SPARKING CHANGE: THE ARCHAEOLOGY OF FIREFIGHTING IN YELLOWSTONE NATIONAL PARK

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ABSTRACT

Yellowstone National Park was created in 1872 and wildland fire has been a major factor in shaping the physical appearance of the park ever since. Wildland fire has shifted from being an indivisible part of the landscape, to a foe in need of suppression, and finally to a natural but often unpredictable element that perpetuates natural processes. These changes in approaches towards fire are visible in historical and archaeological records. This thesis seeks to answer what motives drove change in the perception of fire on the landscape, how wildland firefighting is present in the archaeological record, and how wildland fire is part of our definition of wilderness.

ACKNOWLEDGEMENTS

I would like to give a well-deserved thanks to my major advisor and lead committee member Dr. Stacey Camp without whom I would have never properly formulated a concise thesis nor had the support to gain permission to study in one of our nation's greatest national parks. Dr. Adam Sowards is one of the most demanding professors I have taken a class from and his keen attention to academic writing has shaped my work into the product shown in the following pages. Dr. Lee Sappington provided much needed feedback not only in my writing but also in my presentation style. Dr. Mark Warner has an uncanny ability to spur existential crises in the minds of his students and force them to find real meaning and practical application in their work. Without his unfiltered opinions, I would have drafted something far less useful.

I also could not have accomplished this without the help of the staff at the Heritage and Research Center located in Gardiner, Montana. Working far from home, on a tight timeline and budget, they ensured I received the materials and information I needed for my work. Archivist Anne Foster was instrumental in making my trip to the Heritage and Research Center a success.

Since I elected to study something I found interesting but did not have first-hand experience with I needed an expert on firefighting who would endure constant questioning, provide emergency feedback, and give me insight into the world of wildland firefighting. Without the help of Heather Heward I would only have the vaguest understanding of wildland firefighting and would have written in a lexicon unrecognizable to those that

actually carry a Pulaski into the field. Her help ensured my work would be truly interdisciplinary and relevant to several fields.

My father, Roy Hugie, who found as much enjoyment in this work as I did, provided feedback, edits, and his own environmental expertise to many aspects of this thesis. His professional experience in land rehabilitation proved invaluable in the chapter on the archaeology of firefighting.

Lastly, my wife served as my photographer, chief editor, conversationalist, and pack mule for this work. She endured innumerable conversations concerning methodology, theory, and how to apply the knowledge gained from this work into something tangible. She joined me in Yellowstone National Park during my first trip with our one-year-old baby girl and both accompanied me up Mount Washburn, Bunsen Peak, and Purple Mountain to photograph the fire lookout sites located on those mountains. Those three hikes are all memorable; Mount Washburn for the inspiring view, Bunsen Peak for being incredibly long and steep, and Purple Mountain for the rainstorm that rolled in when we were half way up the mountain. Only a dedicated and loving wife would hike up those mountains with a sometimes laughing and sometimes crying baby. She also paid far more attention to grammar in her English classes than I did and I am very thankful she did. Thank you so much for the support in finishing this thesis.

DEDICATION

To my wife Courtney and our daughter Madeleine.

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LIST OF ACRONYMS

BRC	Blister Rust Control
CCC	Civilian Conservation Corps
ECW	Emergency Conservation Work
FMP	Fire Management Plan
DBH	Diameter at Breast Height
GYE	Greater Yellowstone Ecosystem
NPS	National Park Service
USFS	United States Forest Service
YNP	Yellowstone National Park

INTRODUCTION

Landscapes tell stories. They are a canvas on which humanity has painted with its own narrative. This narrative can be as minimal as footprints in sand or as catastrophic as nuclear weaponry. On March 24, 2010, I found myself observing a landscape that I had heard about as a child and seen on nightly news broadcasts. I was flying a local area familiarization flight as part of my deployment to Kuwait and southern Iraq with the 2515th Naval Air Ambulance Detachment based at Camp Buehring in Kuwait. The goal of the flight was to become familiar with the region I would be flying over as a Navy helicopter medevac pilot. The emphasis for the flight was on learning commonly referenced landmarks and practicing the procedures needed to fly around a country still in the thralls of war. The tormented landscape below me had not only been a witness to war but also a victim of the world's thirst for oil. Adjacent to the scars of war were numerous structures conceived for the purpose of extracting oil. The plumes of smoke emanating from these structures announced to the casual observer that this was a vital resource worth investment.

During the first Gulf War in 1991, Saddam Hussein promised "the mother of all battles" during a January 17 broadcast on Baghdad state radio.[1] Part of his strategy for this upcoming battle with coalition forces was to bury his Soviet built tanks in the desert, but only up to their turrets. This resulted in hundreds of tank-sized pits dotting the landscapes of Iraq and Kuwait. While this afforded the Iraqi tanks some protection from coalition ground forces, it did nothing to protect the tank or its crew from air strikes. The pockmarked

[1] Rick Atkinson and David S. Broder, "U.S., Allies Launch Massive Air War Against Targets in Iraq and Kuwait," *Washington Post* (Washington D.C.), Jan. 17, 1991.

landscape between Um Qasr and Nasiriyah in southern Iraq is littered with the remnants of the actions of February and March of 1991.

It was while flying over these U-shaped pits with jagged rusting tank hulls in them that I realized that this landscape would remember this war just as long, if not longer, than humanity. The landscape in this case tells a story of conflict and resource extraction, of offensive and defensive measures taken through acts of war. Similarly, landscapes affected by wildland fire have stories that span over centuries and even millennia in terms of damage, efforts to control it, and ways to prevent its occurrence.

In its own way, wildfire can assume the role of combatant in the study of wildland firefighting. The lexicon used by professional wildland firefighters borrows heavily from military terms. Like an enemy force, fires have flanks and can be assaulted through direct or indirect attack. Fires can also outflank firefighters and strike behind firelines to cause hot spots that are isolated fires burning in front of the primary fire.[2] The primary means of controlling fires is done through actively smothering the fire with dirt or water, or building lines across the ground voided of any burnable material.[3] It is easy to draw parallels between the trench work of past wars with the hand and bulldozer cut firelines of past and present.

Unlike warfare, wildland firefighting is a grossly understudied portion of archaeology. In many ways, it is a difficult, or at least unconventional, topic for an archaeologist to study. It leaves little behind in the way of material culture since the physical act of digging a fireline or spraying a fire with water involve equipment that is only left in

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[2] *Wildland Fire Suppression Tactics Reference Guide* (Boise, ID: National Interagency Fire Center, 1996), 18-19.

[3] Ibid, 16.

the field accidently. All equipment, debris, and trash carried into the field by the modern firefighter is packed out or incinerated.[4] The camps established to support firefighters are also only present for a few days or maybe a month. In the aftermath of the blaze, the landscape is rehabilitated, both naturally and through human effort, to obliterate any signs that a struggle between humanity and nature occurred at that location.

Tracking the evidence of wildfire events becomes problematic in that the more time that passes between the events; the more difficult it is to find evidence of and the extent of its occurrence. Therefore, one of the primary questions of this thesis is, "How does evidence of fighting a wildland fire show up in the archaeological record?" Christian A. Kull's article "Landscapes of Fire: Origin, Politics, and Questions" is an excellent starting point for researching wildland firefighting.[5] In that article, Kull details a methodology for studying fire on a landscape and this methodology proved to be influential in both archival and field research. He mentions remote sensing, archival photographs, archival documents, dendrochronology, paleoecology, personal stories, and interviews as possible research sources. The data and information obtained through implementation of these methods were supplemented with data collected by the author at known wildland fire sites in Yellowstone National Park (YNP) during two weeks in July and August of 2014. The goal of the fieldwork was to locate evidence of human impacts that had survived rehabilitation and to gain a sense of how fast forest regrowth obliterates evidence of firefighting. Forest regrowth was evaluated using Diameter at Breast Height (DBH) measurements. This measurement is a low impact means of estimating the age of a tree by measuring the DBH and comparing it

[4] Cody Hunter and Ry Phipps (Grangeville Smoke Jumpers) during open house event at Grangeville Airport, July 12, 2014.

[5] Christian A. Kull, "Landscapes of Fire: Origins, Politics, and Questions," in *Handbook of Landscape Archaeology,* ed. Bruno David and Julian Thomas, (Walnut Creek, CA: Left Coast Press, 2008), 424-429.

with known tree age samples. Normally a tree-boring tool and counting tree rings is the preferred method but given the low-impact emphasis of conducting research in a national park, this methodology best suited the scope of this thesis.

However, wildland firefighting itself is anything but a low-impact occurrence on a landscape. Firefighting represents a huge monetary investment and an inescapable question of firefighting is why humanity engages in the practice. No less an expert than Elers Koch, a veteran of the infamous 1910 fires, stated in his autobiography that, "The results in fire control have been almost negligible."[6] Koch wrote this statement in the final chapter of his book, where he gives recommendations for the future of the United States Forest Service (USFS). His personal conclusion is that firefighting in most cases is an ineffective and inefficient landscape management practice. His reasoning is that it only takes one bad fire season to expunge the suppression efforts of previous years. He added, "If I could show you in color a map of this region with the areas burned over since the beginning of the national forest administration, the country would be shocked at the lack of results for the millions expended."[7] Koch failed to see value in the USFS firefighting policy during his service.

Nevertheless, firefighting has become an integral part of both the USFS and the National Park Service (NPS) and has remained so since the creation of these two government agencies. David Easton's political systems theory can be used to explain why the NPS fights fire and how it has altered its fire policy over time.[8] Easton's approach

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[6] Elers Koch, *Forty Years a Forester: 1903-1943* (Missoula, MT: Mountain Press Publishing Company, 1998), 193.

[7] Ibid.

[8] David Easton, "An Approach to the Analysis of Political System," *World Politics* 9, no. 3 (April 1957): 383-400.

involves identifying the inputs into a political system in the form of demands and support. The output of the political system takes the form of decisions or policies, and these in turn result in feedback, which can be used to shape additional inputs. Easton is not a theoretician commonly used by anthropologists but his theory provides an excellent means of framing how policies are created. The evolving purposes of YNP and surrounding area (Greater Yellowstone Ecosystem (GYE)) have shaped fire policy. These shifts in approaches to fire are covered in Chapters One, Two, and Three.

The phrase "landscape management" may seem out of place when it is included in a sentence concerning YNP. For many tourists and visitors, YNP represents wilderness in its most unrestrained form, at least wilderness that can be comfortably observed from trails and the security of vehicles. The geothermal features, the abundance of charismatic megafauna, and sparse structural development help promote YNP as not just a national park but as a vestige of our environmental past. With regard to the past, fire has been ignored, tolerated, suppressed, set intentionally, and closely managed in YNP and the GYE. Fire's role in the park fluctuates depending on whether we see its presence as compatible with our intended end use. As the concept of what a wilderness should be has evolved, justifications as to the inclusion or exclusion of fire have evolved to match.

The role of fire on the landscape has actually come almost full circle from where it started in 1872. Noted fire historian Stephen Pyne created a model in his 2012 book *Fire: Nature and Culture*, which I will refer to as the three fires model.[9] The first fire is natural fire sparked by lightning; the second fire is that set by humans to control a landscape, hereafter referred to as anthropogenic fire; and the third fire is found in an internal

[9] Stephen J. Pyne, *Fire: Nature and Culture*, (London: Reaktion Books, 2012), 7-10.

combustion engine, which in turn powers machinery used to manage landscapes. In each stage, fire is harnessed for a purpose until it is trapped in an engine, fed air and fuel in closely manipulated quantities, and readily extinguished when no longer desired.

YNP and the GYE have witnessed all three fires and, in the interest of better fire ecology, have partially reverted to natural fire and even anthropogenic fire practices. However, anthropogenic fire has been part of GYE with YNP at its core since the ending of the last Ice Age. Native use of fire to manage the landscape was a common practice long before YNP was established.[10] Current policy and practices do not attempt to take the park back to an earlier time but instead exclude all anthropogenic fire as if humans had never visited the landscape. This suppression of anthropogenic fire suggests that our desired end state for YNP is for it to be representative of an ecosystem devoid of humans, a system that has not existed in perhaps 11,000 years.

Understanding how firefighting shows up in the archaeological record, why people fight wildland fires, and how this action translates into our definition of wilderness are the three primary questions addressed in this thesis. This encompasses developing methodology suggested by Christian Kull, the use of David Easton's systems theory, and discussion concerning Stephen Pyne's three fires model as it applies to a national park.

A common question that I encountered during this research was what academic discipline does my research fit into? Kull's methodology overlaps considerably with resources that a historian would use to study a topic. David Easton focused most of his work on political systems theory, which can be adapted to explain a wide range of subjects but it

[10] Mark David Spence, *Dispossessing the Wilderness: Indian Removal and the Making of the National Parks* New York: Oxford University Press, 1999) 43-44.

is still a theory with origins outside of anthropology. Pyne probably never meant to have his three fires explanation used in the context that I have. The multidisciplinary nature of my thesis is very apparent in my choice of theory, method, and model. What firmly plants my research in the historical archaeology subfield is my use of theory to explain change and the need to conduct fieldwork, two aspects that move my work away from a purely historical approach and into the field of archaeology. This theory and fieldwork based approach is what separates social sciences from humanities. This thesis reflects the anthropology, history, rangeland ecology and management, and conservation social science courses I took as part of my degree.

The first three chapters detail how fire policy in YNP has evolved and pursue answers to the second and third questions posed above. The period from the park's inception in 1872 to the founding of the NPS in 1916 makes up the contents of Chapter One. Chapter Two discusses the buildup of infrastructure in the park during the first 50 years of NPS administration, from 1916 to 1966. Chapter Three addresses the changes that occurred between 1966 and the aftermath of the 1988 fires. Each of these chapters emphasizes how the perceived role of fire on the landscape has shaped the park into its present form and demonstrates that fire sparks the changes in policies.

Chapter Four focuses solely on the first question. Six historical fire sites make up the survey covering over 50 years in the park, from the 1931 Heart Lake Fire to the famous North Fork Fire of 1988. Fires were selected based on their date (roughly one per decade), equipment used, and location. During August 2014, three of the sites were surveyed through fieldwork, with particular attention paid to evidence of firefighting and forest regrowth. The three sites that were not surveyed were evaluated using Google Earth and historical

documents. Together, these six fires illustrate not only changes in firefighting tactics and equipment, but tell a story about how fire has been managed on a landscape prone to awe-inspiring bursts of ecological renewal.

CHAPTER ONE: 1872–1916

The concept of a national park was revolutionary in late 1871 to both the House of Representatives and the Senate. Yet on March 1, 1872, Yellowstone National Park (YNP) was established.[1] This new entity became a part of the Department of the Interior. However, the policy and methodology required to manage this new entity was inadequately delineated. The present steward of the park, the National Park Service (NPS), was not established until 1916. Prior to the NPS, the United States Army managed the park from 1886 to 1916. Even when the NPS took over the park, they retained procedures established by the Army. These practices included systematic backcountry patrols, lookouts, and a policy of stamping out every fire, and these practices remained after the last troops had departed the park.

The period from the park's inception in 1872 until 1916 is unique in the park's history. The early years of the park saw a succession of superintendents that at times had little guidance or resources to administer the duties of their post. Nathanial Pitt Langford, the first superintendent of the park, wrote in his first report to the Secretary of the Interior that unattended fires were a significant problem in the park.[2] Even in the park's inaugural year, fires were a concern of those charged with its protection.

Forest fires during this period were analogous to vandalism, especially when ignited by unattended campfires. Reports and letters written by early superintendents mention the hazards of fire along with the need to curtail poachers and protect geysers from souvenir hunters. Applying Easton's systems theory allows us to define concerns regarding fire

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[1] Aubrey L. Haines, *The Yellowstone Story: A History of Our First National Park Volume One* (Niwot: University Press of Colorado, 1996), 171-172.

[2] Nathanial P. Langford, *Report of the Superintendent of the Yellowstone National Park for the Year 1872*, U.S. 42d Cong. 3d Sess. Senate Ex. Doc. 35. February 4, 1873.

during this timeframe and support the conclusion that the primary catalyst for policy change in YNP was wildland fires. To a lesser extent poaching and protection of the natural wonders of the park spurred policy change, sometimes at very crucial moments, but the conservation movement that came from the Progressive era emphasized fire control on public lands. Fire would ensure the ultimate inadequacies of the early superintendents to manage YNP, which in turn would prompt a change in policy that would allow military administration of the park. It would also give the Army a foe to combat during peacetime and ultimately lead to turning over the park to the NPS on the eve of the United States entry into World War I.

Before being set aside as the first national park, Yellowstone had to be thoroughly explored. The first well-organized expedition into the area, the Washburn Expedition, was in 1870.[3] Previous expeditions to the park lacked representatives from the government or military. This 1870 expedition included General Henry D. Washburn and Lieutenant Gustavus C. Doane as well as representatives from the commercial interests of neighboring areas. The purpose of this expedition was to ascertain if the rumors of the unique natural phenomena were true. The diaries of those that traveled on this expedition exclaim about the magnificent features they encountered. They also remarked about their encounters with fire as they traveled through the future park. Lieutenant Doane remarked in his journal on August 25, 1870, that "from this camp was seen the smoke of fires on the mountain in front,

[3] Nathaniel Pitt Langford, *Diary of the Washburn Expedition to the Yellowstone and Firehole Rivers in the Year 1870,* (Berkley: University of California, 1905), xvi.

while Indian signs become more numerous and distinct."[4] This observation, made just three days into the expedition, demonstrates fire's association with the Native American inhabitants of the park. Lieutenant Doane recognized that the fires he saw were likely set by Native Americans, but fire is also associated with the wilderness aspect of the park. While these early surveyors were thrilled with the geysers, mud-volcanoes, lakes, and falls found in the park, they also saw a landscape at risk. This observation would establish the perceived threat of fire in Yellowstone throughout the late 19th and early 20th century.

The next year saw another expedition into the future park. Ferdinand V. Hayden, a geologist and professor at the University of Pennsylvania, conducted a geological survey of the northwestern part of the Territory of Wyoming in 1871. Although principally a geological survey, he included scientists from many fields of study. An entomologist, meteorologist, botanist, mineralogist, several artists, a physician, a photographer, and a topographer were included in the expedition.[5] It was the conclusion of this expedition that prompted legislation to set aside what Professor Hayden called a "wonderland as a great National Park for all time."[6] In the vocabulary of system's theory, both of these expeditions are inputs in the form of demands on a political system. Both expeditions provided facts in the form of scientific data and observations. William Henry Jackson, the photographer that Hayden included in his expedition, provided the photographic evidence needed to confirm that the Yellowstone region did have unique geothermal features. Absent from this source of

[4] Gustavus C. Doane, *The report of Lieutenant Gustavus C. Doane upon the so-called Yellowstone Expedition of 1870,* U.S. 41st Cong, 3rd Sess. Ex. Doc. 51, (Washington, Government Printing Press) March 3, 1871.

[5] Louis C. Cramton, *Early History of Yellowstone National Park and its Relation to National Park Policies,* (Washington, Government Printing Press, 1932), 22.

[6] Ibid., 24.

demands is any mention of wildland fire, the focus instead being on the protection of the geothermal features.

