Smoke & Mirrors

Wildfire Policy & the Legacy of the Greater Yellowstone Area Fires of 1988

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GPH903 – Spring 2012
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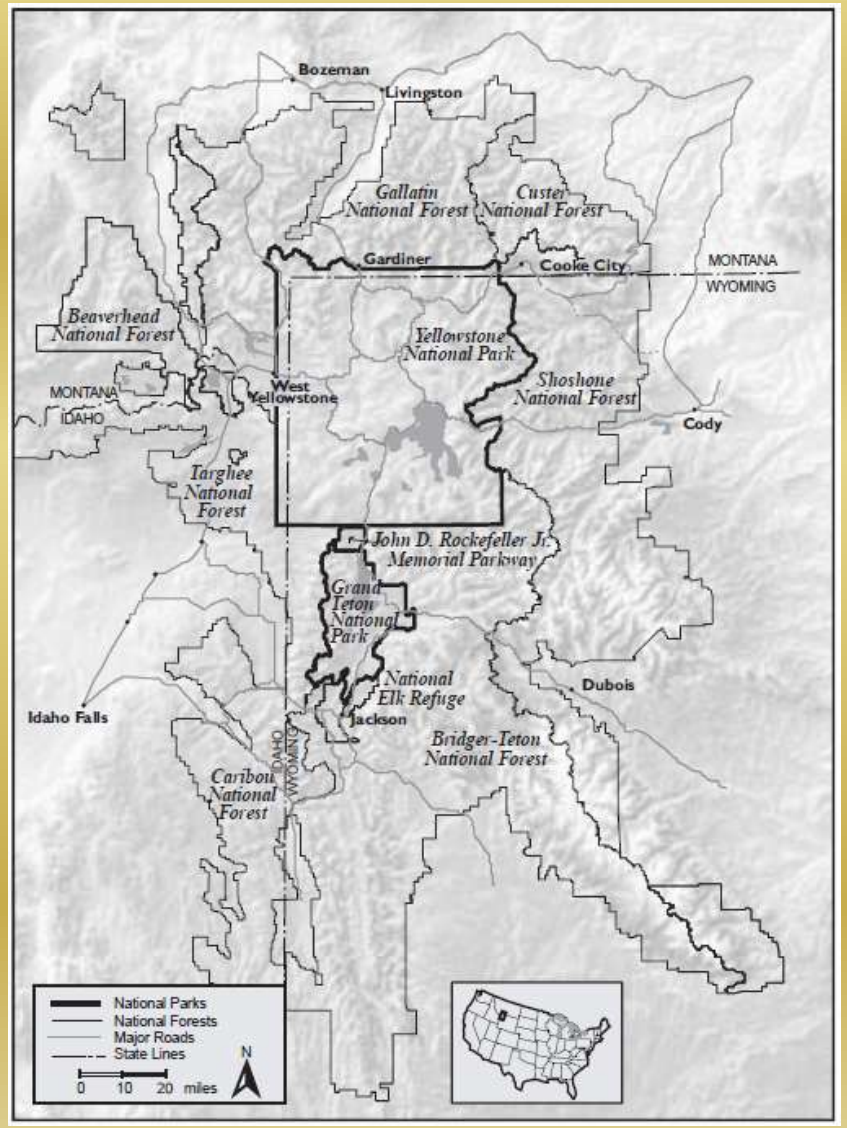
Greater Yellowstone Area



INTRODUCTION:

While the main objective of this project is to use GIS to visually show the growth of the 1988 fires in the Greater Yellowstone Area from July 14 to October 1 as represented in the form of daily fire perimeter maps animated within ArcMap software, the project will also compare historic fires within the same area by mapping fire perimeters of those fires greater than 100 acres in size from 1881 through in 1987 and also those fires greater than 100 acres in size from 1990 through 1998 so a clear comparison can be made between the pre-1988 fires, the 1988 fires, and the post-1988 fires can be made.

In order to give the reader some perspective and background, a brief introduction to wildfire policy as it relates to National Parks versus that of National Forests will be presented.

The World's First National Park

After many expeditions to the Yellowstone area, which is located today in what is northwest Wyoming, including the following:

- The 1869 Folsom-Cook-Peterson Expedition
- The 1870 Washburn-Langford-Doane Expedition
- And most importantly the 1874 Hayden Expedition; Ferdinand V. Hayden, head of the U.S. Geological and Geographical Survey of the Territories

Because of the natural wonders these men saw, in particular members of the Hayden expedition, and they documented of the area, they promoted a park bill in Washington D.C.

The photographs of William Henry Jackson, along with the paintings of Thomas Moran played a crucial role in convincing Congress to set the geological wonderland aside as the world's first national park .

On March 1, 1872, President Ulysses S. Grant signed the Yellowstone National Park Protection Act into law creating the world’s first National Park.

William Henry Jackson photo of Old Faithful in eruption

Thomas Moran painting the Grand canyon of the Yellowstone River.

The World's First National Park, and no one to manage it.

Despite the success in getting the bill to create Yellowstone passed, not much else happened other than on paper.

The National Park Service Organic Act, which was an act to establish a National Park Service, was not enacted until 1916.

For the decade after 1872 when Yellowstone National Park was established, the park was under serious threat from those who would exploit, rather than protect, its resources. Poachers killed animals. Souvenir hunters broke large pieces off the geysers and hot springs. Developers set up camps for tourists, along with bath and laundry facilities at hot springs.

Yellowstone National Park turned to the U.S. Army for help. Invoking the Sundry Civil Act of 1883, the Secretary of the Interior called upon the Secretary of War for assistance in protecting the park. The Army came to the rescue and in 1886 men from Company M, First United States Cavalry, Fort Custer, Montana Territory under Captain Moses Harris came to Yellowstone to begin what would be more than 30 years of military presence in Yellowstone.

Yellowstone at a Glance

• **Established:** In 1872, primarily to protect the area's unusual thermal features. Yellowstone contains the world's largest concentration of geysers.

• **Size:** 2.2 million acres; 63 miles from north to south, and 54 miles east to west, which makes it larger than Rhode Island and Delaware combined.

• **Topography:** About 80% is forested and 13% is meadow and grassland. About three-quarters of the park lies on a plateau with elevations ranging from about 7,000 to 9,000 feet. The highest point is Eagle Peak, 11,358 feet

• **Rivers and lakes:** About 5% is covered by water including more than 220 lakes and 1,000 streams. Yellowstone Lake, which covers 136 square miles and is 400 feet deep, is the largest high-elevation lake in North America.

• **Wildlife species:** More than 300 birds, 18 fish (5 non-native), 8 ungulates (1 non-native), 2 bears, and about 49 other mammalian species.

• **Developed areas:** Less than 5% of the park area has been altered to accommodate visitor use and park administration, including 370 miles of paved roads, 900 miles of trails, historic buildings, campgrounds and other facilities

In 1905, the USDA Forest Service was established within the Department of Agriculture. The agency was given a unique mission: to sustain healthy, diverse, and productive forests and grasslands for present and future generations.

From the earliest days of the agency, the U.S. Forest Service has kept forest management as a primary focus.

Forest management basically meant protecting the forests from all threats, the most damaging being fire.

Any and all fire on National Forests was considered such a threat the Forest Service implemented the “10:00am” rule, which stated that any fire detected within a National Forest was to be extinguished by 10:00am the morning after it was discovered.

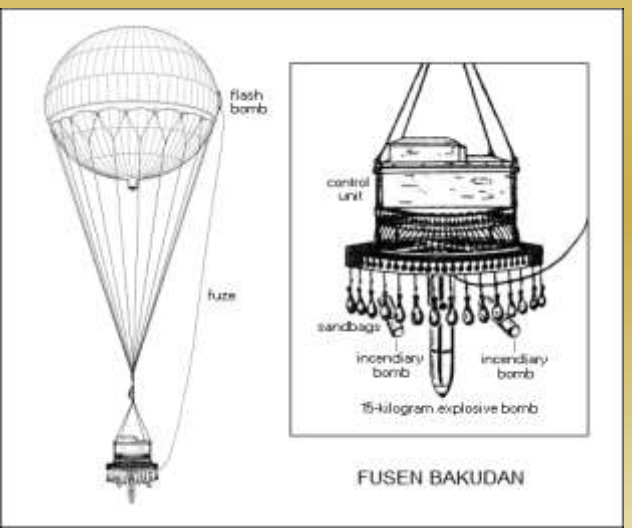
It was never considered that fire had a natural role in a healthy forest ecosystem.

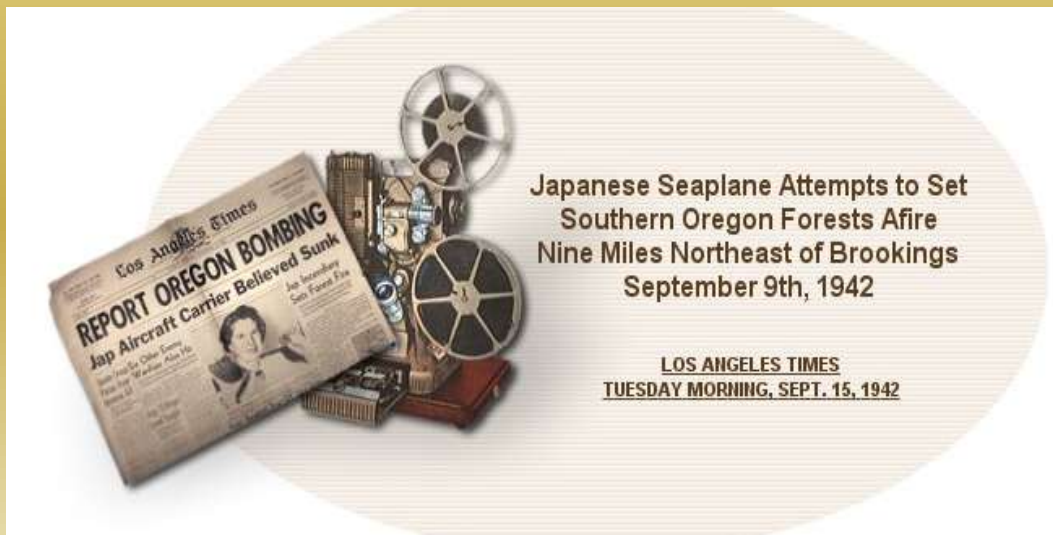
Once it was established, the National Park Service generally followed the fire management policies established by the Forest Service.

