

# Yellowstone *fires* 1988

A Special Supplement to Yellowstone Today

## The New Yellowstone



*Photos (clockwise, starting above):*

*Billowing smoke clouds and leaping flames -- common sights in the Greater Yellowstone Area during summer 1988.  
NPS photo by Jim Peaco*

*From the air, a mottled mosaic burn pattern on the park's west boundary.  
NPS Photo by Jim Peaco*

*After just two years, fireweed returns to a park area burned in the 1970's.  
NPS photo by Don Despain*

*A cow elk grazes in a newly-burned Yellowstone meadow.  
NPS photo by Jim Peaco*



Yellowstone and its neighbors have just experienced a summer like no other in local memory. The Yellowstone fires are already being described as the greatest ecological event in the history of the national parks, and they also have been the cause of the greatest fire fighting effort in all of history.

Those of us who live in this part of the Rockies, and the many others who visited the park this summer, received a lesson in the power of nature that we will never forget. We saw spectacular and sometimes frightening fire behavior, and together we rode an emotional roller coaster while the fires grew and spread, sending convection clouds to the stratosphere. We knew the oppressive effects of the dense smoke, but also knew that if the smoke cleared it meant that the winds had returned and the fires were again on the move. It has been a time of human drama, intense media attention, economic distress, and most of all, awe-inspiring natural changes in the Yellowstone landscape.

Yellowstone is still the magnificent place it always has been; fires are a part of the life processes here, and the park will heal and regenerate its natural scars as it has countless times before. I'm excited about that process, and equally excited to welcome you. We have the rare opportunity to witness wilderness regeneration on a scale rarely seen anywhere on earth. Nature is not always a gentle hostess, but it never fails to be an inspiring teacher. This supplement to Yellowstone Today has been produced to introduce you to what happened here, what it means to the park's natural communities, and what it means to you.


So welcome to Yellowstone, a park with a new face. The features that have attracted tens of millions of visitors in the past are still here: the geysers, wildlife, trout streams, beautiful vistas and peaceful moments are as available as ever. But to them has been added a new attraction, a memorable lesson in wilderness processes that in their own way are as beautiful as an elk or a mountain lake.

Enjoy your park. It has never offered more than it does now.

Robert Barbee, Superintendent

A number of individuals, organizations, corporations and school groups have expressed interest in helping Yellowstone National Park recover from the fires. In response, the Park Rehabilitation and Recovery Program has been organized to coordinate donations and provide information about recovery and rehabilitation projects.

To find out more about the Park Rehabilitation and Recovery Program, ask at any visitor center or call (307) 344-7381, ext. 2363, or write the Superintendent, P.O. Box 168, Yellowstone National Park, WY 82190.

 This publication was produced on a Macintosh computer and an Apple Laserwriter II printer.





## Fire History

Naturally caused fires have occurred in the Yellowstone area as long as there has been vegetation to burn - at least since vegetation appeared following the retreat of glaciers about 12,000 years ago. Fire, climate, erosion, and a vast assortment of life forms ranging from microbes to insects to mammals have all played roles in the creation of the vegetative landscape of Yellowstone. During several thousand years of intermittent occupation of the Yellowstone area, native Americans may also have influenced the vegetation in many ways, such as setting fires (accidental or intentional), moving seeds (in plant foods or horse's feed, for example), or influencing the numbers or movements of various plant-eating animals.

After the park was established in 1872, park managers gradually improved their ability to monitor and control fires. Virtually no effective fire fighting was done until 1886, when the U.S. Cavalry was placed in charge of protecting the park. In fact, the soldiers marked the debut of federal involvement in fighting wildfires in the United States.

In the early days, fire suppression was most effective on the park's northern grasslands; fires were not allowed to burn freely on the grasslands and groves of the northern range for nearly a century. Over the rest of the park, which is largely covered by forest, reliable and consistent fire suppression had to wait until modern airborne firefighting techniques became available, in the last thirty or forty years.