The act that establishes YNP does not mention fire directly. The act stipulates that the Secretary of the Interior should establish regulations to prevent "injury or spoliation of all timber, mineral deposits, natural curiosities, or wonders within said park."[7] The use of the word timber in the legislation is an interesting choice. Indeed, during the parks first few years the possibility of harvesting timber was a viable option for income. Nathaniel P. Langford, the first superintendent of the park and a member of the 1870 expedition, was also a resident of Minnesota and was familiar with the timber industry through his banking practice. Rocky Barker illustrated in his book, *Scorched Earth: How the Fires of Yellowstone Changed America*, that it was this familiarity with the timber industry, which drove Langford to protect the timber of the national park as if it was a harvestable resource.[8] Langford proposed a law making it a punishable offense to leave a fire unattended to protect this harvestable resource. However, Langford's desired regulations were unenforceable. What was missing from the Yellowstone Act was any sort of financial appropriations for management or development of the park. In an effort to ensure passage of the act establishing YNP, Professor Hayden pledged that the park would not need any appropriations for at least a decade.[9] This meant that Langford lacked the funding to create any sort of law enforcement for park purposes. Langford's own position of superintendent

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[7] U.S. Senate and House, 42nd Cong., 2nd Sess., *An Act to set apart a certain tract of land lying near the headwaters of the Yellowstone River as a public park*, Washington, Government Printing Office, 1872.

[8] Rocky Barker, *Scorched Earth: How the Fires of Yellowstone Changed America* (Washington: Island Press, 2005), 44-45.

[9] Cramton, *Early History of Yellowstone National Park and its Relation to National Park Policies*, 37.

was a title with no salary. He only visited the park twice during his five year administration since he had to remain in Minnesota to continue his employment as a bank inspector.

Langford's first report of February 1873 to the Secretary of the Interior Columbus Delano, details many of the problems he encountered during his first year of park administration. He mentions poaching, squatters, and unattended fires as problems that will require laws to be enacted and enforced.[10] Reassessing the system's theory, if the two expeditions are the demands placed on the political system, and the act establishing YNP is the output, then Langford's report is the first real feedback into the system. Langford knew that members of the Senate and House of Representatives would review his report. Appropriations for the park would come from congressional approval and Langford played to this audience by listing the wonders of the park and the pressing need to protect them. Langford's alternative source of income for the park is also in his report. Private companies immediately sought leases for land inside the park to erect lodging for park visitors. Companies also inquired about the possibility of toll roads and timber harvesting in the park. Langford had the authorization to grant such leases. Thankfully, Langford saw these sources of revenue as detrimental to the national park concept and denied all requests. He mentions these proposals for leases in his letter to emphasize the dire need for federal support of the national park idea beyond merely delineating the land as a park. In Langford's mind, the land needs more than just to be set aside; it needs protection from those forces that would spoil its beauty.

[10] U.S. Senate and House, 42d Cong., 3 Sess., Ex. Doc. 35, *Report of the Superintendent of the Yellowstone National Park for the year 1872,* Washington, Government Printing Press: 1873.

Philetus Norris became the second superintendent of the park on April 18, 1877. The next day he penned a letter to James C. McCartney who ran a boarding house on the north end of the park and appointed him as his assistant superintendent. In this letter he encouraged the newly appointed assistant to protect the game and geysers of the park, with a particular emphasis on forest-fires as the primary problem.[11] Norris might have been the second superintendent of the park but he was the first to receive a salary and budget for the park. In 1878, a yearly appropriation of $10,000 was available to the park superintendent to "protect, preserve, and improve the Yellowstone National Park."[12] Norris would use these funds to expand access to the park through roads and trail development. Feedback from Langford's report had reshaped the demands for what a national park should be. The output was that funds for creating better access to the park were now available to the new superintendent and it was expected that the park would be more than just land off limits to settlers; rather, it would be accessible with some semblance of protection.

To protect the park, Norris created a small staff that would actively manage the park. Harry Yount, a guide for the 1871 Hayden survey, became gamekeeper of the park in June of 1880.[13] Yount would only hold the post for fourteen months but his two reports had a profound impact on the direction of the park for the next forty years. In his second report, he called for the creation of a reliable police force of men to protect game and "the forests from

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[11] Haines, *The Yellowstone Story: A History of Our First National Park Volume One*, 216.

[12] Cramton, *Early History of Yellowstone National Park and its Relation to National Park Policies*, 40-41.

[13] Haines, *The Yellowstone Story: A History of Our First National Park Volume One*, 252.

careless use of fire."[14] He acknowledged his own limitations as a single man charged with patrolling a vast national park.

Yount's suggestion coincides with Superintendent Norris's improvements to the park. Norris undertook ambitious road and trail building during his administration in an effort to improve access. When Norris took over in 1877, 32 miles of road and 108 miles of trail existed in the park. By the conclusion of his administration in 1882, the figure stood at 153 miles of road and 204 miles of trail.[15] Norris also erected something else in the park that had not been seen before: billboards. Visitation to the park was increasing. The park was now a decade old and the purpose of what a national park could be was finally dawning on the public and drawing them in. Whereas Langford administered a park that was inaccessible to most visitors, Norris was facing problems created by his own improvements. By increasing the miles of road in the park, Norris opened up previously remote regions of the park. No longer could one person be charged with the post of gamekeeper and be expected to police the actions of visitors all over the park.

The neglected campfires from these new visitors posed a major problem, one that was compounded by even more visitors and few officials to police them. Captain Moses Harris of M Troop, 6th Cavalry would observe within the first year of Army administration of the park in 1886 that the majority of the forest-fires that occurred were ignited outside the park, between Gardiner and Cooke City, Montana, by careless visitors coming into the

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[14] U.S. Secretary of the Interior, *Annual report of the Secretary of the Interior on the Operations of the Department for the Year Ended June 30, 1881,* Washington, Government Printing Press: 1882.

[15] Haines, *The Yellowstone Story: A History of Our First National Park Volume One*, 246.

park.[16] While the forests within the park were somewhat protected, the forests encircling the park's borders were still open to homesteading and still subject to the fires used by settlers. When faced with clearing land by manually cutting down trees or burning them, settlers opted for the less labor-intensive option. Burning forest to clear land for cultivation was an accepted practice in the 1870s, but it would not find acceptance in the national park system. This is another type of input from Easton's systems theory: that of support. Support comes from the community, the regime, or the government itself.[17] It is what is required to sustain a demand so that it actually is considered by the political system. In this case, the community surrounding YNP does not support the park and settlers continue to exercise unacceptable fire practices.

This settler attitude toward the use of fire stems from a philosophy of the time. When YNP was created settlers still sparsely populated the west. The Territory of Wyoming was actually the lowest populated territory (or state) in the 1870 censes with a mere 11,518 residents being reported.[18] Land and resources seemed inexhaustible to these newcomers.[19] Land scorched by fire was readily passed by since evermore-pristine land lay just beyond the next hill. When the settlers did find land to their liking, they burned large sections of land so they could utilize small plots cleared by the blaze.

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[16] Hal K. Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks* (New York: Oxford University Press, 2007), 13.

[17] David Easton, "An Approach to the Analysis of Political Systems," *World Politics* 9, no. 3 (April 1957), 383-400.

[18] Superintendent of Census, *Ninth Census-Volume I*, (Washington D.C.: GPO, 1872), xvii.

[19] Nancy Langston, *Forest Dreams, Forest Nightmares* (Seattle: University of Washington Press, 1995), 71.

Support for suppression of fires in and around the park would arrive in 1881. General Philip Sheridan had been a major proponent of the park and an advocate for strong federal management. It was only in 1881 that he was finally able to visit YNP. When writing about his trip, Sheridan remarked that five or six fires burned in the park when he entered from the south.[20] He was not impressed with the civilian administration of the park. Lieutenant Doane was part of Sheridan's party and penned a scathing letter about Superintendent Norris's administration of the park to Congressman Martin Maginnis.[21] In this letter, Doane suggests that a detachment of cavalry could protect the park more effectively. Sheridan and Doane both felt that a much stronger federal presence would ensure the protection of the park's geothermal features and surrounding forests from souvenir hunters and campfires left by careless visitors. Both men also felt that Norris had expended too much of the park's appropriations on roads and had neglected the park's natural resources. Fires were a major part of this neglect, but the poaching of game was also a serious grievance against the civilian administrators.

In 1883 General Sheridan's discontent with the state of Yellowstone would find its way into legislation. Buried in the Sundry Civil Appropriations for the 1884 fiscal year, under the heading "Columbia Hospital for Women and Lying-In Asylum," was an amendment that provided Yellowstone with $40,000 of funding. The amendment also authorized the Secretary of the Interior to request from the Secretary of War troops to "prevent trespassers or intruders from entering the park for the purpose of destroying the

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[20] Barker, *Scorched Earth: How the Fires of Yellowstone Changed America*, 44-45.

[21] H. Duane Hampton, *How the U.S. Cavalry Saved Our National Parks* (Indiana University Press, 1971), Chapter 3.

game or objects of curiosity therein."[22] The amendment offered a means of military management of the park should such a need arise.

In August of 1886 all funding for the national parks was cut off. The reason behind this was a growing disinterest in Congress of continuing to fund, as Congressman John A. Reagan of Texas put it, a "show business."[23] Congress was also less than satisfied with the performance of Norris's successors Patrick Conger and, later, Robert Carpenter. Within the month, Secretary of the Interior Lucius Q. C. Lamar had requested troops from Secretary of War William C. Endicott. This request ultimately went through General Sheridan who chose Captain Harris's troop for the detail. The use of the Army was to be a temporary solution to park management. This solution would last for thirty years. General Sheridan's dissatisfaction with the civilian administration concerning their virtually non-existent fire-fighting policy had ultimately removed the civilian staff from the park. In system theory terms the demands in this case were a loss of confidence in civilian administration of the park, an interest in seeing the park actually protected, and an interest in seeing an end to a government subsidized park administration. The support, or lack of support, comes from the withdrawal of funding for the park and the provision for military protection of the park. All of the inputs aligned in 1886 to oust the last superintendent and place a young cavalry officer in charge of YNP.

When Captain Harris entered the park, he immediately encountered forest fires. The Captain toured the park with former Superintendent David W. Wear, who explained that

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[22] U.S. Congress, *The Statutes at Large of the United States of America from December, 1881, to March 1883, and Recent Treaties, Postal Conventions, and Executive Proclamations,* Washington, Government Printing Office: 1883.

[23] Hampton, *How the U.S. Cavalry Saved Our National Parks*, Chapter 4.

disgruntled settlers on the periphery of the park ignited the fires. In 1884 the laws of the Territory of Wyoming were the source of regulations inside the park, but by March of 1886 this was no longer the case. Spurred by the removal of civilian administration and the repeal of the Wyoming jurisdiction, settlers had set grassland and forest-fires to embarrass the former superintendent.[24] Wear, unlike his predecessors, had adopted an aggressive policy in the park and seemed to be making some headway against poachers and squatters within the park. Congress however had lost faith in the civilian administration.[25] Captain Harris continued Wear's aggressive style of management but, unlike Wear, Captain Harris had far more men at his command. He immediately sent troops to protect the well-known attractions in the park and used the rest to control fires.

Military administration of the park would be markedly different from the civilian predecessors. By 1889 the Army had established campground sites for visitors.[26] This allowed for better control of the visitors and their campfires. The cavalry detachment had enough men that it could afford to place troopers at these new campgrounds for monitoring campers. Prior to these permanent campgrounds visitors pitched camp wherever they happened to be at the end of the day. This illustrates the transition from wilderness to national park ideology. This concept also applies to wild game as well. During the park's earliest years, shooting game or catching fish were permissible activities in the park. Only fishing would survive in the 20th century as an acceptable activity. This illustrates a

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[24] Aubrey L. Haines, *The Yellowstone Story: A History of Our First National Park Volume Two* (Boulder: University Press of Colorado, 1996), 5.

[25] Hampton, *How the U.S. Cavalry Saved Our National Parks*, Chapter 4.

[26] Hal K. Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks* (New York: Oxford University Press, 2007), 14.

transition in ideology in the West from being a land to be used to being a land in need of conservation and protection.

The Army introduced the use of mountaintop lookouts, which was also a marked improvement in fire control of the park. Mount Washburn and Mount Sheridan offer spectacular views and offer excellent vantage points as fire lookouts, a purpose they would serve into the 1930s.[27] This demonstrates the military approach to fire control, which resemblances their approach to combat. The idea being to deter the ignition, spot the fires when they do occur, and then rush overwhelming suppression to the fire.

Following Captain Harris's administration, the next acting superintendent was Captain Frazier Boutelle. Captain Boutelle was a proponent of the growing conservation movement and his actions would stimulate fire control policy in the park. His first annual report asked for $100,000 in funding for clearing fallen timber away from roads. He reasoned that visitors were the primary cause of forest-fires and if one removed all of the fallen timber from the side of a road to 100 yards into the forest, and thus away from visitors, then the forest would be much safer from negligent fires.[28] Captain Boutelle would tackle the forest-fire issue with more vigor than any of his predecessors. In his report for the 1890 fiscal year, he recounted an episode where he found himself with only a cursory inventory of shovels, buckets, and axes to fight fires. The equipment supplied to the Army was not actually for firefighting purposes, it was for garrison upkeep. After finding fires raging in the park and little equipment to combat them, a park visitor actually donated $40

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[27] Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks*, 14.

[28] U.S. Department of the Interior, *Report of the Secretary of the Interior; being part of The Message and Documents Communicated to the Two Houses of Congress at the Beginning of the First Session of the Fifty-First Congress, Volume III,* Washington: Government Printing Office: 1890, 616-617.

for the purpose of procuring two dozen buckets for the Army.[29] Embarrassing accounts like this and a growing concern in Congress to protect the park from spoliation from fire prompted the Army's continued occupation of the park.

A key moment in park history came in 1894 when Edgar Howell's bison poaching expedition ended with his apprehension. This arrest differs from other incidents because Howell was in the act of skinning his quarry when caught and reporters from *Forest and Stream* were present to witness his arrest. The published photos and article provided the evidence to Congress that legislation detailing legal jurisdiction and authority for punishment was necessary in the park.[30] The resultant legislation is the Lacey Act and it placed the park under the jurisdiction of the United States; it included the park as part of the judicial district of Wyoming. Previously the worst available punishment for poachers was banishment from the park and confiscation of their equipment. While fire had sparked many of the policy changes in the park, it failed to create judicial consequences that could be levied against park visitors. This single act of poaching opened up YNP to the possibility of prosecuting those that broke park rules, including the failure to monitor one's campfire.

The Army, once properly outfitted and given a set of laws to enforce, adapted well to national park protection. The National Academy of Science would actually suggest that the West Point Academy teach forestry to its cadets in 1897.[31] The late 19th century was a relatively peaceful period for the United States. The Spanish-American War in 1898 was

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[29] Haines, *The Yellowstone Story: A History of Our First National Park Volume Two*, 20.

[30] Hampton, *How the U.S. Cavalry Saved Our National Parks,* Chapter 7.

[31] Stephen J. Pyne, "Flame & Fortune," *Forest History Today,* (1996): 6.

only three and a half months long and the last conflict that saw the issuance of the Indian Campaign Medal by the Army concluded at Pine Ridge in January 1891.[32]

However, by the early 20th century, numerous external demands were being placed on the Army and their continued administration of the national park system became less supported by the Department of War. Starting in 1910 the Secretary of War became increasingly concerned about the revolution developing in Mexico. United States intervention in Mexico seemed like a strong possibility, which resulted in fewer troops in Yellowstone.[33] Another demand on the system in 1910 was one of the largest forest fires in United States history that burned huge portions of northern Idaho and western Montana. The fire became a rallying cry for the Progressive conservation movement. Gifford Pinchot, chief forester of the Forest Service in the years preceding the 1910 fire and a staunch advocate of conservation, was adamant that to properly manage forest and control fire required "a tough corps of forest guards."[34] Pinchot had long advocated federal charge of fire control but not military involvement. By the early 20th century the temporary rescue mission of the Army was ending. Bureaucratic support for civilian administration of the park gained traction during the progressive era. The creation of the United States Forest Service in 1905 demonstrated that perhaps civilian management of forests was finally coming of age.

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[32] Code of Federal Regulations, *Decorations, Medals, Ribbons, and Similar Devices*, Title 32, Section 578.29.

[33] H. Duane Hampton, *How the U.S. Cavalry Saved Our National Parks* (Indiana University Press, 1971), Chapter 9.

[34] Stephen J. Pyne, *Year of the Fires* (Missoula: Mountain Press Publishing Company, 2008), 227.

A recurring issue with military protection of the park stemmed from bureaucratic differences. The park was part of the Department of the Interior while the troops stationed there were under the control of the Department of War. This arrangement worked well during peacetime when the Army had more flexibility to accept assignments inside the parks. The outbreak of World War I led many in the military to question if the protection of a national park was still a task in which they should be engaged.[35] The cost of maintaining troops in national parks had reached $400,000 annually, all of which was being paid through the Department of War. The drawdown of military protection of the national parks started on September 30, 1916, when twenty-two men were discharged from the Army and employed in the National Park Service as park rangers.[36] By 1918, the last troops had departed Yellowstone and left the park in the care of the NPS.

The demands for this change were the increasing threat of war in Europe, a realization that the military had been performing this temporary mission for thirty years, and an argument that perhaps a smaller force of civilian rangers could do the job more efficiently and for less money than what the Department of War was spending. Government support comes indirectly from the creation of the USFS. If national forests are the domain of a civilian agency, then national parks should conceivably be able to receive similar administration. The outcome was the withdrawal of military protection of the park and the formation of the NPS.

The early expeditions into Yellowstone recognized the potential, or rather lack of potential, of the land. The relatively high altitude, short growing season, and marginal soil

[35] Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks*, 30.

[36] Haines, *The Yellowstone Story: A History of Our First National Park Volume Two*, 289.

made the land a poor candidate for agriculture. The geothermal features are what made Yellowstone a unique destination in the West. Since the land had unique natural attractions and was a poor choice for agricultural purposes, it was not open to homesteading. By setting it aside as a national park, the government sought to protect that land for the enjoyment of the nation, even before it was accessible to the nation. YNP benefited greatly from military presence during its early years. The early superintendents lacked the funding and resources necessary to protect the park. The lack of funding and support staff effectively curtailed the portion of the Yellowstone Act that mandated its protection. It was not until 1878 that the park received any sort of appropriations, and those funds primarily went to building the roads that would provide access to the park for visitors. With the increase in visitors came an increase in human-sparked forest-fires that are reflected in statements made by superintendents and military visitors in the late 1870s and 1880s. With the cancellation of federal appropriations in 1885, the continued protection of the park was perilously at stake. Military administration of the park provided the temporary solution. While Yellowstone would not become subject to martial law, the cavalry and infantry regiments stationed there from 1886 to 1916 were able to perform duties that their meager civilian predecessors were incapable of. The beginning of federal forest-fire management started when the U.S. Army entered the park and initiated forest-fire patrols in 1886.[37]

Yellowstone became a national park because of the unique phenomena that reside inside its boundaries. It was created when the western half of the United States was still sparsely populated by European settlers and fire was a tool for clearing land and managing

[37] Scott L. Stephens and Lawrence W. Ruth, "Federal Forest-Fire Policy in the United States," *Ecological Applications* 15, no. 2 (Apr, 2005): 532-533.

wild game.[38] Early superintendents could not protect a park still exposed to these frontier fire regimes. The sparse funding and small staff would prove ineffectual enough at fire control to be relieved in 1886 by a cavalry detachment handpicked by General Sheridan himself. The Army took on fire control like a combative foe. They reduced its supply by removing fallen trees, minimized its chance for ignition through organized campgrounds, and established systematic patrols and lookout towers to track fires movement.[39] The 1910 fires fostered recognition of federal control of forested land. A few short years later, with the impending entry of the United States into World War I, the Department of War sought to extract itself from the park protection mission and leave it to civilian stewards once again. Fire, or at least concern over fire control, sparked the transformations that occurred in Yellowstone National Park during the first forty-four years of its existence and ultimately created the NPS. The 1872 creation of YNP, the 1886 replacement of civilian with military administration, and the 1916 formation of the NPS all stemmed from a set of demands related to the control of fire on the landscape.