• The need for lumber during World War II was so high, and fires that destroyed timberland were deemed unacceptable that during World War II the Japanese tried to start massive wildfires in the Pacific Northwest by releasing incendiary bombs attached to balloons into the easterly wintertime jet stream winds above 30,000 feet to float 5,000 miles across the north Pacific. The Japanese nicknamed their devices '*Fugu'* after the deadly pacific puffer fish which the inflated balloon resembled.

•The idea was to have these devices explode over the forested regions of the Pacific Northwest and initiate large forest fires that would hopefully divert U.S. manpower from warfighting in the Pacific theater to combating fires at home.

• They also tried to ignite fires by dropping incendiary bombs from submarine-launched seaplanes.





Re-thinking an Old Idea

• In the early 60's the complete suppression policy began to be questioned when it was realized that no new Giant Sequoia had grown in the forests of California, because fire is an essential part of their life cycle.

• In 1962, Secretary of the Interior Stewart Udall assembled a Special Advisory Board on Wildlife and Wildfire Management to look into management problems in the national parks.

• The report took the ecological view that parks should be managed as ecosystems.

• The passage of the 1964 Wilderness Act encouraged the allowance of natural processes to occur, including fire. Afterwards, the National Park Service changed its policy in 1968 to recognize fire as an ecological process. Fires were to be allowed to run their courses as long as they could be contained within fire management units and accomplished approved management objectives.

• The Forest Service enacted similar measures in 1974 by changing its policy from fire control to fire management, allowing lightning fires to burn in wilderness areas.

“Let Burn” Policy

Any fire that is human-caused or that threatens human life or property is considered “wildfire” and suppressed as quickly as possible using methods that will minimize damage to the park’s natural and cultural resources.

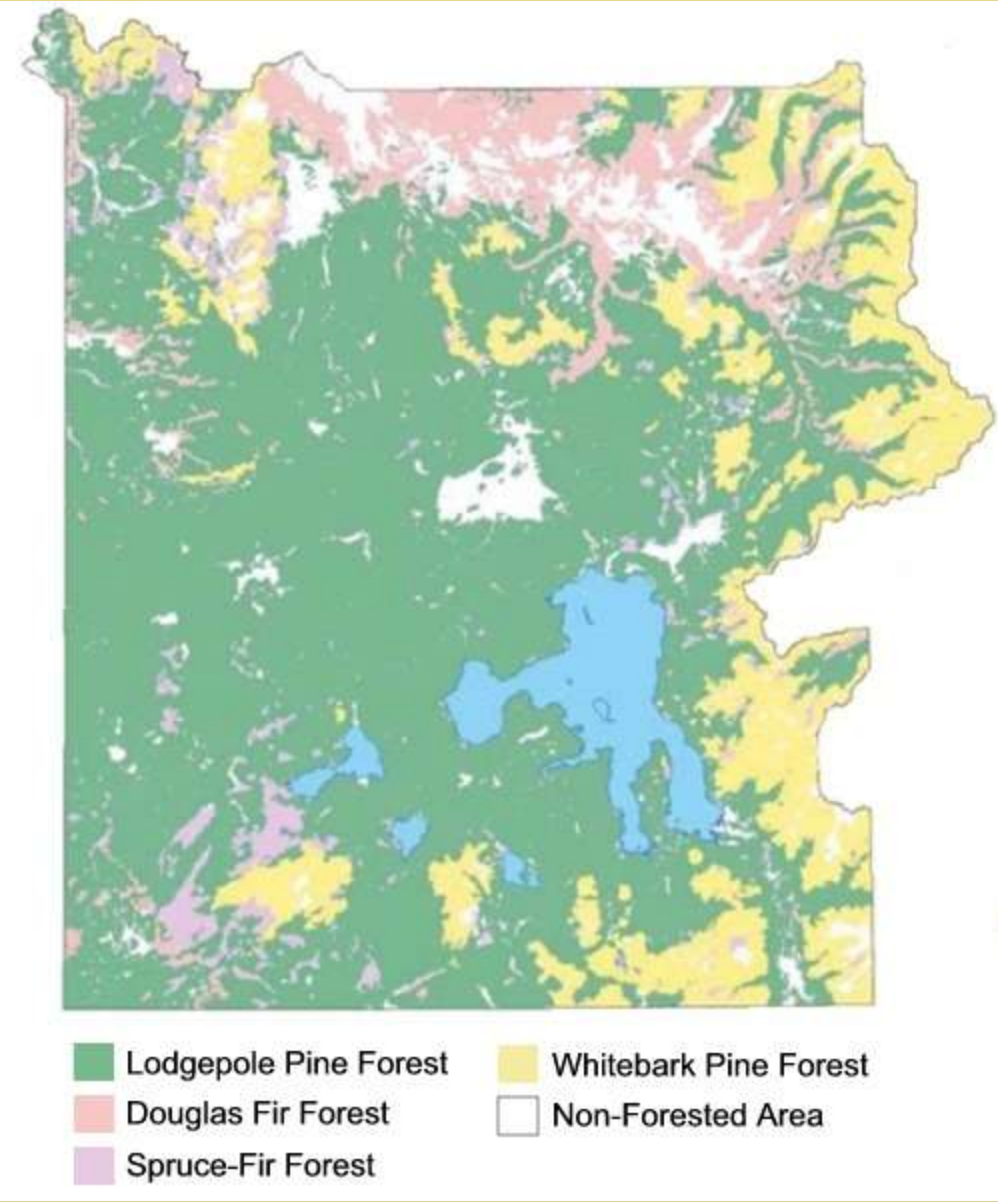
Naturally ignited fires that do not threaten human life or property may be allowed to burn if they are “within prescription”—if they meet certain criteria pertaining to fire behavior, weather, and fuel moisture content.

Wildland fire use is a relatively new wildland fire management action. It was originally termed as prescribed natural fire and initiated by the National Park Service (NPS) in 1968. Prescribed natural fire grew slowly in the Park Service and in the U.S. Forest Service during the 1970s and 1980s. The 1995 Federal Wildland Fire Management Policy renamed prescribed natural fire to wildland fire use and documented the need to increase these types of actions in response to wildfire. Since 1995, wildland fire use has increased dramatically.

Land managers quickly went from considering fighting wildfires as a “moral equivalent of war” to understanding **The Importance of Fire:**

The Greater Yellowstone Area is an ecosystem adapted to wildfires. Many of its plants have adaptations that help them survive fires, such as having roots that live even if the top of the plant is burnt. Some plants actually need fire to reproduce. Lodgepole pines need fire to burn off the resin that keeps their pinecones closed until fire opens up new spaces in which the pine seedlings can grow.

Vegetation Map of Yellowstone – The fire-adapted lodgepole pine accounts for 75 – 80% of vegetative cover.



Causes of the Major Fires of 1988

Fire Name	***Ignition Type***
Clover	Lightning
Fan	Lightning
Hellroaring	Human caused
Huck	Downed power line
Mink Creek	Lightning
Mist	Lightning
North Fork	Human caused
Snake River Complex (Fan, Red, & Shoshone)	Lightning

Spring & Summer of 1988

By the spring of 1988 the policy of allowing naturally occurring fires that posed no threat to park property , resources or people to burn themselves out (so-called "let-burn" policy) had been in affect for almost 2 decades. As such, when the Storm Creek fire was detected in wilderness area just north of Yellowstone on June 14th, it was monitored, but no action was taken to suppress it.

By the end of 1987, the greater Yellowstone area was in a mild drought. That winter's snowpack was only 31% of the long-term average, but precipitation was 155% of the average in April and 181% of the average in May

The 20 lightning-caused fires that started in the park in late May and early June were each evaluated before being allowed to burn, and 11 soon went out on their own. Others were still smoldering in mid-June, when the weather turned dry again, but as late as July 11, the National Weather Service was predicting normal July rainfall for the area. But that was not to be. June saw only 20% of normal rainfall and while July saw 79% of normal rainfall, the damage was already done. The real threat came when August saw only 10% of normal rainfall

Year	% of Normal Precipitation	Number of Ignitions	Acres Burned
1972	155%	21	4
1973	103%	33	145
1974	60%	38	1,307
1975	75%	26	6
1976	166%	30	1,603
1977	119%	29	67
1978	65%	24	14
1979	73%	54	11,234
1980	122%	25	4
1981	77%	64	20,595
1982	118%	20	<1
1983	137%	7	<1
1984	138%	11	<1
1985	90%	53	33
1986	114%	33	2
1987	117%	35	964
1988	32%	45	793,880

"Normal precipitation" is based on June through September data, 1950-1980. "Ignitions" do not include fires that started outside the park and moved in, of which there were five in 1988.

(Renkin and Despain, 1991)

June

• **1988-06-14**: A small fire starts on Storm Creek (named the Storm Creek Fire), just north of Yellowstone National Park, marking the beginning of what will become one of the largest firefighting efforts in American history. This particular lightning-caused fire burns 79,666 acres.

• **1988-06-23**: The Shoshone Fire starts. The lightning-caused fire burns 24,253 acres over the course of the subsequent weeks.

• **1988-06-23**: The Snake Fire starts. The lightning-caused fire burns 76,442 acres before being brought under control.

• **1988-06-30**: The Red Fire starts. The lightning-caused fire burns 17,787 acres before being brought under control.

July

• **1988-07-09**: The Mist Fire starts, caused by lightning. By the time it merges with the Clover Fire, it burns 3,237 acres.

• **1988-07-11**: The Clover Fire begins, caused by lightning. The fire burns 25,339 acres before it is brought under control.

• **1988-07-11**: The Mink Creek Fire starts, caused by lightning. The fire burns 84,630 acres before being brought under control.

• **1988-07-12**: The Falls Fire starts, caused by lightning. The fire burns 13,204 acres before being brought under control.

• **1988-07-14**: President George H.W. Bush, on a fly-fishing trip to the park, is forced to evacuate due to fire conditions.