NPS photo by Jim Peaco



NPS photo by Jeff Henry



## Fire Management Plan

Ecologists have known for many years that wildfire is essential to the evolution of a natural setting; when fires are suppressed, normal plant succession processes are stagnated, and biological diversity is reduced or altered. Research into Yellowstone's prehistory has shown that on the park's northern range, fires occurred one to four times a century, while over the vast extent of the park's subalpine forests the fire interval was more typically 200 to 400 years. The legislative mandate of the National Park Service is to maintain as near as possible a primitive ecological situation, and so it was that in the 1960's and early 1970's interest grew in restoring the influence of fire to wilderness areas within the national park system.

In 1972, Yellowstone initiated a program to allow some natural fires to run their courses. The plan was developed and implemented after substantial communication with related agencies, and with the endorsement of the conservation and scientific communities. In 1974, after the initial successes of the program, plans were made to expand the acreage. In 1975, an Environmental Assessment was prepared for natural fire management of about 1,700,000 acres in the park; the E.A. was approved early in 1976. Shortly thereafter, Yellowstone Park and the Bridger-Teton National Forest entered into a cooperative program to involve the Teton Wilderness in the fire plan, so that naturally occurring fires could burn across the boundary between the two federal units. Over the years since 1976, Yellowstone's fire management plan has been gradually revised and updated in accordance with National Park Service guidelines.

All park fires, whether man-caused or natural, are managed according to criteria in the fire management plan. Natural fires are continuously monitored, and tactics for monitoring and possible control are updated daily. Fires that threaten adjacent public or private lands and communities, park developments, or other significant resources, are subject to suppression efforts.

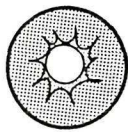
Yellowstone's fire management plan has four goals:

1. To permit as many lightning-caused fires as possible to burn under natural conditions.
2. To prevent wildfires from destroying human life, property, historic and cultural sites, special natural features, or threatened and endangered species.
3. To suppress all man-caused fires (and any natural fires whose suppression is deemed necessary) in as safe, cost-effective, and environmentally sensitive ways as possible.
4. To resort to prescribed burning when and where necessary and practical to reduce hazardous fuels, primarily dead and down trees.

Scientists have learned much about the occurrence and behavior of fire during the sixteen years since this plan has been put into effect. Tens of thousands of lightning strikes simply fizzle out with no acreage burned. Of those that have occurred in the past sixteen years, 233 produced fires that were allowed to burn. Most burned less than an acre. Fifteen exceeded 100 acres.

During this sixteen-year period, a total of 34,157 acres burned in the park due to natural fires. The largest natural fire burned about 7,400 acres. We learned that in most years Yellowstone is too wet to allow fires to reach any significant size. The largest natural fire in the park's written history prior to 1988 was a burn at Heart Lake in 1931. It was fought, but burned about 18,000 acres.

Fire was permitted to reassert its role in creating and maintaining the natural variety of habitats and vegetation types typical of a healthy wilderness, and millions of visitors had the opportunity to observe this fascinating natural process in operation.



## Drought/Climate History

The fall of 1987 was unusually dry in the Yellowstone area. With that in mind, park fire specialists began monitoring more than a dozen separate fire danger indices in early April. The monitoring included measurement of moisture content of several types of fuels, daily computations of "spread component" (a measure of a potential fire's ability to move), "energy release component" (a measure of a potential fire's ability to produce heat that would make fire fighting difficult), lightning risk, man-caused fire risk, "ignition component" (the probability of a firebrand producing a fire that would require suppression), and several others. All these indices were monitored daily; by

July 1, each was being monitored at 26 locations around the park as part of the routine administration of the park's fire management plan. Through this monitoring system, coupled with regular consultation with regional fire authorities and close attention to weather conditions, fire risk seemed well within established parameters based on previous experience. But it was weather that eventually proved most difficult to anticipate. Yellowstone experienced an untypical weather pattern in recent years. Though there was below-average precipitation in winter, summers were abnormally wet, reaching 200 to 300 percent of normal rainfall in July.