[38] Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks*, 13.

[39] Barker, *Scorched Earth: How the Fires of Yellowstone Changed America*, 4.

CHAPTER TWO: 1916-1968

Crise revelatrice, the concept that a society is tried by the disasters that it endures, works well when applied to naturally occurring events such as earthquakes, floods, or, in this case, forest fires. In the crackle and hiss of a burning tree, we can find the convergence of society, technology, and the environment. Forest fires, when perceived as disasters, can "signal the failure of a society to adapt successfully to certain features of its natural and socially constructed environment in a sustainable fashion."[1] Yellowstone National Park (YNP) illustrates this three-part construct in light of its considerable history of forest fires. Since the park's creation in 1872, the focus of its stewards has been to "provide for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park."[2] Thus, fire that causes any of the previously mentioned injuries inside YNP is a foe in need of suppression. What has changed over time is the ideology surrounding why to suppress the fire.

Nowhere is this change in ideology more evident than in the period spanning the creation of the National Park Service (NPS) in 1916 to the rise of the environmental movement of the 1960s. Prior to the NPS, the military protected the park as it had done since 1886. The military administration created organized campgrounds, established fire lookouts, improved roads, and constructed backcountry patrol cabins, but it would be the creation of the NPS and guidance provided by the United States Forest Service (USFS) that would significantly alter the landscape. By examining the buildup of firefighting infrastructure

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[1] Anthony Oliver-Smith, "Anthropological Research on Hazards and Disasters," *Annual Review of Anthropology* 25, (1996): 303.

[2] US Senate and House, 42nd Cong., 2nd Sess., *An Act to set apart a certain tract of land lying near the headwaters of the Yellowstone River as a public park*, Washington, GPO, 1872.

from 1916 to 1968, I will illustrate how our perception of the role of fire in a national park setting has changed and how this change is part of the manmade features built on the landscape.

In addition to the concept of *crise revelatrice,* and the three-part construct, I will also draw upon the "Three Fires" model found in *Fire: Nature and Culture* by noted fire historian and professor at Arizona State University, Stephen Pyne.[3] The three fires concept identifies the first fire as natural fire ignited by lighting or other naturally occurring ignition sources. The second fire is anthropogenic fire, which is fire ignited and controlled by humans. The third fire is that harnessed in the internal combustion engine. This last fire is conquered, contained, and used to combat the first fire. During the period from 1916 to 1968, Yellowstone transitioned from being at the mercy of the first fire to fully implementing the abilities of the third. I will also use Easton's systems theory as an outline to identify the inputs and outputs that spurred the changes in YNP.

During the first 50 years of the NPS's existence, the phrases forest-fire and disaster were closely associated. Horace M. Albright, a legal assistant to NPS director Stephen Mather in 1918 and future chief ranger of YNP, summarized the culture of early fire suppression in his autobiography:

> Throughout the federal government, the policy on fire was to fight it immediately and vigorously, and this was costly, for fire was a common occurrence in the West. For the national forests, the reason was that valuable commercial timber could be

[3] Stephen Pyne, *Fire: Nature and Culture*, (London: Reaktion Books Ltd, 2012) 7-10.

burned. For the national parks, the idea was the beauty of the landscape and the wildlife in them should be protected and left "unimpaired."[4]

The public expectations surrounding national parks and national forests are inherently different. The Organic Act of 1916 established the NPS and the choice of words used in the legislation echo Albright's terminology. Phrases such as, "to conserve the scenery" and "leave them unimpaired for the enjoyment of future generations" stress the role of the NPS as an agent of protection of natural national parks.[5] The Transfer Act of 1905 founded the USFS and incorporates a very different vernacular that explicitly outlines that various construction projects can take place in national forests; dams, tunnels, and canals are permissible and mining is a possible source of income for the USFS along with proceeds from timber sales.[6]

However, even though the public expectations of the NPS and USFS differed, they found common ground when it came to the environmental management, specifically in response to forest fires, albeit for different reasons. The NPS sought to preserve the areas under their charge in order to provide a tourism experience rich in natural and cultural resources and be a vestige of the natural past.[7] The USFS sought to conserve the resources

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[4] Horace M. Albright and Marian Albright Schenck, *Creating the National Park Service: The Missing Years*, (Norman: University of Oklahoma Press, 1999), 279.

[5] US Senate and House, 64th Cong., 1st Sess., National Park Service Organic Act, (Washington, Government Printing Office, 1916).

[6] US Senate and House, 58th Cong, 3rd Sess., An Act Providing for the transfer of forest reserves from the Deparmtent of the Interior to the Deparmtent of Agriculture, (Washington, Government Printing Office, 1905).

[7] Hal K. Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks* (New York: Oxford University Press, 2007), 65.

located on its lands for economic reasons.[8] In both instances, forest fire was a disastrous event that demands suppression since it reflects the success of the agency in the protection of its assets. In addition, many of the national parks founded after 1905 were originally national forests, therefore making the two services neighbors with overlapping forests and a mutual interest in them.

The United States Army, stewards of YNP from 1886 to 1916, fought fires outside of national park boundaries as well as within. Army troops saw action during the challenging 1910 fire season. The five seasons leading up to 1910 were relatively easy seasons for the fledgling USFS to control.[9] In 1910, forest fires swept through northern Idaho and portions of neighboring states. Towns burned, lumber became ash, and the USFS found its identity as a fire-fighting agency. Gifford Pinchot, the first Chief of the USFS (1905-1910) argued that fire could be controlled if the forest was closely managed with roads, trails, telephone lines, lookout towers, and staffed by forest rangers.[10] Pinchot's successor, Henry Graves (1910-1920), determined that 90 percent of the USFS mission was to protect the forests from fire.[11] This set the precedent that federal stewardship of the nation's forests would primarily focus on fire control, and more importantly, that it would be a joint effort among federal departments.

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[8] Bruce M. Kilgore, "Origin and History of Wildland Fire Use in the US National Park System," *The George Wright Forum,* 24, no. 3 (2007): 94.

[9]Stephen J. Pyne, *Fire in America: A Cultural History of Wildland and Rural Fire* (1982; Reprint, Seattle: University of Washington Press, 1997), 242-243.

[10] Stephen J. Pyne, *Year of the Fires: The Story of the Great Fires of 1910,* (2001; Reprint, Missoula, MT: Mountain Press Publishing Company, 2008), 227.

[11] Rothman, *Blazing Heritage*, 35.

The 1910 fires are an example of an external demand on the policy-making system. In this case, external demands are those demands that originate outside of the NPS. Since the fires occurred well before the formation of the NPS but nonetheless shaped forest-fire fighting for the next fifty years, it fits into that category. Those that fought the 1910 fires had a strong impact on the USFS and acted as a supporting element in the fire suppression decision. Bill Weigle, Joe Halm, Ed Pulaski, and Elers Koch all continued in USFS employment after 1910 and their stories circulated within the USFS.[12] While neither Theodore Roosevelt nor Gifford Pinchot directly fought the fires, their post-fire political maneuverings shaped the emphasis on conservation that the USFS would come to embody. Both men delivered speeches advocating for an expanded USFS, more land under federal control, and led an ultimately successful campaign to remove William H. Taft from the presidency.[13] These are all excellent examples of support sustaining and cultivating the fire suppression policy.

The demand for better forest-fire fighting collaboration between government services resulted in the USFS and the Army entering into a formal firefighting agreement in 1912, an agreement that the NPS later maintained. This agreement insured mutual support for forest firefighting among the Departments of the Interior, Agriculture, and War.[14] The emphasis in this agreement was to bring all department resources to bear on fires that burned near or on park and national forest boundaries in a timely and efficient manner. Soldiers and USFS rangers first used this agreement to fight a fire that occurred south of Yellowstone, Montana,

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[12] Timothy Egan, *The Big Burn & the Fire That Saved America*, (Boston: Mariner Books, 2009), 263-283.

[13] Ibid, 239-248.

[14] US Department of the Interior, *Report of the Acting Superintendent of Yellowstone National Park to the Secretary of the Interior, 1912*, by LtCol L. M. Brett, (Washington DC: GPO), 655.

on September 7, 1914. Later that summer the agreement saw subsequent implementation to fight a fire located on the south end of the park.[15] In both cases Forest Service rangers requested the aid of soldiers stationed inside the park to contain a blaze before it spread into YNP. Interdepartmental forest firefighting had found acceptance by those in charge of national forests and parks.

On August 26, 1916, President Woodrow Wilson signed into law the National Park Service Organic Act, thus creating a new civilian agency to take the reins from the Army cavalry troops stationed in national parks.[16] Demands and supports for this decision are more thoroughly reviewed in the previous chapter. This new ranger force was to be made up of "hardy men of the mountains, skilled in forestry and woodcraft, accustomed to the hardships of the severe winters, trained in the use of snowshoes and skiis[sic], and thoroughly familiar, in most cases, with the entire park area."[17] The best hiring pool for this new agency came from the ranks of discharged Army personnel who had served tours protecting national parks. Civilian scouts attached to the Army also came into the fold of the new service.[18] The resultant force had a strong military presence associated with it. In fact, the first Park Service uniforms combined features from the USFS uniform while maintaining

[15] US Department of the Interior, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1914,* (Washington DC: GPO), 19-20.

[16] US Senate and House, 64th Cong., 1st Sess., National Park Service Organic Act, (Washington DC: GPO, 1916).

[17] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30 1918 Volume I*, (Washington, D.C.: United States Government Printing Office, 1918), 843.

[18] "Park Rangers Succeed Cavalry," *Spokane Statesman-Review,* June 6, 1919.

a military cavalry appearance, such as the leather-riding boots worn by park rangers until World War II.[19]

Figure 1. Chittenden Road leading up to Mt. Washburn Fire Lookout
Source: Taken by author July 30, 2014.

The transition from the Army to the NPS saw a minimum number of changes to the fire-fighting infrastructure of YNP. The Army had mandated the use of organized campgrounds in 1889 in order to monitor an ever-growing flow of tourists into the park.[20] Since the number of park rangers available would be fewer than the number of troops the Army used, the use of organized campgrounds continued to be utilized and expanded. Mount Sheridan, located in the south end of the park, and Mount Washburn, situated in the

[19] Aubrey L. Haines, *The Yellowstone Story: A History of Our First National Park Volume Two* (Boulder: University Press of Colorado, 1996), 258-259.

[20] Rothman, *Blazing Heritage*, 14.

northeast corner of the park, had been used by the Army as fire lookouts.[21] Both mountains have summits over 10,000 feet high and offer excellent views in all directions. NPS rangers continued to use these peaks as fire lookouts and later sought an expansion of the fire lookout system. The road system observable in the park today is a product of the Army Corps of Engineers, namely Dan C. Kingman, who completed the grand loop in 1886, and Hiram M. Chittenden, who built a Melan Arch Bridge over the Yellowstone River and constructed the road leading over Mount Washburn (Figure 1).[22] Both men emphasized the social and environmental construct of YNP by detailing in their notes their interest in the preservation of the landscape upon which they were building as well as an aversion to building unnecessary roads and bridges. They saw these additions as unnecessary wounds to the landscape and sought to minimize the perception of a managed landscape. Lastly, the Army had created a network of patrol cabins throughout the park. These cabins, located on the park's boundaries, enabled soldiers to deter poachers from entering the park. The NPS readily adopted both the cabins and the Army's system of backcountry patrols to deter poaching and scout for fires.

Many things remained the same after the transition; however, the NPS did see room for further development and embarked almost immediately at improving the fire-fighting capability in the park, even though troops would remain in the park until 1918. Representative John Fitzgerald of Montana held strong reservations about the ability of a small civilian force being able to protect the park and he led an ultimately successful

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[21] Rothman, *Blazing Heritage,* 54.

[22] Kenneth H. Baldwin, *Enchanted Enclosure: The Army Engineers and Yellowstone National Park,* (Honolulu, HI: University Press of the Pacific, 2005), 85-110.

campaign to limit the funds the NPS received to work in YNP.[23] Nonetheless, 1917 saw the expansion of the telephone network inside the park. The remote patrol cabins gained the ability to communicate with park headquarters in order to expedite information concerning "forest fires, accidents, and violations of the rules and regulations."[24] Connecting these cabins with park headquarters resulted in miles of telephone line installed in the park, the first marked improvement initiated by the infant NPS.

The construction of fire lanes throughout the park began in 1917. These lanes, more suited to equine travel than automobile, served two purposes. They allowed firefighting crews to reach remote sections of the park and provided a unique tourism opportunity for visitors wanting to explore these more isolated areas.[25] The concept of dual-purpose use would eventually become visible in other facets of the park's growing firefighting infrastructure.

When the 450 troops that had been protecting YNP formally departed in 1918, they left the park under the stewardship of a force of 50 rangers.[26] The severe reduction in work force necessitated the inclusion of new technologies to control fire in the park. Timely identification of a conflagration, communication, and an immediate firefighting response would be critical for fire suppression in YNP. As early as 1919, the superintendent of YNP, Horace M. Albright, argued that aircraft would have a role in the management and

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[23] Haines, *The Yellowstone Story Volume II,* 290.

[24] US Department of the Interior, *Annual Reports for Yellowstone National Park,* (Washington DC: GPO, 1917), 12.

[25] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30 1917 Volume I*, (Washington, D.C.: GPO), 12-13.

[26] Haines, *The Yellowstone Story Volume II,* 290.

development of YNP. He foresaw the possibility of airline service from YNP to Glacier National Park. Regarding forest-fire, Albright saw aircraft as essential for "detecting and controlling the flames."[27] If an airfield could be constructed in Yellowstone it would serve dual purposes; it would provide visitors with a means of traveling to Glacier and serve as a base for fire scouting aircraft. Ultimately, YNP never had an airfield cut into its landscape. In 1933 the USFS allowed the construction of a field near the town of West Yellowstone, which served the park until the mid-1960s.[28] This airfield served as the aviation hub for Yellowstone tourism and fire-fighting operations since it was conveniently located only a mile outside of the park boundaries.

Following World War I, the NPS sought to reorganize the way it not only detected fires but also funded fire-fighting operations. In 1920 Glacier National Park's annual budget was $85,000; of that amount, $65,000 was burned up suppressing fires.[29] To avoid national parks using up their entire budget to fight fires the NPS recommended a fund strictly for firefighting costs. An initial request of $100,000 per annum was reduced to $25,000 in the budget passed by Congress for the 1921 season.[30] Nonetheless, this budget marks the beginning of spending dedicated to fire suppression for the next two decades.

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[27] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30 1919 Volume I*, (Washington, D.C.: United States Government Printing Office, 1919), 942.

[28] Paul Freeman, "Abandoned and Little Know Fields: Western Montana," last modified July 20, 2013, accessed November 17, 2013, http://www.airfields-freeman.com/MT/Airfields_MT_W.html#yellowstone.

[29] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30 1920 Volume I*, (Washington, D.C.: United States Government Printing Office, 1920), 47.

[30] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30 1921 Volume I*, (Washington, DC: GPO, 1921), 118.

Yellowstone continued to build up its fire-fighting capability and by 1923 had 350 miles of road, 800 miles of trail, 300 miles of telephone line, and 21 ranger stations to maintain with their meager ranger force.[31] Guests wishing to explore remote corners of the park could utilize the roads and trails but these same paths were also vital to the fire suppression strategy adopted by the park rangers. While tourists may enjoy the tranquility of the park, the rangers enjoyed the mobility afforded by the extensive network. The park rangers had access to funds for firefighting, access to most corners of the park, and a viable means of detecting fires. The key part missing to successful implementation of complete fire suppression was a large enough labor force to make that vision a reality.

In 1924 the rangers of YNP found themselves futilely trying to stamp out a fire in the southwest corner of the park.[32] The Pitchstone Plateau is a broad, exposed, windswept feature located to the west of the park's southern entrance. It is almost at 9,000 feet of elevation and contains none of the 350 miles of improved roads found elsewhere in the park. Men and supplies reached the scene by horse and mule to combat the flames. When the fire had subsided, 2,500 acres had burned.[33] Mount Sheridan, located to the east of the southern entrance, had served its role as a fire lookout and rangers on duty there had reported the fire. The system had worked as well as it could have with the infrastructure that existed.

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[31] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1923,* (Washington, DC: GPO, 1923), 48.

[32] "5,000 Acres Burned Over and Still Unchecked," *The Ogden Standard-Examiner* (Ogden, UT), Sep. 8, 1924.

[33] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1924,* (Washington, DC: GPO, 1924), 31.

John D. Coffman sought to improve this system significantly. Hired by the NPS in 1928 as a forestry specialist, he was a strong advocate of complete fire suppression. The meager annual budget of $25,000 approved by Congress in 1920 had only grown to $30,000 by the time Coffman took office.[34] Coffman had been supervisor of the California National Forest and his expertise as a trained forester was a skill missing in the NPS. In 1930 he drafted a fire plan for the NPS system, paying particular attention to preparedness for particularly turbulent fire seasons.[35] For YNP he specifically cited the need for more fire lookouts and fire caches. Fire caches, boxes located along roadsides or ranger stations that contained firefighting equipment, were standardized and enlarged under the direction of Coffman.[36] In 1930 the two fire lookouts in Yellowstone, Mount Sheridan and Mount Washburn, lacked facilities to allow an observer to remain at their post overnight. Observers had previously been stationed at nearby cabins and hiked up the mountain every day to watch for fires.[37] Coffman strengthened the fire detection in the park by constructing simple lookout stations, complete with basic amenities on top of both those peaks. By the end of the 1930s, five lookout stations existed in Yellowstone. A topographical map of Yellowstone in 1930 confirms the absence of any formal lookout stations in the park; a 1938 map shows all

[34] Rothman, *Blazing Heritage,* 46-47.

[35] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1930,* (Washington, DC: GPO, 1930), 87.

[36] Dale L. Taylor, "Forest Fires in Yellowstone National Park," *Journal of Forest History 18*, no. 3 (1974): 74.

[37] Rothman, *Blazing Heritage,* 54.

five stations: Mt. Sheridan, Mt. Washburn, Mt. Holmes, Bunsen Peak, and Lewis Canyon.[38] [39]

In 1931 Heart Lake, located on the southern end of the park near Mount Sheridan, witnessed the largest fire that the NPS had dealt with inside Yellowstone's boundaries. 18,000 acres of timber burned despite the efforts of 700 men to halt the lightning-ignited blaze.[40] However, Coffman's goal of fire preparedness ensured that this fire, despite its size, was cold within two weeks of ignition.[41]

The election of President Franklin D. Roosevelt in 1932 would see an even greater expansion and realization of Coffman's fire ideology. Roosevelt's vision for the nation and the role that forests would play has had profound impacts on Yellowstone. Emergency Conservation Work (ECW) is what the president named it; the reality of the New Deal in the national parks was unbelievable amounts of funding and labor. In 1933 Roosevelt set a goal of establishing 70 camps, employing 35,000 men, and hiring 2,300 additional men to work as supervisors in national parks. The goals of the Emergency Conservation Work were to suppress all fires, cleanup roads of burnable material, cleanup burned over areas, and create even more fire and truck trails.[42] A year later the goal of 35,000 men had not been met, but

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[38] US Geological Survey. *Topographical Map of the Yellowstone National Park, Wyoming-Montana-Idaho,* Map 4246.Y4C2 1930.G46 (Washington, DC: 1930).