July – Continued

- **1988-07-14**: The Clover Fire burns a corral at the Calfee Creek Patrol Cabin; rangers must dive under their emergency fire shelters as flames overtake them.

- **1988-07-21:** Park officials declare ALL fires as wildfires and full suppression Begins on all fires regardless of cause.

July – Continued

• **1988-07-22**: The North Fork Fire starts, caused by an improperly discarded cigarette in the forest outside the west boundary of the park. The fire burns 422,726 acres before being brought under control.

• **1988-07-22: Lewis Lake Campground closes as the Red Fire approaches.**

• **1988-07-23**: The Clover Fire and Mist Fire merge.

• **1988-07-23: Grant Village is evacuated as the Shoshone Fire approaches.**

• **1988-07-25**: The Fan Fire starts in the northwestern portion of the park. The lightning-caused fire burns 15,001 acres before it is brought under control.

• **1988-07-30**: Shoshone Fire jumps the road and comes close to West Thumb Geyser Basin; the basin is evacuated. Several old road camps buildings near West Thumb burn (this had been the last "intact" road camp remaining in the park).

• **1988-07-31**: Sportsman Lake Patrol Cabin, in the northwest corner of the park, is burned by the Fan Fire.

August

• **1988-08-08**: The Shoshone and Red fires join.

• **1988-08-14**: The North Fork Fire surrounds Madison Campground and begins spot fires north to Gibbon Falls.

• **1988-08-15**: The Hellroaring Fire begins just north of the park. The human-caused fire burns 47,806 acres before being brought under control.

• **1988-08-19**: The North Fork Fire burns boardwalks at Artists Paint Pots.

• **1988-08-20**: "Black Saturday" — Fires double to more than 480,000 acres.

• **1988-08-20**: The Huck Fire starts, caused by sparks from a power line. The fire burns 60,888 acres before being brought under control.

• **1988-08-21**: The Clover-Mist Fire burns into a thermal area; sulfur caught fire resulting in poisonous gases. Seven firefighters were treated for inhalation of these gases.

August - Continued

• **1988-08-22**: Fire sweeps through Norris Geyser Basin; Grant Village is evacuated a second time; fire comes within 4 miles of Silver Gate, Montana; Huck Fire threatens South Entrance & causes Flagg Ranch to be evacuated.

• **1988-08-24**: Canyon Village evacuated.

• **1988-08-31**: Mt. Sheridan Fire Lookout evacuated.

September & Beyond

1988-09-04: Cooke City & Silver Gate evacuated. Several homes outside the city are lost.

1988-09-07: Fire storm blasts Old Faithful area in afternoon; historic Inn is saved, but 14 employee and "Frontier" Snow Lodge guest cabins are lost.

1988-09-09: North Fork Fire crests Bunsen Peak and threatens Mammoth.

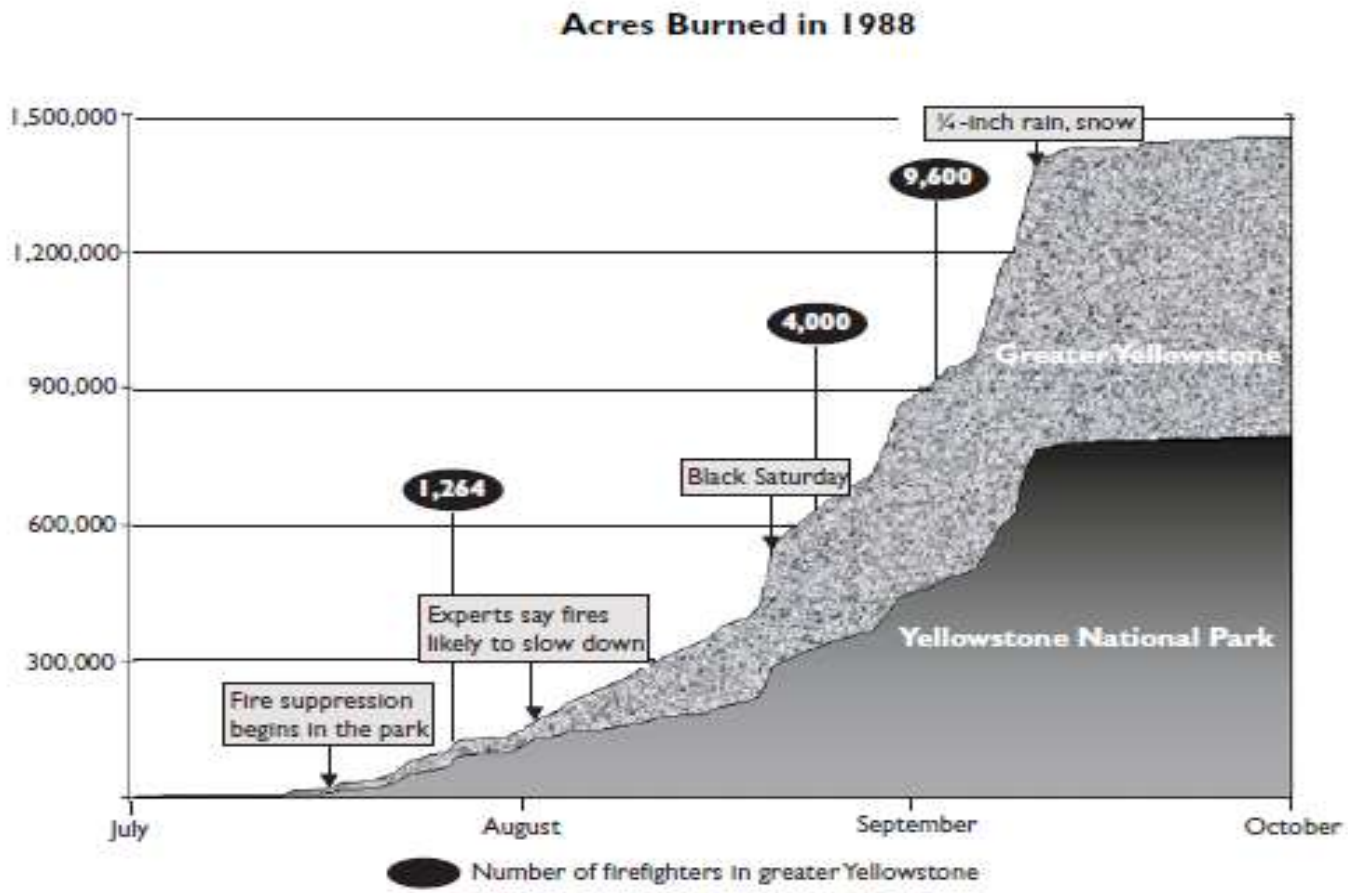
1988-09-10: Residents of Mammoth evacuated.

1988-09-11: Rain and snowfall help dampen many of the fires as U.S. Marines arrive to assist firefighters as the first snow falls on the park. The Huck & Mink fires merge.

1988-09-14: Most areas of the park reopen, campgrounds reopen. U. S. Marines land to begin mop up operations.

1988-10-11: A BLM employee is killed by a falling tree on the Clover-Mist Fire.

1988-11-13: With winter snow covering most fires, officials declare then



This graph shows the relative increase in burned area in greater Yellowstone from July 1 to October 1, 1988, as derived from both the estimated daily growth in the fire perimeter and the total burned area estimated after the fires were out. To eliminate large unburned patches from the estimate, the park was surveyed at a smaller scale than the rest of greater Yellowstone, for which the estimate is therefore even more approximate.

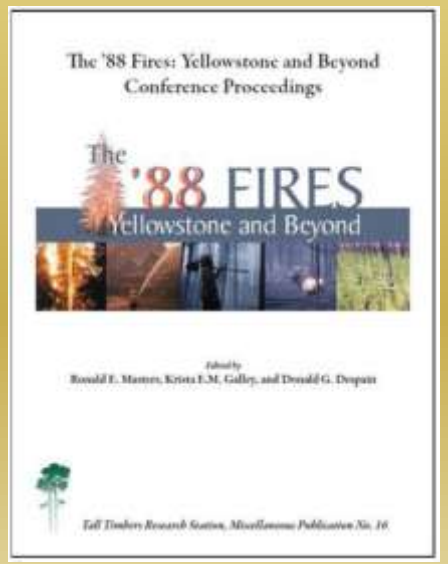
The Political Aftermath

Due mainly to the sensationalism of the media coverage of the fires of 1988, most members of the public thought that Yellowstone, the crowning jewel of the National Park System was being allowed to be destroyed by the Park Service's "let-burn" policy. The symbolic power of the world's first national park in flames as seemingly ineffective firefighters and administrators responded with little success – provided powerful ammunition for outright assaults on the NPS and its programs. The public wanted a scapegoat, someone they could blame. As Superintendant of Yellowstone, Bob Barbee became that person. Local media started to refer to him as a Superintendant "Barbee-Que"

"Welcome to West Yellowstone Barbee-Que"

Barbee was “burned” in the press, and was “grilled” before Congress during three congressional hearings that were held in the months following the fires. Wyoming`s two senators, Malcolm Wallop and Alan Simpson, called for the NPS` director, William Penn Mott, and Yellowstone`s Superintendent, Bob Barbee, to resign.

In the end, none of them did resign and the resulting report issued in May 1989 following Congressional hearings upheld the need for fire in maintaining a wild land ecosystem, but did criticize several aspects of the National Park Service’s fire management plans, in particular, agency budgets and training were inadequate.