Anticipating the continuation of this pattern, park managers and fire behavior specialists saw reason to expect that natural fires could be allowed to burn. Six consecutive years of significantly above-average July rainfall suggested that July of 1988 would be similarly wet.

April rainfall was 155 percent of normal, and May rainfall was 181 percent of normal, but practically no rain fell in June, July, or August, an event previously unrecorded in the park's 112-year written record of weather conditions. In early summer, about 20 lightning-caused fires had been allowed to burn. According to the fire plan, fires were evaluated on a case-by-case basis, each on its own

situation and merits, before being allowed to burn. Eleven of these burned themselves out, behaving as such fires did in previous years.

But those that survived into the extremely dry weeks of late June and July met dramatically changed conditions. By late July, moisture content of grasses and small branches in the park reached levels as low as two or three percent, and down trees were measured at seven percent. At 8 to 12 percent, lightning will start lots of fires, many of which will burn freely. A series of unusually high winds, associated with dry fronts, fanned flames that even in the dry conditions would not have moved with great speed.





## Fighting the Fires

By July 15 it was clear that recent weather patterns were not of use in predicting this summer's weather. As of that day, the perimeter of fires in the park was about 8,600 acres. After that day, no new natural fires were allowed to burn. Exceptions were made for natural fires that started adjacent to existing fires, when the new fires were clearly going to burn into existing fires. After July 21, all other fires were subjected to full suppression efforts as manpower would allow. As of that day, the perimeter of the fires in the park totalled less than 17,000 acres. On July 27, during a visit to Yellowstone, the Secretary of the Interior reaffirmed that the natural fire program had been temporarily suspended and all fires would be fought. Man-caused fires had been vigorously suppressed all along.

An extensive interagency fire suppression effort was initiated in mid-July in the Greater Yellowstone Area, to attempt to control or contain an unprecedented series of wildfires. The extreme weather conditions and heavy, dry fuel accumulations presented even the most skilled professional firefighters with conditions rarely observed.

Accepted firefighting techniques, such as constructing fire lines along the edges of the advancing fires to create fuel breaks, and backfiring to reduce fuel accumulations in front of advancing fires, were frequently ineffective because fires spread long distances by "spotting," a

phenomenon by which wind carries embers from the tops of the 200-foot flames far out across unburned forest to start spot fires well ahead of the main fire. Regular spotting up to a mile and a half away from the fires made the widest bulldozer lines useless and enabled the fires to cross such major topographic features as the Grand Canyon of the Yellowstone River. Fires routinely jumped such traditionally recognized barriers as rivers and roads.

Fires often moved two miles per hour, with common daily advances of five to ten miles, consuming even very light fuels that would have been unburnable during an average season. The fast movement, coupled with spotting, made frontal attacks on the fires impossible and dangerous, as fire crews could easily be overrun or trapped between a main fire and its outlying spot fires.

Even night time fires could not be fought. Normally, wildfires "lie down" at night, as increased humidity and decreased temperature quiet them; humidity remained low at night, and fire fighting was further complicated by extreme danger from falling trees.

Fire fighting efforts were directed at controlling the flanks of fires and protecting lives and property in the advancing paths of the fires, and the experts on site generally agreed that without help from the weather, in the form of rain or snow,

there was no technology in existence that could stop the fires.

The frustration and wonder of the firefighters at these conditions were summed up by Denny Bungarz, a U.S. Forest Service fireboss from Mendocino National Forest in California. Bungarz was incident commander on the North Fork Fire, the one that threatened seven park developments and one gateway community. Bungarz said, "We threw everything at that fire from Day One. We tried everything we knew of or could think of, and that fire kicked our ass from one end of the park to the other." Similar sentiments were expressed by other leading firefighters. Efforts to protect structures in the park were almost totally successful; only a small number of cabins and outbuildings were lost.