[39] US Department of the Interior. *Motorists Guide Yellowstone National Park 1938*, Map 4262.Y4.E625.1938.U5 (Washington, DC: 1938).

[40] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1931,* (Washington, D.C.: United States Government Printing Office, 1931), 28.

[41] Rothman, *Blazing Heritage,* 54.

[42] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1933,* (Washington, D.C.: United States Government Printing Office, 1933), 157.

nearly 13,000 men did find work with the ECW program inside national parks. The annual Department of the Interior report of 1934 remarks, "the presence of Emergency Conservation Corps work camps within the national parks and monuments was of immense assistance as a fire protection measure through the availability and use of Civilian Conservation Corps (CCC) enrollees for fire patrol and fire suppression service."[43] The increase in personnel and budget to support projects saw the dedicated firefighting infrastructure of YNP spread across the landscape. The term "dedicated" is critical in this sense because, unlike trails cut through Yellowstone decades earlier, this build up in the 1930s consisted of dedicated firefighting structures and transportation routes. The fire lookouts previously mentioned do not have roads leading to them with the exception of the station on Mt. Washburn. Despite the breathtaking view afforded by these structures, they are away from the reach of car-bound tourists. The stations at Mt. Holmes and Mt. Sheridan are in use today and require resupply by mule train due to the lack of roads leading to them. USFS-inspired firefighting had come to YNP under the tutelage of Coffman. However, the park value of maintaining a seemingly pristine nature stipulated that these fire lookouts and trails not affect the tourist's perception of the landscape as a wild and unmanaged environment. Fire lookout towers do not exist on Yellowstone's landscape because of this perception. These towers require heavy equipment to construct and therefore must have a road that leads to them. They also, like misplaced lighthouses, stand out from the landscape and mar the immersion of the tourists.

[43] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1934,* (Washington, DC: GPO, 1934), 164.

Backcountry patrol cabins are hidden off the beaten path and do not obstruct the view of tourists. The backcountry cabin system expanded in the 1920s and 1930s. Of the 37 backcountry cabins that exist in the park, over half of them were built during the first 25 years of NPS administration.[44] The Army had started the cabin system in 1890 with six built to aid soldiers patrolling the park in the winter.[45] The concern then was deterring poachers keen on hunting the few remaining bison in the park. The 1920s and 1930s saw a shift in the purpose of these cabins to backcountry fire detection and suppression.

The three elements, society, the environment, and technology, came together in the 1930s to produce a national park landscape devoid of fire. The public expectations of what a national park should be portrayed fire as an inherently evil entity. From an environmental standpoint, national parks should be a pristine landscape, frozen in ecological time, free of modern improvements, and an embodiment of the American frontier spirit. The technology and labor needed to suppress fires was coming together under the guise of the New Deal programs. Fire lookouts, roads, and backcountry patrol cabins sprouted from the landscape during this era. These are the most readily identifiable changes to Yellowstone but other more subtle technologies appeared. The source of the demands that facilitated these changes come externally from the strong influence of the USFS fire policy, the labor provided by the New Deal to the NPS, and rapid technological improvements that enabled a relatively small NPS staff (compared to the pre-1916 military administration) to fight fires. Internally, the mission of the NPS in YNP remained focused on providing the visitor with a unique environmental experience devoid of the hazards of wildland fire. For example, the 1924

[44] "Backcountry Patrol Cabins," *secretyellowstone.com,* last modified 2010, http://www.secretyellowstone.com/park-infrastructure/buildings/backcountry-patrol-cabins

[45] Haines, *The Yellowstone Story Volume II,* 291.

Pitchstone Plateau fire garnered enough international interest that a German natural science publication, *Gesellschaft der Naturfreunde*, wrote an open letter to the administration of YNP asking for photographs and with hopes that the park "was not damaged so much."[46] Fire became the ever greater villain inside the USFS and NPS systems, a villain that required new technology to suppress.

Two-way radio made its debut in the park in 1934 when $15,000 worth of equipment was installed in YNP, Glacier National Park, and the Great Smokey Mountains National Park.[47] Panoramic photographs taken from fire lookouts and posted in ranger stations allowed observers to communicate the location of a fire to a ranger by referencing the photograph. The panoramic photograph project started in 1936 and was complete by 1938 for all lookouts in the national park system.[48] Formalized firefighting training helped ensure the safety and efficiency of fire fighters in 1939.[49]

Naturally occurring fire did not belong on the landscape of Yellowstone during Coffman's administration. What started with 50 rangers and a relatively informal system of lookouts and horse trails had advanced considerably with his hiring and the USFS ideology he brought with him. World War II would bring the expansion to an extinguishing halt. Wartime in Yellowstone saw a drop in the number of visitors to the park, down 30 percent

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[46] Letter from Kosmos/Gesellschaft der Naturfreunde to Administation of Yellowstone National Park, RG 03, Series 01, Box 01, Folder Administrative Correspondence 1924-1925, Yellowstone Research Archives.

[47] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1934,* (Washington, DC: GPO, 1934), 199.

[48] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1938,* (Washington, DC: GPO, 1938), 18.

[49] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1939,* (Washington, DC: GPO, 1939), 272.

in 1942 when compared with visitors in 1941.[50] Commercial trucking, when related to war efforts, made an appearance in the park to expedite shipping and reduce fuel consumption. Funds limited, staff reduced, and a public that had limited leisure time or fuel to travel to YNP made for a quiet war in the park. Interestingly enough, suppression of fires continued but the source of labor shifted from CCC enrollees to Japanese internees. Chapter Four explores this transformation and the racial aspects of this shift in labor.

World War II saw the expansion of several key pieces of aviation technology related to firefighting. The size and reliability of aircraft increased considerably from pre-war models. In 1939 the USFS experimented with the use of smokejumpers with the help of Missoula-based Johnson Air Service.[51] They used a Ford Tri-Motor that could barely lift a crew of eight into the thin mountain air to evaluate if they could get firefighters to the blaze faster by air. By the end of World War II, surplus aircraft, such as the Douglas C-47, were available to transport crews of fifteen jumpers. YNP would have its own smokejumper crew stationed at the West Yellowstone airport starting with the 1949 fire season.[52] West Yellowstone served as the base since the NPS had formally banned the construction of airports on their lands in 1946. Arguments had been circulating as to whether aircraft, like cars, should be granted access inside national parks. Grand Teton National Park and Grand Canyon National Park actually both have active airports within their boundaries today. In the case of Yellowstone, the precedent for the inclusion or exclusion of aircraft stems not

[50] US Department of the Interior, *Reports of the Department of the Interior CONDENSED WAR EDITION for the Fiscal Year Ended June 30, 1942,* (Washington, DC: GPO, 1942), xviii.

[51] Dale White and Larry Florek, *Tall Timber Pilots*, (New York: The Viking Press, 1953) 124-126.

[52] Rothman, *Blazing Heritage,* 79.

from motor vehicles but from trains.[53] Trains had, since Army administration times, dropped off visitors to the northern entrance of the park where people boarded a stagecoach or, later a bus, to continue their journey. Similar to trains, aircraft are a means of getting to the park, not around inside of it. Therefore, YNP does not have an airport within its boundaries. However, aircraft would continue to play a firefighting role, first with smokejumpers and later with tanker aircraft, but their bases are outside of the park, and in the case of West Yellowstone, on USFS land.

Fire suppression continued in the 1950s similar to what originated in the 1930s. Despite the lack of ECW funds or CCC personnel, the NPS was able to contain fires in the parks to remarkably small areas. During the 1950 season, the NPS reported 399 fires in the parks, 89 percent of them were less than 10 acres in size.[54] One fire had burned 300 acres in YNP but it had been in a very remote area of the park. The key to fire suppression in the 1950s was interagency cooperation on firefighting, something that was initiated in 1912 with the cooperative agreement between the Departments of War, Interior, and Agriculture. The 1954 fire season in Yellowstone was particularly difficult, but with the aid of neighboring agencies and Native American fire crews flown in from southwestern reservations, the system of fire suppression was still a reality.[55]

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[53] US Department of the Interior, *Reports of the Department of the Interior VICTORY EDITION for the Fiscal Year Ended June 30, 1946,* (Washington, D.C.: United States Government Printing Office, 1946), 328.

[54] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1950,* (Washington, DC: GPO, 1950), 326.

[55] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1954,* (Washington, D.C.: GPO), 350.

The USFS managed to embody their fire suppression ethos into the cartoon character Smokey Bear. In 1950 a small singed cub, found in a New Mexico forest fire, became the living physical embodiment of the cartoon character.[56] The easily remembered phrase spoken from a somber looking bear, "only you can prevent forest fires," helped drive down the number of major forest fires from 195 in 1940 to 103 in 1960.[57] While the USFS still had the means to suppress fires, the NPS started to diverge from the USFS fire policy in the 1950s. Funding for expansion, improvement, and maintenance of the park failed to keep pace with the number of visitors driving into the park. In 1939 there had been 465,727 visitors to the park; in 1947 that figure topped one million for the first time.[58] The pre-war Yellowstone infrastructure soldiered on with few improvements in the postwar era despite a tourist population that doubled in less than ten years. The appropriations for the 1939 season were just shy of $2 million; ten years later the appropriations barely broached $1 million.[59] With limited resources available and a rising number tourists, the NPS focused on educating the public about fire safety to curtail forest fires. This shift in strategy comes from the demands for less spending, reduced labor sources, and a slowly growing support for a better ecological understanding of the Greater Yellowstone Ecosystem.

Salvation came to the NPS in the form of the Mission 66 project. 1966 marked the fiftieth birthday of the NPS and starting in 1956 Congress appropriated $1 billion for the

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[56] Roberta Robin Dods, "The Death of Smokey Bear: The Ecodisaster Myth and Forest Management Practices in Prehistoric North America," *World Archaeology, 33*, no. 3 (Feb., 2002), 475-76.

[57] Rocky Barker, *Scorched Earth: How the Fires of Yellowstone Changed America,* (Washington: Island Press, 2005), 154.

[58] US Department of the Interior, *Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1947,* (Washington, D.C.: GPO, 1947), 324.

[59] Haines, *The Yellowstone Story Volume II,* 482.

NPS to upgrade their overburdened system over the next ten years.[60] This meant money for roads, campgrounds, hotels, and other vital tourist structures. While the Mission 66 project did not specifically address forest fires, the funding allowed for maintenance of roads that served both tourists and fire-fighting operations. The Mission 66 project is imperative to understanding how the role of fire was changing in Yellowstone. The funds available went to improving both the tourist experience in the park and the already existent park infrastructure. This marks a departure from the Coffman era that saw a buildup of dedicated fire-fighting structures and equipment. In a way, the Mission 66 project harkens back to the early days of the NPS in YNP. The 1930s, Coffman's era, stands out in Yellowstone's history. It was an era when dual-purpose functionality was trumped in favor of firm control of fire on the landscape. The Mission 66 era shed the single-purpose spending on firefighting equipment and embraced dual-purpose programs. An example of this is the expansion of interpretation programs inside YNP that taught careful use of campfires but also attempted to place fire as an ecological force in the park. With increased access provided by improved roads, visitors could attend ranger presentations and museums that stressed preservation of natural environments while they visited ever more remote regions of the park.[61] The message presented to the public was one of gentle use of the land and natural ecological process.

In 1963 two events, neither directly related to forest fires, shaped the future of fire in YNP. The elk population of Yellowstone has always been a source of concern for the stewards of the park. Park rangers have actively culled the northern elk herd since 1951.

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[60] Rothman, *Blazing Heritage,* 90.

[61] Haines, *The Yellowstone Story Volume II,* 380.

They sought to match up the size of the herd with what they deemed to be the carrying capacity of the region.[62] Hunting had been prohibited in the park since early in Yellowstone's history and the actions of the rangers seemed to not be in keeping with how a natural ecologically functioning park should operate. By the early 1960s nearly 10,000 elk had been culled from the herd in order to establish some sort of equilibrium with natural carrying capacity.[63] This outraged hunters who were allowed to harvest game on Forest Service land but were not permitted to pursue elk in YNP.

Although some earlier information existed, research regarding the role of fire in various ecosystems began to receive substantial, focused, and well-funded attention from universities and land management agencies in the US during the 1960s and continuing in the 1970s. The landmark scientific guidance for the NPS came from the *Wildlife Management in the National Parks Report*, better known as the *Leopold Report.* A. Starker Leopold, professor of zoology at University of California Berkley, researched the current state of wildlife management and ecology in the United States and furnished a report to the Secretary of the Interior. The fourth statement in the report mentions the use of fire as a tool for game management since it provides a catalyst for ecological succession.[64] YNP biologist Robert E. Howe decided to test this management practice in the park in 1966. The goal was to improve elk habitat by burning a patch of forest that at one time was populated with aspens, a fire dependent species of food for elk, but had been displaced by conifers due to

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[62] Haines, *The Yellowstone Story Volume II,* 381.

[63] Kilgore, "Origin and History of Wildland Fire," 99.

[64] A. S. Leopold, S. A. Cain, C. M. Cottam, I. N. Gabrielson, T. L. Kimball, *Wildlife Management in the National Parks*, Advisory Board on Wildlife Management appointed by Sectray of the Interior Udall, (Washington DC: GPO, 1963), 3.

fire suppression. On October 28 Howe and his crew sprayed 200 gallons of diesel fuel into a patch of conifers and attempted to ignite it. The fire burned but eventually went cold after the wind died down in the evening.[65] While this was a failure in converting a patch of conifers into an aspen stand, it marks the appearance of fire as a management tool in Yellowstone. It would be another decade before the use of fire in park and game management found widespread acceptance with policy-makers and managers.

Fire transitioned from an agent of disaster to a tool for management. The wounds that would mark Yellowstone's landscape would no longer include new firefighting infrastructure. The progressive buildup of dedicated firefighting features such as cabins, telephone lines, roads, trails, lookouts, and fire caches that had widespread impacts to biological and cultural resources had reached its peak. The social construct of what a national park is and what constitutes a disaster is proving to be a dynamic process and this change shows itself in the buildup of firefighting features in Yellowstone. Over the course of 50 years, YNP saw a significant change in the perception of fire on the landscape. Complete fire suppression had proved impossible and costly to battle. In that sense, the environmental and technological construct were in a race with the environment becoming ever more difficult to manage and technology attempting to provide the next method of detection, communication, or means of extinguishing blazes. Fire has an ecological value and is a catalyst for change in a national park setting and not a disaster that highlights the failures of its caretakers. In this way, Pyne's "Three Fire" model actually reverses direction in Yellowstone. Instead of finishing with the third fire, the role of fire actually reverts to the first. Yellowstone eventually adopted a natural fire policy that would permit naturally

[65] Rothman, *Blazing Heritage,* 94.

occurring fires, such as those sparked by lightning, to burn if they were located in remote areas of the park.[66] The 1966 experimental burning by Howe is the park transitioning from the third fire to the second, or anthropogenic, fire. In 1968 the fire policy changed to reflect this transition and this is addressed in the next chapter. Flames in the trees no longer equate disaster. The social construct of what a national park should be, that of a pristine but ecologically functioning wilderness, is significantly closer to reality today than it was a hundred years ago when fire was strictly a foe in the park that demanded suppression and total control.

[66] Rothman, *Blazing Heritage,* 106.

CHAPTER THREE: 1968-1988

According to wisdom attributed to the Greek fabulist Aesop; "It is easy to be brave from a safe distance." From a policymaking viewpoint, it is much easier to implement a controversial policy when the conditions are favorable or neutral. The real trial of adopting or implementing a policy comes when conditions are unfavorable such as when the forest is burning, opponents have rallied, or resources are scarce. Yellowstone National Park (YNP) bravely embraced a natural fire policy in 1968. The new policy found its way into the *Administrative Policies for Natural Areas* for that year which recognized fire "as one of the ecological factors contributing to the perpetuation of plants and animals native to that habitat."[1] In 1970 the firefighting policy stipulated that, "wildfire will be controlled as necessary to prevent unacceptable loss of wilderness values, loss of life, damage to property, and the spread of wildfire to lands outside of the wilderness."[2] The landscape of national parks would include fire as a force of ecological succession. Fire suppression would still be present but severely restricted in application following the implementation of this policy.

This decision came at the crest of the environmental movement of the 1960s. The new direction of fire in YNP had several factors that delayed any major challenge to the policy until the fires of 1988. For 20 years favorable conditions allowed YNP to claim that it was a natural fire park. However, the 1988 fires brought with them realities, pressures, and controversy that challenged the implementation of this policy. David Easton's systems

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[1] National Park Service, *Administrative Policies for Natural Areas of the National Park System*, (Washington D.C.: Government Printing Office, 1968), 17.

[2] National Park Service, *Administrative Policies for Natural Areas of the National Park System*, (Washington D.C.: Government Printing Office, 1970) 56.

theory explains why agencies and the public adopted the policy, what factors sustained it for two decades, and what ultimately led to its modification and reversal.

Easton's system theory explains decisions or policy outcomes by identifying the inputs (demands and supports) that apply to the decision-making process. Demands can come from both internal and external sources while supports will come from the community, regime, or government. Supports are necessary to sustain the implementation of the decision or policy. Easton recognized that feedback from the outcome is also an input and this in turn causes the system to remain in flux.[3] This model provides us with a means of framing the inputs that went into the decision and how this cycle of inputs, outputs, and feedback sustains and alters decisions.

The external demands for changes to Yellowstone's fire policy change stemmed from several sources. The *Wildlife Management in the National Parks* report, also known as the Leopold Report, sanctioned the use of fire for wildlife management in 1963.[4] The report originated from a request by Secretary of the Interior Stewart Udall to study the future of wildlife management in the National Park system. A. Starker Leopold took the appointment of Chairman for the research committee, which included Stanley A. Cain, Clarence M. Cottam, Ira A. Gabrielson, and Thomas L. Kimball. In the section "The Concept of Park Management," the researchers note that fire is used as a tool for maintaining the ecology of East African open savannas and could be a useful tool in our own environments.[5] While the

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[3] David Easton, "An Approach to the Analysis of Political Systems," *World Politics* 9, no. 3 (April, 1957): 383-400.

[4] Aldo S. Leopold, et al, *Wildlife Management in the National Parks*, (Washington D.C.: Government Printing Office, 1963).

[5] Ibid.

report focuses on wildlife management, one of the key points is the management of habitat for natural ecological relationships, which in turn incorporates fire as a tool.

Although YNP is not a designated wilderness area under provisions of the Wilderness Act (1964, as amended), it has been managed as one since 1972 when it was first recommended for designation. [6] About 2 million of the 2.2 million acres are currently managed as "Recommended Wilderness."[7] The Wilderness Act carries with it stipulations regarding firefighting equipment in areas managed as wilderness that have an impact on park planning. One of the crucial tenets of the Wilderness Act is the prohibition of motorized equipment, such as vehicles, boats, aircraft, and structures within wilderness-designated areas. However, the Act allows the use of these prohibited vehicles and equipment for the purpose of fire management.[8] National parks and wilderness areas have a key fundamental difference that will keep YNP from becoming a designated wilderness area. The definition of wilderness from the Act defines wilderness "as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The verbiage used in the act that established YNP in 1872 mentions that it be "set apart as a public park or pleasuring-ground for the benefit and enjoyment of the

[6] "Yellowstone Wilderness," *National Park Service*, accessed November 7, 2014, http://www.nps.gov/yell/naturescience/wilderness.htm.