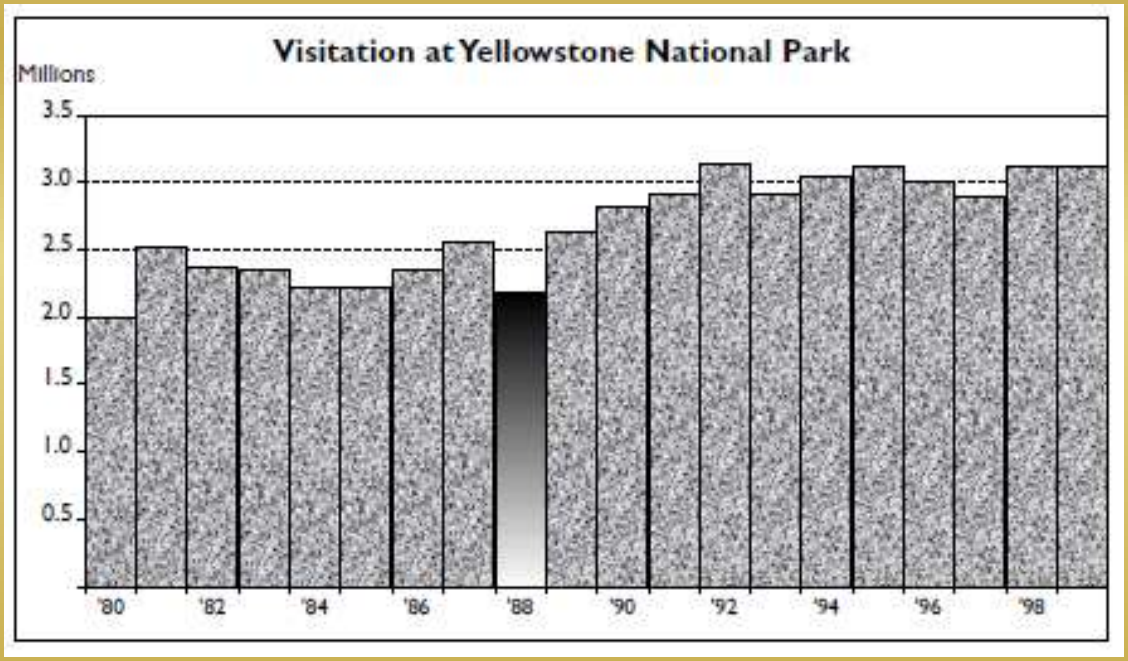
In hindsight even the media realized thier mistake in the way it reported on the fire:

Yellowstone National Barbecue Pit

"As one bleak moonscape after another appeared on the screen, NBC's correspondent offered a sad benediction on the world's first national park: 'This is what's left of Yellowstone tonight.' It was a moving, high-impact piece of television. It was also wrong…. Though many Americans were led to believe that Yellowstone had come to look like the bottom of a barbecue pit, its best known features—the steaming geysers and fumaroles, the towering waterfalls along the Grand Canyon of the Yellowstone, the wildlife—survived more or less unscathed. If the first job of the media is to convey accurate information, then we failed in our job."

—T.R. Reid, writing in the *Washington Post on July 23, 1989*

Despite what was predicted, visitation actually increased in the years after the fires



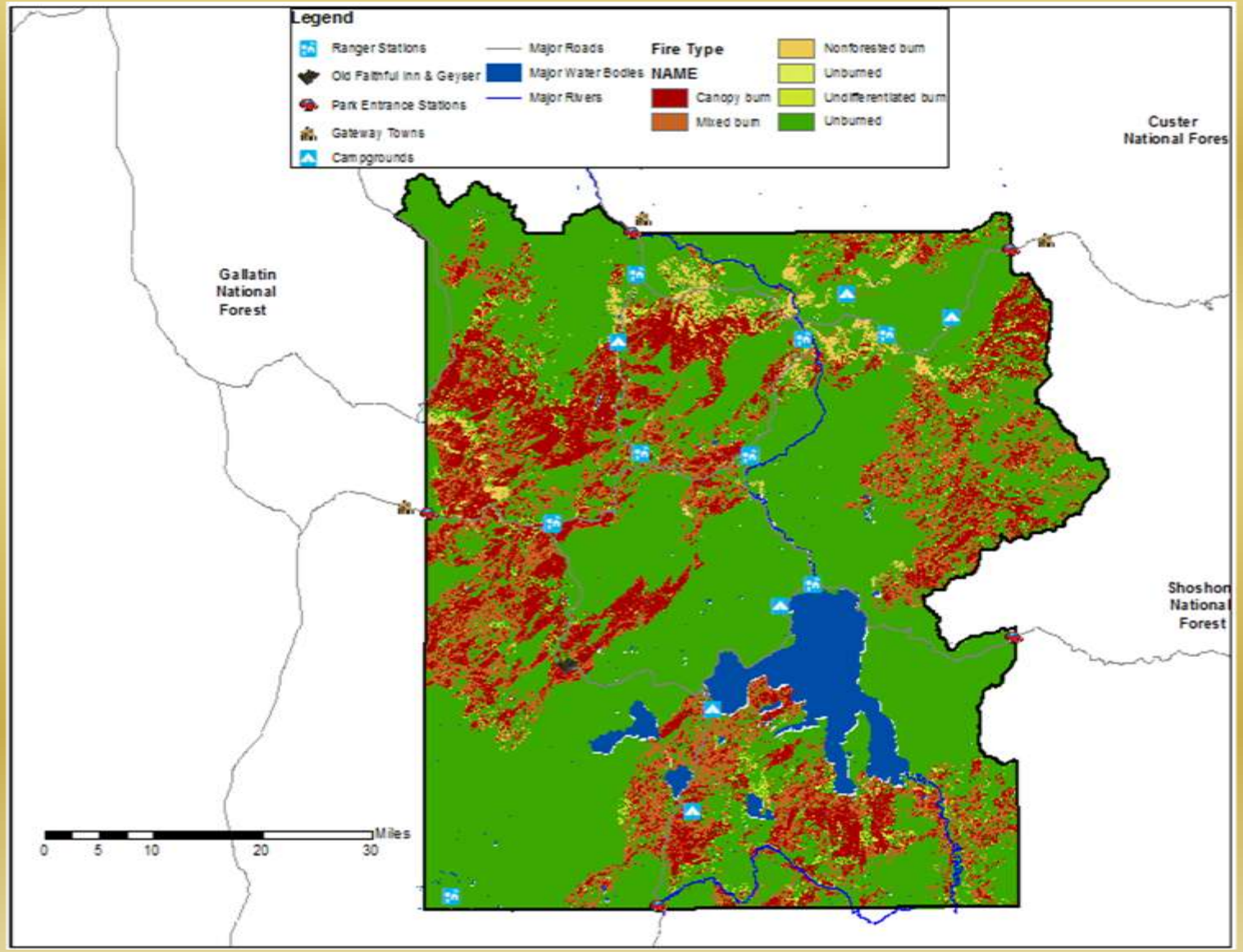
The Yellowstone Fires of 1988 by the numbers:

Burned Area within Yellowstone National Park

Burn Type	Acres Burned*	Percent of Park
Crown Fire: consuming the forest canopy, needles, and ground cover & debris	323,291	15%
Mixed: mixture of burn types in areas where most of the ground surface was burned	281,098	13%
Meadows, sagebrush & grassland	51,301	2%
Undifferentiated: variety of burn types	37,202	2%
Undelineated: surface burns not detectable by satellite because of under burned canopy	100,988	4%
Total Burned Area *	**793,880**	**36%**
Total Unburned Area	**1,427,920**	**64%**

* The above numbers refer to only the fires that burned within the boundary of Yellowstone and does not include acres burned in the surrounding National Forests. About 30,000 acres of timber suitable for harvest were burned in the surrounding National Forests.

Burn Types


Legend
Ranger Stations
Old Faithful Inn & Geyser
Park Entrance Stations
Gateway Towns
Campgrounds
Major Roads
Major Water Bodies
Major Rivers
Fire Type
NAME
Canopy burn
Mixed burn
Nonforested burn
Unburned
Undifferentiated burn
Unburned
Gallatin National Forest
Custer National Fores
Shoshon National Forest
0 5 10 20 30
Miles

9 of the major fires were caused by humans.

42 fires were caused by lightning.

Approximately 300 large mammals perished as a direct result of the fires: 246 elk, 48 bison, 4 mule deer & 2 moose.

Over $120 million was spent fighting the fires.

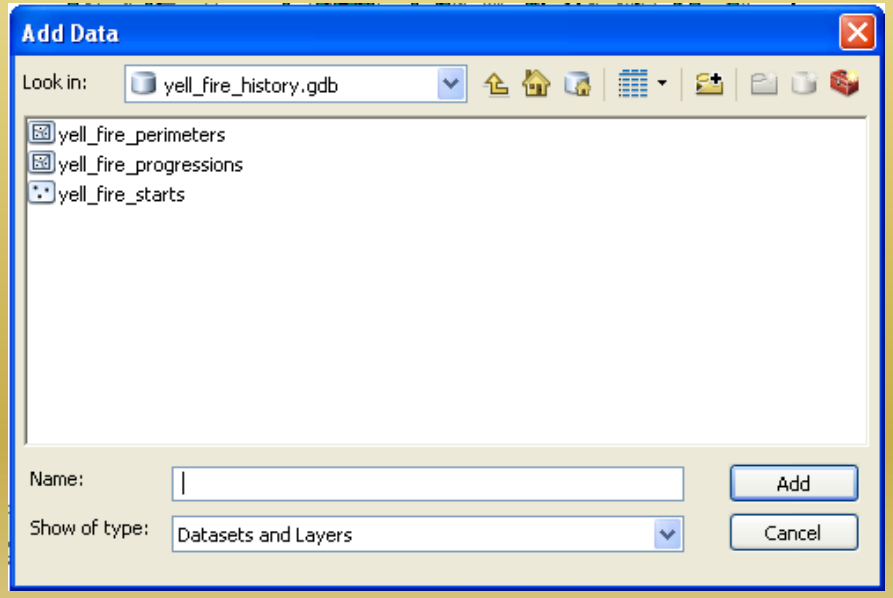
25,000 people were involved in firefighting efforts.

Only 1 human fatality was directly attributed to the fires.