By the last week in September, about 50 lightning-caused fires had occurred in the park, eight of which were still burning. Additional natural and More than \$100,000,000 had been spent in control efforts on fires in the Greater Yellowstone Area, and most major park developments - and a few surrounding communities - had been evacuated at least once as fires approached within a few miles of them. At the operation's peak, nine thousand firefighters (including army and marine units), more than 100 fire engines, and dozens of helicopters from many states participated in a huge, complex

effort to control the fires and protect developments.

Later in the fall, as the fires were diminishing, plans were underway in Yellowstone Park to develop comprehensive programs for all aspects of post-fire response. These will include replacement, rehabilitation, or repair of damaged buildings, power lines, fire lines, trails, campsites and other facilities. An estimated 882 miles of fire lines, dozens of fire camps, tons of litter, 100 miles of roads, more than 600 miles of trails, and innumerable helispots and other local impacts will eventually require restoration. The restoration of Yellowstone's wilderness setting - that is, the healing of the necessary wounds of firefighting - will be of great importance to the National Park Service, to many members of the conservation community, and to the public.

The scientific community, both private and public sector, has already shown great interest in monitoring the ecological processes following these major fires. The National Park Service is cooperating with other agencies and independent researchers and institutions in developing comprehensive research directions to take full advantage of this unparalleled scientific opportunity. It is probably safe to say that this research effort will be unparalleled in the history of the national parks, and its impact will be felt throughout the scientific community for many years to come.



## Ecological Consequences and Public Opportunities

The fires of 1988 had an enormous effect on the Greater Yellowstone area. The face of the park and surrounding lands has been dramatically changed, on a scale not widely anticipated even among fire ecologists. But the change is not without precedent. The most recent research by Dr. William Romme, an independent Colorado fire history scientist, and his associates, still unpublished, suggests that the Yellowstone area has been visited by natural fires on this scale periodically in the past, including comprehensive burns in the early 1700s and in 1850.

The vegetative setting of Yellowstone is in good part the product of fires that burned here freely before the arrival of European man. Each new burn initiates a sequence of events in the plant community that influences all other living forms in the area, especially in terms of the nutrient flow through the ecological systems. Fire suppression, as suggested earlier, halts or retards that flow.

The fires of Yellowstone did not simply annihilate all life forms in their paths. Burning at a variety of temperatures, sometimes along the ground, sometimes in the tree crowns, they killed many lodgepole pines and other trees, but in fact did not kill most other plants; they merely burned the tops off of them, leaving roots to regenerate.

Some plants, such as the lodgepole pine, are fire tolerant, and begin to seed in immediately following the fire, with seeds being released from both heat-sensitive cones and from mature cones-of-the-year. Park plant ecologist Don Despain has already documented seed densities in forests burned in 1988 ranging from 50,000 to 1,000,000 seeds per acre, which equals one to 20 seeds per square foot. Some of these seeds will survive the appetites of mice, squirrels and birds, and will eventually produce a forest much like the one that burned. Within five

years, there may be 1,000 seedlings per acre, depending upon how much competition they face from grasses, wildflowers, and shrubs.

The growth of the new plant and animal community begins immediately following a burn. Studies after the fires revealed that less than one-tenth of one percent of the soil received heat extreme enough to penetrate more than an inch into the soil. Only under logs and deep litter accumulations, where the fire was able to burn for several hours, does the lethal heat pulse penetrate more deeply into the soil. Where water is available, new plant growth is immediate — within a few days. In dry soils, the rhizomes, bulbs, root crown, seeds and other reproductive tissues must wait until soil moisture is replenished the following spring.

Insects not associated with the pre-burn forest begin to use the new food sources (dead trees) immediately, while others lay their eggs in the bark. Squirrels and birds make use of a variety of seeds and cones, and root stalks of many plant species resprout within a few weeks. Within a few growing seasons, the forest floor is a mat of grasses, shrubs and flowers, and seedlings of future forests of fir, spruce and pine appear. Plant growth is unusually lush because of the mineral nutrients in the ash and because of increased light levels on the previously shaded forest floor.