[7] "Yellowstone Wilderness," *Greater Yellowstone Science Learning Center*, accessed December 11, 2014, http://www.greateryellowstonescience.org/research/yell/wilderness.

[8] U.S. Congress, *An Act To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes*, (Washington D.C.: Government Printing Office, 1964).

people."[9] The Wilderness Act places severe limitations on the activities of visitors while the act establishing YNP allows for services and infrastructure expected in a public park setting.

The last of the external demands came in 1966 when YNP saw the expiration of the Mission 66 project that had provided over a billion dollars to the national park system over a span of ten years.[10] Much of that money paid for road and maintenance programs that increased the array of potential suppression methods and accessibility for fighting fires in remote parts of YNP. The increase in roads and trails also meant that visitors were reaching ever more remote regions of the park, bringing with them an increased potential of igniting wildland fires. NPS director Eivind T. Scoyen recognized how the Mission 66 program was altering visitor use patterns in the park by 1960 and realized that when the program concluded the NPS would be unable to obtain resources to fight wildland fires on its present scale.[11] The pending loss of the Mission 66 program necessitated that the YNP find a way of economical land management.

Internal demands came from a growing cadre of NPS rangers and researchers that wanted to see a different approach to managing wildland fires in the parks. Many of the rangers that pushed for the natural fire policy in the 1960s continued to publish ecology papers in the 1970s and 1980s that further clarified the historical role of fire in Yellowstone. Don G. Despain, William H. Romme, Douglas B. Houston, Dale L. Taylor, and Robert E. Sellers all penned work supporting the continued use of natural fire in YNP. Despain, an

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[9] U.S. Senate and House, 42nd Cong., 2nd Sess., *An Act to set apart a certain tract of land lying near the headwaters of the Yellowstone River as a public park*, (Washington, Government Printing Office, 1872).

[10] Hal K. Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks* (Oxford: Oxford University Press, 2007), 90.

[11] Ibid, 91.

YNP Research Biologist, and Sellers, a NPS Fire Management Specialist, executed a study during the 1976 fire season that championed the adoption of the natural fire program in YNP. They chose to study three naturally ignited fires and use them to demonstrate the adaptability of the new fire plan. The Straight Fire was suppressed almost immediately because it threatened a power line, while the Arrow Fire was allowed to burn until it threatened the same power line and caused traffic congestion on the Mammoth-Norris Road. The Divide Fire occurred near the South Arm of Yellowstone Lake and was remote enough that it burned naturally and extinguished itself after 91 days.[12] The study demonstrated that even though YNP had adopted a natural fire policy it was not completely without limits. Fire suppression would occur as prescribed in the 1970 *Administrative Policies for Natural Areas*, but suppression would occur only when it threatened something vital to the operation of the park. In this way, science and park objectives were coordinated in order to improve the ecological function and visitor experience in YNP.

Houston, part of the Office of Natural Science Studies of YNP in the early 1970s, wrote extensively on the role of fire and plant succession in the park. By comparing historic with recent photographs, Houston was able to argue that fire was a restoration tool.[13] The forest observed in 1970 by Houston lacked biodiversity and recently burned areas brought new diversity to the landscape. Human exclusion of fire in this case was not just apparent in the physical evidence of firefighting; it is in the deficiency in biodiversity of the ecosystem. Historic photographs show a landscape rich in trees at various stages of growth and a blend

[12] Don G. Despain and Robert E. Sellers, "Natural Fire in Yellowstone National Park," *Western Wildlands* 4 (1977): 20-24.

[13] Dougals B. Houston, "Wildfires in Northern Yellowstone National Park," *Ecology* 54, no. 5 (Sept, 1973): 1111-1117.

of grasses. Recent photographs (Houston used a collection of photographs from 1970) show a dense forest, with little diversity, and very little undergrowth. Houston and several other scientists contributed to the understanding of ecology in YNP. Failure to understand the interconnectedness of the natural, cultural, and social resources within and adjacent to YNP eventually became problematic in later years.

YNP and adjacent areas were experiencing a renaissance of science that supported natural fire ecology. Researchers sought to better understand the role of fire on the landscape and continue to build support for the natural fire program. This support, originating from the scientific community and embraced by government officials (i.e., the NPS), is one of two factors that sustained the natural fire policy. The other supporting factor was an environment that, despite ample fuel loading, did not ignite for 20 years due to particularly wet seasons.

A method of building scientific support for natural fire came from trying to establish the history of fire in the park. Romme, a botany professor at the University of Wyoming, added to the work of Despain and Sellers by doing his own research in 1982. Romme attempted to determine the long-term fire patterns in the park by reconstructing the fire history of the park. What Romme determined was that the forests within YNP, predominantly lodgepole pine (*Pinus contorta*), are subject to a 300-400 year fire-cycle.[14] Romme concluded that a lodgepole pine forest that is <150-200 years old is unlikely to burn since it will not support a crown fire; this finding supports a similar conclusion reached by Despain and Sellers. Once a forest reaches the 300-400 year range it can support a crown fire and the probability to ignite and sustain fire that consumes much of the forest increases

[14] William H. Romme, "Fire and Landscape Diversity in Subalpine Forests of Yellowstone National Park," *Ecological Monographs* 52, no. 2 (June, 1982): 199-221.

substantially. One of Romme's conclusions was that fire suppression had done little to fuel-loading in the forest and had not changed the potential fire behavior of YNP. His area of study was the Little Firehole River watershed located in the western area of the park, an area that burned extensively during the 1988 fires. His historical analysis suggests that fires were unlikely during the period of complete fire suppression. Romme's conclusion explains why complete fire suppression in YNP was possible during the early years of NPS administration, the environment did not favor large stand replacing fires.

The emphasis for all of the researchers mentioned above was that it is possible to restore YNP and some of the adjoining areas to an ecosystem that allows for fire. Taylor, a Ph.D. student at the University of Wyoming, determined that if fire is suppressed from a lodgepole pine forest for long enough, the forest is replaced by Engelmann spruce and subalpine fir; this is because older lodgepole pines are more susceptible to disease and insects and incur greater mortality. Old growth forests in Yellowstone will have a mix of pine, spruce, and fir and are susceptible to stand-replacing fire. Taylor's primary argument was that lightning-sparked fires would return the ecology of the park to a pre-1872 appearance.[15] Missing from consideration in any of the studies mentioned above was the role of anthropogenic fire in YNP. The 1968 decision to adopt a natural fire policy resonated with the scientific community and found acceptance with park stewards. The science continued to support this decision leading up to the 1988 fire season. In Pyne's terms, this would be an adoption of first fire (natural fire) as the sole means of fire on the landscape while anthropogenic fire remained a foe to be suppressed and third fire (mechanical fire) was still used against anthropogenic fire and sometimes natural fire.

[15] Dale L. Taylor, "Forest Fires in Yellowstone National Park," *Forest History* 18, no. 3 (July, 1974): 68-77.

Another supporting factor previously mentioned was the existing environment itself, i.e., short-term climate conditions. Prior to 1988, only one major fire stood out in the history of YNP. On a hot July afternoon in 1931, Clarence Johnson, a lookout posted at the Mt. Sheridan fire lookout, spotted a column of smoke building to the south of Mt. Sheridan. About 25 minutes later, the lookout at Mt. Washburn reported the same fire. The forest had received less than 0.2 inches of rain in the previous five weeks. A temperature high of 86º Fahrenheit and a low of 13% relative humidity created conditions during July that were conducive for a highly combustible forest.[16] The ensuing Heart Lake fire consumed 18,756 acres of forest near the south end of the park and was the largest fire YNP would experience until 1988. [17] The key data points for understanding large fires in YNP are annual precipitation and the amount of precipitation occurring during the peak fire months of July through September. The year 1931 stands out as an exceptionally dry year with only 10.56 inches of annual precipitation recorded. During the peak fire months, only 2.34 of those 10.56 inches fell in the park.[18] By comparison, in 1988, the annual precipitation was 14.86 inches but only 1.66 inches fell during the peak fire months.[19] Only two years between 1968 and 1988 saw less than 15 inches of annual precipitation and only one of those years had less than 3 inches of precipitation during the peak fire months. That year, 1976, was a relatively major fire season for YNP having both a low annual precipitation (12.62 inches)

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[16] Letter, Roger W. Toll to Director, National Park Service, August 3, 1931, RG 03, Series 3, Box 6 "Final Fire Records for 1931," Yellowstone Research Library.

[17] Individual Fire Report for Heart Lake, November 24, 1931, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1931," Yellowstone Research Library

[18] National Oceanic & Atmospheric Administration, "Annual Climatological Summary (1931) Lake Yellowstone, WY US," (weather report, National Climatic Data Center, November 22, 2014).

[19] National Oceanic & Atmospheric Administration, "Annual Climatological Summary (1988) Lake Yellowstone, WY US," (weather report, National Climatic Data Center, November 22, 2014).

and low peak fire month precipitation (2.76 inches). The rest of the years were all relatively wet years for the park. Both 1985 and 1986 were actually two of the wettest years in park history with 23.05 and 26.73 inches of annual precipitation, respectively. Figure 2 shows the annual precipitation in inches and the sum of precipitation received during the peak fire season months of July, August, and September. The threshold for predicting major fire seasons seems to align with the previously mentioned number of 15 inches annually and 3 inches during the peak fire season. A year that does not reach either of those amounts (i.e. 1988) will likely have major fires associated with it.

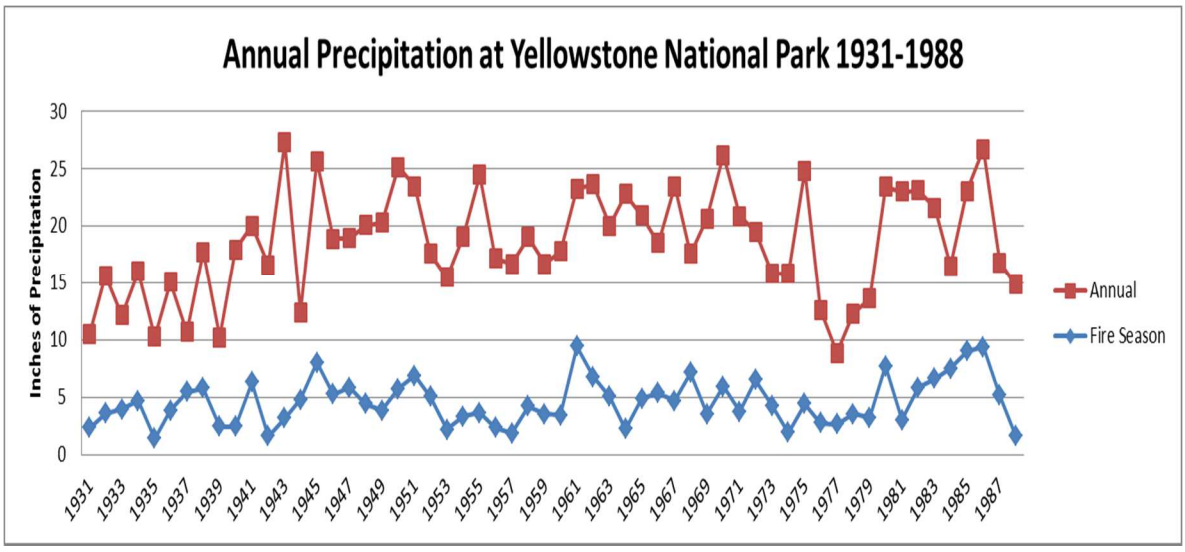

Figure 2. Annual Precipitation at Yellowstone National Park 1931-1988.
Source: U.S. Department of Commerce, National Oceanic & Atmospheric Administration, Annual Climatological Summaries 1931-1988 for Station: Lake Yellowstone, WY US.

Scientific support for the policy and an abundance of precipitation made the natural fire policy in YNP sustainable and acceptable for 20 years. During those 20 years researchers added extensively to the ecological knowledge regarding the role of fire in YNP. A common theme for the research mentioned above is that fire has a facilitating ecological role and that lodgepole pine stands burn within a certain time scale. By establishing that fires in lodgepole pine forests have a fire return interval of 100 to 400 years and that the

fires are typically large, continuous, and stand-replacing; the question became, when did YNP last experience a large fire?[20] According to Despain, Romme, and Paul Schullery it was likely during the early 1700s. All of these authors published papers immediately after the 1988 fires, which detailed how YNP was likely due for a large fire and that this fire could have occurred any time after 1930.[21]

The trial by fire of YNP's fire policy came in 1988. Schullery, a technical writer and editor with the Research Division of the NPS in YNP, actually identified the 1988 fires as "the sternest test of the practicality of maintaining biotic associations."[22] The fires consumed 793,000 acres inside the park, which is 36 percent of the total area.[23] Media attention concerning the fires had grown from curiosity to national outrage at the perceived destruction of one of the nation's national treasures. The policy came under ruthless attack. Thomas Bonnicksen, professor of the Department of Recreation and Parks at Texas A&M University, published a scathing assessment of park policy in the July-August 1989 edition of *American Forests*. He predicted, "In the future, managing a Park or a Wilderness will only require that rangers stand on mountaintops making incantations to the Greek God Zeus. Who needs science when you believe that the gods are managing your forests?"[24] Conceding

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[20] Timothy J. Fahey and Dennsi H. Knight, "Lodgepole Pine Ecosystems: Biotic processes play a critical role in regulating material flux in Rocky Mountain lodgepole pine forests," *BioScience* 36, no. 9 (Oct 1986): 610.

[21] William H. Romme and Don G. Despain, "Historical Perspective on the Yellowstone Fires of 1988," *BioScience* 39, no. 10 (November, 1989): 696-699.

[22] Paul Schullery, "The Fires and Fire Policy: The Drama of the 1988 Yellowstone fires generated a review of national policy," *BioScience* 39, no. 10 (November, 1989): 686-694.

[23] "History of Wildland Fire in Yellowstone," *NPS.gov*, last modified November 21, 2014, http://www.nps.gov/yell/naturescience/wildlandfire.htm.

[24] Thomas Bonnicksen, "Fire Gods and Federal Policy," *American Forests* (July-August, 1989): 14-16.

that phrases such as “let burn” and “natural fire” do not inspire images of intensive fire management, the research published in the preceding two decades established that this policy was not wholly without limits or reason; and that neither limit nor reason defer to deities for guidance.

The outcome of the 1988 fires was a regrouping of fire policy across the NPS and USFS. Administrators and managers did not complete the revised fire management policy plans in time for use during the 1989 fire season. Consequently, they reverted to using the suppression plans.[25] The 1988 fires had provided a strong enough feedback to cause the decision-making process to evaluate new inputs and reassess its policy. A new stakeholder had also become apparent during the 1988 fires: that of the media and public, which demonstrated that they could and will influence policy-makers and that they have a stake regarding whether the management of YNP will focus on its function as a park or an ecological preserve. YNP must continue to address both demands as the fire-regime recycles itself and prepares to create more disruptive feedback into the decision-making system.

Easton’s model adequately addresses this 20-year span in the park’s history. It is difficult to identify all of the inputs into a decision, but as long as major themes are identified, Easton’s model works. An unforeseen strength of Easton’s model is that new stakeholders can be identified through the feedback mechanism. Extreme negative or positive outcomes can affect new groups and the feedback they generate will cause repercussions in the process. The simplicity of Easton’s model allows us to frame the process but also address new developments.

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[25] Schullery, 693.

CHAPTER FOUR: THE ARCHAEOLOGY OF WILDLAND FIREFIGHTING

During the summer of 2005, I worked for my father's company, Pioneer Environmental Services, Inc., on a reclamation project at the JY Ranch located south of Moose, Wyoming. The ranch, now known as the Laurance S. Rockefeller Preserve (LSRP) and part of Grand Teton National Park, consists of 1,106 acres of land that the Rockefeller family managed as a private dude ranch for over 70 years. In 2001 Laurance S. Rockefeller announced his intention to give the land to the National Park Service (NPS) as a turnkey operation complete with visitor's center, exhibits, interpretive features, a trail system with elevated walkways and footbridges, and some features accessible under provisions of the Americans with Disabilities Act (ADA). However, before Rockefeller gave the LSRP to the NPS 29 buildings and foundations were removed from the property, the existing paved and unpaved access roads and most of the horse/hiking trails were obliterated and reclaimed to pre-disturbance conditions, and a new trail system with complete bridges, rest/contemplation areas, and elevated walkways was built. For reference, the entire JY Ranch and its amenities were photographed and surveyed using GPS methods. The photographs of the buildings and their architectural plans are in the book *JY Ranch: Historic American Buildings Survey Documentation,* published by the Estate of Laurance S. Rockefeller. The book reveals the expansive estate that once existed by Phelps Lake and the surrounding area. Today the casual visitor will likely be unable to identify where buildings had been located. The reclamation processes involved smoothing grades, planting trees, shrubs, and other herbaceous plants, rolling rocks and logs into place, filling in foundations, and removing any sign that this area was once the site of an exclusive dude ranch.

This was my first exposure to reclamation and the process is not unlike that which modern firefighters use to remove evidence of firefighting. This hands-on experience gave me an appreciation for well-done reclamation work and an eye for failed reclamation attempts that would require remedial effort. It was with this background that I conducted my field research in Yellowstone National Park (YNP) during late July and early August of 2014.

I selected six fire sites based on time, location, traceable records, and suppression tactics. The fires include the 1931 Heart Lake Fire, 1939 Astringent Creek Fire, 1943 Lewis Lake Fire, 1954 Kiewit Fire, 1966 Buffalo Plateau Fire, and the 1988 North Fork Fire. I surveyed three of the fire sites (Lewis Lake, Kiewit, and North Fork) in the field and used Google Earth to analyze the remaining three sites (Heart Lake, Astringent Creek, Buffalo Plateau). The three remotely surveyed sites are in distant regions of YNP and which the park often closes to public access as precautions for bear management.

I started my research by spending a week at the Heritage and Research Center located in Gardiner, Montana. The Heritage and Research Center houses the archives for YNP, which includes a collection under call number RG 03 entitled Fire Management Records 1919-Present. The 1988 fire season collection is under the call number RG 03-1988 since the archival material associated with that fire is extensive. These collections are where I was able to find the Individual Fire Reports for the six fires selected for this study. Every wildland fire in YNP has one of these Individual Fire Reports that details important timeline information, suppression efforts, and costs. Some of these reports include hand-drawn maps detailing where firelines are located and what areas burned. Larger fires, or those ignited under unusual circumstances, will often have a detailed narrative that accompanies the

report. I made photocopies of these reports and took them into the field. Using the maps, township and range coordinates, and narratives, I was able to locate the sites of the three fires I wanted to survey. After locating the sites, I attempted to identify the boundaries of where the fire burned. These boundaries are the most probable areas to contain material goods or evidence of firefighting since that is where the firelines likely were. While evidence of a wildland fire might be extensive, the human aspect of the fire is on the periphery of the burned area. I then set to work hiking the periphery and sometimes inside the burned areas looking for saw marks, sterile soil, rehabilitation efforts, markers, erosion barriers, discarded equipment, and trash. I photographed features and artifacts and recorded their location using a GPS. After my fieldwork, I used Google Maps to map out the location of the photographs I took and built an overhead picture of what the fire site looks like today.