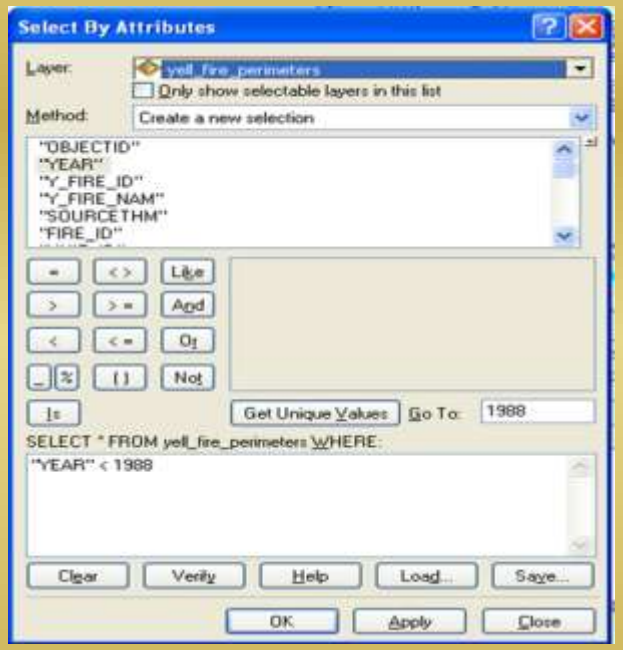
Data & Methodology

All data used for this project was obtained via download from the National Park Service's (NPS) Integration of Resource Management Applications (IRMA) web portal.

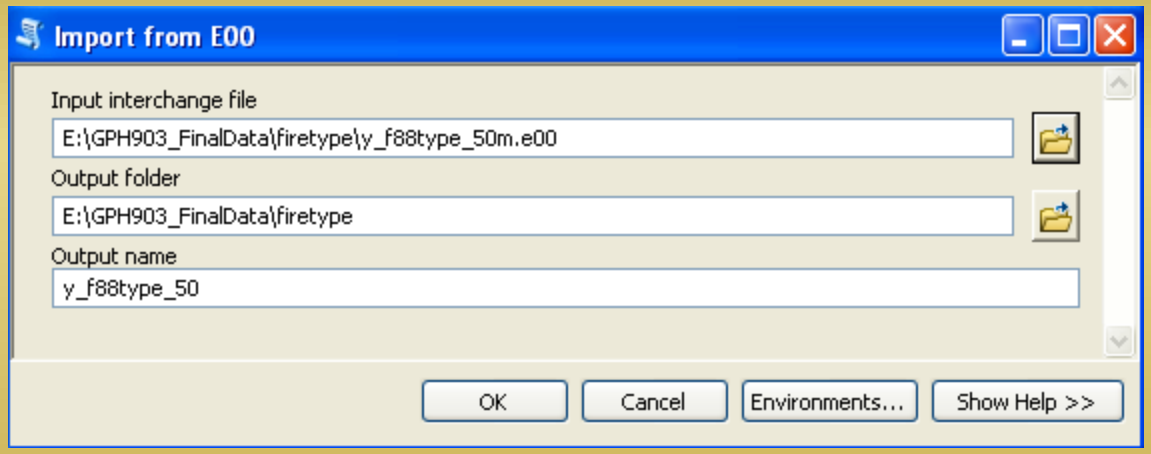
The fire data downloaded was in the form of zip file containing a single geodatabase. The geodatabase contained 3 feature classes:



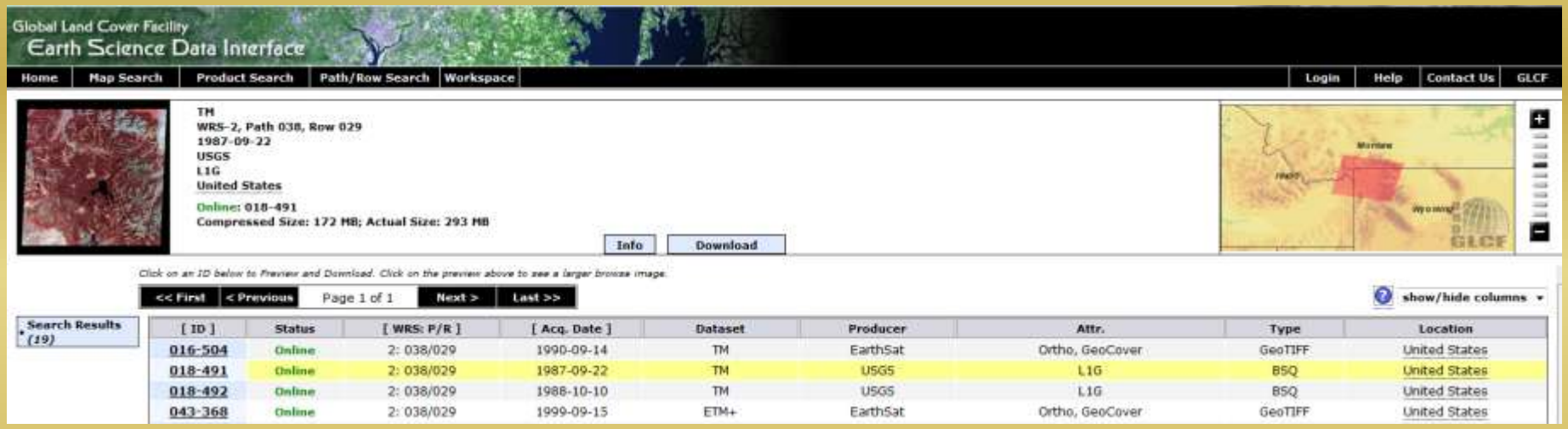
The yell_fire_perimeters feature class contains fire perimeters for all fires that occurred within the Greater Yellowstone National Area from 1881 through 2008. This data was used to create the pre-1988 and post-1988 fire maps by selecting all those fires with a year < 1988 and exporting those records to their own shape file and then doing the same for all fires with a year > 1988.



Some of the data downloaded was in ArcInfo Interchange (.E00) format and had to be converted using the Import from E00 option in ArcToolbox:



Landsat Data used was downloaded from the Global Land Cover Facility, hosted by the University of Maryland



Potential Sources of Error in the Data

• The data should not be considered to be the absolute truth. Boundaries, streams, and sites used for reference at map production scales were taken from a variety of sources and were digitized at a variety of scales. These results should not be considered for determining legal questions such as whether or when a fire burned a particular feature.

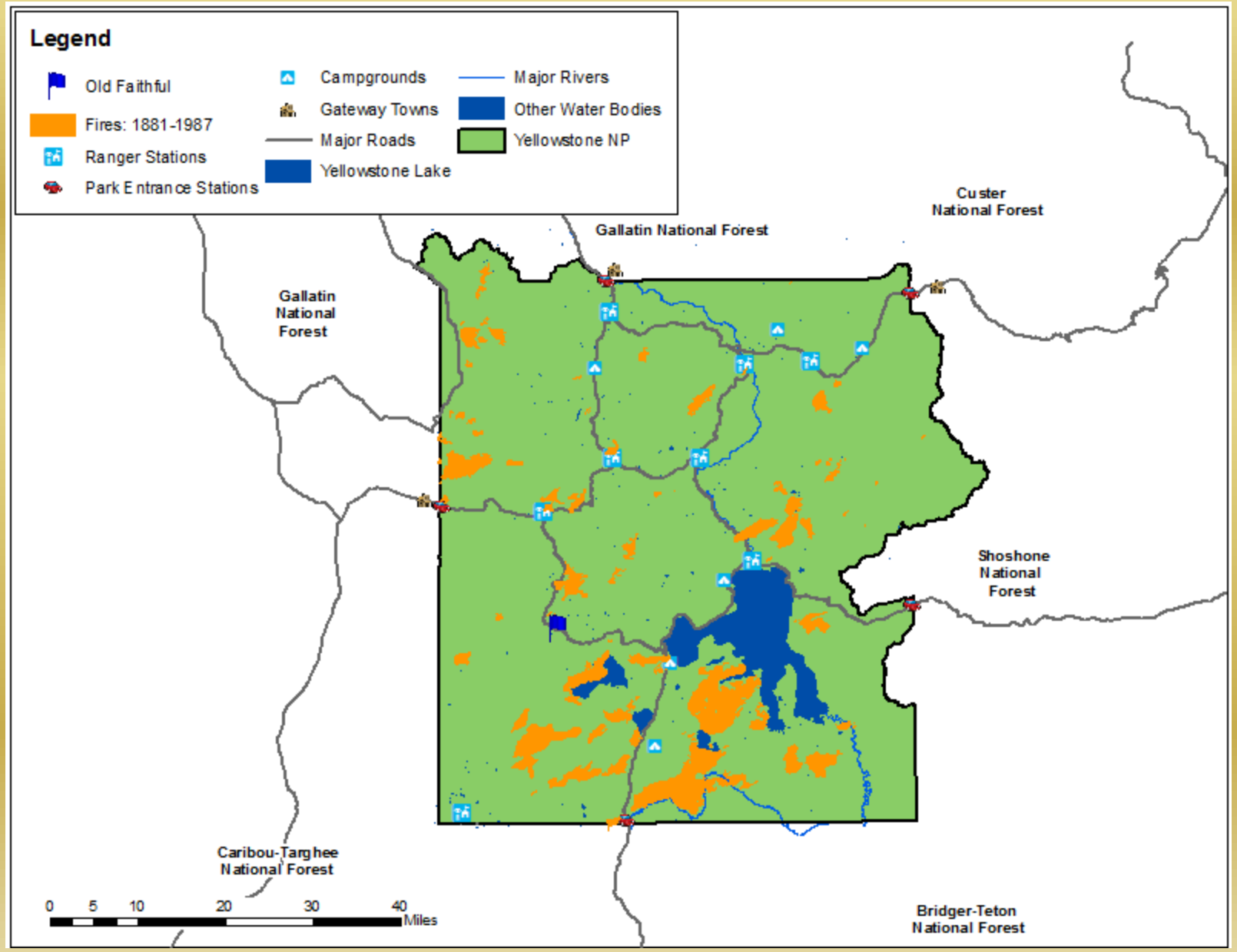
• In particular, fire perimeter maps for fires prior to 1960 and earler should be considered most suspect.

• Two aircrafts (with infrared scanners) were available until late August, at which point one was sent to other fires. Unfortunately, the largest fire growth was taking place at this time, and one aircraft could not cover the entire active fire perimeter in one night of flying. Areas on the Snake Complex in the south, the Clover-Mist Fire in the eastern section, and the North Fork Fire were not well mapped late in the summer.