As the fires passed, they created a vegetative mosaic of burns, partial burns, and non-burns that will now become the new habitats of plants and animals in Yellowstone. One of the most frequent comments heard from autumn visitors to Yellowstone Park has been, "I didn't expect to see so much green."

This is not to understate the large acreages that were indeed burned; it is instead to suggest that the fires did nothing to Yellowstone that has not been

done many times in the past. We may have preferred that only natural fires had burned, and it certainly would have been preferable if the process had not involved such expense and economic hardship, but the park's natural systems do not directly suffer from human economics. One of the greatest challenges offered by national parks is a conceptual one: they compel us to take the long view, and consider nature's directions rather than our own. We are not protecting the parks merely for ourselves, but for many later generations, who will witness the revegetation of Yellowstone with an interest and excitement hard to appreciate through the smoke of 1988.

And the burns will affect future fires. Vegetation capable of sustaining another major fire is quite rare for decades, except in extraordinary situations. Lightning strikes and even firebrands from fires in neighboring forests can only ignite small spots. The mosaic of young and mature plant communities provides natural firebreaks while sustaining a greater variety of plant and animal species.

Losses of wildlife were surprisingly light. Wildlife showed considerable adaptability and skill at avoiding fires; only broad, fast-moving fires seemed able to catch elk, bison, and other large mammals. Movie portrayals of forest fires, such as "Bambi," have given the public a distorted view of destruction of wildlife in fires.

As of November, 1988, carcass surveys in Yellowstone Park had revealed 243 elk (less than one percent of the park's summering population of 30,000-35,000), 5 bison (park population - 2,700), 2 moose, and 4 deer killed by fire or smoke. Similarly light losses were reported on the surrounding national forests. Park Service, Forest Service, and independent researchers are currently monitoring radio collars on more than 150 animals in the Greater Yellow-

stone Area, including 36 grizzly bears, and the movements of these test animals in relation to the fires are being studied. No threatened or endangered animals have been reported killed by the fires. Research is currently underway to assess the effects of the fires on wildlife habitat, and independent panels have been created to evaluate possible problem areas. Some portions of various winter ranges in the Greater Yellowstone Area burned, and some concern has been expressed that there may be food shortages for some wildlife species this winter. The National Park Service, U.S. Forest Service, and Montana Department of Fish, Wildlife and Parks, as well as independent advisors, have recommended against large feeding programs as doing ecological and scientific harm with only marginal chance of doing good. Detailed studies on this and other related questions are underway.

There is general agreement among observers that in the long run the fires created much new habitat that will serve the animals well. The fires of Yellowstone are not an isolated event, but part of an endless process.

Those of us who are fortunate enough to witness the regeneration of life after the fires will be seeing nature operating on a grand scale, a scale rarely observed in the world today. This isn't just a show for ecologists and researchers; it's for everybody, a once-in-several-centuries chance. Children will follow the process through their lives, remembering how the new Yellowstone was born in the fires of 1988. Once the meadows have resprouted next spring, and once the newly-opened forest floors have begun to sprout as well, most of Yellowstone will be green, so that visitors will still be able to enjoy green scenic vistas as well as view the effects of the fires. The wildlife, the thousands of thermal features, and the grand mountain scenery are still in place, and the fires of 1988 have added one more attraction to the park's list.





## What Burned?

No topic has caused more confusion in the media and in the public mind than the actual extent of the fires. Confusion has resulted from all fires in the Greater Yellowstone Area, which includes more than eleven million acres of public land, being called "Yellowstone Park fires," from all fires in the Yellowstone area being ascribed to the park's natural burn program, and from frequent and unfortunate oversimplification and exaggeration of burn acreages.

country surrounding Yellowstone Park was hit heavily. A number of major fires, most notably the North Fork Fire, the Hellroaring Fire, the Storm Creek Fire, the Huck Fire, and the Mink Fire, started outside the park and moved in. These fires accounted for more than half of the total burn in the Greater Yellowstone area, and include most of the ones that have received intensive media attention. The North fork fire, which

threatened Old Faithful, Madison, Canyon, Norris, West Yellowstone, Mammoth Hot Springs, and Tower-Roosevelt Lodge, was a man-caused fire that originated in Targhee National Forest and was the subject of immediate suppression efforts. The Storm Creek Fire started as a lightning strike in the