The photos I took at the three sites that I visited document the state of regrowth of vegetation and the remaining evidence of firefighting. The goal was to demonstrate how fast the archaeological evidence of firefighting deteriorates from the landscape despite the presence of sometimes hundreds of firefighters on a particular fire. The camps created by firefighters might be occupied for a few days or months depending on the size of the fire and the success of its containment. Many of the sites have burned multiple times, especially during the 1988 season when large swaths of forest were all reduced to the same ecological state of regrowth. This made differentiating regrowth in tree stands exceptionally difficult. Several of the photos provide a clear visual separation of burns that compare favorably with burn reports. Other photos demonstrate the difficulty of trying to locate the site of a fire and document where the roads, trails, fire lines, camps, and logistical centers were located, especially if the site is older than 40 years.

HEART LAKE FIRE, 1931

Heart Lake is located on the south end of YNP at coordinates 44° 16'01N, 110° 29'07W. It holds the distinction of being the second largest fire in the park's history with a total of 18,756 acres burned from July 17 to August 17, 1931.[1] At its height, 678 people were involved in suppressing the fire. Fire Control Expert John D. Coffman personally visited the fire on July 20, 1931, to inspect the suppression efforts.[2] Coffman was essential in revamping the National Park Service's fire program in 1928 and a major fire in Yellowstone drew his immediate attention. His impact on NPS policy is covered in Chapter Two.

The Heart Lake fire is also unique in its use of aircraft to map the location of the fire. Observer Howard Flint and pilot H. Wakefield conducted two flights over the fire, one on July 21 and the second on July 24, and were able to map the burn area of the fire and depict where the firefighting camps were located. While landscape archaeology is the method best suited to this research, the locations of the firefighting camps depicted on Flint's map could be potential sites for actual excavation. These sites would provide excellent areas for research for those interested in the material culture associated with 1930s firefighting. This material would likely include camping equipment, food related refuse, firefighting tools, and possibility horse/mule related tackle since that was the method of moving equipment into remote regions of the park.

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[1] Individual Fire Report for Heart Lake, November 24, 1931, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1931," Yellowstone Research Library.

[2] Letter, Roger W. Toll to Director, National Park Service, August 3, 1931, RG 03, Series 3, Box 6 "Final Fire Records for 1931," Yellowstone Research Library.

Three maps are useful in understanding the Heart Lake Fire. The first map is Flint's map (Figure 3) that he drafted following the overflight of July 24. The map includes the most likely ignition point of the fire, which was next to Basin Creek. Flint depicted 11 camps that were situated upwind of the fire or used Heart Lake as a barrier between the camp and the head of the fire.[3] At least three of the camps were located in areas that burned over, such as McCarty's Camps on July 21 and July 22 (Figure 3). The second map is the fire history map located in the Fire Management Plan (FMP) of Yellowstone, which is not included in this thesis due to its size.[4] This map is invaluable in understanding what areas of the park have burned and in identifying what areas have frequent fires. The Park declared that the Heart Lake fire was out on August 17, which explains why Flint's map shows a smaller burn area of the fire. A common observation concerning the fire history map is that early fires have very well-defined areas. In contrast, depictions of the 1988 fires are presented on a small scale, showing large swaths of the Park with hatch marks that denote burning. Lakes are included in the 1988 burns, which demonstrate a lack of attention to detail concerning YNP's largest fire.

[3] Copy of Howard Flint's Airplane Map of Fire Area, 4:45PM, Friday, July 24, 1931, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1931," Yellowstone Research Library.

[4] US Department of the Interior, National Park Service, *Yellowstone National Park 2014 Fire Management Plan*.

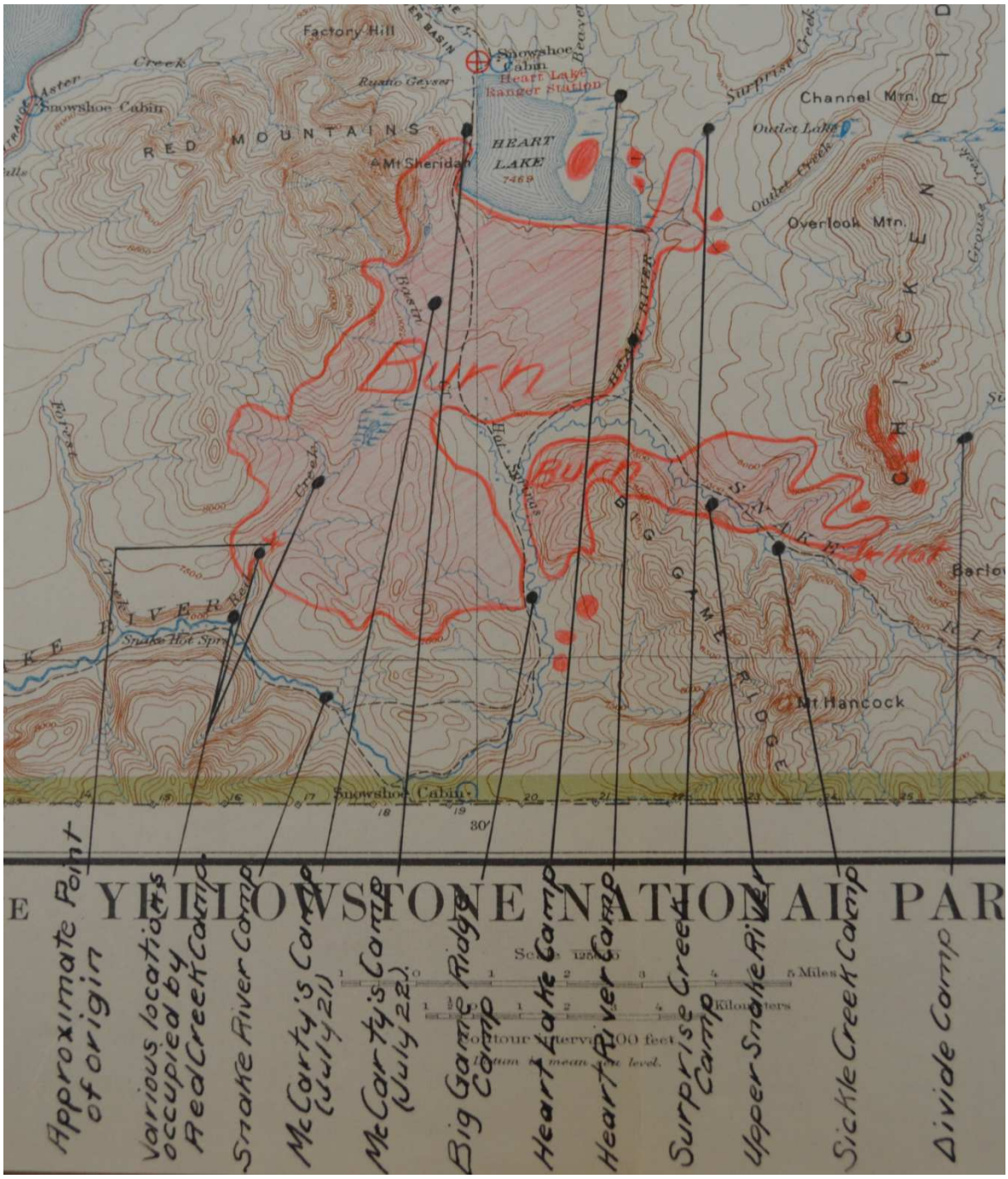

Figure 3. Flint's July 24 Map of the Heart Lake Fire.
Source: Copy of Howard Flint's Airplane Map of Fire Area, 4:45PM, Friday, July 24, 1931, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1931," Yellowstone Research Library.

Satellite photography that is available on Google Earth illustrates the results of these fires and is the third map. The Heart Lake area burned again during the 1988 fires and the detail provided on the fire history map corresponds with what is visible today. In particular,

the lowland area south of the lake has two large fingers that originate from the southwest and point to the northeast. This is where the fire of 1988 meets the fire of 1931 (Figure 4, arrow pointing at northern finger). Knowing the fire history of the area allows an observer to see this distinction between the two fires.

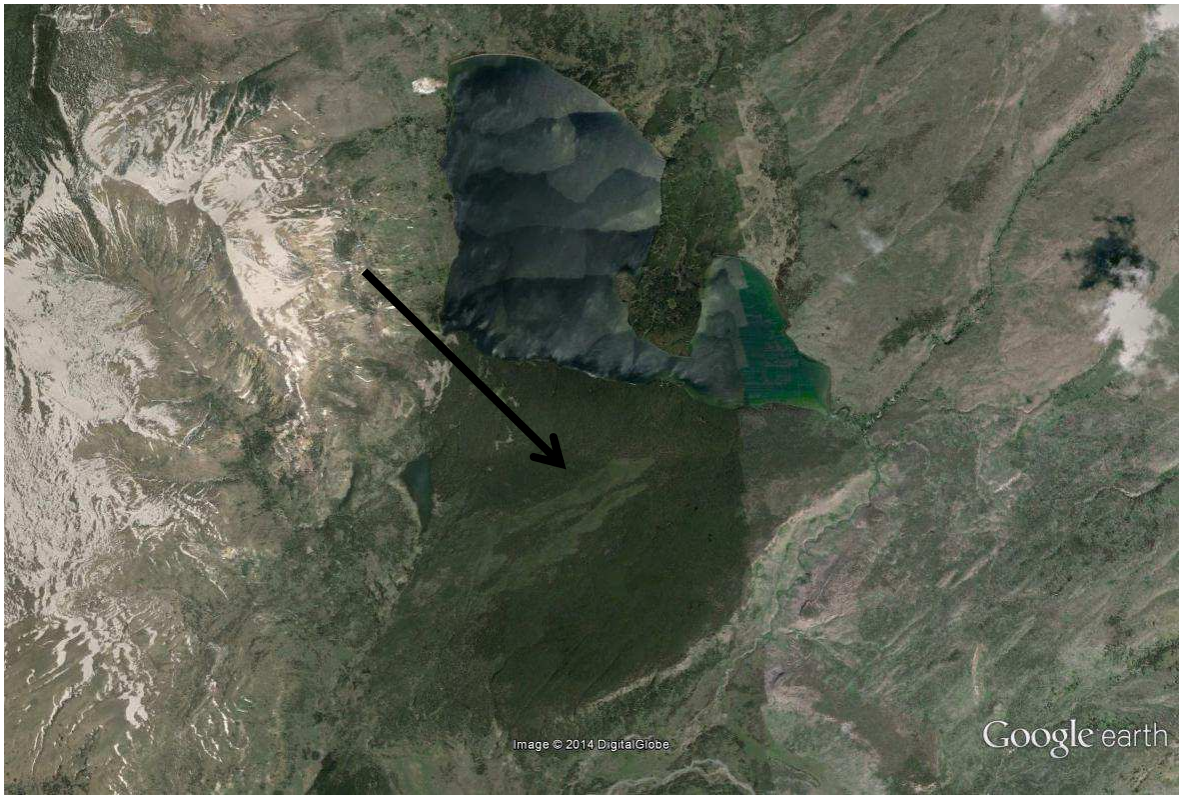

Figure 4. 2014 Imagery of Heart Lake Area.
Source: Google Earth, DigitalGlobe, 2014.

The Heart Lake fire is a classic fire of the 1930s. With only basic hand tools at their disposal, the men that fought the fire had to use pack animals to get their camp gear and tools into the area. Photos of the pack train of horses made it into the *Annual Report of the Director of National Park Service to the Secretary of the Interior* for that year.[5] The Heritage and Research Center has a collection of photographs covering the firefighting

[5] US Department of the Interior, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1931 Volume I*, (Washington, D.C.: United States Government Printing Office, 1931), 29.

efforts. One of the photographs shows men next to Heart Lake cutting down trees in an effort to prevent a crown fire from continuing to the north. Trees exposed to a fast moving crown fire often had burnt canopies with some needles remaining on the tree. Given another field season, this area could provide even more evidence of firefighting. However, environmental factors restrict access to the area. Heart Lake is a Bear Management Area and off-limits annually April 1 through June 30, with additional restrictions at other times of the year.[6] It is also a 9-mile hike from the nearest road and is typically a stop on longer backcountry excursions to remote parts of the Park.

ASTRINGENT CREEK FIRE, 1939

While the fire is named after Astringent Creek, the fire primarily burned around White Lake which is located 44° 39'06N, 110° 16'22W just to the east of the center of the park. The fire consumed 1,561 acres from July 15 to August 1, 1939. Lighting sparked the fire that thrived in the "dense stand of mature Engelmann spruce, lodgepole pine, and alpine fir" that occupied much of the area.[7] While this fire is significantly smaller than the Heart Lake fire of eight years prior it actually had more people involved in suppression.

Seven hundred and ninety nine people are reported to have been engaged in firefighting efforts according to the fire report that breaks down personnel into 23 park officers and 776 "others."[8] The "others" that are listed in the report are Civilian

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[6]National Park Service, "Backcountry Trip Planner," *NPS.gov,* accessed February 9, 2015, *www*.nps.gov/yell/planyourvisit/backcountrytripplanner.htm

[7] Letter, Superintendent to Director, National Park Service, September 20, 1939, RG 03, Series 3, Box 6 "Final Fire Records for 1939," Yellowstone Research Library.

[8] Individual Fire Report for Astringent Cr., September 19, 1939, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1939," Yellowstone Research Library.

Conservation Corps (CCC) enrollees. These enrollees make up the majority of the personnel involved with the fire. CCC enrollees were typically untrained in firefighting but an experienced ranger guided them in suppression efforts. Hal Rothman argued in his book *Blazing Heritage: A History of Wildland Fire in the National Parks* that there are two periods in national park history when complete fire suppression was possible. One of those periods was during the 1930s when the CCC provided the bulk of cheap labor to combat every fire.[9] The other was during the Mission 66 project mentioned in Chapters Two and Three. This fire illustrates the implementation of the New Deal and the CCC in YNP. Chapter Two covers this period and the changes to the park that occurred during the New Deal era.

Whereas the Heart Lake fire suffered from a lack of firefighters, the Astringent Creek fire suffered from lack of equipment to furnish to the large firefighting force. YNP rangers secured additional equipment from the United States Forest Service (USFS) to outfit 500 of these CCC enrollees. They also had to revert to using obsolete blanket bedrolls instead of the new kapok-filled bedrolls.[10]

Equipment shortages and a large workforce did not stop the crews from erecting six fire camps and two base camps. Two of the fire camps were located on the shores of White Lake; one on the east side on a peninsula and the other on the south end. The other camps are around Tern and Fern Lakes to the north. Firefighting personnel created base camps south of White Lake along the trail in order to supply the firefighters (Figure 5).

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[9] Hal Rothman, *Blazing Heritage: A History of Wildland Fire in the National Parks* (Oxford: Oxford University Press, 2007), 97.

[10] Individual Fire Report for Astringent Cr., September 19, 1939, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1939," Yellowstone Research Library.

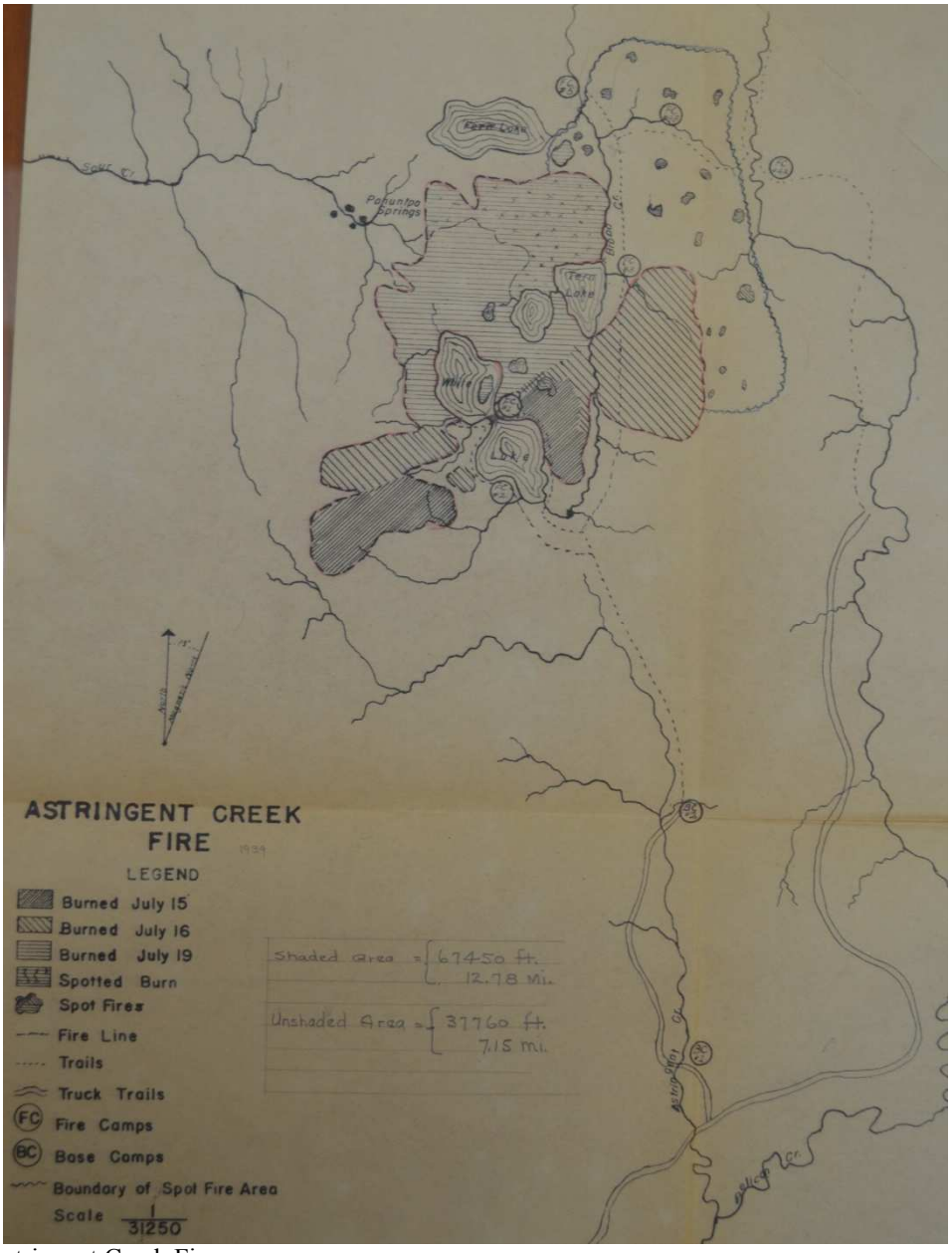

Figure 5. Astringent Creek Fire.
Source: Individual Fire Report for Astringent Cr., September 19, 1939, RG 03, Series 3, Box 6, Folder "Final Fire Records for 1939," Yellowstone Research Library.

The Astringent Creek fire is an excellent example of a New Deal era fire. While comparatively small in acreage burned, the large workforce demonstrated that suppression was possible with a large enough labor pool. This supports Rothman's thesis that complete fire suppression was possible during the New Deal with the aid of CCC labor. Excavation of the fire camps, particularly those around White Lake, could lend some understanding of

what material goods CCC firefighters carried into the field, but the major point of study for this fire is comparing the acres burned with the personnel detailed to fight it.

LEWIS LAKE FIRE, 1943

Lewis Lake is located at 44° 18'19N, 110° 37'50W in the southern region of YNP. On the southeast corner of the lake is the Lewis Lake Campground and boat ramp, which I used as my base of operations for my second field trip. The Lewis River flows in from the north and exits to the south of the lake. Lewis Falls is a popular attraction and a viewing area is located where US Highway 89 crosses the Lewis River.