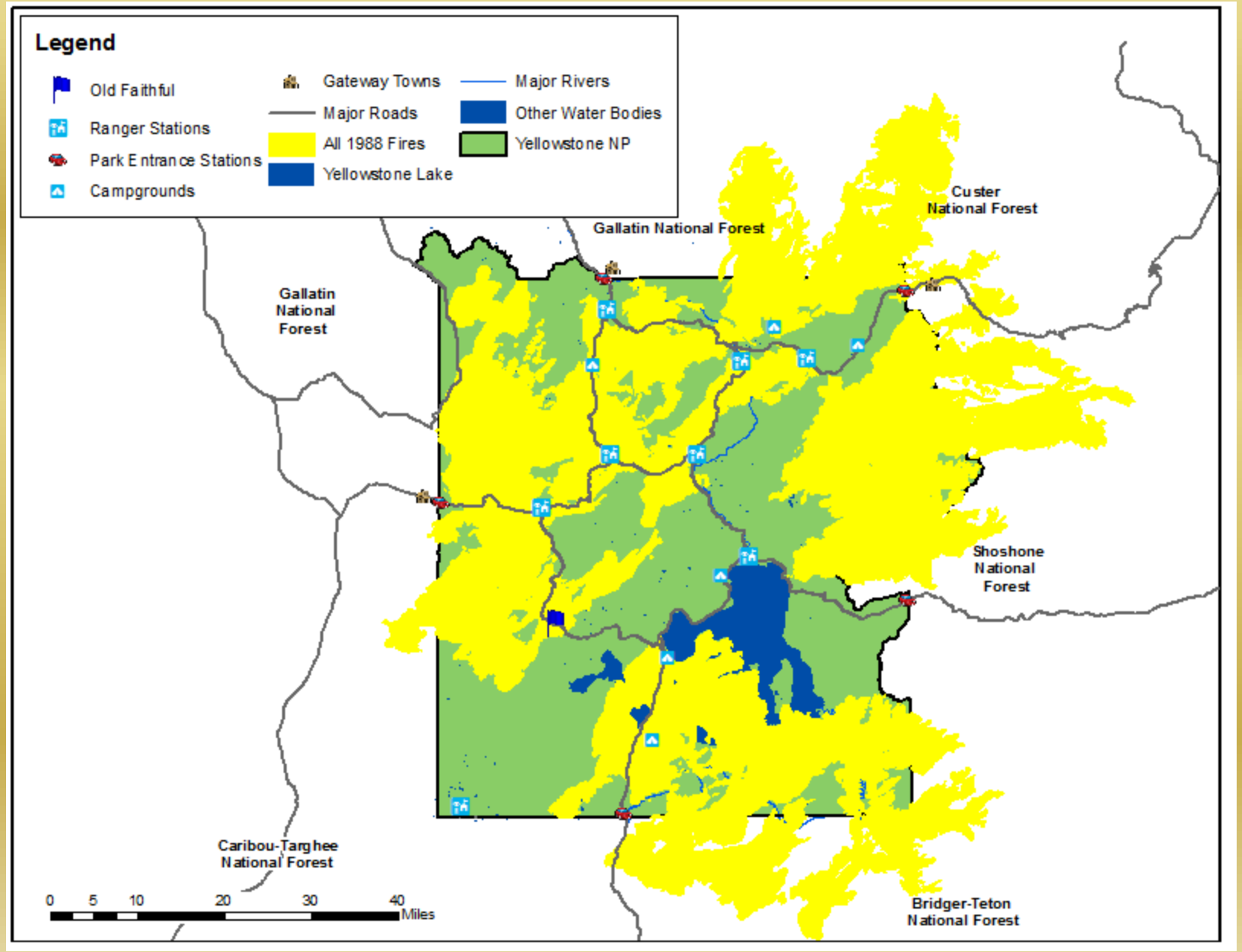
The Maps Created

- All Fires: 1881 – 1987
- All Fires: 1988
- All Fires: 1989 – 2008
- All Fires: 1881 – 2008
- Animated Map showing fire starts and spread for 1988
- Close-up Map of Old Faithful Area
- “Black Saturday”

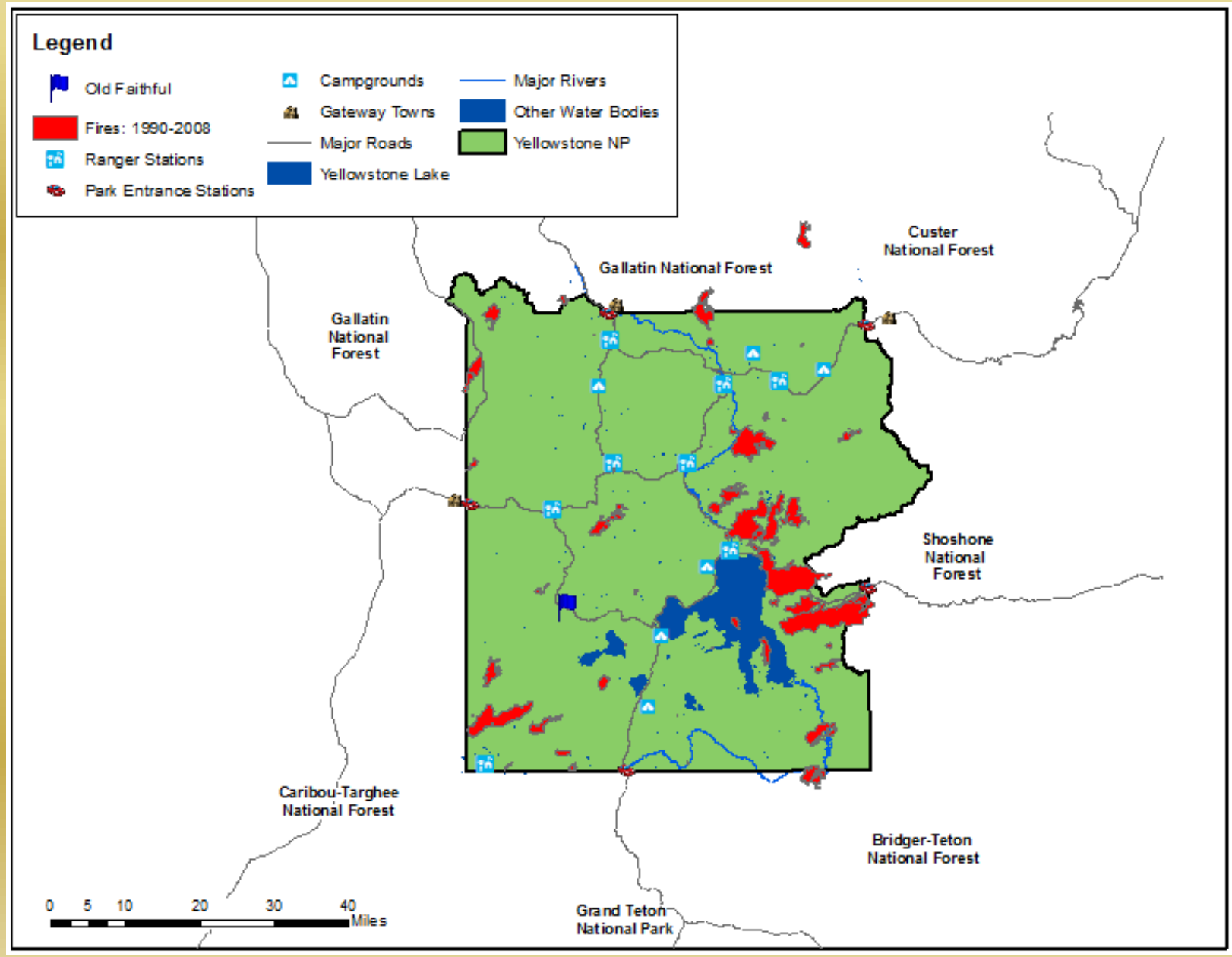
Total fire perimeters in the Greater Yellowstone Area – 1881 through 1987



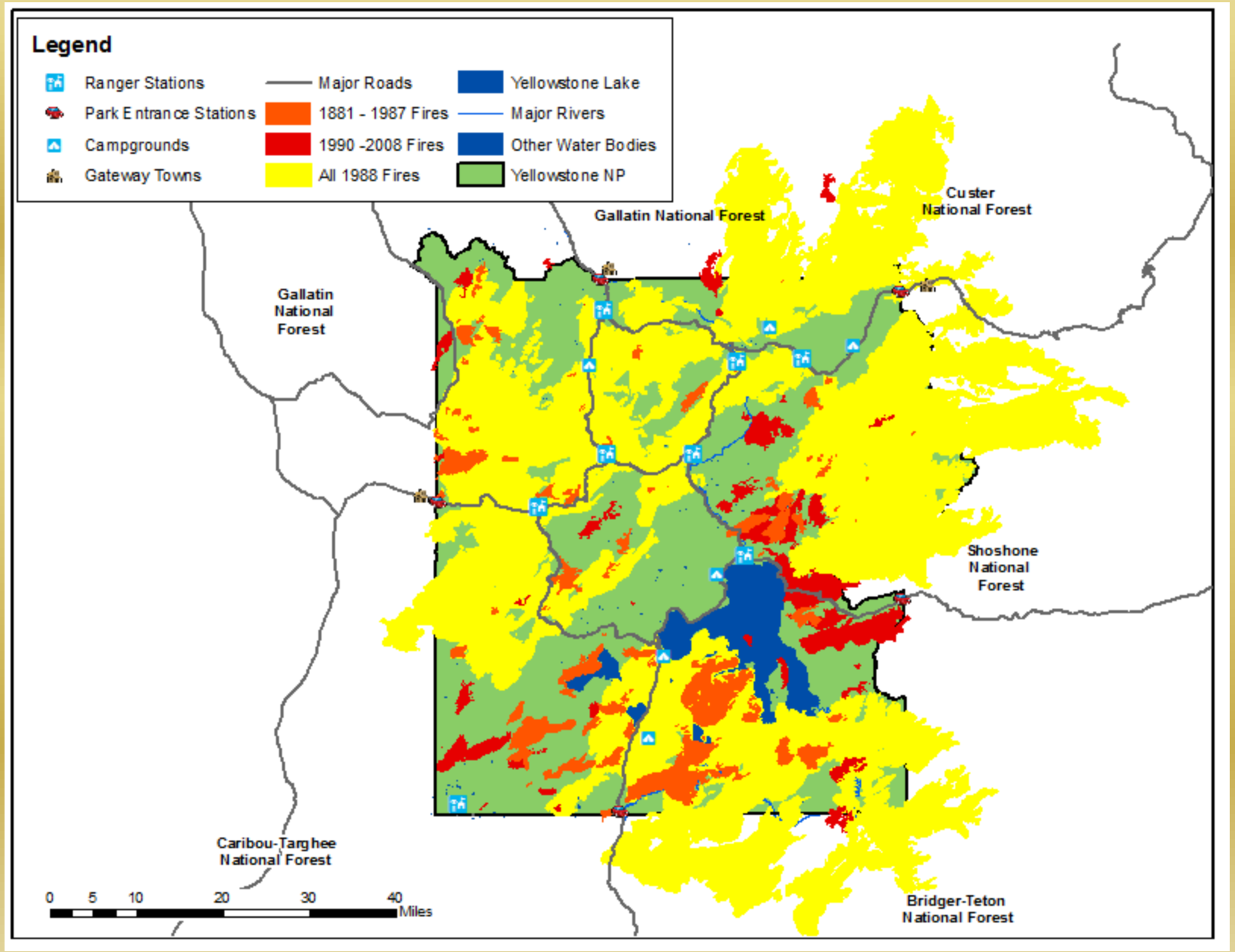
Total fire perimeters in the Greater Yellowstone Area – 1988