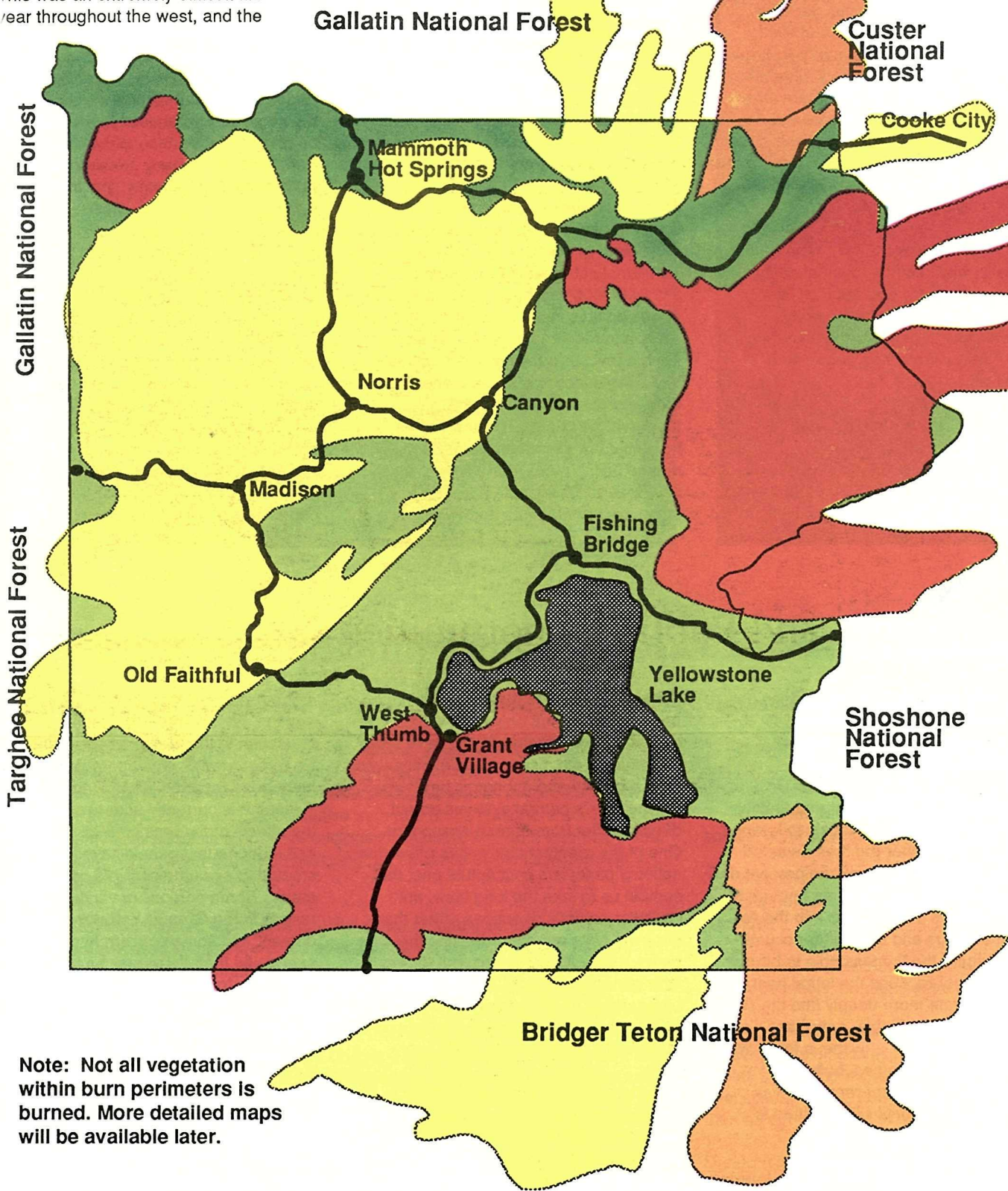
Yellowstone Park, and eventually threatened the Cooke City-Silver Gate area, where it received extended national television coverage and was usually reported as a result of Yellowstone Park's natural fire program.