On July 27, 1943, a lightning strike ignited a stand of trees a mile west of the Lewis Falls viewing area. Southerly winds drove the fire north towards the lake. Eventually the fire spotted to the east side of Lewis River, which threated to burn north into the campground or south into the viewing area. Ninety-seven men were dispatched to extinguish a fire that eventually consumed 335.2 acres.[11]

In the four years between the Astringent Creek fire and the Lewis Lake fire the labor force changed dramatically. Military or national defense occupations absorbed the labor force of young men previously utilized by the NPS. As a result, YNP had to look to alternative sources of labor to combat wildland fires. In the case of the Lewis Lake Fire, Japanese internees from the Heart Mountain Relocation Center fought the head of the fire on the west bank of the Lewis River. According to the fire report:

[11] Individual Fire Report for Lewis Lake Outlet, September 28, 1943, RG 03, Series 3, Box 6, Folder "1942-1943," Yellowstone Research Library.

> This was a regular line construction job and so long as the fire was burning briskly close at hand the Japs worked very hard. However once the line was built and mop up began, they seemed to lost [sic] interest. Thus they were released and mop up completed by N.P.S. crews.[12]

Other fires during World War II that used internee labor actually divide hours along racial lines. The Miller Creek No. 1 Fire of 1943 is a good example of this with 2349.25 Japanese man-hours and 91 Caucasian man-hours (presumably NPS staff).[13] While the CCC had been disbanded, this new labor force allowed YNP to continue suppression efforts that had started under Coffman's revamping early in 1930s.

Despite an exhaustive search on the west side of Lewis River, I was unable to locate evidence of firelines cut by the Japanese internees. Handcut firelines vary depending on the dominant fuel but they do follow some guidelines. A fireline is typically a one to three foot wide ditch dug down to mineral soil.[14] The width of a fireline is determined by the dominant fuel and usually the line is one and one half times as wide as the height of the dominant fuel. The presents a problem in lodgepole pine forests since the trees can reach heights of over 80 feet.[15] To avoid digging a 120 foot wide ditch firefighters will dig a one to three foot wide ditch and attempt to clear or minimize the fuel present between the ditch and the fire. They will also remove overhanging branches that might allow the fire to cross over the fireline.

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[12] Ibid.

[13] Individual Fire Report for Miller Creek No.1, August 11, 1943, RG 03, Series 3, Box 6, Folder "1942-1943," Yellowstone Research Library.

[14] National Wildfire Coordinating Group, *Wildland Fire Suppression Tactics Reference Guide*, (Boise, ID: National Interagency Fire Center, April 1996), 29-35.

[15] James E. Lotan and William B. Critchfield, "Lodgepole Pine," accessed Febuary 9, 2015, http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/pinus/contorta.htm

When fighting a fire on a hill, the depth of the ditch becomes more important since it may need to stop burning logs from rolling downhill. The fireline constructed on the west side of Lewis River should resemble the firelines mentioned above.

The small spot fire that burned on the east bank of the river provided to be quite useful. The burn history map of YNP has the area west of the river as the site of three fires (1943, 1946, and 1988), but the east side only has the 1943 and 1988 burns. Figure 6 was taken from the west side of the river and shows the eastern side of Lewis River.

Figure 6. East Side of Lewis River.
Source: Taken by author August 15, 2014.

One could understandably assume that the 1988 fires obliterated any environmental evidence of the 1943 fire. However, large stands of lodgepole pine survived the 1988 fires and are apparent in the Figure 6. These stands are located next to wetland areas and this source of moisture might have been enough to lessen the ignitibility of those trees. One

particular stand located to the right of Figure 6 and more precisely centered in Figure 7 (arrow pointing towards boundary) is the stand that burned in 1943.

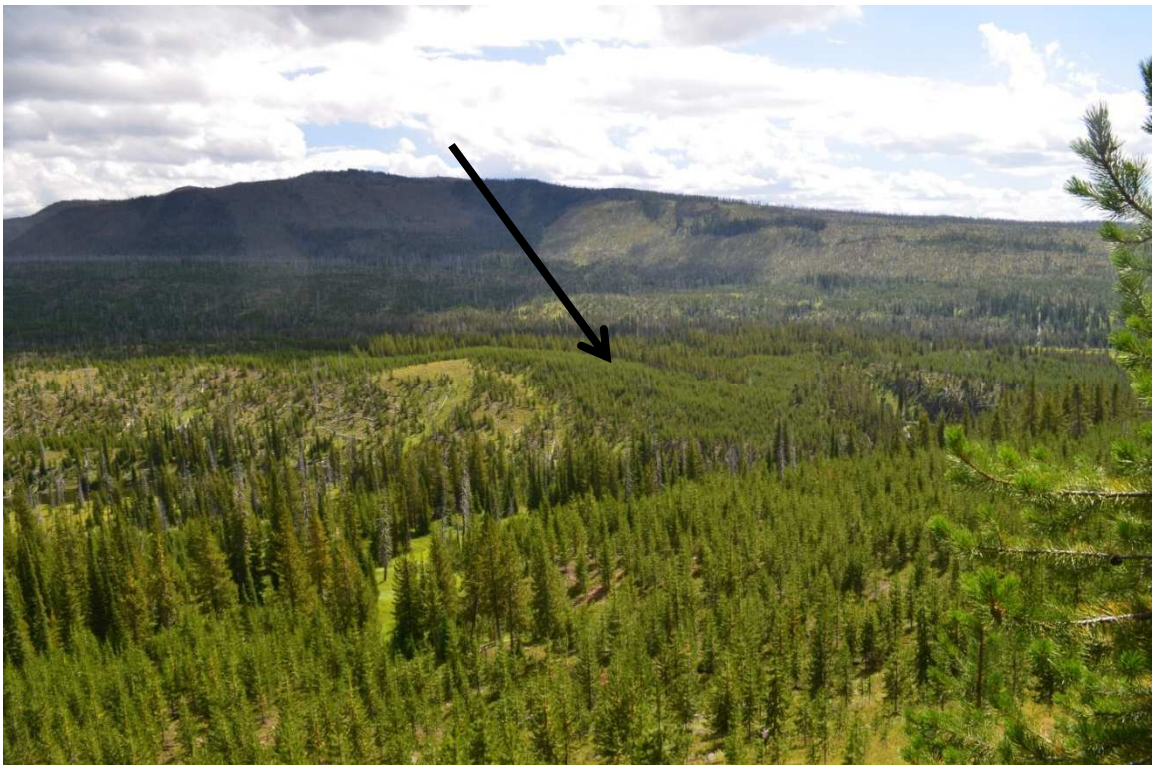

Figure 7. East Bank of Lewis River Photograph Centered on Regrowth Areas.
Source: Taken by author August 15, 2014.

Essentially, there are three stands of trees located in this one area: regrowth from the 1988 fire, regrowth from the 1943 fire, and a stand that has not experienced a major fire. The unburned stand is located in a wetland area, which is likely the environmental factor that has kept this stand of lodgepole pines unburned despite two fires in close temporal proximity. Figure 8 shows a tree, located at 44° 16'10.60N, 110° 38'2.50W, with two basal fire scars. A fire scar occurs when a fire destroys the cambium layer of a tree by raising the temperature to 60° C or by burning away the bark exposing the cambium layer to insects/infection.[16] This effectively stops tree growth on that side of the tree but the tree may

[16] Joe R. McBride, "Analysis of Tree Rings and Fire Scars to Establish Fire History," *Tree-Ring Bulletin* 43, (1983): 51-67.

survive and continue to grow by using the unaffected cambium. This tree would have been on the eastern edge of both the 1943 and the 1988 fires; the side with the scarring is roughly the side that would have been exposed to the flames.

Figure 8. Basal Fire Scarred Tree.
Source: Taken by author August 15, 2014.

However, the evidence presented thus far only demonstrates a few of the environmental indicators of wildland fire. The real focus of this research is the lasting human impact of wildland fire management. While it is not mentioned in the Individual Fire Report, Roy Renkin, a Supervisory Vegetation Specialist with the Yellowstone Center for

Resources, asserts that at least one bulldozer stopped the Lewis Lake Fire from proceeding north towards the campground. He provided in an email an undated photograph showing the non-rehabilitated bulldozer-cut fireline (Figure 9).

Figure 9. Lewis Lake Fire, Bulldozer-Cut Fireline, undated.
Source: Email Correspondence, Roy Renkin.

Bulldozers can quickly build a fireline but create large sterile vegetation areas since they remove the top soil. For that reason, wildland firefighters seldom use bulldozers in YNP. The perception is that using bulldozers creates a lasting and unsightly scar on the landscape that never fades away. Using Renkin's description, the Individual Fire Report, and the Fire History Map, I was able to locate the bulldozer line from 1943. Figure 10 is a photograph taken during my fieldwork and shows how the noticeable route present in Figure 9 has deteriorated and is almost unrecognizable as a fireline. Supporting the site depicted in Figure 10 as the scene of the fireline are two other artifacts.

Figure 10. Site of Lewis Lake Bulldozer Fireline.
Source: Taken by author August 15, 2014.

The large tree located to the left of the fireline in Figure 10 has a surveying stake nailed to it (Figure 11). This was likely to delineate the route approved for the bulldozer. The other artifact is shown in Figure 12 and is located slightly to the west of the bulldozer line. A method of moving a fast moving crown fire to the surface level is to cut trees down near the fireline and have them fall towards the oncoming fire. This forces the fire to the surface level where the fireline will be more effective. Figure 12 shows a tree that has been notched in order to fall towards the fire but was not completely cut down.

Figure 11. Surveying Stake, Lewis Lake.
Source: Taken by author August 15, 2014.

Figure 12. Notching in Tree, Lewis Lake.
Source: Taken by Roy Hugie October 5, 2014.

The Lewis Lake Fire proved to be one of the more productive sites visited. I established that hand-cut firelines are impossible to locate and firelines cut by bulldozers, even if non-rehabilitated, are difficult to find unless you have ample historical information aiding in its identification. Equipment left in the field by firefighters is minimal and the physical evidence is limited to saw marks and sterile vegetation areas. The racial aspect of the labor force, and the drop in the number of people involved in suppression, speaks to the dire need for labor in YNP during World War II.

KIEWIT FIRE, 1954

A fire's name usually comes from the closest landmark to the ignition point. In the case of the Kiewit Fire, the name came from the construction company that accidently let a pile of burning debris get out of control during a lunch break. The Peter Kiewit Sons Company, which is still in operation as of 2015, built the Norris Canyon Road in 1954 that is currently in use. On July 9, six employees were tending a pile of burning debris when a strong wind pushed the fire into nearby trees and it began to spread.[17] The fire was visible from the Mount Washburn fire lookout that alerted District Ranger Dan Nelson of the building column of smoke. Nelson drove to the site only to find Kiewit employees, led by supervisor Mr. Willis, combating the blaze with the tools the construction company had on hand: gas-powered chain saws and bulldozers.[18]

The present-day Grebe Lake Trailhead, located at 44° 43'03N, 110° 32'59W, is just to the west of the point of origin of the fire. In fact, much of the Grebe Lake Trail is the bulldozer cut fireline. This makes finding evidence of the bulldozer cut fireline extremely difficult since most of it is now a trail and has been so for over 60 years. Finding hand-cut firelines is equally problematic since the hand crews worked behind and sometimes parallel to the bulldozer.[19] The Fire History Map also shows that the area burned again in 1988. The Kiewit Fire is not on the Fire History Map since it is too small (46.4 acres burned).[20]

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[17]Individual Fire Report for Kiewit Fire, RG 03, Series 3, Box 7, Folder "10-400 1954," Yellowstone Research Library.

[18] Ibid.

[19] Ibid.

[20] Ibid.

Figure 13 shows the current Google Earth imagery and Figure 14 is the hand drawn map that accompanies the Individual Fire Report. Separating the bulldozer fireline from the current hiking trail is possible in two locations. The first location, Point E on Figure 13, is the location where the bulldozer and the hand crew temporarily separated. This separation is apparent in Figure 15, which shows that the vegetation has still not recovered. A clear line exists between the forest and the meadow and the sterile soil between is where the bulldozer plowed on July 9, 1954. Visitors would likely mistake this vehicle-wide swath as an old road; however, comparing the hand drawn map with current imagery illustrates that this is actually an old fireline. This fireline along with the bulldozer fireline at Lewis Lake were the two firelines in the park that Roy Renkin referred to me because the park did minimal reclamation at either site.

Figure 13. Current Google Earth Imagery Showing Grebe Lake Trail and Points.
Source: Google Earth, 2014

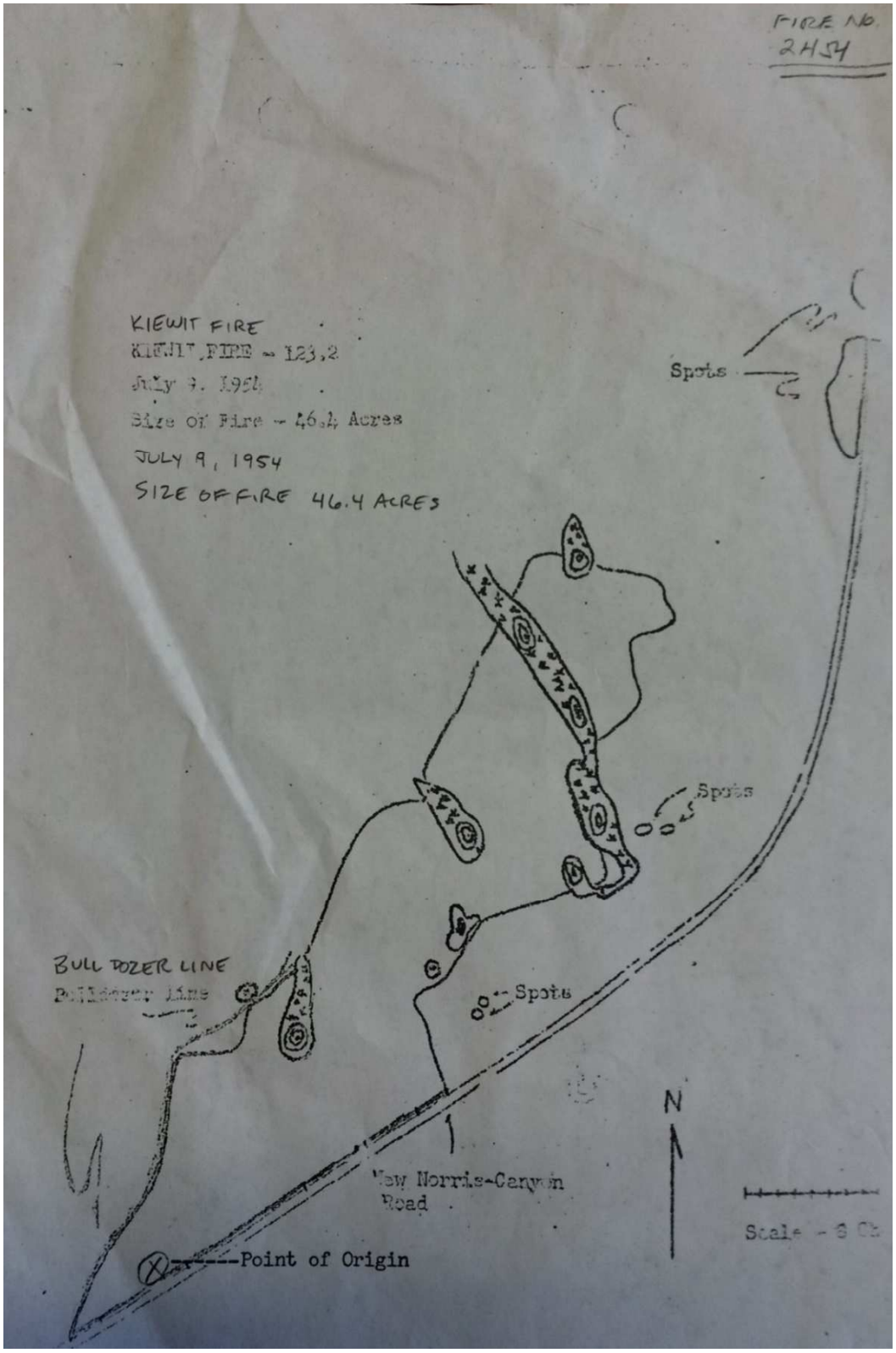

Figure 14. Kiewit Fire Map.
Source: Individual Fire Report for Kiewit Fire, RG 03, Series 3, Box 7, Folder "10-400 1954," Yellowstone Research Library.

Figure 15. Bulldozer Deviation, Kiewit Fire.
Source: Taken by author August 16, 2014.

The second location where evidence is still visible is farther up the trail where a minor deviation to the north by the bulldozer occurred. Figure 16 (Point B on Figure 11) shows the beginning of the deviation as it comes off the trail, Figure 17 (Point D on Figure 13) shows the two track path with regrowth between the two tracks, and Figure 18 (Point C on Figure 13) shows the rejoining of the bulldozer path with the trail. This is likely a turnaround point for the bulldozer since the bulldozer only built fireline for about a third of the western fireline.

Figure 16. Fireline Deviating from Trail, Kiewit Fire.
Source: Taken by author August 16, 2014.

Figure 17. Two Track Deviation from Trail, Kiewit Fire.
Source: Taken by author August 16, 2014.

Figure 18. Fireline Rejoining Trail, Kiewit Fire.
Source: Taken by author August 16, 2014.

The average Diameter at Breast Height (DBH) of the trees in Figure 16 was 13.7 cm. Based on counting tree rings for similar sized trees in the vicinity, this equates to an estimated age of 75 years.[21] The discrepancy between the 60 years that have elapsed since the fire and the estimated 75-year age of the trees is likely because the bulldozer did not have its blade dropped when it deviated from the trail. At least, the blade was not low enough to kill any saplings that were between its tracks. The bulldozer likely pushed over and killed older, larger trees but I was unable to find bulldozer blade marks on lodgepole pines in the immediate vicinity. The lack of regrowth in the two tracks also serves as evidence that the bulldozer did not have its blade completely lowered when it deviated from the trail. Comparing Figure 15 with Figures 16 through 18 allows one to understand the

[21] Don Despain, "Nonpyrogenous Climax Lodgepole Pine Communities in Yellowstone National Park," *Ecology* 64, no. 2 (April, 1983): 231-234.

difference between a track made by a bulldozer with its blade down and that with its blade up. Soil and hence regrowth are more severely affected if the blade is down whereas only the soil beneath the two tracks is heavily affected if the blade is up.

The last artifact found was a survey stake (Point A on Figure 13). I came across this stake while searching for evidence of the eastern hand-cut fireline. The stake was nailed to a burned stump and it is difficult to ascertain whether the stake was nailed to the stump before it burned or immediately after (Figure 19). The stake is charred and warped but a fire large enough to cause heavy charring on the stump would have likely consumed the stake. The stake could possibly be a marker for the eastern fireline since no other type of human activity would necessitate use of survey stakes in such an isolated area.

Figure 19. Survey Stake on East Side of Fireline, Kiewit Fire.
Source: Taken by author August 16, 2014.