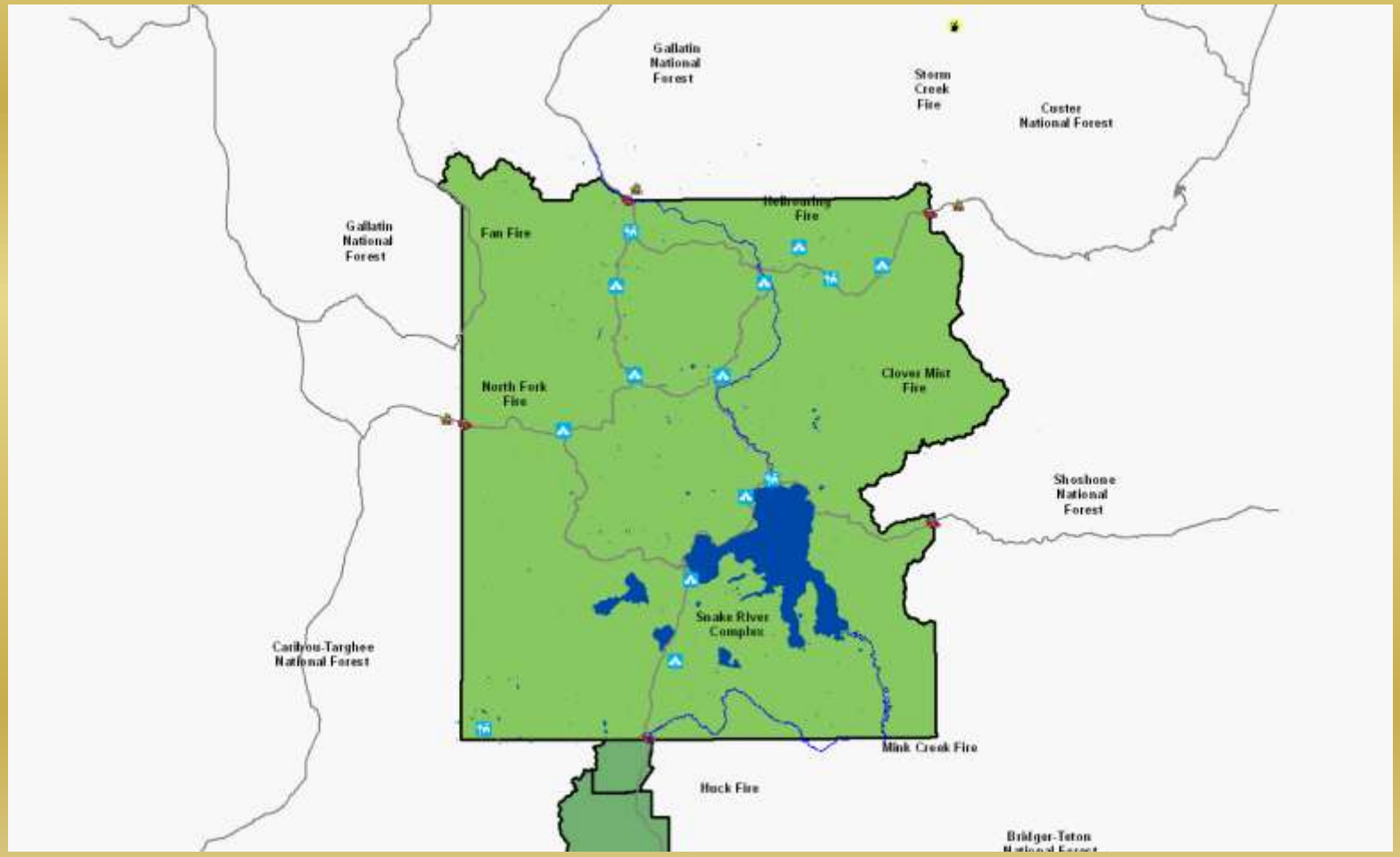
Total fire perimeters in the Greater Yellowstone Area – 1990 through 2008



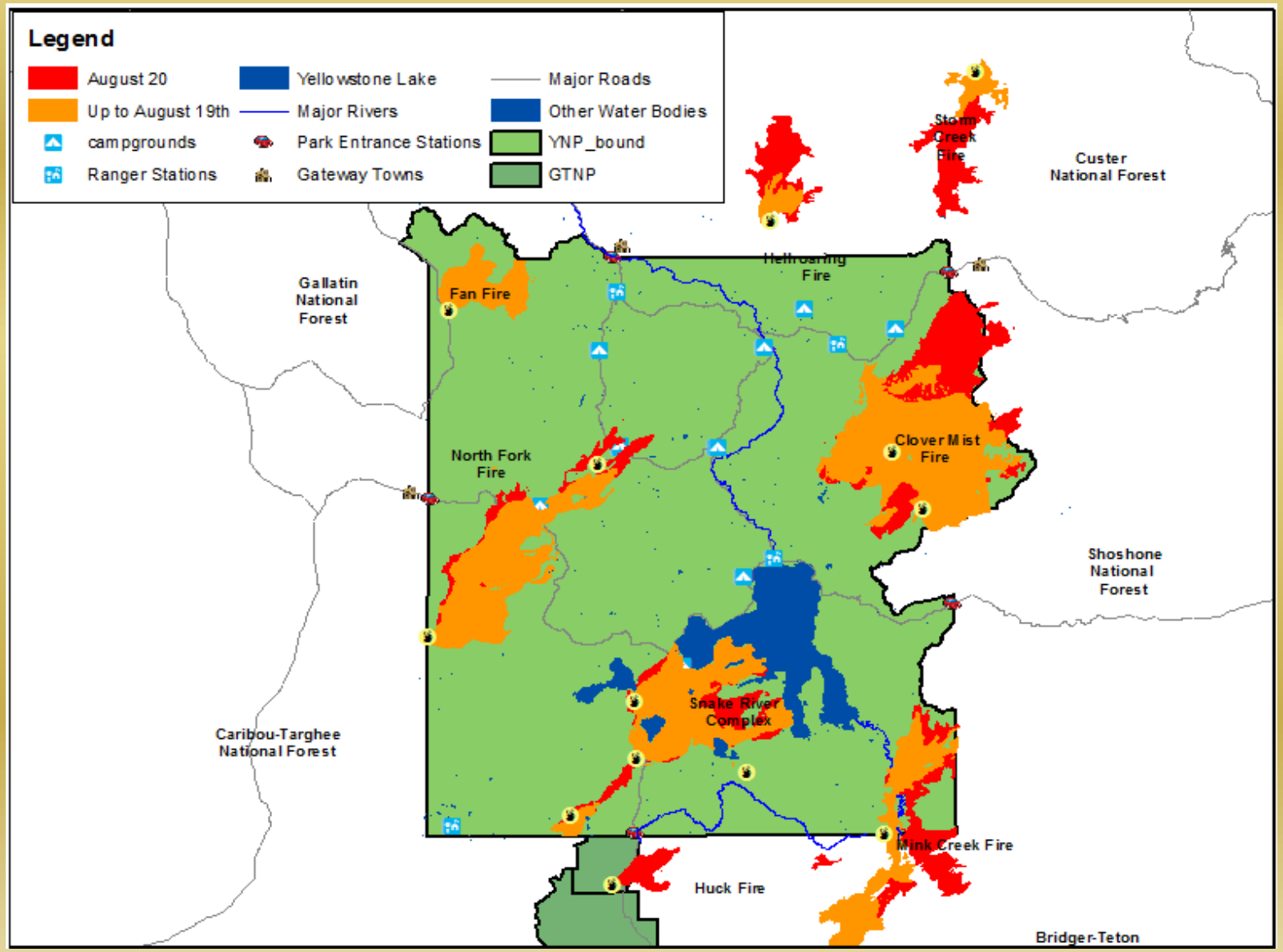
Total fire perimeters in the Greater Yellowstone Area – 1881 through 2008