Additional confusion results from continued media and public belief that managers in the Yellowstone area let park fires continue burning unchecked, out of blind devotion to the natural fire plan, long after such fires were in fact being fought. As pointed out earlier, no fires were managed to burn after July 21. Public confusion was probably heightened by misunderstandings over just what the firefighting strategies were; if crews were observed letting a fire burn an area, it may have seemed to the casual observer that the burn was merely being monitored. In fact, in many instances firebosses recognized the hopelessness of stopping fires in certain situations, and concentrated their efforts on the protection of buildings and developed areas. The most unfortunate public and media misconception may have been that human beings can always control fire if they really want to; the raw unbridled power of these fires cannot be overemphasized.

Perhaps the worst source of confusion, however, has resulted from oversimplification of burn acreages. The daily reports issued cooperatively by the U.S. Forest Service and the National Park Service on fire status gave total acreages within the perimeters of each fire, pointing out that, "only about half of the vegetation has burned within many fire perimeters." Most reporting has focused on the total acreage, and neglected the important statement about unburned vegetation. The park was regularly portrayed as a blackened moonscape.

Aerial mapping indicates that about 1.38 million acres in the Greater Yellowstone Area received some type of burning. Within Yellowstone Park, mapping indicates that a maximum of 995,000 acres experienced some kind of burning. Of that, 573,000 acres was "canopy burn," meaning that the forest was blackened. Another 367,000 acres was "surface burn," meaning that only the forest understory burned and most trees will not die. Burned meadow and sage-grassland totalled 55,000 acres.

This was an extremely difficult fire year throughout the west, and the



## Natural and Man-caused Fires, Greater Yellowstone Area, 1988

■ Natural fires originating in Yellowstone National Park ■ Natural fires originating on adjacent U.S. Forest Service lands ■ Man-caused fires originating outside the park



## What the Fires Mean to Yellowstone's Friends

Ultimately, the greatest impacts of the 1988 Yellowstone fire season will not be ecological. Yellowstone itself is already well on its way to responding to the massive stimuli provided by the fires: natural revegetation is underway, wildlife is adapting, and the wilderness setting survives.

Far greater concern is now being expressed in many circles over the future of management of Yellowstone and other parks. The course of the summer's fire management raised many questions, and some management actions and policies will be challenged. There are debates underway about firefighting logistics, as

well as over the natural fire management plan itself.

The American public, management agencies, and many special interest groups now face a singular challenge: to come to grips with a newfound understanding of the power of the natural settings we are attempting to preserve and celebrate in the national parks. Beyond the operational questions of just how best to fight fires in wilderness, and beyond the policy questions of how an agency can be true to its mandate and yet anticipate an extraordinary event of this sort, are deeper questions of just what we want from our parks, and just

how far we are willing to let nature go in giving it to us.

Fire is one of the last great natural "public enemies." The same ecological community that decades ago taught us that predators are not bad in any intrinsic sense, and that natural diversity is as useful to human culture as a closely managed harvest, has more recently recognized that wildfire also has its values — scientific, esthetic, and even commercial. Fire is and has always been an essential part of the setting in our parks and natural areas; we cannot ignore its role, and to return to the total exclusion of it from those areas would be a folly for which our descendants would pay dearly.

Our goal in the national parks is the same as it has always been: to find some balance — some "reasonable illusion," as ecologist A. Starker Leopold so aptly put it in 1963 — between the directions the natural setting might take on its own and our needs of it. We seek a course of action that will permit us to appreciate fire's place and power without so wholly risking the financial and emotional disasters of the 1988 fire season. But even at that we would be well advised to retain enough humility to know that nature will not always be controlled despite our best, most carefully planned management.