Lastly, the labor used to combat this fire primarily came from the construction crews responsible for its ignition. Peter Kiewit Sons Company was actually billed for their cost for fighting the fire, totaling $496.89, since they caused it.[22] The fire report lists 105 people involved in the suppression of the fire.[23] Another source of labor came not from the construction company or the NPS but from a Blister Rust Control (BRC) crew operating nearby. White Pine Blister Rust was a major concern in YNP during that period, and it is foreseeable that a crew dedicated to controlling the disease would be working in the Park that summer.[24] A non-native fungus (*Cronartium ribicola*) grows on trees and creates the reddish blisters that blister rust is named after.[25] Over the course of several years, the blisters destroy the cambium layer of the tree, effectively stopping the movement of water and nutrients and killing the tree. Since the tree is dead and exceptionally dry, blister rust creates forests that are extremely susceptible to large stand-replacing fires.

To the west of the Grebe Lake Trailhead, evidence of the BRC program still exists. Figure 20 shows an example of the tree tags used to delineate BRC areas. The tag on the left has "BRC BOUNDARY N11W" etched into it while any etching or marking on the tag on the right is no longer legible.

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[22] Letter accompanying bill by Warren F. Hamilton, Acting Superintendent of Yellowstone National Park dated October 12, 1954, RG 03, Series 01, Box 1, Administrative Correspondence, 1924-1972, Folder "1954," Yellowstone Research Library.

[23] Kiewit Fire Report, Yellowstone Research Library.

[24] US Department of the Interior, *Annual Report to the Director National Parks Service and the Secretary of the Interior for the fiscal year ended June 30, 1954*, (Washington D.C.: GPO, 1954): 350.

[25] "White Pine Blister Rust," *fs.fed.us*, accessed on February 9, 2015, http://www.fs.fed.us/rm/highelevationwhitepines/Threats/blister-rust-threat.htm

Figure 20. BRC Boundary Tags, Kiewit Fire.
Source: Taken by author August 16, 2014.

The Kiewit Fire is an anomaly in firefighting in YNP. It is one of the few to incorporate bulldozer-cut firelines into its suppression and for a yet undiscovered reason the Park did not rehabilitate the site. One possibility is that the bulldozer cut fireline was remade into the Grebe Lake Trail to minimize the impact. While I was able to find evidence of firefighting with the aid of historical documents, it was not an easy task. Sixty years of time, weather, and regrowth have lessened the impact of the fire and the firefighting crews. It is also easy to mistake firelines for old roads unless one is familiar with the history of the area. The labor used to combat wildland fires in the 1950s continued to come from sources other than the NPS. With no CCC enrollees or Japanese internees, YNP made do with available labor in the form of construction and BRC crews.

BUFFALO PLATEAU, 1966

Blister Rust Control crews made another appearance in the firefighting records in 1966 when a total of 60 men from BRC crews hiked into one of the more remote regions of YNP to fight a small fire. While the Buffalo Plateau Fire was small in size, only 128 acres, the equipment used was some of the most technologically advanced equipment the NPS had at their disposal. Located on the north border of the park at 45° 1'28"N, 110° 16'39"W the Buffalo Plateau Fire required the use of retardant dropping aircraft, smokejumpers, cargo aircraft, helicopters, and packhorses.[26]

An observer at the Mount Holmes fire lookout saw the lightning-sparked fire on July 24, which initiated a response from Park Ranger and Fire Boss Ted Weight who flew to the scene of the fire by helicopter. Weight, along with five smokejumpers made the initial attack on the fire. Smokejumpers are firefighters that are specially trained and equipped to strike at remote backcountry fires via parachuting from aircraft. Essentially, they are the rapid response force for wildland firefighting. The next three days saw the arrival of the 60 BRC, 25 maintenance personnel, 82 Forest Service firefighters, 2 hotshot crews, and additional smokejumpers. Hotshot crews are similar to smokejumpers but do not deploy via aircraft. They are typically very experienced and physically fit firefighters accustomed to working in remote locations with little external support. Transportation to the base camp, located at Slough Creek Campground (44° 56' 54"N, 110° 18' 30"W), was via bus, but from the campground helicopters served as the primary means of reaching the fire.

[26] Individual Forest Fire Report for Buffalo Plateau, RG 03, Series 3, Box 7, Folder 10-400 1966, Yellowstone Research Library.

Retardant-dropping tankers flew from Cody, Wyoming, and Missoula, Montana, to deliver their loads on the fire. Missoula was also the point of origin for the smokejumpers that entered the fray on July 27. The Forest Service personnel came from the station at Gardiner, Montana. While the maximum number of personnel fighting the fire never exceeded 187, it is the diversity, short response time, and the mobility of the crews that set this fire apart from earlier fires.[27] The ability to quickly mobilize and strike at a backcountry fire became a reality in the 1960s. Speed and efficiency made the Buffalo Plateau fire small in acreage and low in personnel involved. Weight mentions in his summary:

> The helicopters that shuttled men and equipment in and out of the fire area added much to curtailing the size of the fire. The added expense of this type of equipment is justifiable, in my opinion because of getting needed men and equipment on the fire when you need it, the men are fresh when they get to a remote fire and are ready to work. Pack trains are still fine in getting equipment out from the fire area as at this time, the element of time is not the big issue.[28]

Buffalo Plateau represents the apex of fire suppression in YNP. The immediate mechanized response and reliance on aircraft to not only suppress the fire but to supply firefighters is comparable of military strategies being implemented in Southeast Asia that same year. A diverse workforce with supporting technology made firefighting in the 1960s possible in YNP. The rapid mobilization of highly trained smokejumpers and hot shot crews is how YNP kept fires small with minimal acreage burned.

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[27] Ibid.

[28] Ibid.

NORTH FORK FIRE, 1988

The 1988 YNP fires are popular to research while exploring wildland firefighting history. While the historical record provides accounts of larger and deadlier fires, few fires have inspired the amount of controversy, concerning national park management. The previous chapter discusses the 1968 decision to allow natural fire in YNP and further explains how this policy went unchallenged until the 1988 fires. One of the fires that challenged the natural fire policy was the North Fork fire.

Ignited by a cigarette discarded by a man cutting firewood in Targhee National Forest on July 22, 1988, the North Fork fire was immediately suppressed once discovered but quickly spread inside the park boundaries.[29] It met the criteria of being a non-naturally ignited fire but it also occurred a week after the park had suspended the natural fire policy and embraced suppression of all fires inside the park.[30] One of the most important areas of the fire is the area to the east of the town of West Yellowstone, MT.

While the fires of 1988 consumed vast expanses of forests inside the Park, it failed to incinerate many structures. When West Yellowstone came under threat of the North Fork fire, that scenario became a strong possibility. Dan Sholly, Chief Ranger of YNP during the 1988 fires, describes in an interview how the town of West Yellowstone and others requested 300 miles of bulldozer cut firelines during that fire season. Ultimately, only a little

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[29] Karen Wildung Reinhart, *Yellowstone's Rebirth by Fire: Rising from the Ashes of the 1988 Wildfires* (Helena, MT: Farcountry Press, 2008), 43.

[30] Rothman, *Blazing Heritage*, 160.

over 30 miles met with approval.[31] Saving the town of West Yellowstone and stopping the fire from burning outside of the park were two major priorities facing firefighters in mid-August 1988. Firefighting crews sought to stop the fire by constructing fireline by hand, using bulldozers, and implementing roads already in place. They also used a tactic called wet lining, which involves spraying water on the surface to saturate the burnable material and slow the advance of the fire.

All three types of line are present in the area south of the West Entrance Road 2.6 miles past the present park entrance and a mere three miles from the town of West Yellowstone. Firefighters planned to use the Madison River, burnout areas, and wetlines to stop the fire north of the West Entrance Road but south of the road the fireline was an access road, handline, and dozerline in that order.[32]

The fireline starts near the westernmost pullout for the Two Ribbons Trail located at 44° 39’8”N, 111° 02’09.84”W. To the east, an observer would see a large relatively flat expanse of lodgepole pine (Figure 21) while to the west one would see the hill that firefighters built the fireline around in mid-August 1988. The access road was rehabilitated at some point and can be identified through rebar stakes (Figure 22).

[31] Dan Sholly, “Dan Sholly: No Dozer Line Ever Held,” *Wildland Fire LLC,* published March 16, 2012, https://www.youtube.com/watch?v=NrfEFkz-CM0.

[32]North Fork Fire Information, RG 03-1988, Series 7, Box 25, Folder Briefing 8/29 8/30 W. L., Yellowstone Research Library.

Figure 21. Looking East Towards YNP, North Fork Fire.
Source: Taken by author August 16, 2014.

Figure 22. Fireline Marked by Rebar, North Fork Fire.
Source: Taken by author August 16, 2014.

Figure 23. Stump with Scoring, North Fork Fire.
Source: Taken by author August 16, 2014.

The other source of evidence in identifying fireline for this area is the abundance of saw cut wood. Figure 22 not only shows a rebar stake but also the stump of a tree that was cut down to build the fireline. Figure 23 is another stump that shows evidence of chainsaw scoring to the top of the stump that accelerates decomposition. Also of note is how close to the ground the stump in Figure 23 is cut since this also accelerates the decomposition process.

Another common rehabilitation method is to "buck-up" downed trees into smaller logs shown in Figure 25. These smaller logs will decompose faster, and since they are light enough to be moved by hand, they can be arranged to obscure where a fireline was present. Figure 24 shows how logs and downed trees can be used to rehabilitate a fireline. In this case, this was the section of the fireline built on the existing access road. The road no longer

exists but the trail of rebar markers and bucked logs makes it relatively easy to identify. In addition, while rehabilitation of this section of the fireline was attempted, the fact that one can still readily identify it testifies that it was a failed rehabilitation effort. All chainsaw cut logs and downed trees within 50 feet of the old fireline are on top of it. This makes it obvious that this cluster of decaying wood is not naturally occurring. However, this area of the fireline is not viewable from the West Entrance Road and is not near any trails. It is unlikely a visitor would come across this feature. The abundance of decaying wood on the old fireline could also help replenish the sterile soil and provide the nutrients for the regrowth of lodgepole pine.

Figure 24. Rehabilitated Fireline, North Fork Fire.
Source: Taken by author August 16, 2014.

Figure 25. Bucked Logs, North Fork Fire.
Source: Taken by author August 16, 2014.

The access road and handcut fireline in this area are littered with the features explained above. Material goods are again exceedingly rare and difficult to locate but this site yielded two artifacts. The first looks like a piece of processed lumber but is likely a roughhewn piece of lumber created by an Alaskan Log Mill (Figure 26). An Alaskan Log Mill is a device that holds a chainsaw in place and allows the user to create roughhewn lumber. The lumber can then be used for structures. Given the location of this piece of lumber (44° 38’51.78”N, 111° 2’19.14”W), it seems unlikely that this would have been created for use in a temporary structure. The most plausible explanation for it was that it was a piece of scrap tossed off a vehicle or was part of a campsite used during either firefighting or reclamation efforts.

Figure 26. Alaskan Log Mill Cut Board, North Fork Fire.
Source: Taken by Author August 16, 2014.

The other artifact found was a discarded Orange Crush soda can located at 44° 39'1.08"N, 111° 2'18.96"W (Figure 27). The forest surrounding the can is an extremely dense stand of lodgepole pines that are likely regrowth from the 1988 fire. Although the color has faded, the design on the can is appropriate for 1988 through 1990.[33] Someone felling the trees on the side of the hill likely discarded the can. Numerous cut logs and stumps are located on this hillside; an example being the cut stump located 150' northeast of the can (Figure 28).

[33] "History 103: Evolution of Soft Drink Cans," *boldpost.leibold.com*, last modified February 2012, http://boldpost.leibold.com/2012/02/history-103-evolution-of-soft-drink-cans/.

Figure 27. Orange Crush Can, North Fork Fire.
Source: Taken by Author August 16, 2014.

Figure 28. Stumps near Orange Crush Can, North Fork Fire.
Source: Taken by Author August 16, 2014.

CONCLUSION

Elers Koch, Aldo Leopold, Don Despain, and Stephen Pyne are separated by decades, academic backgrounds, and services, but they all are proponents of one ideal; the ideal that fire is a source of landscape renewal and indivisible from the environment. Wildland fires will continue in YNP and the park will suppress them when necessary. The six fires mentioned in Chapter Four each illustrate a different time in the history of YNP. The labor force shifted from NPS rangers, to CCC enrollees, to Japanese internees, to professional firefighters, and occasionally whatever crews were on hand. The equipment used to combat wildland fire has evolved but essentially saws and a Pulaski remain the primary tools of wildland firefighters in the park environment. The means of getting to a fire have progressed from horses, to vehicles, to aircraft, both fixed and rotary wing. Bulldozers, while used outside of national parks, make an appearance only sparingly inside the boundaries of YNP. The physical evidence of firefighting decomposes as fast as the forest regrows and wood decays. Despite the presence of sometimes hundreds of firefighters, the landscape heals itself from the fire and the presence of humans. The remaining evidence of the fire is a topic covered extensively in life science and socioeconomic disciplines. Academic programs in biology, ecology, environmental science, and forestry cover the effects of fire on the environment.

The purpose of this research was to try to derive the human element out of wildland fire management and establish how long that element remains in the archaeological record. Ultimately, Chris Kull provided the best method of identifying the location of fires through his list of archival materials mentioned in the introduction. Using historical maps, photographs, and individual fire reports it is possible to locate a historic wildland fire sites.

Modern use of GPS devices, satellite imagery, and other remote sensing has created a historical record that can be easily revisited in order to verify the past locations of fires and efforts to control them. Researchers and historians can verify the location of past fires through finding physical evidence such as saw marks, sterile soil, and the occasional artifact but with passage of time this trail of evidence vanishes. With the exception of the occasional metal artifact, all of these sources of evidence are organic and will decompose along with the charred logs and fire-scarred trees. The older the fire, the more faded the evidence.

Environments also have a fire return interval that is a prediction of how long the wildland area will have between major fires. Even given the best modeling, it is hard to predict when a wildland area will experience another major conflagration. Young lodgepole pines can sometimes act as firebreaks, but the 1988 fires provide examples of an exception to this statement.[1] Areas burned in 1988 had burned just a few years prior. Major fires can occur in the same area in a very short timeline. Identifying the location of a fire, the regrowth that resulted, and the artifacts and evidence associated with it is difficult but accomplishable if the historical documentation is sufficient.

The catalyst for change in YNP is not the direct effects of fire, but the re-envisioning of what the park should be. This re-envisioning changes the role of fire on the Park's landscape. Easton's systems theory lays out the finer details of how fire has transformed the Park in Chapters One, Two, and Three. On a macro scale, fire was an inseparable part of the landscape until a park budget (first available in 1878) and a sufficient labor force (available

[1] D. G. Despain and R. E. Sellers, "Natural Fire in Yellowstone National Park," *Western Wildlands* 4 (1977): 4-20.

in 1886) were part of the park.[2] With a budget and labor in place, the stewards of the park could entertain the idea of trying to manipulate the landscape to suit their desired vision of the park. How fire relates to this vision of what the park should be is best explained by dividing up the park's history into eras and then applying Easton's theory.

The first period would start in 1872 and end in 1886. This is the early civilian administration of the park and fire's role on the landscape remained largely unchanged during this era compared to fire's role before the park was established. Transportation in the Park was lacking and the meager budget and workforce of the civilian administration did not lend itself to large-scale landscape management. The output of the decision making process, that of uninhibited fire on the landscape, came about more from a lack of inputs than a conscientious effort to construct such a landscape.

Once fire was identified as a detrimental environmental phenomenon, the Park moved into its next phase that lasted from the beginning of Army administration in 1886 to the 1968 decision to allow natural fire in the park. Major inputs during this era include an interest by the Army in regulating the visitation experience in the park. Permanent campgrounds and backcountry patrols are both excellent examples of the Army implementing this vision. The 1910 fires and the formation of the USFS sealed the concept that fire was a foe and one that could be combated by a civilian agency given enough resources. Even though the Army turned over administration of all national parks to the NPS, the NPS largely elected to continue the practices established by the Army. This was covered extensively in Chapter Two. Advances in firefighting technology during the first 50

[2] Haines, *The Yellowstone Story: A History of Our First National Park Volume One*, 252.

years of the NPS enabled, or in system theory terms, supported, suppression of every fire ignited in the Park.

The era between 1968 and 1988 is unique because YNP allowed fire to return to the landscape and attempted to become more of an ecological preserve than a park. Major inputs during this period were the numerous scientific studies demanding and later supporting a natural fire policy in the park. The environment permitted such a policy to be in place until a dry summer, with strong winds, and both natural and un-natural ignition sources, caused a feedback into the system. This resulted in a return to suppression until a better fire plan could be created that placed severe limitations on where and when naturally-occurring fire would be allowed to burn.

Fire is thus the biggest catalyst for change in YNP. Its very presence can be disruptive to the visitor and the Park Ranger even when both acknowledge that fire is an essential part of the landscape. We want YNP to be a usable park first, and this entails the control of fire as a basic function of the stewards of the Park. The inscription on the arch at the North end of the park, "For the Benefit and Enjoyment of the People," stresses this emphasis on visitor experience over ecological preserve. This is the current vision of what YNP should be; a wild ecological preserve that is approachable and safe to visitors. Whether or not YNP is truly an ecological preserve is beyond the scope of this thesis but Alston Chase's tome *Playing God in Yellowstone: The Destruction of America's First National Park* outlines many of the shortfalls in attempts to manage the park as an ecological preserve.[3] Examples include the reduction of beaver, elk, and wolf habitat as well discussion

[3] Alston Chase, *Playing God in Yellowstone: The Destruction of America's First National Park* (San Diego, Harcourt Brace Jovanovich Publishers, 1987).

concerning the removal of both natural and anthropogenic fire from the landscape. His argument is that YNP is a landscape managed for a specific goal. Since fire is a tool for landscape management, I have tried to demonstrate fire's role in shaping YNP for its current use. The goals associated with the management of YNP change over time.

With this in mind, Stephen Pyne's three fires model is not always a linear transition. Depending on the desired end state of a landscape, it is possible for people to revert to older relationships with fire. Recalling the three fires model mentioned in the Introduction, first fire is natural fire, fire that is neither controlled nor ignited by humans. This type of fire returned to YNP in 1968, but it is only permitted in the most remote regions of the park, far away from the roads, power lines, and visitor centers. Second fire came back to the park in 1966 with controlled burning to improve elk habitat.[4] However, since 1988 it has lost its place in the Park. YNP is recognized by the Environmental Protection Agency (EPA) as a Class 1 area subject to the Regional Haze Program.[5] This program stresses coordination between the EPA, NPS, and USFS to reduce haze to improve visibility in certain sensitive areas. Since many visitors come to National Parks for the sweeping vistas, they are subject to restrictions that seek to eliminate pollution and smoke and promote visibility. Third fire remains the staple of fire suppression. The equipment used in the field has improved since the end of WWII but the essential tools of the trade remain the same: saws and Pulaskis.

Like warfare, firefighting generates stories. Combative engagement with natural forces is similar to combative engagement with military forces. The experiences of those that go into the field are the types of stories that define human's role in an environment.

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[4] Rothman, *Blazing Heritage,* 94.

[5] "EPA's Regional Haze Program," *United States Environmental Protection Agency,* last modified May 31, 2012, http://www.epa.gov/visibility/program.html.

These stories and the physical scars that remain on the landscape help us see ourselves as either in control of our environment or at its mercy. Our desired end state for a landscape is what is going to drive us to allow or suppress fire. This desired end state fluctuates over time and leaves physical evidence and a written record in historical archives. If the idiom, “where there is smoke, there is fire” is held true, then the historical and archaeological record both smolder with possibilities.