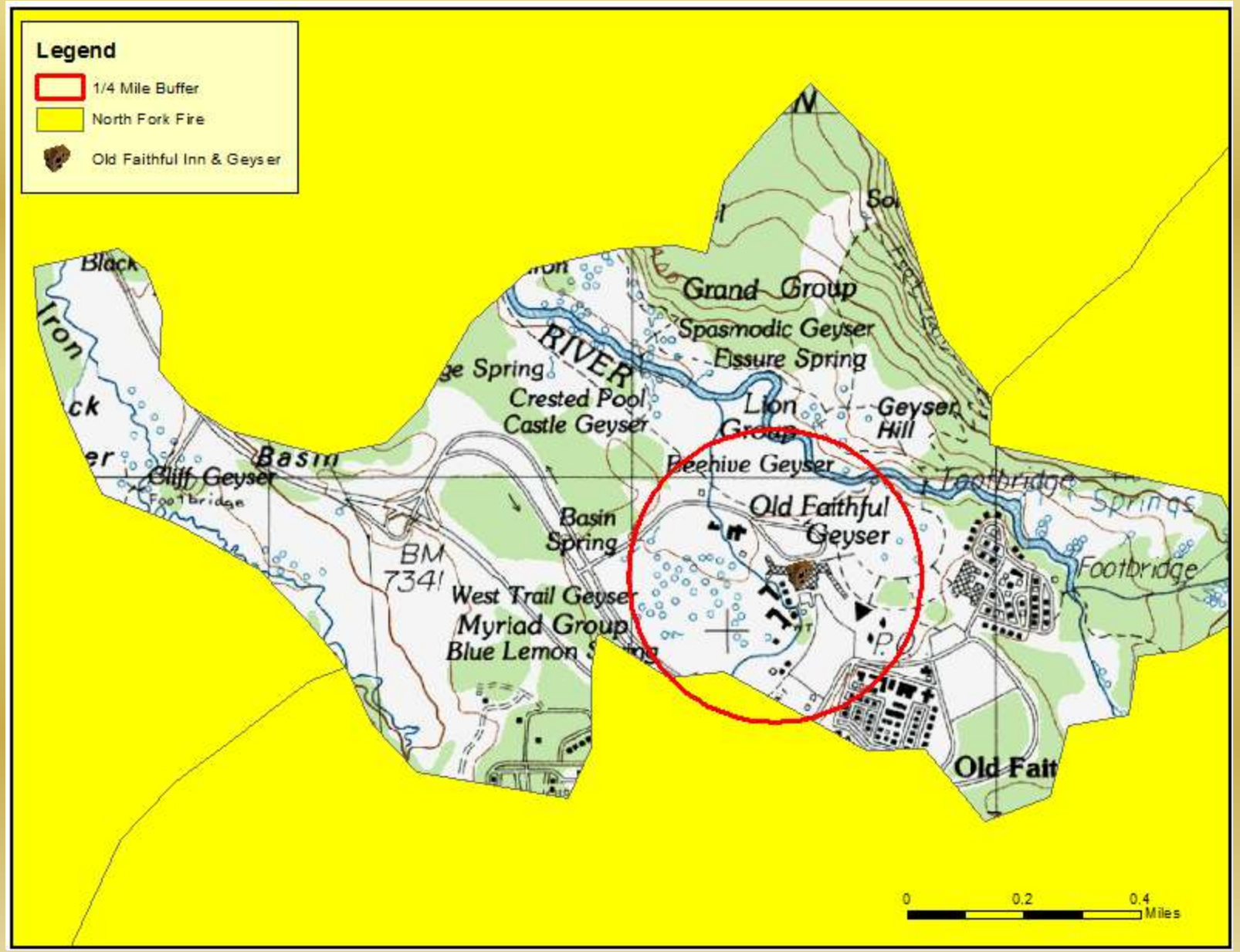
Fire Progression June 14th – October 1st, 1988



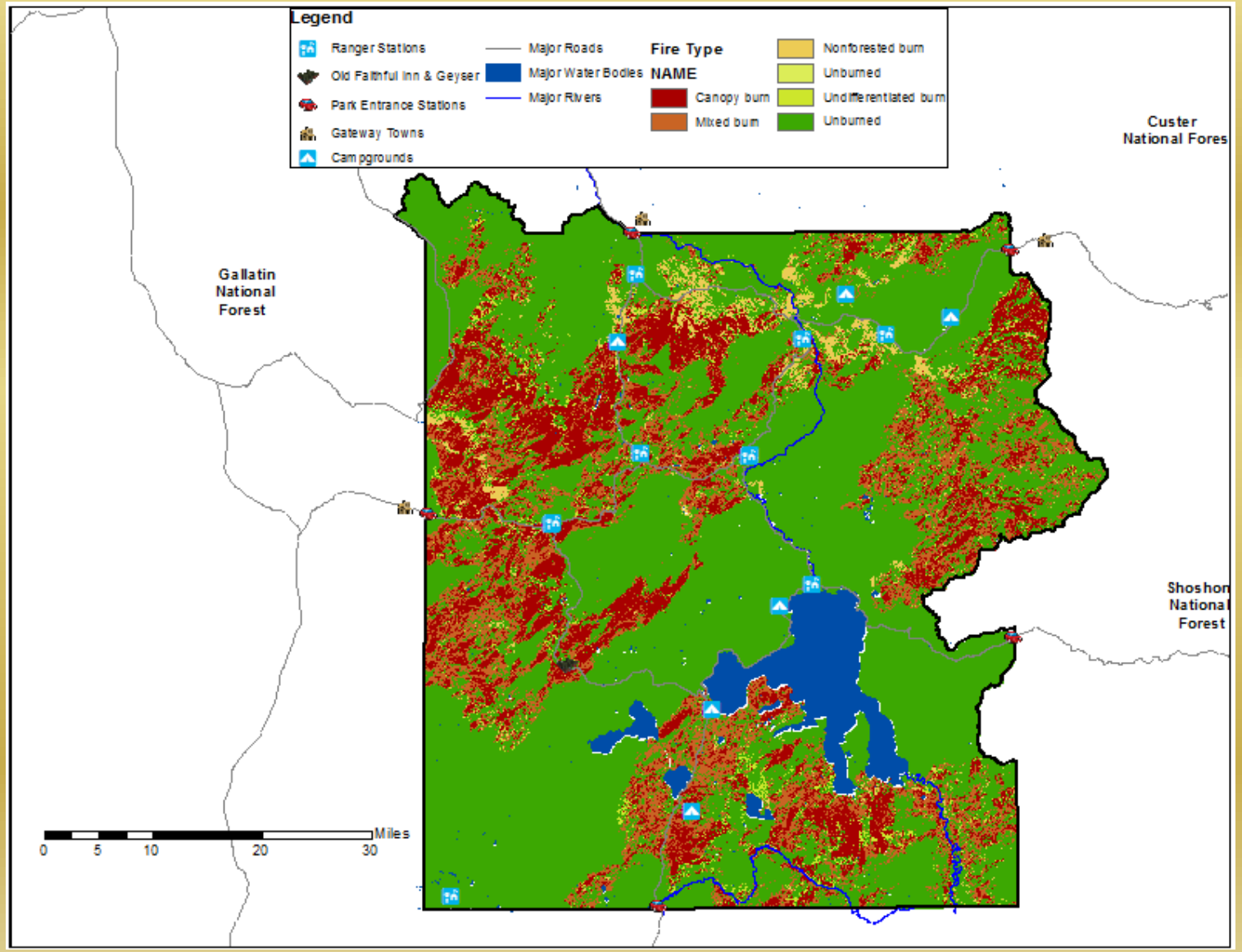
“Black Saturday” – August 20th



North Fork Fire & Old Faithful Area

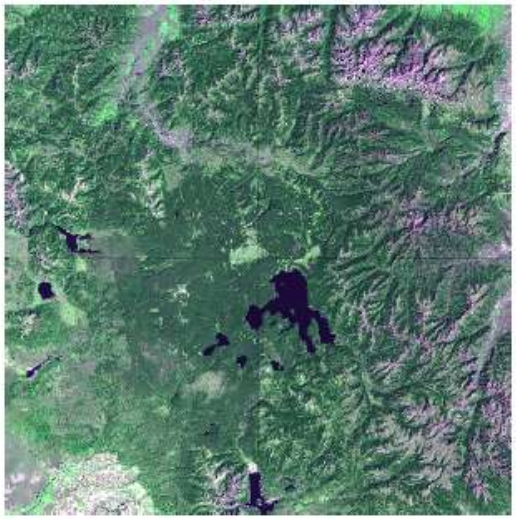


Burn Types


Legend
Ranger Stations
Old Faithful Inn & Geyser
Park Entrance Stations
Gateway Towns
Campgrounds
Major Roads
Major Water Bodies
Major Rivers
Fire Type
NAME
Canopy burn
Mixed burn
Nonforested burn
Unburned
Undifferentiated burn
Unburned
Gallatin National Forest
Custer National Fores
Shoshon National Forest
0 5 10 20 30
Miles

1987 & 1988 Landsat Images

243 Composite image - Sptember 1987 (1 year prior to the fires)



243 Composite image - September 1988
Notice the obvious burned areas and smoke in some areas

421 Composite Image - September 1987 (1 year prior to the fires)
In this image vegetation appears red in color because in the composite, band 4, infrared was assigned the color red.

421 Composite Image - September 1988
In this image the unburned vegetation appears red and the burned areas are much easier to distinguish than in the color composite above

References

Rothermel, Richard C.; Hartford, Roberta; Chase, Carolyn H. 1994. Fire Growth Maps for the 1988 Greater Yellowstone Area Fires. United States Department of Agriculture, 1994, General Technical Report, INT-304.

Franke, M.A. 2000. Yellowstone in the Afterglow: Lessons From the Fires. Mammoth, WY: Yellowstone Center for Resources, Yellowstone National Park, 2000

Pyne, S. 1982. Fire in America: A Cultural History of Wildland and Rural Fires. University of Washington Press, Seattle, WA. 654pp.

Anderson, J.E., and W.H. Romme. 1991. Initial floristics in lodgepole pine forests following the 1988 Yellowstone fires. International Journal of Wildland Fire. 1:119-124.

Bonnicksen, T.M. 1989. Fire Gods and Federal Policy. American Forests 95(7/8): 14-16.

Bath, A.J. 1993. Attitudes toward fire and fire management issues in Yellowstone National Park. Dissertation, University of Calgary, Alberta, Canada.

Barker, Rocky. Scorched Earth: How the Fires of Yellowstone Changed America. Washington, D.C.: Island Press, 2005.

Morrison, Micah. Fire in Paradise: The Yellowstone Fires and the Politics of Environmentalism. New York: HarperCollins Publishers,1993.

Wuerthner, George. editor. Wildfire: A Century of Failed Forest Policy. Sausalito, CA: Foundation for Deep Ecology, 2006.

Reinhart, Karen W. Yellowstone's Rebirth by Fire - -Rising From the Ashes of the 1988 Wildfires.
Helena, MT: Far Country Press,2008.

Carle, David. Burning Questions: America's Fight with Nature's Fire. Westport, CT: Praeger Publishers. 2002.

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