute jumps. In these, Dave said, the men follow the cardinal rule of smokejumping: "Always land as close to the target as safety permits, and hit the fire hard and fast."

Since smokejumpers often land in trees, with a force equal to that of a 10-foot free fall, they wear tough nylon jump suits and wire-mesh face masks attached to plastic helmets (page 111). Each jumper's outfit includes a nylon line, coiled in a leg pocket, by which he can lower himself from a tree like a mountain climber rappelling down a cliff face (page 113).

Once on the ground, jumpers must collect and shoulder 40-pound packs of equipment, which are dropped separately. Besides fire-fighting tools, each pack contains a sleeping bag and enough food to sustain a man for two days.

Tornado-like fire whirl, its funnel-shaped vortex of flame spinning at 300 miles an hour, uproots centuries-old cedars. An artist's recreation depicts the fearsome fire storm that pulled in air to feed its fury as the Sundance conflagration swept across Idaho's narrow Pack River last September. So intense was the heat that it split granite boulders in its path. Scientists estimate that at its peak the cataclysmic fire front released energy equivalent to that of a 20-kiloton bomb exploding every two minutes. One such bomb leveled Hiroshima. And, like Hiroshima, the Pack River region cooled to a scene of awesome devastation (page 125).

Threading a pine needle into a thermocouple, a technologist records the surface temperature of the needle up to the instant of ignition. The U. S. Forest Service's Northern Forest Fire Laboratory in Missoula, Montana, conducts this study.



Wired for science, a bed of ponderosa pine needles blazes in a six-story combustion chamber at the Missoula laboratory. Recorded and filmed data on how fires spread will help scientists devise better ways of controlling future conflagrations.

Gray-black death shrouds the once-idyllic Pack River watershed. Only charred snags stand where 150-foot cedars and hemlocks raised a green canopy above slopes lush with ferns, wild flowers, and shrubs. Researchers from the fire laboratory measure shredded tree trunks to determine the strength of the fire-spawned winds that toppled them.

Working beside Dave Robinson was Leonard Krout, assistant project superintendent at the school. Grounded because he had passed the maximum jumping age of 40, Krout estimated that he had made 200 parachute descents. At the moment, he said, crews drawn from the 190 men based at Missoula were continually being dispatched to fire areas.

"Our fellows are primarily shock troops," he explained. "They fly out in DC-3's, which hold as many as 16 men and their equipment, or in smaller twin-engine aircraft.

"Sometimes," he added, "we even use that old crate over there. Do you recognize it?"

Leonard pointed to a boxy object that resembled a corrugated-iron garage with a wing and three engines. Amazingly, it was a Ford trimotor plane, an aeronautical sensation back in the early 1930's. Smokejumpers esteem this relic because it lumbers along at less than 100 miles an hour and permits easy

exit from a door placed well below the wing.

Next door to the smokejumpers school at Missoula stands the Northern Forest Fire Laboratory. Here laboratory chief Arthur P. Brackebusch and a corps of scientists busy themselves with forest-fire problems. Fuels such as pine needles, moss, and grass are studied to learn their flammability characteristics. In two large wind tunnels and a six-story combustion chamber, the researchers conduct burning experiments under controlled environmental conditions.

Throughout the mountains around Missoula the laboratory's mobile stations and radar units record different types of lightning strikes. Experiments also continue in the seeding of clouds with silver iodide crystals during lightning storms in the hope of preventing fire-setting discharges.

One of the Forest Service's most promising new tools is Fire Scan, the infrared detection

KODACHROME (BELOW) BY PAUL BEAVER; EKTACHROME (FAR LEFT) AND KODACHROME BY DAVID FALCONER © N.G.S.





Bone-weary fighter, half-blinded by smoke, silently prays for the rain so desperately

device developed by the Missoula laboratory, which I mentioned earlier. Taken aloft in a swift aircraft, this heat-sensing instrument reacts to even the smallest blaze in a forest and provides instant thermal maps of endangered areas.

In a Fire Scan plane flying as high as 15,000 feet above the ground, an image covering up to 250,000 acres appears on a cathode-ray tube like the screen of a television set. Fire shows up in varying degrees of intensity against a background of cooler vegetation and terrain.

The image on the cathode-ray tube is recorded on Polaroid film. Prints dropped in plastic capsules to fire-control officers provide up-to-the-minute intelligence on

the enemy's movements and capabilities.

Fire Scan makes maps accurately by day or night or through dense smoke. It cannot penetrate clouds, however; the minute water droplets blank out the infrared signal.

Looking beyond Fire Scan, researchers at Missoula and other Forest Service laboratories foresee the day when similar devices, riding satellites far out in space, may bring man to a long-sought goal—detection of all forest fires at the very moment of birth.

Finale: the View From Headquarters

Back in Washington, D. C., Jay and I discussed the 1967 fires, and the outlook for future summers, with officials of the Department of Agriculture's Forest Service. Among



EKTACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEHALES © N.G.S.

needed. September storms finally ended the Northwest's nightmare summer of fire.

them was Malcolm Hardy, Director of the Cooperative Forest Fire Prevention Program, the symbol of which is Smokey Bear.

From Mr. Hardy we learned that fire in the forest isn't always bad; it can be a boon as well as a bane.

"When conditions are just right," he said, "skilled foresters use fire to prepare sites for seeding or planting, to reduce hazardous accumulations of fuel, to curb diseases that afflict trees, and to improve conditions for wildlife and livestock.

"But fire must be controlled by man. Unleashed, it changes from docile servant to berserk destroyer.

"The fires of 1967 in the Northwest show what lightning can do when conditions are

critical. For the Nation as a whole, however, nine out of ten forest fires result from somebody's carelessness, ignorance, bad luck, or malicious disregard for the rights of others.

"A disturbingly large number—more than one in four—are set intentionally," Mr. Hardy continued. "Not far below incendiaryism in the statistics is debris burning.

"Thus, while people are the principal cause of the wildfire problem, people are also the only hope of its solution."

Through its prevention program the Forest Service strives constantly to remind Americans that fighting forest fires is a dirty, dangerous, and difficult business, sometimes exciting, but always expensive—in dollars, lives, and resources.

THE END